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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.50 Browning

Synonyms:

12.7 × 99 mm

Armament

Browning M2 and M2 HB machine guns; [M85](#) machine gun; also used in Barrett, Harris and similar anti-materiel rifles; CIS 50MG.

Development

This cartridge was developed in the 1920s. Its design was greatly influenced by the German 13 mm Tank und Flieger (TuF) machine gun round. The [0.50 Browning](#) gun was originally devised as an anti-aircraft weapon, but during 1940 to 1945 it achieved prominence as an aircraft, tank and infantry support gun. Since then it has been widely distributed and adopted by almost every country outside the former Soviet Bloc. Ammunition has been manufactured in many countries but largely to US specifications, although since the 1970s several manufacturers have developed more potent rounds of their own design. The basic design was intended to extract as much performance as possible and there is not a great deal of room for improvement, except in the development of complex bullets to improve terminal effects. With the advent of widespread use of anti-matérial rifles worldwide, several manufacturers have developed match grade ammunition for use in these weapons. This ammunition is manufactured to a higher level of precision and achieves far greater accuracy than most ammunition

manufactured for use in machine guns.

Description

A rimless, brass, bottlenecked case, Berdan or Boxer primed. The standard bullet is ball, using a steel core in lead support, steel jacket and gilding metal envelope. In view of the tactical use of this weapon, AP-I and similar bullets with better terminal effects are used more commonly today.

Specifications

Ball M33

Round length: 137.8 mm

Case length: 99.1 mm

Rim diameter: 20.3 mm

Bullet diameter: 12.96 mm

Bullet weight: 42.9 g

Muzzle velocity: 887 m/s

Muzzle energy: 16,876 J

ABU DHABI

Manufacturer

Adcom Manufacturing

Type: Ball: FMJ; lead core; 45 g; MV 887 m/s

Tracer: AP-I and AP-I-T are also available but no details have been provided.

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball [FMK 1 Mod 0](#): FMJ; steel core in lead sleeve, gilding metal jacket; 45 g; MV 802 m/s

Tracer [FMK 5 Mod 0](#): FMJ; steel core in lead sleeve, tracer capsule; 43.5 g; MV 812 m/s

AP [FMK 6 Mod 0](#): FMJ; steel core; 45 g; MV 800 m/s

AP [FMK 9 Mod 0](#): FMJ; steel core; 45 g; MV 800 m/s. Fitted with electric primer and used as a subcalibre training round for the 105 mm [FMK 4 Mod 0](#) recoilless gun

Blank [FMK 7 Mod 0](#): Brass case, rose crimped

BELGIUM

Manufacturer

FN HERSTAL SA

Type: Ball [M33](#): FMJ; 43 g; V_{25} 910 m/s

Tracer [M17](#): FMJ; base tracer, red trace to >1,500 m; 42 g; V_{25} 910 m/s

API [M8](#): FMJ; AP steel core; incendiary composition in tip; 43.1 g; V_{25} 910 m/s; penetrates 15 mm steel plate of 450 Brinell at 200 m. Ballistically equivalent to [M33](#)

API-T [M20](#): FMJ; base tracer; red trace visible to >1,500 m; AP steel core; incendiary composition in tip 40.3 g; V_{25} 910 m/s; penetrates 15 mm steel plate of 450 Brinell at 200 m

APEI: This round uses a bullet with a solid steel body, supporting a heavy alloy penetrative core inside a brass jacket. The space between core and jacket is filled with a non-phosphorus explosive/incendiary

mixture. 43.5 g; V_{25} 910 m/s. The core will defeat 6-11 mm armour steel (400 Brinell) up to 1,000 m range, and will also defeat plastic armour at angles up to 80°. A 1 mm steel or 2 mm dural plate is sufficient to detonate the projectile, which occurs about 200 mm after piercing the target skin

Blank: Brass case, crimped. Cartridge weight 57.5 g

BOSNIA-HERZEGOVINA

Manufacturer

Unis Igman d.o.o.

Type: Ball M33: FMJ; 45 g; $V_{23.77}$ 887 m/s

Tracer M17: FMJ; 40.3 g, green tip; $V_{23.77}$ 872 m/s

APIT M20: FMJ; 40.2 g, black/red tip; $V_{23.77}$ 887 m/s

API M8: FMJ; 42.9 g; $V_{23.77}$ 887 m/s

Blank: Rosette crimp at case mouth

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball M2: FMJ; 45.2 g; V_{25} 856 m/s

Ball M33: FMJ, SL; steel core; 42.4 g; V_{25} 887 m/s

Tracer M1: FMJ; red trace to 1,600 m; 42.6 g; V_{25} 823 m/s

Tracer M17: FMJ; red trace visible to 1,800 m; 40.8 g; V_{25} 872 m/s

Tracer M33: FMJ; red trace; 37.8 g; V_{25} 887 m/s

AP-I-T M20: FMJ, SL; steel core; incendiary tip filler, red trace; 39.7 g; V_{25} 887 m/s

AP M2: FMJ, SL; steel core; 45.5 g; V_{25} 856 m/s

AP-HC: FMJ; alloy steel core; 49.2 g; V_{25} 830 m/s

Incendiary M1: FMJ, SL; steel sleeve; 40.8 g; V_{25} 900 m/s

AP-I M8: FMJ, AP; steel core; incendiary tip filler; 42.6 g; V_{25} 887 m/s

AP-I-HC: FMJ; alloy steel core; incendiary composition in nose; 50 g; V_{25} 830 m/s

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: Ball M2: FMJ; 44.5-44.97 g; MV 856 m/s

Type: Ball M33: FMJ; 41.4-42.9 g; MV 881 m/s

Tracer M17: FMJ; red trace visible to 1,850 m; 43 g; MV 872 m/s

AP-T C44: FMJ; tungsten carbide core; red trace, dark ignition; visible 150 to 1,200 m; 62 g; MV 785 m/s; penetration 22 mm/0°/800 m

Blank C48: Brass case, star crimped; cartridge weight 58 g

Ball: FMJ (Sniper Elite API); 48.8 g; V_{24} 880 m/s

Ball: FMJ (Sniper Elite TP-S); 45.5 g; V_{24} 880 m/s

EGYPT

Manufacturer

Shoubra Company

Type: Ball: FMJ, SL; steel core; 43.35 g; MV 860 m/s

AP-I: FMJ; steel core with incendiary filling in nose; 43.35 g; MV 860 m/s

Tracer: FMJ; dark ignition tracer, duration 2 seconds. 43.7 g; MV 845 m/s

AP-I-T: FMJ, steel core, dark ignition tracer, duration 2 seconds; 41.6 g; MV 845 m/s

FRANCE

Manufacturer

Giat Industries

Type: Ball M33: FMJ, SL; steel core; 41.7 g; MV 900 m/s

Tracer M33T: FMJ; red trace; 42.7 g; MV 900 m/s

Anti-ricochet balle O: 40.1 g; MV 910 m/s

Anti-ricochet tracer T: 40.1 g; MV 910 m/s

AP M2: FMJ, SL; steel core; 41.85 g; MV 900 m/s

AP-I M8: FMJ; AP steel core; incendiary tip filler; 42.2 g; MV 900 m/s

AP-I-T M20: FMJ, SL; steel core; incendiary tip filler, red trace; 39.66 g; MV 900 m/s

AP-I-HC: FMJ; hard core; incendiary tip filler; 51 g; MV 882 m/s

Manufacturer

SFM Défense

Type: Ball: FMJ; ? g; MV 860 m/s

Tracer: no details

AP: no details

AP-I: no details

AP-I-T: no details

Manufacturer

Anthena

Type: PPI/AP: Hardened steel penetrator, brass sabot; 48.5 g; MV 850 m/s, penetration: 13 mm RHA at 1,000 m

GERMANY

Manufacturer

Dynamit Nobel

Type: Plastic practice ball M858: This is a one-piece plastic moulded case and bullet attached to a metal extracting rim. The bullet section is solid, but the junction of the bullet section and case mouth section is weak and will shear under the pressure of the propellant gas. This is so the bullet breaks free and is fired from the weapon. The round is intended for use on scaled practice ranges and is produced to meet US military specifications. Bullet weight 3.2 g; MV 1,075 m/s. The bullet has a velocity of 850 m/s at 23.7 m from the gun muzzle and a maximum range of 700 m. The maximum effective training range is 150 m

Practice plastic tracer M860: This is similar to the practice ball round described previously but the bullet is counterbored at the base to receive a tracer filling giving a red trace from 20 to 150 m range. 3.2 g; MV 1,045 m/s

Ball, Short range: 38 g; V_{10} 905 m/s

Ball, short range tracer: 40 g; V_{10} 890 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball M33: FMJ, SL; soft steel core; sodium monohydrate point filler; 42.5 g; MV 880 m/s

AP-I M8: FMJ; manganese molybdenum steel core; point filler of incendiary composition and lead-antimony base seal; 43 g; MV 880 m/s

AP-I-T M20: As for [M8](#) but tracer in place of base seal; 40.1 g; MV 880 m/s

Tracer M17: FMJ; lead-antimony core, base tracer; 41.55 g; MV 880 m/s

Tracer (Pyrkal): Details not known; accuracy better than [M17](#); MV 880 m/s

Multipurpose: Details not known, but presumably licensed version of Raufoss design

INDONESIA

Manufacturer

Pindad

Type: Armour Piercing MU-3P: FMJ; 45.2 g; V_{25} 900 m/s

Armour Piercing Tracer MU-3PN: FMJ; 43.9 g; V_{25} 900 m/s

Armour Piercing Incendiary MU-3PB: FMJ; 41.75 g; V_{25} 900 m/s

Armour Piercing Incendiary Tracer MU-3PBN: FMJ; 40 g; V_{25} 900 m/s

Ball MU-3TJ: Soft steel core; FMJ; 45.0 g V_{25} 900 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball M2: FMJ; 45.88 g; MV 915 m/s

Ball M33: FMJ; steel core; 42.9 g; MV 915 m/s

Ball M33 Mod: FMJ; hard core; 42.5 g; MV 915 m/s

Tracer M17: FMJ; 41.66 g; MV 915 m/s

AP-I-T M20: FMJ; hard core; 40.11 g; MV 915 m/s

AP-I M8: FMJ; hard core; 42.5 g; MV 915 m/s

AP M2: FMJ; hard core; 45.88 g; MV 915 m/s

HP Test: FMJ; steel core; 42.5 g; pressure 4,700 kg/cm

ITALY

Manufacturer

Europa Metalli

Type: Ball M33: FMJ Match; steel core; 42 g; V_{24} 890 m/s

Tracer M33T: FMJ; steel core; dark ignition trace visible to >1,500 m; 40 g; V_{24} 890 m/s

AP-I M8: FMJ; steel core; 43 g; V_{24} 890 m/s. Penetration: 22 mm MS plate at 100 m

AP-I-T M20: FMJ; steel core; red dark ignition trace 40 to >1,500 m; 40 g; V_{24} 890 m/s. Penetration:

22 mm MS plate at 100 m

AP-I-HC (MD-SMI-3 type): FMJ; tungsten carbide core; 46 g; V_{24} 860 m/s. Penetration: 30 mm MS plate at 0° at 200 m

Blank: Brass case; rose crimp

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball M33: FMJ; 43 g; MV 890 m/s

Tracer M17: FMJ; dark ignition red trace to 1,600 m; 43 g; MV 870 m/s

AP M2: FMJ; steel core; 46 g; MV 885 m/s

AP-I M8: FMJ; AP steel core; 43 g; MV 870 m/s

AP-I-T M20: FMJ; steel core; incendiary tip filler, red trace to 1,600 m; 45.5 g; MV 870 m/s

NETHERLANDS

Manufacturer

Eurometaal NV

Type: AP 2000: FMJ; ballistic conformity to Ball M2, M33, API [M8](#) and so on, but with superior penetrative capability. Will effectively penetrate up to 40 mm RHA or 20 mm HHA plates at various angles and ranges. Post-armour effect is significant

API 2000: Similar armour-defeating performance to the AP 2000 but with added incendiary effect

NORWAY

Manufacturer

[Nammo](#) Raufoss A/S

Type: Multipurpose NM140: The exterior of this round conforms to the standard US M2 Ball, but the bullet is a design patented by [Nammo](#) Raufoss which incorporates penetrative, incendiary and fragmentation effects. NM140 will defeat 16 mm of armour (Brinell 360) at 30° at 400 m; after penetration it will explode and produce about 20 effective fragments inside the target. There will also be a shower of incendiary particles which are still effective 15 m behind the target plate. No mechanical fuze is used because the need for detonators or sensitive high explosives has been eliminated. Muzzle velocity 900 m/s, bullet weight 43 g

Multipurpose NM140A1: Similar to the NM140 but with some minor changes to meet a US Navy specification

Multipurpose Tracer NM160: This is the NM140 but with the addition of a base tracer element. The inclusion of this reduces the effective fragmentation by about 30 per cent but does not affect the penetrative or incendiary performance. The tracer is a dark ignition type which is invisible to 50 m from the muzzle, fully visible from 200-1,500 m

AP-S NM173: Ballistic conformity compares to US Ball M2 but is characterised by tremendous penetration effect. Penetration of 20 mm armour plate at 0° NATO at 1,000 m and 11 mm armour plate at 30° NATO at 1,500 m

AP-S NM185: Similar to the NM173 with identical armour piercing capabilities but is inert

[PAKISTAN](#)

Manufacturer

Pakistan Ordnance Factories

Type: AP-I: FMJ; hard core; incendiary filling in nose; ? g; MV 833 m/s

AP-I-T: FMJ; hard core; incendiary and tracer fillings; ? g; MV 818 m/s

ROMANIA

Manufacturer

S.N. ROMARM S.A.

Type: API (M8): 116 g

(M33): 116g; MV 925 m/s

SINGAPORE

Manufacturer

Chartered Ammunition Industries

Type: Ball M33: FMJ; 42.9 g; V_{24} 887 m/s. Conforms to MIL-C-10190

Tracer M17: FMJ; red trace to not less than 1,463 m; 41.65 g; V_{24} 872 m/s. Conforms to MIL-C-1318

AP-I M8: V_{24} 887 m/s. Conforms to MIL-C-3066

AP-I-T M20: V_{24} 887 m/s. Conforms to MIL-C-3066

APHCI: AP hard core incendiary; V_{24} 870 m/s; penetration 15 mm RHA at 500 m

SLAP: APDS subprojectile in plastic sabot; 27 g; V_{24} 1,190 m/s; penetration 25 mm RHA (321-375 BH) at 1,000 m. For use in CIS 50MG heavy machine gun only

SLAP-T: APDS as for SLAP above but with tracer to 1,370 m from gun

SRA: Short-Range Ammunition: A target practice round representing SLAP, for use in areas where the safety trace is inadequate for SLAP. Exterior ballistics match SLAP to 800 m range and fall off thereafter

SRA-T: Short-Range Ammunition, Tracer: As for SRA but simulating SLAP-T and giving a ballistic match with SRA with the addition of a trace to the required range

Blank: Brass case, rose crimp. Conforms to MIL-C-48623

SOUTH AFRICA

Manufacturer

PMP, a division of Denel (Pty) Ltd

Type: Ball: M33 FMJ; 42.4 g; V_{24} 887 m/s. Conforms to MIL-C-10190

Tracer: M17; FMJ; 29.25 g; V_{24} 872 m/s. Trace not less than 1,460 m. Conforms to MIL-C-1318

API: M8: FMJ; V_{24} 887 m/s. Conforms to MIL-C-3066. Penetrates 22 mm armour plate at 91 m

API HC: FMJ; hard core; 44.75 g; MV 876 m/s; penetrates 15 mm RHA at 1,000 m with incendiary effect

Incendiary-Tracer: Brass jacket, tracer and incendiary elements; 41.6 g; MV 876 m/s; red trace >1,700 m; penetration 10 mm RHA at 1,000 m

SPAIN

Manufacturer

SANTA BARBARA SA

Type: AP-I [M8](#): FMJ; 42.5 g; MV 895 m/s
AP-I-T [M20](#): FMJ; hard core; 40.1 g; MV 895 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball [M33](#): FMJ; 43 g; MV 890 m/s

Tracer [M17](#): FMJ; red trace to 1,500 m; 43 g; MV 870 m/s

AP-I [M8](#): FMJ; AP steel core; 43 g; MV 870 m/s

AP-I-T [M20](#): FMJ; steel core; incendiary tip filler, red trace; 45.3 g; MV 865 m/s

UNITED STATES OF AMERICA

Manufacturer

Government contractors

Type: Ball [M2](#): FMJ, SL; steel core; 46.01 g; MV 858 m/s

Ball [M33](#): FMJ, SL; steel core; 42.90 g; MV 888 m/s

AP [M2](#): FMJ, SL; steel core; 45.88 g; MV 885 m/s

Tracer [M10](#): FMJ; red trace 205-1,450 m; 41.67 g; MV 873 m/s

Tracer [M17](#): FMJ; red trace 100-1,450 m; 41.67 g; MV 873 m/s

Tracer, headlight, [M21](#): FMJ; red trace 200-500 m; 45.3 g; MV 867 m/s

AP-I [M8](#): FMJ, SL; steel core; incendiary tip filler; 42.06 g; MV 888 m/s

AP-I-T [M20](#): FMJ, SL; steel core; incendiary tip filler, red trace 100-1,450 m; 39.66 g; MV 888 m/s

Incendiary [M1](#): FMJ, SL; steel sleeve; 41.02 g; MV 901 m/s

Incendiary [M23](#): DMJ; steel incendiary container; 33.18 g; MV 1,036 m/s

Limited Range Training Ammunition (LRTA) Ball and Tracer: 45.6 g; MV 900±15 m/s

Manufacturer

Winchester-Olin

Type: SLAP [M903](#): APDS, AP subprojectile in amber coloured plastic sabot; 26.89 g; V_{25} 1,220 m/s

SLAP/T [M962](#): APDS-T, the AP subprojectile carrying a red tracer being fitted into a red coloured sabot. 26.89 g; V_{25} 1,173 m/s

AP-I [M8](#): FMJ; steel core with incendiary material in nose; 40.34 g; V_{25} 887 m/s

AP-I Mk211 Mod 0 (multipurpose): Based upon the Norwegian Raufoss NM140, made under licence. Similar performance. 43.48 g; V_{25} 899 m/s

AP-I-T [M20](#): FMJ; steel core with incendiary material in nose, red trace; 40.11 g; V_{25} 887 m/s

Ball [M33](#): FMJ; 42.77 g; V_{25} 887 m/s

Tracer [M17](#): FMJ; red trace 100-1,450 m; 40.82 g; V_{25} 872 m/s

Blank [M1A1](#): Brass case, rose crimp

Match: HPBT; 48.5 g; V_{50} 902 m/s

Manufacturer

Talon Manufacturing Company

Type: AP-I [M8](#): FMJ; 42.8 g; MV 886 m/s

API-T [M20](#): FMJ; 40.1 g; MV 886 m/s

Ball: FMJ match; 48.6 g; MV 792 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball [M33](#): FMJ; steel core, lead inner tip; 45 g; MV 887 m/s

Tracer [M17](#): FMJ; red trace, visible to >1,463 m; 40 g; MV 887 m/s

AP-I [M8](#): FMJ, AP; steel core; thermite incendiary composition in tip; 42.8 g; MV 887 m/s

AP-I-T [M20](#): FMJ, AP; steel core; base tracer, thermite composition in tip; red trace, visible from 91 to >1,463 m; 40.2 g; MV 887 m/s

UPDATED



12.7 × 99 mm rounds produced by FN HERSTAL SA, from left, Ball M33; Tracer [M17](#); API [M8](#); API-T [M20](#); APEI; Blank (1997)



Left: Olin M903 0.50 SLAP; Right: Olin M9620.50 SLAP tracer (1998)



[0.50 Browning Machine Gun](#) round

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

9 × 19 mm Parabellum

Synonyms:

9 × 19 mm; 9 mm Luger; 9 mm Patrone '08

Armament

Any pistol marked `9 × 19', `9 mm Luger' or any other synonym; the more notable being the Parabellum (Luger), Browning GP35, Beretta 92, SIG [P225](#) and so on, and pistols by Astra, Bernardelli, Star, FEG, Walther, Heckler and Koch, Smith & Wesson, Ruger and many others. Also the predominant sub-machine gun cartridge throughout the world. It has been used in revolvers (Ruger, Smith & Wesson and Manurhin, for example) and semi-automatic carbines (Marlin), though in lesser numbers. It has recently been designated by [Russia](#) as a replacement for the 9 × 18 mm.

Development

Developed in 1902 by Georg Luger in order to improve the stopping power of his pistol; the mouth of the 7.62 mm Parabellum case was widened and a 9 mm bullet was inserted to meet German Navy demand. It was adopted by the German Navy in 1904 and by the army in 1908. In its original form it used a cylindro-conoidal bullet with a flat tip. This showed a tendency to jam in early sub-machine guns and was replaced during 1917 with an ogival-shaped bullet which has remained the military standard; bullets of the original shape are still available commercially.

Since its introduction, the 9 mm Parabellum has been universally accepted and manufactured all over

the world, with the exception of the former Warsaw Pact countries, but most of these have also undertaken its production for commercial reasons and some are now producing pistols in this calibre. In January 2000, even the [People's Republic of China](#) announced the adoption of an indigenously designed 9x19mm pistol and a special high penetration cartridge for it, also an indigenous design.

Description

A rimless, straight taper case with Berdan or Boxer priming; due to its broad-based manufacture brass, steel, aluminium and alloy cases have been made and every sort of bullet has been tried. The military standard is a conventional lead-cored bullet, steel jacketed with gilding metal envelope and an ogival head pattern, weighing 7.45 g.

Specifications

British Mk 2Z Round length: 29.28 mm

Case length: 19.35 mm

Rim diameter: 9.94 mm

Bullet diameter: 9 mm

Bullet weight: 7.45 g

Muzzle velocity: 396 m/s

Muzzle energy: 583 J

Abridged ballistic table: 9 mm Parabellum, 7.45 g ball

Range	Velocity	Energy
0 m	396 m/s	583 J
10 m	390 m/s	565 J
25 m	383 m/s	545 J
50 m	369 m/s	506 J

ABU DHABI

Manufacturer

Adcom Manufacturing

Type: Ball: FMJ; lead core; 7.45 g; MV 384 m/s

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball FMK 5 Mod 0: FMJ; 8 g; MV 245 m/s

Tracer FMK 2 Mod 0: FMJ; red trace to over 200 m; 7.18 g; MV 340 m/s

[ARMENIA](#)

Manufacturer

Neutron Research and Production Company

Type: Ball: FMJ, steel core; 8 g; MV 350-375 m/s

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 8 g; MV 380 m/s

Combat match: FMJ; 7.5 g; MV 370 m/s

Ball, police `defender': JHP; 8.0 g; MV 360 m/s

Tracer: FMJ; red trace to 350 m; 7.0 g; MV 380 m/s

Frangible, non-toxic: 4.8 g bullet made from special non-toxic metal, free from Sb, Ba, Pb; MV 500±15 m/s

HP test: FMJ; 8 g; pressure >=3,200 bar

Training tracer: Special round for use with subcalibre device in Miniman anti-tank weapon. Truncated conical 5 g bullet with red tracer burning 1.5 seconds; MV 165 m/s.

FL (flat nose): JHP, 8.0 g; V₁₀ 360 m/s

EMB: FMJ, controlled expansion, 5.0 g; MV 500 m/s

BELGIUM

Manufacturer

FN HERSTAL SA

Type: Ball: FMJ; 8 g; MV 350 m/s

Blank: Brass case, rose crimp; cartridge weight 5 g

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 8.03 g; MV 384 m/s

Ball: JHP; 7.45 g; MV 400 m/s

BULGARIA

Manufacturer

Arsenal

Type: Ball: FMJ; 8.03 g; V₁₀ 380 m/s

Manufacturer

NITI Kazanlak

Type: Ball, non-lethal: Rubber bullet; 2.7-2.8 g; MV 350 m/s

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: Ball CDN Mk 1: FMJ; 7.5 g; MV 388 m/s

Ball: JHP; 7.45 g; MV 364 m/s

Ball: JHP; 9.53 g; MV 297 m/s

Ball: JHP; 7.45 g; MV 354 m/s

Blank C30: Brass case, star crimped

FX red marker: Plastic in plastic sabot; 0.5 g; MV 125 m/s; max range 100 m. Manufactured by SIMUNITION, a Division of SNC Technologies Inc for close-quarter combat training

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Ball: FMJ; 7.55 g; MV 370 m/s

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: Ball: FMJ; 8 g; MV 345 m/s

Ball: FMJ; 7.5 g; MV 376 m/s

Ball, Model DAP92 High Penetration: FMJ; 8g; MV 360m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; steel core; 7.5 g; MV 398 m/s

Ball: FMJ; steel core; 6.45 g; MV 452 m/s

Semi-wadcutter: Lead; 8 g; MV 372 m/s

[EGYPT](#)

Manufacturer

Shoubra Company

Type: Ball: FMJ; 7.45 g; MV 380 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Oy

Type: Combat ball 4319613: FMJ; 8 g; MV 355 m/s

Ball 4319200: FMJ; 7.5 g; MV 405 m/s

Ball 4319177: FMJ; 8 g; MV 320 m/s

Ball 4319181: JHP; 8 g; MV 355 m/s

Ball 4319230: FMJ; 8 g; MV 400 m/s

Police ball L434: FMJ; 3.25 g; MV 530 m/s

Combat trainer 4319208: FMJ; 8 g; MV 355 m/s

Ball: CEPP Super; 7.8 g; MV 360 m/s

Ball: CEPP Extra; 7.8 g; MV 360 m/s

Ball: CEPP Extra Subsonic; 9.7 g; MV 315 m/s

Manufacturer

[Sako Ltd](#)

Type: Ball: FMJ; 7.5 g; MV 355 m/s
Ball: FMJ 7.4 g; MV 360 m/s (non-ricocheting security)

FRANCE

Manufacturer

Giat Industries

Type: Ball BO: FMJ; 8 g; MV 395 m/s
Tracer T: FMJ; red trace; 8 g; MV 385 m/s
Subsonic ball BO SUB: 9.6 g; MV 295 m/s
Ball EXP: JSP; 5.5 g; MV 450 m/s
Plastic ball TRN: Brass case; 4.1 g plastic bullet; MV 540 m/s
Blank: Brass case, rose crimp
Blank: Plastic case

Manufacturer

SFM Défense

Type: Ball `UL': JSP; 3.2 g; MV 655 m/s
Tracer: 8 g; MV 418 m/s
THV: 2.9 g; MV 780 m/s; penetrates 2 mm steel at 7 m
Blank: Plastic case

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball DM41: FMJ; 8 g; MV 380 m/s; Sintox, non-toxic
Ball: DM51: FMJ; 8g; MV 395 m/s, Sintox
Tracer: FMJ; red trace; 7.5 g; MV 375 m/s
Ball: Solid point; Action 1; 5.4 g; MV 430 m/s, Sintox
Ball: Solid point; Action 3; 5.9 g; MV 410 m/s, Sintox
Ball: SP; 8.0 g, MV 350 m/s
Ball: PSP; 8.0 g, MV 350 m/s
Blank: Plastic, brass case.
Practice PT: Plastic; 0.42 g; MV 410 m/s

Manufacturer

Metallwerke Elisenhutte GmbH (MEN)

Type: Ball DM 11A1B2: FMJ; lead-antimony core, steel jacket, gilding metal envelope; single or double base propellant, Berdan primed, non-mercuric; 8 g; MV 395±15 m/s
Schadstoffarm: This is a special lead- and barium-free round designed for practice shooting in indoor ranges. Although the bullet is the standard lead-cored FMJ pattern, the primer cap has a special non-toxic composition which has minimal emission of lead and barium, thus considerably reducing the health hazard common with indoor ranges. 8 g; MV 385±15 m/s
Subsonic: For use in silenced arms; FMJ; lead-antimony core, steel jacket with gilding metal envelope; 9.5 g; MV 300±15 m/s fired in MP5SD sub-machine gun.
Quick Defence 1 (QD 1): This is a special bullet intended to open out very rapidly on impact, delivering maximum energy as quickly as possible. The bullet is of gilding metal, and is virtually a

hollow point type with a ball placed in the mouth of the hollow. The shape thus resembles the normal ogive and feeds through automatic weapons without causing problems. On impact the ball is driven back into the hollow, spreading the walls of the bullet to give a greater impact area. 5.2 g; MV 440±15 m/s

Quick Defence 2 (QD 2): This is similar to the QD 1 round described previously but is designed so that the deformation of the bullet and hence the energy transfer is somewhat less; 6.0 g; gilding metal bullet; MV V_{10} 420±15 m/s

QD Tracer: 6.3 g; MV 44±15 m/s; red trace to 50-70 m

QD - PEP satisfies German Police Technical Specifications; 5/9 g; V_3 420 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball: FMJ, ogival; 8 g; MV 330 m/s

HUNGARY

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ, cylindro-conoidal; 8 g; MV 360 m/s

Ball: FMJ, ogival; 8 g; MV 360 m/s

INDIA

Manufacturer

Indian Ordnance Factory Khadki

Type: Ball Mark 2Z: FMJ, ogival; 7.45 g; MV 396± 15 m/s at 18.5 m

INDONESIA

Manufacturer

Pindad

Ball MU-1TJ: FMJ; 8 g; $V_{12.5}$ 380 m/s

Ball MU-1SS: FMJ; 10.14 g; $V_{12.5}$ 300 m/s

Blank MU-1H: sound level min 90 dB

Anti Riot MU-1PHH: Plastic/Rubber Bullet; 0.75 g; V_{10} 200 m/s

IRAN

Manufacturer

State Ammunition Industries

Type: Ball: FMJ; 7.45 g; MV 385 m/s

ISRAEL

Manufacturer

Israel Military Industries (IMI)

Type: Carbine ball: FMJ; 7.45 g; MV 420 m/s
Carbine tracer: FMJ; 7.45 g; MV 420 m/s
Pistol ball: FMJ; 7.45 g; MV 325 m/s
Subsonic ball: FMJ; 10.24 g; MV 286 m/s
Subsonic ball: FMJ; 8.04 g; MV 314 m/s
Pistol ball special: FMJ; 7.45 g; MV 384 m/s
Pistol ball +P: FMJ; 7.45 g; MV 450 m/s
Carbine ball +P: JHP; 7.45 g; MV 430 m/s
Carbine ball +P: FMJ; 7.45 g; MV 420 m/s
Luger ball: JHP; 7.45 g; MV 354 m/s
Luger ball: FMJ; 7.45 g; MV 343 m/s

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd
Type: Ball: FMJ; 7.45 g; MV 335 m/s
Ball: FMJ; 7.45 g; MV 351 m/s
Ball: FMJ; 7.45 g; MV 370 m/s

ITALY

Manufacturer

Europa Metalli
Type: Ball: FMJ; lead core; 7.5 g; MV 380 m/s

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: FMJ; 7.45 g; MV 415 m/s
Ball: FMJ; 8 g; MV 390 m/s
Ball: Lead; 8 g; MV 322 m/s

Manufacturer

Government arsenals
Type: Ball M38: FMJ; 8 g; MV 305 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball 9A: FMJ; 7.45 g; MV 353 m/s
Ball 9B: JHP; 7.45 g; MV 356 m/s

[MALAYSIA](#)

Manufacturer

SME Ordnance SDN BHD
Type: Ball: FMJ; 7.45 g; MV 396 m/s

[MEXICO](#)

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 8.03 g; MV 340 m/s

Ball: FMJ; 7.45 g; MV 381 m/s

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: Ball 2Z: FMJ; ? g; MV 395 m/s

POLAND

Manufacturer

Zaklady Metalowe (Mesko)

Type: Ball: FMJ, ogival; 8 g; MV 350 m/s

Ball: JSP; 8 g; MV 350 m/s

PORTUGAL

Manufacturer

INDEP

Type: Ball M347: FMJ; lead core; 7.45 g; MV 396 m/s

Ball M419: FMJ; lead core, hardened steel jacket; 8 g; MV 396 m/s

Ball, luger: FMJ; lead core; 8 g; MV 392 m/s

Ball, training, M420: Ogival lead; 7.45 g; MV 377 m/s

Manufacturer

Prvi Partizan

Type: Ball: FMJ; 8 g; MV 390 m/s

Ball: FMJ; 8 g; MV 365 m/s

Ball: FMJ; 7.5 g; MV 407 m/s

ROMANIA

Manufacturer

Arsenalul Armatel

Type: Ball: FMJ; 7.45g; MV 380m/s

Manufacturer

SN ROMARM SA

Type: Ball: FMJ; 7 g; MV 380 m/s

Ball: FMJ; 8 g; MV 380 m/s

Manufacturer

Romtehnica

Type: Ball: FMJ; 7.45 g; MV 380 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

JSC Barnaul

Type: Ball: FMJ; 7.5 g; MV 370 m/s

Manufacturer

JSC LVE (Novosibirsk Low Voltage Equipment Works)

Type: Ball: 8.8 g; V25 350 m/s

Manufacturer

Tula Cartridge Works

Type: Ball: FMJ; 7.46 g; V10 358 m/s

SLOVAKIA

Manufacturer

Povazské strojárne Povzbroj

Type: Ball: FMJ; 7.5 g; V_{12.5} 360 m/s

Manufacturer

Technopol, Military and Police Group

Type: Ball: FMJ; 6.15 g; V₂₅ 389 m/s

Ball: FMJ; 6.15 g; V₂₅ 397 m/s

Ball: FMJ; 7.5 g; V₂₅ 348 m/s

Ball FP: FMJ Flat Point; 7.5 g; V₂₅ 350 m/s

Ball: FMJ; 7.5 g; V₂₅ 349 m/s

Ball LFN: Lead Flat Nose; 7.8 g; V₂₅ 337 m/s

Ball: FMJ; 8 g; V₂₅ 341 m/s

Ball FP: FMJ Flat Point; 8 g; V₂₅ 345 m/s

Ball: FMJ; 8 g; V₂₅ 357 m/s

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: Ball: FMJ; 7.45 g; MV 401 m/s

Manufacturer

PMP

Type: Ball: FMJ; 6.16 g; MV 405 m/s

Ball: FMJ; 7.45 g; MV 349 m/s

Tracer: FMJ; 6.95 g; MV 386 m/s

Blank: Rosette crimp

Subsonic: 8.13 g; MV 340 m/s

MONAD: FMJ, plastic ogive 3.5 g; MV 575 m/s. This bullet is designed to defeat auto glass and steel with little or no subsequent deflection

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; ? g; MV 425 m/s

[SWEDEN](#)

Manufacturer

Bofors AB

Type: HP: FMJ, lead-antimony core inside steel jacket; 6.75 g; MV 420 m/s. Designed to penetrate body armour

Ball M39B: FMJ; 6.8 g; MV 420 m/s

Practice M39: Steel ball 5.3 mm diameter held in plastic bullet. Total bullet weight 1.4 g

Ball HP: Armour-piercing steel bullet, gilding metal clad, lead core; 6.75 g; MV 420 m/s

Blank M39: Plastic bullet

Tracer FFV740: FMJ; 6 g; used in Miniman anti-tank weapon subcalibre trainer

Tracer FFV840: FMJ; 5.5 g; MV 300 m/s. Used in Carl Gustaf RCL gun subcalibre trainer

Manufacturer

Norma Precision AB

Type: Ball: Bronze, ogival; 6.7 g; MV 390 m/s

Ball 19021: JHP; 7.4 g; MV 355 m/s

Ball 19022: FMJ; 7.5 g; MV 355 m/s

Ball: Cylindro-conoidal; 7.5 g; MV 355 m/s

Ball 19026: JSP; 7.5 g; MV 355 m/s

Manufacturer

[Nammo](#) Vanasverken AB

Type: Ball HP: FMJ; 6.75 g; MV 440 m/s

Ball: 7.5 g; MV 380-410 m/s

SWITZERLAND

Manufacturer

RUAG Munition (formerly SM Swiss Ammunition Enterprise Corp)

Type: Ball: FMJ; 8 g; MV 365 m/s

Self: FMJ; 6.4 g; MV 400 m/s (lead-free projectile)

Ball Subsonic: FMJ; 9.5 g; MV 315 m/s

SeCa: JDP; 6.5 g; MV 400 m/s (lead-free projectile)

Subsonic Ball: JHP; 9.5 g; MV 315 m/s

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball: FMJ, ogival; 8 g; MV 350 m/s

UNITED KINGDOM

Manufacturer

[British Aerospace](#) Defence Limited, Royal Ordnance Division

Type: Ball: FMJ; 7.45 g; V₁₆ 395 m/s

Ball: JSP; 6.16 g; V₁₆ 425 m/s

Manufacturer

Cobra Gun Company

Type: Ball: HSA Flechette; MV 490 m/s

Manufacturer

Conjay Arms Company

Type: Carbine ball: CBXX; 6.8 g; MV 460 m/s in 254 mm barrel

Carbine AP: CBAP; 5.51 g; MV 495 m/s; penetration of RHA as for Pistol AP above; it will also drive plugs from the rear of the same material at 5.5 mm thickness. This round is no longer in production.

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: FMJ; 9.52 g; MV 290 m/s

Ball: FMJ; 8.0G; MV 320 m/s

Ball: FMJ; 7.45 g; MV 350 m/s

Ball: JHP; 9.52 g; MV 294 m/s

Ball: JHP; 7.45 g; MV 350 m/s

Ball: Lead, RN; 8.1 g; MV 320 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: FMJ; 7.4 g; MV 350 m/s

Ball: JHP; 7.4 g; MV 350 m/s

Ball +P: JHP; 7.4 g; MV 400 m/s

Ball +P: JHP; 8.0 g; MV381 m/s

Ball: JHP; 8 g; MV 350 m/s

Ball: FMJ; 9.5 g; MV 300 m/s

Ball: JHP; 9.5 g; MV 300 m/s

Manufacturer

CCI-Speer

Type: Ball: FMJ; 7.45 g; MV 350 m/s

Ball: JHP; 7.45 g; MV 351 m/s

Ball +P: 8.0 g; 371 m/s

Ball: JSP; 8 g; MV 352 m/s

Blazer: JHP; 7.5 g; MV 349 m/s

Blazer: TMJ; 7.5 g; MV 349 m/s

Blazer: TMJ; 8 g; MV 332 m/s

Blazer: TMJ; 9.5 g; MV 300 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball +P: JHP; 5.8 g; MV 457 m/s

Ball +P: JHP; 7.4 g; MV 411 m/s

Ball +P: JHP; 8.1 g; MV 381 m/s

Manufacturer

Delta Defense Inc

Type: Frangible: 5.51 g; MV 434 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: JHP; 6.2 g; MV 381 m/s

Ball: JHP; 8.0 g; MV 332 m/s

Ball: FMJ; 7.5 g; MV 353 m/s

Ball: JHP; 7.5 g; MV 356 m/s

Ball: FMJ; 8.0 g; MV 338 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: SJHP; 6.2 g; MV 412 m/s

Ball: FMJ; 8 g; MV 341 m/s

Ball: JHP; 7.5 g; MV 354 m/s

Ball,+P+: 7.45 g; MV 396 m/s

Hydra-Shok: 9.5 g; MV 320 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 5.18 g; MV 503 m/s

Ball: Glaser Silver; 5.18 g; MV 503 m/s

Manufacturer

Longbow, Inc

Type: Frangible ball: Copper powder and epoxy; 6.2 g; MV 442 m/s

Manufacturer

Mullins Ammunition

Type: Frangible ball: FMJ; 8.0 g; MV 387 m/s

Frangible ball: FMJ; 10.2 g; MV 289 m/s

Frangible ball: FMJ; 12.3 g; MV 259 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JHP; 7.45 g; MV 354 m/s

Ball: FMJ; 8 g; MV 341 m/s

Ball: FMJ; 7.45 g; MV 350 m/s

Subsonic ball: JHP; 9.5 g; MV 302 m/s

Subsonic ball: BJHP; 9.5 g; MV 302 m/s

Ball: JHP; 5.72 g; MV 457 m/s

Ball: JHP; 7.5 g; MV 381 m/s

Frangible Ball: FMJ; 6.5 g; MV 372 m/s, nontoxic

Manufacturer

Winchester-Olin

Type: Ball: JSP; 6.17 g; MV 413 m/s

Ball: FMJ (gilding metal jacket); 7.5 g; MV 352 m/s

Ball: FMJ (brass alloy jacket); 7.5 g; MV 352 m/s

Ball: JHP; 7.5 g; MV 374 m/s

Ball, nontoxic: FMJ; 7.45 g; MV 363 m/s

Ball, Ranger T: JHP; 8.0 g; MV 411 m/s

Ball, Ranger T: JHP; 9.5 g; MV 303 m/s

Ball, Partition Gold: JHP; 8.0 g; MV 341 m/s

Ball, Silvertip: JHP; 7.45 g; MV 373 m/s

Ball, Silvertip: JHP; 9.5 g; MV 308 m/s

Ball M882: FMJ; 8.03 g; V₁₆ 375 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 7.45 g; MV 343 m/s

Ball: FMJ; 8 g; MV 327 m/s

Ball: JHP; 7.45 g; MV 344 m/s

Ball: Lead, RN; 8 g; MV 328 m/s

Ball: FMJ, cylindro-conoidal; 8 g; MV 328 m/s

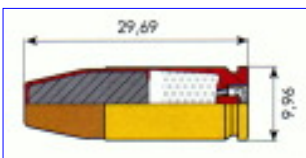
Subsonic Ball: FMJ; 9.5 g; MV 296 m/s

Subsonic Ball: JHP; 9.5 g; MV 297 m/s

UPDATED



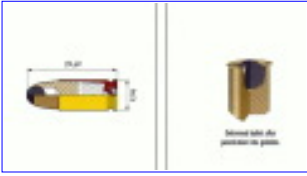
9 × 19 mm Parabellum rounds produced by FN HERSTAL with Ball (left) and Blank (right) (1997)



Metallwerke Eisenhutte GmbH (MEN) 9 × 19 mm Subsonic ball (2002)



*Hertenberger 9 × 19 mm EMB monoblok (+P) sectional view
(1998)*



*Metallwerke Elisenhutte GmbH (MEN) 9 × 19 mm Quick Defence 2 round and,
right, the bullet after deformation in gelatin
(2002)*



9 mm Parabellum

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.62 × 51 mm

Synonyms:

7.62 mm NATO; 0.308 Winchester

Armament

All weapons chambered to NATO standard dimensions; notably FN FAL, G3, [M14](#), BM59 rifles, FN MAG, L4, MG3, [M60](#) machine guns.

Development

The 7.62 × 51 mm cartridge was devised in the early 1950s as a compromise between the full-sized 0.30-06 and a proposed British 7 mm round; it is little more than the 0.30-06 with a shortened case. Improvements in powder technology allowed the new round to essentially retain the same ballistics as the 0.30-06. Despite this, many of its competitors were far more advanced. The USA used its considerable influence to override all allied objections and the 7.62 × 51 mm was made NATO standard. The 7.62 mm NATO cartridge is too powerful to be a practical assault rifle round, resulting in development of the 5.56 × 45 mm cartridge only a few years after its adoption. The 7.62 mm NATO cartridge remains in wide distribution for use in general purpose machine guns and sniper rifles.

Description

The case is rimless and bottlenecked, brass or lacquered steel, Berdan or Boxer primed. Cartridges

manufactured to the relevant NATO specification will be marked with a cross-in-circle symbol on the head, forming part of the national pattern of headstamp. The standard ball bullet is lead-antimony cored in a GMCS jacket.

Specifications

US Ball [M80](#)

Round length: 69.85 mm

Case length: 51.05 mm

Rim diameter: 11.94 mm

Bullet diameter: 7.82 mm

Bullet weight: 9.65 g

Muzzle velocity: 854 m/s

Muzzle energy: 3,519 J

Abridged ballistic table: 7.62 × 51 mm Ball [M80](#)

Range	Velocity	Energy	Drop	Elevation	Vertex
0 m	854 m/s	3,519 J	0 mm	0 mils	0 mm
100 m	778 m/s	2,920 J	79 mm	0.75 mils	20 mm
200 m	709 m/s	2,425 J	317 mm	1.6 mils	85 mm
300 m	642 m/s	1,988 J	659 mm	2.63 mils	211 mm
400 m	578 m/s	1,612 J	1,455 mm	3.77 mils	418 mm
500 m	518 m/s	1,295 J	2,456 mm	5.09 mils	730 mm

ABU DHABI

Manufacturer

Adcom Manufacturing

Type: Ball: FMJ; lead core; 9.4 g; MV 850 m/s

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball [FMK 1 Mod 0:](#) FMJ; 9.3 g; MV 830 m/s

Tracer: FMJ; 8.93 g; MV 810 m/s; red trace visible to 800 m minimum

AP [FMK 2 Mod 0:](#) FMJ; hardened steel core; 9.75 g; MV 812 m/s

AP-I [FMK 3 Mod 0:](#) FMJ; steel core, with incendiary filling in the nose of the jacket; 9 g; MV 830 m/s

Observing [FMK 5 Mod 0:](#) FMJ; steel core, explosive filling so as to produce a smoke ball upon impact. Trajectory matches that of the ball [FMK 1 Mod 0](#); 9 g; MV 830 m/s

Ball, special match, [FMK 9 Mod 0:](#) FMJ; 9.3 g; 848 m/s. This is a specially assembled and selected ball cartridge for sniping and competition use in bolt-action rifles

Blank [FMK 8 Mod 0:](#) Plastic case, steel extraction rim, case mouth plugged with wax

Blank, Star: Plastic case with extended nose to simulate bullet, steel extraction rim. Alternatively aluminium case with extended crimped nose

Blank [FMK 14 Mod 0:](#) Aluminium case, rose crimp

Grenade launcher FMK 11 Mod 0: Brass case, rose crimp

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 9.45 g; MV 837 m/s

Tracer: FMJ; dark ignition, red trace to 1,000 m; 8.95 g; V_{10} 834 m/s

AP: FMJ, AP steel core; 9.45 g; MV 837 m/s

AP: FMJ, tungsten core, 9.7 g; V_{10} 850 m/s; penetrates 10 mm armour plate at 300 m.

Sniper ball: FMJ; 11.0 g; V_{10} 760 m/s

Match ball: FMJ; 12.3 g; MV 730 m/s

Short-range ball: Plastic core, brass jacket; 4.35 g; V_0 905 m/s; max range 750 m; functions: automatic weapons

Ball, subsonic: JHP; 12.3 g; V_{10} 310 m/s

Ball: JSP, Sierra bullet; 10.7 g; V_0 780 m/s

Ball: JSP, Nosler bullet; 11.6 g; V_0 770 m/s

Ball ABC: FMJ; 10.7 g; V_0 750 m/s; gilding metal jacket, lead core. Four longitudinal expansion grooves ensure penetration with controlled expansion

Blank: Brass case, crimped

Bulleted blank: Brass case, wooden bullet coloured red

Grenade launcher: Brass case, crimped

BELGIUM

Manufacturer

FN HERSTAL SA

Type: Ball SS77/1: FMJ; 9.3 g; V_{25} 833.5 m/s

Tracer L78: FMJ; 8.93 g; V_{25} 828 m/s

AP P80: FMJ; 9.75 g; V_{25} 823 m/s. Can penetrate 6 mm steel plate at 100 m

API PI86: FMJ; 9 g; V_{25} 822 m/s. Can penetrate 6 mm steel plate at 100 m

Blank: Brass case, rose crimp. Cartridge weight 10 g

BOSNIA-HERZEGOVINA

Manufacturer

Unis Igman d.o.o.

Type: Ball: FMJ; 9.4 g; $V_{23.77}$ 838 m/s

Tracer: FMJ; 8.51 g; $V_{23.77}$ 813 m/s

Blank: Rosette crimp

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Match ball: FMJ; 10.5 g; V_{25} 750 m/s

Ball: FMJ, SL; 9.33 g; V_{25} 838 m/s

Tracer: FMJ; 8.75 g; velocity adjusted during manufacture to obtain best match with ball trajectory; V_{25} 838 m/s

AP: FMJ; steel core; 9.55 g; V_{25} 838 m/s

AP-HC: FMJ; tungsten core; 8.3 g; V_{25} 840 m/s

Incendiary [M77](#): FMJ; 9.4 g; V_{25} 808 m/s

Blank: Brass case, crimped

CANADA

Manufacturer

Simunition

Type: Frangible Ball: Solid bronze/copper polymer compound bullet; 3.85 g; MV 800 m/s; max range 600 m

Tracer: Bronze/copper polymer compound; 3.85g; MV 800m/s; red trace to 100m; max range 600m

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Ball: FMJ; 9.5 g; MV 810 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 11.7 g; MV ? m/s

[EGYPT](#)

Manufacturer

Aboukir Engineering Industries

Type: Ball: FMJ; 8 g; MV 833 m/s

Tracer: FMJ; rear trace to 770 m; MV 827 m/s

Manufacturer

Shoubra Company

Type: Ball: FMJ; lead core; 9.45 g; V_{10} 837 m/s

Tracer: FMJ; red trace; 8.95 g; V_{10} 834 m/s

AP: FMJ; steel core; 9.45 g; V_{10} 837 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Oy

Type: Ball S734: FMJ; 8 g; MV 895 m/s

Ball FMJ123: FMJ; 8 g; MV 895 m/s

Ball B448: FMJ; 9.72 g; MV 905 m/s
Ball GB422: FMJ; 10.85 g; MV 780 m/s
Ball B436: FMJ; 11 g; MV 795 m/s
Ball EB423: FMJ, Mega; 12 g; MV 765 m/s
Ball E375: JSP; 12 g; MV 765 m/s
Ball E415: FMJ, Mega; 12 g; MV 765 m/s
Ball EX481: JSP, Forex; 12 g; MV 785 m/s
Ball GB432: FMJ; 12 g; MV 755 m/s
AP492: FMJ; 11g; MV 860m/s
Lock Base Sniper: FMJ; 9.72g; MV 850m/s
Scenar HPBT Sniper Ball: FMJ; 10.0g; MV 860m/s
Scenar HPBT Sniper Ball: FMJ; 10.85g; MV 820m/s
FMJBT: FMJ; 11.0g; MV 780m/s
Lock Base HPS: FMJ; 11.0g; MV 860m/s
Scenar HPBT Sniper Ball: FMJ, SL; 12 g; MV 760 m/s
FMJBT: 12.0g; 760m/s
Precision ball D47: FMJ, SL; cannelured, for use in automatic rifles; 12 g; MV 760 m/s
FMJBT Subsonic: FMJ; 13.0g; MV 320m/s

Manufacturer

Sako Ltd

Type: Ball: FMJ; 6.6 g; MV 950 m/s

Ball: FMJ; 8 g; MV 890 m/s

Ball: JSP; 8 g; MV 925 m/s

Ball: HP; 10.9 g; MV 845 m/s

Ball: JHP; 12.3 g; MV 770 m/s

SP: 9.7 g; MV 870 m/s

SP: 11.7; MV 795 m/s

SP: 13 g; MV 745 m/s

SP 10.1 g; MV 850 m/s

FRANCE

Manufacturer

Giat Industries

Type: Ball SS77/1: FMJ; 9.3 g; MV 850 m/s

Ball SS97: FMJ; 9.3 g; MV 850 m/s

Ball BO: FMJ; 9.65 g; MV 815 m/s

Ball BOPR (precision): HPBT; 9.65 g; 815 m/s

Tracer L78: FMJ; base tracer, red trace visible to 777 m; 8.93 g; MV 850 m/s

Ball BT (tracer): FMJ; red trace; 8.93 g; MV 820 m/s

AP P80: FMJ; steel core; 9.75 g; MV 850 m/s

AP-I P86: FMJ; AP steel core, incendiary composition in tip; 9 g; MV 850 m/s

Precision: HPBT, Sierra bullet; 10.9 g; MV 820 m/s

AP: FMJ, tungsten core; 9.5 g; MV 820 m/s

Balle plastique: 3.9 g; MV 810 m/s

Practice ball: 2.1 g; MV 1,300 m/s

Short-range practice ball: 2.12 g; MV 1,100 m/s

Blank: Brass case, crimped

Manufacturer

SFM Défense

Type: Tracer: FMJ; red trace; 9 g; MV 820 m/s

TR reduced charge: Plastic; ? g; MV 675 m/s

Manufacturer

Anthena

AP/PPI: 9.5 g; MV 820 m/s. Penetration >10 mm RHA at 200 m; 3.5 mm NATO plate at 1,150 m

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball DM111: FMJ; 9.45 g; MV 850 m/s. SIntox, non-toxic

Tracer: FMJ; red trace; 8.95 g; MV 850 m/s

Match S ball: FMJ; 12.3 g; MV 750 m/s

Practice KB: This uses a special short-range bullet composed of a light-alloy body with a plastic pointed nose cap. During firing, the nose cap is ejected from the body of the bullet and falls to the ground shortly after leaving the muzzle. The bullet body, now flat nosed, is strongly retarded due to air resistance and therefore has a maximum range approximating some 50 per cent of that of a service bullet. Bullet weight 5.55 g; MV 870 m/s; maximum training range 150 m; maximum flight range 1,150 m

Practice PT: This is a one-piece plastic case/bullet with metal extraction rim. The 'bullet' portion is weakened so as to detach from the 'case' on firing and be ejected from the muzzle. The bullet has a maximum flight range of about 300 m and a maximum training range of 50 m. Bullet weight 0.70 g; MV 1,100 m/s

Practice PT-T: Similar to the PT round but with a tracer element in the bullet. 1 g; MV 1,100 m/s

Manufacturer

Dynamit Nobel (RWS)

Type: Target: FMJ; 9.52 g; MV 900 m/s

Ball: FMJ; 9.45 g; MV 835 m/s, Sintox

Tracer: FMJ; 8.95 g; MV 835 m/s, Sintox

Blank: Plastic case, star crimp, Sintex

Short range training ball: Plastic bullet, 0.7 g; MV 1100 m/s

Short range training tracer: Plastic bullet, 1.0 g; MV 1100 m/s

Cone point: FMJ; 9.72 g; MV 870 m/s

Ball: PSP; 9.72 g; MV 868 m/s

Brenneke ideal: 9.72 g; MV 868 m/s

Match: FMJ; 10.87 g; MV 800 m/s

Cone point: FMJ; 10.69 g; MV 820 m/s

H-Mantle: JHP; 11.66 g; MV 780 m/s

Brenneke universal: 11.66 g; MV 777 m/s

Match: FMJ; 12.31 g; MV 750 m/s

Manufacturer

Metallwerke Elisenhutte GmbH (MEN)

Type: Ball: FMJ; lead-antimony core, steel jacket, gilding metal envelope; 9.55 g; MV 837±15 m/s. Single or double base propellant, Berdan primed, non-mercuric

Ball, DM111: FMJ; lead-antimony core, steel jacket, gilding metal envelope. Single or double base propellant. Boxer primed, using a lead- and barium-free composition. 9.55 g; MV 827±15 m/s

Match 23.0033: HPBT; 12.3 g; V₀ 785 m/s

Match 23.0019: HPBT; 10.9 g; V₀ 805 m/s

Short-range KB: This uses a plastic-cored bullet and is generally similar to the 5.56 mm KB round described previously. Bullet weight 3 g; MV 1,150 m/s; point-blank range 330 m

Blank: Brass case, fluted crimp to represent bullet; 0.75 g single base powder; Berdan primed, non-mercuric. Crimp sealed with black lacquer, primer annulus with green lacquer

Armour Piercing: Steel, plated with gilding metal and a tin layer; tungsten carbide core; 11.1 g; V₀ 780 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball: FMJ; ? g; MV 838 m/s

Tracer: FMJ; ? g; MV 838 m/s

AP-HC: FMJ; steel core; no further details

INDIA

Manufacturer

Indian Ordnance Factory Varangaon

Type: Ball M80: FMJ, SL; 9.65 g; MV 817±9 m/s

Tracer M62: FMJ; 9.2 g; dark ignition, trace 100 to 800 m; MV 817±9 m/s

INDONESIA

Manufacturer

Pindad

Type: Ball: MU-2TJ; FMJ; 9.45 g; V₁₀ 837 m/s

Tracer: MU-2N; FMJ; 9.15 g; V₁₀ 837 m/s

Sniper: MU-2TJS; HPBT; 10.91 g; V₁₀ 815 m/s

Ball: MU-2UL; JSP; 10.5 g; V₁₀ 830 m/s

Ball: MU-2H: sound level min 90 dB

IRAN

Manufacturer

Ammunition Industries

Ball: FMJ; 9 g; MV 835 m/s

ISRAEL

Manufacturer

Israel Military Industries (IMI)

Type: Ball M80: FMJ; 9.72 g; MV 852 m/s

Tracer M62: FMJ; 9 g; MV 837 m/s

AP M61: FMJ; steel core; 9.91 g; MV 852 m/s

HP Test: FMJ; 9.72 g; pressure 4,746 kg/cm²

Grenade launcher: Crimped; pressure 850 kg/cm²

Ball 30AM: FMJ, SL; 9.72 g; MV 853 m/s

Ball 30CM: JSP, SL; 9.72 g; MV 853 m/s

Ball 33CM: JSP, SL; 10.69 g; MV 823 m/s

Ball 36CM: JSP, SL; 11.66 g; MV 792 m/s

ITALY

Manufacturer

Europa Metall

Type: Ball: FMJ; lead core; 9.6 g; MV 780 m/s

Tracer: FMJ; lead core; dark ignition trace visible 40 to >775 m; trajectory crosses ball at 550 m; 9.20 g; MV 782 m/s

Short range: Lead/brass jacket with plastic nose; 5.7 g; V₂₄ 810 m/s; maximum range 1,300 m

Plastic training: CU/Zn sleeve containing a plastic core, exposed at the tip; 4.6 g; V₂₄ 920 m/s.

Maximum range 1,100 m

Blank: Brass case elongated and crimped to represent bullet

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 308A: PSP; 9.72 g; MV 806 m/s

Ball 308B: FMJ; 9.52 g; MV 838 m/s

Ball 308C: PSP; 11.66 g; MV 735 m/s

MALAYSIA

Manufacturer

SME Ordnance SDN BHD

Type: Ball: FMJ; 9.45 g; V₂₃ 838 m/s

Tracer: FMJ; 8.95 g; V₂₃ 817 m/s

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: Ball L2A2: FMJ; ? g; MV 810 m/s

Tracer L5A3: FMJ; red trace; ? g; MV 795 m/s

Blank L10A2: Star crimp, brass case; 12.75 g

Blank, Rifle Grenade: Taper crimp, brass case; 13.95 g

PORTUGAL

Manufacturer

INDEP

Type: Ball M350: FMJ; lead core, SL; 9.45 g; MV 844 m/s

Tracer M351: FMJ; lead core; semi-streamlined, red trace to 775 m; 8.95 g; MV 841 m/s

Sniper Ball, M359: FMJ; lead core; 9.45 g; MV 840 m/s

Match Ball M435: JHP, S/L; lead core; 11.66 g; MV 755 m/s

Match Ball M436: JHP, S/L; lead core; 12.32 g; MV 755 m/s

Ball .308 Win: FMJ; lead core; 9.45 g; MV 844 m/s

AP M352: FMJ; lead envelope, steel core; 9.45 g; MV 837 m/s

HP Test: FMJ; pressure 4,600 kg/cm²

Blank: Brass case, rose or plain crimp

Grenade Launcher: Brass case; chamber pressure ≤ 750 kg/cm²

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Barnaul Machine Tool Building Plant

Type: Ball: FMJ; lead core; 9.4 g; MV 820 m/s

Novosibirsk Low Voltage Equipment Works, JSC (LVE)

Type: Ball SC: FMJ, steel core; 9.45g; MV 820-835m/s

Ball AP: FMJ; 9.43g; 820-835m/s

SINGAPORE

Manufacturer

Chartered Ammunition Industries, [Singapore](#) Technologies(CAI)

Type: Ball M80: V₂₄ 838 m/s. Conforms to US Mil-Spec MIL-C-46931

Tracer M62: V₂₄ 838 m/s. Trace to not less than 777 m. Conforms to US Mil-Spec MIL-C-46281

AP M61: V₂₄ 838 m/s. Conforms to US Mil-Spec MIL-C-60617. Penetrates 6 mm chrome nickel plate (Brinell 450) at 100 m

SOUTH AFRICA

Manufacturer

PMP

Type: Ball M80: V₂₄ 838 m/s. Conforms to US Mil Spec MIL-C-46931

Ball: Tracer M62: V₂₄ 813 m/s. Trace to not less than 777 m. Conforms to US Mil spec MIL-C-46281

Ball: Metal Blank: Crimp sealed with lacquer

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; ? g; MV 815 m/s

Tracer: FMJ; ? g; MV 820 m/s

AP: FMJ; ? g; MV 867 m/s

Survival: Shot loading over wad; no external bullet; effective range 50 m

HP Test: FMJ; pressure 4,200 kg/cm²

Blank: Long or short crimp

SWEDEN

Manufacturer

Bofors Carl Gustaf

Type: Ball: FMJ; 9.45 g; MV 840 m/s

Tracer: FMJ; red trace visible 110 to 1,000 m; 9.05 g; MV 825 m/s

AP: FMJ; heavy metal penetrator in soft casing; 8.2 g; MV 970 m/s. Armour penetration 13 mm at 300 m

Short-range practice: Plastic bullet; 0.7 g

Blank: Wooden bullet

Tracer: FMJ; 9.1 g; MV 450 m/s. For use in subcalibre training device in 84 mm Carl Gustav RCL gun

Manufacturer

Norma AB

Type: Ball 17623: JSP; 8.4 g; MV 884 m/s

Ball 17615: HPBT Berger bullet, 10.9 g; MV 820 m/s

Ball 17616: HPBT Sierra bullet, 12.3g; MV 785m/s

Ball 17624: JSP; 9.7 g; MV 880 m/s

Ball 17679: FMJ; 10.9 g; MV 777 m/s

Ball 17628: Plastic Point; 11.6 g; MV 820 m/s

Ball 17635: JSP; 11.6 g; MV 820 m/s

Ball 17636: JSP; 11.6 g; MV 820 m/s

Ball 17660: JSP; 11.6 g; MV 820 m/s

Ball 17681: JSP; SL; 11.6 g; MV 750 m/s

Ball 17683: JSP; 13 g; MV 750 m/s

Manufacturer

[Nammo](#) Vanasverken AB

Type: Sniper 9 AP: FMJ; 9.4g; 840m/s

SWITZERLAND

Manufacturer

RUAG Munition (formerly SM Swiss Ammunition Enterprise Corp)

Type: SWISS P Ball: FMJ; 11.4 g; MV 790 m/s

SWISS P Armour Piercing: FMJHC; 12.7 g; MV 810 m/s; penetration 300 m; body armour class 4++

Swiss P Ball: HPBT; 10.9 g; MV 805 m/s

Swiss P [Styx Action](#): HPBT; 10.8 g; MV 810 m/s

SWISS P Subsonic ball: HPBT; 13.0 g; MV 320 m/s

Swiss P Target: HPBT; 10.9 g; MV 805 m/s

Note: Swiss P cartridges are ballistically matched to a range of 300 m, except Subsonic

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball: FMJ; 9.3 g; MV 850 m/s

Tracer: FMJ; red trace; 9 g; MV 835 m/s

Blank: Brass case, star crimp

UNITED KINGDOM

Manufacturer

[British Aerospace](#) Defence Limited, Royal Ordnance Division

Type: Ball [L2A2](#): FMJ; 9.33 g; MV 855 m/s (NATO Qualified)

Ball, sniper, L38A1: FMJ; 9.33 g; MV 870 m/s

Ball, greenspot target: FMJ; 9.33 g; MV 870 m/s; FOM <76 mm at 500 m

Tracer L5A3: FMJ; red trace to 1,000 m; 8.75 g; MV 855 m/s

Sniper L38A1: FMJ; 9.33 g; MV 850 m/s

Target: FMJ; 9.33 g; MV 850 m/s

Blank L13A2: Brass case, crimped nose

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition

Type: Ball: Hollow point match; 10.8 g; MV 807 m/s

Ball: Hollow point match; 11.3 g; MV 792 m/s

Ball: Ballistic tip; 10.6g; MV 807m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 8.1 g; MV 960 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: FMJ; 9.5 g; MV 839 m/s

Ball: FMJ; 10.8 g; MV 792 m/s

Ball Match: HPBT; 10.8 g; MV 808 m/s

Manufacturer

Engel Ballistic Research

Type: Subsonic Ball (Thumper): FMJ; 11.6 g; MV 305 m/s

Subsonic Ball (PBS): JHP; 10.6 g; MV 305 m/s

Subsonic Ball: FMJ; 14.2 g; MV 305 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JHP match; 10.88 g; MV 792 m/s

Ball: JHP match; 11.34 g; MV 792 m/s

Ball: JHP match; 10.04 g; MV 899 m/s

Ball: FMJ; 9.72 g; MV 859 m/s

Ball: Bonded SP; 10.69 g; MV 945 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 8.42 g; MV 914 m/s

Manufacturer

Government contractors

Type: Ball [M59](#): FMJ; non-streamlined, lead core; 7 g; MV 838 m/s

Ball [M80](#): FMJ, SL; lead core; 9.65 g; MV 838 m/s

Ball, Duplex, [M198](#): Front bullet 5.44 g; rear bullet 5.5 g; MV 838 m/s (front); 670 m/s (rear)

Ball, frangible, [M160](#): 7.06 g, formed of bakelite and powdered lead. Not to perforate 0.476 mm Dural at 25 m. MV 402 m/s

Ball, Match, [M118](#): FMJ; 11.37 g; MV 777 m/s

Tracer [M16](#): FMJ; semi-streamlined, lead tip filler; base tracer; 6.93 g

Tracer [M27](#): FMJ; similar to [M16](#) but dark ignition; 6.45 g

Tracer [M62](#): FMJ; 9.2 g; dark ignition red trace 100-800 m; MV 838 m/s

AP [M61](#): FMJ; steel core; 9.75 g; MV 838 m/s

Grenade [M64](#): star crimp; MV 48 m/s with 700 g grenade

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ, SL; 9.7 g; MV 852 m/s

Ball: JSP; 9.7 g; MV 870 m/s

Ball: JSP; 11.7 g; MV 780 m/s

Ball: FMJ; 8.1 g; MV 923 m/s

Manufacturer

HJ Ballistic Research

Type: Subsonic Ball: FMJ; 12.9 g; MV 297 m/s

Manufacturer

Hornady Manufacturing Company

Type: Frangible Ball: TAP Precision; 10.8 g; MV 822 m/s

Manufacturer

Longbow Incorporated

Type: Frangible ball: Copper Powder and Epoxy; 7.7 g; MV 792 m/s

Manufacturer

Remington Arms Company Inc

Type: Accelerator: APDS Ball; FMJ in plastic sabot; 3.6 g; MV 1,243 m/s

Ball: PSP; 9.7 g; MV 860 m/s

Ball: PSP; 11.7 g; MV 798 m/s

Ball: SP; 11.7 g; MV 798 m/s

Ball: Hollow point match; 10.9 g; MV 817 m/s
Ball: Extended range; FMJ; 11.5 g; MV 798 m/s

Manufacturer

Talon Manufacturing Company

Type: Ball: JHP Match; 11.3 g; MV 810 m/s

Manufacturer

Winchester-Olin

Type: Ball [M80](#): FMJ; 9.52 g; V_{25} 838 m/s

Tracer [M62](#): FMJ; red trace; 9.2 g; V_{25} 838 m/s

Ball, SLAP, M948: 5.56 mm bullet in plastic sabot; 4.02 g; V_{25} 1,220 m/s

Tracer M959: 5.56 mm bullet in plastic sabot; red trace; 3.82 g; V_{25} 1,220 m/s

Dim tracer XM276: FMJ; trace visible only through night vision devices; 9.07 g; V_{25} 838 m/s

Match ball M852: FMJ; 10.89 g; V_{25} 777 m/s

Special match ball M118: FMJ; 11.15 g; V_{25} 777 m/s

Ballistic Silvertip Match: FMJ; 10.9 g; MV 814 m/s

SLAP Sniper: 5.56 mm tungsten bullet in plastic sabot; 3.36 g; MV 1,340 m/s

Blank, [M82](#): Brass case extended to simulate bullet; roll crimp

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 9.4 g; MV 825 m/s

Tracer: FMJ; red trace, dark ignition, visible from 115 m to >830 m; 8.5 g; MV 800 m/s

Blank: Steel case, crimped

Ball: FMJ; 9.4 g; MV 865 m/s

Ball: JSP; 9.7 g; MV 844 m/s

Ball: JSP; 11.7 g; MV 738 m/s

HP test Type 1: FMJ; 9.4 g; pressure

4,200±150 kg/cm²

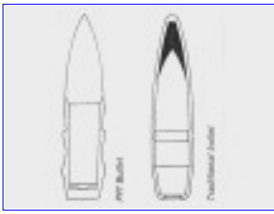
HP test Type 2: FMJ; 9.4 g; pressure

5,000±100 kg/cm²

UPDATED



7.62 × 51 mm NATO rounds produced by FN HERSTAL SA, from left, Ball SS77/1; Tracer L78; AP P80, API PI86, Blank (1997)



*Comparison of PPI and conventional AP bullets
(1993)*



*Examples of Bofors Carl Gustaf 7.62 × 51 mm AP rounds showing penetration
performance
(1997)*



*7.62 mm NATO
(1993)*



*Black Hills tactical limited penetration match-grade cartridges
(1998)*

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 139 mm

Synonyms:

[20 mm Hispano-Suiza HS 820](#)

Armament

Hispano-Suiza HS820; Oerlikon KAD, KAD-B; Rheinmetall Rh202; US [M139](#); French M693/F2; Mauser Model B.

Development

Developed by Hispano-Suiza in the late 1940s as a more powerful replacement for the wartime 20 × 110 mm round. The new weapon which accompanied it, the HS820 gun, became one of the most successful 20 mm designs ever made and was widely purchased throughout the world as an aircraft and ground weapon. As a result of this wide distribution the cartridge was adopted by other designers who developed suitable guns, notably the German Rheinmetall Rh202, the French [M693](#) and the US [M139](#).

Description

The rimless, bottlenecked case may be of steel or brass and is percussion primed. A wide variety of projectiles has been made across the years, but those listed below are the current manufacturing standards. Propelling charges are generally regulated to give a muzzle velocity of 1,040 m/s in a 95 calibre barrel.

Specifications

Round length: 213 mm

Case length: 138.5 mm

Rim diameter: 28.4 mm

Bourellet diameter: 19.9 mm

Projectile weight: ca 125 g

Muzzle velocity: 1,040 m/s

Muzzle energy: 72.6 kJ

Equivalent rounds

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: HE-I: Steel shell with sintered iron driving band, loaded explosive/incendiary mixture; nose impact fuze with self-destruction between 3.5 - 10 seconds; 122 g; MV 1,041 m/s

AP-T: Hard core, light body, sintered iron driving band; 114 g; MV 1,090 m/s. Steel cartridge case

TP: Steel shell, sintered iron driving band; inert aluminium fuze; 122 g; MV 1,041 m/s

TP-T FMK 8 Mod 0: Steel shell with inert loading and tracer capsule; inert fuze; percussion primed; 317 g; MV 1,041 m/s

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel shell filled 10 g explosive/incendiary mixture; fuzed MR26 impact fuze; 120 g; MV 1,050 m/s

HE-I: As above but fuzed MR201B impact fuze with self-destruction between 3.5 - 9 seconds; 120 g; Mv 1,050 m/s

HE-I: As above but fuzed MR203B delay impact fuze with self-destruction after 3.5 - 9 seconds; 120 g; MV 1,050 m/s

HE-I-T: Two-section steel shell, front section filled 8.5 g explosive/incendiary mixture, rear section filled red tracer; fuzed MR26 impact fuze; 120 g; MV 1,050 m/s

HE-I-T: As above but fuzed MR201B impact fuze with self-destruction between 3.5 - 9 seconds; 120 g; Mv 1,050 m/s

HE-I-T: As above but fuzed MR203B delay impact fuze with self-destruction after 3.5 - 9 seconds; 120 g; Mv 1,050 m/s

AP-I: Hard core in light-alloy body with ballistic cap filled incendiary mixture; 112 g; MV 1,100 m/s

AP-T: As above but without incendiary filling and body bored for red tracer; 112 g; MV 1,100 m/s

AP-I-T: As for AP-I but with body bored for red tracer; 112 g; MV 1,100 m/s

SAP-HE-I: Pointed shell with ballistic cap, filled explosive/incendiary mixture and with base delay fuze MR205 giving self-destruction between 3.5 - 8 seconds; 120 g; MV 1,050 m/s

TP: Body of HE-I shell, empty; dummy fuze; 120 g; Mv 1,050 m/s

TP-T: Body of HE-I-T shell, front section empty; dummy fuze; 120 g; MV 1,050 m/s

GERMANY

Manufacturer

Diehl GmbH

Type: Shrapnel DM 111: A hollow shell containing an ejection charge in the base, above which is an ejection tube and an extension tube. Within these tubes are a number of heavy metal balls. The nose of the shell is closed by a ballistic cap. The shell base contains a striker, cap and delay element. On firing, gas pressure drives the striker forward to fire the cap and ignite the delay. After about 40 ms the delay ignites the ejection charge. The ejection tube is then forced forward; this presses on the extension tube which shears off the shell nose cap and allows the two tubes and the shot to be ejected. The extension tube is prefragmented and shatters to add to the effect. The ejection tube is retarded, permitting the balls to fly free on a cone with an angle of about 3°. About 120 fragments are produced, capable of penetrating 2 mm F40 dural at 70 m range. 118 g; MV 1,055 m/s

HE-I M599: Steel two-section shell, front loaded HE, rear loaded red tracer burning 3.4 seconds; nose impact fuze M594 providing self-destruction after 5.5 (± 1.5) seconds, or M594A1 providing self-destruction after 5.75 (± 2.25) seconds. 122 g; MV 1,045 m/s

HE-I DM 81: As M599 but longer shell body and shorter fuze, giving better explosive capacity. Self-destruction by nose fuze after 3.1 or 5.7 seconds nominal time. 120 g; MV 1,055 m/s

HE-I DM 101: Pointed piercing shell with ballistic cap containing incendiary composition; shell filled HE; base fuze giving self-destruction after 3.1 or 5.7 seconds nominal time. 120 g; MV 1,055 m/s

TP-T DM 48A1: M599 shell body, front filled inert, rear filled red tracer; dummy fuze; 122 g; MV 1,045 m/s

Blank: Special training round produced by Rheinmetall for use in a special training barrel. The projectile body has a crimped nose that ruptures only when the necessary pressure has been produced to operate the gun fully automatically. The projectile body remains secured to the case on ejection. Round weight approx 230 g; case content weight 15 g

Manufacturer

Rheinmetall GmbH

Type HE-I: Steel shell filled 6.5 g HE-Incendiary composition; nose impact fuze; 120 g; MV 1,045 m/s

HE-I-T DM 81: Steel two-section shell, front filled HE-Incendiary composition, rear filled red tracer; nose impact fuze; 120 g; MV 1,045 m/s

AP-I-T DM 43A1: Hard subprojectile in steel body, light alloy ballistic cap with incendiary filler, red tracer; 111 g; MV 1,100 m/s. Penetrates 32 mm armour at 1,000 m

APDS-T DM 63: Tungsten carbide subprojectile in light alloy/plastic sabot, red tracer; 108 g; MV 1,150 m/s

TP DM 48: Steel two-section shell, filled inert; dummy fuze; 120 g; MV 1,045 m/s

TP-T DM 48A1: Similar to DM 48 but with tracer in rear section; 120 g; MV 1,045 m/s

Break-up shot DM 78A1: Plastic body filled with dust shot. When fired it produces sufficient resistance in the bore to actuate automatic and recoil mechanisms but after leaving the bore, centrifugal force causes the body to disintegrate within a short distance of the gun. For training, practice in confined areas and gun testing. 120 g; MV 1,045 m/s

Blank: Intended for use in special Blank-firing barrel produced by Rheinmetall GmbH to replace operational barrels during training. The case carries a reduced weight of propellant (15 g) sufficient to rupture the crimped nose of the metal body which remains attached to the case when the required mechanism operating temperature has been reached. Round weight is approx 230 g

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-I-T NM75MP: Steel shell with sintered iron driving band, loaded RX51 explosive charge, RS40/41 incendiary charge, and strikerless fuze, with rear tracer burning >4.3 seconds. Self-destruction is provided by means of a heat relay between the tracer and the explosive filling. 120 g; MV 1,045 m/s

HE-I-T M599: Steel body, sintered iron driving band, 5.8 g of Hexal 70/30 and an impact fuze M594 with self-destruction after 5.5 seconds. A dark ignition tracer is fitted, burning from 300 to about 2,000 m, and a tracerless version is also available. 120 g; MV 1,055 m/s

TP: Steel shell, empty; dummy fuze; 120 g; Mv 1,045 m/s

TP-T: Steel two-section shell, front empty with rear filled red tracer; 120 g; dummy fuze; MV 1,045 m/s

NETHERLANDS

Manufacturer

NWM de Kruithoorn BV (now closed)

Type: HE-I-T-SD DM 81: Steel two-section shell, front filled HE-Incendiary composition, rear filled red tracer burning for 3.4 seconds; nose impact fuze with self-destruction mechanism after 5.5 or 9 seconds; 120 g; MV 1,045 m/s

AP-I-T DM 43A1: Hard core in steel body, light alloy ballistic cap with incendiary filler, red tracer burning for 1.4 seconds; 111 g; MV 1,100 m/s

APDS-T DM 63: Tungsten carbide subprojectile in plastic discarding sabot, red tracer burning for 1.2 seconds; 108 g; MV 1,150 m/s

TP DM 48: Steel two-section shell, filled inert; light alloy dummy fuze; 120 g; Mv 1,045 m/s

TP-T DM 48A1: Similar to DM 48 but with tracer in rear section burning for 3.4 seconds; 120 g; MV 1,045 m/s

TP-T DM 98A2: Steel two-section shell, filled inert; plastic dummy fuze; 120 g; MV 1,045 m/s

TP-T DM 98A3: Similar to DM 98A2 but with red tracer in rear section burning for 3.4 seconds

Break-up shot DM 78A2: Plastic body filled with iron powder. Projectile disintegrates within less than 100 m from the muzzle; gun will function as with normal rounds. For training and practice in very restricted areas and gun testing. 120 g

NORWAY

Manufacturer

[Nammo](#) Raufoss Technology A/S

Type: Multipurpose NM75 (MP-T-SD): Steel shell with high-explosive and incendiary fillings, the incendiary extending into the nose cap. A red tracer is in the rear, with a heat relay giving self-destruction after 3.7 to 5 seconds of flight. The projectile will function against 1.5 mm dural at 1,000 m range, producing a minimum of 10 fragments, and will penetrate 12.7 mm steel plate to 200 m range and an impact angle of 60° NATO. Red tracer 200 to 2,200 m; projectile weight 122 g; MV 1,045 m/s

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd ([PMP](#))

Type: APT: Solid core armour-piercing tracer with ballistic cap; soft iron driving band; steel cartridge case; 110 g; MV 1,100 m/s; penetration 40 mm at 30° at 100 m

HE-I: Filled Hexal P30; soft iron driving band; KZA348 nose impact fuze; steel cartridge case; 120 g; MV 1,050 m/s

HE-I-T: As HE-I but with base tracer

TP: Inert loading; 120 g; MV 1,050 m/s

TP-T: As for TP but with base tracer

SPAIN

Manufacturer

EXPAL SA

Type: Multipurpose NM75: The shell carries a strikerless compression-ignition fuze in the nose, above a 5.5 g incendiary filling and a 2.8 g explosive filling. On impact the fuze is crushed, igniting the incendiary filling which then ignites the explosive. The explosion gives a forward impulse to the burning incendiary fragments. The rear of the projectile carries a red tracer, which by heat transfer actuates self-destruction between 3.8 to 5.3 seconds. Steel cartridge case DM1001A1 with DM64 percussion primer. MV 1,045 m/s

TP-T: Steel two-section shell, front empty with rear filled red tracer; dummy fuze; 120 g; MV 1,050 m/s

Manufacturer

SANTA BARBARA SA

Type: HE-I: Thin-wall steel shell loaded with 10 g of Hexal and fitted with an impact nose fuze providing self-destruction after 6 to 11 seconds flight; 125 g; MV 1,040 m/s

SAP-HE-I: Pointed shell, light alloy ballistic cap filled 4.7 g Hexal; base fuze with self-destruction after 6 to 11 seconds; 125 g; MV 1,040 m/s

TP-T: Steel two-section shell, front empty, rear with tracer; dummy fuze; 125 g; MV 1,040 m/s

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: Mine HE-I MSA: A large capacity steel shell loaded with 10 g of Hexal and fitted with an impact nose fuze providing self-destruction after 6 to 11 seconds flight; 125 g; MV 1,040 m/s

Mine HE-I-T MLA: Similar to Type MSA but with the shell body divided into two, the front section loaded 5.6 g of Hexal, the rear containing tracer composition; 125 g; MV 1,040 m/s

SAPHEI PSA: A pointed shell with light alloy ballistic cap, filled 4.7 g Hexal and fitted with a base fuze providing self-destruction after 6 to 11 seconds of flight; 125 g; MV 1,040 m/s

SAPHEI-T PLA: Similar to Type PSA but with the addition of a base tracer; 125 g; MV 1,040 m/s

APHC-T HLA: A light-alloy body containing a core of tungsten carbide and a base tracer; 110 g; MV 1,100 m/s

TP UGA: Uses a similar steel body to the Mine HE-I but of cheaper steel and with a smaller cavity which is left empty and plugged with a dummy fuze; 125 g; MV 1,040 m/s

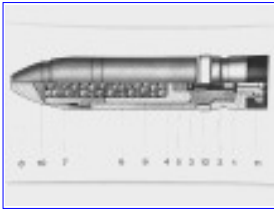
TP-T ULA: Uses a similar two-section body to the Mine HE-I-T but with a larger tracer section; plugged with dummy fuze; 125 g; MV 1,040 m/s



20 × 139 mm



Giat Industries 20 × 139 mm rounds



Diehl DM 111 shrapnel shell: (1) ignition vent; (2) striker; (3) delay cap; (4) expelling charge; (5) seal; (6) ejection tube; (7) extension tube; (8) nose cap; (9) bullets; (10) silicon shock-absorber; (11) rubber gas seal; (12) driving band



NWM range of 20 × 139 mm cannon ammunition



Blank cartridge for special Rh202 cannon series barrel produced by Rheinmetall GmbH (1998)

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 110 mm

Synonyms:

20 mm [M24](#); 20 mm Hispano-Suiza HS 404/804

Armament

Hispano-Suiza HS404, HS804, Mk II and Mk V guns; US M3, [M24](#) and M24A1 guns; UK Mk 2 and 5; [Israel TCM-20](#); Yugoslav [M55](#) guns.

Development

This cartridge was used extensively by the UK and USA during the Second World War and large numbers of these guns are still in use. Both countries produced the same range of cartridges in this chambering as that produced for the Oerlikon guns. The projectiles were exactly the same, only the cartridge case and propelling charge differed.

Description

The ammunition is almost identical to the 20 × 110RB Oerlikon, but the case is a rimless type rather than a rebated rimless. European manufactured ammunition uses Berdan primers, while the US [M21](#), M21A1 and M21A1B1 cases use a Boxer primer. In post-war years the US Air Force developed electrically primed ammunition in this chambering for use in the [M24](#) gun. It was prominently marked 'ELECTRIC' on the side of the cartridge case, and the primer cap exhibits a ring of black insulating

material around it. Other nations have adopted electric priming, although the presence of the insulating material is often the only indication.

Projectiles resemble those developed for the Oerlikon 20 × 110RB gun. They are notable for having the explosive cavity reduced in diameter at the rear, in order to better resist the crushing action set up by the driving band during its passage up the gun bore. For this reason the tracer recess is smaller.

Specifications

Round length: 184 mm

Case length: 110.1 mm

Rim diameter: 24.5 mm

Bourellet diameter: 19.9 mm

Projectile weight: 122 g

Muzzle velocity: 844 m/s

Muzzle energy: 43.5 kJ

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: HE-T [FMK 1 Mod 0](#): Steel shell loaded 5 g Hexogen; tracer capsule in rear; impact fuzed; percussion primed; 118.7 g; MV 830 m/s. For Oerlikon guns

HE-I [FMK 15 Mod 0](#): Steel shell loaded 4 g of HE-Incendiary material; impact fuzed; electric primed; 110 g; MV 950 m/s. For EINC guns

HE-I [FMK 7 Mod 0](#): Steel shell loaded 11 g HE-Incendiary material; impact fuzed; percussion primed; 258 g; MV 845 m/s. For HS 404 guns

TP-T [FMK 4 Mod 0](#): Steel shell loaded 5 g inert ballast; dummy fuze; 124.8 g; MV 830 m/s. For Oerlikon guns

TP-T [FMK 13 Mod 0](#): Steel shell loaded 4 g inert ballast; dummy fuze; electric primed; 110 g; MV 950 m/s. For EINC guns

TP-T [FMK 6 Mod 0](#): Steel shell loaded 16 g inert ballast; tracer capsule in rear; percussion primed; 260 g; MV 845 m/s. For HS 404 guns

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: HE-I [M74E1](#): Steel shell with copper driving band and loaded with 11 g RDX; impact fuzed CBC M74E1; 100 g; $V_{7.5}$ 810 m/s

HE-I-T-SD [M72E1](#): Steel shell with copper driving band and loaded with 7 g RDX impact fuzed CBC M72E1. Tracer loaded into the rear of the shell with a heat relay giving self-destruction between 3 - 7 seconds of flight. 101 g; $V_{7.5}$ 875 m/s

TP: Hollow steel shell, flat nosed, no filling; 123 g; V_{25} 810 m/s

TP-T: As for TP but with tracer capsule inserted in rear

[EGYPT](#)

Manufacturer

Maasara Company for Engineering

Type: HE-I: Steel shell, brass case; nose impact fuze. Appears to be based upon the standard Oerlikon HE-I round. No details

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel shell containing 14 g HE-I filling as one prepressed pellet of HE, one of incendiary material and a final pellet of HE; MR21 or 16/18 Mle 61 impact fuze; 122 g; MV 840 m/s

HE-I: As above but fuzed MR22 short delay impact fuze

HE-I: As above but fuzed MR2028 impact with self-destruction between 2.5 and 9 seconds

HE-I-T: Steel shell with 8 g filling composed of one pellet of HE and one of incendiary material; MR212 impact fuze; 128 g; MV 840 m/s

HE-I-T: As above but fuzed MR22 short delay impact fuze

HE-I-T: As above but fuzed MR2028 impact with self-destruct between 2.5 and 9 seconds

TP: Steel-pointed shell, empty; 132 g; MV 840 m/s

TP-T: Steel-pointed shell, part filled inert, remainder filled red tracer; 132 g; MV 840 m/s

AP-T: Hard steel-pointed shell, base bored for tracer; 139 g; MV 830 m/s

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: HE: Steel shell loaded HE; self-destroying fuze; 135 g; MV 810 m/s

HE-I: Steel shell loaded HE-Incendiary mixture; self-destroying fuze; 135 g; MV 810 m/s

AP-I: Steel-pointed shell with incendiary filled ballistic cap; 130 g; MV 815 m/s

AP-T: Steel-pointed shot with tracer; 130 g; MV 815 m/s

SAP-I: Steel shell loaded HE-Incendiary mixture; reinforced nose impact delay fuze; 135 g; MV 810 m/s

BL: Target practice round. Steel shell shaped to represent HE shell and fuze, hollow, inert; 130 g; MV 815 m/s

BL-T: As for BL but with tracer capsule in rear; 130 g; MV 815 m/s

TP: Steel shell body, empty; dummy fuze; 125 g; MV 815 m/s

NORWAY

Manufacturer

[Nammo](#) Raufoss Technology A/S

Type: MultiPurpose High Capacity Tracer (MPHC-T): Fragmentation and incendiary comparable to standard 20 mm multipurpose. Optimised penetration capability due to the introduction of a hard core penetrator. Tracer optimised for HS 404 guns. 120 g; MV 904 m/s

SPAIN

Manufacturer

EXPAL SA

Type: HE-I: Steel shell, filled Hexolite; nose impact fuze Mk 26; 122 g; MV 845 m/s

HE-I-T: Steel shell, filled Hexolite; nose impact fuze Mk 26; red tracer with minimum burning time of 3 seconds; 122 g; MV 845 m/s

HE-I: Steel shell, filled RDX; nose impact fuze Mk 26; 120 g; MV 845 m/s

TP and TP-T: The HE-I and HE-I-T projectile bodies filled inert and with inert fuze; 122 g; MV 945 m/s

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: HE-I: Steel shell, filled Hexal; nose impact fuze; 122 g; MV 830 m/s

HE-I-T: Steel two-section shell, front filled Hexal, rear filled red tracer; nose impact fuze; 122 g; MV 830 m/s

AP-I-T: Pointed steel shell with Hexal filling and red tracer; base delay fuze; 113 g; MV 965 m/s

TP-T: Steel two-section shell body, front empty, rear filled red tracer; dummy fuze; 122 g; MV 830 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE-I-T [M57](#): Steel shell filled TNT or RDX/Al; red trace composition in rear, trace for 3 seconds; self-destruction by fuze between 4.5 - 8 seconds; 137 g; MV 850 m/s

HE-T [M57](#): Steel shell filled TNT or RDX/Al; red trace for 3 seconds; self-destruction between 4.5 - 8 seconds; 137 g; MV 850 m/s

HE-I [M57](#): Steel shell filled TNT with central filling of incendiary composition; self-destruction between 4.5 - 8 seconds; 132 g; MV 850 m/s

HE [M57](#): Steel shell filled TNT or RDX/Al; self-destruction between 4.5 - 8 seconds; 132 g; MV 840 m/s

AP-I [M60](#): Steel pointed shell filled from the rear with incendiary composition; unfuzed; 142 g; MV 840 m/s

AP-I-T [M60](#): As for AP-I but with tracer burning for 3 seconds; 142 g; MV 840 m/s

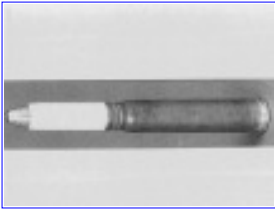
AP-T [M60](#): Steel pointed shot with tracer cavity in rear; red tracer for 3 seconds; 142 g; MV 850 m/s

TP-T [M57](#): This is the same shell as the HE-I [M57](#) but with the forward section filled inert and with tracer for 3 seconds; dummy fuze; 137 g; MV 850 m/s

TP [M57](#): The same shell as the HE [M57](#) but filled inert; dummy fuze; 132 g; MV 850 m/s

TP-T [M79](#): This has the two-section shell of the HE-I [M57](#); the front section is filled with flash composition, and the rear with tracer composition. An impact fuze is fitted. On striking the target the shell explodes with a bright flash. 137 g; MV 850 m/s. Not for use in cannon: for subcalibre training tubes fitted to larger weapons only

Blank [M77](#): Polyethylene projectile filled with sintered iron powder. For training and test use in [M55](#) AA guns only. The projectile breaks up in the bore, having provided sufficient recoil force to operate the automatic mechanism. Maximum range of fragments and dust is 65 m from muzzle. The entire cartridge weighs 195 g



20 mm Hispano-Suiza HS 404



Giat Industries 20 × 110 mm projectiles; (left to right): TP; TP-T; HE-I; HE-I-T; AP-T



Oerlikon Contraves Pyrotec 20 × 110 mm ammunition; projectiles, left to right: TP-T; HE-I; HE-I-T; AP-I-T



Yugoslavian Blank [M77](#) showing construction of the projectile

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.38 Special

Synonyms:

0.38 Smith & Wesson Special

Armament

Suitably chambered revolvers.

Development

This was developed by Smith & Wesson in about 1900 as a possible military round, before the US Army decided that 0.45 was the minimum calibre it would consider for pistols. It was placed on commercial sale in 1902 and attained considerable popularity with police and as a sporting and target round. At one time revolvers in 0.38 Special were widely used in the US military for aircrew and military police, but they have been largely replaced by 9 × 19 mm pistols. Revolvers in this calibre continue to be widely used by police, especially for plainclothes work in the higher-powered 'Plus P' loadings.

Description

A rimmed, straight-taper case, brass, nickel-plated brass, or aluminium. Boxer or Berdan primed. Various bullets can be found with soft point predominating. The US military standard Ball [M41](#) uses an FMJ type weighing 8.55 g.

Specifications

US [M41](#) Ball Round length: 39.37 mm

Case length: 29.45 mm

Rim diameter: 11 mm

Bullet diameter: 9.04 mm

Bullet weight: 8.55 g

Muzzle velocity: 289 m/s

Muzzle energy: 357 J

Abridged ballistic table: 0.38 Special, 10.2 g ball

Range	Velocity	Energy
0 m	260 m/s	344 J
10 m	255 m/s	331 J
25 m	245 m/s	305 J
50 m	235 m/s	281 J

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball: Lead-antimony, RN; 10.25 g; MV 255 m/s (151 mm barrel)

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; 10.2 g; MV 350 m/s

Ball: Lead WC; 10.2 g; MV 225 m/s

Ball: JSP; 10.2 g; MV 350 m/s

Ball: FMJ; 10.2 g; MV 320 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: Lead, RN; 10.24 g; MV 230 m/s

Ball: JSP; 10.24 g; MV 235 m/s

Ball: JHP; 10.24 g; MV 245 m/s

Ball +P: JSP; 8.1 g; MV 266 m/s

Ball +P: JHP; 8.1 g; MV 288 m/s

Ball: Lead, WC; 9.59 g; MV 216 m/s

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Ball: Lead, RN; 10.15 g; MV 225 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: JHP; 10.25 g; MV 266 m/s

Ball: Lead, RN; 10.25 g; MV 266 m/s

Ball: Lead, WC; 9.6 g; MV 213 m/s

FINLAND

Manufacturer

Nammo Lapua Cartridge Factory Ltd

Type: Ball: JHP; 8 g; MV 355 m/s

Ball: LWC; 9.3 g; MV 230 m/s

Ball: FMJ CEPP; 9.7 g; MV 300 m/s

Ball: JSP; 10.2 g; MV 315 m/s

Ball: FMJ; 10.2 g; MV 255 m/s

Ball: LRN; 10.3 g; MV 255 m/s

Manufacturer

Sako Ltd

Type: Ball: Lead, WC; 9.6 g; MV 235 m/s

Ball: Lead, SWC; 10.3 g; MV 235 m/s

FRANCE

Manufacturer

GIAT Industries

Type: Ball NT: FMJ; 9.6 g; V_{10} 310 m/s

Ball TRN: Plastic bullet; 4 g; MV 30 m/s

Manufacturer

SFM Défense

Type: Ball: Lead, RN; 10.4 g; MV 240 m/s

Ball: Lead, WC; MV 220 m/s

Ball: JSP; 3.9 g; MV 470 m/s

Ball: JSP; 10.4 g; MV 320 m/s

Ball: JHP; 9.7 g; MV 290 m/s

Ball: JHP; 10.4 g; MV 280 m/s

THV: 2.9 g; MV 740 m/s; penetrates 3 mm steel at 7 m

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: WC; 9.6 g; MV 225 m/s

Ball: Lead, RN; 10.25 g; MV 337 m/s
Ball: Plastic; 0.4 g; MV 280 m/s
Ball: JSP; 10.25 g; MV 335 m/s
Ball: FMJ, conical; 10.25 g; MV 335 m/s

Manufacturer

Metallwerke Elisenhutte GmbH (MEN)

Type: Ball: FMJ; 9.6 g, MV 310 m/s

Quick Defence Ball: JHP; 6.0 g; V_{10} 380 m/s

Frangible Ball: Solid Copper/polymer bullet; 5.4 g; V_{10} 410 m/s

INDONESIA

Manufacturer

PT Pindad

Type Ball MU-6TJ: Lead, RN; 10.25 g; V_{10} 265 m/s

Ball: (MU-6WC): 9.6 g; V_{10} 225 m/s

Blank MU-6H: sound level min 90 dB

IRAN

Manufacturer

[Iran](#) Ammunition Industries

Type: Ball: FMJ: ? g; 250 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: WC; 9.59 g; MV 219 m/s

Ball: SWC; 10.24 g; MV 232 m/s

Ball: Lead, HP, SWC; 10.24 g; MV 232 m/s

Ball +P: JHP; 7.13 g; MV 402 m/s

Ball +P: JHP; 8.1 g; MV 287 m/s

Ball +P: JHP; 10.24 g; MV 279 m/s

Ball +P: JSP; 10.24 g; MV 279 m/s

Ball +P: SWC; 10.24 g; MV 271 m/s

Ball +P: Lead, HP, SWC; 10.24 g; MV 271 m/s

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd

Type: Ball: SWC; 9.72 g; MV 259 m/s

Ball: WC; 9.4 g; MV 229 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 10.0 g; MV 293 m/s

Ball: JHP; 9.6 g; MV 250 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 38A: Lead, RN; 10.24 g; MV 250 m/s

Ball 38B: SWC; 10.24 g; MV 250 m/s

Ball 38C: WC; 9.59 g; MV 222 m/s

Ball +P 38D: JHP; 8.05 g; MV 297 m/s

Ball +P 38E: JHP; 7.13 g; MV 328 m/s

Ball +P 38F: JHP; 9.72 g; MV 270 m/s

Ball 38G: FMJ; 8.55 g; MV 256 m/s

Ball 38H: JSP; 8.1 g; MV 296 m/s

Ball 38AC: Lead, copper-plated, RN; 10.24 g; MV 242 m/s

Ball 38BC: SWC, copper-plated; 10.24 g; MV 241 m/s

[MALAYSIA](#)

Manufacturer

SME Ordnance SDN BHD

Type: Ball: LRN; 10.25 g; MV 265 m/s

[MEXICO](#)

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 10.2 g; MV 230 m/s

Ball: Lead; 10.2 g; MV 193 m/s

Ball: Lead, WC; 9.6 g; MV 216 m/s

[POLAND](#)

Manufacturer

Zaklady Metalowe (Mesko)

Type: Ball: JSP; 10.2 g; MV 265 m/s

Ball: Lead, RN; 10.3 g; MV 215 m/s

Target: Wadcutter; 9.6 g; MV 170 m/s

Target: Plastic, RN; 3 g; MV 300 m/s

[RUSSIAN FEDERATION AND ASSOCIATED STATES \(CIS\)](#)

Manufacturer

Novosibirsk Low-Voltage Equipment Works, LVE(JSC)

Type: Ball: FMJ; 6.1 g; MV 315 m/s

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: Ball: JHP; 9.1 g; MV 286 m/s

Type: Ball: WC; 9.6 g; MV 216 m/s

Type: Ball: SWC; 10.2 g; MV 230 m/s

Type: Ball: FMJ; 10.2 g; MV 230 m/s

Type: Ball +P: SWC; 10.2 g; MV 279 m/s

Type: Bullet: JHP; 8.1 g; V₅ 325 m/s

Type: Bullet: JSP; 10.2 g; V₅ 230 m/s

Type: Bullet: JHP; 10.2 g; V₅ 230 m/s

Manufacturer

PMP

Type: Ball: JSP; 10.24 g; MV 274 m/s

Ball: JHP; 10.24 g; MV 274 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: JSP; 10.25 g; MV 265 m/s

Ball: WC; 9.65 g; MV 250 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball 19119: JHP; 7.1 g; MV 470 m/s

Ball 19110: WC; 9.6 g; MV 235 m/s

Ball 19112: Lead, RN; 10.2 g; MV 265 m/s

Ball 19114: FMJ, SWC; 10.2 g; MV 274 m/s

Ball 19124: JSP; 10.2 g; MV 274 m/s

Ball 19125: JHP; 10.2 g; MV 274 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball: Lead, RN; 10.2 g; MV 265 m/s

Target: Wadcutter; 9.5 g; MV 250 m/s

UNITED KINGDOM

Manufacturer

Cobra Gun Company

Type: Ball: HSA Flechette

Manufacturer

Conjay Arms Company

Type: Ball +P: CBX; 5.51 g; MV ?

Ball +P: CBXX; 6.8 g; MV ?

Ball +P: CBAP; 5.51 g; MV 690 m/s; penetrates
5.5 mm RHA (480-530 Brinell, 52 Rockwell)

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: JHP; 8.1 g; MV 282 m/s

Ball: Lead, SWC; 10.24 g; MV 233 m/s

Ball: Lead, SWC; 8.1 g; MV 251 m/s

Ball: Lead, WC; 6.48 g; MV 244 m/s

Ball: Lead, hollow base WC; 9.59 g; MV 236 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball +P: JHP; 8.1 g; MV 320 m/s

Ball: Lead, SWC; 10.2 g; MV 259 m/s

Ball: LCN; 10.0 g; MV 244 m/s

Ball MATCH: LWC; 9.6 g; MV 213 m/s

Ball: JHP; 8.0 g; MV 290 m/s

Manufacturer

CCI-Speer

Type: Shot: 7 g; MV 305 m/s

Ball: JHP; 7.1 g; MV 305 m/s

Ball: JHP; 8.1 g; MV 288 m/s

Ball: JHP; 9 g; MV 283 m/s

Ball: WC; 9.6 g; MV 217 m/s

Ball: SWC; 10.2 g; MV 230 m/s

Ball: Lead; 10.2 g; MV 230 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball +P: JHP; 7.5 g; MV 381 m/s

Ball +P: JHP; 10.2 g; MV 305 m/s

Ball +P: JHP; 7.5 g; MV 442 m/s

Ball +P: JHP; 8 g; MV 412 m/s

Manufacturer

Delta Defense Inc

Type: Frangible: 5.51 g; 386 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammunition)

Type: Ball+P: JHP; 8.1 g; MV 290 m/s

Ball: LRN; 10.0 g; MV 250 m/s

Ball: LWC; 9.6 g; MV 222 m/s

Ball+P: JHP; 8.1 g; MV 297 m/s

Ball: FMJ; 8.6 g; MV 256 m/s

Ball: JSP; 10.0 g; MV 255 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: WC; 9.6 g; MV 216 m/s

Ball: Lead; 10.2 g; MV 230 m/s

Ball: Lead; 10.2 g; MV 230 m/s

Ball: Lead, SWC; 10.2 g; MV 230 m/s

Ball: Lead, SWC; 10.2 g; MV 279 m/s

Ball: Lead, ogival; 10.2 g; MV 279 m/s

Ball: JHP; 8.4 g; MV 288 m/s

Ball: JHP; 7.1 g; MV 311 m/s

Ball: JSP; 8.1 g; MV 251 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 5.18 g; MV 457 m/s

Ball +P: Glaser Blue; 5.18 g; MV 503 m/s

Ball: Glaser Silver; 5.18 g; MV 457 m/s

Ball +P: Glaser Silver; 5.18 g; MV 503 m/s

Manufacturer

Longbow Incorporated

Type: Frangible Ball: 5.5 g; MV 396 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball +P: JHP; 6.2 g; MV 358 m/s

Ball +P: JHP; 7.10 g; MV 310 m/s

Ball +P: JHP; 8.1 g; MV 288 m/s

Ball: Lead, WC; 10.2 g; MV 230 m/s

Ball: Lead, RN; 10.2 g; MV 230 m/s

Ball: Lead; 10.2 g; MV 230 m/s

Ball: SWC; 10.2 g; MV 230 m/s

Ball +P: Lead; 10.2 g; MV 287 m/s

Ball +P: Lead, HP; 10.2 g; MV 278 m/s

Ball: Lead; 13 g; MV 193 m/s

Manufacturer

Winchester-Olin

Type: Ball [M41](#): FMJ; 8.42 g; V₅ 290 m/s

Manufacturer

Winchester-Olin

Type: Ball: JHP; 6.16 g; MV 288 m/s

Ball: JHP; 7.1 g; MV 193 m/s

Ball: JHP; 7.1 g; MV 303 m/s

Ball: JHP; 8.1 g; MV 303 m/s

Ball: BJHP; 8.1 g; MV 297 m/s

Ball: FMJ; 10.2 g; MV 230 m/s

Ball: MP; 9.7 g; MV 262 m/s

Ball: LRN; 9.7 g; MV 223 m/s

Ball: MP; 10.2 g; MV 230 m/s

Ball: JHP; 10.2 g; MV 230 m/s

Ball: Lead; 9.7 g; MV 335 m/s

Ball: Lead, SWC; 10.2 g; MV 230 m/s

Ball: Lead, WC; 9.6 g; MV 216 m/s

Ball: Lead, `Match'; 13 g; MV 190 m/s

Ball: Lead, `Super Match'; 10.2 g; MV 230 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: Lead, RN; 10.25 g; MV 264 m/s

Ball: Lead, WC; 9.6 g; MV 252 m/s

Ball: SWC; 10.25 g; MV 264 m/s

Ball: FMJ; 10.2 g; MV 264 m/s

Ball: JHP; 10.2 g; MV 254 m/s

Ball +P: Lead, RN; 10.25 g; MV 312 m/s

Ball +P: SWC; 10.25 g; MV 312 m/s

Ball +P: JHP; 10.2 g; MV 312 m/s

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.45 ACP

Synonyms:

[0.45 Auto Colt](#); 0.45 Automatic; 11.43 × 23 mm Norwegian Colt

Armament

Colt [M1911](#), [M1911A1](#) semi-automatic pistols and pistols based on the original [M1911](#) design; Smith & Wesson, Star, Obregon, Hafdasa, Heckler and Koch and many other pistols; Smith & Wesson and Colt M1917 revolvers; Thompson, Reising, M2, M3 and [M3A1](#) sub-machine guns; De Lisle silent carbine; other police carbines.

Development

Originally developed by John Browning in 1905, this cartridge was approved by the US Ordnance in 1911 along with the Colt pistol. It was the standard military pistol cartridge in the USA until the adoption of the 9 × 19 mm Parabellum round in 1985 and is still in general use. It continues as the standard pistol calibre for US special operations forces, particularly in its +P loading. The cartridge is also used by many US police agencies. The 0.45 ACP was adopted by Norway and several Central and South American countries and has been used by the UK and Commonwealth forces at various times. A popular commercial round, weapons continue to be made for it in many countries. Despite adoption of the 9 × 19 mm cartridge by the US military, American special operations forces continue to use pistols in this calibre.

Description

A rimless, straight-taper case which may be of brass, aluminium, or steel, Boxer or Berdan primed. An enormous variety of bullets has been developed for this round, but the standard military loading has always been a 15.16 g lead-cored, full metal jacket round-nosed type.

Specifications

US Ball [M1911](#)

Round length: 32.19 mm

Case length: 22.79 mm

Rim diameter: 11.86 mm

Bullet diameter: 11.43 mm

Bullet weight: 14.9 g

Muzzle velocity: 245 m/s

Muzzle energy: 446 J

Abridged ballistic table: 0.45 ACP, 14.9 g ball

Range	Velocity	Energy
0 m	245 m/s	446 J
10 m	242 m/s	435 J
25 m	240 m/s	428 J
50 m	236 m/s	414 J
75 m	231 m/s	396 J
100 m	226 m/s	380 J

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball [FMK 1](#) Mod C: FMJ, RN; lead core in brass jacket; 14.9 g; MV 255 m/s

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 14.9 g; MV 265 m/s

Ball EMB: FMJ controlled expansion; 7.5 g; V_{10} 425 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 14.9 g; MV 255 m/s

Ball: FMJ, SWC; 14.9 g; MV 226 m/s

Ball: Lead, SWC; 12.96 g; MV 277 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: FMJ; 14.9 g; MV 270 m/s

Ball: Lead; 14.9 g; MV 230 m/s

Ball: THV; 3.9 g; MV 780 m/s

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: FMJ; 14.95 g; MV 265 m/s

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball: FMJ; 14.9 g; MV 261 m/s

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 14.9 g; MV 257 m/s

Ball: JHP; 11.99 g; MV 283 m/s

Ball: Metal-cased, SWC; 11.99 g; MV 236 m/s

High-velocity carbine ball: Metal-cased, SWC; 11.99 g; MV 335 m/s

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd

Type: Ball: Lead; 13.6 g; MV 256 m/s

Ball: Lead, SWC; 12.56 g; MV 256 m/s

ITALY

Manufacturer

Fiocchi SpA

Type: Ball: FMJ; 14.9 g; MV 267 m/s

Ball: JHP; 13.0 g; MV 274 m/s

Ball: JHP; 14.9 g; MV 267 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 45A: FMJ; 14.9 g; MV 273 m/s

Ball 45B: JHP; 14.9 g; MV 275 m/s

Ball: FMJ, SWC; 13 g; MV 259 m/s

MEXICO

Manufacturer

Industrias Technos S A (Aquila)

Type: Ball: HP alloy, controlled fragmentation; 7.58 g; MV 442 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

JSC Barnaul

Type: Ball: FMJ; 14.9 g; MV 265 m/s

Manufacturer

Tula Cartridge Works, JSC

Type: Ball: FMJ; 14.9 g; MV 265 m/s

SOUTH AFRICA

Manufacturer

PMP, a division of Denel (Pty) Ltd

Type: Bullet: FMJ; 14.3 g; V₅ 258 m/s

Type: Bullet: JHP; 13.0 g; V₅ 288 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru (MKEK)

Type: Ball: FMJ; 14.9 g; MV 265 m/s

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: JHP; 12.96 g; MV 256 m/s

Ball: JHP; 11.98 g; MV 312 m/s

Ball: FMJ; 14.9 g; MV 251 m/s

Ball: Lead, RN; 14.9 g; MV 236 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: JHP; 12 g; MV 297 m/s

Ball: JHP; 12 g; MV 304 m/s

Match: SWC; 12.9 g; MV 266 m/s

Ball: Lead; 14.9 g; MV 259 m/s

Ball: FMJ; 14.9 g; MV 259 m/s

Ball: JHP; 14.9 g; MV 274 m/s

Ball: Devel; 10.0 g; MV 351 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball +P: JHP; 10.7 g; MV 381 m/s

Ball +P: JHP; 11.9 g; MV 351 m/s

Ball +P: JHP; 13 g; MV 320 m/s

Ball +P: JHP; 14.9 g; MV 290 m/s

Pre-fragmented: JSP; 7.0 g; MV 457 m/s

Manufacturer

Delta Defense Inc

Type: Frangible: 8.1 g; MV 307 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: JHP; 14.9 g; MV 259 m/s

Ball: FMJ; 14.9 g; MV 253 m/s

Ball: JHP; 12.0 g; MV 275 m/s

Ball: FMJ-SWC; 13.0 g; MV 259 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 9.4 g; MV 412 m/s

Ball: Glaser Silver; 9.4 g; MV 412 m/s

Manufacturer

Government contractors

Type: Ball [M1911](#): FMJ, RN; 15.16 g; MV 260 m/s

Tracer [M26](#): FMJ; red trace visible 15 to 150 m; 13.15 g; MV 270 m/s

Blank [M9](#): Mouth tapered and sealed with red lacquered disc

Manufacturer

Longbow Incorporated

Type: Ball: Frangible Ball; 9.3 g; MV 365 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: Jacketed, WC; 12 g; MV 235 m/s

Ball: JHP; 12 g; MV 286 m/s

Ball: FMJ; 15 g; MV 246 m/s

Targetmaster ball: FMJ; 15 g; MV 246 m/s

Manufacturer

Winchester-Olin

Type: Ball [M1911](#): FMJ; 14.9 g; V_{7.7} 260 m/s

Match ball [M1911](#): FMJ; 14.9 g; $V_{7.7}$ 260 m/s

Ball: JHP; 14.9 g; MV 282 m/s

Ball: JHP; 14.9 g; MV 300 m/s

Frangible Ball: 8.1 g; MV 418 m/s

Ball: Lead-free FMJ; 14.9 g; MV 255 m/s

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 14.9 g; MV 246 m/s

Ball: BJHP; 14.9 g; 267 m/s

Ball: FMJ (gilding metal jacket), SWC; 12 g; MV 262 m/s

Ball: (brass alloy jacket) FMJ; 12 g; MV 282 m/s

Ball: JHP; 12 g; MV 304 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 14.85 g; MV 257 m/s

Ball: JHP; 12 g; MV 274 m/s

Ball: FMJ; 13 g; MV 268 m/s

Ball: Lead, RN; 14.9 g; MV 257 m/s

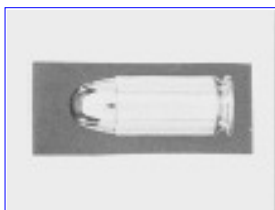
Ball: JHP; 12 g; MV 269 m/s

Ball: FMJ; 13 g; MV 263 m/s

Ball: FMJ; 14.85 g; MV 252 m/s

Ball: Lead, RN; 14.9 g; MV 252 m/s

UPDATED



0.45 ACP



*0.45 ACP high-power cartridge
(1999)*

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

9 × 17 mm

Synonyms:

[9 mm Browning Short](#); 9 mm Kurz; 9 mm Corto; 0.380 Auto; 0.380 ACP

Armament

All pistols chambered for 9 × 17 mm or any of the synonyms shown above. The cartridge has also been tried in one or two sub-machine guns, without much success.

Development

Introduced by Colt in the USA in 1908 as the 0.380 Auto Pistol round. In 1910 it was adopted by Fabrique National Herstal for its Model 1910 pistol. FN coined the name 'Browning Short' to distinguish it from the existing 9 mm Browning cartridge, which thereafter became the 'Browning Long'. Widely adopted by central European police forces from the outset, the 9 × 17 mm went into use as a military cartridge in the 1920s, notably by Czechoslovakia and Italy. It is still widely used by police and security forces and is particularly applicable as an airline security round. It combines adequate stopping power with a velocity low enough to reduce the risk of overpenetration or ricochet, especially when frangible ammunition is used.

Description

A rimless, straight taper, brass case with Berdan or Boxer priming. There are numerous designs of

bullet, mostly soft point in order to improve the stopping ability, but the military/police standard is a metal jacketed, lead-cored, round-nose bullet of 6.15 g weight. Frangible bullets have recently been introduced for this cartridge.

Specifications

Round length: 24.89 mm

Case length: 17.27 mm

Rim diameter: 9.5 mm

Bullet diameter: 9.04 mm

Bullet weight: 6.1 g

Muzzle velocity: 285 m/s

Muzzle energy: 248 J

Abridged ballistic table: 9 mm Short, 6.1 g ball

Range	Velocity	Energy
0 m	285 m/s	248 J
25 m	276 m/s	232 J
50 m	268 m/s	219 J
100 m	252 m/s	194 J

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: Ball: FMJ, RN; 6.15 g; MV 274 m/s

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 6.2 g; MV 280 m/s

BELGIUM

Manufacturer

Browning SA

Type: Ball: FMJ; 6.05 g; MV 270 m/s

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: JHP; 6.15 g; MV 290 m/s

Ball: FMJ; 5.83 g; V₀ 302 m/s

CHILE

Manufacturer

FAMAE

Type: Ball: FMJ; 6 g; MV 290 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 6 g; MV 291 m/s

Ball vz 82: 4.5 g; MV 412 m/s

EGYPT

Manufacturer

Shoubra Company

Type: Ball: FMJ; 6 g; MV 285 m/s

FINLAND

Manufacturer

Nammo Lapua Cartridge Factory Ltd

Type: Ball 4319170: FMJ; 6.1 g; MV 285 m/s

HUNGARY

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ; 6 g; MV 270 m/s

INDONESIA

Manufacturer

PT Pindad

Type: Ball: MU-16TJ: FMJ; 6.15 g; V₁₀ 265 m/s

Anti Riot MU-16PHH: Plastic/rubber Bullet; 0.8 g; V₁₀ 200 m/s

ISRAEL

Manufacturer

Israel Military Industries (IMI)

Type: Ball: FMJ; 6.16 g; MV 288 m/s

Ball: JHP; 5.83 g; MV 305 m/s

Manufacturer

Kalia Israel Cartridge Company Ltd

Type: Ball: JSP; 5.6 g; MV 252 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 6 g; MV 285 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: FMJ; 5.8 g; MV 278 m/s

Ball: JSP; 5.8 g; MV 280 m/s

[MEXICO](#)

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 6 g; MV 288 m/s

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: Ball P11Z: JSP; 6 g; MV 340 m/s

[ROMANIA](#)

Manufacturer

S.N. ROMARM S.A.

Type: Ball: FMJ; 6 g; MV 270 m/s

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

JSC Barnaul Machine Tool Plant

Type: Ball: FMJ; 5.9 g; MV 313 m/s

Manufacturer

Novosibirsk Low Voltage Equipment Works, JSC (LVE Works)

Type: Ball: FMJ; 6.0g; MV 300 m/s

Manufacturer

Tula Cartridge Works, JSC

Type: Ball: FMJ; 6.0 g; MV 300 m/s

[SLOVAKIA](#)

Manufacturer

Technopol, Military and Police Group
Type: Ball: FMJ; 6.15 g; V_{25} 286 m/s

SOUTH AFRICA

Manufacturer

PMP

Type: Bullet type FMJ; weight 6.2 g; V_5 288 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 6.15 g; MV 310 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: FMJ; 6.1 g; MV 315 m/s

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: FMJ; 6.16 g; MV 274 m/s

Ball: JHP; 6.48 g; MV 290 m/s

Ball: Lead, RN; 7.45 g; MV 244 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: FMJ; 6.1 g; MV 290 m/s

Ball: JHP; 5.8 g; MV 304 m/s

Manufacturer

CCI-Speer

Type: Ball: JSP; 5.72 g; MV 320 m/s

Ball: FMJ; 6 g; MV 291 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball+P: JHP; 5.8 g; MV 320 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: JHP; 6.1 g; MV 281 m/s

Ball: FMJ; 5.8 g; MV 277 m/s

Ball: JHP; 5.8 g; MV 279 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: FMJ; 6 g; MV 291 m/s

Ball: JSP; 5.8 g; MV 305 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 4.54 g; MV 411 m/s

Ball: Glaser Silver; 4.54 g; MV 411 m/s

Manufacturer

Longbow Incorporated

Type: Ball: Copper Powder and epoxy; 4.8 g; Mv 305 m/s

Manufacturer

Mullins Ammunition Company

Type: Frangible Ball: Tungsten powder and epoxy; 5.8 g; MV 323 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: FMJ; 6.16 g; MV 291 m/s

Ball: JHP; 5.72 g; MV 302 m/s

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 6.2 g; MV 316 m/s

Ball: JSP; 5.5 g; MV 291 m/s

Ball: FMJ; 6.1 g; MV 291 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 6.1 g; MV 289 m/s

Ball: JHP; 6.1 g; MV 290 m/s

UPDATED



9 × 17 mm

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

5.56 × 45 mm

Synonyms

0.223 Armalilte; 0.223 Remington; 5.56 mm NATO

Armament

Suitably chambered rifles, machine guns or carbines. The [SS109/M855](#) cartridge will have degraded accuracy in firearms having a twist rate of 1:305 mm.

Development

The 5.56 × 45 mm cartridge was derived from the 0.222 Remington during development of the Armalite [AR-15](#) rifle that was subsequently adopted by the US military as the [M16](#). Original prototypes of the [AR-15](#) were in 0.222 Remington calibre, but during testing in 1957, the army raised the ballistics requirements, necessitating a change in the cartridge. Eugene Stoner personally calculated the bullet weight and muzzle velocity necessary in order to achieve the army's requirements and decided that a slightly enlarged cartridge case was necessary, in addition to a heavier bullet. Stoner commissioned Remington to produce the cartridges with 3.56 g (55 grain) bullets, which were designated 0.222 Remington Special. The 0.222 Remington Special cartridge was officially adopted by the US Army in 1964 as the 5.56 × 45 mm [M193](#). This cartridge was subsequently marketed commercially by Remington for sporting rifles as the 0.223 Remington. The 5.56 × 45 mm [M193](#) cartridge was the standard US military rifle cartridge until introduction of the [M855](#) ([SS109](#)) cartridge in 1984. Because

of the widespread use of the [M16](#) and other rifles intended for use with the 3.56 g bullet, the [M193](#) is still produced in large quantities worldwide. The [M193](#) may be safely fired from rifles chambered for the [SS109](#) cartridge.

As a result of extensive tests which were carried out from 1976 to 1979, the 5.56 × 45 mm cartridge was standardised for NATO use, but with a heavier 4 g (62 grain) bullet designed by FN Herstal. This cartridge was designated [SS109](#) in Europe and [M855](#) when it was adopted by the US in 1984. The [SS109](#) cartridge proved to actually outperform the 7.62 × 51 mm NATO cartridge in penetration tests and was more accurate than the [M193](#). The new cartridge did, however require a faster (1:178 mm) rifling twist rate to stabilise its heavier bullet. The faster twist rate will also stabilise the [M193](#) bullet, but the slower 1:305 mm rifling twist rate of older rifles will not properly stabilise the [SS109/M855](#) bullets and [SS109](#) cartridges fired in rifles having a 1:305 mm twist rate will have degraded accuracy. Many rifles presently use an intermediate twist rate of 1:228 mm that stabilises either [M193](#) or [SS109](#) bullets.

Because the 5.56 × 45 mm cartridge has achieved such widespread use in so many types of small arms, from suppressed sub-machine gun sized carbines to long-range heavy rifles, a large number of manufacturers now produce cartridges for tactical use ranging in bullet weight from 3.36 g to 8.4 g. The latter are subsonic cartridges intended for use in suppressed CQB weapons at ranges of 50 m or less. Military match and sniper rifles use 5.56 × 45 mm cartridges with bullets which range in weight from 4 g to 4.8 g. The variety of 5.56 × 45 mm cartridges for military use can be appreciated by scanning the cartridges available from various manufacturers. Concerns over heavy metal contamination in the United States have resulted in the development of new cartridges with steel and copper cores and lead-free primers rather than the traditional steel- and lead-cored bullets.

Despite the proliferation of specialised 5.56 × 45 mm cartridges, the two primary 5.56 × 45 mm cartridges in military use today remain the [M193](#) and [SS109](#). For this reason, we will provide abbreviated ballistics only for these two variants of the 5.56 × 45 mm. The reader is cautioned that due to differences in manufacturing and national specifications, not all 5.56 × 45 mm military cartridges can be safely chambered and fired in every rifle that is nominally chambered for that calibre. This is especially the case with sporting rifles in 5.56 × 45 mm/0.223 Remington calibre. Ammunition manufactured to NATO specification can, of course, be used in any rifle chambered in 5.56 × 45 mm NATO.

Description

The case is rimless and bottlenecked and, usually, is made of brass, although steel and plastic cases are occasionally encountered. Cases may be either Boxer or Berdan primed.

Military bullets are streamlined with a crimping cannelure. Bullets may be found with lead cores ([M193](#)) or lead and steel cores ([SS109](#)). Other bullet shapes and weights may be encountered (due to the large variety of cartridges available), but these are the primary ones.

Specifications

(Data are for [M193](#); [SS109](#) specifications are in parentheses.)

Round length: 57.3 mm

Round weight: 11.7 g (12.5 g)

Case length: 44.5 mm

Head diameter: 9.5 mm

Bullet diameter: 5.66 mm

Bullet weight: 3.56 g (4 g)

Case neck diameter: 6.42 mm

Abridged ballistic table: 5.56 × 45 mm [M193](#) cartridge

Range	Velocity	Energy	Drop	Elevation
0 m	975 m/s	1,692 J	0 mm	0 mils
100 m	852 m/s	1,292 J	63 mm	0.62 mils
200 m	735 m/s	962 J	260 mm	1.33 mils
300 m	626 m/s	698 J	646 mm	2.25 mils
400 m	522 m/s	485 J	1,290 mm	3.38 mils
500 m	420 m/s	314 J	2,295 mm	4.84 mils

Abridged ballistic table: 5.56 × 45 mm [SS109](#) cartridge

Range	Velocity	Energy	Drop	Elevation
0 m	930 m/s	1,708 J	0 mm	0 mils
100 m	832 m/s	1,367 J	66 mm	0.65 mils
200 m	740 m/s	1,081 J	281 mm	1.41 mils
300 m	650 m/s	834 J	675 mm	2.30 mils
400 m	574 m/s	650 J	1,296 mm	3.37 mils
500 m	500 m/w	494 J	2,268 mm	4.68 mils

[ARGENTINA](#)**Manufacturer**

Direccion General de Fabricacion Militares

Type: Ball `C': FMJ; 3.6 g; MV 952 m/s

AUSTRIA**Manufacturer**

Hirtenberger AG

Type: Ball: FMJ; 3.6 g; MV 980 m/s

Type: Ball SC: FMJ; 4 g; MV 935 m/s

Tracer LD: FMJ; base tracer, red to 457 m; 3.6 g; MV 970 m/s

HP Test: FMJ; 3.6 g; pressure ~4,400 bar

Blank: Steel case, crimped

Frangible short-range ball: 1.8 g bullet of approximately 80% copper and 20% plastic; MV 1,050 m/s; Maximum range 750 m; effective range 180 m. Specially designed to function in automatic weapons up to 600 rds/min. Also available with heavy metal (lead, antimony, barium) free primers.

Ball: JSP Nosler bullet; 3.6 g; MV 1,000 m/s

Ball: JSP, Sierra bullet ; 3.6 g; MV 995 m/s

Match: JHP; 4.47 g; V_{10} 825 m/s

BELGIUM

Manufacturer

FN Herstal, SA

Type: Ball [SS109](#): Brass or steel case; FMJ; 4 g; V_{25} 915 m/s. Penetrates 3.5 mm mild steel plate at >600 m

Tracer L110: Brass or steel case; FMJ; 4.13 g; red trace; V_{25} 875 m/s

Blank: Brass case star crimp. Cartridge weight 6.54 g

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball [M193](#): FMJ; 3.56 g; V_{25} 965 m/s

Type: Tracer [M196](#): FMJ; 3.35 g; V_{25} 950 m/s, dim trace 70-450 m

Type: Ball [SS109](#) ([M2811](#)): FMJ; steel/lead core; 4 g; V_{25} 915 m/s. Penetrates 3.5 mm SAE 1010 (Rockwell B55-70) steel plate at 570 m

Blank: Brass case, star crimp

Sporting: (Magtech): FMJ; 3.56 g; MV 988 m/s

[BULGARIA](#)

Manufacturer

Kintex

Type: Ball [M193](#): FMJ; 3.61 g; steel/lead core; MV 1005 m/s

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: Ball [C77](#): FMJ; 4 g; MV 910 m/s

Tracer [C78](#): FMJ; 3.6 g; red trace; MV 875 m/s

Blank [C79](#): Brass case, crimped

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: Ball [M193](#): FMJ; 3.56 g; MV 1,006 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 3.6 g; MV 1,006 m/s

EGYPT

Manufacturer

Shoubra Company

Type: Ball M193: FMJ; 3.6 g; MV 959 m/s

Ball SS109: FMJ; 4 g; MV 940 m/s

Tracer L110: FMJ; 3.6 g; MV 875 m/s; red trace to 457 m

Armour Piercing P112: FMJ; 4 g; MV 940 m/s

FINLAND

Manufacturer

Nammo Lapua Cartridge Factory, Ltd

Type: Ball S350: FMJ; 3.6 g; MV 955 m/s

Ball E372: JSP; 3.6 g; MV 599 m/s

Sniper Ball B421: FMJ; 4.7 g

Manufacturer

Sako Ltd

Type: Ball: FMJ; 3.2 g; MV 985 m/s

Ball: JSP; 3.56 g; MV 1,015 m/s

Ball: JSP; 3.2 g; MV 985 m/s

FRANCE

Manufacturer

Giat Industries

Type: Ball ON: FMJ; 4 g; MV 915 m/s

Type: Tracer TN : FMJ; 4.1 g; MV 890 m/s

Balle ordinaire F1A: FMJ; 3.5 g; MV 957 m/s; brass or steel case

Balle traceur F1A: FMJ; 3.5 g; MV 950 m/s; red trace; brass or steel case

Tracer: FMJ; 3.55 g; MV 950 m/s; red trace

Balle PPA: FMJ; hard core; 3.6 g; MV 950 m/s; penetrates 3.5 mm mild steel at 600 m and has the anti-personnel effect of the ordinary Balle O

Ball, plastic bullet, FTA: Plastic bullet, 1.25 g; MV 870 m/s

Grenade launcher BALLIST: brass case, star crimp

Blank G: Brass case, star crimp

Blanc F1: Brass case, star crimp

Grenade launcher: Brass case, star crimp

Manufacturer

SFM Défense

Type: Ball: FMJ; 3.55 g; MV 950 m/s

Type: Balle O: FMJ; 3.5 g; MV 957 m/s

Tracer: FMJ; 3.55 g; MV 950 m/s; red trace

SR-TR reduced charge R1: Plastic bullet; 1.17 g; MV 750 m/s

SR-TR reduced charge R2: Plastic bullet; 0.85 g; MV 915 m/s

Training Ball R1: Rilsan-bronze cylindro-conoidal bullet; 1.15 g; MV 740 m/s. Accuracy to 100 m is comparable to service ball; maximum range 600 m. Case may be brass or aluminium

Training Ball R2: Rilsan-bronze ogival bullet; 0.9 g; MV 880 m/s. Maximum range 500 m. Case may be brass or aluminium.

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: FMJ; 3.56 g; MV 1,010 m/s

Tracer: FMJ; red trace; 3.5 g; MV 1,010m/s

Practice PT: Brass case, plastic bullet for short-range training. The bullet has a maximum range of 250 m, and a maximum training range of 30 m. Bullet weight 0.2 g; MV 1,000 m/s.

Manufacturer

Dynamit Nobel (RWS)

Type: Ball TM: FMJ; 3.6 g; MV 989 m/s

Ball M11: FMJ; 4.0 g; MV 925 m/s; Sintox

Tracer, M21: FMJ, red trace; 4.1 g; MV 890 m/s; Sintox

Blank: Plastic case, star crimp; Sintox

Ball SPP: JSP; 3.56 g; MV 989 m/s

Manufacturer

Metallwerke Elisenhutte GmbH (MEN)

Type: Special Ball: FMJ; steel and lead core; steel jacket; gilding metal envelope; 4.1 g; MV 930±15 m/s. available with single- or double-base powder, Boxer or Berdan primed

Type: Practice KB: This is a short-range practice round using a bullet comprised of a copper alloy part-jacket and a plastic core, the nose of which is exposed and forms the nose of the bullet. The round feeds in automatic weapons, and the ballistics are such that at 100 m the centre of impact is the same as that of the [SS109](#) ball round. The bullet has a maximum range of approximately 750 m although at this range the remaining energy is very little. Bullet weight 1.3 g; MV 1,100 m/s.

Short-range KB: A special cartridge for use in training on ranges with restricted safety areas. It can be fired in standard weapons without requiring any change of parts, and at a range of 100 m the centre of impact corresponds with the standard [SS109](#) round. Fired at point-blank, the bullet will strike the ground at approximately 240 m from the weapon. The bullet weighs 1.3 g and is composed of a plastic material with a light metal supporting cup and jacket to give a soft point effect. MV 1,100 m/s

Blank DM18: Brass case, crimped star

Manufacturer

SK Jagd und Sportmunition

Type: Ball: FMJ; steel core; 3.6 g; MV 955 m/s

[INDONESIA](#)

Manufacturer

PT PINDAD

Type: Ball MU-4TJ: FMJ; 3.6 g; V_{10} 989m/s

Tracer Mu-5N: FMJ; 407 g; V_{25} 915 m/s

Blank MU-5H: sound level min 90 dB

Anti Riot MU-5DK: Plastic/rubber bullet; 0.24 g; V_{10} 812 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 4.08 g; MV 940 m/s

Type: Ball [M193](#): FMJ; 3.62 g; MV 990 m/s

Tracer M196: 3.5 g; MV 975 m/s

HP Test: 6.62 g; Pressure 4,920 kg/cm²

Grenade launcher: Crimped; Pressure 2,000 kg/cm²

Ball 11AM: FMJ, SL; 3.56 g; MV 988 m/s

Ball 11BM: JHP, SL; 3.56 g; MV 988 m/s

Ball 11CM: JSP, SL; 3.56 g; MV 988 m/s

Ball 13CL: JSP; .08 g; MV 899 m/s

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd

Type: Ball: FMJ; 3.56 g; MV 882 m/s

ITALY

Manufacturer

Europa Metalli

Type: Ball IT-EM/01: FMJ; steel core with lead filler; 4 g; MV 866 m/s

Tracer IT-EM/04: FMJ; lead core; dark ignition trace 30 to +600 m. Trajectory crosses ball at 600 m. 4 g; MV 866 m/s

Short-range training (frangible): Bronze powder with plastic binder; 1.6 g; MV 1,000 m/s. Shoots within 120 mm of service ball at 100 m range. Maximum range 1,000 m

Plastic training metal jacket: Plastic core with copper and zinc jacket to increase bullet mass; 1.6 g; MV 970 m/s; No perforation of 2.5 mm MS plate at 100 m. Maximum range 750 m.

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 223A: FMJ; 3.56 g; MV 974 m/s

Ball 223B: PSP; 3.56 g; MV 959 m/s

MALAYSIA

Manufacturer

SME Ordnance SDN BHD

Type: Ball: FMJ; 3.56 g; V_{23} 965 m/s

MEXICO

Manufacturer

Industrias Technos, S A (Aquila)

Type: Ball: FMJ; 3.56 g; MV 945 m/s

POLAND

Manufacturer

Zaklady Metalowe (Mesko)

Type: Ball: FMJ; 3.56 g; MV 956 m/s

Type: Ball: FMJ (steel core); 4 g; MV 915 m/s

Tracer: FMJ; 4.1 g; MV 910 m/s

Blank: Cartridge weight 10.3 g

PORTUGAL

Manufacturer

INDEP

Type: Ball M366: FMJ; lead core; 3.55 g; $V_{4.5}$ 990 m/s. For [M16](#) rifling weapons

Type: Ball M369: FMJ; lead core; 4 g; MV 940 m/s

Ball: FMJ; lead core; 3.55 g; MV 990 m/s

Ball [SS109](#) type: FMJ; 4 g; V_{10} 932 m/s. For [M16A2](#) rifling weapons

Tracer: FMJ; 3.39 g; $V_{4.5}$ 975 m/s. For [M16](#) rifling weapons

Blank: Brass case, star crimped nose

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Tula Cartridge Works

Type: Ball: FMJ; 3.6 g; MV 955 m/s; steel case

Ball: FMJ; 4.0 g; MV 920 m/s; steel case

Manufacturer

JSC Barnaul Machine Tool Plant

Type: Ball: FMJ; steel core; 4.0 g; V_{25} 900-920 m/s

Ball: FMJ; AP; 4.0 g; V_{25} 900-920 m/s

Manufacturer

Novosibirsk Low Voltage Equipment Works JSC (LVE)

Type: Ball: FMJ, steel core; 4.0 g; MV 900-920 m/s

Ball: FMJ, armour piercing; 4.0 g; MV 900-920 m/s

SINGAPORE

Manufacturer

Chartered Ammunition Industries(CAI)

Type: Ball M193: V_{24} 965 m/s; conforms to US Mil Spec MIL-C-9963

Ball SS109: FMJ; V_{24} 914 m/s. Conforms to US Mil-Spec C-63989

ER: FMJ; 4.0 g; V_{24} 930 m/s. Delivers SS109 performance from rifles with 1:12 twist barrels.

Penetrates 10 mm steel plate of 55-70HRB at 200 m. Fully perforates NATO standard plate at 600 m

Tracer M196: V_{24} 965 m/s; conforms to US Mil Spec MIL-C-60111; red trace to not less than 457 m

FLEA: Frangible Low Energy Ammunition: Plastic bullet; V_{24} 950 m/s. Accuracy at 183 m: 152 mm.

Will not penetrate 5 mm plate at 5 m, will not ricochet.

Plastic Blank: Metal case head, plastic body, star crimped nose. Weight 2.8 g

SOUTH AFRICA

Manufacturer

PMP Division, Denel (Pty) Ltd

Type: Ball M193: V_{24} 965 m/s. Conforms to US Mil Spec MIL-C-9963

Type: Ball SS109/M855: V_{24} 914 m/s. Conforms to US Mil Spec MIL-C-63989

Type: Tracer M196: V_{24} 965 m/s. Conforms to US Mil Spec MIL-C-60111. Red trace to not less than 457 m.

Type: Metal Blank M200: Star crimped nose.

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 3.56 g; MV 985 m/s

Tracer: FMJ; red trace; 3.56 g; MV 985 m/s

Survival: Shot charge over a wad; no external bullet; maximum range approximately 50 m

HP Test: FMJ; pressure 4,350 kg/cm²

SWEDEN

Manufacturer

Bofors-Carl Gustaf

Type: 5.56 AP: FMJ, special heavy metal penetrator covered by a soft casing; 3.4 g; MV 1,000 m/s.

Can penetrate 13 mm of 300 Brinell hardness steel at 100 m or 8 mm of 400 Brinell hardness steel at 200 m

Manufacturer

Norma Precision AB

Type: Ball: 4.47 g; V_o 975 m/s

Manufacturer

Nammo Vanasverken AB

Type: Ball, Non-toxic: 4.0 g; MV 930 m/s

Type: Ball, Armour Piercing 4: FMJ, tungsten carbide core; 4.0 g; MV 940 m/s, armour penetration 15 mm RHA at 100 m and 10 mm RHA at 300 m (300HB at 0°).

SWITZERLAND

Manufacturer

RUAG Munition (formerly SM Swiss Munition Enterprise)

Type: Ball GP90: FMJ; 4.1 g; MV 905 m/s

Tracer: FMJ; 3.8 g; MV 905 m/s

SWISS P Target: HPBT; 4.47 g; MV 890 m/s

SWISS ORDNANCE: FMJ; 4.1 g; MV 905 m/s

UNITED ARAB EMIRATES

Manufacturer

Adcom Manufacturing

Type: Ball: FMJ; lead core; 3.52 g; MV 955 m/s

UNITED KINGDOM

Manufacturer

[British Aerospace](#) Defence Limited, Royal Ordnance Division

Type: Ball L15A1: FMJ; steel core; 4 g; MV 940 m/s (NATO Qualified)

Ball L2A2: FMJ; dark ignition, red trace to 600 m; 4.2 g; MV 890 m/s

Blank L1A1: Brass case, crimped nose

ROTA training: Frangible bullet; 1.8 g; MV 1,000 m/s. Maximum range 1,200 m

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition

Type: Ball: JSP; 3.6 g; MV 990 m/s

Ball Match: JHP; 3.3 g; MV 1005 m/s

Ball: JSP; 3.8 g; MV 960 m/s

Ball: FMJ; 3.2 g; MV 1005 m/s

Ball: FMJ; 4.0 g; MV 899 m/s

Ball Match: JHP; 4.4 g; MV 868 m/s

Ball Match: JHP; 4.8 g; MV 838 m/s

Ball Match: JHP; 4.9 g; MV 838 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 3.56 g; MV 975 m/s

Manufacturer

Delta Defense Inc

Type: Frangible: 2.14 g; MV 847 m/s

Manufacturer

Engel Ballistic Research

Type: Subsonic Ball: JHP; 3.4 g; MV 305 m/s

Subsonic Ball: FMJ; 9.1 g; MV 305 m/s

Subsonic AP: FMJ; tungsten core; 9.1 g; MV 305 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: FMJ; 3.56 g; MV 988 m/s

Ball: FMJ; 3.24 g; MV 1036 m/s

Ball: JSP; 3.56 g; MV 987 m/s

Ball: JHP; 3.56 g; MV 987 m/s

Ball: FMJ; 4.0 g; MV 920 m/s

Frangible nontoxic ball, short range training: FMJ; 2.72 g; MV 1066 m/s

Nontoxic Ball: FMJ; 4.02 g; MV 814 m/s

Ball: JHP, 4.47 g; MV 914 m/s

Ball: JHP; 4.99 g; MV 838 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 2.92 g; MV 1,045 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ; steel core; 4 g; MV 915 m/s

Manufacturer

HJ Ballistic Research

Type: Subsonic Ball: JHP; 5.8 g; MV 297 m/s

Manufacturer

Hornady Manufacturing Co

Type: Frangible Ball: TAP Urban 3.6 g; MV 987 m/s

Frangible Ball: TAP Urban; 3.8 g; MV 944 m/s

Frangible Ball: TAP Precision; 4.8 g; 850 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: FMJ; 3.6 g; MV 948 m/s

Ball Match: HPBT; 3.4 g MV 972 m/s

Ball: FMJ; 3.2 g; MV 1005 m/s

Manufacturer

Mullins Ammunition

Type: Subsonic Ball: FMJ; 7.45 g; 312 m/s

Subsonic Frangible Ball: FMJ; 5.8 g; 274 m/s

Ball: FMJ; 4.5 g; 811 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: FMJ; 3.6 g; MV 987 m/s

Ball: PSP; 3.6 g; MV 987 m/s

Ball: JHP; 3.6 g; MV 987 m/s

Manufacturer

SNC Technologies

Type: Ball: FMJ; 3.8 g; Vo 925 m/s

Manufacturer

Subsonic Munitions Group

Type: AMF Frangible Ball : FMJ; 8.4 g; Vo 289 m/s

Covert Ball: FMJ; 6.5 g; Vo 289 m/s

Manufacturer

US Military Contractors

Type: Ball [M193](#): FMJ; 3.63 g; MV 990 m/s

Ball, M885: FMJ; 4.0 g; MV 914 m/s

Armor Piercing, [M995](#): FMJ, 4.0 g; MV 1,000 m/s

Tracer M196: Red trace from 75-500 m; 3.5 g; MV 975 m/s

Grenade M195: Star crimp; MV 43-50 m/s with 700 g grenade

Blank M200: Star crimp

Manufacturer

Winchester-Olin

Type: Ball [M855](#): FMJ; forward core steel, rear core lead; 4.02 g; V₂₅ 914 m/s

Ball: Lead Free Penetrator: FMJ; forward core steel, rear core copper; 3.6 g; Vo, 974 m/s

Ball, frangible: FMJ, 2.9 g; MV 1044 m/s

Ball: FMJ; 3.2 g; 1039 m/s

Ball, Silvertip penetrator: FMJ; 4.01 g; MV 945 m/s

Ball [M193](#): FMJ; 3.56 g; V₂₅ 964 m/s

Tracer M196: FMJ; red trace; 3.56 g; V₂₅ 950 m/s

Tracer M856: FMJ; red trace; 4.13 g; V₂₅ 911 m/s

Short-range training M862: Plastic bullet; 0.26 g; MV 1,326 m/s

Blank M200: Brass case, star crimp

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 3.53 g; MV 963 m/s

Type: Ball: FMJ; 4 g; MV 914 m/s

Ball: FMJ; 3.56 g; MV 1,004 m/s

Ball: FMJ; 4 g; MV 940 m/s

Ball: JSP; 3.56 g; MV 999 m/s

Tracer: FMJ; red trace to 450 m; 3.5 g; MV 956 m/s

HP test type 2: FMJ; 3.56 g; pressure 4,810 kg/cm²

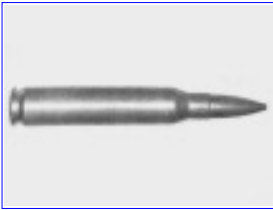
Blank M200: Brass case, short crimp

Blank PPU18: Brass case, long crimp

UPDATED



5.56 × 45 mm NATO round produced by FN HERSTAL, from left: Ball [SS109](#); Tracer L110 and Blank



5.56 × 45 mm NATO

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.22 in Long Rifle

Synonyms:

5.5 × 15R

Armament

All 0.22 rifles and pistols except those specifically chambered for 0.22 Short cartridges.

Development

The 0.22 Long Rifle rimfire cartridge was developed in 1887 by the J Stevens Arms & Tool Company of the USA. The existing 0.22 Long cartridge was used and fitted with a 0.324 g powder charge and a 2.59 g lead bullet instead of the conventional 1.88 g bullet. It was probably first commercially manufactured by the Union Metallic Cartridge Company in 1888. The first high-velocity loadings were developed by Remington in 1930. Over the years it has become the most highly developed and accurate of all rimfire cartridges, and is generally found with either 2.59 g solid lead or 2.4 g hollow point bullets, although innumerable variations can be found. In military hands this cartridge is almost invariably used for training purposes, though clandestine agencies, resistance forces, Special Forces and similar organisations use it in combat roles where the low signature and accuracy were of particular value. A recent development in .22 Long Rifle technology is prefragmented bullets driven at hyper velocity. These prefragmented bullets separate into three equal components upon impact, thereby increasing wounding capability. This patented .22 Long Rifle cartridge is marketed under the trade name "Quik-Shok". (See USA manufacturers)

Description

The cartridge case is rimmed and usually of brass, copper- or brass-plated steel. The priming composition is distributed around the rim, therefore the ductility of this area is critical. Bullets are of lead, occasionally with a light plating of copper and usually with lubricating cannelures, although lubricant may not always be present. Round-nose or hollow point bullets are the normal types.

Specifications

Round length: 24.76 mm

Case length: 15.11 mm

Rim diameter: 6.98 mm

Bullet diameter: 5.66 mm

Bullet weight: 2.6 g

Muzzle velocity: 348 m/s

Muzzle energy: 157 J

Abridged ballistic table: 0.22LR, 2.6 g ball

Range	Velocity	Energy
0 m	348 m/s	157 J
25 m	331 m/s	142 J
50 m	316 m/s	130 J
100 m	294 m/s	112 J

ARGENTINA

Manufacturer

Cartuchos Orbea

Type: Standard: Lead; 2.6 g; MV 330 m/s

HP: Lead, HP; 2.6 g; MV 380 m/s

Pistol: Lead; 2.6 g; MV 310 m/s

BELGIUM

Manufacturer

Browning SA

Type: Standard: Lead; 2.59 g; MV 340 m/s

High Velocity: Lead; 2.59 g; MV 390 m/s

Match: Lead; 2.59 g; MV 335 m/s

Zimmer: 2.59 g; MV 225 m/s

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Standard: Lead; 2.59 g; MV 332 m/s

High Velocity: Lead, copper-plated; 2.33 g; MV 390 m/s

BULGARIA

Manufacturer

Kintex

Type: Ball: Lead; 2.5 g; MV 320 m/s. Brass case, propelling charge 0.083 g pyroxyline

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: Ball: Lead; 2.6 g; MV 342 m/s

Competition: Lead; 2.6 g; MV 322 m/s

Manufacturer

Sotem

Type: Sniper: Lead; 2.6 g; MV 320 m/s

Biathlon: Lead; 2.71 g; MV 315 m/s

Temp pistol: Lead; 2.6 g; MV 315 m/s

Junior: Lead; 2.6 g; MV 320 m/s

Manufacturer

Mvstok

Type: Ball: Lead; 2.4 g; MV 315 m/s

Ball: Lead; 2.4 g; MV 300 m/s

Ball: Lead; 2.5 g; MV 300 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Rex: Lead; 2.5 g; MV 345 m/s

Rex expansive: Lead, HP; 2.4 g; MV 345 m/s

FINLAND

Manufacturer

Lapua Cartridge Factory Ltd

Type: Trainer: Lead; 2.6 g; MV 335 m/s

Multimatch: Lead; 2.6 g; MV 335 m/s

Master: Lead; 2.6 g; MV 325 m/s

Pistol king: Lead; 2.6 g; MV 315 m/s

Speed ace: Lead; 2.6 g; MV 410 m/s

Subsonic HP: Lead; 2.35 g; MV 315 m/s

HP: Lead, HP; 2.35 g; MV 410 m/s
Super club: Lead; 2.6 g; MV 320 m/s

FRANCE

Manufacturer

SFM Défense

Type: Standard: Lead; 2.6 g; MV 340 m/s
HP: Lead, HP; 2.6 g; MV 340 m/s
Tracer: Lead, red trace; 2.6 g; MV 340 m/s

Manufacturer

Survilliers-NCS

Type: Match NCS20: Lead; 2.59 g; MV 320 m/s
Training NCS30: Lead; 2.59 g; MV 320 m/s
Pistol match NCS20: Lead; 2.59 g; MV 280 m/s
Pistol training NCS30: Lead; 2.59 g; MV 280 m/s

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball, Pistol: Lead; 2.6 g; MV 290 m/s
Ball, Rifle: Lead; 2.6 g; MV 325 m/s

Manufacturer

Dynamit Nobel (RWS)

Type: R.50: Lead; 2.6 g; MV 325 m/s
Standard: Lead; 2.55 g; MV 325 m/s
Tracer: Lead, red trace; 2.55 g; MV 330 m/s
Sport: Lead; 2.6 g; MV 325 m/s
High velocity: Lead, solid or HP; 2.55 g; MV 400 m/s
Pistol match: Lead; 2.6 g; MV 270 m/s
Rifle match: Lead; 2.6 g; MV 325 m/s
Biathlon: Lead; 2.6 g; MV 340 m/s
Subsonic: Lead; 2.6 g; MV 305 m/s

Manufacturer

Fiocchi Munizioni SpA

Type: Maxac: Lead; 2.6 g; MV 355 m/s
Carabine: Lead; 2.6 g; MV 330 m/s
Ultrasonic: Lead; 2.6 g; MV 390 m/s
Expansive: Lead, HP; 2.4 g; MV 400 m/s
Asonic: Lead; 2.4 g; MV 310 m/s
Free pistol: Lead; 2.6 g; MV 320 m/s

Standard pistol: Lead; 2.6 g; MV 290 m/s

Mobile: Lead; 2.6 g; MV 335 m/s

Biathlon: Lead; 2.6 g; MV 330 m/s

Competition: Lead; 2.6 g; MV 325 m/s

Super speed: Lead; 2.4 g; MV 490 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball Sidewinder: Lead; 2.59 g; MV 380 m/s

Ball zapper: Lead, HP; 2.5 g; MV 390 m/s

MEXICO

Manufacturer

Industrias Tecnos S A (Aquila)

Type: SE Extra High Velocity: Lead; 2.4 g; MV 390 m/s

SE Extra Subsonic: Lead, HP; 2.4 g; MV 312 m/s

SE Extra Standard: Lead; 2.6 g; MV 350 m/s

Super Maximum Hyper Velocity: Lead; 1.9 g; 533 m/s

Colibri: Lead; 1.3 g; 114 m/s

PHILIPPINES

Manufacturer

[Armscor](#)

Type: Ball: Lead; 2.6 g; MV 382 m/s

Ball: Lead, HP; 2.5 g; MV 390 m/s

Standard velocity: 2.6 g; MV 350 m/s

ROMANIA

Manufacturer

ROMARM SA

Type: Ball: Lead; 2.5 g; MV 320 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Olimp

Type: Ball R: Lead; 2.6 g; MV 318 m/s

Ball B: Lead; 2.7 g; MV 315 m/s

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: High velocity: Lead; 2.6 g; MV 370 m/s

Standard velocity: Lead; 2.6 g; MV 350 m/s

HP: Lead; 2.5 g; MV 370 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Standard: Lead; 2.5 g; MV 330 m/s

HP: Lead, HP; 2.5 g; MV 330 m/s

SWEDEN

Manufacturer

Norma AB

Type: Match: Lead; 2.6 g; MV 330 m/s

UNITED KINGDOM

Manufacturer

Eley Ltd

Type: Standard: Lead; 2.59 g; MV 331 m/s

Tracer: Lead, red trace; 2.27 g; MV 330 m/s

Moving target: Lead; 2.59 g; MV 441 m/s

Silhouex: Lead; 2.59 g; MV 411 m/s

LRZ: Lead; 2.59 g; MV 243 m/s

Tenex: Lead; 2.59 g; MV 331 m/s

Pistol: Lead; 2.59 g; MV 314 m/s

Pistol match: Lead; 2.59 g; MV 305 m/s

HV solid point: Lead; 2.59 g; MV 400 m/s

HV HP: Lead, HP; 2.27 g; MV 400 m/s

Subsonic HP: Lead, HP; 2.27 g; MV 320 m/s

UNITED STATES OF AMERICA

Manufacturer

Blount Incorporated

Type: Quik-Shok Hyper Velocity: Lead, copper plated, prefragmented. 2.07 g, MV 500 m/s

Manufacturer

Cascade Cartridge Company

Type: Standard velocity: Lead; 2.6 g; MV 346 m/s

High velocity: Lead; 2.6 g; MV 376 m/s

HP: Lead; 2.4 g; MV 384 m/s

Super match: Lead; 2.6 g; MV 346 m/s

Manufacturer

CCI-Speer

Type: Stinger: Lead, HP; 2.08 g; MV 514 m/s

Mini-mag: Lead; 2.6 g; MV 410 m/s

Mini-mag HP: Lead, HP; 2.4 g; MV 410 m/s

Mini-mag +V: Lead; 2.4 g; MV 435 m/s

Standard velocity: Lead; 2.6 g; MV 347 m/s

Competition: Lead; 2.6 g; MV 347 m/s

Pistol match: Lead; 2.6 g; MV 326 m/s

Small game: 2.5 g; MV 390 m/s

Manufacturer

Federal Cartridge Company

Type: 710/810: Lead; 2.6 g; MV 382 m/s

712 Hi-power: Lead; 2.5 g; MV 390 m/s

711 Champion: Lead; 2.6 g; MV 350 m/s

Lightning 510: Lead; 2.6 g; MV 383 m/s

Spitfire 720: Lead, conoidal; 2.34 g; MV 430 m/s

Spitfire 722: Lead, conoidal, HP; 2.15 g; MV 457 m/s

Gold medal ultra match: Lead; 2.6 g; MV 348 m/s

Gold medal target: Lead; 2.6 g; MV 351 m/s

Manufacturer

Remington Arms Company Inc

Type: High velocity: Lead; 2.59 g; MV 407 m/s

High velocity HP: Lead, HP; 2.33 g; MV 416 m/s

Target: 2.59 g; MV 349 m/s

Viper: Lead; 2.34 g; MV 430 m/s

Yellow jacket: Lead; 2.14 g; MV 457 m/s

Thunderbolt: Lead; 2.6 g; MV 383 m/s

Cyclone: Lead; 2.3 g; MV 390 m/s

Subsonic: Lead; 2.4 g; MV 320 m/s

Manufacturer

SK Industries

Type: Rifle match: Lead; 2.6 g; MV 320 m/s

Pistol match: Lead; 2.6 g; MV 320 m/s

Subsonic: Lead; 2.6 g; MV 315 m/s

Turbomatch: Lead; 2.6 g; MV 390 m/s

HP: Lead, HP; 2.6 g; MV 385 m/s

Manufacturer

Winchester-Olin

Type: Super X: Lead; 2.6 g; MV 383 m/s

Dynapoint: Lead; 2.6 g; MV 383 m/s

HP Super X: Lead, HP; 2.4 g; MV 390 m/s

Target: Lead; 2.6 g; MV 351 m/s

T22: Lead; 2.6 g; MV 341 m/s

Laser: Lead, coppered; 2.6 g; MV 430 m/s

Laser HP: Lead, coppered, HP; 2.4 g; MV 430 m/s

Xpediter: Lead, coppered; 1.9 g; MV 505 m/s

Rabbit: Lead, coppered, HP; 2.6 g; MV 385 m/s

Subsonic: Lead, HP; 2.5 g; MV 320 m/s

Super match: Lead; 2.6 g; MV 323 m/s

Xpert: Lead; 2.6 g; MV 330 m/s

Pistol: Lead; 2.6 g; MV 323 m/s

Super silhouette: Lead; 2.7 g; MV 372 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Standard: Steel case, lead bullet; 2.56 g; MV 320 m/s

High speed: Lead; 2.56 g; MV 380 m/s

Ball: Lead, HP; 2.56 g; MV 380 m/s

High speed: HP; 2.3 g; MV 380 m/s

Manufacturer

Pobjeda

Type: Standard: Lead; 2.6 g; MV 330 m/s

High velocity: Lead; 2.6 g; MV 375 m/s

UPDATED



.22 in Long Rifle

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Giat 105 mm HE - OE 105 F1

Armament

CN105F1 series tank guns; 105 mm 105 G2 gun; 105 mm 105 G1 gun; all 105 mm L7, Rh 105 and [M68](#) series tank guns and South African GT7 tank gun.

Development

The 105 mm HE OE 105 F1 is a general purpose high-explosive shell. It is stated to have a similar on-target performance to the US 105 mm HE M1, scattering fragments over a lethal radius of 15 to 20 m.

The OE 105 F1 has been referred to as the OC 105 or OE M1e 60, and is sometimes designated as a Fragmentation round.

This round is no longer in production.

Description

The 105 mm HE OE 105 F1 is a fixed round, with the projectile rigidly secured to the brass or steel cartridge case by a single crimping ring. This engages in a pronounced cannelure on the projectile just to the rear of the copper or gilding metal drive band.

The projectile, sometimes referred to as the OE M1e 60, is steel and is filled with 2 kg of Hexolite 50:50. A point detonating FUI 56 fuze is threaded into the nose fuze well; the PD [M51](#) may also be used.

The round uses an M1e F2 brass or steel cartridge case (of the M148 or M150 type - length 617 mm) with a TPA electrical primer in the base. The charge is a nominal 2.4 kg of multiperforated LB-7 T-70 single-base propellant. The propellant load produces a muzzle velocity of 700 m/s.

The reduced power round uses a shorter (531 mm) brass or steel cartridge case with straight sides. It uses the same propellant charge so that the resultant muzzle velocity is also 700 m/s.

The 105 mm HE OE 105 F1 produces a muzzle velocity of 700 m/s and has the following ballistic characteristics:

Range	Time of flight	Remaining velocity
1,000 m	1.54 s	601 m/s
1,500 m	2.4 s	555 m/s
2,000 m	3.34 s	512 m/s
2,500 m	4.36 s	470 m/s

A practice round known as the PLPN is produced as the training equivalent for the OE 105 F1.

Specifications

Weights:

complete round - 21 kg

projectile - 12.1 kg

explosive - 2 kg Hexolite 50:50

propellant, nominal - 2.4 kg LB-7 T-70

Lengths:

complete round - 998 mm

projectile - 444 mm

cartridge case - 617 mm

Muzzle velocity: 700 m/s

Authorised fuzes

BD FUI 56 or [M51](#)

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: 105 mm EF

Description: Standard specifications for reduced power round for 105 mm 105 G1 gun on [AMX-13](#)

FRANCE

Manufacturer

Giat Industries

Type: 105 mm OE

Description: See text

SPAIN

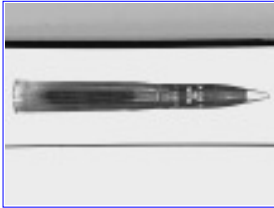
Manufacturer

SANTA BARBARA SA

Type: OE 105 F2

Description: Standard specifications for full power round. Uses brass cartridge case

VERIFIED



The 105 mm HE M1010, the MECAR equivalent of the Giat Industries OE F1, now no longer in production by MECAR

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FIELD ARTILLERY

Date Posted: 23 January 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm: HE M1

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence L119/M119A1 Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178](#) ([South Korea](#)); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); NDSB SAKTI [105 mm Light Gun](#) ([Malaysia](#)); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) Modified (Germany); [105 mm Howitzer M56](#) and M18/61 (Federal Republic of [Yugoslavia](#)).

Development

The 105 mm Cartridge HE M1 is one of the oldest serving of all modern artillery rounds, as its origins can be traced back to the Westervelt Board convened by the USA in 1919 to report on the lessons of the Great War. The advisory board recommended the development of a 105 mm howitzer, later accepted for service as the M1 in 1928. After further development the 105 mm M1 howitzer reached the M2 stage which was accepted for mass production along with an associated round, the HE M1. When the M2 howitzer was later redesignated the [M101](#), the HE round remained the M1. The 105 mm HE M1 served the US armed forces from 1941 onwards and is still in service with them, their latest weapon procured to fire the 105 mm HE M1 being the Royal Ordnance (now [BAE Systems](#), RO Defence) [M119A1](#) Towed Howitzer. The 105 mm HE M1 continues to serve with many other nations and is still widely produced, having attained the distinction of virtually becoming the 'standard' 105 mm HE round.

Metal parts for US 105 mm HE M1 projectiles are manufactured at the Scranton Army Ammunition Plant operated by Chamberlain Manufacturing.

The UK service designation for the 105 mm HE M1 when fired from L119 Light Guns is Round, 105 mm, How, HE L41A2.

The M1 (Mod) round for the USAF is made by converting standard M1 rounds under contract from the US Army Operations Support Command. In October 2001 the Army announced a requirement for the conversion of 49,998 rounds.

Description

The 105 mm Cartridge HE M1 is a semi-fixed round with the projectile being a free fit in the cartridge case to allow free access to the propellant increments inside the case. The projectile is a hollow high-tensile steel forging with a boat-tailed base and a welded base cover, a streamlined ogive and a single gilding metal driving band. The projectile may have either a normal or deep cavity, formed or drilled into the explosive filling beneath the fuze well to accept whatever fuze is to be employed. For example a deep cavity projectile for long intrusion fuzes may be loaded with 2.087 kg of Composition B or 1.93 kg of cast TNT, plus a supplementary charge consisting of 136 g of TNT pressed into an aluminium liner found below the nose-located fuze well. Shells have been filled with RDX/WX6 or RDX/WX8. Normal cavity projectiles are packed either with a fuze or a closing plug in place of a fuze. Deep cavity projectiles may be packed with the supplementary charge and a fuze, the supplementary charge and a closing plug, or with a closing plug only.

A groundburst detonation of a 105 mm HE M1 projectile will result in a lethal area covering from 288 to 290 m².

The cartridge case is of the [M14](#) type. The standard [M14](#) is manufactured using 70:30 brass but other materials have been used and may still be encountered; for instance the M14B1 used copper-plated drawn steel while the M14B4 is a three-piece spiral wrapped lacquered steel case. The base-mounted percussion primer is pressed into place and may be one of several types including the M1B1A2, M28A2 (brass), M28B2 (steel) or [M1A2](#). The primers most commonly encountered are the M28A2 (containing 150 g of black powder) and the M28B2 (122.5 g).

The cartridge case contains the M67 propelling charge. This consists of seven M1 dualgrain propellant increments packed in individually numbered cloth bags, threaded together in numerical order on a length of silk or acrylic twine. (Older types of charges used single-granulation M1 propellant). Before loading, the required increments are arranged inside the case with the No 1 increment, the base charge, at the bottom and the No 7 increment located towards the case mouth. The others are arranged around the walls of the case and around the primer tube.

Charge 1 is the base charge consisting of 238.42 g of propellant M1 (small size).

Charge 2 consists of Charge 1 plus a 41.11 g increment of propellant M1 (small size). Nominal charge weight is 279.53 g.

Charge 3 consists of Charge 2 plus a 70.87 g increment of propellant M1 (large size). Nominal charge weight is 350.4 g.

Charge 4 consists of Charge 3 plus a 96.39 g increment of propellant M1 (large size). Nominal charge weight is 446.79 g.

Charge 5 consists of Charge 4 plus a 153.09 g increment of propellant M1 (large size) and a sheet of lead which functions as a decoppering agent. Nominal charge weight is 599.88 g.

Charge 6 consists of Charge 5 plus a 243.81 g increment of propellant M1 (large size). Nominal charge weight is 843.69 g.

Charge 7 consists of Charge 6 plus a 369.89 g increment of propellant M1 (large size). Total nominal charge weight is then 1.241 kg.

Ballistic data for the 105 mm HE M1 when fired from M101/M101A1 howitzers is as follows:

Charge 1 - MV 198.1 m/s - max range 3,510 m
Charge 2 - MV 216.4 m/s - max range 4,110 m
Charge 3 - MV 237.7 m/s - max range 4,860 m
Charge 4 - MV 266.7 m/s - max range 5,950 m
Charge 5 - MV 310.9 m/s - max range 7,650 m
Charge 6 - MV 376.4 m/s - max range 9,380 m
Charge 7 - MV 472.4 m/s - max range 11,270 m.

Ballistic data for the 105 mm HE M1 when fired from [M102](#) howitzers is as follows:

Charge 1 - MV 205 m/s - max range 3,700 m
Charge 2 - MV 223 m/s - max range 4,300 m
Charge 3 - MV 247 m/s - max range 5,200 m
Charge 4 - MV 278 m/s - max range 6,300 m
Charge 5 - MV 325 m/s - max range 8,100 m
Charge 6 - MV 393 m/s - max range 9,600 m
Charge 7 - MV 494 m/s - max range 11,500 m.

Range data for the L119/M119A1 Towed Howitzer when firing the 105 mm HE M1 is as follows:

Charge 1 - range 1,800 to 3,400 m
Charge 2 - range 2,100 to 4,100 m
Charge 3 - range 2,600 to 4,800 m
Charge 4 - range 4,100 to 6,300 m
Charge 5 - range 4,200 to 7,900 m
Charge 6 - range 5,000 to 9,500 m
Charge 7 - range 6,200 to 11,500 m.

The training round used most commonly as the equivalent to the 105 mm HE M1 is the Cartridge, 105 mm, TP, M67. The projectile used with this round (which is painted blue) contains 1.76 kg of an inert explosive substitute and is fitted with a dummy fuze. The complete round weighs 16.81 kg and the maximum muzzle velocity is 381 m/s. A TP-T version of the M67 has been produced.

A completely inert drill round is known as the Cartridge, 105 mm: Dummy, [M14](#). It cannot be fired and is fitted with a PD Dummy [M59](#) fuze.

RO Defence produce Shell, 105 mm, How, Practice Flash Indicating RO 37-05 for practice firing as the equivalent of the HE M1 projectile. The RO 37-05 is hollow and uses a Flash Indicator Unit B118 in the base to produce flash and smoke for spotting purposes on impact. See separate entry for details.

The M1 (Mod) round is created by reworking M1 rounds in the US Army inventory for use in USAF AC-130 gunships. The M14B4 cartridge case is removed and replaced by an [M14](#) brass case, propellant replaced as needed after inspection and an FMU-153/B PD/delay fuze installed.

Specifications

Weights:

complete round - 18.1 kg
projectile - 14.97 kg
explosive, normal cavity - 2.3 kg Comp B
explosive, normal cavity - 2.177 kg TNT
explosive, deep cavity - 2.087 kg Comp B
explosive, deep cavity - 1.93 kg TNT
supplementary charge - 136 g TNT
propellant, nominal - 1.241 kg

Lengths:

complete round with fuze - 789.18 mm
projectile - 494.8 mm
cartridge case - 371.9 mm
Max body diameter: 104.95 mm
Max diameter over driving band: 107.26 mm
Type of propellant: M1 dualgran

Authorised fuzes

The following are for use with M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers:
PD - M51A5, [M78](#) series, M439, M508 series, M535, M557, M739
MTSQ - M520 series, M500 series, M564, M582
Prox - M513 series, [M728](#) (both require removal of the supplementary charge, if present, and cannot be fired using Charge 7), M732

The M1 (Mod) round used in AC-130 gunships employs the FMU-153/B PD/delay fuze.

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Explosivo de Fragmentacion (EF)

Description: Standard US specifications. Used with Otobreda 105/14 Pack Howitzer

AUSTRALIA

Manufacturer

Office of Defence Production

Type: 105 mm HE M1

Description: Standard US specifications. Used with Otobreda 105/14 Pack Howitzer

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defence, Department of Defence Industry

Type: 105 mm HE M1

Description: Standard US specifications.

[BRAZIL](#)

Manufacturer

ENGEQUÌMICA

Type: 105 mm HE M1 CTG [MD1](#) (brass case) and MD1A1 (steel case)

Description: Standard US specifications

Manufacturer

FI Indústria e Comércio Ltda

Type: HE M1

Description: Standard US specifications. Produced with both [M14](#) and M14B4 cartridge cases. Can be supplied fitted with PD M557 fuze

CANADA

Manufacturer

SNC Industrial Technologies Inc (SNC TEC)

Type: Cartridge 105 mm HE M1

Description: Overall, same as HE M1 but supplementary charge is 140 g of Composition A-3. Primer is [M28](#)

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Municion de Artilleria Cal 105 mm (HE M1)

Description: Standard US specifications. Supplied fitted with PD M557 or M739 fuze. A base-bleed version is reported to be under development

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 105 mm HE

Description: Projectile weight given as 18.12 kg with length 789 mm. Filled with 2.31 kg of Composition B or 2.18 kg of TNT. Muzzle velocity 494 m/s. May be fitted with standard NATO fuzes. No other information available although stated to be compatible with standard NATO howitzers

FRANCE

Manufacturer

Giat Industries

Type: HE M1

Description: Standard US specifications. M67 charge system also produced

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 105 mm HE M1

Description: Standard US specifications. Filled with 2.09 kg of cast TNT and issued with PD M557 fuze fitted

IRAN

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 105 mm HE

Description: Fitted with PD M55A5 or M557 fuze. Standard US specifications

IRAQ

Manufacturer

State factories

Type: 105 mm HE (semi-fixed)

Description: Believed to be HE M1. May no longer be in production

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 105 mm HE M1

Description: Standard US specifications. Supplied fitted with PD M557 or PD M739 fuze. M67 propelling charge also produced

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: 105 mm HE

Description: Standard US specifications, although projectile weight given as 15 kg

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: 105 mm HE M1

Description: Standard US specifications. Supplied fitted with M557 fuze

MALAYSIA

Manufacturer

SME Ordnance Sdn Bhd

Type: Round 105 mm HE M1 PH

Description: Standard US specifications. Fitted with PD M739 fuze. Produced for licence-produced NDSB SAKTI [105 mm Light Gun](#) (equivalent to Royal Ordnance L119/M119A1)

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 105 mm HE

Description: Stated to be equivalent to 105 mm HE M1. Extended range ERM1 also available - see separate entry

PAKISTAN

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 105 mm Howitzer HE

Description: Standard US specifications. Fitted with PD M557 fuze. Complete rounds weight given as 19.07 kg and filled with 2.13 kg of TNT

PORTUGAL

Manufacturer

Explosivos da Trafaria SA

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

INDEP - Industrias Nacionais de Defesa

Type: 105 mm HE M1

Description: Delivered with PD M557 fuze installed but may also be encountered with PD M51A5 or M739. Also available with MTSQ M520A1 or M564. Complete round weight given as 19.02 kg filled

with 2.2 kg of TNT

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: 105 mm HE M1

Description: Standard US specifications. Filled with Composition B or TNT. Available with PD M557 or M739 fuzes. 105 mm ER HPER (High-Performance Extended Range) projectile also available - see separate entry

Manufacturer

FOREX SA

Type: 105 mm HE M1

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: 105 mm Howitzer HE

Description: Standard US specifications

[TAIWAN](#)

Manufacturer

Hsing-Hua Company Ltd

Type: 105 mm HE M1

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 105 mm HE M1 Mermisi

Description: Standard US specifications. Filled with 1.982 kg TNT. Offered fitted with PD M51A5 or M557 fuze or unspecified Proximity fuze.

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: Round 105 mm How HE Training L65

Description: Equivalent to the 105 mm HE M1, intended for low cost training and firing from [105 mm Light Gun](#) L119 and [M101 33](#)- or 34-calibre upgraded guns. It contains 2.2 kg of RDX/TNT. Maximum range when fired from the L119 using Increment 6 is 9,400 m

UNITED STATES OF AMERICA

Manufacturer

Scranton Army Ammunition Plant

Type: 105 mm HE M1

Description: Standard specifications

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: 105 mm HE M1

Description: Essentially the same as HE M1. For 105 mm [M56](#) howitzer, from which it is fired using a seven-charge propellant system plus a Super Charge. Maximum muzzle velocity is 570 m/s and maximum range 13,000 m. May no longer be in production

UPDATED



Cartridge, 105 mm: HE M1 on a projectile/cartridge case mating frame (T J Gander)



Cartridge, 105 mm: HE M1 produced by INDEP of Portugal, complete with packing materials



Cartridge, 105 mm: HE M1 produced by Giat Industries



Cartridge, 105 mm: HE M1 produced by [Pakistan](#) Ordnance Factories

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Cartridge, 40 mm: L/60 AP-T

Armament

All 40 mm L/60 Bofors Guns.

Development

The 40 mm L/60 AP-T round was originally developed just prior to or during the Second World War, providing the Bofors 40 mm L/60 anti-aircraft gun with a capability to defeat armoured land targets. It is still deployed to penetrate the protection carried by many modern strike aircraft and helicopters.

Description

The 40 mm L/60 AP-T round has the same ballistic properties as the 40 mm L/60 HE-T but does not carry explosive or fuze. The penetrator is made from forged hardened steel with a nose cap of cold rolled steel and it is provided with a copper drive band. The nose of the penetrator is covered by a thin steel windshield crimped onto the penetrator body, or joined to it by an adaptor to provide a smooth streamlined outline. The base of the penetrator is machined to accept a tracer element which burns for at least 4 seconds after firing. The cartridge case is crimped rigidly to the projectile by one or two 360° crimping bands; weapons using automatic feed systems or guns with increased rate of fire modifications should use double-crimped ammunition.

The brass cartridge case, which can be reused several times if required, has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. Propellant loads vary from manufacturer to manufacturer, but the Bofors 40 mm L/60 AP-T uses approximately 320 g of NC 1066 single-base

low-erosion propellant, producing a muzzle velocity of 860 m/s.

As a further rough guide to other similar 40 mm L/60 AP-T rounds, the US [M81](#) and M81A1 AP-T round cartridge case (the M25 or M25B1) contains approximately 295 g of M1 propellant. This produces a muzzle velocity of 875 m/s.

On impact with the target the steel windshield crumples to allow the penetrator to pierce the target armour. The Bofors 40 mm L/60 AP-T can penetrate 40 mm of armour plate set at an angle of 60° at a distance of 100 to 150 m.

Specifications

Bofors AB 40 mm L/60 AP-T

Weights:

complete round - 2.1 kg

projectile - 1.2 kg

cartridge case - 760 g

propellant - approx 320 g

Lengths:

complete round - 447 mm

projectile - 151 mm

cartridge case - 310.8 mm

Max case diameter: 62 mm

Tracer burn time: 4 s

Muzzle velocity: 860 m/s

Operating temperature range: -40 to +60°C

Authorised fuzes

None involved

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: 40 mm FMK 2 MOD 0 EJT

Description: Standard specifications

BELGIUM

Manufacturer

FN HERSTAL SA

Type: FN 110 AP-T

Description: Standard specifications. No longer in production but may be retained in service

[BRAZIL](#)

Manufacturer

FI Indústria e Comércio Ltda

Type: AP-T

Description: Standard specifications

FINLAND

Manufacturer

Patria Vammas Oy

Type: AP-T

Description: Standard specifications. Cartridge cases made by OY Hackman AB

FRANCE

Manufacturer

Giat Industries

Type: AP-T

Description: Projectile weight 888 g. Muzzle velocity approximately 880 m/s

GERMANY

Manufacturer

Diehl-Wehrtechnik

Type: AP-T

Description: Standard specifications

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: AP-T

Description: Standard specifications

SWEDEN

Manufacturer

Bofors AB

Type: L/60 AP-T

Description: No longer in production. Standard specifications, see text

UNITED STATES OF AMERICA

Manufacturer

Government arsenals

Type: AP-T [M81](#) and M81A2

Description: No longer in production but may be widely encountered. Complete round weight is 2.08 kg and length 447 mm. MV 875 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: AP-T

Description: May no longer be in production. Standard specifications

VERIFIED



The round on the extreme right is the Bofors L/60 AP-T as produced by Giat Industries. The other rounds are, from the left: TP; TP-T; HE-I-SD; HEI-T-SD

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Terry J Gander

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Cartridge, 40 mm: L/60 HE-T

Armament

All 40 mm L/60 Bofors Guns.

Development

The 40 mm L/60 HE-T is the base round for the entire Bofors 40 mm L/60 anti-aircraft gun family. It has its origins in a 1925 Swedish Navy requirement for a projectile that could virtually guarantee a 'one hit, one kill' performance against aircraft targets. The original requirement was for a 20 mm projectile and gun but it was almost immediately realised that this calibre was too small to ensure the required performance. Bofors AB then proceeded to double the calibre of the projectile to 40 mm and developed an automatic gun to fire the ammunition. The result was the famous and widely used Bofors Gun, the 40 mm L/60, the prototype of which was first fired in 1930. The 40 mm L/60 was produced in huge numbers before and during the Second World War and still remains in front-line service with many armed forces (land and naval) to this day. The 40 mm L/60 ammunition has been produced on a corresponding scale.

Over the years the basic 40 mm L/60 HE-T round has undergone many changes in filling, fuzing, propellant and materials but remains much the same in appearance as the original design. The following Description outlines the current Bofors AB data. For many years 40 mm L/60 HE-T ammunition was produced by LIAB (Lindesbergs Industri AB) which became part of Bofors AB.

The 40 mm L/60 HE-T round is still in production and remains available from Bofors on request. Many other manufacturers produce the round on a regular basis, often referring to it as HE-I or HE-I-T.

Although 40 mm L/60 HE-T rounds were made in huge quantities in the USA for many years, during and since the Second World War, they are no longer in production in that nation other than to special order.

Description

The 40 mm L/60 HE-T is a fixed round with a brass cartridge case and a streamlined boat-tailed projectile, the body is made of a special high-fragmentation steel. The cartridge case is crimped rigidly to the projectile by one or two 360° crimping bands; weapons using automatic feed systems or guns with increased rate of fire modifications should use double-crimped ammunition. A copper drive band (gilding metal has been used) encircles the projectile just above the cartridge case/projectile junction. Rounds are usually fed into the gun in four-round charger clips.

The Bofors 40 mm L/60 HE-T projectile is filled with 92 g of Hexotonal, comprising 42 per cent TNT, 40 per cent RDX, 15 per cent aluminium powder and 3 per cent desensitiser. Many other fillings have been used, for example the US HE-T, SD, MV2 700 contains approximately 63.5 g of tetryl. The base of the projectile contains a tracer element which burns for 5 seconds after firing.

The nose of the projectile may be threaded to accept fuzes with UK, US and Bofors threads. Typical Swedish fuzes for the 40 mm L/60 HE-T include the Type LI 460 PD, which functions against 2 mm dural at impact velocities as low as 350 m/s and self-destructs after 12 seconds (on some HE-T projectiles the end of the tracer burn initiates the self-destruct process). The LI 460 PD uses a UK fuze well thread. The similar LI 462 PD has Bofors threads while the LI 463 PD has US threads. All three fuzes have a tropical rain safety. The LI 465 is similar but will delay arming until the projectile has travelled 55 m. The LI 466 PD also has the arming device plus an integral post-impact device that delays detonation by 0.3 µs; The LI 473 is generally similar.

The brass cartridge case, which can be reused several times if required, has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. Propellant loads vary from manufacturer to manufacturer but the Bofors AB HE-T uses approximately 320 g of NC 1066 single-base low-erosion propellant, producing a muzzle velocity of 860 m/s. As a further rough guide to other similar HE-T rounds, the US MK 2 or MK 3 cartridge case contains approximately 326 g of M1 propellant. This produces a muzzle velocity of 879 m/s.

The training equivalent to the 40 mm L/60 HE-T is the 40 mm L/60 TP or TP-T. It has the same ballistic, weight and dimensional characteristics as the HE-T but either lacks any filling or is filled with an inert HE substitute. It is fitted with an inert or dummy PD fuze. The US 40 mm TP-T is the Cartridge, 40 mm: TP-T, [M91](#).

Drill rounds are available, for example the US Cartridge, 40 mm: Dummy, M25.

Specifications

Bofors AB 40 mm L/60 HE-T

Weights:

complete round - 2.1 kg

projectile - 930 g

cartridge case - 760 g

explosive - 92 g Hexotonal

propellant - approx 320 g

Lengths:

complete round - 447 mm

projectile - 184 mm

cartridge case - 310.8 mm

Max case diameter: 62 mm
Tracer burn time: 5 s
Muzzle velocity: 860 m/s
Operating temperature range: -40 to +60°C

Authorised fuzes

Bofors AB fuzes: PD LI 460, 462, 463, 465, 466, 473
American fuzes: PD MK 27/M3 or [M3A1](#), M27, M71/MK 11 or MK 11 Mod 2

Equivalent rounds

ARGENTINA

Manufacturer

Dirección General de Fabricaciones Militares

Type: 40 mm [FMK 3](#) MOD 0 ET

Description: Standard specifications. TP-T FMK MOD 0 EJT also produced

BELGIUM

Manufacturer

FN HERSTAL SA

Type: FN 116 HE-I-T, FN 117 HE-I-T-SD

Description: Standard specifications. No longer in production but may be retained in service. FN 114 TP-T also produced

BRAZIL

Manufacturer

ENGEQUÍMICA

Type: 40G HE-T CTG [MD1](#)

Description: Standard specifications. TP-T also produced

Manufacturer

FI Indústria e Comércio Ltda

Type: HE-T, HE-I-T

Description: Standard specifications. TP-T also produced

EGYPT

Manufacturer

Maasara Company for Engineering

Type: HE-T

Description: Standard specifications

FRANCE

Manufacturer

Giat Industries

Type: HE-I, HE-I-T

Description: Filled with 82 g Hexal. Projectile weight 910 g. Muzzle velocity approximately 880 m/s. Fitted with PD MR 4061 or MK 27 fuze. TP and TP-T also produced

GERMANY

Manufacturer

Diehl-Wehrtechnik

Type: HE-I-T

Description: Standard specifications. TP-T also produced

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-T

Description: Fitted with LI 465 PD SD fuze. Otherwise standard specifications. TP-T also produced

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HE-T, HE-I-T

Description: Standard specifications. Explosive filling is TNT. TP and TP-T also produced

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: HE-I-T MK 2

Description: Equivalent to US MK 2. Fitted with MK 27 fuze. TP-T [M19](#) also produced

NETHERLANDS

Manufacturer

Eurometaal NV

Type: HE-T

Description: Standard specifications. TP-T also produced

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: HE-T

Description: Standard specifications. Fitted with PD No 255 Mark 4 fuze

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd

Type: HE, HE-T

Description: Standard specifications

SPAIN

Manufacturer

FAEX: Fabricaciones Extrameñas SA

Type: HE-I, HE-I-T

Description: Standard specifications. TP-T also produced

[SWEDEN](#)

Manufacturer

Bofors AB

Type: L/60 HE-T

Description: Production as required. Standard specifications as in text. TP-T also available

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: 40 mm L/60 Break-Up

Description: See separate entry

UNITED STATES OF AMERICA

Manufacturer

Government Arsenals

Type: HEI-T MK 2

Description: No longer in production but may be widely encountered. Weight of complete round is 2.15 kg with the projectile containing 60 g of TNT. Length is 447 mm; MV 879 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

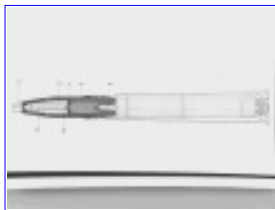
Manufacturer

Yugoimport SDPR

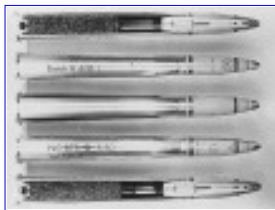
Type: HE-I-T, HE-T, TP-T

Description: May no longer be in production. Standard specifications

UPDATED



An early example of a 40 mm L/60 HE-T round showing: (1) projectile casing; (2) TNT filling; (3) tracer; (4) nose impact fuze; (5) tracer igniter; (6) self-destruct element; (7) detonator tube



Typical Bofors 40 mm L/60 HE-T rounds from the 1950s



Cutaway of a modern 40 mm L/60 TP-T projectile



Cutaway of a modern 40 mm L/60 HE-T projectile

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: WP/Smoke, M60

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence L119/M119A1 Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178](#) ([South Korea](#)); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); NDSB SAKTI [105 mm Light Gun](#) ([Malaysia](#)); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) Modified (Germany); [105 mm Howitzer M56](#) and M18/61 (Federal Republic of [Yugoslavia](#)).

Development

The Cartridge, 105 mm: WP/Smoke, [M60](#) was type classified in 1972, having been adapted from a 105 mm chemical agent (H or HD) [M60](#) projectile type classified in 1958. It is intended for the production of screening and spotting smoke and has a secondary incendiary effect.

Any remaining chemical agent-filled 105 mm [M60](#) projectiles are scheduled for destruction. Chemical-filled [M60](#) projectiles may contain 1.44 kg of H (Mustard agent) or 1.347 kg of HD (Distilled Mustard agent) in liquid form.

The UK service designation for the 105 mm WP/Smoke [M60](#) when fired from L119 Light Guns is Round, 105 mm, How, Smoke Bursting, WP, L42A2.

Description

The 105 mm Cartridge WP/Smoke [M60](#) is a semi-fixed round with the projectile being a free fit in the cartridge case, allowing free access to the propellant increments inside the case. The projectile is a hollow steel forging with a boat-tailed base and a welded base cover, a streamlined ogive and a single gilding metal driving band. The shell is fitted with a steel bush adaptor, which is brazed into position to provide a surface for sealing the forward end of the press-fitted burster casing; it also provides a well for the fuze. On the [M60](#) the adaptor is machined to accept a tubular steel [M5](#) burster casing located towards the base of the shell body; the burster charge is approximately 113 g of Tetrytol in pellet form.

The shell filling consists of 1.737 kg of cast White Phosphorus (WP) although other smoke producing substances such as titanium tetrachloride have been employed. The shell normally operates on impact when the point detonating or MTSQ nose fuze initiates a small charge under the fuze and creates a flash to ignite the burster charge. The burster charge is sufficient to rupture the shell body to release the WP filling which, on contact with the atmosphere, creates a dense white smoke cloud.

The 105 mm WP/Smoke [M60](#) uses a steel burster casing for the [M5](#) burster containing Tetrytol. The only fuze that can be accommodated is the PD M557.

The [M60A1](#) has a high-strength aluminium burster casing for the [M53](#) burster containing Composition A5. Fuzes that can be used include the PD M557 and the MTSQ M564.

The [M60A2](#) is the same as the [M60A1](#) but the burster is changed to the [M53A1](#).

The cartridge case is of the [M14](#) type. The standard [M14](#) is manufactured using 70:30 brass but other materials have been used and may still be encountered; for example the M14B1 used copper-plated drawn steel while the M14B4 is a three-piece spiral-wrapped lacquered steel case. The base-mounted percussion primer is pressed into place and may be one of several types including the M1B1A2, M28A2 (brass), M28B2 (steel) or [M1A2](#).

The cartridge case contains the M67 propelling charge. This consists of seven M1 dualgran propellant increments, packed in individually numbered cloth bags threaded together in numerical order on a length of silk or acrylic twine. Before loading, the required increments are arranged inside the case with the No 1 increment, the base charge, at the bottom and the No 7 increment located towards the case mouth. The other increments are arranged around the walls of the case and around the primer tube.

Charge 1 is the base charge consisting of 238.42 g of propellant M1 (small size).

Charge 2 consists of Charge 1 plus a 41.11 g increment of propellant M1 (small size). Nominal charge weight is 279.53 g.

Charge 3 consists of Charge 2 plus a 70.87 g increment of propellant M1 (large size). Nominal charge weight is 350.4 g.

Charge 4 consists of Charge 3 plus a 96.39 g increment of propellant M1 (large size). Nominal charge weight is 446.79 g.

Charge 5 consists of Charge 4 plus a 153.09 g increment of propellant M1 (large size) and a sheet of lead which functions as a decoppering agent. Nominal charge weight is 599.88 g.

Charge 6 consists of Charge 5 plus a 243.81 g increment of propellant M1 (large size). Nominal charge weight is 843.69 g.

Charge 7 consists of Charge 6 plus a 369.89 g increment of propellant M1 (large size). Total nominal charge weight is then 1.241 kg.

Ballistic data for the 105 mm WP/Smoke [M60](#) when fired from 105 mm M101/M101A1 howitzers is as follows:

Charge 1 - MV 198.1 m/s - max range 3,510 m

Charge 2 - MV 216.4 m/s - max range 4,110 m

Charge 3 - MV 237.7 m/s - max range 4,860 m

Charge 4 - MV 266.7 m/s - max range 5,950 m

Charge 5 - MV 310.9 m/s - max range 7,650 m

Charge 6 - MV 376.4 m/s - max range 9,380 m

Charge 7 - MV 472.4 m/s - max range 11,270 m.

Ballistic data for the 105 mm WP/Smoke [M60](#) when fired from [105 mm M102](#) howitzers is as follows:

Charge 1 - MV 205 m/s - max range 3,700 m

Charge 2 - MV 223 m/s - max range 4,300 m

Charge 3 - MV 247 m/s - max range 5,200 m

Charge 4 - MV 278 m/s - max range 6,300 m

Charge 5 - MV 325 m/s - max range 8,100 m

Charge 6 - MV 393 m/s - max range 9,600 m

Charge 7 - MV 494 m/s - max range 11,500 m.

Range data for the 105 mm L119/M119A1 Towed Howitzer when firing the WP/Smoke [M60](#) is as follows:

Charge 1 - range 1,800 to 3,400 m

Charge 2 - range 2,100 to 4,100 m

Charge 3 - range 2,600 to 4,800 m

Charge 4 - range 4,100 to 6,300 m

Charge 5 - range 4,200 to 7,900 m

Charge 6 - range 5,000 to 9,500 m

Charge 7 - range 6,200 to 11,500 m.

Specifications

Weights:

complete round - 19.47 kg

projectile, less fuze - 14.623 kg

filling, nominal - 1.75 kg cast WP

propellant, nominal - 1.241 kg

Lengths:

cartridge with fuze - 789.94 mm

projectile, less fuze - 399 mm

cartridge case - 371.9 mm

Type of propellant: M1 dualgran

Authorised fuzes

PD M557 and M739; MTSQ M564

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Direccion General de Fabricaciones Militares

Type: Humoso Incendio (HINC)

Description: Standard US specifications. Used with Otobreda 105/14 Pack Howitzer

AUSTRALIA

Manufacturer

Office of Defence Production

Type: 105 mm WP/Smoke [M60](#)

Description: Standard US specifications. Used with Otobreda 105/14 Pack Howitzer

BELGIUM

Manufacturer

PRB SA

Type: 105 mm Smoke NR 144

Description: Standard US specifications but weight complete given as 20 kg. No longer in production but in widespread service

[BRAZIL](#)

Manufacturer

ENGEQUÌMICA

Type: 105 mm Smoke/WP CTG [MD1](#)

Description: Standard US specifications

FRANCE

Manufacturer

Giat Industries

Type: 105 mm WP [M60](#)

Description: Standard US specifications

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 105 mm Smoke/WP [M60](#)

Description: Standard US specifications. Issued with PD M557 fuze fitted

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 105 mm Smoke

Description: Fitted with PD M55A5 or M557 fuze. Standard US specifications

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 105 mm WP/Smoke [M60A2](#)

Description: Standard US specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 105 mm Smoke

Description: Standard US specifications

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 105 mm WP/Smoke [M60](#)

Description: Standard US specifications. Issued fitted with PD M557 fuze

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 105 mm Smoke/WP

Description: Stated to be equivalent to 105 mm WP/Smoke [M60](#)

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 105 mm Smoke

Description: Standard US specifications. Fitted with PD M557 fuze. Weight of complete round given as 19.77 kg and filled with 1.85 kg of White Phosphorus (WP) or 1.95 kg of tetryl pellets. Brass cartridge case is fitted with P-1 Mark 3 percussion primer

PORTUGAL

Manufacturer

INDEP - Industrias Nacionais de Defesa

Type: 105 mm WP/Smoke [M60](#)

Description: Standard US specifications

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: 105 mm Smoke/WP [M60](#)

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: 105 mm Smoke/WP ME60A1

Description: Standard US specifications. Contains 1.75 to 1.8 kg of WP. May be fitted with PPD 440 proximity fuze

Manufacturer

FOREX SA

Type: 105 mm Smoke/WP

Description: Standard US specifications

UNITED STATES OF AMERICA

Manufacturer

Scranton Army Ammunition Plant

Type: 105 mm Smoke/WP

Description: Standard specifications

[YUGOSLAVIA](#), FEDERAL REPUBLIC

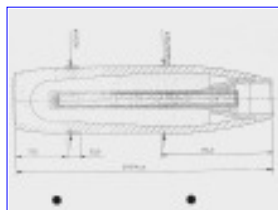
Manufacturer

Yugoimport SDPR

Type: 105 mm Smoke/WP [M60](#)

Description: Essentially the same as WP/Smoke [M60](#). For 105 mm [M56](#) and M18/61 howitzers (a modernised version of the Second World War German 105 mm leFH 18), it is fired using a seven-charge propellant system plus a Super Charge. Maximum possible muzzle velocity is 570 m/s and maximum range 13,000 m, although the normal muzzle velocity is given as 491 m/s and maximum range 11,620 m. Complete round weight given as 20.049 kg and projectile weight 15.8 kg. May no longer be in production

VERIFIED



Cross-section drawing of Cartridge, 105 mm: WP/Smoke, [M60](#)



Cartridge, 105 mm: WP/Smoke, [M60](#) as produced by Giat Industries



Cartridge, 105 mm: WP/Smoke, [M60A1](#) as produced by EXPAL

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 106 mm: HEAT, M344 and M344A1

Armament

[M40A1](#), M40A1C and [M40A2](#) cannon.

Development

The 106 mm HEAT, M344 (originally the T119E11) and M344A1 were developed for use against armoured targets. These two 106 mm (actual calibre 105 mm) rounds differ in several respects, the most obvious being the types of cartridge case and propellant employed. There are also differences in the shaped charges involved.

These rounds are no longer in the US inventory but are widely utilised elsewhere.

Description

The 106 mm HEAT M344 and M344A1 are fixed rounds with the projectiles rigidly secured to the perforated steel cartridge cases by eight equally spaced ball-point crimps. The projectile involved has two indexing buttons 180° apart on the forward bourrelet and a smooth drive band encircles the projectile just forward of the base.

The HEAT M344A1 projectile has a thin-walled steel body containing a shaped charge with 1.265 kg of Composition B inside a conical copper liner; the design of the cone differs between the two types of round. The projectile nose cone adaptor carries a threaded conical cap acting as an ogive with a piezoelectric element connected by a wire to initiate the PIBD M509A1 or M509A2 fuze in the base. An aluminium chamber threaded to the projectile base supports the PIBD fuze, six folding fins and a

piston assembly used to open the fins after firing.

As the projectile is fired it is propelled along the barrel. The same propelling pressure builds up inside the piston assembly, so as soon as the projectile leaves the gun muzzle the piston moves to the rear to extend the six tailfins providing in-flight stabilisation. On impact with a target the piezoelectric element generates an electrical charge to initiate the PIBD fuze and detonate the projectile charge. The resultant detonation produces a high-velocity particle jet to penetrate the target armour.

The M344 round uses an M93 or M93B1 perforated steel cartridge case; the M344A1 uses an M94B1 case. All types of case have an [M57](#) percussion primer press fitted in the base; the [M57](#) consists of a perforated steel tube containing a black powder priming charge and a brass bead. The M344 has a propelling charge of 3.67 kg of [M10](#) propellant while the M344A1 uses [M26](#) double-base, multiperforated granular propellant. In both instances the charge is contained in a rayon and plastic liner.

The maximum effective range of both types of round is approximately 1,350 m, although the maximum possible range can be as high as 3,000 m. Muzzle velocity is 503 m/s. The M344A1 warhead can penetrate 150 mm of armour set at an angle of 60°.

Specifications

Weights:

complete round - 16.89 kg

projectile - 7.96 kg

explosive - 1.265 kg Comp B

propellant - 3.67 kg [M10](#) (M344) or [M26](#) (M344A1)

Length: 998.5 mm

Muzzle velocity: 503 m/s

Max effective range: 1,350 m

Max possible range: 3,000 m

Authorised fuzes

PIBD M509A1 or M509A2

Equivalent rounds

[ARGENTINA](#)

Manufacturer

Fábrica [Militar](#) Rio Tercero

Type: FMK12 Mod 0

Description: Modification of M344A1 used with [105 mm Mod 1974 FMK1 Mod 1 RCL](#) produced in [Argentina](#). Weight is 14.7 kg with explosive weighing 1.2 kg. Muzzle velocity 514 m/s. Maximum effective range given as 2,000 m

[BRAZIL](#)

Manufacturer

ENGEQUÍMICA

Type: HEAT CTG [MD1](#)

Description: Standard US specifications

Manufacturer

FI Indústria e Comércio Ltda

Type: HEAT

Description: Described as under development

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 105 mm HEAT-FS

Description: This round uses a fin-stabilised projectile which is fired from the 105 mm Recoilless Rifle Type 75, a close copy of the US [M40](#) ordnance. The round is 985 mm long and weighs 15.6 kg. The projectile weighs 7.96 kg, 1.26 kg of which is the RDX/TNT shaped charge. Muzzle velocity is 503 m/s and the warhead can penetrate 150 mm of armour set at an angle of 65°. Direct fire range is 580 m. An HE round weighing 21.6 kg and with a maximum range of 7,400 m is also available

FRANCE

Manufacturer

Giat Industries

Type: HEAT-T NR 160

Description: Originally produced in Belgium by PRB. Also known as the FSN 1315 C 650. Standard M344A1 specifications

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder and Cartridge Company

Type: 106 I-HEAT

Description: See following entry

[INDIA](#)

Manufacturer

Indian Ordnance Factory Khamaria
Jabalpur

Type: 106 mm RCL HEAT

Description: Similar to standard M344A1 but primer is No 13A and propellant charge is 3.61 kg of T-28. Fuze is BD 2B. Maximum range given as 3,110 m. Penetration at normal attack angle given as 600 mm

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 106 I-HEAT

Description: See following entry

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: HEAT

Description: Complete round weight given as 16.25 kg and fitted with PIBD M509A1 fuze. Otherwise standard US specifications

[IRAQ](#)

Manufacturer

State factories

Type: 106 mm HEAT

Description: Exact model not confirmed. May no longer be in production

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HEAT

Description: Standard US specifications. Graze-fuzed HE-PFF round weighing 18.7 kg also produced; projectile weight is 9.89 kg

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: HEAT-T M344A1

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: HEAT-T M344A1

Description: Standard US specifications

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: HEAT

Description: Standard M344A1 specification but explosive charge is 1.247 kg RDX/TNT and case primer is Type P-6

Manufacturer

National Development Complex

Type: Improved HEAT

Description: Local development. Has hardened projectile tip to punch through ERA prior to the main trumpet-shaped charge penetrating between 460 and 480 mm of RHA protected by the ERA. Projectile weight 6 kg and muzzle velocity 500 m/s

SPAIN

Manufacturer

DEFEX SA

Type: HEAT M344A1

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: HEAT

Description: Standard US specifications

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: HEAT M344A1

Description: Standard US specifications. Weight of complete round given as 16.416 kg

UPDATED



Cross-section of 106 mm HEAT M344A1 as produced by [MKEK](#) of [Turkey](#)



Cartridge, 106 mm: HEAT, M344A1



*[NORINCO 105 mm HEAT-FS](#) projectile and cartridge case for use with the
*NORINCO Recoilless Rifle Type 75**

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Terry J Gander

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CANNON

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

30 × 170 mm Oerlikon ammunition

Armament

HS 661 towed anti-aircraft gun; [AMX-13](#) and [AMX-30](#) twin self-propelled anti-aircraft guns; Flying Tiger (Biho) twin 30 mm self-propelled anti-aircraft gun system ([South Korea](#)); SABRE twin turret fitted in prototype form to [AMX-10RC](#), [AMX-30](#), [Chieftain](#) and Steyr chassis; MBT TCM 30 twin naval mounting; Oerlikon Contraves GCM series of twin naval mountings; DS 30 B naval mounting; Emerlec 30 twin naval mounting.

KCB ammunition can also be fired by 30 mm L21 RARDEN guns and RARDEN ammunition can be fired from KCB series cannon.

Oerlikon Contraves, including Oerlikon Contraves Pyrotec, is now a member of [Rheinmetall DeTec AG](#).

Development

When originally produced, the series of 30 mm automatic cannon now generally known as the Oerlikon Contraves 30 × 170 mm KCB series was designated the Hispano-Suiza HSS 831 L series. The designation was officially changed when Hispano-Suiza became part of [Oerlikon Contraves AG](#) but is often retained. The 30 mm cannon design involved was virtually a scaled-up version of the 20 mm Type KAD cannon and has been produced in several forms. Modified versions of the 30 × 170 mm Oerlikon ammunition family (with a longer 173 mm case) are used by the Oerlikon Contraves 30 mm KCA series of aircraft revolver cannon (see separate entry).

Oerlikon Contraves Pyrotec AG's KCB ammunition family was used as the basis for the 30 mm RARDEN gun ammunition family, although 30 mm KCB ammunition can be fired from L21 RARDEN guns.

Description

Oerlikon Contraves Pyrotec AG 30 × 170 mm KCB rounds are fixed, with the steel projectiles rigidly fixed into the lacquered steel cartridge cases by crimping points which engage in cannellures on the projectile body. A

single sintered iron drive band is used on the streamlined projectiles.

The same 170.3 mm long necked cartridge cases are used for all types of round in the KCB family and are each filled with 160 g of an NC single-base propellant. A percussion primer is threaded into the base of the cartridge case. All types of projectile are ballistically matched and have a muzzle velocity of 1,080 m/s.

Oerlikon Contraves Pyrotec AG's 30 mm KCB ammunition family includes the following rounds:

HE-I The HE-I projectile is a thin-walled steel shell pressed from a steel blank by a technique ensuring high fragmentation. The filling is 40 g of Hexal P30 which, when detonated, has been demonstrated to produce an average of 1,133 fragments (of which only 0.05 g is dust) in addition to the blast and incendiary effects. The projectile nose is largely occupied by an impact nose fuze originally known as the Type F-831-L3, now the KZC-L3. The rain safe fuze has a muzzle safety distance of 20 m and self-destructs the projectile after approximately 6 to 11 seconds. The fuze functions at a delayed interval after impact to maximise the blast and fragmentation effects in the target. The explosive filling also produces an incendiary effect.

HE-I-T This projectile is much the same as the HE-I but the base of the projectile is occupied by a tracer element so the explosive filling is reduced to 25 g of Hexal P30. After firing, the tracer burns for an average of 4 seconds, during which time the projectile will have reached a range of approximately 2,700 m.

SAPHEI The projectile for this round is manufactured from tempered steel and has relatively thick walls. As the nose of the shell is blunt, for armour penetration efficiency it is covered by a light aluminium windshield to maintain the correct aerodynamic outline. The base of the projectile is occupied by a base impact fuze, known as the BZC-L5, which functions after a short delay following an impact to detonate 20 g of Hexal P30 inside the target armour. In this way blast, fragmentation and incendiary effects are added to the target penetration. The fuze provides projectile self-destruct after 6 to 11 seconds.

TP This training round is a hollow steel shell containing an inert material. The nose fuze is replaced by an aluminium plug, with an outline corresponding to operational KCB rounds.

TP-T This uses exactly the same projectile as the TP but the rear of the shell is occupied by a tracer element. After firing, the tracer burns for an average of 4 seconds, during which time the projectile will have reached a range of approximately 2,700 m.

Specifications

Type	HE-I	HE-I-T	SAPHEI	TP	TP-T
Weights					
complete round	870 g	870 g	870 g	870 g	870 g
projectile	360 g	360 g	360 g	360 g	360 g
filling	40 g	25 g	20 g	none	none
Lengths					
complete round	285.25 mm	285.25 mm	285.25 mm	285.25 mm	285.25 mm
cartridge case	170.3 mm	170.3 mm	170.3 mm	170.3 mm	170.3 mm
Muzzle velocity	1,080 m/s	1,080 m/s	1,080 m/s	1,080 m/s	1,080 m/s
Flight time					
to 1,000 m	1.08 s	1.08 s	1.08 s	1.08 s	1.08 s
to 2,000 m	2.61 s	2.56 s	2.61 s	2.61 s	2.56 s
to 3,000 m	4.93 s	4.83 s	4.93 s	4.93 s	4.83 s
Chamber pressure	4,200 bar	4,200 bar	4,200 bar	4,200 bar	4,200 bar

Authorised fuzes

Integral - see text

Equivalent rounds

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: HE-I (EINC-AD), HE-I-T-SD (EINC-T-AD), AP (SPEINC), TP-T (EJT)

Description: Manufacturers are Fabrica [Militar](#) 'Fray Luis Beltran' of Santa Fe. Standard specifications

FINLAND

Manufacturer

Patria Vammass Oy

Type: HEI, HEI-T, TP, TP-T

Description: Standard specifications Produced by Vammass Defencetec Ltd

FRANCE

Manufacturer

Giat Industries

Type: HEI/SD, HEI-T/SD, TP, TP-T

Description: Brass or steel cartridge cases. Operational rounds fitted with MR3002 PD fuze. Otherwise standard specifications

GREECE

Manufacturer

Hellenic Arms Industry SA (EBO)

Type: HE-I-SD, HE-I-SD-T, TP, TP-T

Description: Standard specifications

KOREA, SOUTH

Manufacturer

[Daewoo](#) Ammunition Corporation

Type: HE-I, HE-I-T, TP-T

Description: Standard specifications

Manufacturer

Poongsan Corporation

Type: HEIT-SD K154, HEI-SD K155, TP-T K156, HEIT-PD K160, HEI-PD K161

Description: All these rounds are basically to standard specifications but the fuzes differ slightly (PD K515, SD K503) and arm after a distance of 18 m.

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: See text

Description: See text

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: Break-Up

Description: A practice round with the thin-walled plastic projectile filled with pressed iron powder which breaks up soon after leaving the muzzle. Production and sales rights taken over from NWM de Kruihoorn

UNITED KINGDOM

Manufacturer

[BAE Systems](#), Royal Ordnance Division

Type: TP, TP-T, HE-I, HE-I-T, SAPHEI

Description: Standard specifications

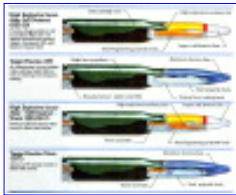
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30 × 170 mm KCB ammunition from Oerlikon and Royal Ordnance: from left, TP; TP-T; HE-I; HE-I-T; SAPHEI



30 × 170 mm ammunition from Giat Industries: from left, TP; TP-T; HEI/SD; HEI-T/SD (1999)



30 × 170 mm KCB ammunition produced by Hellenic Arms Industry SA (EBO) (2000)

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CANNON

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 30 mm DEFA guns

Armament

Giat Industries 30 mm DEFA Series 552/553 guns; Giat Industries 30 mm Series 554 gun; Giat Industries 30 mm Mle 781 (30 M 781) cannon; [M230](#) Chain Gun.

Development

The French 30 mm DEFA Series 552/553 and Series 554 aircraft guns have the same design origins as the UK 30 mm Aden Guns, namely the Second World War German Mauser 213C revolver cannon. The German gun was taken as the base for what became a series of 30 mm aircraft guns, culminating in the Series 552/553 and 554 guns used in the Dassault Mirage series of strike fighters and other aircraft. Following early French cartridge design forays, international design collaboration with the UK resulted in the 30 × 113 mm B cartridge, which is nominally interchangeable between the DEFA guns and the 30 mm Aden Gun series. However, DEFA cartridges have significant priming and other differences, plus a higher muzzle velocity, which renders them incompatible with the 30 mm Aden gun counterparts. [Nammo](#) Raufoss A/S of Norway produces a 30 mm MultiPurpose (MP) round suitable for DEFA cannon.

DEFA 30 mm ammunition is in production throughout the world, especially with nations receiving French defence export matériel. More than 13,500 30 mm DEFA guns have been sold to 40 countries. The latest production model is the 30-550 F4 carried by the Mirage 2000 family. This gun has two rates of fire, 1,800 rds/min for air-to-air combat and 1,100 rds/min for air-to-surface fire missions.

Description

All 30 × 113 mm B DEFA rounds are fixed with the projectiles rigidly crimped to their J-type thermally treated steel cartridge cases, coated with a self-lubricating lacquer. The cartridge case has a raised belt just above the extraction rim. All projectiles have copper or gilding metal drive bands, although sintered iron may be encountered. Primers are electrical, using a special conductive compound which ensures correct powder ignition whatever the position of the round. The propellant used is approximately 50 g of a nitrocellulose-based multiperforated (19-hole) tubular propellant known as B.19.T and produced by SNPE.

DEFA 30 × 113 mm B ammunition may be put into one of three groups; high-explosive, armour-piercing and practice. A further discrimination can be made between ammunition for air-to-air combat and air-to-ground use.

Operating temperature limits are from -54 to +74°C. Firing safety temperature limits are from -60 to +100°C.

Rounds are fed to the revolver loading mechanism on the Series 553/554 guns in belts using pressed steel links.

The following 30 mm DEFA ammunition types are those originally produced by Matra Manurhin Defense, later known as Manurhin Defense and now part of Giat Industries.

HE-I - type F 7572 Known as a 'mine' (Obus Mine Explosif Incendiaire), the round in this air-to-air combat category is the 30 mm type F 7572, which utilises a cold drawn steel, thin-walled, flat-based projectile fitted with a nose-mounted MR3081 short delay fuze with muzzle and rain safety features. The projectile is filled with 50 g of high-temperature tolerant Hexal (RDX/Aluminium). The fuze has a self-destruct mechanism operating between 6 and 15 seconds after firing, using a pyrotechnic chain to time the self-destruct point.

The HE-I projectile weighs 245 g, while a complete round weighs 441 g. Muzzle velocity is 810 m/s.

The training round used to simulate the air-to-air HE-I is the 30 mm TP-T type F 2570. It is fitted with an inert nose plug, filled with an inert powder and matches the ballistics of the 30 mm HE-I projectiles exactly. Projectile weight is 245 g and the complete round weighs 452 g.

There were two earlier versions of the HE-I round, which are no longer in production, the type F 7570 with an ML68 fuze and the HE-I type F 7571 with an MR381 fuze.

HEI - type F 2270 This type of HE-I round is used in the air-to-ground role and is provided with a nose-mounted MR3001 impact fuze. At one time this round was known as an APHEI, with the AP referring to anti-personnel. It is filled with 30 g of high-temperature tolerant Hexal (RDX/Aluminium). There is no self-destruct mechanism.

The HE-I projectile weighs 275 g, while the weight of a complete round is 490 g. Muzzle velocity is 775 m/s.

The training round used to simulate this HE-I is the TP F 2270. It is fitted with an inert nose plug, filled with an inert substance and matches the ballistics of the air-to-ground HE-I projectile exactly. Projectile weight is 275 g and the complete round weighs 490 g. This round is no longer in series production having been replaced by the generally similar type F5272 with a high fragmentation projectile casing for anti-personnel applications. For this round the MR 3001 point detonating fuze is utilised.

There are two earlier versions of air-to-ground HE-I round that are no longer in production, the OAPEI type F 5270 with an MRX70 fuze and the OAPEI type F 5271 with an MR31 fuze.

SAPHEI type F 7670 Intended primarily for air-to-air combat, this round is known as the 30 mm type F 7670. It uses a thick-walled, heat-treated steel projectile with a blunt nose, covered by a light alloy windshield to retain a ballistic match with other rounds in the DEFA 30 mm family. The base of the

projectile is occupied by a delayed action base fuze known as the MR3005, with an arming distance of 20 m from the muzzle and a self-destruct time between 6 and 15 seconds. When the fuze functions it detonates the explosive payload, which weighs 18 g, to create high-fragmentation effects behind the target armour. The projectile can penetrate up to 20 mm of armour.

The weight of the projectile used with this round is 275 g and the weight of a complete round is 490 g. Muzzle velocity is 775 m/s.

API-T - OPIT This round, no longer produced, is known as the 30 mm Mle 5970, and is intended for the air-to-ground attack of hard targets such as armoured vehicles. The projectile uses a cold drawn steel body with thin sidewalls, carrying a heat-treated special steel blunt nose slug that acts as the armour penetrator. It is capable of piercing approximately 20 mm of armour plate. The projectile nose is covered by a light alloy windshield to retain a ballistic match with the other rounds in the DEFA 30 mm family. The projectile body is filled with 20 g of an incendiary composition and a tracer element is mounted in the projectile base.

The projectile used with this round weighs 275 g and the weight of a complete round is 490 g. Muzzle velocity is 765 m/s.

This round is no longer in series production.

TP-T - OXT This round acts as a general purpose training round for the 30 mm DEFA family. Known as the Mle F3170, it has a thick-walled steel body with an inert nose plug. The interior is hollow and empty and the base is occupied by the same tracer element assembly as that used on the 30 mm API-T (OPIT) Mle F5970.

The projectile used with this round weighs 245 g and the weight of a complete round is 490 g. Muzzle velocity is 795 m/s.

TP - OXL This round, the type F 2570, has an inert ballasted projectile.

TP - OXAS The OXAS Practice round, the type F 2270, was developed to prevent fired training rounds ricocheting into aircraft following low-altitude flight patterns, it is also suitable for use where ground safety areas are restricted. The OXAS projectile has a steel body with a plastic nose cap that separates from the body on impact, thereby allowing the rest of the body to fragment, even at low angles of incidence.

The OXAS projectile has the same ballistic characteristics as the SAPHEI combat round. The complete round weighs approximately 475 g and the projectile 275 g.

MP Produced by [Nammo](#) Raufoss A/S of Norway, this 30 mm MP projectile will function reliably against a 2 mm dural plate at impact angles between 0 and 87° NATO, but will not function against a 0.5 mm dural plate in front of the gun muzzle. No fuze is involved as the MP projectile relies upon a drop safe pyrotechnic ignition train. When impacting against aircraft type targets, the projectiles will detonate approximately 300 mm within the target. The distribution of fragments is approximately 20° on each side of the line of fire; the fragments are heavy and optimised to defeat material type targets. The secondary incendiary effects will ignite JP4 and JP5 or heavy diesel oil in self-sealing tanks. Incendiary and blast effects are contained within the target.

The length of the [Nammo](#) Raufoss 30 mm MP round is given as 199.88 mm and it weighs 440 g; projectile weight is 245 g. Muzzle velocity is 810 m/s.

Specifications

For specific details of each round see text

Weights:

complete round HE-I type 7572 - 441 g

complete round, HE-I type 5272, SAPHEI - 490 g

complete round MP - 440 g

projectile HE-I type 7572 - 245 g

projectile - HE-I type 5272, SAPHEI - 275 g

projectile MP - 245 g

propellant - approx 50 g

Lengths:

complete round - 200 mm

cartridge case - 113 mm

Max projectile diameter: 29.99 mm

Max case diameter (over band): 33.8 mm

Max case diameter (over rim): 33.4 mm

Chamber pressure: 294 MPa

Operating temperature range: -54 to +74°C

Authorised fuzes

See text

Equivalent rounds

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: HE-I (EINC), HE-I-SD (EINC-AD), AP (SPEINC), TP (EJ)

Description: Manufacturers are Fabrica [Militar](#) 'Fray Luis Beltran' of Santa Fe. Standard specifications

BELGIUM

Manufacturer

FN HERSTAL SA

Type: HE-I, SAPHEI, API-T, TP

Description: No longer in production but may still be retained for service. Standard specifications

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: HE-I, API, TP, TP-T

Description: Standard specifications

EGYPT

Manufacturer

Maasara Company for Engineering

Type: HE-I (OMEI - GMET F 7570 A/C), TP-T (OXT - F 3170 A/A), TP (OXL - F 2570 A/A)

Description: Standard specifications

FRANCE

Manufacturer

Giat Industries

Type: See text

Description: See text

GREECE

Manufacturer

Hellenic Arms Industry SA (EBO)

Type: HE-I-SD, HE-I-SD-T, TP, TP-T

Description: Round weight for all types is 435 g and projectile weight 244 g. Round length is 200 mm and muzzle velocity 810 m/s

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE, HE-I, TP

Description: Standard specifications

NORWAY

Manufacturer

[Nammo](#) Raufoss AS

Type: MP

Description: See text

SINGAPORE

Manufacturer

[Singapore](#) Technologies Kinetics

Type: HE-I, TP

Description: Standard specifications

SOUTH AFRICA

Manufacturer

Denel (pty) Ltd ([PMP](#))

Type: HE-I, HE-I-T, SAPHEI, APCI [M1A1](#), TP, TP-T

Description: APCI [M1A1](#) has a tungsten carbide core that can penetrate 50 mm of armour at 0° NATO at 200 m with strong after-penetration incendiary effects. SAPHEI stated to penetrate 25 mm of armour at 0° NATO at a range of 100 m. HE-I and HE-I-T are filled with Hexal P 30. Drive bands are sintered iron. Muzzle velocity for all types of round given as 820 m/s. Where appropriate fuze self-destruct time is given as 5 to 13 seconds. Tracing time is a minimum of 4 seconds. A reloading cartridge is also produced

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems Inc (ATK)

Type: HE-I, HEDP, TP

Description: See separate entry

Manufacturer

General Dynamics Land and Ordnance Systems

Type: HEDP, TP

Description: See separate entry

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The range of 30 × 113 mm B ammunition produced by Giat Industries for 30 mm DEFA guns: from left, TP; TP OXAS; TP-T; HE-I; HEI; SAPHEI (1999)



The range of 30 × 113 mm B ammunition produced by Hellenic Arms Industry SA (EBO) Industries for 30 mm DEFA guns (2000)

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FUZES - TIME FUZES, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FMK 22

Armament

120 mm mortar illuminating bombs with suitably threaded fuze well.

Development

No development details known.

Description

The FMK 22 is an electronic time fuze with mechanically non-aligned firing train. A setting device recessed in the nose of the fuze allows setting between 2 and 99.9 seconds, in increments of 0.1 second.

Specifications

Type: electronic time

Weight: 940 g

Thread: [M70](#) × 1.25 mm

Intrusion: 8 mm

Setting range: 2-99.9 × 0.1 s

Arming distance: 60 m

Manufacturer



Electronic time fuze FMK 22

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FUZES - IMPACT FUZES, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FMK 20

Armament

60 mm mortar bombs with UNF-1A thread.

Development

Appears to be derived from the V19 pattern.

Description

A turnscrew in the side of this fuze permits setting to delay or direct action modes. In direct action mode the nose striker impinges on a detonator which fires the magazine. When set to delay the detonator flash is routed through a delay element before reaching the magazine.

Specifications

Type: percussion, direct action, with optional delay

Weight: 206 g

Thread: UNF-1A, 1.5 in × 12 tpi

Intrusion: 28.3 mm

Optional delay: 0.05 s

Arming distance: 40 m

Manufacturer



Impact fuze FMK 20

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FUZES - IMPACT FUZES, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FMK 13

Armament

All 81 mm and 120 mm smoothbore mortars with suitable thread.

Development

Appears to have been derived from the French V19 series.

Description

A direct action impact fuze with optional delay, set by a turnscrew in the side of the fuze. In the direct action mode the striker in the nose is driven into a detonator which fires the magazine; in the delay setting the detonator flash is channelled through a delay element before reaching the magazine.

Specifications

Type: percussion, direct action, with optional delay

Weight: 384 g

Thread: 35.5 × 2 mm

Intrusion: 28.3 mm

Optional delay: 0.05 s

Arming distance: 40 m

Manufacturer



Impact fuze FMK 13

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FUZES - IMPACT FUZES, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FMK 28

Armament

60 mm mortar bombs with 1.5 in fuze thread.

Development

No development history known but appears to be derived from the FMK 20.

Description

The FMK 28 is similar to the FMK 20, offering direct action or delay operation, but appears to be of a more simple construction. The delay can be set by the usual turnscrew in the side of the fuze.

Specifications

Type: direct action and optional delay

Weight: 125 g

Thread: UNF-1A, 1.5 in × 12 tpi

Intrusion: 28.3 mm

Optional delay: 0.05 s

Arming distance: 40 m

Manufacturer



Impact fuze FMK 28

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MORTARS - 120 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm WP smoke bomb `H'

Armament

All 120 mm smoothbore mortars.

Development

Manufactured by Fabrica [Militar](#) Rio Tercero under licence from Thomson Brandt/TDA.

Description

Based upon the [TDA](#) Mle 44 bomb, this is generally similar to the [FMK2 Mod 1](#) HE/fragmentation bomb described previously but is filled with White Phosphorus (WP). There is the usual central burster tube filled with Hexolite beneath the fuze. The ballistic performance is the same as that of the HE/fragmentation bomb.

Specifications

Length, fuzed: 672 mm

Weight: 13 kg

Type of payload: WP

Number of charges: P + 7

Fuze: PD [FMK13 Mod 0](#) or [V19P](#)

Max range: 6,700 m

Max muzzle velocity: 336 m/s

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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MORTARS - 120 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

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120 mm HE/fragmentation bomb FMK2 Mod 1

Armament

All 120 mm smoothbore mortars.

Development

Manufactured by Fabrica [Militar](#) Rio tercero under licence from Thomson Brandt/TDA.

Description

This is based upon the Brandt Mle 44 bomb, a steel streamlined body with alloy tailboom and fins. There are four gas check grooves around the waist of the bomb. The propelling charge consists of a primary cartridge pressed into the end of the tailboom and up to seven secondary increments in horseshoe containers that fit around the tailboom.

Specifications

Length, fuze: 672 mm

Weight, fuze: 13 kg

Weight and type of payload: 2.6 kg TNT or Comp B

Number of charges: P + 7

Fuze: impact, SQ and delay, [V19P](#) or FMK 13

Min range: 400 m

Max range: 6,700 m

Ballistic performance:

Charge	Muzzle velocity	Max range
P	119 m/s	1,360 m
1	153 m/s	2,200 m
2	185 m/s	3,050 m
3	217 m/s	3,850 m
4	248 m/s	4,750 m
5	277 m/s	5,550 m
6	305 m/s	6,150 m
7	336 m/s	6,700 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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MORTARS - 120 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm high-capacity HE bomb FMK1 Mod 1

Armament

All 120 mm smoothbore mortars.

Development

By the Fabrica [Militar](#) Rio Tercero for [TDA](#) and similar 120 mm mortars in Argentine service.

Description

This bomb uses a body and tail unit of steel and is of streamlined shape, with four gas check grooves at the waist. The tailboom has a primary cartridge pressed into place and up to six secondary increments in horseshoe containers, can be fitted around the boom ahead of the fins.

Specifications

Length, fuze: 820 mm

Weight, fuze, in flight: 17.2 kg

Weight and type of payload: 4.2 kg TNT or Comp B

Number of charges: P + 6

Fuze: impact, SQ and delay, [V19P](#) or FMK 13

Min range: 400 m

Max range: 5,650 m

Ballistic performance:

Charge	Muzzle velocity	Max range
P	105 m/s	1,050 m
1	137 m/s	1,740 m
2	166 m/s	2,550 m
3	196 m/s	3,300 m
4	222 m/s	4,100 m
5	246 m/s	4,950 m
6	272 m/s	5,650 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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120 mm HE, practice, smoke and illuminating bombs

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MORTARS - 81 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm practice bomb M80

Armament

Argentine FMRT and other [TDA](#) type 81 mm mortars.

Development

This bomb is of French origin, originally provided for the [TDA](#) mortars in Argentine service and since manufactured under licence.

Description

This bomb uses the same body, tail unit and propelling charge as the 81 mm WP Smoke Bomb [M80](#) described previously, but is filled completely with inert material and carries a dummy fuze in the nose. There is no flash or smoke composition, observation of the fall of shot being entirely reliant upon the disturbance of the ground on impact.

Specifications

Length, fuzed: 415 mm

Weight: 4.2 kg in flight

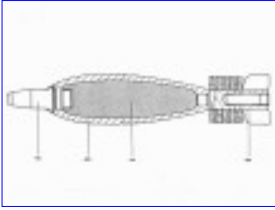
Max range: 5,000 m

Max muzzle velocity: 290 m/s

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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81 mm practice bomb [M80](#): (a) dummy fuze; (b) body; (c) inert filling; (d) tail unit

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MORTARS - 81 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm WP smoke bomb M80

Armament

Argentine FMRT and other [TDA](#) types of 81 mm mortar.

Development

Of French origin, originally provided for [TDA](#) mortars in Argentine service and since manufactured under licence.

Description

This uses the same body and tail assembly as the 81 mm HE Bomb [FMK13 Mod 0](#), with the same propelling charge, but differs internally. The main filling is White Phosphorus (WP) and there is a central burster tube, filled TNT, beneath the impact fuze. There is a slight weight difference and hence a small increase in maximum range.

Specifications

Length, fuze: 415 mm

Weight: 4.2 kg in flight

Type of payload: WP

Fuze: impact SQ, [FMK13](#) or [V19P](#)

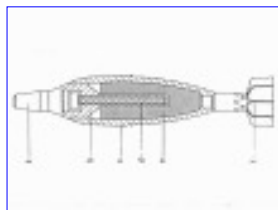
Max range: 5,000 m

Max muzzle velocity: 290 m/s

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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81 mm smoke bomb [M80](#): (a) fuze [FMK13](#); (b) adaptor; (c) body; (d) burster; (e) WP filling; (f) tail unit

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MORTARS - 81 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE/fragmentation bomb FMK13 Mod 0

Armament

Argentine FMRT and other [TDA](#) type 81 mm mortars.

Development

This bomb is of French origin, originally provided for the Brandt/TDA mortars in Argentine service and since manufactured under licence.

Description

The body is of forged steel and the stabiliser an aluminium casting. The filling is 700 g of TNT although Composition B can be filled if desired. The fuze may be the Argentine [FMK13](#) or the [TDA V19P](#). The propelling charge consists of a primary cartridge screwed into the stabiliser and eight secondary charges clipped around the stabiliser tube.

An inert version, loaded to the correct weight, is available for practice purposes.

Specifications

Length, fuze: 415 mm

Weight, fuze: 4.3 kg

Weight and type of payload: 700 g TNT or Comp B

Number of charges: P + 8

Fuze: impact SQ [FMK13](#) or [V19P](#)

Ballistic performance:

Charge	Muzzle velocity	Max range
Primary	70 m/s	485 m
1	111 m/s	1,160 m
2	143 m/s	1,820 m
3	172 m/s	2,380 m
4	199 m/s	2,940 m
5	224 m/s	3,480 m
6	247 m/s	4,000 m
7	269 m/s	4,470 m
8	290 m/s	4,900 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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[81 mm HE/fragmentation bomb FMK13 Mod 0](#)

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MORTARS - 81 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE/fragmentation bomb FMK6 Mod 0 High Capacity

Armament

Argentine FMRT and other Brandt [TDA](#) type 81 mm mortars.

Development

This bomb is manufactured under licence from [TDA](#) of France and is the Brandt Model 81 GC.

Description

The body and tail unit are of steel and it is filled with 2 kg of TNT or Comp B. The fuze may be the Argentine [FMK13](#) or the [TDA V19P](#). The propelling charge consists of a primary cartridge pressed into the cartridge carrier and four secondary charges clipped around the stem of the carrier.

An inert version, loaded to the correct weight, is available for practice purposes.

Specifications

Length, fuzed: 615 mm

Weight, fuzed: 6.6 kg

Weight and type of payload: 2 kg TNT or Comp B

Number of charges: P + 4

Fuze: impact SQ [FMK13](#) or [V19P](#)

Ballistic performance:

Charge	Muzzle velocity	Max range
Primary	45 m/s	200 m
1	75 m/s	535 m
2	98 m/s	900 m
3	120 m/s	1,250 m
4	138 m/s	1,620 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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[81 mm HE/fragmentation bomb FMK6 Mod 0 High Capacity](#)

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MORTARS - 60 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HEAT bomb FMK4 Mod 0

Armament

Argentine assault mortar [FMK1](#) Mod 0, and could probably be employed in other 60 mm mortars capable of firing in the lower register.

Development

By the Rio Tercero factory, to provide an anti-tank projectile for the infantry assault mortar, which is capable of being fired horizontally.

Description

This generally resembles the 60 mm high-explosive bomb but is longer, with a distinct parallel-sided section to the body and a conical rather than ogival nose. The nose section is hollow, and the parallel-walled section contains a conventional shaped charge initiated by a PIBD fuze with a piezoelectric element in the nose of the bomb. The tail unit is that of the HE bomb, but only two propellant increments are provided, sufficient to give an effective range of about 200 m. Although intended for short-range direct fire, there seems no reason why this bomb could not be used with a conventional charge system for indirect fire and top attack of armoured vehicles.

Specifications

Length, fuzed: 414 mm

Weight, fuzed: 2 kg

Weight and type of payload: 250 g TNT or RDX

Number of charges: P + 2

Fuze: PIBD M509 or FMK25 (qv)

Effective range: 200 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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Argentine [60 mm HEAT bomb FMK4 Mod 0](#)

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MORTARS - 60 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb FMK3 Mod 0

Armament

Specifically for the Argentine Standard [FMK3](#) Mod 0, Assault [FMK1](#) Mod 0 and Commando [FMK2 Mod 0](#) 60 mm mortars, but suitable for use in most modern 60 mm [TDA](#) pattern mortars.

Development

Developed by Rio Tercero factory.

Description

This uses the same body as the high-explosive bomb, [FMK1](#) Mod 0, but the steel is specially heat-treated to break into large pieces rather than small fragments, since the requirement is simply to liberate the payload. A central exploder carries a charge of high explosive, initiated by a nose fuze, shattering the bomb body and distributing the charge of White Phosphorus (WP). The tail unit is the same as that of the HE bomb, the same propelling charge system is used and the ballistic performance is the same.

Specifications

Length, fuzed: 384.7 mm

Weight, fuzed: 1.9 kg

Weight and type of payload: 270 g WP

Number of charges: P + 6

Fuze: nose percussion FMK20 or [FMK13](#) of Argentine manufacture, or [V19P](#)

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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Argentine [60 mm smoke bomb FMK3 Mod 0](#)

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MORTARS - 60 mm MORTARS, [ARGENTINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb FMK1 Mod 0

Armament

Argentine 60 mm Mortar [FMK3](#) Mod 0; Assault Mortar [FMK1](#) Mod 0; Hotchkiss-Brandt ([TDA](#)) pattern 60 mm mortars and similar.

Development

Developed by the Rio Tercero Factory.

Description

The bomb has a heat-treated forged steel body of streamlined shape with four gas check grooves at the waist. A light-alloy tail unit with eight fins is screwed into the tail of the body. A shotgun type primary cartridge fits into the tail tube and up to six horseshoe type secondary charges clip around the tail tube ahead of the fins.

Specifications

Length, fuze: 384.7 mm

Weight, fuze: 1.9 kg

Weight and type of payload: 350 g TNT or Comp B

Number of charges: 7

Fuze: FMK 20 impact SQ; or any 1.5 in thread

Ballistic performance:

Charge	Muzzle velocity	Max range
P	65 m/s	415 m
P+1	100 m/s	903 m
P+2	127 m/s	1,353 m
P+3	150 m/s	1,842 m
P+4	170 m/s	2,220 m
P+5	189 m/s	2,632 m
P+6	205 m/s	3,000 m

Manufacturer

Fabrica [Militar](#) Rio Tercero.

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Argentine 60 mm HE bomb [FMKI](#) Mod 0

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [ARGENTINA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm ammunition:

AP	black
HE-I	grey body, yellow ring over red ring around nose
SAP-HE-I	black body, yellow ring over red ring at tip
TP	blue

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [ARGENTINA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Tracer	red tip
AP	black tip

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 33 mm subcalibre

Synonyms:

7.62 × 33 `T'; 7.62 mm Spanish Regaña; 7.62 mm Modelo 68; 7.62mm subcalibre

Armament

Subcalibre inserts for the 88.9 mm Instalaza [M-65](#) anti-tank rocket launcher used by the Spanish and other armies.

Development

This cartridge was developed in 1968 by Colonel Regaña of the Spanish Army. It was originally based on a 7.92 × 33 mm Kurz case necked down to take a 7.62 × 51 mm NATO tracer bullet, providing a suitable cartridge for the subcalibre training device.

Description

Although using the same metric notation, this round should not be confused with the 7.62 × 33 mm 0.30 Carbine cartridge described previously. The two completely different and cannot be interchanged.

The round consists of a pointed rifle-type tracer bullet fitted into a cut down and necked 7.62 × 51 mm cartridge case. The bullet and propelling charge are designed to reproduce the trajectory of the anti-tank rocket fired from the parent weapon. A 7.62 mm calibre barrel is inserted into the rocket launcher tube in the form of a dummy rocket which is loaded in the same fashion as a live round. The firing circuit is arranged to fire the cartridge, after which the dummy rocket is removed and a fresh one loaded. The

bullet displays a visible trace which permits its flight to be tracked for instructional purposes.

Specifications

Round length: 52.7 mm

Case length: 32.8 mm

Rim diameter: 11.94 mm

Bullet diameter: 7.8 mm

Bullet weight: 8.81 g

Muzzle velocity: 215 m/s

ARGENTINA

Manufacturer

Direccion General de Fabricaciones Militares

Type: Tracer `T': FMJ; base tracer; 8.81 g

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

155 mm extended range full-bore HE projectiles

Armament

Towed 155 mm Howitzers: NORICUM GH [N-45](#); CITEFA CALA 30/2; SRC International GC 45; [NORINCO Type](#) WA 021 and Type [GM-45](#); Patria Vammias 155 GH 52 Howitzer; Giat Industries TR and 155/52 guns and M114F Howitzer; [FH-70](#); Soltam Model 839P, 845P, Upgraded M-46 and [M114S](#); Otobreda 155/39; [KH179](#); RDM [M139](#) and [M114/39](#); STK [FH-88](#) and FH-2000; [LIW](#) G5; SITECSA 155/45 ST 012, [M114](#) 155/45 and [M114](#) 155/39; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers; Bofors [FH-77B](#); Extended Range Gun ([Taiwan](#)); XM777 Lightweight Towed Howitzer; [M46/84](#) (Federal Republic of [Yugoslavia](#)).

Self-propelled 155 mm howitzers: TAMSE VCA 155; NORINCO [PLZ45](#) Self-propelled Gun-Howitzer; Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Majnoon ([Iraq](#)); Soltam Rascal and Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; [XT-69](#) ([Taiwan](#)); [AS90](#) and [Braveheart](#); M109A4, M109A5 and [M109A6](#) Paladin; XM2001/XM2002 [Crusader](#) AFAS.

Development

The 155 mm Extended Range Full-Bore (ERFB) projectile is a logical development of ballistic design exercises, extending back to the German 'Paris Gun' of the First World War and even beyond. The basic outline of the modern ERFB was discernible in the 21 cm projectiles fired from the German 21 cm K

(E) railway gun of the Second World War but it took the genius of the late Doctor Gerald Bull and his Space Research Corporation (SRC) team to fully exploit the potential of the design concept and bring it to the ERFB's present operational state, thereby increasing the range potential of modern 155 mm artillery pieces by a factor of at least one third, and often more, in one technological bound.

During the early 1970s, and following the demise of the High Altitude Research Project (HARP), the Space Research Corporation of Canada undertook a series of design studies for the US Navy to increase the range of its shore bombardment weapons. No operational projectiles resulted from those studies but the experience led directly, over a four-year period, to the current form of the 155 mm ERFB design (the Mk 10 Mod.2), and the design of the 155 mm GC 45 gun-howitzer to fire the projectiles. The success of this 45 calibre gun-howitzer and ammunition combination led to numerous international collaborations, such as those between the Space Research Corporation and the Austrian NORICUM, the Belgian PRB SA and the South African [Arm Scor](#), among others. Since the late 1970s/early 1980s, the spread of the ERFB concept and weapons to fire such munitions, has been one of the most significant technological and marketing aspects of the current artillery scene.

During 1996, [India](#) placed a contract with Denel of [South Africa](#) for a total of 50,000 rounds of 155 mm ERFB ammunition. The contract was worth approximately R840 million (US\$24.1 million) and included 40,000 HE rounds offered at US\$390 each. More similar projectiles are being sought to replace those expended during the 1999 fighting in northern Kashmir.

The application of the Base Bleed, or Base Burn (BB), unit to the 155 mm ERFB brought an additional significant range increase capability to the artillery field. Since the BB unit concept is relatively simple to apply to the ERFB, the 155 mm ERFB-BB projectile will also be considered in this entry.

In 1996, it was announced that [SOMCHEM](#), a Denel subsidiary, had developed a 155 mm Velocity-Enhanced Long Range (VLAP) projectile. See following entry for details.

Description

The 155 mm ERFB projectile follows a basic pattern but there are minor differences between projectiles produced by various manufacturers. The main design features of the 155 mm ERFB projectile are common to all, as they all have an extremely long streamlined outline which is virtually a continuous ogive from the nose to the copper or gilding metal drive band and plastic obturator band located close to the base; the drive and obturator bands are protected by a grommet until just before loading. The body outline is marked by the use of four steel bore riding nubs which are either machined at the same time as the rest of the projectile body or, more commonly, welded to the outline using mild steel. These angled nubs are intended to match the average projectile rotation and provide support for launch stability. A boat tailed drag reduction steel Hollow Base (HB) unit with a pronounced open hollow cavity is threaded onto the base of the shell body.

The one-piece body is forged from high-grade steel, typically AISI 9260 or a similar grade. The explosive payload can vary but a typical explosive filling is 8.2 kg of Composition B or 8.6 kg of TNT. The detonation of a 155 mm HE ERFB projectile filled with Composition B and manufactured using AISI 9260 steel will result in an average of 4,750 fragments. The South African 155 mm ERFB produces approximately 7,000 fragments with an individual mass larger than 0.5 g using a nominal payload of 8.71 kg of RDX/TNT 50:50.

The nose fuze cavity, which is normally occupied by a lifting plug during transport and handling, can accommodate a range of standard fuzes, including proximity and electronic fuzes.

In place of the standard aluminium hollow base unit a BB unit can be installed without greatly affecting the overall dimensions or payload-carrying capabilities of the basic ERFB projectile. The steel-cased BB unit is threaded onto the base in place of the normal hollow base unit. The 155 mm ERFB then becomes 155 mm ERFB-BB and significant range increases can be achieved.

The range increases are produced by a slow-burning block of inhibited propellant powder which is ignited on firing by the propelling charge gases. To ensure that the ignition remains constant as the projectile leaves the barrel the propellant gases also ignite a zirconium pellet which continues to burn for 2 seconds and ensures grain combustion. Most base bleed units continue to burn for about the first 30 seconds of a trajectory.

The burning propellant does not provide thrust. Instead the gases produced by the BB unit emerge at subsonic velocity through a central port in the unit and inhibit the formation of drag-inducing turbulence which would otherwise collect to create drag behind the projectile base. By burning the BB propellant the base drag can be reduced by at least 50 per cent and sometimes as much as 70 per cent. This creates a significant increase in range potential, as much as 25 per cent in most cases, without the reduction in accuracy inherent in other range-enhancing systems such as rocket propulsion. A typical maximum dispersion figure for a 155 mm ERFB-BB is less than 0.5 per cent of the range; the figure for a 155 mm ERFB is 0.35 per cent. As an example the South African Motor BB 155 mm M1 weighs 4.8 kg, is 120 mm long and has an external diameter of 152 mm.

South African 155 mm ERFB projectiles may be converted in the field by removing boat tails from ERFB projectiles and fitting base bleed units to produce 155 mm ERFB-BB projectiles. The process is carried out using a projectile clamping table. The same table can also be used to remove damaged obturators and fit new ones. The table can be folded flat and weighs 25 kg.

To take full advantage of the range potential of 155 mm HE ERFB and ERFB-BB projectiles they are usually fired with high-energy charges, typically the NATO/American [M3A1](#) (zones 3, 4 and 5), M4A2 (zones 3, 4, 5, 6 and 7), [M119A1](#) (zone 8), [M203](#) (zone 9) or the [M11](#) (zone 10), the latter being restricted to 45 calibre or longer barrels.

Typical range comparison figures for 155 mm HE ERFB projectiles fired from 39 and 45 calibre barrels are as follows:

Barrel length	39 calibres	45 calibres
Propelling charge		
M119A1	19,200 m	21,100 m
M203	25,900 m	26,500 m
M11	n/a	30,000 m

Typical range comparison figures for 155 mm HE ERFB-BB projectiles fired from 39 and 45 calibre barrels are as follows:

Barrel length	39 calibres	45 calibres
Propelling charge		
M119A1	24,500 m	26,200 m
M203	32,500 m	32,600 m
M11	n/a	39,600 m

Typical muzzle velocities for 155 mm HE ERFB and ERFB-BB projectiles when fired from 45 calibre barrels are as follows:

Charge	Muzzle velocity
M3A1 zone 3	266 m/s
M3A1 zone 4	302.1 m/s

M3A1 zone 5	359.9 m/s
M4A2 zone 6	458.1 m/s
M4A2 zone 7	541.9 m/s
M119 zone 8	658 m/s
M203 zone 9	795.5 m/s
M11 zone 10	897 m/s

The propelling system for the [LIW 155 mm G5](#) and G6 gun-howitzers originally involved a three-charge cloth bag system. This has been replaced by a modular system involving combustible cases, developed by [SOMCHEM](#), with a built-in charge retaining device. The system may be used with ERFB, (above the basic Charge 2) ERFB-BB projectiles and all NATO 155 mm projectiles.

The lowest charge for the [SOMCHEM](#) modular charge system is the Charge Propelling 155 mm Modular Charge 1 [M51](#). The combustible container for this charge is red and contains single-base granular propellant. The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 2.3 kg, is 211 mm long and the diameter is 164 mm.

The next charge is the Charge Propelling 155 mm Modular Charge 2 [M52](#). The combustible case is blue and houses triple-base propellant cords. The diameter at the front of the case is reduced to allow it to friction fit into the rear of a Charge 2 increment (see below). The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 5.6 kg, is 373 mm long and the diameter is 164 mm.

This modular system continues with the Charge Propelling 155 mm Modular Increment [M52](#). One or two of these increments can be added to the normal Charge 2. Charge 2 plus one increment can be used with boat tailed ERFB and all NATO 155 mm projectiles. Charge 2 plus two increments can be used with ERFB, ERFB-BB and all NATO 155 mm projectiles. Each increment is contained in a green combustible case containing triple-base propellant cords. The igniter consists of 60 g of G12 gunpowder. The charge weighs approximately 4 kg, is 289 mm long and has a diameter of 164 mm.

The top charge of the modular system is the Charge Propelling 155 mm Modular Charge 3 [M53](#). The charge is contained in a purple (jacaranda) combustible case containing triple-base tubular propellant. The igniter consists of G12 gunpowder. The charge weighs approximately 17.1 kg, is 930 mm long and the diameter is 164 mm.

All charges are ignited by the Tube Percussion [M82](#) which contains 1.4 to 1.5 g of gunpowder. The tube is 49.37 mm long with a diameter over the rim of 15.24 mm.

With this system the following ballistic performances can be achieved using a 45 calibre barrel:

- Charge 1 - MV 350 ± 5 m/s - max range 9,100 m
- Charge 2 - MV 483 ± 5 m/s - max range 13,400 m
- Charge 2 + 1 increment - MV 645 ± 5 m/s - max range 19,000 m
- Charge 2 + 2 increments - MV 795 ± 5 m/s - max range 25,400 m
- Charge 2 + 2 increments + BB - MV 789 ± 5 m/s - max range 31,000 m
- Charge 3, standard shell - MV 897 ± 5 m/s - max range 30,200 m
- Charge 3 + BB - MV 895 ± 5 m/s - max range 39,000 m.

This modular charge system was replaced by one involving up to six [M62A1](#) combustible modular charges all with the same content and meeting the NATO Joint Ballistics MoU. The charges are produced by [SOMCHEM](#) and can be used with ordnance up to 52 calibres long. Other similar modular charge systems could be employed with ERFB and ERFB-BB projectiles.

One-piece Combustible Cartridge Cases (CCC) have been developed for use with 155 mm ERFB projectiles. A typical example is the C30 charge manufactured by Chartered Ammunition Industries of [Singapore](#). The separate loading C30 contains 14 kg of triple-base propellant, is 770 mm long and has a diameter of 160 mm. It will provide a range of 30,000 m using a 39 calibre barrel and 40,000 m using a 45 calibre barrel.

One further charge developed for use with 39 and 45 calibre 155 mm barrels firing ERFB projectiles, is the Propelling Charge No 16 produced by Eurometaal NV of the Netherlands. This is a separate loading single-bag charge of single-base nitrocellulose CH21 propellant with a 50 g clean-burning igniter in a red cloth bag sewn onto the base. The charge incorporates a central igniter core and a flash reducer containing 250 g of potassium sulphate. A wear-reducing and decoppering liner are sewn to the inner surface of the bag. The complete charge weighs 13.12 kg, 12.12 kg of which is the CH21 propellant. It is 764 mm long.

For training purposes, Denel developed its Shell 155 mm Prac [M1A1](#). This projectile contains an inert material along with three exploder pellets weighing 400 g which detonate on impact to produce a spotting flash. The projectile may have a boat tail or base bleed unit, as required.

Specifications

South African HE M1

Weights:

projectile, ERFB - 42.84-45.34 kg

projectile, ERFB-BB - 45.27-47.77 kg

filling - (nominal) 8.71 kg RDX/TNT 50/50

Length:

ERFB - 843 mm

ERFB-BB - 861 mm

Diameter over nubs: 154.69 mm

Diameter over drive band: 157.86 mm

Muzzle velocity:

ERFB - 897 m/s

ERFB-BB - 895 m/s

Max range:

ERFB - 30,000 m

ERFB-BB - 39,000 m

Chamber pressure (typical): 3,500 bar

Operational temperature range: -20 to +60°C

Authorised fuzes

PD M557, [M78](#) series, M739, Fuchs M841

MTSQ M564, M582

Prox M514 series, Fuchs 8513

Electronic NINA, ZELAR, Fuchs M8611

Equivalent projectiles

[ARGENTINA](#)

Manufacturer

CITEFA

Type: Long Range Artillery projectiles PALA 37/CH and 37/BB

Description: Under development for use with CITEFA 30/2 CALA gun-howitzer. PALA 37/CH is ERFB and PALA 37/BB is ERFB-BB. Weight is 45.5 kg and filling 8.8 kg of Hexogen. Total length 937 mm fitted with a PD M557 fuze. Maximum range at muzzle velocity of 897 m/s is 39,000 m

AUSTRIA

Manufacturer

Hirtenberger AG

Type: 155 mm ERFB, ERFB-BB

Description: Standard specifications. No longer in production but may remain in service

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 155 mm ERFB, ERFB-BB

Description: Standard specifications. Produced for 155 mm Type WA 021 gun-howitzer but compatible with other 155 mm gun systems. Fitted with PD M739 fuze

FRANCE

Manufacturer

Giat Industries

Type: 155 mm HE ERFB BB NR 265 B1, HE ERFB BT NR 173 B1

Description: Originally produced in Belgium by PRB SA. Weight of 155 mm HE ERFB-BB NR 265 B1 with fuze given as 47.2 kg and weight of TNT as 8.2 kg; 8.8 kg of RDX/TNT is an alternative. Both projectiles are in production

[IRAQ](#)

Manufacturer

State factories

Type: 155 mm ERFB-BT, ERFB-BT-BB

Description: No details available. It is possible that these projectiles were imported rather than produced locally. See also separate entry for details of an Iranian 155 mm HE-BB

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: 155 mm HE-ERFB K307

Description: Actually an ERFB-BB with a maximum range of 40,000 m. Length with lifting plug is 960 mm and weight 47.17 kg. Fitted with PD M557 fuze or PD M739A1

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm ERFB, ERFB-BB

Description: Standard specifications. Propelling charge No 16 also produced

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries

Type: 155 mm ERFB, ERFB-BB

Description: Standard specifications. Filling is 8 kg of TNT with an additive. C30 unitary CCC also produced

[SLOVAKIA](#)

Manufacturer

Technopol

Type: 155 mm HE Nub Shell with BB

Description: As above. Developed for use with the ZTS [ZUZANA](#) 155 mm self-propelled artillery system but equally applicable to any NATO 155 mm artillery system. A 152 mm version of this projectile also exists

Manufacturer

Konstrukta Defence

Type: 155 mm HE Nub Shell with BB

Description: Developed for use with the ZTS [ZUZANA](#) 155 mm self-propelled artillery system but equally applicable to any NATO 155 mm artillery system. Weight complete with base bleed unit given as 47.5 kg containing 8.2 kg of explosive. Muzzle velocity 897 m/s. Maximum range 39,000 m with minimum range 5,900 m. Can be used with any NATO 155 mm propellant charge system or with combustible cartridge case system also produced by Konstrukta Defence. A 152 mm version of this projectile also exists

Manufacturer

Vihorlat

Type: 155 mm HE Nub Shell with BB

Description: Specifications as for the Konstrukta Defence projectile (see previous)

[SOUTH AFRICA](#)

Manufacturer

[NASCHEM](#)

Type: Shell, 155 mm HE M1 and HE [M1A2](#)

Description: Produced by [NASCHEM](#) for [LIW 155 mm G5](#) and G6 artillery systems. HE filling weight (nominal) 8.7 kg of RDX/TNT 50:50. Weights: ERFB 44.5 kg, ERFB-BB 46 kg. Fired using combustible three-part charge system with maximum muzzle velocity of 897 m/s (± 5 m/s) with ERFB. [NASCHEM](#) also produces the Practice projectile (Shell 155 mm Prac [M1A1](#)) for both ERFB and ERFB-BB

Manufacturer

SOMCHEM

Type: 155 mm VLAP

Description: See following entry for details

SPAIN

Manufacturer

EXPAL SA

Type: 155 mm ERFB Mk 10 Mod 2, ERFB/BB Mk 10 Mod 2B

Description: Standard specifications

Manufacturer

FOREX SA

Type: 155 mm ERFB

Description: Standard specifications

SWITZERLAND

Manufacturer

NORICUM

Type: SEN-155 mm HE/BT and HE/BB

Description: Marketed by T & T Technology Trading Limited. HE/BT weighs 45.5 kg and HE/BB 47.5 kg. Used with NORICUM [N10](#) (Zone 10) or N89 (Zones 8 and 9) charges

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: 155 mm ERFB, ERFB-BB

Description: Standard specifications. Produced for Yugoslav 155 mm [M46/84](#) gun. Charges contained in long brass cartridge case. May no longer be in production

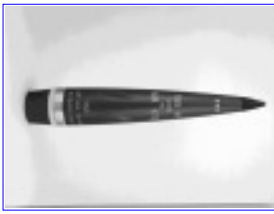
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155 mm ERFB projectiles produced by Chartered Ammunition Industries of [Singapore](#), from left; two Smoke WP ERFB-BB and two HE ERFB-BB, with a C30 propelling charge on the right



155 mm HE ERFB-BB projectiles awaiting delivery from the [NASCHEM](#) production facility



155 mm HE ERFB-BT NR 173 produced by Giat Industries



155 mm HE ERFB-BB NR 265 produced by Giat Industries



Base Bleed (BB) units produced for 155 mm ERFB systems by [SOMCHEM](#) of [South Africa](#)



The Argentinian CITEFA 155 mm PALA/37CH under development for use with the CITEFA 155 mm 30/2 gun-howitzer



[NORINCO 155 mm](#) ERFB or ERFB-BB HE projectile with base unit removed



155 mm ERFB-BB produced by EXPAL of Spain



155 mm HE-ERFB K307, AN ERFB-BB produced in [South Korea](#) by the Poongsan Corporation (1999)



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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.62 × 39 mm

Synonyms:

7.62 mm [M43](#); 7.62 × 39 mm Soviet; 7.62 mm Kalashnikov; 7.62 mm obr 43 g

Armament

Chinese Type 56 carbine, Type 56 and 56-1 rifles, Type 68 rifle, Types 75 and 81 light machine guns; Colt Model 6830 Lightweight Rifle; Finnish [M60](#), [M62](#), [M76](#) and [M90](#) rifles, [M78](#) heavy barrel rifle and [M62](#) machine gun; Hungarian AMD-65 rifle; North Korean Type 68 rifle; Polish [PMK](#), PMK-DGN and PMKM rifles; Soviet [AK-47](#), [AKM](#), SKS rifles, RPD and RPK machine guns; Ruger Mini-Thirty rifle; Yugoslavian [M59/66A1](#), [M70B1](#), [M70AB2](#) rifles and [M72](#), [M72AB1](#) machine guns. Recently developed and fielded Russian weapons such as the [A-91M](#) and Ots-14 *Groza* have continue to give life to this cartridge. In addition, certain early Heckler and Koch rifles and machine guns were offered in this calibre.

Development

Soviet development of an intermediate rifle cartridge had begun in the late 1930s, parallel with similar work in [Finland](#), Germany and Switzerland, but was dropped in 1939. Probably spurred by the appearance of the German 7.92 × 33 mm `Kurz' cartridge in late 1941, development was restarted in 1943. A design, attributed to N M Elizarov and B V Semin, was approved in late 1943 and applied to an experimental carbine by Simonov which later became the SKS. However, the major adoption of the

cartridge came with the [AK-47](#) Kalashnikov rifle, after which it became the standard rifle and light machine gun round for the Warsaw Pact and was widely adopted by other countries obtaining arms from the Soviet Union. Despite the introduction of the 5.45 × 39 mm cartridge by the Soviet military in 1974, newly designed assault rifles in 7.62 × 39 mm continue in use with Russian special operations units. Moreover, the cartridge continues to be the choice of some units of Russian special operations forces. The cartridge thus will remain in Russian military service for the foreseeable future. Recent developments include subsonic ammunition with heavy bullets for use by unspecified military and law enforcement agencies.

Description

The case is rimless and bottlenecked, of lacquered steel, brass, or brass-coated steel, Berdan or Boxer primed. The standard ball bullet PS is streamlined, with a steel core and GMCS jacket. Ball bullets manufactured in other countries may be non-streamlined and use a lead core, the weight being adjusted to the PS pattern. A recent development in this cartridge is frangible ball ammunition for use in training and for tactical use in areas where ricochets and over-penetration are an operational concern. (See entry under United States of America.)

Specifications

Ball 57N231

Round length: 55.8 mm

Case length: 38.65 mm

Rim diameter: 11.3 mm

Bullet diameter: 7.9 mm

Bullet weight: 7.97 g

Nominal charge: 1.6 g; SSNF 50 powder

Muzzle velocity: 710 m/s

Muzzle energy: 2,010 J

Subsonic 57N231U

Round length: 55.8 mm

Case length: 38.65 mm

Rim diameter: 11.3 mm

Bullet diameter: 7.9 mm

Bullet weight: 12.5 g

Muzzle velocity: 295-310 m/s

Muzzle energy: 1,843 J

Abridged ballistic table: 7.62 × 39 mm Ball Type PS

Range	Velocity	Energy	Drop	Elevation	Vertex
0 m	710 m/s	2,010 J	0 mm	0 mils	0 mm
100 m	632 m/s	1,592 J	116 mm	1.03 mils	15 mm
200 m	547 m/s	1,192 J	668 mm	2.68 mils	120 mm
300 m	471 m/s	884 J	1,192 mm	4.63 mils	328 mm
400 m	399 m/s	634 J	2,338 mm	6.27 mils	700 mm
500 m	343 m/s	468 J	4,173 mm	8.85 mils	1,305 mm

ARMENIA

Manufacturer

Neutron Research and Production Company

Type: Ball: FMJ steel core; 7.93 g; MV 710-725 m/s

Type: Subsonic: FMJ; 12.99 g; MV 310 m/s

Type: Inert: FMJ; 7.93 g; MV not applicable

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 7.95 g; MV 710 m/s

Tracer: FMJ, semi-streamlined; red trace to 800 m minimum; 7.62 g; MV 700 m/s

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 7.91 g; MV 710 m/s

BOSNIA-HERZEGOVINA

Manufacturer

Unis Igman d.o.o.

Type: Ball M67: FMJ; 8 g; V_{25} 730 m/s

Tracer M78: FMJ; 7.7 g; V_{25} 706 m/s

API M83: FMJ; 7.5 g; V_{25} 730 m/s

BULGARIA

Manufacturer

Arsenal

Type: Heavy Ball: FMJ; steel core in lead jacket and cupro-nickel envelope; steel case; 7.9 g; V_{25} 717 m/s

Tracer T-45: FMJ; lead core, cupro-nickel envelope; red trace in rear tracing to 800 m; 7.58 g; V_{25} 710-725 m/s

Blank: Steel case, rose crimp; 0.77 g P-125 powder

Manufacturer

Kintex

Type: Ball: FMJ; steel and lead core in gilding metal jacket; gilding metal case; 7.9 g; MV 715 m/s

Tracer: FMJ; lead core; gilding metal jacket, trace element, green tip; 7.5 g; MV 715 m/s

CHINA, PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: Ball Type 56: FMJ; steel core; 7.9 g; MV 710-725 m/s

Tracer Type 56: FMJ; partial steel core; red trace; 7.56 g; MV 687-702 m/s

Incendiary tracer Type 56: FMJ; steel core with tip exposed; partial gilding metal jacket; incendiary filling in capsule behind core; 6.63 g; MV 740-755 m/s

AP-I Type 56: FMJ; steel half-core inside gilding metal jacket; incendiary tracer element in capsule behind core; 7.67 g; MV 725-740 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; lead core; 8 g; V₂₅ 710 m/s

[EGYPT](#)

Manufacturer

Aboukir Engineering Industries

Type: Ball: FMJ; lead core; 8 g; MV 725 m/s

Manufacturer

Shoubra Company

Type: Ball: FMJ; V₂₅ 725 m/s

AP-I: FMJ; steel core; V₂₅ 735 m/s

Tracer: FMJ; red trace; V₂₅ 718 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Oy

Type: Ball S309: FMJ; lead core; 8.04 g

Tracer VJ313: FMJ; red trace; 8.04 g

Ball, S361: FMJ; 3.7g, aluminum core SRTA;

Ball S405: FMJ; 8 g; MV 725 m/s

Tracer: FMJ; red trace; 8 g; MV 725 m/s

AP: FMJ; hard core, steel or gilding metal jacket

Blank: Wooden bullet

Manufacturer

Sako Ltd

Type: Ball: JSP, SL; 8 g; MV 715 m/s

[HUNGARY](#)

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ; steel core; 8 g; MV 715 m/s; steel cartridge case

Ball: FMJ; steel core; 8 g; MV 715 m/s; brass cartridge case

INDONESIA

Manufacturer

Pindad

Type: Ball MU-8TJ: FMJ; 7.95 g; V_{10} 725 m/s

IRAN

Manufacturer

Ammunition Industries

Type: Ball: FMJ; 8 g; MV 710 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 8 g; MV 693 m/s; E_0 1,920 J

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: FMJ; 7.9 g; MV 716 m/s

Ball: PSP; 8.1 g; MV 707 m/s

POLAND

Manufacturer

Mesko Zaklady Metalowe

Type: Ball: FMJ; 7.9 g; MV 715 m/s

Tracer: FMJ; red trace; 7.2 g; MV 715 m/s

Blank: Steel case, star crimp

PORTUGAL

Manufacturer

INDEP

Type: Ball M361: FMJ; 7.95 g; MV 710 m/s; brass case

Tracer: FMJ; 7.95 g; MV 800 m/s; brass case

ROMANIA

Manufacturer

Arsenalul Armatel

Type: Ball: FMJ; 7.75 g; MV 725 m/s

Tracer: FMJ; 7.45 g; MV 725 m/s

API: 7.8 g; MV 740 m/s

Manufacturer

ROMARM SA

Type: Ball: FMJ; steel/lead core; 7.75 g; MV 725 m/s

Tracer: FMJ; lead core; 7.45 g; MV 725 m/s

API: FMJ; steel core; 7.8 g; MV 740 m/s

Blank: Steel case, rose crimped. Cartridge weight 7.3 g

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

JSC Barnaul Machine Tool Building Plant; LVE Novosibirsk; Tula Cartridge Works; Ulyanovsk Machine Production Association

Type: Ball: 57-N-231S, steel core; 7.9g; MV 710-725 m/s

Subsonic ball, Type US: FMJ; 12.5g; MV 295-310 m/s

Armour Piercing, 7N23: FMJ; 7.9g; 725-740m/s

Tracer T45: FMJ; 7.45 g non-streamlined bullet; green trace

AP-I BZ: FMJ, SL; steel core with incendiary pellet in the nose; 7.77 g

Ball, high pressure test: FMJ; 7.75 g, black bullet

Blank: 57-X-231; No bullet, star crimp

SLOVAKIA

Manufacturer

Technopol, Military and Police Group

Ball: FMJ; 8.2 g; MV 720 m/s

Ball BT: FMJ Boat Tail; 8 g; MV 725 m/s

Ball FPJ-M: Full Profile Metal Jacket - Match; 9.4 g; MV 720 m/s

Ball SP: Soft point; 9.7 g; MV 700 m/s

Ball FPJ-M: Full Profile Metal Jacket - Match; 10.7 g; MV 700 m/s

Ball SP: Soft point; 11 g; MV 680 m/s

Ball FPJ-M: Full Profile Metal Jacket - Match; 11.4 g; MV 680 m/s

Ball SP: Soft point; 11.7 g; MV 670 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: SP; 11.7 g; MV 785 m/s

Ball: SP; 9.7 g; MV 900 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition Company

Type: Ball: JSP; 8 g; MV 410 m/s

Ball: JSP; 9.7 g; 838 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 8.1 g; MV 732 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: FMJ; 8 g; 716 m/s

Ball: PSP; 8.1 g; 707 m/s

Manufacturer

Engel Ballistic Research

Type: Ball: FMJ, 14.2 g; MV 290 m/s

Ball: JHP; 11.0 g; MV 305 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: SP; 8 g; MV 701 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 8.42 g; MV 701 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ; 8 g; MV 708 m/s

Ball: JSP; 8 g; MV 732 m/s

Manufacturer

Longbow Incorporated

Type: Frangible ball: Copper powder and epoxy; 7.7 g; MV 671 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: SP; 8 g; MV 721 m/s

Manufacturer

Winchester-Olin

Type: Ball: SP; 8 g; MV 721 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball M67: FMJ; 8 g; lead-antimony core in gilding metal jacket, non-streamlined; MV 733 m/s; brass or steel case; Boxer or Berdan primed

Tracer [M78](#): 7.7 g; non-streamlined, lead-antimony core in gilding metal jacket with tracer composition at rear end. Dark ignition to 15 m from weapon, then visible from 115 to 800 m. Brass or steel case

API-T [M82](#): 7.55 g; steel core, lead liner, gilding metal jacket, incendiary-tracer composition in capsule at rear end; penetration 7 mm steel at 200 m; MV 730 m/s; brass case

Practice [M76](#): The bullet uses an aluminium core with a gilding metal half-jacket which encloses the flat base but leaves the reduced diameter point exposed. The weight is 1.7 g and this, with the odd shape, provides a maximum range of 560 m. Accuracy at 100 m is comparable with the standard ball round. MV 700 m/s. The standard brass case is used

Grenade Launcher: Crimped

Ball: FMJ; 8 g; MV 752 m/s

Ball: JSP; 8 g; MV 747 m/s

Ball: JSP, RN; 8 g; MV 747 m/s

Subsonic Ball: FMJ; 11.8 g; MV 296 m/s

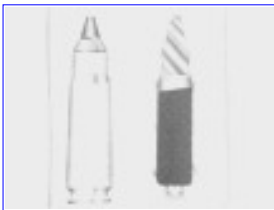
HP Test M67 Type 1: FMJ; 8 g; Pressure $3,100 \pm 100$ kg/cm²

HP Test M67 Type 2: FMJ; 9.05 g; Pressure $3,700 \pm 100$ kg/cm²

UPDATED



7.62 mm Soviet [M1943](#)
(1998)



Serbian Practice cartridge

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

5.45 × 39 mm

Synonyms:

5.45 × 40 mm; 5.45 mm [M74](#); 5.45 mm Kalashnikov; 5.45 × 39 mm Soviet; 5.45 mm Russian.

Armament

[AK-74](#) series rifles and sub-carbines, [AK-107](#), [AN-94](#) assault rifle, [RPK-74](#) light machine gun and others.

Development

Soviet ballisticians are known to have been experimenting with reduced calibres prior to 1939, but work was abandoned during the Second World War. The 5.45 × 39 mm cartridge was probably developed as a result of the successful American experience with the 5.56 × 45mm cartridge in [Vietnam](#) to reduce recoil and increase full automatic fire control in AK-type rifles, resulting in the adoption of this round in 1974. The existence of this calibre in Soviet use was not known in the West until 1978 and specimens of ammunition were not obtained until late 1979.

Description

The round is of conventional rimless bottlenecked form, somewhat fatter and shorter than the 5.56 × 45 mm round. The case is of lacquered steel and a stripe of red laquer seals the case/bullet joint. The Berdan primer is of brass and there are two fireholes in the primer pocket. The streamlined bullet

consists of a mild steel core filling about two-thirds of the gilding metal envelope, and a lead plug about 3 mm long in front of it. The extreme 3 mm of the tip is hollow, which enhances the terminal effects of the bullet against a human target.

Specifications

Round length: 56.5 mm

Round weight (nominal): 10.75 g

Case length: 39.5 mm

Rim diameter: 10 mm

Bullet diameter: 5.59 mm

Bullet weight: 3.499 g

Muzzle velocity: 900 m/s

Muzzle energy: 1,417 J

Abridged ballistic table: 5.45 × 39.5 mm Ball Type PS

Range	Velocity	Energy	Drop	Elevation	Vertex
0 m	900 m/s	1,417 J	0 mm	0 mils	0 mm
100 m	802 m/s	1,105 J	73 mm	0.82 mils	20 mm
200 m	713 m/s	873 J	296 mm	1.53 mils	82 mm
300 m	628 m/s	677 J	732 mm	2.54 mils	208 mm
400 m	550 m/s	519 J	1,416 mm	3.68 mils	420 mm
500 m	473 m/s	384 J	2,454 mm	5.11 mils	722 mm

ARMENIA

Manufacturer

Neutron Research & Production Company

Type: Ball: FMJ; steel core; 3.53 g; MV 870-890 m/s; cartridge weight 10.57 g

AP: FMJ; heavy metal core (possibly tungsten carbide); 3.65 g; MV 870-890 m/s; cartridge weight 10.64 g

Blank: cartridge weight 6.6 g

BULGARIA

Manufacturer

Kintex

Type: Ball 7N6: FMJ; steel core, lead sleeve, steel jacket; 3.4 g; MV 890 m/s. Steel case; 1.45 g charge of SF 033FL powder.

Tracer TgS: FMJ; steel jacket, lead/steel core with trace element, green tip; 3.4 g; MV 890 m/s

Manufacturer

Arsenal

Type: Ball: FMJ, gilding metal jacket, lead/steel core; 3.43 g; MV 880 m/s

Tracer: FMJ, gilding metal jacket, lead core with trace element, green tip; 3.23 g; MV 880 m/s

Blank: Wooden bullet, white colour coded, cartridge weight 6.6 g

GERMANY

Manufacturer

SK Jagd und Sportmunitions

Type: Ball: FMJ; steel core; 3.4 g; MV 880 m/s

[POLAND](#)

Manufacturer

Mesko Zaklady Metalowe

Type: Ball: FMJ; steel core; 3.4 g; MV 880 m/s

Ball: FMJ; Lead core; 3.4 g; MV 880 m/s

Practice: Plastic bullet; no performance details available

[ROMANIA](#)

Manufacturer

Aresnalul Armatel

Type: Ball: FMJ; 3.35 g; MV 890 m/s

Tracer: FMJ; 3.15 g; MV 870 m/s

Blank: Star crimp

Manufacturer

ROMARM SA

Type: Ball: FMJ; steel/lead core; 3.35 g; MV 890 m/s

Tracer: FMJ; steel/lead core; 3.15 g; MV 870 m/s

Blank: Steel case, crimped neck. Cartridge weight 6.75 g

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

JSC Barnaul Machine Tool Plant

Type: Ball (7N6): FMJ, steel core; 3.42 g; V_{25} 870-900 m/s

Tracer: FMJ; red, dark ignition, burns 100-400 m

Enhanced penetration (7N10): FMJ; steel core; 3.61 g; V_{25} 870-890 m/s

Armour piercing (7N22): steel core, 3.68 g; V_{25} 870-890 m/s

Practice blank (7H3): Plastic bullet

Manufacturer

Lugansk Machine Tool Factory

Type: Ball: FMJ; lead core; 3.45 g; MV 880 m/s

Armour-piercing: FMJ; hard steel core; 3.56 g; MV 880 m/s

Subsonic: FMJ; 5.15 g; MV 303 m/s

Blank: Plastic; 0.24 g

Manufacturer

Tula Cartridge Works

Type: Ball: FMJ; 3.3-3.5 g; MV 870-890 m/s

Ball: Supercharge (weapon proof) test, FMJ; 3.3-3.5 g black bullet

Ball: High pressure (barrel proof) test, FMJ; 3.4-3.65 g yellow bullet

Blank: Steel case, punch crimp, cartridge weight 6.2-7 g

Dummy: FMJ, lead jacket; gilding metal case with three longitudinal grooves, no propellant; cartridge weight 8.5 g

Manufacturer

Ulyanovsk Machine Production Association

Type: Tracer 7T3: FMJ; 3.2 g, green tip; MV 882 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; steel core; 3.4 g; MV 969 m/s

UPDATED



5.45 × 39 mm Soviet Rifle

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 18 mm Makarov

Synonyms:

9 mm PM; 9 × 18 mm Soviet; [9 mm Stechkin](#); 9 mm Type 59

Armament

Soviet PM and PMM Makarov and Stechkin pistols; Makarov copies such as the Chinese Type 59, Czech Model 83, East German Pistole M, and other pistols chambered for this round such as the Hungarian [PA-63](#) and Polish [P-64](#). Sub-machine guns include the [Bison](#), Kiparis, [PP-90](#) and [PP-90M](#) and KEDR.

Development

The [9 mm Makarov](#) cartridge was designed by Boris Semin and was introduced into Soviet service together with the PM Makarov and Stechkin pistols in 1951. Various changes have been introduced over the years, including at one time a Tracer projectile, and the original brass case was replaced by steel.

In 1993, a modernised Makarov pistol was introduced chambered for the 57-N-181M 9 × 18 mm cartridge, a high-velocity high-penetration version of the original round. Several new sub-machine guns have since been chambered for the new cartridge, as well. Ballistically, the new cartridge is on a par with the 9 × 19 mm Parabellum, a dramatic improvement. The new cartridge is externally identical to the earlier 9 × 18 mm, apart from its conically shaped bullet designed to penetrate soft body armour and

mild steel plate. Because of increased chamber pressures, this new cartridge cannot be safely fired in older PM pistols, although the original cartridge can be safely fired from the modernised PM. Several Russian arms makers recently showed new prototype military pistols in 9 ×19 mm and announced that the military's next pistol will be chambered for that cartridge. The 9 ×18 mm will thus eventually be replaced in Russian military service. Despite this, the many weapons produced in this calibre will ensure the presence of the 9 ×18 mm in the world's military and police forces for many years to come.

Description

A rimless, straight taper cartridge of brass or, more usually, of copper-coated or lacquered steel. The bullet is jacketed, round-nosed and flat-based; early designs used a lead alloy core, more recent manufacture uses a lead core with a small steel insert. Both bullets weigh the same. High-velocity cartridges are identical save for a somewhat lighter conically shaped bullet.

It should be noted that there is a third 9 × 18 mm cartridge, the 9 mm Police or 'Ultra' of Western origin. Although the nomenclature is the same they are not interchangeable and to avoid confusion the words, 'Makarov,' 'Soviet' 'Police' or 'Ultra' should be used when identifying these different rounds.

Specifications

Round length: 24.79 mm

Case length: 17.98 mm

Rim diameter: 9.98 mm

Bullet diameter: 9.23 mm

Bullet weight: 6.1 g

Muzzle velocity: 310 m/s

Muzzle energy: 348 J

Abridged ballistic table: [9 mm Makarov](#), 6.1 g ball

Range	Velocity	Energy
0 m	310 m/s	348 J
10 m	305 m/s	283 J
25 m	300 m/s	274 J
50 m	290 m/s	256 J

[ARMENIA](#)

Manufacturer

Neutron Research and Production Company

Type: Ball: FMJ; 5.95 g; MV 315 m/s

[BULGARIA](#)

Manufacturer

Arsenal

Type: Ball: FMJ, steel core, gilding metal envelope; 5.95 g; V₁₀ 303 m/s

Manufacturer

Kintex

Type: Ball: Steel core, steel jacket, gilding metal envelope; 6.1 g; MV 315 m/s. Cartridge case steel-, brass- or copper-plated

Manufacturer

NITI Kazanlak

Type: Ball, non-lethal: Rubber bullet; 2.7-2.8 g; Mv 350 m/s

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: Ball: FMJ; 6.1 g; MV 315 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 6.1 g; MV 310 m/s

Ball: Lead; 4.5 g; MV 380 m/s

Manufacturer

State arsenals

Type: Ball vz82: FMJ; 4.5 g; MV 400 m/s. This round was developed specifically for use with the vz 82 pistol and a 9 mm version of the [Skorpion](#) machine pistol. The complete round weighs 8.1 g, instead of the 10 g of the Soviet original, though the length of bullet and round are the same.

[HUNGARY](#)

Manufacturer

Technika Foreign Trading Company

Type: Reduced Effect Ball: Polyamid plastic bullet with metal base cup; 1.7 g; MV 420 m/s. This is a special round in use with Hungarian [PA-63](#) and R-61 pistols for security and police personnel, combining good terminal effect with low ricochet and shoot-through risks.

Ball: FMJ; steel core; 6 g; MV 300 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 6.1 g; MV 330 m/s

[POLAND](#)

Manufacturer

Mesko Zaklady Metalowe

Type: Ball: FMJ, RN; 6 g; MV 305 m/s

Blank: Star crimp

SLOVAKIA

Manufacturer

Technopol, Military and Police Group

Type: Ball: FMJ; 6 g; V₂₅ 295 m/s

Ball: FMJ; 6 g; V₂₅ 303 m/s

Plastic: 1.7 g; V₂₅ 424 m/s

Plastic: 1.7 g; V₂₅ 446 m/s

ROMANIA

Manufacturer

Kintex

Type: Ball: FMJ, steel/lead core; 6.1 g; MV 315 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

LVE Novosibirsk

Type: Ball: FMJ; 5.9 g; Mv: 315 m/s

High-penetration ball, PMM: FMJ; 5.6 g; MV: 410 m/s

Manufacturer

Tula Cartridge Works

Type: Ball: FMJ; 6.8 g; MV 303 m/s

Manufacturer

JSC Barnaul

Type: Ball: FMJ; 6.9 g; MV 311 m/s

Manufacturer

State arsenals

Type: Ball: FMJ; 6.02 g; MV 340 m/s

SP-8 Limited-penetration ball: Plastic bullet; 1.1 g; MV 250 m/s

Tracer: FMJ; 6.15 g; MV 340 m/s (est)

Armour Piercing: Steel bullet; 5.07 g; MV 400 m/s (est)

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer

Type: Ball: JHP; 5.8 g; MV 320 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 6.1 g; MV 320 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ; 6.1 g; MV 315 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: JHP; 6.1 g; MV 305 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 6 g; MV 325 m/s

UPDATED



9 × 18 mm Makarov

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MORTARS - 81 mm MORTARS, AUSTRALIA

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb

Armament

All medium- and high-pressure 81 mm mortars.

Development

Developed from 1990 to 1992 by ADI to fully utilise the capabilities of the 81 mm [L16](#) and F2 mortar systems in service with the Australian Army.

Description

Full details have not yet been divulged, but this design improves the lethality, developing over 7,500 effective fragments. It employs a new propulsion system, loaded with ADI AR2001 propellant specifically developed for this employment. This new propulsion system achieves very consistent muzzle velocities, with standard deviations of less than 1 m/s at maximum range.

It would seem that the bomb is generally the same as the British L36A2, streamlined, with a plastic obturating ring and that the improvements are confined to matters of construction.

Specifications

Length, fuze: 473 mm

Weight, fuze: 4.2 kg

Type of payload: RDX/TNT

Number of charges: P + 8

Fuze: impact SQ and delay

Min range: 125 m
Max range: 6,500 m

Manufacturer

[ADI Limited](#), Lithgow Facility.

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: Illumination M314

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence L119/M119A1 Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178](#) ([South Korea](#)); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); NDSB SAKTI [105 mm Light Gun](#) ([Malaysia](#)); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) Modified (Germany); [105 mm Howitzer M56](#) (Federal Republic of [Yugoslavia](#)).

Development

The Cartridge, 105 mm: Illumination M314 is intended to illuminate targets or target areas and may also be used for signalling or marking purposes. It has been produced in a number of sub-variants, with the main types being the M314A1, the M314A2 and the M314A3, the latter being the standard US Army version. The main distinction is that the M314A1 and M314A2 use the MTSQ M501 series of fuzes, while the M314A3 uses the MT M565 or MTSQ M577.

By the beginning of FY98 approximately 4,112,000 M314 series cartridges had been produced in the USA, although at that time production was in abeyance. In FY00 \$7,937 million was allocated to restart the production of about 12,000 M314A2 rounds to support training and war reserve stockpiles. This procurement will overlap into FY01. After then no further production is planned until FY04 (about 7,000 rounds) and FY05 (about 6,000 rounds).

Description

The Cartridge, 105 mm: Illumination M314 is a semi-fixed round with the projectile being a free fit in the cartridge case to allow free access to the propellant increments inside the case. The base ejection projectile is a relatively thin-walled hollow steel forging with a boat-tailed base, a streamlined ogive and a gilding metal driving band. Carried inside the shell is a canister, filled with 789 g of a pressed illuminating compound, and a parachute unit. The baseplate is held in position with three shear pins; some sub-variants (for example the M314A2E1) also have three twist pins.

In use the nose-mounted time fuze operates at the selected time after firing. Under the fuze base is a flash channel through which the fuze ignition passes a flash to ignite 50 g of black powder in a cloth bag (81 g on the M314A3, held in a sealed plastic holder). The black powder acts as an expulsion charge to exert pressure down onto the baseplate and cause the shear pins to break, the baseplate then falls away cleanly due to an imbalance created in its shape by a machined recess. The expulsion charge also creates a flash to ignite the illuminating compound via 68 g of a 'first fire' composition so that, as the canister and parachute emerge from the shell base, the compound is already burning to create the required light. The average illumination is 400,000 to 450,000 candlepower and the illuminating compound burns for approximately 55 to 60 seconds. The flare canister is suspended from the nylon parachute unit by eight shrouds and excessive rotation of the flare canister is prevented by flaps located above the canister which flip out under air pressure. Maximum illumination range is 8,700 m (minimum 400 m).

The cartridge case is of the [M14](#) type. The standard [M14](#) is manufactured using 70:30 brass but other materials have been used and may still be encountered; for instance the M14B1 used copper-plated drawn steel while the M14B4 is a three-piece spiral-wrapped lacquered steel case. The base-mounted percussion primer is pressed into place and may be one of several types including the M1B1A2, M28A2 (brass), M28B2 (steel) or [M1A2](#).

The cartridge case contains the M67 propelling charge. This consists of seven M1 dualgran propellant increments packed in individually numbered cloth bags threaded together in numerical order on a length of silk or acrylic twine. Before loading, the required increments are arranged inside the case with the No 1 increment, the base charge, at the bottom and the No 7 increment located towards the case mouth. The other increments are arranged around the walls of the case and around the primer tube.

Charge 1 is the base charge consisting of 238.42 g of propellant M1 (small size).

Charge 2 consists of Charge 1 plus a 41.11 g increment of propellant M1 (small size). Nominal charge weight is 279.53 g.

Charge 3 consists of Charge 2 plus a 70.87 g increment of propellant M1 (large size). Nominal charge weight is 350.4 g.

Charge 4 consists of Charge 3 plus a 96.39 g increment of propellant M1 (large size). Nominal charge weight is 446.79 g.

Charge 5 consists of Charge 4 plus a 153.09 g increment of propellant M1 (large size) and a sheet of lead which functions as a decoppering agent. Nominal charge weight is 599.88 g.

Charge 6 consists of Charge 5 plus a 243.81 g increment of propellant M1 (large size). Nominal charge weight is 843.69 g.

Charge 7 consists of Charge 6 plus a 369.89 g increment of propellant M1 (large size). Total nominal charge weight is then 1.241 kg.

Ballistic data for the 105 mm Illumination M314 when fired from 105 mm M101/M101A1 howitzers is as follows:

Charge 1 - MV 198.1 m/s - max range 3,510 m

Charge 2 - MV 216.4 m/s - max range 4,110 m

Charge 3 - MV 237.7 m/s - max range 4,860 m

Charge 4 - MV 266.7 m/s - max range 5,950 m

Charge 5 - MV 310.9 m/s - max range 7,650 m

Charge 6 - MV 376.4 m/s - max range 9,380 m

Charge 7 - MV 472.4 m/s - max range 11,270 m.

Ballistic data for the 105 mm Illumination M314 when fired from [105 mm M102](#) howitzers is as follows:

Charge 1 - MV 205 m/s - max range 3,700 m

Charge 2 - MV 223 m/s - max range 4,300 m

Charge 3 - MV 247 m/s - max range 5,200 m

Charge 4 - MV 278 m/s - max range 6,300 m

Charge 5 - MV 325 m/s - max range 8,100 m

Charge 6 - MV 393 m/s - max range 9,600 m

Charge 7 - MV 494 m/s - max range 11,500 m.

Range data for the 105 mm L119/M119A1 Towed Howitzer when firing the 105 mm Illumination M314 is as follows:

Charge 1 - range 1,800 to 3,400 m

Charge 2 - range 2,100 to 4,100 m

Charge 3 - range 2,600 to 4,800 m

Charge 4 - range 4,100 to 6,300 m

Charge 5 - range 4,200 to 7,900 m

Charge 6 - range 5,000 to 9,500 m

Charge 7 - range 6,200 to 11,500 m.

Specifications

Weights:

complete round - 21.06 kg

projectile - approx 15 kg

filling, illuminating - 789 g

propellant, nominal - 1.241 kg

Lengths:

complete round - 817.1 mm

projectile less fuze - 376.5 mm

cartridge case - 371.9 mm

Max diameter over body: 104.95 mm

Diameter over driving band: 107.26 mm

Type of propellant: M1 dualgran

Illumination: 400,000-450,000 cd

Burning time: up to 60 s

Authorised fuzes

M314A1, M314A2 - MTSQ M501 series (the MTSQ [M548](#) may also be used)

M314A3 - MT M565 or MTSQ M577

Equivalent rounds

AUSTRALIA

Manufacturer

Office of Defence Production

Type: 105 mm Illuminating M314A2

Description: Standard US specifications

BELGIUM

Manufacturer

PRB SA

Type: 105 mm Illuminating NR 146

Description: Standard US specifications. No longer in production but in widespread service

CANADA

Manufacturer

SRC Industrial Technologies Inc

Type: 105 mm Illuminating C103

Description: Standard US M314A3 specifications

FRANCE

Manufacturer

Giat Industries

Type: 105 mm Illuminating M314A3

Description: Standard specifications

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 105 mm Illuminating

Description: Standard US specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 105 mm Illuminating

Description: Exact version uncertain

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 105 mm Illuminating

Description: Standard US M314A2 specifications

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 105 mm Illuminating M314A1

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: 105 mm Illuminating M314A3

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: 105 mm Illuminating K275

Description: Based on M314 but with flare assembly modified to produce 590,000 candela for 60 seconds. Otherwise standard specifications

SPAIN

Manufacturer

EXPAL SA

Type: Cartridge 105 mm Illuminating ME314A3

Description: Standard US specifications. May be fitted with MT M565 or MTSQ 501A1 fuzes

Manufacturer

FOREX SA

Type: 105 mm Illuminating

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: Municion Illuminante 105 mm M314A3

Description: Standard US specifications

UNITED STATES OF AMERICA

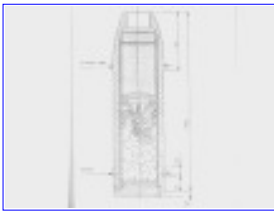
Manufacturer

Morton Thiokol Corporation

Type: Cartridge, 105 mm, Illuminating, M314A3

Description: Standard specifications. Supplied fitted with MTSQ M577 fuze

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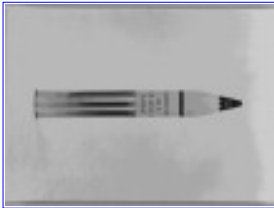
Cutaway drawing of the EXPAL Cartridge, 105 mm: Illumination ME314A3, a Spanish variant of the Cartridge, 105 mm: Illuminating M314



EXPAL Cartridge, 105 mm: Illuminating ME314A3, together with packing tube



Cross-section of Cartridge, 105 mm: Illumination M314A3



Cartridge, 105 mm: Illumination M314A3

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IDENTIFICATION OF SMALL ARMS AMMUNITION, AUSTRALIA

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: HC, M84

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence L119/M119A1 Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178](#) ([South Korea](#)); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); NDSB SAKTI [105 mm Light Gun](#) ([Malaysia](#)); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) Modified (Germany); [105 mm Howitzer M56](#) (Federal Republic of [Yugoslavia](#)).

Development

The Cartridge, 105 mm: HC, [M84](#) was developed during the Second World War based on a UK 25-pounder base ejection shell. Although apparently no longer in production in the USA, it is still in production elsewhere and remains in widespread service. It is used to emit white screening or marker smoke and can be used to produce coloured smoke (red, yellow or green) for target marking and similar purposes.

A variant of this base ejection round, the Cartridge, 105 mm: HC, [M84B1](#), can be configured for the remote distribution of propaganda leaflets. It does not appear to be used widely for this purpose, being normally used to carry white or coloured HC smoke compound containers.

Description

The Cartridge, 105 mm: HC, [M84](#) is a semi-fixed round with the projectile being a free fit in the cartridge case, allowing free access to the propellant increments inside the case. The projectile is a hollow steel forging with a boat-tailed base and a cover over a recess in the base, a streamlined ogive and a single gilding metal driving band. The shell contains three cylindrical steel containers, each filled with HC (hexachloroethane-zinc mixture) smoke compound and separated by chipboard ([M84](#), [M84B1](#)) or aluminium (M84A1) spacers; the total weight of HC is 5.57 kg. The forward end of the shell body is connected to the nose fuze cavity by a flash channel with a recess for a black powder burster charge at the base of the channel. The smoke containers are held in position by a baseplate and a PVC locking ring screwed home against it. The joint between the baseplate and the shell body is sealed by a rubber ring.

In operation, the nose-mounted M565 time fuze functions at the selected time after firing; the MTSQ M577 may also be utilised. As the fuze functions the resultant flash ignites the black powder burster charge at the end of the flash channel. The internal pressure ruptures the PVC locking ring and forces off the baseplate, also ejecting the three smoke containers from the shell body. Before ejection and at the same time as the burster charge ignites, the flash produced is directed through a perforated channel passing through all three smoke containers to ignite their contents. The containers then continue to produce smoke (usually white) for a period lasting between 40-90 seconds, depending on local conditions.

The 105 mm: HC, [M84](#) uses a black powder expulsion charge in a cloth bag and the spacers between the canisters are chipboard. Only MTSQ M501 series fuzes can be used.

The [M84B1](#) is the same as the [M84](#) but the expulsion charge is encased in a plastic cup.

The M84A1 has a slightly revised body forging, the black powder expulsion charge is in a plastic cylinder, and an updated fuze well thread allows the MTSQ [M548](#) and MT M565 fuzes to be used. The spacers between the smoke canisters are aluminium.

The cartridge case is of the [M14](#) type. The standard [M14](#) is manufactured using 70:30 brass but other materials have been used and may still be encountered; for instance the M14B1 used copper-plated drawn steel while the M14B4 is a three-piece spiral-wrapped lacquered steel case. The base-mounted [M28](#) percussion primer is pressed into place..

The cartridge case contains the M67 propelling charge. This consists of seven M1 dualgran propellant increments packed in individually numbered cloth bags threaded together in numerical order on a length of silk or acrylic twine. Before loading, the required increments are arranged inside the case with the No 1 increment, the base charge, at the bottom and the No 7 increment located towards the case mouth. The other increments are arranged around the walls of the case and around the primer tube.

Charge 1 is the base charge consisting of 238.42 g of propellant M1 (small size).

Charge 2 consists of Charge 1 plus a 41.11 g increment of propellant M1 (small size). Nominal charge weight is 279.53 g.

Charge 3 consists of Charge 2 plus a 70.87 g increment of propellant M1 (large size). Nominal charge weight is 350.4 g.

Charge 4 consists of Charge 3 plus a 96.39 g increment of propellant M1 (large size). Nominal charge weight is 446.79 g.

Charge 5 consists of Charge 4 plus a 153.09 g increment of propellant M1 (large size) and a sheet of lead which functions as a decoppering agent. Nominal charge weight is 599.88 g.

Charge 6 consists of Charge 5 plus a 243.81 g increment of propellant M1 (large size). Nominal charge weight is 843.69 g.

Charge 7 consists of Charge 6 plus a 369.89 g increment of propellant M1 (large size). Total nominal charge weight is then 1.241 kg.

Ballistic data for the 105 mm HC [M84](#) when fired from 105 mm M101/M101A1 howitzers is as follows:

Charge 1 - MV 198.1 m/s - max range 3,510 m
Charge 2 - MV 216.4 m/s - max range 4,110 m
Charge 3 - MV 237.7 m/s - max range 4,860 m
Charge 4 - MV 266.7 m/s - max range 5,950 m
Charge 5 - MV 310.9 m/s - max range 7,650 m
Charge 6 - MV 376.4 m/s - max range 9,380 m
Charge 7 - MV 472.4 m/s - max range 11,270 m.

Ballistic data for the 105 mm HC [M84](#) when fired from [105 mm M102](#) howitzers is as follows:

Charge 1 - MV 205 m/s - max range 3,700 m
Charge 2 - MV 223 m/s - max range 4,300 m
Charge 3 - MV 247 m/s - max range 5,200 m
Charge 4 - MV 278 m/s - max range 6,300 m
Charge 5 - MV 325 m/s - max range 8,100 m
Charge 6 - MV 393 m/s - max range 9,600 m
Charge 7 - MV 494 m/s - max range 11,500 m.

Range data for the 105 mm L119/M119A1 Towed Howitzer when firing the 105 mm HC [M84](#) is as follows:

Charge 1 - range 1,800 to 3,400 m
Charge 2 - range 2,100 to 4,100 m
Charge 3 - range 2,600 to 4,800 m
Charge 4 - range 4,100 to 6,300 m
Charge 5 - range 4,200 to 7,900 m
Charge 6 - range 5,000 to 9,500 m
Charge 7 - range 6,200 to 11,500 m.

Specifications

Weights:

complete round - 19.03 kg

projectile - approx 14 kg

filling - 5.57 kg HC

propellant, nominal - 1.241 kg

Lengths:

cartridge with fuze - 774.4 mm

projectile, less fuze - 382.5 mm

cartridge case - 371.9 mm

Max body diameter: 104.95 mm

Max diameter over driving band: 107.26 mm

Type of propellant: M1 dualgran

Authorised fuzes

MT M565. MTSQ M577

Equivalent rounds

AUSTRALIA

Manufacturer

Office of Defence Production

Type: 105 mm HC [M84](#)

Description: Standard US specifications. Used with Otobreda 105/14 Pack Howitzer

CANADA

Manufacturer

SRC Industrial Technologies Inc

Type: Cartridge 105 mm Smoke HC [M84](#)

Description: Standard US specifications

GERMANY

Manufacturer

Buck Werke GmbH & Co

Type: 105 mm Smoke HC DM 15

Description: Standard US specifications. Projectile only

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 105 mm Smoke (BE)

Description: Standard US specifications. Smoke colours available include white, green, red, yellow and violet

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 105 mm Smoke BE

Description: Stated to be equivalent to 105 mm Smoke HC [M84](#)

SPAIN

Manufacturer

EXPAL SA

Type: 105 mm HC M84A1

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: Municion Fumigena 105 mm M84C

Description: Standard US specifications

UNITED STATES OF AMERICA

Manufacturer

Scranton Army Ammunition Plant

Type: 105 mm HC [M84](#)

Description: Standard specifications

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Projectile for Cartridge, 105 mm: HC, [M84](#)



Unfuzed examples of projectiles for Cartridge, 105 mm: HC, M84A1

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MORTARS - 120 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm illuminating bomb ILL-93/ILL Mk2

Armament

HP mortar M12-2222; M12-3222 and all 120 mm smoothbore mortars.

Development

By Hirtenberger.

Description

This uses the same body as the HC-93/Mk2 smoke bomb but contains a magnesium flare and parachute. A time fuze in the nose ignites an ejection charge which separates the front and rear portions of the body, so releasing the parachute. This deploys and pulls the ignited flare from the forebody and then descends slowly, emitting light. The standard tail unit, with a primary and seven secondary charges, is screwed to the rear of the bomb body.

Specifications (Mk2 in parentheses)

Length:

fuzed - 749 mm (755 mm)

unfuzed - (690 mm)

Weight, fuzed: 14.4 kg in flight

Weight and type of payload: 2.1 kg magnesium flare

Number of charges: P + 7 (P + 6)

Fuze: mechanical time

Max range: 7,900 m (7,600 m, 1,535 mm barrel)

Min range: 500 m

Chamber pressure: to 130 mPa (<1,400 bar, P + 6)

Height of burst: 350 m

Rate of descent: 4 m/s

Luminosity: 1,500,000 cd

Duration of illuminating effect: 55 s

Illuminated area: radius: 680 m, 5 lx; 1,080 m, 2 lx (640 m, 5 lx; 1,020 m, 2 lx)

Manufacturer

Hirtenberger AG.

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Hirtenberger 120 mm illuminating bomb ILL-93

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MORTARS - 120 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm HE bomb LD 93/HE Mk2

Armament

HP mortar M12-2222, M12-3222 and all 120 mm smoothbore mortars.

Development

By Hirtenberger.

Description

A streamlined bomb, with the body cast from spheroidal graphite iron of mainly ferritic structure to ensure optimal splinter formation. It has a single groove carrying a plastic obturating ring around the waist. The tail unit, of extruded aluminium alloy, screws into the bomb body. A primary cartridge is screwed into the end of the tailboom and the secondary increments, in horseshoe containers, clip around the boom in front of the fins. The incremental system uses a base increment and seven charge increments.

Specifications (Mk2 in parentheses)

Length, fuze: 747 mm (750 mm)

Weight, fuze: 14.5 kg in flight (15 kg)

Weight and type of payload: 2.34 kg TNT or Comp B

Number of charges: P + 7 (P + 8)

Fuze: impact SQ and delay, or proximity

Max range: 9,000 m

Min range: 500 m

Muzzle velocity, Mk2: 395 m/s

Chamber pressure: < 1,700 bar (P + 8)

Average fragments: 4,000

Manufacturer

Hirtenberger AG.

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Hirtenberger 120 mm HE bomb HE-LD 93

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MORTARS - 120 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm smoke bomb WP-93/WP Mk2

Armament

All 120 mm smoothbore mortars.

Development

By Hirtenberger for Austrian service mortars and general use.

Description

This is essentially the same bomb as the HE-LD 93/Mk2 (qv). The body is of cast iron and the nose is closed with an adaptor, which forms an exploder container and receives the fuze. The body cavity is filled with White Phosphorus (WP) smoke composition. The same tail unit and propelling charge system is used.

Specifications (Mk2 in parentheses)

Length:

fuzed - 747 mm (750 mm)

unfuzed - (687 mm)

Weight, fuzed: 14.5 kg in flight (15 kg)

Weight and type of payload: 2.2 kg WP

Number of charges: P + 7 (P + 8)

Fuze: impact SQ and delay, or proximity

Muzzle velocity: 395 m/s (1,535 mm barrel)

Max range: 9,000 m

Min range: 500 m

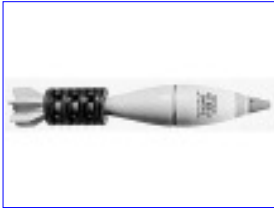
Chamber pressure: < 1,700 bar (P + 8)

Duration of smoke effect: > 150 s (min 120 s)

Manufacturer

Hirtenberger AG.

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Hirtenberger 120 mm smoke WP-93

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MORTARS - 120 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm smoke bomb HC-93/HC Mk2

Armament

HP Mortar M12-222, M12-3222 and all 120 mm smoothbore mortars.

Development

By Hirtenberger.

Description

This bomb outwardly resembles the 120 mm HE Mk2 and WP Mk 2 smoke bombs. It has a cast-iron body with six gas check grooves around the bourrelet but differs in internal construction. The payload is a canister of hexachloroethane smoke composition, which is ejected by the action of a time fuze and expelling charge. The tail unit and propelling charge are those of the WP smoke bomb.

Specifications (Mk2 in parentheses)

Length:

fuzed - 749 mm (750 mm)

unfuzed - 687 mm

Weight, fuzed: 14.3 kg in flight

Weight and type of payload: 2.51 kg hexachlorethane

Number of charges: P + 7

Fuze: mechanical time

Max range: 7,900 m (8,150 m, 1,535 mm barrel)

Min range: 500 m

Muzzle velocity: (377 m/s, 1,535 mm barrel)

Chamber pressure: to 120 mPa

Height of burst: 350 m

Duration of smoke effect: > 180 s (min 150 s)

Manufacturer

Hirtenberger AG.

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Hirtenberger 120 mm smoke HC-93

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke/incendiary bomb RPI Mk 3

Armament

Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

This uses the same aluminium body as the RP-S smoke bomb, the difference being that the filling is formulated to provide a greater fire raising capability while still producing a useful amount of screening smoke.

Specifications

Length, fuze: 635 mm

Weight, fuze: 3.8 kg

Weight and type of payload: 1.2 kg RP

Number of charges: P + 6

Fuze: impact SQ

Max range: 5,470 m, 1.17 m barrel; 5,510 m, 1.45 m barrel

Muzzle velocity: 320 m/s

Chamber pressure: 850 bar
Duration of smoke effect: 120 s

Manufacturer

Hirtenberger AG.

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Hirtenberger 81 mm smoke/incendiary bomb RPI Mk 3

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm illuminating bomb ILL Mk 3

Armament

HP Mortar [M8-111](#), [M8-211](#), Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

This uses the same tubular aluminium body as the Red Phosphorus (RP) smoke bombs, but has the ogive pinned in place and carries a time fuze in the nose. Inside the body is the usual flare container and parachute. At the set time the fuze ignites the flare and fires an expelling charge which removes the ogive and allows the parachute and flare to be ejected.

Specifications

Length, fuzed: 635 mm

Weight, fuzed: 3.8 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time

Max range: 5,800 m (1,365 mm barrel)

Muzzle velocity: 326 m/s (1,365 mm barrel)

Chamber pressure: < 900 bar

Illumination intensity: min 900,000 cd

Duration of illumination: 35 s

Height of ejection: 350 m

Rate of descent: 4-5 m/s

Area illuminated: 2.54 km²

Manufacturer

Hirtenberger AG.

UPDATED



Hirtenberger 81 mm illuminating bomb ILL Mk 3

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke bomb HC/HC-Smoke Mk3

Armament

HP mortar [M8-111](#), [M8-211](#), Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG, to provide a smoke bomb giving a more dense screen without the incendiary risk of phosphorus-based bombs.

Description

This uses a similar body and tail unit to the illuminating bomb, though with a slightly shorter nose. A time fuze ignites an expelling charge at the required point and also ignites the smoke canisters, which are loaded with hexachlorethane/zinc mixture. The nose cap is blown off and the canisters expelled, falling to the ground to emit smoke.

Specifications (Mk3 in parentheses)

Length, fuzed: 625 mm (614 mm)

Length, fuzed: 552 mm

Weight, fuzed: 4.3 kg (3.8 kg)

Weight and type of payload: 1.55 kg hexachloroethane

Number of charges: P + 6, 1,165 mm barrel; P + 6, 1,356 mm barrel

Max range: 5,560 m, 1.17 m barrel; 5,850 m, 1.45 m barrel - to point of ejection; (5,800 m, 1,365 mm barrel)

Min range: 550 m, 1.17 m barrel; 650 m, 1.45 m barrel (Charge P + 1; to point of ejection)

Muzzle velocity: 326 m/s, 1,365 mm barrel

Chamber pressure: < 900 bar P + 6

Height of burst: 300 m

Duration of smoke effect: 150 s (min 90 s)

Manufacturer

Hirtenberger AG.

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Hirtenberger 81 mm smoke bomb HC

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb HE70/Mk4

Armament

HP mortar [M8-111](#), [M8-211](#), Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

The streamlined body is of spheroidal graphitic cast iron; at the rear end is a tail tube and six fins of extruded aluminium alloy. A plastic obturating ring is fitted into a groove at the bourrelet, giving excellent gas sealing and ballistic regularity, and is discarded as the bomb leaves the muzzle of the mortar. A primary cartridge is screwed into the tail tube and six (three large and three small) (normal charge) or seven (Super charge) horseshoe secondary charges clip around the tail tube above the fins.

Specifications (Mk4 in parentheses)

Length:

fuzed - 487 mm (490 mm)

unfuzed - (430 mm)

Weight, fuzed: 4.15 kg

Weight and type of payload: 750 g TNT

Number of charges: P + 6, 1,165 mm barrel; (P + 7, 1,365 mm barrel)

Fuze: impact SQ and delay DM 113A3

Max range: 5,300 m (6,700 m in 1,365 mm barrel)

Chamber pressure: < 650 bar (< 900 bar, P + 7)

Ballistic performance:

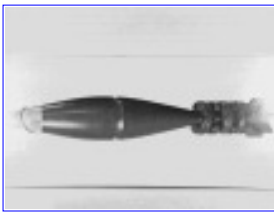
Charge	Muzzle velocity	Max range
P	73 m/s	n/avail
3	162 m/s	n/avail
6	256 m/s	4,600 m
S	n/avail	5,300 m

Status: No longer manufactured.

Manufacturer

Hirtenberger AG.

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Hirtenberger 81 mm HE bomb HE70

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke bomb RP-S Mk 3

Armament

Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

This bomb uses a cylindrical aluminium body, with a light-alloy tail unit. The bomb contains a filling of Red Phosphorus (RP) composition formulated to produce the optimum smoke cloud. It will develop a low-lying cloud for a longer period than is possible with the more usual White Phosphorus (WP) filling.

Specifications

Length:

fuzed - 635 mm

unfuzed - 573 mm

Weight, fuzed: 3.8 kg

Weight and type of payload: 1.2 kg RP

Number of charges: P + 6

Fuze: impact, SQ; or proximity

Max range: 5,800 m (1,365 mm barrel)

Min range: 320 m, 1.17 m barrel; 380 m, 1.45 m barrel (Charge P + 1)

Muzzle velocity: 326 m/s (1,365 mm barrel)

Chamber pressure: <900 bar (P + 6)

Duration of smoke effect: 120 s

Manufacturer

Hirtenberger AG.

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Hirtenberger 81 mm smoke bomb RP-S Mk 3

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb LD

Armament

Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

This is the same as the HE70 bomb described previously, except that the secondary charges comprise six equal sized increments instead of three large and three small, giving an increase in the ballistic performance.

Specifications

Length, fuze: 487 mm

Weight, fuze: 4.15 kg

Weight and type of payload: 750 g TNT or Comp B

Number of charges: P + 6

Fuze: impact SQ and delay DM 113A3 or proximity

Max range: 5,770 m, 1.17 m barrel; 6,270 m, 1.45 m barrel

Min range: 185 m, 1.17 m barrel; 210 m, 1.45 m barrel

Muzzle velocity: 73-296 m/s
Chamber pressure: <800 bar
Average fragments: 1,400

Manufacturer

Hirtenberger AG.

VERIFIED



Hirtenberger 81 mm HE bomb LD

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

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81 mm smoke bomb WP/WP Mk4

Armament

HP mortar [M8-111](#), [M8-211](#), Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

This uses the same body and tail unit as the 81 mm HE Mk4 but is fitted with a central burster and a main filling of White Phosphorus (WP).

Specifications (Mk4 in parentheses)

Length:

fuzed - 487 mm (490 mm)

unfuzed - (430 mm)

Weight, fuzed: 4.17 kg

Weight and type of payload: 700 g WP (560 g WP)

Number of charges: P + 6, 1,165 mm barrel; (P + 7, 1,365 mm barrel)

Fuze: impact SQ and proximity

Max range: 5,770 m, 1,170 mm barrel; 6,270 m, 1,450 mm barrel (5,770 m, 1,165 mm barrel; 6,700 m,

1,365 mm barrel)

Min range: 185 m, 1,170 mm barrel; 210 m, 1,450 mm barrel

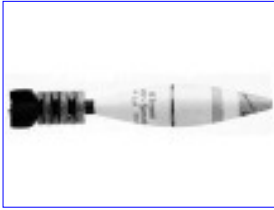
Muzzle velocity: 295 m/s (337 m/s, 1,365 mm barrel)

Chamber pressure: 800 bar (< 900 bar, P + 7)

Manufacturer

Hirtenberger AG.

UPDATED



Hirtenberger 81 mm smoke bomb WP

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

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60 mm smoke bomb RP-S Mk1/RP-S Mk2

Armament

All usual 60 mm mortars.

Development

By Hirtenberger AG, to provide a smoke bomb of longer duration for general use.

Description

A cast-iron bomb with a long cylindrical body and an extruded aluminium tail unit with six fins screwed into the rear. The body is filled with Red Phosphorus (RP) and has a small burster container in the forward end filled with a bursting charge. An impact fuze is used, detonating the burster so as to split open the bomb and distribute the red phosphorus around the impact point, where it inflames and generates smoke. The propelling charge consists of a shotgun type primary cartridge and four horseshoe secondary charges, that clip around the tailboom ahead of the fins.

Specifications (RP-S Mk2 in parentheses)

Length, unfuzed: 470 mm

Weight, unfuzed: 2.3 kg (2.4 kg)

Weight and type of payload: 500 g RP

Number of charges: P + 4, 640 mm barrel; (P + 5, 1,000 mm barrel)

Fuze: impact SQ

Max range: 1,995 m, in 640 mm barrel; 2,495 m, in 1,000 mm barrel; (3.475 mm, 1,000 mm barrel)

Muzzle velocity: (250 m/s 1,000 mm barrel)

Chamber pressure: 450 bar (<540 bar P + 5)

Burning time: 120 s

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm smoke bomb RP-S Mk 1

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

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60 mm illuminating bomb ILL Mk1/Mk2

Armament

HP mortar M6-111, M6-211, M6C and all usual 60 mm mortars.

Development

By Hirtenberger AG.

Description

This uses the same bomb body as the RP-S Mk2 Smoke bomb (qv) but is loaded with a flare canister and folded parachute. A time fuze causes the ejection system to function and blow off the nose of the bomb ejection the flare and parachute.

Specifications (Mk2 in parentheses)

Length:

fuzed - 470 mm

unfuzed - 406 mm

Weight, unfuzed: 2.3 kg; (2.6 kg)

Type of payload: parachute and flare

Number of charges: P + 4, 640 mm barrel; (P + 5, 1,000 mm barrel)

Fuze: time

Max range: 1,760 m, in 640 mm barrel; 2,280 m, in 1,000 mm barrel - range to point of ejection;
(2,000 m, in 640 mm barrel; 3,300 m, in 1,000 mm barrel)

Min range: 100 m, 640 mm barrel, P + 1

Muzzle velocity: 163 m/s; (250 m/s, 1,000 mm barrel)

Chamber pressure: 450 bar (<540 bar - P + 5)

Illuminating power: 400,000 cd

Height of burst: 200 m

Burning time: 35 s

Rate of descent: 3-4 m/s

Area illuminated: 1.13 km²

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm illuminating bomb ILL Mk 1

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb WP-MK2

Armament

All 60 mm smoothbore mortars.

Development

By Hirtenberger AG, to meet a demand for a bomb suitable for use in long-range mortars.

Description

This closely resembles the HE LD bomb (qv) as it is fully streamlined and has a plastic obturating ring at the waist. An alloy tail unit carries the extruded fins and accepts the primary and augmenting cartridges. The bomb is fitted with an impact fuze over a central burster containing explosive; the remainder of the bomb is filled with White Phosphorus (WP). This bomb was formerly designated 60 mm smoke bomb WP-LD.

Specifications

Length, unfuzed: 360 mm

Weight, unfuzed: 1.9 kg

Weight and type of payload: 300 g WP

Number of charges: P + 4

Fuze: impact SQ

Max range: 2,815 m, in 640 mm barrel; 3,400 m, in 1 m barrel

Min range: 85 m, 640 mm barrel; 100 m, 1 m barrel

Chamber pressure: 450 bar

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm smoke bomb WP-LD

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb MK2

Armament

All usual 60 mm mortars.

Development

By Hirtenberger AG, for use in long-range mortars.

Description

The 60 mm HE bomb MK2 is similar to the 60 mm bomb HE 80 (qv) but is longer and heavier and uses a plastic obturating ring around the waist.

It gives 25 per cent better fragmentation, improved flight characteristics and therefore better range and dispersion.

Specifications

Length, unfuzed: 360 mm

Weight, fuzed: 1.9 kg

Weight and type of payload: 300 g TNT or Comp B

Number of charges: P + 5

Fuze: impact SQ

Max range: 3,900 m in 1 m barrel

Muzzle velocity: 275 m/s
Chamber pressure: 550 bar

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm HE bomb 84 LD

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MORTARS - 120 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm smoke bomb TTC Mk2

Armament

HP mortar M12-2222, M12-3222 and all 120 mm smoothbore mortars.

Development

By Hirtenberger.

Description

The 120 mm TTC Mk2 is equivalent to the 120 mm UP-93/WP Mk2 (qv) except the filling of Titanium Tetrachloride.

Specifications

Length:

fuzed - 750 mm

unfuzed - 687 mm

Weight, fuzed: 15 g

Weight and Type of Payload: 2.2 kg TTC

Number of Charges: P + 8

Fuze: impact SQ and delay or proximity

Max range: 9,000 m (1.535 mm barrel)

Muzzle velocity: 395 m/s (535 mm barrel)

Chamber pressure: < 1,700 bar (P + 8)

Duration of smoke effect: min 120 s

Status

In production

Manufacturer

Hirtenberger AG

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

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81 mm smoke bomb TTC Mk 4

Armament

HP Mortar [M8-111](#), [M8-211](#), Tampella, UK [L16A1](#), US [M29](#) and similar 81 mm mortars.

Development

By Hirtenberger AG.

Description

The 81 mm TTC Mk 4 is essentially similar to the 81 mm WP/WP Mk 4 (qv) except for its filling of Titanium tetrachloride (TTC).

Specifications

Type: smoke

Length:

fuzed - 490 mm

unfuzed - 430 mm

Weight, fuzed: 4.17 kg

Type of Payload: 560 g TTC

Type of Charges: P + 6, 1,165 mm barrel; P + 7, 1,365 mm barrel.

Fuze: impact, SQ and proximity

Max range: 5,770 m, 1,165 mm barrel; 6,700 m, 1,365 mm barrel

Chamber pressure: < 900 bar (P + 7)

Status: In production

Manufacturer

Hirttenberger AG

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb TTC Mk2

Armament

HP Mortar M6-111, M6-211, M6C and all standard 60 mm mortars.

Development

By Hirtenberger.

Description

The 60 mm TTC Mk2 is equivalent to the 60 mm WP Mk2 except that it is filled with Titanium tetrachloride (TTC).

Specifications

Length:

fuzed - 360 mm

unfuzed - 295 mm

Weight, fuzed: 1.9 kg

Type of payload: 300 g TTC

Type of charges: P + 4, 640 mm barrel; P + 5, 1,000 mm barrel

Fuze: impact SQ and proximity

Max range: 2,800 m, 640 mm barrel; 4,000 m 1,000 mm barrel

Chamber pressure: < 540 bar P + 5

Status: In production.

Manufacturer

Hirtenberger AG

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.357 Magnum

Synonyms:

0.357 Smith & Wesson Magnum

Armament

Suitably chambered revolvers.

Development

Introduced in 1935 by Smith & Wesson, this virtually became the standard law enforcement round in the USA by the 1960s. Whilst the calibre is the same as the 0.38 Special cartridge, the nomenclature was changed to 0.357 (the exact, rather than the nominal calibre) to distinguish this more powerful round. In addition the case is about 2.5 mm longer than other 0.38 cases, preventing it from being chambered in older revolvers that may not be strong enough to withstand the extra pressure.

Description

A rimmed, straight-taper case of brass or nickel-plated brass, Boxer or Berdan primed. Various types and weights of bullet have been produced. The most common factory loading for many years was a 10.23 g soft-pointed bullet, but in recent years the 8.1 g JHP pattern has achieved widespread use for both law enforcement and personal defence.

Specifications

Round length: 38.5 mm (dependent upon bullet)

Case length: 32.76 mm

Rim diameter: 11.17 mm

Bullet diameter: 9.07 mm

Bullet weight: 10.23 g

Muzzle velocity: 453 m/s (in 4 in barrel)

Muzzle energy: 1,011 J

Abridged ballistic table: [0.357 Magnum](#), 10.23 g ball

Range	Velocity	Energy
0 m	453 m/s	1,011 J
10 m	435 m/s	966 J
25 m	420 m/s	900 J
50 m	395 m/s	796 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; 10.2 g; MV 460 m/s

Ball: FMJ; 10.2 g; MV 320 m/s

Ball, EMB: FMJ, controlled fragmentation; 6.0 g; MV 450 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: JSP; 10.24 g; MV 376 m/s

Ball: JHP; 10.24 g; MV 376 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball: SWC; 10.2 g; MV 360 m/s

Ball: JHP; 10.2 g; MV 470 m/s

Manufacturer

Sako Ltd

FMJ 10 g; MV 400 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: FMJ; 9.7 g; MV 475 m/s

Ball: JSP; 10.46 g; MV 430 m/s

Ball `UL': JSP; 3.9 g; MV 600 m/s

THV: 2.90 g; MV 800 m/s; penetrates 3.5 mm steel at 7 m

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: JSP; 10.25 g; MV 445 m/s

Ball: FMJ, conical; 10.25 g; MV 450 m/s

Manufacturer

Metallwerk Elisenhutte GmbH (MEN)

Type: Ball: JHP (Quick Defense); 6 g; MV 470 m/s

Frangible Ball: Solid copper/polymer bullet; 5.4 g; V₁₀ 440 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: JHP; 8.1 g; MV 434 m/s

Ball: JHP; 10.24 g; MV 372 m/s

Ball: JSP; 8.1 g; MV 434 m/s

Ball: JSP; 10.24 g; MV 372 m/s

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd

Type: Ball: SWC; 9.7 g; MV 320 m/s

Ball: SWC; 9.7 g; MV 379 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: SWC; 10.2 g; MV 375 m/s

Ball: FMJ; 9.2 g; MV 460 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: SWC; 10.2 g; MV 364 m/s

Ball 357A: JSP; 10.24 g; MV 364 m/s

Ball 357B: JHP; 8.1 g; MV 364 m/s

Ball 357C: JHP; 9.72 g; MV 376 m/s

Ball 357D: JHP; 7.13 g; MV 420 m/s

MEXICO

Manufacturer

Aguila Industrias Tecnos

Type: Ball: JSP; 10.2 g; MV 473 m/s

Ball: FMJ; 10.2 g; MV 430 m/s

POLAND

Manufacturer

Zaklady Metalowe (Mesko)

Type: Ball: JSP; 10.2 g; V₁₀ 430 m/s

Ball: SWC; 10.2 g; V₁₀ 350 m/s

Ball: WC; 9.6 g; V₁₀ 250 m/s

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: JHP; 8.1 g; V₅ 415 m/s

Ball: JSP; 10.2 g; V₅ 360 m/s

Type: JHP; 10.2 g; V₅ 360 m/s

Manufacturer

PMP

Type: Ball: JSP; 10.24 g; MV 405 m/s

Ball: JHP; 10.24 g; MV 405 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball 19101: JHP; 10.24 g; MV 442 m/s

Ball 19106: FMJ, SWC; 10.24 g; MV 442 m/s

Ball 19107: JSP; 10.24 g; MV 442 m/s

UNITED KINGDOM

Manufacturer

Cobra Gun Company

Type: Ball: HSA Flechette

Manufacturer

Conjay Arms Company

Type: Ball: CBX; 5.51 g; MV 590 m/s in 152 mm barrel

Ball: CBXX; 6.8 g; MV 495 m/s in 152 mm barrel

Ball: CBAP; 5.51 g; MV 690 m/s; penetrates 5.5 mm RHA (480-530 Brinell, 52 Rockwell) at angles from normal to 45°

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: JHP; 9.07 g; MV 381 m/s

Ball: Lead, SWC; 10.24 g; MV 305 m/s

Ball: FMJ; 9.07 g; MV 381 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: JHP; 8.1 g; MV 427 m/s

Ball: JHP; 10.2 g; MV 366 m/s

Ball: SWC; 10.2 g; MV 320 m/s

Manufacturer

CCI-Speer

Type: Ball: JHP; 7.1 g; MV 421 m/s

Ball: JHP; 8.1 g; MV 442 m/s

Ball: JSP; 8.1 g; MV 442 m/s

Ball: JHP; 9 g; MV 421 m/s

Ball: JHP; 10.2 g; MV 377 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 7.5 g; MV 412 m/s

Ball: JHP; 8.1 g; MV 442 m/s

Ball: JHP; 9 g; MV 404 m/s

Ball: JHP; 11.7 g; MV 381 m/s

Ball `penetrator': FMJ; 13 g; MV 366 m/s

Ball: FMJ; 13.3 g; MV 390 m/s

Ball special: FMJ; 11.7 g; MV 503 m/s

Manufacturer

Delta Defense Inc

Type: Frangible: 5.51 g; MV 449 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: JHP; 9.7 g; MV 367 m/s

Ball: JSP; 10.0 g; MV 364 m/s

Ball: JHP; 8.1 g; MV 364 m/s

Ball: JHP; 9.7 g; MV 376 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JSP; 10.2 g; MV 376 m/s

Ball: JHP; 8.1 g; MV 442 m/s

Ball: SWC; 10.2 g; MV 376 m/s

Ball: JHP; 8.1 g; MV 442 m/s

Ball: FMJ; 11.7 g; MV 332 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 5.18 g; MV 548 m/s

Ball: Glaser Silver; 5.18 g; MV 548 m/s

Manufacturer

Longbow Incorporated

Type: Frangible Ball; 6.1 g; MV 442 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JHP; 8.1 g; MV 441 m/s

Ball: JHP; 7.1 g; MV 394 m/s

Ball: BJHP; 8.1 g; MV 372 m/s

Ball: JHP; 10.24 g; MV 376 m/s

Ball: Lead; 10.24 g; MV 376 m/s

Ball: JSP; 10.24 g; MV 376 m/s

Ball: FMJ; 10.2 g; MV 376 m/s

Manufacturer

Ultramax

Type: Ball: JHP; 8.1 g; MV 436 m/s

Ball: JHP; 10.2 g; MV 335 m/s

Ball: Lead, SWC; 8.1 g; MV 250 m/s

Ball: Lead, SWC; 10.2 g; MV 354 m/s

Manufacturer

Winchester-Olin

Type: Ball: JHP; 7.1 g; MV 394 m/s

Ball: JHP; 8.1 g; MV 441 m/s

Ball: SWC; 10.2 g; MV 376 m/s

Ball: MP; 10.2 g; MV 376 m/s

Ball: JHP; 10.2 g; MV 376 m/s

Ball: JSP; 10.2 g; MV 376 m/s

Ball: JSP; 9.42 g; MV 393 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 10.2 g; MV 467 m/s

Ball: JHP; 10.2 g; MV 493 m/s

HP Test: FMJ, conical or JSP; 10.2 g



0.357 Magnum

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.40 Smith & Wesson

Synonyms:

0.40 Auto

Armament

Suitably chambered Glock, SIG, Smith & Wesson and other pistols and Heckler and Koch sub-machine guns.

Development

Developed by Winchester and Smith & Wesson in the late 1980s as the response to the [10 mm Auto](#) cartridge. The principal difference is the shorter case. This means that a pistol frame originally designed for 9 mm Parabellum can be easily modified to 0.40 S&W, whereas modification of a design to take the longer [10 mm Auto](#) round requires a considerable change to the magazine well. The calibre has been adopted by several influential makers and has eclipsed the 10 mm round in popularity. The 0.40 S&W has not yet been adopted by any military force, but has gained wide use by law enforcement and security activities in the USA and its employment continues to spread.

Description

The 0.40 S&W is a rebated rim cartridge, the extraction rim being somewhat smaller in diameter than the case. The case is of brass, Boxer primed and straight-tapered. Bullets are generally semi-jacketed

hollow point, though a full metal jacketed round has been developed for possible military use.

Specifications

Round length: 28.7 mm

Case length: 21.6 mm

Rim diameter: 10.77 mm

Bullet diameter: 10.11 mm

Bullet weight: 10.6 g

Muzzle velocity: 302 m/s

Muzzle energy: 486 J

Abridged ballistic table: 0.40 S&W 10.6 g bullet

Range	Velocity	Energy
0 m	302 m/s	486 J
10 m	297 m/s	473 J
20 m	293 m/s	460 J
30 m	290 m/s	450 J
40 m	286 m/s	439 J
50 m	282 m/s	428 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball EMB: JHP controlled expansion; 7.0 g; MV 500 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 11.06 g; 305 m/s

INDONESIA

Manufacturer

PT Pindad

Type: Ball MU-18TJ: Flat Nose; 11.10 g; V₁₀ 270 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 11.66 g; MV 290 m/s

Ball: JSP; 11.66 g; MV 290 m/s

Ball: JHP; 11.66 g; MV 290 m/s

ITALY

Manufacturer

Fiocchi Munizioni Spa

Type: Ball: JHP; 9.4 g; MV 351 m/s

Ball: FMJ; 11.0 g; MV 320 m/s

Ball: FMJ; 11.7 g; MV 305 m/s

Ball: JHP; 11.7 g; MV 305 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: HP; 11.7 g; MV 300 m/s

[MEXICO](#)

Manufacturer

Industrias Technos, SA (Aguila)

Type: Ball: FMJ; 11.06 g; MV 305 m/s

[RUSSIAN FEDERATION AND ASSOCIATED STATES \(CIS\)](#)

Manufacturer

Tula Cartridge Works

Type: Ball: FMJ; 11.06 g; MV 305 m/s

[SLOVAKIA](#)

Manufacturer

Technopol, Military and Police Group

Type: Ball: FMJ; 11 g; V_{25} 324 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: Ball: JHP; 11.7 g; V_5 300 m/s

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: FMJ; 11.66 g; MV 290 m/s

Ball: JHP; 11.66 g; MV 290 m/s

Ball: JHP; 10.04 g; MV 335 m/s

Ball: Lead, SWC; 11.66 g; MV 274 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: JHP; 10.0 g; MV 350 m/s

Ball: 10.6 g; MV 350 m/s

Ball: JHP; 11.06 g; MV 305 m/s

Manufacturer

CCI-Speer

Type: Blazer: JHP; 11.6 g; MV 300 m/s

Blazer: FMJ, low toxicity; 11.6 g; MV 305 m/s

Blazer: TMJ; 10 g; MV 358 m/s

Blazer: TMJ; 10.6 g; MV 296 m/s

Blazer: Shot (#6 pellets); 63.5 g; MV 381 m/s

Gold Dot: JHP; 11.6 g; MV 300 m/s

Gold Dot: JHP; 10 g; MV 358 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball +P: JHP; 8.7 g; MV 396 m/s

Ball +P: JHP; 9.7 g; MV 366 m/s

Ball +P: JHP; 10.7 g; MV 366 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammunition)

Ball: JHP; 11.7 g; MV 300 m/s

Ball: JHP; 10.0 g; MV 354 m/s

Ball: JHP; 10.7 g; MV 317 m/s

Ball: FMJ; 10.7 g; MV 308 m/s

Ball: FMJ; 11.7 g; MV 300 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JHP; 11.06 g; MV 305 m/s

Ball: JHP; 11.06 g; MV 301 m/s

Ball: JHP; 10.04 g; MV 347 m/s

Ball: JHP; 10.6 g; MV 320 m/s

Ball: JHP; 10.6 g; MV 298 m/s

Ball: FMJ stranded zinc core; 8.75 g; 362 m/s

Ball, close range training: 8.75 g; 362 m/s

Ball: Lead; 11.66 g; 302 m/s

Ball: FMJ; 11.66 g; 302 m/s

Ball: FMJ; 10.04 g; 347 m/s

Ball: FMJ; 10.6 g; 298 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 7.45 g; MV 472 m/s

Ball: Glaser Silver; 7.45 g; MV 472 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: JHP; 10.1 g; MV 360 m/s

Ball: JHP; 11.7 g; MV 290 m/s

Manufacturer

Longbow Incorporated

Type: Ball: Frangible ball; 7.4 g; MV 442 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JHP; 10.1 g; MV 348 m/s

Ball: JHP; 11.7 g; MV 300 m/s

Ball; BJHP; 11.7 g; MV 309 m/s

Manufacturer

Winchester-Olin

Type: Ball: JHP; 11.7 g; MV 300 m/s

Ball: FMJ; 10.1 g; MV 343 m/s

Ball: (brass alloy jacket) FMJ; 10.7 g; MV 323 m/s

Subsonic Ball: JHP; 11.7 g; MV 302 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: JHP; 11.7 g; MV 286 m/s

Ball: JSP; 12.3 g; MV 281 m/s

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[0.40 Smith & Wesson](#)

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.338 Lapua Magnum

Synonyms:

8.58 × 71 mm; 0.338/.416

Armament

Suitably chambered sniping rifles.

Development

This cartridge was developed in the mid-1980s, by Research Armament Company in the USA, as a long-range sniper round for the US Navy. The bullets for the original cartridge were developed by Hornady. It was never adopted by the US Military, but was put into production by Lapua (now [Nammo Lapua](#)) of [Finland](#) and has since been adopted by several military forces as a long-range (up to 1,500 m) sniping round. Because of the impressive accuracy and consistency at long range, it is highly probable that the cartridge will be increasingly adopted for military and security long-range sniping purposes.

Description

The [0.338 Lapua Magnum](#) uses a necked down and shortened 0.416 Rigby cartridge case. The case is rimless, bottlenecked, brass and Boxer primed. Bullets were originally FMJ only, but Lapua introduced the FOREX JSP tactical bullet and an AP round in 1997.

Specifications

Round length: 93.5 mm

Case length: 69.2 mm

Rim diameter: 14.93 mm

Bullet diameter: 8.61 mm

Bullet weight: 16.2 g

Muzzle velocity: 915 m/s

Muzzle energy: 6,766 J

Abridged ballistic table: [0.338 Lapua Magnum](#)

Range	Velocity	Energy	Drop
0 m	915 m/s	6,766 J	0 mm
200 m	820 m/s	5,318 J	250 mm
400 m	730 m/s	4,127 J	1,100 mm
600 m	645 m/s	3,156 J	2,740 mm
800 m	566 m/s	2,375 J	5,380 mm
1,000 m	492 m/s	1,769 J	9,390 mm
1,200 m	423 m/s	1,321 J	15,270 mm
1,400 m	354 m/s	1,015 J	23,640 mm
1,600 m	319 m/s	828 J	35,260 mm
1,800 m	296 m/s	710 J	50,590 mm
2,000 m	278 m/s	626 J	70,110 mm

AUSTRIA

Manufacturer

Hirtenberger, AG

Type: Ball: JHP; 19.4 g; MV 830 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball: FMJ; 16.2 g; MV 914 m/s

Ball: FMJ; 16.2 g; MV 870 m/s

Ball: JSP; 16.8 g; MV 875 m/s

[SWEDEN](#)

Manufacturer

Norma Precision AB

Type: Ball: FMJ; 17.8 g; MV 910 m/s

SWITZERLAND

Manufacturer

RUAG Munition

Type: SWISS P Ball: FMJ 16.3 g; MV 830 m/s

SWISS P Target: HPBT; 16.2 g; MV 830 m/s

SWISS P Armour Piercing: FMJHC; 16.8 g; 830 m/s

Note: penetration 550 m: 12 mm 560 HB

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition

Type: Ball: HPBT; 19.4g; MV 853 m/s

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[0.338 Lapua Magnum](#)

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.32 Smith & Wesson Long

Synonyms:

0.32 Long; GR931; 7.65 × 32R mm

Armament

Suitably chambered revolvers, including Indian Ordnance Factories Revolver 0.32 Mark 1.

Development

This appeared in 1896, accompanying the first Smith & Wesson revolver to feature a side-opening cylinder. Like the shorter cartridge it became a common police round, although it is today generally regarded as underpowered in that or any military role. It is almost identical to the 0.32 Colt New Police revolver cartridge, except that the Colt has a flat-nosed bullet.

Description

A rimmed, straight, Boxer primed brass or plated cartridge case carrying a round-nose lead or ogival jacketed bullet, or a lead wadcutter bullet.

Specifications

Round length: 32.26 mm

Case length: 23.62 mm

Rim diameter: 9.53 mm
Bullet diameter: 7.92 mm
Bullet weight: 6.35 g
Muzzle velocity: 238 m/s
Muzzle energy: 180 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: Lead, ogival; 6.4 g; MV 225 m/s

Ball: Lead, WC; 6.5 g; MV 220 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: Lead, ogival; 6.35 g; MV 238 m/s

Ball: Lead, WC; 6.35 g; MV 212 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball: Lead, ogival; 6.35 g; MV 250 m/s

Ball: Lead, WC; 5.35 g; MV 240 m/s

Ball: Lead, WC; 6 g; MV 240 m/s

Ball: Lead, WC; 6.35 g; MV 250 m/s

Manufacturer

[Sako Ltd](#)

Type: Ball: Lead, WC; 6.35 g; MV 235 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: Lead, ogival; 6.35 g; MV 240 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS-Geco)

Type: Ball: Lead, WC; 6.5 g; MV 225 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 6.3 g; MV 255 m/s

Ball: Lead, ogival; 6.3 g; MV 250 m/s

Ball: Lead, WC; 6.5 g; MV 225 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: Lead, ogival; 6.4 g; MV 241 m/s

Ball: Lead, WC; 6.5 g; MV 208 m/s

MEXICO

Manufacturer

Aguila Industrias Tecnos

Type: Ball: Lead, ogival; 6.4 g; MV 236 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: Lead, WC; 6.4 g; MV 240 m/s

UNITED STATES OF AMERICA

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: LRN; 6.35 g; MV 240 m/s

Ball: LWC; 6.5 g; MV 208 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: Lead, ogival; 6.4 g; MV 215 m/s

Ball: Lead, WC; 6.4 g; MV 238 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: Lead, ogival; 6.35 g; MV 215 m/s

Manufacturer

Winchester-Olin

Type: Ball: Lead, RN; 6.4 g; MV 215 m/s

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0.32 Smith & Wesson Long

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.65 ×17SRmm

Synonyms:

0.32 ACP; [7.65mm Browning](#); 7.65 mm ACP

Armament

This cartridge will function in any automatic pistol marked `7.65 mm Auto', `0.32 Auto', `0.32 ACP', or `[7.65 mm Browning](#)' and also in a number of cheap European revolvers of pre-1939 manufacture which are similarly marked. It is also used in the Czech `[Skorpion](#)' machine pistol for which an armour-piercing bullet is manufactured. Modern compact pistols in this calibre continue to be widely used by law enforcement and undercover personnel as secondary or `backup' weapons.

Development

The 7.65 mm cartridge was developed in the late 1890s, by John Browning and Fabrique National Herstal, for use in the Browning 1900 automatic pistol, after which it became the most widely used pocket pistol cartridge in the world. It has been estimated that about 65 per cent of the automatic pistols made this century have been chambered for this round.

In military service it has generally been confined to use in staff officers' and second-line troops' pistols, although during both World Wars the German and French armies issued them widely to combat troops in default of sufficient heavier calibres. Its greatest formal application has been as a police and security force weapon in Europe. Being semi-rimmed it has also been used in commercial revolvers.

Description

The case is semi-rimmed, that is, the extraction rim is slightly larger than the body of the case, sufficiently large to provide a positioning stop in the chamber but not large enough to interfere with feeding from a magazine. Cases of brass, steel and light alloy can be found, although brass is most common. As with any commercial cartridge with such a long history, innumerable different bullets have appeared but the general police/military standard is a round-nosed full metal jacket bullet, with lead core of about 4.7 g.

Specifications

Round length: 26.16 mm

Case length: 17.27 mm

Rim diameter: 8.99 mm

Bullet diameter: 7.85 mm

Bullet weight: 4.7 g

Muzzle velocity: 305 m/s

Muzzle energy: 218 J

Abridged ballistic table: [7.65 mm Browning](#), 4.7 g ball

Range	Velocity	Energy
0 m	305 m/s	218 J
10 m	300 m/s	211 J
25 m	295 m/s	204 J
50 m	285 m/s	190 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 4.6 g; MV 300 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 4.6 g; MV 276 m/s

Ball: JHP; 4.6 g; MV 276 m/s

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Ball: 4.75 g; MV 270 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 4.75 g; MV 318 m/s

Ball: FMJ; 4.4 g; 300 m/s

MP: FMJ; steel core; 4.75 g; MV 318 m/s

FINLAND

Manufacturer

Nammo Lapua Cartridge Factory Ltd

Type: Ball R429: FMJ; 4.8 g; MV 274 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: FMJ; 4.5 g; MV 300 m/s

Ball: JSP; 4.5 g; MV 260 m/s

Ball: THV; 1.65 g; MV 780 m/s

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: FMJ; 4.7 g; MV 305 m/s

HUNGARY

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ; steel jacket; 4.65 g; MV 300 m/s

Ball: FMJ; Tombak jacket; 4.65 g; MV 300 m/s

INDONESIA

Manufacturer

PT Pindad

Type: Ball MU-15TJ: FMJ; 4.75 g; V₁₀ 265 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 4.75 g; MV 290 m/s

Ball: JSP; 4.85 g; MV 275 m/s

Ball: JHP; 3.9 g; MV 380 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 32A: FMJ; 4.6 g; MV 265 m/s

MEXICO

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 4.6 g; MV 274 m/s

SLOVAKIA

Manufacturer

Technopol, Military and Police Group

Type: Ball: FMJ; 4.6 g; MV 315 m/s

Ball: FMJ; 4.6 g; MV 320 m/s

SOUTH AFRICA

Manufacturer

PMP

Type: Bullet type FMJ; weight 4.7 g; V₅ 300 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 4.6 g; MV 310 m/s

Ball: JSP; 4.4 g; MV 310 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: FMJ; 5 g; MV 274 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball: FMJ; 5 g; 275 m/s

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer

Type: Ball: FMJ; 4.6 g; MV 276 m/s

Ball: JHP; 3.8 g; 304 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 3.8g; MV 320m/s

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: FMJ; 4.6 g; MV 265 m/s

Ball: JHP; 4.4 g; MV 268 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: FMJ; 4.6 g; MV 293 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 3.56 g; MV 396 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: FMJ; 4.6 g; MV 275 m/s

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 4.6 g; MV 276 m/s

Ball: JHP; 3.9 g; MV 296 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 4.6 g; MV 290 m/s

HP Test: FMJ; 4.6 g; pressure 2,600 kg/cm²

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[7.65 mm Browning](#)

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.30-06 Springfield

Synonyms:

7.62 × 63 mm; 0.30 US Service; 0.30 Browning

Armament

US Springfield M1903 and Enfield M1917 bolt-action rifles; US [M1 Garand](#) semi-automatic rifle; Browning M1917, M1919 machine guns; Marlin, Lewis, Savage-Lewis, Chauchat machine guns; Browning Automatic Rifle (BAR).

Development

The 0.30-06 cartridge was introduced into US Army service in 1906, with 0.30 indicating the bullet diameter and 06 the year of adoption. Its pointed bullet replaced the earlier round-nose 0.30-03 cartridge as the service round for the M1903 Springfield rifle. The original bullet was a 9.72 g flat-based type, but complaints of lack of machine gun range during the First World War led to the standardisation of the boat tail 11.2 g M1 bullet in 1926. By 1936 complaints had arisen of the excessive safety area required for training with this cartridge and of malfunctions in the then new [M1 Garand](#) semi-automatic rifle. This led to adoption of the flat-based 9.72 g M2 bullet in 1938, which has remained the standard military ball round ever since.

Description

The case is rimless, bottlenecked, Boxer or Berdan primed and usually of brass, although lacquered steel or even aluminium cases may be encountered. The M2 bullet has a lead core with gilding metal jacket, with a cannelure in the parallel section. Other significant types include M1 armour-piercing, which has a hardened steel core and weighs 10.7 g and M1 and M2 tracer.

Specifications

Round length: 84.8 mm

Case length: 63.2 mm

Rim diameter: 12 mm

Bullet diameter: 7.82 mm

Bullet weight: 9.72 g

Abridged ballistic table: 0.30-06

Range	Velocity	Energy	Drop
0 m	887 m/s	3,810 J	0 mm
100 m	798 m/s	3,082 J	23 mm
200 m	714 m/s	2,469 J	79 mm
300 m	635 m/s	1,953 J	327 mm
400 m	562 m/s	1,528 J	688 mm
500 m	494 m/s	1,183 J	1,371 mm

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 9.94 g; MV 830 m/s

Tracer: FMJ; base tracer, red trace to 1,000 m minimum; 9.3 g; MV 825 m/s

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Unis Igman doo

Type: Ball M2: FMJ; 9.85 g; $V_{23.77}$ 835 m/s

Tracer M25: FMJ; 9.3 g red tip; $V_{23.77}$ 812 m/s

AP M14: FMJ; 9.6 g black/red tip; $V_{23.77}$ 838 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball M2: FMJ; 9.75 g; V_{25} 835 m/s

Tracer M1: FMJ; 9.34 g; V_{25} 812 m/s

AP M2: FMJ; steel core; 10.72 g; V_{25} 730 m/s

Incendiary M1: FMJ; 9.75 g; V_{25} 770 m/s

Blank M1909: Star crimp

Grenade launcher: Star crimp, to deliver MV 46 m/s with a 560 g grenade

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 11.7 g; MV 870 m/s

FINLAND

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball S374: FMJ; 8 g; MV 895 m/s

Ball FMJ123: FMJ; 8 g; MV 895 m/s

Ball D46: FMJ, SL; 12 g; MV 810 m/s

Ball E415: FMJ, Mega; 12 g; MV 800 m/s

Ball EB423: JSP; 12 g; MV 786 m/s

Ball EX481: JSP Forex; 12 g; 800 m/s

Ball GB432: FMJ; 12 g; MV 755 m/s

Ball E401: FMJ, Mega; 13 g; MV 775 m/s

Manufacturer

Sako Ltd

Type: Ball: FMJ; 8 g; MV 890 m/s

Ball: JSP; 8 g; MV 950 m/s

Ball: JSP; 10.1 g; MV 880 m/s

Ball: JHP; 11.7 g; MV 825 m/s

SP 11.7 g; MV 825 m/s

SP 9.7 g; MV 905 m/s

SP 14.3 g; MV 735 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: FMJ; 11.7 g; MV 820 m/s

Tracer: FMJ; red trace; 11.7 g; MV 820 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Target: FMJ; 9.53 g; MV 900 m/s

Cone Point: FMJ; 9.72 g; MV 911 m/s

Ball: 9.72 g; MV 911 m/s

Cone point: FMJ; 10.69 g; MV 870 m/s

H-mantle: JHP; 11.66 g; MV 841 m/s

Brenneke universal: 11.66 g; MV 840 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball M2: FMJ; 9.7 g; MV 850 m/s

Tracer: FMJ; red trace for 3 s minimum; 9.1 g; MV 850 m/s

HUNGARY

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ; 9.2 g; MV 920 m/s

Ball: PSP; 11.7 g; MV 825 m/s

Ball: SPRN; 9.7 g; MV 880 m/s

Ball: SPRN; 11.7 g; MV 825 m/s

INDONESIA

Manufacturer

Pindad

Type: Ball (MU-7TJ): FMJ; 9.85 g; V_{10} 830 m/s

Blank MU-7H: sound level min 90 dB

Anti-riot MU-7PHH: PHH: Plastic/rubber bullet; 0.85 g; V_{10} 450 m/s

ISRAEL

Manufacturer

Israel Military Industries (IMI)

Type: Ball 30AM: FMJ, SL; 9.72 g; MV 861 m/s

Ball 30CM: JSP, SL; 9.72 g; MV 887 m/s

Ball 33CM: JSP, SL; 10.69 g; MV 853 m/s

Ball 36CM: JSP, SL; 11.66 g; MV 823 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 3006A: PSP; 9.72 g; MV 845 m/s

Ball 3006B: PSP; 11.66 g; MV 777 m/s

Ball 3006C: FMJ; 9.72 g; MV 845 m/s

SOUTH AFRICA

Manufacturer

PMP

Type: Bullet type Soft Point; weight 9.7 g; V_5 860 m/s

Type: Bullet type Soft Point; weight 10.9 g; V_5 830 m/s

Type: Bullet type Soft point; weight 14.3 g; V₅ 800 m/s

Type: Bullet type Soft point; weight 14.3 g; V₅ 732 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball 17640: JSP; 8.4 g; MV 977 m/s

Ball 17643: JSP; 9.7 g; MV 910 m/s

Ball 17648: JSP; 11.6 g; MV 850 m/s

Ball 17649: JSP, Nosler; 11.6 g; MV 850 m/s

Ball 17653: Plastic point; 11.6 g; MV 850 m/s

Ball 17659: JSP; 11.6 g; MV 850 m/s

Ball 17682: JSP; 11.6 g; MV 750 m/s

Ball 17684: JSP; 13 g; MV 805 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: Ball M2: FMJ; 9.9 g; MV 835 m/s

Tracer M25: FMJ; dark ignition, red trace; 9.45 g; MV 815 m/s

Blank M1909: Star crimp, brass case

UNITED STATES OF AMERICA

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: FMJ; 9.7 g; MV 792 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JHP match; 10.88 g; MV 822 m/s

Ball: FMJ; 9.72 g; 859 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 8.42 g; MV 945 m/s

Manufacturer

Government contractors

Type: Ball M2: FMJ; 9.85 g; MV 837 m/s

AP M2: FMJ; steel core; 10.69 g; MV 829 m/s

AP-I [M14](#): FMJ; steel core; 9.72 g; MV 849 m/s

Incendiary M1: FMJ; 9.07 g; MV 901 m/s

Tracer M25: FMJ; dark ignition red trace 70 to 850 m; 9.46 g; MV 814 m/s

Manufacturer

Remington Arms Company Inc

Type: Accelerator: APDS Ball; FMJ in plastic sabot; 3.6 g; MV 1,243 m/s

Ball: PSP; 8.1 g; MV 957 m/s

Ball: Bronze point; 9.7 g; MV 886 m/s

Ball: Bronze point; 9.7 g; MV 886 m/s

Ball: PSP; 10.7 g; MV 853 m/s

Ball: SP; 11.7 g; MV 822 m/s

Ball: PSP; 11.7 g; MV 822 m/s

Ball: Bronze point; 11.7 g; MV 822 m/s

Ball: SP; 14.3 g; MV 735 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 9.7 g; MV 889 m/s

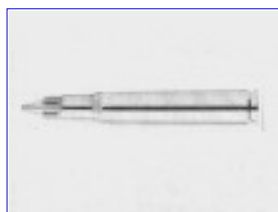
Tracer: FMJ; red trace, dark ignition, visible from 114 m to >823 m; 9.3 g; MV 812 m/s

AP-I: FMJ; AP steel core, thermite incendiary composition in nose; 9.6 g; MV 838 m/s

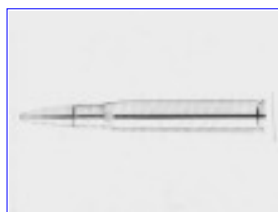
Ball: JSP; 9.7 g; MV 910 m/s

Ball: JSP; 11.7 g; MV 820 m/s

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0.30-06 Remington Accelerator cartridge



0.30-06 Springfield

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.300 Winchester Magnum

Synonyms:

0.300 Win Mag

Armament

Suitably chambered rifles.

Development

This cartridge was introduced in 1963 for the Winchester Model 70 bolt-action hunting rifle, after which it was used by several US and European rifle makers. It proved to be a very accurate and consistent long-range round with a flat trajectory; because of this it has been adopted by a number of military and security forces as a sniping round. Military development of this round was undertaken by the US Navy in the late 1980s when their special operations units began seeking a long-range anti-personnel cartridge that improved upon the ballistics of the 7.62 × 51 mm cartridge. The Navy's requirement was for a cartridge with an extreme spread of less than 203 mm at 550 m and less than 89 mm at 275 m. Muzzle velocity was specified at 900 m/s, plus or minus 15 m/s. Current US Military specification calls for a velocity of 914 m/s using a 12.3 g Sierra Match King bullet with sub-minute of angle accuracy across the bullet's effective range. The 0.300 Win Mag fills an operational capability divergence between the 7.62 × 51 mm round, which is effective to only about 800 m and the .50 BMG (12.7 × 99 mm) round, whose accuracy and signature make it less desirable in the 800 to 1200 m ranges. The 'pin point' accuracy and relatively low signature of the current military round make it ideal for use in the 800 to

1200 m spectrum. A recent development for sniper use is the Swiss Munitions family of cartridges in this calibre; these are ballistically matched out to a range of 250 m.

Description

The case is belted and bottlenecked brass, Boxer primed. The belt acts as a positive chambering stop and also reinforces the case against internal pressure. Hunting bullets are usually of pointed soft point design, but military cartridges utilize either full metal jacketed or jacketed hollow point match bullets.

Specifications

Round length: 83.82 mm

Case length: 66.55 mm

Rim diameter: 13.51 mm

Belt diameter: 13.51 mm

Bullet diameter: 7.82 mm

Bullet weight: 9.72 g

Muzzle velocity: 987 m/s

Muzzle energy: 4,725 J

Ballistic table: US Military Specification [0.300 Winchester Magnum](#), 12.3 g ball

Range	Velocity	Energy
0 m	914 m/s	5,147 J
100 m	860 m/s	4,556 J
200 m	808 m/s	4,018 J
300 m	758 m/s	3,533 J
400 m	710 m/s	3,098 J
500 m	664 m/s	2,710 J
600 m	620 m/s	2,364 J
700 m	578 m/s	2,056 J
800 m	538 m/s	1,784 J
900 m	501 m/s	1,545 J
1,000 m	468 m/s	1,339 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 10.7 g; MV 910 m/s

Ball: PSP; 9.7 g; MV 975 m/s

Ball: PSP; 11.6 g; MV 910 m/s

Ball: FMJ; 12.0 g; MV 875 m/s

[FINLAND](#)

Manufacturer

[Nammo Lapua Oy](#)

Type: Ball: MIRA; 12 g; MV 895 m/s

Sniper Ball: FMJ, SL; 12.6 g; MV 870 m/s

Ball: PSP; 11.6 g; MV 910 m/s

Ball: MEGA; 13 g; MV 830 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball: FMJ; 10.7 g; MV 970 m/s

Ball: FMJ; 10.9 g; MV 980 m/s

Ball: Brenneke; 11.7 g; MV 940 m/s

Manufacturer

Metallwerk Elisenhutte GmbH (MEN)

Type: Ball SFC: JHP bullet entirely of gilding metal, the hollow point being plugged and the exterior of the ogival formed in spiral grooves; 10 g; brass case; Boxer non-corrosive primed, single or double base propellant; MV 950±15 m/s in 600 mm barrel. Accuracy 15 shots in a 350 mm circle at 100 m

Ball: Hollow point match; 13.0 g; MV 890 m/s

Amour Piercing: Steel jacket, plated with gilding metal and tin layer; tungsten carbide core; 12.8 g; V₁₀ 870 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: PSP; 9.7 g; MV 961 m/s

Ball: PSP; 11.7 g; MV 870 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: Bullet type Soft Point, weight 11.7 g; V₅ 880 m/s

Type: Bullet type Soft Point; weight 14.3 g; V₅ 800 m/s

[SWEDEN](#)

Manufacturer

Norma Precision AB

Type: Ball: PSP; 11.6 g; MV 920 m/s

Manufacturer

[Nammo](#) Vanasverken AB

Type: Ball: FMJ; 12.3 g; MV 920 m/s

Sniper 12 ball: FMJ; 12.3 g; MV 920 m/s

Armour piercing: FMJ; 12.3 g; MV 920 m/s

SWITZERLAND

Manufacturer

RUAG Munition (formerly Swiss Munition Enterprise)

Type: Ball: HPBT; 11.4 g; MV 865 m/s

AP: FMJ; HC (tungsten) core; 12.7 g; MV 855 m/s

SwissP: Standard: HPBT; 13.0 g; MV 870 m/s

SwissP: Armour-Piercing: FMJ (tungsten core); 12.6 g; MV 855 m/s

SwissP: Styx Action: HPBT; 12.85 g; MV 880 m/s

Swiss P Target: HPBT; 13 g; MV 870 m/s

UNITED STATES OF AMERICA

Manufacturer

A-Square Company Inc

Type: Ball: FMJ; 11.7 g; MV 933 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: Military specification Match Hollow Point; 12.3 g; MV 914 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: HPBT; 9.7 g; MV 955 m/s

Ball: HPBT; 11.6 g; MV 886 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: PSP; 11.6 g; MV 914 m/s

Ball: PSP; 13 g; MV 863 m/s

Ball: PSP; 11.6 g; MV 902 m/s

Ball: JHP match; 12.3 g; 883 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: PSP; 9.72 g; MV 1,003 m/s

Ball: PSP; 11.66 g; MV 914 m/s

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 12.3 g; MV 879 m/s

Ball: PSP; 9.7 g; MV 1,003 m/s

Ball: PSP; 11.7 g; MV 914 m/s

Ball: PSP; 14.3 g; MV 817 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

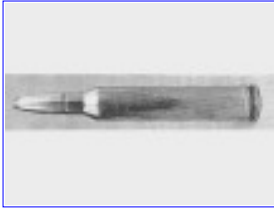
Manufacturer

Yugoimport SDPR

Type: Ball: PSP; 9.7 g; MV 1,005 m/s

Ball: PSP; 11.7 g; MV 915 m/s

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[*0.300 Winchester Magnum*](#)

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7 × 57 mm

Synonyms:

7 mm Mauser; 7 mm Spanish Mauser; 7 mm M1893

Armament

Suitably chambered rifles and machine guns.

Development

The 7 × 57 mm Mauser rifle cartridge was developed by Mauser in 1892 and, together with an improved Mauser rifle, was adopted by the Spanish Army in 1893. It was subsequently widely adopted by South American, Chinese and South African forces. It won fame in the Spanish-American War and was responsible for the USA's rapid abandonment of the M1892 Krag-Jorgensen rifle and its adoption of the M1903 Springfield in 0.30-06 (7.62 × 63 mm), a near copy of the [M98](#) Mauser. Though no longer in first-line service with any country it is still in use by police and paramilitary forces, particularly in South America, for which military ammunition is produced. It is also in wide use as a sporting round.

Description

The brass cartridge case is bottlenecked and rimless, and can be found with Boxer or Berdan priming. The standard military bullet is the usual jacketed lead core, non-streamlined, pointed type although round-nose bullets can still be encountered and there is a variety of soft-nosed and expanding

commercial bullets in use.

Specifications

Round length: 77.7 mm

Case length: 56.65 mm

Rim diameter: 12 mm

Bullet diameter: 7.2 mm

Bullet weight: 9 g

Muzzle velocity: 773 m/s

Muzzle energy: 2,689 J

Abridged ballistic table: 7 × 57 mm, 9 g ball

Range	Velocity	Energy
0 m	773 m/s	2,689 J
100 m	684 m/s	2,105 J
200 m	601 m/s	1,625 J
300 m	523 m/s	1,231 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; 9 g; MV 840 m/s

Ball: PSP; 9.1 g; MV 860 m/s

Ball: PSP; 10 g; MV 820 m/s

Ball: JSP; 11.2 g; MV 750 m/s

Ball: PSP; 11.3 g; MV 770 m/s

BELGIUM

Manufacturer

Browning SA

Type: Ball: JSP; 11.2 g; MV 760 m/s

[CHILE](#)

Manufacturer

[FAMAE](#)

Type: Ball: FMJ; 9 g; MV 860 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball: FMJ, Round-nose; 11.2 g; MV 765 m/s

Ball: FMJ, SL; 11.2 g; MV 755 m/s

Manufacturer

Sako Ltd

Type: Ball 108B: FMJ; 5.1 g

Ball 116B: JSP; 11 g;

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball: KS cone point; 7.97 g; MV 900 m/s; Eo 3,230 J

Target Ball: FMJ, flat tip; 9 g; MV 800 m/s

Ball: PSP; 9 g; MV 780 m/s

Ball: H-Mantel, JHP; 11.21 g; MV 770 m/s

Ball TIG: Brenneke JSP; 7.5 g; 800 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: JHP; 9.1 g; MV 953 m/s

Ball: JHP; 10.4 g; MV 897 m/s

Ball: JSP; 9.1 g; MV 811 m/s

Ball: JSP; 11.2 g; MV 744 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: Bullet type Soft Point; weight 8.4 g; V₅ 800 m/s

Type: Bullet type Soft point; weight 9.7 g; V₅ 760 m/s

Type: Bullet type Soft point; weight 11.0 g; V₅ 740 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball: JSP; 9.7 g; 840 m/s

UNITED STATES OF AMERICA

Manufacturer

Federal Cartridge Company

Type: Ball: JSP; 9.1 g; MV 811 m/s

Ball: JSP; 11.3 g; MV 753 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: JSP; 9.1 g; MV 811 m/s

Ball: JSP, SL; 11.3 g; MV 744 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: JSP, SL; 9 g; MV 823 m/s

Ball: JSP; 10 g; MV 793 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JSP; 9.1 g; MV 811 m/s

Manufacturer

Winchester-Olin

Type: Ball: PSP; 9.4 g; MV 811 m/s

Ball: JSP; 11.3 g; MV 753 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball (Igman): JSP; 11.3 g; MV 770 m/s

Ball (Partizan): JSP; 9 g; MV 780 m/s

Ball (Partizan): JSP; 11.2 g; MV 770 m/s

Ball (Partizan): FMJ; 11.2 g; MV 740 m/s

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7 mm Spanish Mauser

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.243 Winchester

Synonyms:

none

Armament

Suitably chambered sniping rifles.

Development

This cartridge was developed commercially by the Winchester company in 1955 as a hunting round. It soon acquired a reputation for accuracy. This resulted in a number of companies producing military sniping rifles chambered for this round, since it produced better accuracy figures than the more usual 7.62 × 51 mm NATO cartridge.

Description

The 0.243 Winchester was developed by taking the 7.62 × 51 mm NATO cartridge case and reducing the neck to accommodate a 6 mm bullet. This means that the alterations to a weapon originally designed for the 7.62 mm cartridge are relatively minor except for the different barrel, facilitating the conversion. The case is of brass, bottlenecked and usually Boxer primed. The bullet is of conventional pattern, streamlined, lead cored, with a steel jacket and gilding metal envelope. Various hunting bullets can be found, but the military standard is a full metal jacket bullet.

Specifications

Round length: 68.84 mm

Case length: 51.94 mm

Rim diameter: 12.01 mm

Neck diameter: 7 mm

Head diameter: 11.94 mm

Bullet diameter: 6.17 mm

Bullet weight: 6.48 g

Abridged ballistic table: 0.243 Winchester 6.48 g ball

Range	Velocity	Energy
0 m	836 m/s	2,257 J
100 m	764 m/s	1,885 J
200 m	696 m/s	1,563 J
300 m	631 m/s	1,285 J
400 m	570 m/s	1,050 J
500 m	512 m/s	846 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 5.8 g; MV 945 m/s

Ball: SP; 6.5 g; MV 900 m/s

[BRAZIL](#)

Manufacturer

CBC Magtech

Type: Ball: PSP; 6.48 g; MV 985 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: SP; 6.5 g; MV 905 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball E453: FMJ; 5.8 g; MV 945 m/s

Ball S342: FMJ; 5.8 g; MV 885 m/s

Manufacturer

Sako AB

Type: Ball: FMJ; 5.8 g; MV 870 m/s

Ball: SP; 5.8 g; MV 955 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball CP: cone point; 6.22 g; MV 955 m/s

Ball SPP: PSP; 6.48 g; MV 936 m/s

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: SP; 6.5 g; MV 902 m/s

Ball: HP; 5.2 g; MV 1,020 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: PSP; 5.2 g; MV 896 m/s

Ball: PSP; 6.5 g; MV 836 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: .243 win Soft Point 6.5 g; V_5 900 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball 16002: FMJ; 6.5 g; MV 945 m/s

Ball 16003: JSP; 6.5 g; MV 945 m/s

UNITED STATES OF AMERICA

Manufacturer

Federal Cartridge Company

Type: Ball: SP; 5.2 g; MV 1,042 m/s

Ball: SP; 6.5 g; MV 902 m/s

Ball: HP; 3.9 g; MV 1,098 m/s

Ball: Streamlined HP; 5.5 g; MV 1,012 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: PSP; 5.2 g; MV 1,021 m/s

Ball: JHP; 5.2 g; MV 1,021 m/s

Ball: PSP; 6.05 g; MV 902 m/s

Ball: JSP; Etronix electric primer; 5.8 g; MV 1,000 m/s

Manufacturer

Winchester-Olin

Type: Silver tip: FMJ; 6.5 g; MV 902 m/s

Ball: SP; 5.2 g; MV 1,042 m/s

Ball: SP; 6.5 g; MV 902 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

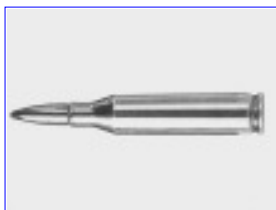
Manufacturer

Yugoimport SDPR

Type: Ball: JSP; 6.5 g; MV 902 m/s

HP Test: JSP; 6.5 g

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0.243 Winchester

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.22 Hornet

Synonyms:

5.6 × 35R; .22 [M65](#);

Armament

M4 and [M6](#) Aircrew Survival rifles; suitably chambered sporting rifles and pistols.

Development

This was derived from the older 0.22 Winchester Centre Fire (WCF) cartridge which was habitually loaded to much higher velocities in Europe than it was in the USA. Various US sportsmen began experimenting with similar improvements and in 1930 Winchester bowed to the public demand and produced the Hornet, which became a popular round for small game shooting. It has an excellent reputation for accuracy at ranges up to about 300 m, and has been used as a police sniping rifle round in the past.

Description

A rimmed, bottlenecked round with an unusually long neck, normally loaded with a pointed soft point bullet, though both full metal jacket ball and tracer cartridges have been produced for military use.

Specifications

Round length: 43.69 mm
Case length: 35.56 mm
Rim diameter: 8.76 mm
Bullet diameter: 5.68 mm
Bullet weight: 2.9 g
Muzzle velocity: 800 m/s
Muzzle energy: 928 J

Abridged ballistic table: 0.22 Hornet, 2.9 g ball

Range	Velocity	Energy
0 m	800 m/s	928 J
100 m	626 m/s	568 J
200 m	462 m/s	323 J
300 m	340 m/s	168 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; 2.92 g; MV 770 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 2.9 g; MV 715 m/s

FINLAND

Manufacturer

Sako, Ltd

Type: Ball: JSP; 2.9 g; MV 700 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball KTMS: JSP; 3 g; MV 740 m/s

Ball: FMJ; 3 g; MV 740 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball 15601: JHP; 2.9 g; MV 740 m/s

UNITED STATES OF AMERICA

Manufacturer

Hornady Manufacturing Company

Type: Ball: JSP; 2.26 g; MV 975 m/s

Remington Arms Company Inc

Type: Ball: JHP; 2.92 g; MV 820 m/s

Ball: JSP; 2.92 g; MV 820 m/s

Manufacturer

Winchester-Olin

Type: Ball: JSP; 2.9 g; MV 820 m/s

Ball: JHP; 3 g; MV 820 m/s

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.22 Hornet

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SMALL ARMS

Date Posted: 06 February 2002

Jane's Ammunition Handbook 2002-2003

7 mm Remington Magnum

Synonyms:

none

Armament

Suitably chambered sniping and sporting rifles.

Development

Introduced by Remington in 1962 to accompany a new range of bolt-action rifles. It was the first belted cartridge to be produced by a major manufacturer for many years, and was really a response to the popularity of various 7 mm Wildcat high-velocity cartridges using belted cases. It is occasionally used by military and police snipers.

Description

A brass, belted rimless case with a tapering shoulder and short neck. Boxer primed.

Specifications

Round length: 82.3 mm

Case length: 63.5 mm

Rim diameter: 13.33 mm

Bullet diameter: 7.21 mm

Bullet weight: 9.72 g

Muzzle velocity: 948 m/s

Muzzle energy: 4,358 J

Abridged ballistic table: 7 mm Remington Magnum, 9.72 g ball

Range	Velocity	Energy
0 m	948 m/s	4,358 J
100 m	855 m/s	3,546 J
200 m	768 m/s	2,860 J
300 m	686 m/s	2,282 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: PSP; 9.1 g; MV 980 m/s

Ball: PSP; 10 g; MV 900 m/s

Ball: JSP; 9.1 g; MV 985 m/s

Ball: JSP; 11.2 g; MV 860 m/s

Ball: PSP; 11.3 g; MV 870 m/s

BELGIUM

Manufacturer

Browning SA

Type: Ball: JSP; 9.72 g; MV 994 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball: FMJ, SL; 11 g; MV 842 m/s

Ball: FMJ; 11 g; MV 850 m/s

Manufacturer

Sako AB

Type: Ball: JSP; 11 g MV 935 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball: JSP; 9.40 g; MV 970 m/s

Ball: KS cone point; 10.4 g; MV 930 m/s

Ball: JSP; 11.3 g; MV 500 m/s

Ball **TIG**: Brenneke PSP; 11.5 g; MV 890 m/s

Manufacturer

SK Jagd und Sportmunitions

Type: Ball: FMJ; 11 g; MV 765 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: JHP; 9.1 g; MV 945 m/s

Ball: JHP; 10.4 g; MV 889 m/s

Ball: JSP; 11.3 g; MV 872 m/s

SOUTH AFRICA

Manufacturer

PMP

Type: Bullet type Soft Point; weight 9.7 g; V₅ 920 m/s

Type: Bullet type Soft point; weight 11.0 g; V₅ 840 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: JSP; 10 g; MV 970 m/s

Ball: JHP; 11 g; MV 920 m/s

Match Ball: FMJ, ogival; 9.7 g; MV 913 m/s

UNITED STATES OF AMERICA

Manufacturer

A-Square Company Inc

Type: Ball: FMJ; 11.4 g; MV 872 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: Solid copper HP; 9.07 g; MV 914 m/s

Ball: Solid copper HP; 10.3 d; MV 853 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: PSP; 9.1 g; MV 960 m/s

Ball: JSP; 9.7 g; MV 948 m/s

Ball: JSP, SL; 9.7 g; MV 949 m/s

Ball: JSP, SL; 10.7 g; MV 872 m/s

Ball: PSP; 10.5 g; MV 900 m/s

Ball: JSP; 11.3 g; MV 872 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: JSP; 9.4 g; MV 959 m/s

Ball: JSP; 11.3 g; MV 872 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: JSP, SL; 9 g; MV 961 m/s

Ball: JSP; 10 g; MV 925 m/s

Ball: JSP, SL; 10.5 g; MV 897 m/s

Ball: JSP; 11.4 g; MV 872 m/s

Manufacturer

KDF

Type: Ball: JSP; 10 g; MV 903 m/s

Ball: JSP; 11.4 g; MV 872 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JSP; 9.72 g; MV 948 m/s

Ball: JSP; 11.34 g; MV 872 m/s

Ball: JSP; 9.1 g; MV 968 m/s

Ball `Safari': JHP; 10.4 g; MV 884 m/s

Ball `extended range': FMJ; 10.7 g; MV 884 m/s

Manufacturer

Winchester-Olin

Type: Ball: JSP, SL; 9 g; MV 965 m/s

Ball: JSP, SL; 10.4 g; MV 900 m/s

Ball: JSP; 8.1 g; MV 1,009 m/s

Ball: JSP; 9.7 g; MV 948 m/s

Ball: JSP; 11.3 g; MV 872 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: JSP; 9.4 g; MV 1,005 m/s

Ball: JSP; 11.3 g; MV 952 m/s

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7 mm Remington Magnum

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SMALL ARMS

Date Posted: 06 February 2002

Jane's Ammunition Handbook 2002-2003

6.35 × 16 mmSR

Synonyms:

.25ACP; 6.35 Auto Pistol; .25 Auto

Armament

All suitably chambered automatic pistols; also a limited number of European revolvers of pre-1939 vintage.

Development

Developed by Fabrique Nationale of Liege in association with John Browning, for the Browning Model 1906 pocket automatic pistol. Like many Browning designs it has a semi-rimmed case, allowing it to be used in small revolvers. As a combat round it is useless, and as a personal defence cartridge it barely suffices; the 0.22 Long Rifle cartridge has more power. Automatic pistols in this calibre are, however, carried by senior officers and staff personnel in some armies, and it is used to some extent as a concealed or secondary 'backup' weapons by some police officers.

Description

The semi-rimmed case is usually of brass, though steel and alloy have been tried in the past. The standard bullet is a metal jacketed, lead-cored pattern, round-nosed or ogival although lead bullets are sometimes seen, these being more suited to revolver use.

Specifications

Round length: 23.11 mm

Case length: 15.62 mm

Rim diameter: 7.67 mm

Bullet diameter: 6.37 mm

Bullet weight: 3.2 g

Muzzle velocity: 225 m/s

Muzzle energy: 81 J

Abridged ballistic table: 6.35 mm Auto, 3.2 g ball

Range	Velocity	Energy
0 m	225 m/s	81 J
10 m	220 m/s	77 J
25 m	215 m/s	74 J
50 m	205 m/s	67 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 3.2 g; MV 220 m/s

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 3.24 g; MV 232 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 3.3 g; MV 238 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Ball 4316040: FMJ; 3.25 g; MV 225 m/s

Manufacturer

Sako AB

Type: Ball: FMJ; 3.25 g; MV 245 m/s

FRANCE

Manufacturer

SFM Défense

Type: Ball: FMJ; 3.25 g; MV 200 m/s

GERMANY

Manufacturer

Dynamit Nobel (Geco)

Type: Ball: FMJ; 3.2 g; MV 255 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 3.2 g; MV 220 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball 25A: FMJ; 3.24 g; MV 230 m/s

[MEXICO](#)

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 3.2 g; MV 239 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: 6.35 mm; .25 ACP Soft Point, bullet type FMJ, weight 3.2 g; V₅ 230 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 3.2 g; MV 230 m/s

Ball: JSP; 3 g; MV 230 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball: FMJ; 3.2 g; MV 245 m/s

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer

Type: Ball: FMJ; 3.2 g; MV 247 m/s

Ball: JSP; 2.9 g; MV 260 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammunition)

Type: Ball: FMJ; 3.2 g; MV 230 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: FMJ; 3.2 g; MV 247 m/s

Manufacturer

Hornady Manufacturing Company

Type: Ball: FMJ; 3.2 g; MV 247 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 2.26 g; MV 350 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: FMJ; 3.2 g; MV 246 m/s

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 3.2 g; MV 231 m/s

Ball: JSP; 2.92 g; MV 248 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 3.25 g; MV 241 m/s

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6.35 mm automatic pistol

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

7.92 × 57 mm

Synonyms:

[7.92 mm Mauser](#); 8 × 57 mm; 8 mm Mauser

Armament

All German service rifles and 7.92 mm machine guns from 1888 to 1945. It was used also as the standard service calibre by Austria, [Bulgaria](#), the former Czechoslovakia, [Hungary](#), [Poland](#), Portugal and some South American countries prior to 1945. Used by the UK in the Besa tank machine gun from 1939 to 1950. Now used by [Yugoslavia](#) in some sniping rifles and machine guns (including the [M53](#)).

Development

This became the standard German rifle and machine gun cartridge in 1888 and with periodic improvement remained so until 1945. Widely adopted elsewhere it has been made by every major ammunition manufacturer at some time or other.

Description

A rimless, bottlenecked case with Berdan or Boxer priming, which may be made of brass, brass- or copper-coated, lacquered steel or light alloy. The standard ball bullet varied from country to country but was generally a lead-cored, steel jacketed, pointed, streamlined type of about 12 g weight.

Specifications

Round length: 80.6 mm

Case length: 57 mm

Rim diameter: 12 mm

Bullet diameter: 8.2 mm

Bullet weight: 12.85 g

Muzzle velocity: 737 m/s

Muzzle energy: 3,490 J

Abridged ballistic table: 7.92 × 57 mm, 12.85 g ball

Range	Velocity	Energy
0 m	737 m/s	3,490 J
100 m	671 m/s	2,893 J
200 m	610 m/s	2,391 J
300 m	554 m/s	1,972 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; Sierra; 11.3 g; MV 780 m/s

Ball: JSP, Nosler, 13.0 g; MV 750 m/s

BOSNIA-HERZEGOVINA

Manufacturer

Unis Igman d.o.o.

Type: Ball [M49](#): FMJ; 12.85 g; V₂₅ 720 m/s

Tracer [M70](#): 12.55 g, green tip; V₂₅ 705 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Target: FMJ; 12.12 g; MV 800 m/s

H-Mantle: JHP; 12.12 g; MV 820 m/s

Ball: JSP, RN; 12.7 g; MV 798 m/s

Brenneke ideal: 12.83 g; MV 798 m/s

PORTUGAL

Manufacturer

INDEP

Type: Ball [M380](#): FMJ; lead core; 12.8 g; MV 747 m/s; Berdan primed

Ball: FMJ; lead core; 12.8 g; MV 747 m/s; Boxer primed

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company Inc
Type: Ball: JSP; 11.0 g; 719 m/s

Manufacturer

Winchester
Type: Ball: JSP; 11.0 g; 719 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball [M49](#): FMJ; 12.85 g; MV 720 m/s

Tracer [M70](#): FMJ; red trace, dark ignition, visible 115 to >900 m; 12.55 g; MV 705 m/s

AP-I: FMJ; steel core, base tracer, incendiary composition in nose; 11.36 g; MV 765 m/s

Sniper ball [M75](#): FMJ; 12.85 g; MV 720 m/s

Blank: Brass case, crimped

Grenade launcher: Brass case, crimped

Practice ball [M76](#): Light alloy bullet with copper base cup and part jacket, conical nose; 1.9 g; MV 830 m/s

HP Test [M49](#) **Type 1:** FMJ; 12.85 g; Pressure 3,500 kg/cm²

HP Test [M49](#) **Type 2:** FMJ; 12.85 g; Pressure 4,250 kg/cm²

Ball: FMJ; 12.85 g; MV 737 m/s

Ball: PSP; 9 g; MV 807 m/s

Ball: PSP; 12.7 g; MV 755 m/s

Match ball: FMJ; 12.85 g; MV 737 m/s

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[7.92 mm Mauser](#)

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

6.5 × 55 mm

Synonyms:

6.5 mm Swedish; 6.5 mm Swedish Mauser; 6.5 mm Mauser; 6.5 mm Krag Jorgensen; 6.5 mm Norwegian

Armament

Swedish Models 94, 96 and 38 rifles and carbines. Suitably chambered FN MAG machine guns, Browning Automatic Rifles Ksp M36 and AG42B rifles.

Development

This cartridge was adopted by [Sweden](#) in 1895 together with the [M94](#) and subsequent [M96](#) Mauser rifle. Though largely replaced by the 7.62 × 51 mm NATO cartridge in the 1970s it is still in use with some weapons. Fired from a suitably chambered Krag-Jorgensen rifle it was also used by the Norwegians for many years. The cartridge is well designed and has a high reputation for accuracy; for this reason it continues in widespread use throughout Scandinavia and North America in sporting rifles. Surplus military rifles in this caliber continue to be available on the international arms market.

Description

The case is rimless, bottlenecked, brass and Berdan or Boxer primed. The original bullet was round-nosed, but was later changed to a jacketed ogival type with the usual lead-antimony core. It

should be noted there were several 6.5 mm cartridges of this era, of Mauser or Mannlicher ancestry, many of which are still in existence as hunting rounds. They all look very alike with similar dimensions but none are interchangeable, although a few can be loaded into the wrong weapon.

Specifications

M41 Ball

Round length: 78 mm

Case length: 54.9 mm

Rim diameter: 12.2 mm

Bullet diameter: 6.7 mm

Bullet weight: 9.3 g

Muzzle velocity: 800 m/s

Muzzle energy: 2,976 J

Abridged ballistic table: 6.5 × 55 mm, 9 g ball

Range	Velocity	Energy
0 m	870 m/s	3,407 J
100 m	773 m/s	2,689 J
200 m	682 m/s	2,095 J
300 m	597 m/s	1,608 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 9.25 g; MV 800 m/s

Tracer: FMJ; base trace, red to 800 m; 7.12 g; MV 800 m/s

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 9.1 g; MV 787 m/s

FINLAND

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd

Type: Sniper ball B343: FMJ, SL; 9.3 g; MV 780 m/s

Ball: PSP; 10.1 g; MV 782 m/s

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball: FMJ; 6.03 g; MV 910 m/s

Ball: JSP; 9 g; MV 829 m/s

Manufacturer

SK Jagd und Sportmunitions

Type: Ball: FMJ, SL; 9.3 g; MV 780 m/s

PORTUGAL

Manufacturer

INDEP

Type: Ball: FMJ; lead core; 9.3 g; MV 770 m/s

[SWEDEN](#)

Manufacturer

Bofors AB

Type: Ball [M41](#): FMJ; 9.3 g; MV 800 m/s

Tracer [M41](#): FMJ; red trace 110-800 m; 7.12 g; MV 790 m/s

Short-range practice: Plastic; 0.6 g

Blank: Wooden bullet; 0.5 g; safe at 5 m from muzzle

Manufacturer

Norma AB

Type: Ball: FMJ; 9 g; MV 830 m/s

Ball: FMJ; 5.2 g; MV 853 m/s

Match ball: FMJ; 5.2 g; MV 905 m/s

UNITED STATES OF AMERICA

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ, SL; 9 g; MV 747 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC)

Type: Ball: Hollow point match; 9.1 g; MV 780 m/s

Ball: FMJ; 9.3 g; 808 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

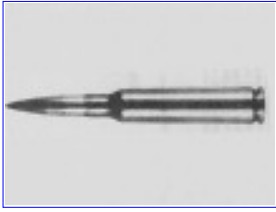
Yugoimport SDPR

Type: Ball: FMJ; 9 g; MV 775 m/s

Ball: JSP; 8 g; MV 823 m/s

Ball: JSP; 9 g; MV 775 m/s
Ball: JSP; 10.1 g; MV 719 m/s

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6.5x55mm

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MORTARS - 81 mm MORTARS, AUSTRIA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm SprGr DNG

Armament

All high-pressure 81 mm smoothbore mortars.

Development

By [DNG](#) under licence from UK.

Description

The 81 mm bombs are a licensed version of the British L15A1 made to close tolerances and high standards. As a result, the fragmentation pattern is very even and flight is regular and predictable. Distribution of the fragments is claimed to be precisely even, so producing the optimal effect from the weight of the bomb.

Specifications

Length: 487 mm

Weight: 4.15 kg

Weight of casing: 2.9 kg

Weight and type of payload: 750 g TNT

Number of fragments: ca 1,600 of at least 0.5 g; ca 2,000 of 0.3-0.5 g

Muzzle velocity: 75-300 m/s

Max range: 5,800 m

Max barrel pressure: 750 bar

Fuzes: percussion, M125A1, DM 111A2 or equivalent

Status: In production.

Service: Austrian Army.

Manufacturer

Dynamit Nobel Graz.

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81 mm [DNG](#) HE bomb without secondary charges

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm incendiary bomb RP-I

Armament

All standard 60 mm mortars.

Development

By Hirtenberger AG for general use.

Description

This bomb is similar to the RP-S Mk 1 smoke bomb, described previously, but the Red Phosphorus (RP) filling is slightly different in order to enhance incendiary over smoke effects. The RP-I bomb still produces a useful amount of long lasting smoke, however. Red Phosphorus is used in both the RP-S Mk 1 and in the RP-I because it achieves a higher combustion temperature than White Phosphorus (WP) and thus has a greater incendiary effect.

Specifications

Length, unfuzed: 470 mm

Weight, unfuzed: 2.3 kg

Weight and type of payload: 500 g RP

Number of charges: P + 4

Fuze: impact SQ

Max range: 1,995 m, in 640 mm barrel; 2,495 m, in 1 m barrel

Muzzle velocity: 163 m/s

Chamber pressure: 450 bar

Burning time: 120 s

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm incendiary bomb RP-I

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MORTARS - 60 mm MORTARS, AUSTRIA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb 80

Armament

All usual 60 mm mortars.

Development

By Hirtenberger AG, for general use in 60 mm mortars of all types with suitable ballistic requirements.

Description

A spheroidal graphite cast-iron bomb of streamlined shape, with four gas check grooves around the bourrelet. The tail unit is of extruded aluminium alloy and has six fins; it is firmly screwed into the rear of the bomb body. The propelling charge consists of a primary cartridge of shotgun type inserted into the tail tube and four or five horseshoe containers that clip around the tail tube ahead of the fins. Four secondary charges are used with most mortars, but five may be used with mortars having a barrel length of 1 m or more.

Specifications

Length, unfuzed: 300 mm

Weight, unfuzed: 1.6 kg

Weight and type of payload: 200 g TNT or Comp B

Number of charges: P + 4

Fuze: impact SQ

Max range: 2,600 m, 640 mm barrel; 3,065 m, 1 m barrel

Min range: 60 m, 640 mm barrel; 70 m, 1 m barrel

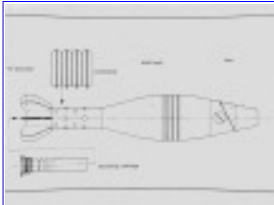
Muzzle velocity: 199 m/s

Chamber pressure: 450 bar

Manufacturer

Hirtenberger AG.

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Hirtenberger 60 mm HE bomb 80



Hirtenberger 60 mm HE bomb 80

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IDENTIFICATION OF SMALL ARMS AMMUNITION, AUSTRIA

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO system plus one national code:

Sniper ball purple bullet tip

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[1 Image](#)

SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

15.2 mm Steyr AMR

Synonyms:

15.2 mm IWS 2000

Armament

Steyr-Mannlicher 15.2 mm anti-matériel rifle.

Development

Developed in 1988 to 1990 by Steyr-Mannlicher for their anti-matériel sniping rifle, a heavy rifle designed to attack vulnerable equipment at long range. Development of the weapon is complete. Originally 15 mm, then changed to 14.5 mm, the calibre is now 15.2 mm.

Description

The cartridge is of partially synthetic material, partly metal construction and of conventional bottlenecked form. The projectile is a fin-stabilised 35 g, 5.5 mm tungsten dart with an effective range of 1,000 to 2,000 m depending upon the nature of the target. At 800 m range the dart will penetrate 40 mm of Rolled Homogeneous Armour (RHA), with considerable secondary fragmentation behind the plate. The high velocity produces an exceptionally flat trajectory. The vertex at 1,000 m range is only 800 mm above the line of sight. The cartridge uses a long primer to give optimum ignition of the propelling charge, and a pusher plate drives the projectile up the bore.

Specifications

Round length: 207 mm

Round weight: 150 g

Case diameter: 26 mm

Bullet diameter: 5.5 mm

Bullet weight: 35 g

Muzzle velocity: 1,450 m/s

Muzzle energy: 36,793 J

Max pressure: 4,800 bar

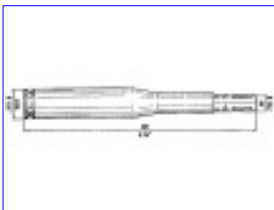
AUSTRIA

Manufacturer

Steyr-Mannlicher GmbH

Type: **Fin-stabilised discarding sabot:** See above

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Internal arrangement of the Steyr 15.2 mm FSDS round

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

10 mm Auto

Synonyms:

10 mm Bren Ten

Armament

Suitably chambered Glock, SIG, Smith & Wesson, Colt and Heckler and Koch pistols, Heckler and Koch [MP5/10 sub-machine](#) gun, Steyr Tactical Machine Pistol (TMP).

Development

The [10 mm Auto](#) cartridge was developed with the 10 mm Bren Ten automatic pistol in 1980 to 1983, by Dornaus & Dixon Enterprises (now defunct) in co-operation with Norma AB. The object was to provide a pistol round with recoil, comparable to the 0.45 ACP but with greater velocity and energy. The Bren Ten pistol failed, but the ballistics of the cartridge were sufficient to keep firearms manufacturers interested. Colt eventually took the lead with its 10 mm Delta Elite, although this pistol is no longer produced. The FBI then decided upon the 10 mm as its service round. This gave it a degree of official approval, although the 10 mm was quickly supplanted by the 0.40 S&W in FBI service. **The 10 mm continues in law enforcement use in the Western hemisphere, although the widespread adoption of pistols in 0.40 S&W and [0.357 Sig](#) by numerous law enforcement agencies has caused its popularity to wane.**

Description

A straight-taper, rimless cartridge case in brass, Boxer primed. The bullet may be hollow point or full metal jacket with lead core.

Specifications

Norma 11002

Round length: 31.78 mm

Case length: 25 mm

Rim diameter: 10.72 mm

Bullet diameter: 10.13 mm

Bullet weight: 11 g

Muzzle velocity: 336 m/s

Muzzle energy: 861 J

Abridged ballistic table: [10 mm Auto](#), 11 g ball

Range	Velocity	Energy
0 m	396 m/s	861 J
10 m	384 m/s	809 J
25 m	368 m/s	743 J
50 m	345 m/s	653 J

AUSTRIA

Manufacturer

Hirtenberger, AG

Type: Ball EMB: FMJ controlled expansion; 7.0 g; MV 600 m/s

[BRAZIL](#)

Manufacturer

CBC Magtech

Type: Ball: JHP; 11.66 g; MV 302 m/s

Ball: FMJ; 11.66 g; MV 302 m/s

Ball: Lead, SWC; 10.4 g; MV 301 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: SP; 11.7 g; MV 290 m/s

Type: Ball: HP; 13 g; MV 320 m/s

Type: Ball: FMJ; 11 g; MV 366 m/s

Target: SWC; 13.6 g; MV 366 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball 11001: FMJ; 13 g; MV 340 m/s

Ball 11002: JHP; 13 g; MV 340 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition Company

Type: Ball: JHP; 10.1 g; MV 381 m/s

Ball: JHP; 11.7 g; MV 290 m/s

Manufacturer

CCI-Speer

Type: Ball: FMJ; 13 g; MV 320 m/s

Ball: JHP; 11.7 g; MV 351 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 8.7 g; MV 427 m/s

Ball: JHP; 9.7 g; MV 396 m/s

Ball: JHP; 10.7 g; MV 381 m/s

Manufacturer

Eldorado Cartridge Corporation(PMC)

Type: Ball: JHP; 11.6 g; MV 290 m/s

Ball: JHP; 11 g; MV 366 m/s

Ball: FMJ; 12.9 g; 320 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JHP; 10.1 g; MV 404 m/s

Hydra-Shok: 11.7 g; MV 290 m/s

Ball: JHP; 11.7 g; MV 314 m/s

Ball: FMJ; 13 g; MV 290 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 7.45 g; MV 503 m/s

Ball: Glaser Silver; 7.45 g; MV 503 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: HP; 10.1 g; MV 430 m/s

Ball: HP; 11.7 g; MV 386 m/s

Ball: HP; 13 g; MV 351 m/s

Subsonic ball: HP; 11.7 g; MV 290 m/s

Ball: FMJ; 13 g; MV 351 m/s

Manufacturer

Remington Arms Company Inc

Type: High-velocity ball: FMJ; 11.7 g; MV 378 m/s

Subsonic ball: FMJ; 11.7 g; MV 290 m/s

Ball: SP; 11 g; MV 410 m/s

Ball: FMJ; 13 g; MV 365 m/s

Manufacturer

Winchester-Olin

Type: Subsonic ball: SP; 11.7 g; MV 302 m/s

Ball: HP; 11.4 g; MV 393 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: JHP; 11.7 g; MV 364 m/s

Ball: JSP; 12.3 g; MV 354 m/s

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 21 mm

Synonyms:

none

Armament

Suitably chambered automatic pistols.

Development

This round was developed in the early 1980s in order to satisfy the civilian market in Italy, [Mexico](#) and France, where the normal 9 × 19 mm Parabellum cartridge was prohibited for civilian use. Except for the case length the dimensions are the same as the 9 × 19 mm round, thus adaptation of automatic pistols to this cartridge was simply a matter of altering the chamber length and did not involve changes to the bolt face or magazine well. Since that time it has become apparent that it is an exceptionally accurate cartridge, rapidly gaining ground as a competition round. There are also suggestions that the extra case length might accommodate an increased charge which could be of interest to military and police.

Description

The case is rimless, brass, straight tapered and Berdan or Boxer primed. The dimensions are the same as the 9 × 19 mm except for the case length. The bullet has the same jacketed bullet as the 9 × 19 mm

cartridge.

Specifications

Round length: 31.25 mm

Case length: 21.1 mm

Rim diameter: 9.94 mm

Bullet diameter: 9 mm

Bullet weight: 8 g

Muzzle velocity: 350 m/s

Muzzle energy: 490 J

Abridged ballistic table: 9 × 21 mm, 8 g ball

Range	Velocity	Energy
0 m	350 m/s	490 J
10 m	345 m/s	475 J
25 m	335 m/s	448 J
50 m	320 m/s	408 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 8 g; MV 360 m/s

Manufacturer

Spowa

Type: Ball: FMJ; 6.5 g; MV 480 m/s

Ball: FMJ; 7.5 g; MV 445 m/s

Ball: FMJ; 8 g; MV 440 m/s

Ball: FMJ; 9 g; MV 405 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 7.5 g; MV 368 m/s

[HUNGARY](#)

Manufacturer

Mátravidéki Fémművek

Type: Ball: FMJ, RN; 8 g; MV 360 m/s

[INDONESIA](#)

Manufacturer

Pindad

Type: Soft Point (MU-9UL); 8.25 g; $V_{12.5}$ 370 m/s

Ball (MU-9TJ); 7.45 g; $V_{12.5}$ 350 m/s

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 7.4 g; MV 360 m/s

Ball: FMJ; 8 g; MV 350 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: Lead, conical; 8 g; MV 322 m/s

Ball: FMJ; 8 g; MV 322 m/s

Ball: FMJ; 8 g; MV 434 m/s

Ball: JHP; 9.5 g; MV 312 m/s

Ball: JHP; 7.4 g; MV 410 m/s

Frangible, low toxicity: 4.1 g; MV 520 m/s

SLOVAKIA

Manufacturer

Technopol, Military and Police Group

Type: Ball: FMJ; 6.15 g; V_{25} 389 m/s

Ball: FMJ; 7.5 g; V_{25} 348 m/s

Ball: FMJ flat point; 7.5 g; V_{25} 350 m/s

Ball: Lead flat nose; 7.8 g; V_{25} 337 m/s

Ball: FMJ flat point; 8 g; V_{25} 345 m/s

Ball: FMJ; 8 g; V_{25} 341 m/s

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 mm Steyr

Synonyms:

9 × 23 mm; 9 mm Mannlicher

Armament

9 mm Steyr M1912 automatic pistol; certain Steyr-Solothurn, Neuhausen and Bergmann sub-machine guns.

Development

An Austrian service round for many years, this was introduced with the M1912 Steyr automatic pistol and subsequently used in various sub-machine guns. When the Austrian Army was integrated into the German *Wehrmacht* in 1938, most weapons were rebarrelled to accept the German standard 9 mm Parabellum round and official manufacture of the 9 mm Steyr cartridge ceased. However, sufficient weapons escaped modification to make it worth keeping the cartridge in commercial production.

Description

A rimless, straight-taper brass case, Berdan primed. The bullet is steel-jacketed, with an ogival pattern. The round is almost identical to the 9 mm Largo (Bergmann-Bayard), and can only be distinguished by the headstamps and the bullet which weighs approximately 1 g less. However, the Steyr bullet is almost always steel-jacketed, whereas the Largo bullet is the more usual gilding metal.

Specifications

Austrian service round

Round length: 33 mm

Case length: 22.86 mm

Rim diameter: 9.65 mm

Bullet diameter: 8.99 mm

Bullet weight: 7.58 g

Muzzle velocity: 360 m/s

Muzzle energy: 491 J

Abridged ballistic table: 9 mm Steyr, 7.45 g ball

Range	Velocity	Energy
0 m	375 m/s	523 J
10 m	358 m/s	476 J
25 m	337 m/s	422 J
50 m	307 m/s	350 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 7.45 g; MV 375 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 7.45 g; MV 355 m/s

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9 mm Steyr

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 mm Police

Synonyms:

9 × 18 mm Police; 9 mm Police; 9 mm Ultra

Armament

Suitably chambered Mauser, Heckler and Koch and other pistols. Not usable in the PM Makarov or similar pistols.

Development

The round appeared in Germany in the early 1970s, as a result of demands for a cartridge more powerful than the 9 mm Short but not requiring a locked breech; much the same sort of demand that produced the [9 mm Makarov](#) cartridge. As the name implies it was devised at the request of police authorities and was adopted by several German police forces, although it did not attain the popularity hoped for. The 9 mm Police cartridge was derived from the 9 × 19 mm and, apart from case length, other dimensions are the same as the more powerful round.

This round is also known as the '9 mm Ultra' in both Europe and North America and will be found so marked.

Description

The Police round uses a rimless, straight taper case of brass, Berdan primed. Although the dimensions

are nominally similar, the proportions of the rim and groove differ from the Soviet 9 × 18 mm case and the two are not interchangeable. The original bullet was cylindro-conoidal with a flat tip, but a more conventional lead-cored, steel-jacketed round-nose bullet appears to have become the accepted standard.

Specifications

Round length: 25.15 mm

Case length: 17.98 mm

Rim diameter: 9.52 mm

Bullet diameter: 8.99 mm

Bullet weight: 6.1 g

Muzzle velocity: 330 m/s

Muzzle energy: 332 J

Abridged ballistic table: 9 mm Police, 6.1 g ball

Range	Velocity	Energy
0 m	330 m/s	332 J
10 m	320 m/s	312 J
25 m	310 m/s	293 J
50 m	290 m/s	256 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: FMJ; 6.5 g; MV 315 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 6.5 g; MV 315 m/s

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9 mm Police

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.32 Smith & Wesson

Synonyms:

0.32 S&W Short; DWM202; GR930

Armament

Suitably chambered revolvers.

Development

Developed by Smith & Wesson for its Model 1 1/2 revolver introduced in 1878. This round soon became popular and suitable revolvers have been made by virtually every manufacturer throughout the world. As a home or personal defence cartridge it is only marginally adequate by modern standards and is unsuitable for police or military applications.

Description

A rimmed, straight cartridge, Boxer primed, with a variety of lead or jacketed bullets. Shot-filled cartridges can also be encountered in this calibre.

Specifications

Round length: 23.4 mm

Case length: 15.5 mm

Rim diameter: 9.53 mm
Bullet diameter: 7.92 mm
Bullet weight: 5.5 g
Muzzle velocity: 215 m/s
Muzzle energy: 127 J

AUSTRIA

Manufacturer

Hirtenberger AG
Type: Ball: Lead, ogival; 5.7 g; MV 215 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: Lead, ogival; 5.5 g; MV 220 m/s

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company Inc
Type: Ball: Lead, ogival; 5.7 g; MV 207 m/s

Manufacturer

Winchester-Olin
Type: Ball: Lead, ogival; 5.5 g; MV 207 m/s

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0.32 Smith & Wesson

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

6.5 × 54 mm

Synonyms:

6.5 mm Mannlicher-Schoenauer; 6.5 mm Greek Mannlicher; DWM 477; Roth 632

Armament

Greek service M1903 Mannlicher rifle and carbine, M1914 carbine, M1924 Hotchkiss machine gun; Schwarzlose machine gun; and suitably chambered sporting rifles.

Development

Developed by Steyr, probably with the assistance of Roth, and first used with the M1903 Greek army rifle. Mannlicher then made sporting rifles in the same calibre and the round became quite popular both in Europe and the USA, having considerable killing power against large game. There are still a few surplus military rifles available in this caliber, although it is rarely encountered in active duty forces.

Description

A rimless, brass, bottlenecked case with a round-nosed, lead-cored, cupro-nickel jacketed bullet. Sporting ammunition may well have soft point or other types of bullet.

Specifications

Round length: 77.1 mm

Case length: 53.7 mm
Rim diameter: 11.46 mm
Bullet diameter: 6.65 mm
Bullet weight: 10.37 g
Muzzle velocity: 672 m/s
Muzzle energy: 2,337 J

Abridged ballistic table: 6.5 × 54 mm, 10.37 g ball

Range	Velocity	Energy
0 m	672 m/s	2,337 J
100 m	591 m/s	1,807 J
200 m	520 m/s	1,400 J
300 m	457 m/s	1,104 J

AUSTRIA

Manufacturer

Hirtenberger AG

Type: Ball: JSP; 9.1 g; MV 665 m/s

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot

Type: Ball: JSP; 8.5 g; MV 735 m/s

Ball: JSP; 10.3 g; MV 672 m/s

UPDATED



6.5 × 54 mm Mannlicher-Schoenauer

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

25 × 137 mm

Synonyms:

[25 mm Oerlikon KBA](#); 25 mm GAU-12/U; 25 mm Bushmaster

Armament

Oerlikon KBA; GAU-12/U and [M242](#); Mauser Model E; Rheinmetall Rh205; Giat M811; Aden 25.

Development

In the early 1960s the US Army's Bushmaster MICV cannon project resulted in, among other things, the Thompson-Ramo-Wooldridge TRW-6425 cannon, designed by the late Eugene Stoner of Armalite rifle fame. When Bushmaster was shelved, the European rights to the design were acquired by Oerlikon-Bührle (now [Oerlikon Contraves AG](#)). The company made some improvements and produced it as the Model KBA, developing a range of ammunition to go with it. Since then the utility of this calibre has been generally recognised and the Bushmaster project was eventually revived, the Hughes Chain Gun and the GAU-12 Gatling gun were developed and the British Aden aircraft gun adapted to this calibre. Other designers have also developed weapons for this round.

Description

The case is rimless, bottlenecked and of lacquered steel. It is instantly identifiable by the belt link locating groove just behind the case shoulder. This is expanded by internal pressure when fired, but it

leaves an easily discerned mark around the case. The original projectiles were of typical Oerlikon pattern but many new types have been developed subsequently by Oerlikon Contraves Pyrotec AG, as well as in the USA and other countries.

Specifications

Round length: 223 mm

Case length: 137 mm

Rim diameter: 38 mm

Bourellet diameter: 24.99 mm

Projectile weight: 180 g

Muzzle velocity: 1,100 m/s

Muzzle energy: 108.9 kJ

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: APFSDS-T M935: See following entry

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel thin-walled shell, filled Hexal; nose impact fuze MR251 giving self-destruction between 4.5 and 14 s; 183 g; MV 1,100 m/s

HE-I-T: Steel thin-walled shell with tracer socket formed on base, filled Hexal, red tracer; nose impact fuze providing self-destruction; 183 g; MV 1,100 m/s

SAP-HE-I: Pointed steel shell with ballistic cap; shell body filled Hexal, ballistic cap filled incendiary composition; base delay fuze; 185 g; MV 1,100 m/s

SAP-HE-I-T: As SAP-HE-I but with a tracer socket on the rear of the base fuze; 190 g; MV 1,100 m/s

AP-HC: Tungsten core in steel body with alloy ballistic cap; 180 g; MV 1,100 m/s

AP-HC-T: As AP-HC but with red tracer; 178 g; Mv 1,100 m/s

APDS: Tungsten carbide subprojectile in alloy/plastic sabot; 180 g; MV 1,100 m/s

APDS-T: As APDS but with red tracer; 183 g; Mv 1,100 m/s

APFSDS-T: No information available

TP: Steel shell body, empty; dummy fuze; 180 g; MV 1,100 m/s

TP-T: Steel two-section shell body, front empty, rear carrying red tracer; 180 g; MV 1,100 m/s

TP OXER: For training in reduced areas

GERMANY

Manufacturer

Diehl GmbH

Type: HE-I: Self-destruction 3.7 to 5 seconds; 195 g; MV 1,100 m/s

SAP-HE: Self-destruction 3.7 to 5 seconds; 195 g; MV 1,100 m/s

TP-T: 195 g; MV 1,100 m/s

NETHERLANDS

Manufacturer

Eurometaal NV

Type: AP-I-T: Steel pointed projectile with alloy ballistic cap containing incendiary mixture, tail tracer; 185 g; MV 1,100 m/s

TP-T: Inert projectile representing AP-I-T, with tracer; 180 g; MV 1,100 m/s

APDS-T: Tungsten penetrator in plastic sabot

NORWAY

Manufacturer

[Nammo](#) Raufoss Technology A/S

Type: Multipurpose MPT-SD Mark 2: Steel body with high-explosive and incendiary fillings, the incendiary extending into the nose cap. Dark ignition red tracer to 2,500 m in rear, with heat relay to effect self-destruction after 5.3 seconds flight. 183.5 g; MV 1,089 m/s

Multipurpose M84A1: Similar to MPT-SD but without tracer; 183.5 g; MV 1,089 m/s

Multipurpose MPT-SD Low Drag: Similar to MPT-SD Mark 2 but using a new low-drag projectile body which improves terminal velocity at 2,000 m by 54 per cent, reduces the time of flight to 2,000 m by 25 per cent and gives increased terminal effects

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

All Oerlikon rounds are NATO qualified in accordance with STANAG 4173

Type: HE-I-T: Deep drawn steel shell with soft iron driving band, filled 27 g Hexal P30, base tracer; fuze KZB335 impact fuze providing self-destruction after 5 to 11 seconds; 180 g; MV 1,100 m/s

SAP-HE-I-T: Hardened steel shell body with alloy ballistic cap, filled 11 g Hexal P30; base fuze BZB336 providing 200 ms delay and self-destruction after 5 to 11 seconds flight; 180 g; MV 1,100 m/s

APDS-T: Tungsten alloy penetrator core with light alloy ballistic cap, in plastic and alloy sabot, base tracer burning >1.2 seconds; 150 g; MV 1,335 m/s; penetration 30 mm at 60° at 1,000 m, 25 mm at 60° at 2,000 m

FAPDS-T: Generally similar to the APDS projectile but with a penetrator of frangible metal, so that after penetration of the target it disintegrates into a cloud of fragments to cause widespread damage; 150 g; MV 1,310 m/s. Purchased by Canada and qualified by the Netherlands for use in the [M242](#) Chain Gun and Oerlikon-Contraves KBA cannon

APFSDS-T: Fin-stabilised discarding sabot; based on APDS technology but with a fin-stabilising tail unit attached to the subprojectile. Performance is maintained over a 40 per cent range increase over the APDS projectile and it is estimated that this design has a greater growth potential than APDS in the long term. 130 g; MV 1,405 m/s; penetration 36 mm at 60° at 1,000 m; 31 mm at 60° at 2,000 m. Purchased by Canada and qualified by the Netherlands for use in the [M242](#) Chain Gun and Oerlikon-Contraves KBA cannon

TP-T: The same shell body as the HE-I-T shell but filled inert; dummy fuze; tracer in rear, burns >3 seconds; 180 g; MV 1,100 m/s

TPDS-T: A target practice discarding sabot shot with tracer; functions in the same manner as FAPDS-T but uses simpler materials in its construction; 95 g; Mv 1,450 m/s

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems, Defense Systems

Type: M792 HEI-T/SD: Steel thin-walled projectile loaded 30.2 g HE and with red tracer; fuzed PD M758 with self-destruct; projectile, 184 g; MV 1,100 m/s

M791 APDS-T: Tungsten alloy penetrator 102 g in alloy/plastic discarding sabot with red tracer; projectile, 134 g; MV 1,345 m/s. Over 6 million rounds produced by Alliant.

Frangible APDS-T: Identical to M791 save for frangible core optimised for defeat of aircraft targets; 135 g; trace visible for 2.2 seconds; MV 1,330 m/s

APFSDS-T FANG: FANG stands for Fin-stabilised Armor-piercing Next Generation and is a tungsten penetrator round designed to meet future armour threats. Armour penetration is given as 31 mm of armour set at 60° at 2,000 m. Time of flight to 2,000 m is 1.6 seconds with MV of 1,410 m/s. Cartridge weight 450 g. Tracer burns for 1.6 seconds.

M793 TP-T: Hollow steel shell with alloy nose cap and rear tracer, empty, ballistically matched to M792 and Mk210 HEI-T rounds; projectile, 184 g; MV 1,100 m/s

M910 TPDS-T: Inert subprojectile with tracer, in alloy/plastic discarding sabot. Training round ballistically matched to M791 and APDS-T Frangible rounds to a range of 8,000 m. Trace visible for 4 seconds. Time of flight to 2,000 m 1.8 seconds; remaining velocity 785 m/s; 95 g; MV (nominal) 1,515 m/s.

TP-T M793: Hollow steel shell with alloy nose cap and rear tracer, empty, ballistically matched to M792; 184 g; MV 1,100 m/s

PGU-23 TP: Developed as a low-cost training substitute for the PGU-25 HEI round. MV 1,100 m/s.

PGU-25 HEI: High explosive round for use in the AV-8 Harrier; MV 1,100 m/s. Over 1.4 million rounds produced by Alliant.

TPDS-T M910: Training round for the APFSDS-T M919. Uses similar construction but with a steel subprojectile and tracer; 95 g; MV 1,540 m/s

PGU-32/U SAPHEI: Designed for use in both ground and air applications against lightly armoured targets. Trace visible for 5.5 seconds; MV 1,100 m/s. Contract in progress for 1.1 million rounds

TP Frangible PGU-33/U: Solid projectile made of Partially Stabilised Zirconia (PSZ) ceramic material which shatters on impact with the target. For practice purposes; ballistically matched to the PGU-20/U AP projectile

PGU-38/U HEI: Developed to extend the standoff range of the AC-130 aircraft. Projectile weight 184 g. MV 1,100 m/s. Over 1.4 million produced by Alliant.

Mk 210 HEI-T: Developed for the US Navy for use in Mk 38 weapon system. Trace visible for 6 seconds. MV 1,100 m/s.

Manufacturer

General Dynamics, Ordnance and Tactical Systems

APFSDS-T: Identical to the M919 except that the long rod penetrator is tungsten carbide rather than depleted uranium. Developed for export; 138 g; MV 1,420 m/s

APDS-T M791: 102 g tungsten core in alloy/plastic discarding sabot with red tracer; 132 g; MV 1,345 m/s

Type: HEI-T M792: Steel thin-walled projectile loaded 30.2 g HE and with red tracer; fuzed PD M758 with self-destruct between 6.2 and 19 seconds; 184 g; MV 1,100 m/s

TP-T M793: Hollow steel shell with alloy nose cap and trace. Inert. Ballistically matched to the M792; 184 g; MV 1,100 m/s

Dummy M794: Totally inert cartridge used for training and testing

TPDS-T M910: Training practice round for the M919. Similar construction, but with steel subprojectile; 95 g; MV 1,540 m/s

TPDS-T M910E1: Developmental replacement for the M910

AP-I PGU-20/U: 150 g depleted uranium subprojectile in steel body with thin metal ballistic cap; 215 g; MV 1,000 m/s. Ballistically matched to the M919

TP PGU-23/U: Similar to M793 but without tracer. For US Navy and Marine Corps

HE-I PGU-25/U: Similar to M792 but without tracer. For US Navy and Marine Corps

SAPHE-I-T PGU-32/U: Combined high-explosive and armour-piercing capability against light armoured vehicles. For US Navy and Marine Corps

TPF-T PGU-33/U: Frangible training round that does not ricochet upon impact with the target, but breaks up into small fragments

APFSDS-T M919: A 98 g depleted uranium long rod penetrator, fin-stabilised, carried in an alloy/plastic sabot. Rear of fin unit bored for tracer. 132 g; MV 1,390 m/s. Time of flight to 2,000 m 1.56 seconds; remaining velocity 1,149 m/s

UPDATED



Cutaway of the Oerlikon Contraves Pyrotec 25 × 137 mm FAPDS-T round as produced for Canadian Forces



Giat Industries 25 × 137 mm rounds for M811 cannon



NWM range of 25 × 137 mm cannon ammunition



Cutaway of the Oerlikon Contraves Pyrotec 25 × 137 mm APFSDS-T round as produced for the Canadian Forces



Oerlikon Contraves Pyrotec AG 25 × 137 mm ammunition: (left to right) TP-T; TPDS-T; HE-I-T; SAP-HE-I-T; FAPDS-T; APDS-T; APFSDS-T



PRIMEX Technologies 25 mm ammunition, from left: M793 TP-T; M792 HEI-T; M791 APDS-T; M910 TPDS-T; M919 APFSDS-T

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 110 mm USN

Synonyms:

20 mm US Navy Mk 100

Armament

US Navy Mk 11 and 12 guns; Mk 100 gun; Phalanx Close-In Weapon System (CIWS).

Development

This round was developed in the 1950s by the US Navy, together with the Mk 11 and 12 guns, for aircraft use. The Mk 11 was a two-barrelled revolver gun with a rate of fire of 4,200 rds/min and entered service in the late 1950s. The Mk 12 was basically an improved Hispano-Suiza with a rate of 1,000 rds/min. Both guns found their way to other countries in US supplied aircraft.

Description

The rimless, bottlenecked case is more or less an extended version of the 20 × 102 mm case; it carries a more powerful IMR 7013, WC 870 or WC 872 propelling charge and is electrically primed. Projectiles are conventional and weigh about 110 g. Note that this round is not interchangeable with the 20 × 110 mm HS404 round or the 20 × 110RB Oerlikon S round.

Specifications

Round length: 185 mm
Case length: 109.5 mm
Rim diameter: 20.5 mm
Bourrelet diameter: 19.9 mm
Projectile weight: 110 g
Muzzle velocity: approx 1,030 m/s
Muzzle energy: 56.3 kJ

Equivalent rounds

BELGIUM

Manufacturer

FN HERSTAL SA

Type: AP-I FN144: projectile 101 g; MV 1,030 m/s

HE-I FN143A1: Shell impact fuze; 101 g; MV 1,030 m/s

HE-I-T FN142A1: Shell with tracer self-destruction; impact fuze; 101 g; MV 1,030 m/s

TP FN140: Shell, inert; 99 g; MV 1,030 m/s

TP-T FN141: Shell, inert, with tracer; 99 g; Mv 1,030 m/s

FRANCE

Manufacturer

Giat Industries

Type: AP-I: An unusual compound projectile consisting of a base section which is a short, pointed, armour-piercing, steel projectile and a forward ogive section which is hollow, filled with incendiary material and sits on the tip of the base section. The two sections are then connected together by a thin steel sleeve which is pressed into a groove on the base section and into the ogive at the shoulder. A Tombak driving band is pressed into the base. 110 g; Mv 1,012 m/s

HE-I: Steel shell, filled Hexal; fuzed MR214 nose impact fuze; 110 g; MV 1,012 m/s

TP: Steel shell, empty; dummy fuze; 110 g; Mv 1,012 m/s

TP-T: Steel two-section shell, front empty, rear filled tracer; dummy fuze; 110 g; Mv 1,012 m/s

SINGAPORE

Manufacturer

Chartered Industries of [Singapore](#) (CIS)

Type: HE-I: Steel shell, loaded Hexal; nose impact fuze; 110 g; MV 1,012 m/s

AP-I: Solid steel shot with ballistic cap, filled incendiary mixture and base tracer; 100 g; MV 1,012 m/s

TP: Inert projectile representing HE-I; 110 g; MV 1,012 m/s

TP-T: As for TP but with base tracer; 100 g; MV 1,012 m/s

UNITED STATES OF AMERICA

Manufacturer

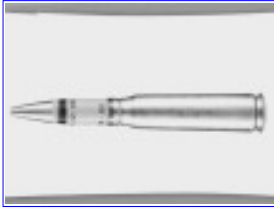
Government contractors

Type: Ball-TP M55A1: Steel inert projectile; dummy fuze

HE-I M56A3: Steel shell loaded with RDX and incendiary composition; Point Detonating fuze, M505 series; 101 g

AP-I [M53](#): Steel pointed shell with alloy ballistic cap and filling of incendiary material

UPDATED



20 × 110 mm USN

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Charles Q Cutshaw

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 110RB mm

Synonyms:

[20 mm Oerlikon S](#)

Armament

Oerlikon Mk 4 (US Navy); Oerlikon Mk 2, 3 and 4 (UK); Polsten (UK).

Development

This was developed by Oerlikon in the 1930s and subsequently adopted by the UK and USA during the Second World War. Several other countries took Oerlikon guns of this chambering into service, and ammunition of this pattern is still widely manufactured.

Description

The bottlenecked cartridge case uses a rebated rim, the rim being very obviously smaller than the head of the case. Cases of steel or brass may be found, although the former is not common. Ignition is by a conventional percussion cap pressed into the base of the case. Projectiles vary from solid shot to explosive and incendiary projectiles with impact fuzes.

Specifications

Round length: 181 mm

Case length: 109.8 mm
Rim diameter: 22.2 mm
Bourellet diameter: 19.8 mm
Projectile weight: 122 g
Muzzle velocity: 830 m/s
Muzzle energy: 42 kJ

Equivalent rounds

BELGIUM

Manufacturer

FN HERSTAL SA

Type: HE-I FN60: Steel shell, forward end filled TNT, rear of cavity filled incendiary mixture; compression-ignition, strikerless nose impact fuze; 122 g; Mv 830 m/s

HE-I-T FN62: Steel two-part shell, front section filled HE-Incendiary mixture, rear filled tracer; strikerless nose impact fuze; 120 g; MV 830 m/s

HE-I-T-SD FN71: As for HE-I-T FN62 but with a heat relay between tracer and explosive to provide self-destruction; 122 g; MV 830 m/s

SAP-I-T FN74: Pointed steel shell, filled incendiary composition and red tracer; 122 g; MV 830 m/s

TP FN65A2: HE-I shell body, filled inert; 122 g; MV 830 m/s

TP-T FN63A1: HE-I-T shell body, front empty, rear filled tracer; dummy fuze; 120 g; Mv 830 m/s

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: HE-I M74E1: Steel shell filled Hexolite; nose impact fuze; 100 g; MV 875 m/s

HE-I-T M72E1: As for HE-I but two-compartment shell, rear filled red tracer with heat relay for self-destruction; nose impact fuze; 101 g; MV 875 m/s

TP: Body of HE-I shell, empty; dummy fuze; 123 g; Mv 810 m/s

TP-T: Body of HE-I-T shell with tracer; dummy fuze; 123 g; MV 810 m/s

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel shell filled 11.5 g Hexal 70/30; impact fuze; 122 g; MV 845 m/s

HE-I: As above but fuzed MR21 impact fuze

HE-I: As above but fuzed MR204B impact fuze with self-destruction between 2.5 - 9 seconds

HE-I-T: Steel two-section shell, front filled 4.7 g Hexal 70/30, rear filled red tracer; fuzed 16/18 Mle 61 impact fuze; 122 g; MV 845 m/s

HE-I-T: As above but fuzed MR21 impact fuze

HE-I-T: As above but fuzed MR204B impact fuze with self-destruction between 2.5 - 9 seconds

AP-T: Steel pointed shell with rear cavity, part filled inert, remainder filled red tracer; 122 g; MV 845 m/s

TP: Steel shell, filled inert; plug representing Fuze MR21; 122 g; MV 845 m/s

TP: Steel shell, filled inert; plug representing Fuze MR204B; 122 g; MV 845 m/s

TP-T: Steel two-section shell, front filled inert, rear section filled red tracer; plug representing Fuze MR21; 122 g; MV 845 m/s

TP-T: As above but with plug representing Fuze MR204B; 122 g; MV 845 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-I: Steel shell, loaded 11.4 g Hexal; impact fuze 16/18 Mle 61; 122 g; MV 845 m/s

HE-I-T: Steel two-section shell, forward section filled 4.7 g Hexal, rear section red tracer; impact fuze 16/18 Mle 61; 123 g; MV 845 m/s

TP: Body of HE-I shell, empty; dummy fuze; 120 g; MV 845 m/s

TP-T: Body of HE-I-T shell with tracer; dummy fuze; 123 g; MV 845 m/s

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: HE: Steel shell, loaded Hexal or TNT; nose impact fuze Mk 26; 120 g; MV 845 m/s

HE-I: As for HE but filled one-third incendiary, two-thirds HE

HE-T: Steel two-section shell, forward section filled HE over incendiary mixture, rear section red tracer; nose impact fuze Mk 26; 122 g; MV 845 m/s

BL: Target practice round; HE shell body filled inert; dummy fuze; 120 g; MV 845 m/s

SPAIN

Manufacturer

EXPAL SA

Type: HE-T: Steel shell, filled RDX with red tracer 3 seconds nominal; fuzed Mk 26 nose impact fuze; 122 g; MV 845 m/s

HE-I: Steel shell, filled Hexolite; nose impact fuze Mk 26; 122 g; MV 845 m/s

HE-I-T: As for HE-I but two-section shell with rear section filled red tracer burning 3 seconds; nose impact fuze Mk 26; 122 g; MV 845 m/s

AP-T: Pointed projectile, filled RDX, red tracer burning 3 seconds; base fuzed; 122 g; MV 845 m/s

TP: HE shell body, filled inert; inert fuze; 122 g; MV 845 m/s

TP-T: HE-I-T shell body with front compartment filled inert rear filled red tracer burning 3 seconds; inert fuze; 122 g; MV 845 m/s

UNITED STATES OF AMERICA

Manufacturer

Government plants

Type: HE: Steel shell filled Pentolite or Tetryl; nose impact fuze Mk 26; 125 g; MV 830 m/s

HE-I Mk 3: Steel shell, filled Pentolite and incendiary composition; nose impact fuze Mk 26; 125 g; MV 830 m/s

HE-I-T Mk 4: As for HE-I but with tracer in shell base and reduced filling of high explosive; 123 g; MV 830 m/s

AP-T Mk 9: Solid steel shot, bored at rear for tracer. 120 g; MV 840 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE: Steel shell, filled 12.1 g TNT or RDX/Aluminium; nose impact fuze; 122 g; MV 845 m/s

HE-T [M62](#): Steel two-section shell, front filled 6.1 g TNT or RDX/Aluminium, rear filled red tracer with heat relay for self-destruction after about 3.5 seconds; nose impact fuze; 122 g; MV 845 m/s

HE-I: As for HE but filled 12.1 g RDX/Aluminium; nose impact fuze; 122 g; MV 845 m/s

HE-I-T: As for HE-T but filled 6.1 g RDX/Aluminium only; nose impact fuze; 122 g; MV 845 m/s

AP: Pointed piercing shot with empty balance cavity; 142 g; MV 844 m/s

AP-T M63: A pointed piercing shot with tracer compartment at the rear; red trace, burning 3.5 seconds; 142 g; MV 844 m/s; penetration 25 mm armour plate at 100 m

AP-I M63: A pointed piercing shot with a rear compartment filled incendiary composition; unfuzed; 142 g; MV 844 m/s; penetration 25 mm of armour plate at 100 m

AP-I-T M63: Similar to the AP-I M63 but the rear compartment is partly filled with incendiary composition and the remainder with a 3.5 seconds tracer; 142 g; MV 844 m/s; penetration 25 mm of armour plate at 100 m

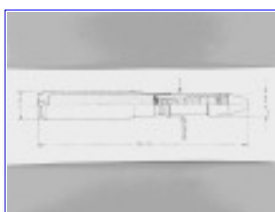
TP: Body of the HE shell, filled inert; dummy fuze; 122 g; MV 845 m/s

TP-T [M62](#): Body of the HE-T [M62](#) but with the front compartment filled inert; inert fuze; 122 g; MV 845 m/s

UPDATED



Giat Industries 20 × 110RB rounds



Dimensioned drawing of Expal 20 × 110RB mm HE-I-T round showing typical two-section shell construction

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.38 Smith & Wesson

Synonyms:

0.38 Super Police; 0.38 S&W Short; DWM 203; GR 932

Armament

Suitably chambered revolvers.

Development

This cartridge was introduced by Smith & Wesson in 1876 to accompany its first 0.38 revolver, the Single-Action `Baby Russian'. It was immediately popular and went on to become perhaps the most common revolver cartridge in the world. Every manufacturer has made revolvers to suit, and every ammunition manufacturer has, at some time or another, produced this cartridge.

Description

A rimmed, brass or plated, straight case, Berdan or Boxer primed. Various bullets have been used, the most usual being ogival or round-nosed lead, round-nose full metal jacket, or wadcutter. Shot cartridges and spherical ball have been known in the past.

Specifications

Round length: 30.5 mm

Case length: 19.81 mm
Rim diameter: 11 mm
Bullet diameter: 9.12 mm
Bullet weight: 9.72 g
Muzzle velocity: 325 m/s
Muzzle energy: 513 J

BELGIUM

Manufacturer

Browning SA
Type: Ball: Lead, RN; 9.76 g; MV 209 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd
Type: Ball: Lead, RN; 9.5 g; MV 230 m/s

FRANCE

Manufacturer

SFM Défense
Type: Ball: Lead, RN; 9.5 g; MV 220 m/s
Ball: FMJ; 9.5 g; MV 220 m/s

[ISRAEL](#)

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd
Type: Ball: Lead, SWC; 9.7 g; MV 213 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: Lead, RN; 9.4 g; MV 220 m/s
Ball: FMJ; 9.4 g; MV 230 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball: Lead, RN; 9.5 g; MV 213 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#), a division of Denel (Pty) Ltd

Type: FMJ; 9.4 g; V₅ 239 m/s

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company Inc

Type: Ball: Lead, RN; 9.46 g; MV 209 m/s

Manufacturer

Winchester-Olin

Type: Ball: Lead, RN; 9.4 g; MV 209 m/s

UPDATED



0.38 Smith & Wesson

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm: Smoke, WP-T, M416

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

This 105 mm tank gun round was standardised in 1964 and is intended to produce spotting, signalling or screening smoke. There are also some secondary incendiary effects against suitable flammable targets.

It is no longer in service with the US Army.

Description

The 105 mm Smoke WP-T [M416](#) is a fixed round with the projectile crimped into a rimmed cartridge case. Two gilding metal drive bands encircle the projectile body.

The M949 projectile has thin steel walls and a relatively short ogive similar to that used on the HEP-T M393 series. The base is flat and houses an M534 series base detonating fuze, together with a protruding housing containing an M12 tracer which burns for a minimum of 6 seconds after firing. The tracer is ignited directly by the [M86](#) primer tube which extends the full length of the cartridge case. The projectile contains a centrally oriented [M48](#) burster assembly containing Composition B. The burster casing is machined with a six-bladed impeller extending into the filling which is 2.72 kg of White Phosphorus (WP). The impeller is used to increase in-flight stability at firing temperatures above +38°C.

The cartridge case may be either a 70:30 brass M150 or a steel M150B1. Both types are fitted with an

[M86](#) electrical primer and are filled with a nominal 2.68 kg of M1 single-base propellant in a cloth bag. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case.

The muzzle velocity of the 105 mm Smoke WP-T [M416](#) is 731.5 m/s. Maximum range is 9,150 m.

Specifications

Weights:

complete round - 20.64 kg

projectile - approx 11.25 kg

filling - 2.72 kg WP

propellant, nominal - 2.68 kg M1

Lengths:

complete round - 939.8 mm

cartridge case - 617 mm

Muzzle velocity: 731.5 m/s

Max range: 9,150 m

Authorised fuzes

BD M534

Equivalent rounds

BELGIUM

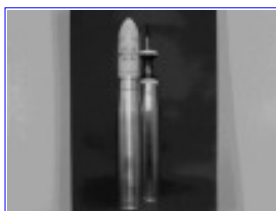
Manufacturer

MECAR SA

Type: SMK(WP)-T [M416](#)

Description: Standard US specifications. Supplied to Middle East

UPDATED



105 mm SMK(WP)-T [M416](#) as manufactured by MECAR SA of Belgium with 105 mm APFSDS-T, also produced by MECAR, in background

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm: HEP-T M393 series

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

There are two rounds in the 105 mm HEP-T M393 series, the M393A1 standardised in 1965, and the M393A2. They differ mainly in the type of base detonating fuze fitted, the M393A1 has the M534 while the M393A2 has the [M578](#). The M393A1 also has slightly less explosive filling than the M393A2. Both rounds may be regarded as general purpose anti-armour and high-explosive munitions. A variant of the M393A2 has been chosen as one of the rounds for the 105 mm armed Mobile Gun System (MGS) variant of the US Interim Armoured Vehicle (IAV). While based on the M393A2 it will incorporate components which meet current fuze and insensitive munitions requirements. A variety of contractor-developed solutions are possible, however, the US Army announced in Q1 of 2001 that a metal cartridge case, granular propellant, electrically initiated primer, high explosive projectile and impact initiating fuze would be used to meet the ammunition requirements for the MGS. To partially replace the aged stockpile of M393A2 rounds the US Army proposed spending US\$6 million in FY02 for 1,000 rounds of the modified ammunition, with delivery beginning in March 2003.

Description

The 105 mm HEP-T M393 series rounds are fixed, with the projectile rigidly secured to the brass or

steel cartridge case by two crimping rings.

The projectiles of the M393A1 and M393A2 have a relatively short ogive and are encircled by two copper drive bands. The projectiles have thin-walled steel bodies filled with Composition A-3 (RDX/Wax 91/9). The M393A1 contains 2.86 kg and the M393A2 2.994 kg. On impact with a target the explosive filling has time to spread over the surface of the target before the base detonating fuze functions. The resultant overpressure causes shockwaves to form throughout the target, close to the detonation, causing internal spalling and damage; there are also secondary fragmentation effects. The base detonating fuze on the M393A1 is the M534 while the M393A2 has the [M578](#). The projectile base also has a protruding housing for an M12 tracer which is directly ignited by the flash tube of the [M86](#) primer as it extends the full length of the cartridge case. The M12 tracer burns for a minimum of 2.5 seconds.

The cartridge case used with the M393 series may be either of the 70:30 brass M150 or steel M150B1, both having an [M86](#) electrical primer in the base. The propellant is a nominal 2.68 kg of single-base M1 packed in a bag. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case.

The muzzle velocity for the 105 mm HEP-T M393A1 and M393A2 is 731.5 m/s. Maximum range is 9,510 m.

The training round used as the equivalent for the 105 mm HEP-T M393 series is the Cartridge, 105 mm: TP-T M393A1 (not to be confused with the operational round). The TP-T M393A1 projectile has an inert filling but retains the M12 tracer; the steel M150B1 cartridge case is used.

A similar and more widely used training round is the Cartridge, 105 mm: TP-T M467. The inert projectile on the TP-T M467 has thicker steel walls than the TP-T M393A1, with a light alloy nose section threaded to the top. Both the TP-T M393A1 and M467 are ballistically matched to the HEP-T M393 series.

MECAR SA of Belgium have developed their M1053 HESH-TP-T which is ballistically matched to the M393A2 HEP-T. This round was specifically developed for firing from [Leopard 1 MBT](#) tank guns and was the subject of a contract award worth \$4 million, involving 10,000 rounds, placed during early 1999. The customer, a member of NATO, was not specified.

A drill round used to train loaders in handling the M393 series of HEP-T rounds is the Cartridge, 105 mm: Dummy, M457. This round cannot be fired and has a steel projectile with a steel weight assembled to the rear of the projectile to simulate the weight and handling characteristics of the HEP-T M393 series exactly. The M457 dummy round may also be used to simulate other 105 mm tank rounds.

Specifications

Weights:

complete round - approx 21.2 kg

projectile - approx 11.25 kg

explosive - M393A1 2.86 kg Comp A-3; M393A2 2.994 kg Comp A-3

propellant, nominal - 2.68 kg M1

Lengths:

complete round - 939.8 mm

projectile with tracer - 498 mm

cartridge case - 617 mm

Muzzle velocity: 731.5 m/s

Max range: 9,510 m

Authorised fuzes

M393A1, BD M534; M393A2, BD [M578](#)

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: HESH-T M393A2

Description: Standard US specifications for M393A2. Brass or steel cases available. Supplied to Belgian Army. HESH-TP-T M467 also produced

Manufacturer

MECAR SA

Type: HESH-T M1053

Description: Ballistically matched to HEP-T M393A2. In production

FRANCE

Manufacturer

Giat Industries

Type: HESH-T NR 133

Description: Equivalent to M393A2. Originally produced by PRB of Belgium. Also known as FSN 1315-C507. Standard US specifications. No longer in series production by Giat Industries

GERMANY

Manufacturer

Rheinmetall DeTec

Type: HESH DM 512

Description: Generally similar to M393 series but round weight is 20.9 kg and projectile weight 11.3 kg. Muzzle velocity is 737 m/s and chamber pressure 1,800 bar. Training round is HESH-P DM 78

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: TP-T M467

Description: Standard US specifications

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: HESH-T M156

Description: Identical to HEP-T M393 in dimensions and ballistic performance but with changes to suit local production methods. Propellant is 2.8 kg of 105-7T-M6 ignited by a M433/1 electrical primer. The base detonating fuze is a L-56. The tracer element burns for a minimum of 6 seconds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

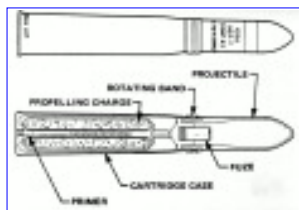
Type: HEP-T

Description: Standard US specifications

UPDATED



Cartridge, 105 mm: TP-T M467 - the training round for the Cartridge, 105 mm: HEP-T M393 series



Outline and cross-section drawings of Cartridge, 105 mm: HEP-T M393A2 (2000)

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm: HEAT-T M456 series

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

There are four service rounds in the 105 mm HEAT-T M456 series. The first three (the M456, M456E1 and M456A1) differ mainly in the type of cartridge case barrel wear reduction liner (the M456 did not have one) while the M456A2, standardised in 1980, differs mainly in having a different method of fixing the nose impact switch assembly so that the warhead will detonate on graze or shoulder impact on any part of the projectile body. The spike assembly for the M456A2 is produced by the AAI Corporation.

At one time there was a programme to replace the M456 series with a new 105 mm HEAT-MP-T round known as the XM815. The projectile involved used folding fins and a PIBD XM763 fuze system. This programme was subsequently cancelled.

Description

All rounds in the 105 mm HEAT-T M456 series are fixed, with the projectile assemblies rigidly secured to the brass or steel cartridge cases by a series of crimping indentations.

The projectiles are steel bodied and all have plastic obturators and seals. The front of the projectile is occupied by a threaded standoff spike assembly (weight 2.13 kg) with an impact switch assembly at the

tip. The sensor switch assembly is connected internally to an M509A1 base detonating fuze. As the assembly impacts on a target, a piezoelectric element generates a voltage enabling the fuze to function and ignite 970 g of Composition B formed into a shaped charge behind a conical copper liner. The rear of the projectile is connected to a fin and boom assembly; the fin is threaded to receive a replaceable [M13](#) tracer which burns for a minimum of 2.5 seconds after firing.

The M148A1B1 cartridge case contains a nominal 5.5 kg of loosely packed [M30](#) triple-base propellant. An [M83](#) electrical primer is fitted to the base, connected to a flash tube extending almost to the tail of the projectile assembly. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case. A barrel wear reducing titanium dioxide liner is assembled to the interior wall of the M456E1 cartridge case; this is not present on the M456. The M456A1 and M456A2 liner is covered by a high-temperature wax topped with a mylar barrier.

The muzzle velocity for all the rounds in the 105 mm HEAT-T M456 series is 1,173.5 m/s. Maximum possible range is 8,975 m, although maximum combat ranges are limited to a maximum of 1,500 m. It has been estimated that the M456A2 warhead can penetrate up to 432 mm of armour or 175 mm set at an angle of 60°. At operational ranges it can penetrate a NATO single heavy target. On detonation, viable anti-personnel fragments are scattered over a radius of at least 15 m.

The training round for the 105 mm HEAT-T M456 series is the Cartridge, 105 mm: TP-T, M490. This has the same ballistic characteristics, weight and dimensions as the 105 mm M456 series but the steel-bodied, inert projectile assembly contains only 38 g of Composition A5 ignited by a PIBD M549 fuze for target marking purposes; there is an [M13](#) tracer in the fin assembly. The standoff spike is solid aluminium. Cartridge cases may be of the M148A1 or M148A1B1 pattern. A complete M490 round weighs 20.4 kg and length is 990.6 mm. Maximum range is 8,207 m. The TP-T M490 is produced in the USA by General Dynamics, Ordnance and Tactical Systems (GD-OTS) and Lockheed Martin.

Also intended for the training role is the Cartridge, 105 mm: TP-T M490A1. This differs from the M490 in several respects, not the least of which is that the M490A1 projectile lacks a tail and boom assembly. The projectile is all-steel and contains an [M13](#) tracer in the projectile base. The cartridge case may be of the M14A or M14B type, containing [M14](#) propellant ignited by an M80A electrical primer. The complete round is 1.164 m long and weighs 20.78 kg.

Specifications

Weights:

complete round - 22.22 kg

projectile - approx 10.3 kg

explosive - 970 g Comp B

propellant, nominal - 5.5 kg [M30](#)

Lengths:

complete round - 1.058 m

cartridge case - 617 mm

Muzzle velocity: 1,173.5 m/s

Max range: 8,975 m

Operating temperature range: -40 to +52°

Storage temperature range: -65 to +63°

Authorised fuzes

PIBD M509A1 or M509A2

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: HEAT-MP-T M1061

Description: Enhanced equivalent to M456A2. Round weight 22 kg and round length 995 mm. Explosive used is 970 g of Composition B acting on a copper liner. Muzzle velocity 1,173 m/s. Stated to have performance characteristics of M456A2 but fitted with an electronic PIBD fuze with a graze function and two independent in-bore safeties. Sales have been made to an unspecified Middle East nation. A training version, the M490A1 HEAT-TP-T, is also available

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries

Type: HEAT-T M456A1

Description: Standard US specifications. TP-T M490 also produced

FRANCE

Manufacturer

Giat Industries

Type: HEAT-T NR 132/M456

Description: Originally produced by PRB of Belgium but now available from Giat Industries. Equivalent to M456A1. Available with either brass or steel cartridge cases. Specifications provided show some changes from the US original. Round weight is 21.8 kg with projectile weight 9.8 kg. Propellant weight is 5.2 kg of [M30](#). Round length is 999 mm. HEAT-TP-T M490 also produced

GERMANY

Manufacturer

Rheinmetall DeTec

Type: HEAT-MP-T

Description: Generally similar to M456 series. Round weight is 21.7 kg and projectile weight 10.3 kg. Muzzle velocity is 1,174 m/s and chamber pressure 3,700 bar. Round length is 1,174 mm. A HEAT-Prac is available

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: HEAT-T M456A1

Description: Standard US specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: HEAT-T

Description: Appears to be based on M456 series with explosive warhead weighing 1.1 kg but otherwise standard specifications

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: I-HEAT-T M152/3

Description: See separate entry

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: HEAT-T

Description: Specifications as for M456A1. TP-T also produced

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: HEAT-T M456A1

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: HEAT-T M456A1

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: HEAT-T M456A1

Description: Standard US specifications. Also produced is TP-T M490

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: HEAT or HEAT-T M456

Description: Available with or without tracer. Otherwise standard US specifications

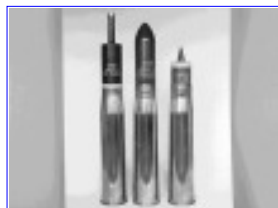
Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: HEAT M456A2

Description: Standard specifications. Also produced is TP-T M490

UPDATED



The round on the left is the Giat Industries 105 mm HEAT-T NR132, equivalent to the HEAT-T M456A1, with the Giat 105 mm HEP-T NR133, equivalent to the HEP-T M393A2 (see following entry). The round on the right is the Giat TK-TP-T/DS NR533, similar to the UK DS Prac L53



105 mm HEAT round produced in [Iran](#) and understood to be based on M456 series



Examples of 105 mm HEAT M456A1 produced by Hellenic Arms Industry (EBO)



Left is 105 mm TP-T M490 with HEAT-T M456A1, both as produced in [South Korea](#) by the Poongsan Corporation (1999)

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TANK AND ANTI-TANK GUNS

Date Posted: 23 January 2002

Jane's Ammunition Handbook 2002-2003

Cartridge 76 mm HESH-T L29

Armament

76 mm L5A1 gun fitted to FV601 [Saladin](#).

76 mm L23A1 gun fitted to FV101 [Scorpion](#), [M113A1](#) fire support vehicle (Australia); Cougar (6 × 6) wheeled fire support vehicle (Canada).

Development

Originally developed for use with the 76 mm [L3A1](#) gun (later developed to the L5A1 standard) fitted to the [Saladin](#) (6 × 6) armoured car, the L29 HESH-T cartridge is also used with the 76 mm L23A1 gun which is lighter than the L5A1 but has the same overall performance. The L26 HESH-T series of projectiles is intended to be a general purpose anti-hard target high-explosive round and is also effective against concrete fortifications, buildings and soft-skinned vehicles.

In April 1992, a ban was placed on firing L23A1 guns on British Army Scorpions and the gun was withdrawn from British Army service, along with the Scorpions.

A special decoppering round, the L44, is available. It has the same weights and performance as the L29 HESH-T.

The design authority for this ammunition rests with [BAE Systems](#), RO Defence.

Description

The 76 mm L29 HESH-T (actual calibre is 76.2 mm) is a one-piece round using a thin-walled projectile.

It has a short rounded ogive and is filled with RDX/Wax initiated by an L71A1 base detonating fuze. The base of the projectile also houses an L5A2 tracer. On impact the ogive and shell wall collapse to spread a 'plaster' of explosive against the target. As the base fuze detonates the explosive, the resultant detonation pressures from the 'plaster' are directed against and through the surface of the target.

The relatively short brass cartridge case is filled with 610 g of NQ/M 07 triple-base propellant and is fitted with a percussion primer.

The 76 mm L29 HESH-T can defeat 90 mm of armour plate at a 60° angle of attack at combat ranges up to 2,500 m. The round is claimed to have a good graze performance and is only slightly less effective against troops in the open than an HE round.

An inert 76 mm SH /Prac L40A1 is available for training purposes. The L40A1 is similar overall to the service L29 HESH-T although the explosive filling is replaced by an inert high-explosive substitute. It is possible to fit this round with a live fuze, together with a flash pellet, to provide an indication of the point of impact by the production of a flash and a cloud of smoke. At realistic combat ranges the 76 mm SH/Prac L40A1 matches the L29 HESH-T trajectory and has the same weights.

MECAR SA of Belgium also produce a 76 mm HESH-T-TP-T M331.

Specifications

Weights:

complete round - 7.42 kg

projectile - 5.4 kg

explosive - 600 g RDX/Wax

propellant, nominal - 160 g

Lengths:

complete round - 539 mm

projectile - 334 mm

Muzzle velocity: 533 m/s

Max combat range: 2,500 m

Max range: 9,350 m

Chamber pressure: 2,313 bar

Type of propellant: NQ/M 07

Authorised fuzes

BD L71A1

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: 76 mm HESH-T-T M329 and HESH-T-TP-T M331

Description: Filled with Composition A-3 and the round utilises a single base multiperforation propellant which includes a decoppering agent. An [M13](#) type tracer burns for more than 3 seconds. The M329 can defeat 90 mm of armour plate at 60° at ranges up to 2,500 m.

The MECAR HESH-T-TP-T M331, with the same ballistics is available for training

CANADA

Manufacturer

SNC TEC

Type: 76 mm L29A5 HESH-T

Description: Standard specifications. Uses NQ/M 028 propellant

Manufacturer

SNC TEC

Type: Cartridge 76 mm SH/P C-69

Description: Equivalent to SH Prac L40A1. Uses NQ/M 028 propellant

VERIFIED



The Canadian Cartridge 76 mm SH/P C-69 produced by SNC Industrial Technologies Inc



*MECAR HESH-T-T M329
(1998)*



*MECAR HESH-T-TP-T M331
(1998)*



*Cross-section drawing of RO Defence 76 mm HESH-T L29
(1999)*



*Cross-section drawing of RO Defence 76 mm SH/Prac L40A1
(1999)*

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TANK AND ANTI-TANK GUNS

Date Posted: 23 January 2002

Jane's Ammunition Handbook 2002-2003

76 mm Cartridge HE-T L24A1/A2

Armament

76 mm L5A1 gun fitted to FV601 [Saladin](#).

76 mm L23A1 gun fitted to FV101 [Scorpion](#), [M113A1](#) fire support vehicle (Australia); Cougar (6 × 6) wheeled fire support vehicle (Canada).

Development

Originally developed for use with the 76 mm [L3A1](#) gun (later developed to the L5A1 standard) fitted to the [Saladin](#) (6 × 6) armoured car, the 76 mm L24A1/A2 HE-T cartridge is also used with the 76 mm L23A1 gun which is lighter than the L5A1 but has the same overall performance. The 76 mm HE-T L24A1/A2 is intended for general infantry fire support in the field.

In April 1992, a ban was placed on firing L23A1 guns on British Army Scorpions and the gun was withdrawn from British Army service, along with the Scorpions.

The design authority for this ammunition rests with [BAE Systems](#), RO Defence.

Description

The Cartridge 76 mm HE-T L24A1/A2 (actual calibre is 76.2 mm) is a fixed round. The projectile is fitted with a L17A6 nose fuze which functions on impact and may be fitted with a proximity fuze if desired. The shell body is manufactured using high-tensile steel to ensure the maximum number of fragments travelling at high velocity on detonation. The filling is 1.5 kg of RDX/TNT. An L5A2 tracer

is fitted into the projectile base and burns for a minimum of 5 seconds. Maximum range is 6,900 m.

The relatively short brass cartridge case contains a nominal 570 g of NQ/M 07 triple-base propellant and is fitted with a percussion primer in the base.

A version of this round used for training is known as the 76 mm HE-Prac-T L25A1. It matches the L25A1/A2 HE-T trajectory at realistic combat ranges. The weight and overall length are the same as the HE-T L24A1/A2 round but the filling is an inert substitute.

Specifications

Weights:

complete round - 7.3 kg

projectile - 5.4 kg

filling - 1.5 kg RDX-TNT

propellant, nominal - 570 g

Length, complete round: 527 mm

Muzzle velocity: 514 m/s

Max effective range: 6,900 m

Chamber pressure: 1,830 bar

Max range: 6,900 m

Type of propellant: NQ/M 07

Authorised fuzes

PD L17A6 and similar

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: 76 mm HE-T M330

Description: Fitted with a PD M557 or equivalent fuze. Projectile contains Composition B and the round utilises a single base multiperforation propellant. Fitted with an [M13](#) type tracer which burns for more than 3 seconds. Direct fire range is 2,500 m and maximum range for indirect fire is 6,900 m.

An HE-TP-T [M332](#) for training is available

VERIFIED



MECAR SA 76 mm rounds, from left: HE-T M330; HESH-TP-T M331; HESH-T M329 (1998)

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FIELD ARTILLERY

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Projectile, 155 mm: HE, M107

Armament

[M1A1](#) Cannon for [M114/M114A1](#) Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; [M199](#) Cannon for [M198](#) Towed Howitzer; [M126/M126A1](#) Cannon for [M109](#) Self-propelled Howitzer; [M185](#) Cannon for [M109A1](#) to [M109A4](#) series of self-propelled howitzers; [M284](#) Cannon for [M109A5](#) and [M109A6](#) Paladin self-propelled howitzers; [XM777](#) Lightweight Towed Howitzer.

The 155 mm HE [M107](#) can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and [M114F](#) Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and [M139/39](#) howitzers; STK [FH-88](#) and [FH-2000](#) Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The 155 mm HE [M107](#) can also be fired from the self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The Projectile, 155 mm: HE, [M107](#) is probably the most widely used of all western artillery projectiles and is still one of the 'NATO standard' projectiles by which all others are measured. This is despite its indifferent charge-to-weight ratio (16.6 per cent), its relatively unsophisticated aerodynamic shape which limits potential range and its erratic fragmentation. All these factors can be attributed to age of design, for the 155 mm HE M107's origins can be directly traced back to the 1930s. It was a development of an earlier projectile, the 155 mm HE [M102](#), the main HE projectile fired by the US M1917/M1918 towed howitzers. The 155 mm HE [M102](#) was, in its turn, an 'Americanized' version of the French Schneider 155 mm HE projectile for their Mle 1917 Howitzer. The 155 mm HE [M107](#) differed from the [M102](#) by having a wider driving band, providing better sealing when fired, especially when fired from a worn barrel. It was originally intended for firing from the US 155 mm M1 Towed Howitzer but has since found widespread acceptance elsewhere (see listing of associated weapons provided above).

Many nations continue to fire the 155 mm HE [M107](#) as a training projectile rather than as an operational round, as its ready availability due to production in volume, often makes it far less costly to fire than some specialised training projectiles. For instance, the British Army had a requirement for 25,000 155 mm HE [M107](#) projectiles for the FY96/97 and FY97/98 and more were required thereafter. British Army HE [M107](#) projectiles are filled with TNT and have provision for long-intrusion fuzes.

The 155 mm HE M795 projectile was type classified to be the replacement for the 155 mm HE [M107](#), although production commenced only recently (1996-1997) and for the time being it will only augment the HE [M107](#) in US Army service - see following entry. The 155 mm HE [M107](#) will not be part of the operational ammunition suite for the forthcoming XM2001/XM2002 [Crusader](#) AFAS.

Despite its vintage and its known ballistic shortcomings, the US armed forces continue to favour the HE [M107](#) both as an operational and training projectile, although most will apparently be fired during training. Prior to FY 98, projectiles procured had reached a total of about 26,605,000 and procurement forecasts for the type extend until at least FY05. None were procured during FY98 but the subsequent planning for FY99 onwards was as follows:

Year	Quantity	Value
FY99	243,000	US\$42,336,000
FY00	114,000	US\$24,108,000
FY01	198,000	US\$39,810,000
FY02	224,000	US\$41,400,000
FY03	185,000	US\$35,493,000
FY04	164,000	US\$35,827,000
FY05	156,000	US\$35,794,000

The Army transformation initiatives have caused long-range forecasts to be scrapped, but the [M107](#) is unlikely to be significantly affected beyond the normal fluctuations. The US does not purchase the complete round from a prime contractor, but places contracts for partial production. Thus, of the FY01 unit cost of US\$200.63, US\$104.78 is provided under contract to Chamberlain for the metal projectile bodies (at the rented Scranton Army Ammunition Plant) and US\$68.69 to American Ordnance as operators of the Iowa Army Ammunition Plant for the load, assemble and pack operation. US firms can, of course, undertake the prime contractor role for export and GD-OTS actively promotes this option.

Description

The Projectile, 155 mm: HE, [M107](#) is a separately loaded munition, it has a hollow forged AISI 1045 steel shell of conventional design with a streamlined ogive (6/12 crh) and a boat tail base to provide aerodynamic efficiency. A steel base cover is welded to the projectile base. A swaged gilding metal drive band encircles the shell casing near the base and is normally protected by a grommet during storage, transport and handling. The fuze well is normally occupied by a threaded lifting plug during transit and handling; the plug can be replaced before firing by a wide range of standard and commercial fuzes.

The 155 mm HE [M107](#) filling may be either 6.62 kg of cast TNT or 6.985 kg of Composition B; 155 mm HE [M107](#) projectiles manufactured in the USA since 1977 have been filled only with TNT. A TNT-filled 155 mm HE [M107](#) will produce approximately 1,950 fragments on detonation.

In 1944, a deep drilled cavity was introduced below the fuze well to accommodate the then new VT (proximity) fuzes. This cavity is now normally occupied by a supplementary charge containing 136 g of TNT contained in an aluminium liner; this charge has to be removed when deep intrusion or proximity fuzes are employed. Some 155 mm HE [M107](#) shells intended for use in circumstances where proximity or similar fuzes are not employed, are still manufactured with original depth filling cavities and lack the supplementary charge.

The 155 mm HE [M107](#) projectiles are zoned into five weight zones ranging from 40.82 kg (zone 2) to 42.91 kg (zone 5). The appropriate weight zone is marked on the projectile ogive by a system of painted squares and punch marks.

The propellant charge system at first sight appears complex, but has been mastered by generations of gunners as only a few weapons make use of its full complexity.

The basic charge system used to fire the 155 mm HE [M107](#) consists of the M3 or [M3A1](#) and the M4, [M4A1](#) or [M4A2](#) bagged charges. Longer barrelled 155 mm pieces, such as the M185 Cannon used with the [M109A1](#) to [M109A4](#) self-propelled howitzers, can make use of the [M119](#) series of bagged charges. The latest generation of 155 mm 39 and 45 calibre weapons can make use of the [M203](#) charge to extract maximum performance, although the 155 mm HE [M107](#) is not usually fired from such weapons.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads, an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge [M4A2](#) is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the [M4A2](#) but does not contain the M2 flash reducer pad (although this can be added if required), the base igniter contains black powder.

The Propelling Charge M4 is a white bag charge that differs from the [M4A1](#) in consisting of a base charge and two increments only for firing as Charges 5 to 7. The M2 flash reducer pad is used with this charge.

The M3 and M4 series of charges are fired using the MK2A4 or [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn onto the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant, it has a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#), including a modified ring-shaped flash reducer that enables the charge to ignite the rocket motor on the 155 mm HE ICM

M549/M549A1 projectiles.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge and can be used with M549/M549A1 projectiles. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The M119A2 is produced by Eurometaal NV as the No 13.

The Propelling Charges [M203](#) and M203A1 (Charge 8S) were developed primarily for use in the 155 mm M199 Cannon used with the [M198](#) Towed Howitzer and the M284 cannon used with the M109A5 and [M109A6](#) Paladin self-propelled howitzers. They can be used with other similar long-barrelled pieces such as the CN79 Cannon used on the South Korean [155 mm KH179](#) Towed Howitzer. The M203/M203A1 is a single red bag charge encased in a tight-fitting lacing jacket for strength. The bag has an igniter sewn to the base, a central core igniter extending through the centre of the charge and a flash reducer in front of the charge. The M203A1 differs from the [M203](#) by producing cooler burning to increase barrel life, together with a reduction in blast and muzzle flash.

The [M119](#) series and [M203](#) propellant charges should be fired using the Primer [M82](#) only.

When fired from the 155 mm [M1/M1A1](#) Cannon on M114/M114A1 towed howitzers the following ballistic performances can be attained:

Charge 1 (M3 green bag) - MV 207.3 m/s - range 3,900 m
Charge 2 (M3 green bag) - MV 234.7 m/s - range 4,800 m
Charge 3 (M3 green bag) - MV 268.2 m/s - range 6,100 m
Charge 4 (M3 green bag) - MV 310.9 m/s - range 7,800 m
Charge 5 (M3 green bag) - MV 371.9 m/s - range 9,700 m
Charge 3 ([M4A1](#) white bag) - MV 274.3 m/s - range 6,300 m
Charge 4 ([M4A1](#) white bag) - MV 316.4 m/s - range 8,000 m
Charge 5 ([M4A1](#) white bag) - MV 374.6 m/s - range 9,700 m
Charge 6 ([M4A1](#) white bag) - MV 463.3 m/s - range 12,000 m
Charge 7 ([M4A1](#) white bag) - MV 563.9 m/s - range 14,600 m.

When fired from the 155 mm M126/M126A1 Cannon on [M109](#) self-propelled howitzers the following ballistic performances can be attained:

Charge 1 ([M3A1](#) green bag) - MV 207.3 m/s - range 3,900 m
Charge 2 ([M3A1](#) green bag) - MV 236.2 m/s - range 4,900 m
Charge 3 ([M3A1](#) green bag) - MV 275.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 317 m/s - range 8,200 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 269.7 m/s - range 6,200 m
Charge 4 (M4A2 white bag) - MV 313.9 m/s - range 8,000 m
Charge 5 (M4A2 white bag) - MV 373.4 m/s - range 9,800 m
Charge 6 (M4A2 white bag) - MV 461.8 m/s - range 12,000 m
Charge 7 (M4A2 white bag) - MV 562.4 m/s - range 14,600 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers the 155 mm HE [M107](#) can attain the following ballistic performances:

Charge 2 ([M3A1](#) green bag) - MV 237.7 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 277.4 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 318.5 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 292.6 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 336.8 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 393.2 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 475.5 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 565.4 m/s - range 14,800 m

Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

When fired from the 155 mm [M119](#) Cannon on the [M198](#) Towed Howitzer the following ballistic performances can be attained:

Charge 2 ([M3A1](#) green bag) - MV 239.8 m/s - range 5,000 m

Charge 3 ([M3A1](#) green bag) - MV 280.8 m/s - range 6,500 m

Charge 4 ([M3A1](#) green bag) - MV 322.9 m/s - range 8,300 m

Charge 5 ([M3A1](#) green bag) - MV 380.1 m/s - range 9,800 m

Charge 3 (M4A2 white bag) - MV 296.5 m/s - range 7,200 m

Charge 4 (M4A2 white bag) - MV 340.9 m/s - range 8,900 m

Charge 5 (M4A2 white bag) - MV 398 m/s - range 10,300 m

Charge 6 (M4A2 white bag) - MV 482 m/s - range 12,400 m

Charge 7 (M4A2 white bag) - MV 574.3 m/s - range 14,800 m

Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

With the 155 mm M284 Cannon used on the M109A5 and [M109A6](#) Paladin self-propelled howitzers, the 155 mm HE [M107](#) fired using the M203/M203A1 Charge 8S can attain a maximum range of 24,000 m.

Giat Industries of France produce a combustible case intended for use with all NATO standard 155 mm weapons. The case consists of a skirt, a base and a cover containing Charges 6 to 9; lower charges are formed using bagged charges. Use of this case system produces a barrel life at maximum charge of 3000 EFC.

The muzzle velocities produced using this combustible case system are as follows:

Charge 6 - 586 m/s

Charge 7 - 705 m/s

Charge 8 - 810 m/s

Charge 9 - 830 m/s.

Charge 9 can fire a standard 155 mm HE [M107](#) projectile to a maximum range of 24,000 m.

Chartered Ammunition Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter and weighs 10 kg.

It is anticipated that future US 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are in the process of adopting similar modular charge systems.

The 155 mm training projectile meant to be used in place of the 155 mm HE [M107](#) is the Projectile, 155 mm: Practice, M804. This is a hollow forged steel shell containing a small smoke canister in the fuze well to provide flash and smoke on impact; the shell body has four vent holes 90° apart just forward of the drive band, which serve to disperse smoke on functioning. The 155 mm Practice M804 is ballistically similar to the 155 mm HE [M107](#) but does not produce any blast or fragmentation. The 155 mm Prac M804 is 698.5 mm long and weighs 43.09 kg. It can be fired using all charges up to the M119A2, producing a maximum range of 18,100 m and is normally used with the PD M577 fuze. In recent years it has proved to be less costly to fire HE [M107](#) projectiles for training, so the M804 is now little encountered.

[Simmel Difesa](#) SpA produce the 155 mm IM170 TP which is ballistically matched to the 155 mm HE [M107](#), containing 7 kg of an inert mixture in place of explosive. Also produced by [Simmel Difesa](#) SpA is the 155 mm IM201 TP which contains 4.65 kg of an inert mixture plus 2 kg of TNT to produce flash, sound and smoke on impact. A 136 g TNT supplementary charge is located under the fuze well. The 155 mm IM170 TP is ballistically matched to the 155 mm HE [M107](#).

The Royal Ordnance (now [BAE Systems](#), RO Defence) 155 mm RO 18-05A1 and RO 18-05A2 have been developed as training round equivalents to the 155 mm HE [M107](#). See separate entry for details.

For drill and general training purposes the inert Projectile, 155 mm: Dummy M7 with Charge, Propelling: Dummy M2 is available. The body of the 155 mm Dummy M7 is hollow and contains a spring-loaded impact plunger to assist in extraction.

Specifications

Weights:

with lifting plug - 40.82-42.91 kg

as fired - 43.88 kg

filler, Comp B - 6.985 kg

filler, cast TNT - 6.62 kg

supplementary charge, TNT - 136 g

Lengths:

with lifting plug - 680.9 mm

shell body - 605.3 mm

Max body diameter: 154.89 mm

Max diameter over drive band: 157.98 mm

Operating temperature range: -32 to +52°C

Authorised fuzes

The 155 mm HE [M107](#) has a standard 2 in 12UN-1B thread in the fuze well and can accommodate a wide range of standard and commercial fuzes. Standard fuzes that can be used with the HE [M107](#) include the following:

PD M51A5, [M728](#) series, M557, M572, M739

MTSQ M564, M577, M582

Prox M732, [M728](#) (If fitted, the supplementary charge must be removed when the [M728](#) is used)

Equivalent projectiles

BELGIUM

Manufacturer

PRB SA

Type: NR-148

Description: Stated to be equivalent to 155 mm HE [M107](#). No longer in production but in widespread service

BOSNIA-HERZEGOVINA

Manufacturer

Ministry of Defence, Department of Defence Industry

Type: 155 mm HE [M107](#)

Description: Standard US specifications. For locally-produced Howitzer [M65](#) and also US [M114A1](#)

BRAZIL

Manufacturer

ENGEQUÌMICA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

FI Indústria e Comércio Ltda

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Can be supplied fitted with PD M557 fuze

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: 155 mm HE [M107](#)

Description: As standard US specifications although supplementary charge is 140 g of Composition A-3 (RDX/Wax 91/9). Explosive filling given as approximately 7 kg of Composition B or TNT

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 155 mm HE [M107](#)

Description: Described as [M107](#) type, filled with either TNT or Composition B. Projectile weight given as 42.91 kg and length 607 mm. Otherwise standard US specifications and offered for export sales

FRANCE

Manufacturer

Giat Industries

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Available for production and likely to be widely encountered

GERMANY

Manufacturer

Rheinmetall DeTec

Type: 155 mm HE [M107](#)

Description: Used by German Army as DM 21. Standard US specifications

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 155 mm HE [M107](#)

Description: Standard US specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 155 mm HE

Description: Standard US specifications. Fitted with PD M572 fuze

[ISRAEL](#)

Manufacturer

[Israel Military Industries](#) (IMI)

Type: 155 mm HE [M107](#)

Description: Standard US specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm IM170A1/A2

Description: Ballistically similar to 155 mm HE [M107](#), containing 6.65 kg of TNT or 7 kg of Composition B. 155 mm TP IM170 and IM201 (with 2 kg TNT charge) also produced

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

Hanwha Corporation

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: 155 mm HE [M107](#)

Description: Standard US specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm HE

Description: Stated to be equivalent to 155 mm HE [M107](#). Standard US specifications. Also produced are M3, M4 and No 13 (M119A2) propelling charges

NORWAY

Manufacturer

[Nammo](#) Raufoss AS

Type: 155 mm NM28 HE

Description: Stated to be equivalent to 155 mm HE [M107](#) but with improved fragmentation

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Filled with 6.62 kg TNT and fitted with PD M557 fuze

PORTUGAL

Manufacturer

Explosivos Da Trafaria SA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

INDEP

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Also produced are Propelling Charges M3, [M3A1](#), [M4A1](#), M4A2, [M119](#) and M119A2

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Propelling Charge M4A2 also produced along with Propelling Charge C20 for use in high-performance ordnance. The latter charge uses [M6](#) propellant and covers zones 6, 7, 8, and 9. Weight of the C20 is 10 kg, length 610 mm and diameter 160 mm

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

FOREX SA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: 155 mm HE [M107](#)

Description: Standard US specifications

[TAIWAN](#)

Manufacturer

Hsing Hua Company

Type: 155 mm HE [M107](#)

Description: Standard US specifications

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 155 mm HE [M107](#)

Description: Standard US specifications

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: 155 mm RO 22

Description: Developed by Royal Ordnance (now [BAE Systems](#), RO Defence) as part of their 155 mm Ammunition System, the RO 22 is a low-cost TNT-filled equivalent to the 155 mm HE [M107](#). It is fired using the BIS 70 propellant charge system which uses six increments covering US zones 3 to 8

UNITED STATES OF AMERICA

Manufacturer

Chamberlain Manufacturing Corporation (Scranton Army Ammunition Plant)

Type: 155 mm HE [M107](#)

Description: Standard specifications

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: 155 mm HE [M107](#)

Description: Standard specifications

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: 155 mm HE [M107](#)

Description: Standard US specifications. Used with 155 mm [M65](#) howitzer so maximum muzzle velocity is 564 m/s and maximum range 14,900 m. May no longer be in production

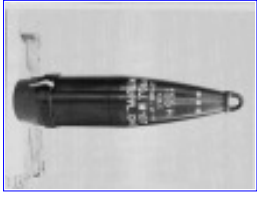
UPDATED



Cross-section drawing of a 155 mm: HE, [M107](#)



Projectile, 155 mm: HE, [M107](#) as produced by Giat Industries



155 mm: HE, [M107](#) projectile in transport and storage condition

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Projectile, 8 in: HE, M106

Armament

M2 and [M2A1](#) Cannon used on [M115](#) Towed Howitzer; M2A2 Cannon used on M110 Self-propelled Howitzer; M201A1 Cannon used on M110A2 Self-propelled Howitzer; [NORINCO 203 mm](#) Gun System.

Development

The 8 in HE [M106](#) was originally developed during the 1930s for use with the 8 in (203 mm) M1 Towed Howitzer, replacing an earlier projectile with coastal defence gun origins known as the Mk 1A1. The 8 in M1 howitzer was later redesignated the [M115](#) and, although this weapon is no longer in the US armed forces inventory it remains in service with other nations. A similar barrel to that mounted on the [M115](#) was later selected as the M2A2 Cannon for use on the 8 in M110 Self-propelled Howitzer. The M110 has been updated by retrofitting the longer barrelled muzzle-braked M201A1 Cannon to create the 8 in M110A2 Self-propelled Howitzer standard. The 8 in HE [M106](#) is used with all these weapons and it is still widely produced although, as the M110 series have been withdrawn from US Army service, it is no longer manufactured within the USA. It remains the most commonly used projectile for all NATO 8 in/203 mm howitzers.

Known users of M110 series self-propelled howitzers include the following: [Bahrain](#) (13 M110A2); [Greece](#) (31 M110); [Iran](#) (38, some destroyed); [Israel](#) (48 M110); Italy (23 M110A2 - due to be replaced by [MLRS](#)); [Japan](#) (201 M110A2); [Jordan](#) (102 M110A2); [South Korea](#) (99 M110); [Pakistan](#) (40

M110A2); Spain (48 M110A2); [Taiwan](#) (M110A2, estimated numbers between 75 and 150); [Turkey](#) (80 M110A2).

The Projectile, 8 in: HE XM711 was under development to replace the HE [M106](#) but development was terminated. No details are available.

An 8 in chemical agent projectile which used the same external configuration as the 8 in HE [M106](#) was known as the 8 in Projectile, Gas/GB/VX, M426. This projectile contained 6.58 kg of persistent nerve agent scattered by a 3.175 kg [M83](#) Composition B-4 burster charge. Weight of the complete projectile was 90.26 kg and length 891.5 mm. Also produced were the generally similar 8 in Projectile Gas VX, M426, and the 8 in Projectile Gas VX2, M736. Any remaining examples of these projectiles have been withdrawn from service and are scheduled for destruction.

Description

The 8 in/203 mm HE [M106](#) separate loading projectile uses a hollow steel forging with a streamlined ogive, a boat tailed base and a base cover welded to the base. A welded copper overlay drive band is normally protected by a metal, plastic or glass fibre grommet which is removed before firing. The nose of the projectile is fitted with an eyebolt lifting plug for storage, transport and handling and covers a shallow or deep cavity drilled into the bursting charge. Deep cavity projectiles are intended for use with deep intrusion proximity and other fuzes and when used a supplementary charge has to be removed. The supplementary charge, 136 g of TNT, is normally held in place beneath the lifting plug by a cardboard spacer.

Loaded projectiles are zoned into one of five weight zones ranging from 86.82 kg (zone 2) to 92.67 kg (zone 6). The appropriate weight zone is marked on the ogive of each projectile by a system of painted squares and punch marks.

The explosive filling of the 8 in HE [M106](#) may be either 16.465 kg of TNT or 17.6 kg of Composition B.

M2, [M2A1](#) and M2A2 Cannon use a system of seven bagged charges. Charges 1 to 4 all use M1 green bag charges. Charge 5 may be either an M1 green bag or a M2 white bag. Charges 6 and 7 use M2 white bag charges.

Charges 1 to 5 (M1) consist of 6.8 kg of single perforated M1 propellant. Charge 1 is the base section with the other four charges in unequal increments. They are assembled end-to-end in sequence and held together by four cloth straps. A red igniter pad containing 142 g of black powder is sewn to the base of the base charge, Charge 1. The complete charge is 533 mm long and 165 mm in diameter.

Charges 5 to 7 (M2) consist of 12.927 kg of multi-perforated M1 propellant. Charge 5 is the base charge with two unequal increments (Charges 6 and 7) attached. The charges are assembled end-to-end in sequence and held together by four cloth straps. A red igniter pad containing 142 g of black powder is sewn to the base of the base charge Charge 5. A Flash Reducer M3 containing 453 g of a potassium sulphate and black powder mixture is added when the full Charge 7 is fired. The complete charge is 609 mm long and 197 mm in diameter.

The longer 8 in M201A1 Cannon makes use of the same system of bagged charges as the M2, [M2A1](#) and M2A2 but with the addition of the M118 or M118A1 bag charges to enhance performance.

The M118, originally developed for the M201 Cannon (without a muzzle brake), is a single-increment white bag charge containing approximately 17.24 kg of high-energy M30A1 propellant in a cloth bag. A red igniter pad containing 142 g of black powder is sewn to the base of the charge and a central ignition core extends throughout the length of the charge. A cylindrical cloth jacket is placed over the entire length and tightly laced. The M118 is approximately 787 mm long and 203 mm in diameter.

The M118A1 was developed for use in the M201A1 Cannon used on the M110A2 Self-propelled

Howitzer. It is a two increment charge (Charges 8 and 9) containing 21.77 kg of high-energy M31A1 propellant. A red igniter pad containing 142 g of black powder (normally covered by a paper cap which has to be removed before firing), is sewn to the base of the charge and a central ignition core extends through most of the length of the charge. This core is a moulded nitrocellulose 355 mm diameter tube, containing a 142 g bag of black powder sewn to the igniter pad. An additive to reduce barrel wear is used to line the increment 9 charge bag. The increment 8 bag is lined with lead foil for decoppering and the bag is laced inside a cloth jacket. The Charge 9 increment is attached to the Charge 8 increment by four tie straps. The entire M118A1 charge weighs 22.7 kg, is 813 mm long and 203 mm in diameter. The Charge 8 increment weighs 19.05 kg and the Charge 9 2.72 kg.

The percussion primer used with the M2 and [M2A1](#) Cannon is the MK2A4. Other Cannon use either the [M82](#) or the MK15.

When the 8 in HE [M106](#) is fired from M2, [M2A1](#) and M2A2 Cannon the following results can be obtained:

Charge 1 (M1 green bag) - MV 249.9 m/s - range 5,600 m
Charge 2 (M1 green bag) - MV 274.3 m/s - range 6,600 m
Charge 3 (M1 green bag) - MV 305 m/s - range 8,000 m
Charge 4 (M1 green bag) - MV 350.5 m/s - range 9,700 m
Charge 5 (M1 green bag) - MV 420.6 m/s - range 11,600 m
Charge 5 (M2 white bag) - MV 420.6 m/s - range 11,600 m
Charge 6 (M2 white bag) - MV 500 m/s - range 13,900 m
Charge 7 (M2 white bag) - MV 594.3 m/s - range 16,800 m.

When fired from the M201A1 Cannon the 8 in HE [M106](#) can produce the following results:

Charge 1 (M1 green bag) - MV 255.4 m/s - range 5,946 m
Charge 2 (M1 green bag) - MV 280.4 m/s - range 7,099 m
Charge 3 (M1 green bag) - MV 309.6 m/s - range 8,450 m
Charge 4 (M1 green bag) - MV 353.8 m/s - range 10,435 m
Charge 5 (M1 green bag) - MV 423.6 m/s - range 12,405 m
Charge 5 (M2 white bag) - MV 445.9 m/s - range 12,987 m
Charge 6 (M2 white bag) - MV 519.7 m/s - range 15,203 m
Charge 7 (M2 white bag) - MV 606.9 m/s - range 17,901 m
Charge 8 (M118) - MV 710.1 m/s - range 21,300 m.

For training in handling the 8 in HE [M106](#) the Projectile, 8 in: Dummy, [M845](#) is used. This is an inert projectile that cannot be fired. It is fitted with an inert [M51](#) nose fuze and a plastic drive band.

Specifications

Weights:

projectile - 86.82-92.67 kg
explosive - 16.465 kg TNT
explosive - 17.6 kg Comp B
Charges 1 to 5, M1 - 6.17 kg
Charges 5 to 7, M2 - 12.927 kg

Lengths:

fuzed - 891.8 mm
without lifting plug - 797.6 mm
with lifting plug - 872.5 mm

Max body diameter: 203.14 mm

Diameter over drive band: 210.41 mm

Max muzzle velocity:

M110 - 594.3 m/s

M110A2 - 710.1 m/s

Max range:

M110 - 16,800 m

M110A2 - 21,300 m

Authorised fuzes

Shallow cavity: PD M577, M51A5, M572, M739. MTSQ M564, M582, Prox M732

Deep cavity: PD M51A5, M577, M572, M739. MTSQ M564, M582. Prox M732, [M728](#)

(Supplementary charge must be removed before Prox [M728](#) is used)

Equivalent projectiles

BELGIUM

Manufacturer

PRB SA

Type: 203 mm HE NR-152

Description: Stated to be equivalent to 8 in HE [M106](#). No longer in production but in widespread service

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: 8 in HE [M106](#)

Description: Standard US specifications

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 8 in HE [M106](#)

Description: Standard US specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Industries

Type: 203 mm HE

Description: Based on US 8 in HE [M106](#). Weight given as 73.03 kg, of which 16 kg is HE filling. Length 797.56 mm. Muzzle velocity given as 594.4 m/s and maximum range 16,800 m

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 203 mm HE

Description: Standard US specifications, filled with TNT. Charges also produced

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 8 in HE [M106](#)

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: 8 in HE [M106](#)

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: 8 in HE [M106](#)

Description: Standard US specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 203 mm HE

Description: Available. Stated to be equivalent to 8 in HE [M106](#). M1 and M2 charges also produced

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 8 in HE How [M106](#)

Description: Filled with 16.5 kg TNT. Otherwise standard specifications.

PORTUGAL

Manufacturer

Explosivos Da Trafaria SA

Type: 8 in HE [M106](#)

Description: Standard US specifications

SPAIN

Manufacturer

EXPAL SA

Type: 8 in HE [M106](#)

Description: Standard US specifications

Manufacturer

FOREX SA

Type: 8 in HE [M106](#)

Description: Standard US specifications

[TAIWAN](#)

Manufacturer

Hsing Hua Company

Type: 8 in HE [M106](#)

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 8 in HE [M106](#)

Description: Standard US specifications. Filled with TNT. Charges also produced

VERIFIED



Projectile, 8 in: HE, [M106](#)



Cutaway illustration of Projectile, 8 in: HE, [M106](#)



Projectile, 8 in: HE, [M106](#) as produced by [Pakistan](#) Ordnance Factories (T J Gander) (1998)

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

155 mm extended range full-bore cargo projectiles

Armament

Towed 155 mm howitzers: NORICUM GH [N-45](#); CITEFA CALA 30/2; SRC International GC 45; [NORINCO Type](#) WA 021 and Type [GM-45](#); Patria Vammas 155 GH 52 Howitzer; Giat Industries TR and 155/52 guns and M114F howitzer; [FH-70](#); Soltam Model 839P, 845P, Upgraded M-46 and [M114S](#); Otobreda 155/39; [KH179](#); RDM [M139](#) and [M114/39](#); STK [FH-88](#) and FH-2000; [LIW](#) G5; SITECSA 155/45 ST 012, [M114](#) 155/45 and [M114](#) 155/39; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers; Bofors [FH-77B](#); Extended Range Gun ([Taiwan](#)); XM777 Lightweight Towed Howitzer; [M46/84](#) ([Yugoslavia](#)).

Self-propelled 155 mm howitzers: TAMSE VCA 155; NORINCO [PLZ45](#) Self-propelled Gun-Howitzer; Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Majnoon ([Iraq](#)); Soltam Rascal and Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); [LIW](#) G6; ZTS [ZUZANA](#) ([Slovakia](#)); [XT-69](#) ([Taiwan](#)); [AS90](#) and [Braveheart](#); M109A4, M109A5 and [M109A6](#) Paladin; XM2001/XM2002 [Crusader](#) AFAS.

Development

Development of a 155 mm ERFB Cargo round was carried out simultaneously by both the Space Research Corporation (SNC) of Canada and [Arm Scor](#) (now Denel (Pty) Ltd) in [South Africa](#). It is probable that [South Africa](#) continued its own development work following its withdrawal from SNC

activities during the early 1970s. From the SNC programme, PRB SA of Belgium marketed and manufactured its 155 mm NR 269 ERFB-BB Cargo round (now available from Giat Industries) and [Arm Scor](#) (now Denel (Pty) Ltd) followed with a similar projectile, the 155 mm HC Cluster M1, with some design differences, especially with the submunitions. The latest form of the South African ERFB cargo projectile is the 155 mm Cluster HE HC [M1A2](#).

PRB SA ceased trading in 1990 but numbers of its 155 mm NR 269 Cargo projectiles may still remain in service with some nations. Giat Industries, who now own the production rights for the 155 mm NR 269, has proposed a version of the NR 269 with a revised obturator and a more durable driving band to enable them to be fired from barrels using NATO standard modular charge systems. This version will be known as the 155 ARF and could have a range in excess of 42,000 m when fired from a 52 calibre barrel at a muzzle velocity of 930 m/s.

Description

The 155 mm PRB/Giat Industries NR-269 and Denel 155 mm HC Cluster M1 SM ERFB-BB Cargo projectiles follow the same overall design outlines and may be described together. The shell body is made of high-grade steel and is a variation of the 155 mm ERFB-BB BE Smoke projectile (see following entry). As such it retains the typical ERFB streamlined outline, (which is the same as the 155 mm ERFB HE projectile - see previous entry), with a continuous ogive almost the entire length of the body down to the copper or gilding metal drive band and plastic obturator band. A Base Bleed (BB) unit is normally threaded to the projectile base with an adaptor to interface with the bomblet payload. Some rounds may be produced and supplied without the base bleed unit.

The 155 mm ERFB-BB Cargo projectile contains 56 bomblets of the [M46](#) type, although the Denel ([SWARTKLIP Products](#)) bomblets differ in some details from those used with the PRB/Giat Industries NR 269. The bomblets are dual-purpose anti-personnel/anti-armour devices stacked using splined spacers in eight layers, each containing seven bomblets. In each row the hollow charges face towards the projectile nose.

The 155 mm ERFB-BB Cargo projectile carries a nose-mounted MT, MTSQ or electronic fuze, typically a MTSQ M577A1. This fuze is set to function at a height of approximately 500 to 600 m above the target area. As the fuze functions it ignites an expulsion charge which creates an internal pressure to bear down on a pusher plate. The pusher plate forces the payload to the rear, separating the base bleed unit from the projectile body and expelling the individual bomblets at an initial velocity of about 100 m/s. As they emerge from the projectile base they are dispersed by centrifugal forces produced by the projectile spin to cover an oval-shaped ground area measuring approximately 120 to 130 m wide and 110 to 120 m deep - this area will vary according to expulsion altitude and local wind conditions.

Each bomblet trails a ribbon which is deployed as the bomblet leaves the projectile. This reduces the rotation rate of the bomblet and at the same time unscrews a threaded rod a few turns, thereby allowing the detonator to arm. As the bomblet impacts a firing pin can then detonate the explosive. Each bomblet contains a shaped charge consisting of approximately 30 g of Composition A5 or a similar explosive, sufficient to penetrate a minimum of 60 mm of armour and spread anti-personnel steel fragments over a lethal radius of 7 m. Bomblets produced for the Denel 155 mm HE HC Cluster M1 and [M1A2 Wasp](#) rounds have an improved detonating system and a fail-safe self-destruct system.

South African 155 mm ERFB projectiles may be converted in the field to remove boat tails from ERFB projectiles and fit base bleed units to produce 155 mm ERFB-BB projectiles. The process is carried out using a projectile clamping table. The same table can also be used to remove damaged obturators and fit new ones. The table can be folded flat and weighs 25 kg.

To take full advantage of the range potential of 155 mm ERFB-BB Cargo projectiles they are usually fired with high-energy charges, typically the NATO [M3A1](#) (zones 3, 4 and 5), M4A2 (zones 3, 4, 5, 6

and 7), [M119A1](#) (zone 8), [M203](#) (zone 9) or the [M11](#) (zone 10), the latter being restricted to 45 calibre or longer barrels.

The propelling system for the [LIW 155 mm G5](#) and G6 gun-howitzers originally involved a three-charge cloth bag system. This has been replaced by a modular system, developed by [SOMCHEM](#), involving combustible cases with a built-in charge retaining device. The system may be used with ERFB and (above the basic Charge 2) ERFB-BB projectiles and all NATO 155 mm projectiles.

The lowest charge for the Denel modular charge system is the Charge Propelling 155 mm Modular Charge 1 [M51](#). The combustible container for this charge is red and contains single-base granular propellant. The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 2.3 kg, is 211 mm long and has a diameter of 164 mm.

The next charge is the Charge Propelling 155 mm Modular Charge 2 [M52](#). The combustible case is blue and houses triple-base propellant cords. The diameter at the front of the case is reduced to allow it to friction fit into the rear of a Charge 2 increment (see below). The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 5.6 kg, is 373 mm long and the diameter is 164 mm.

This modular system continues with the Charge Propelling 155 mm Modular Increment [M52](#). One or two of these increments can be added to the normal Charge 2. Charge 2 plus one increment can be used with boat tailed ERFB and all NATO 155 mm projectiles. Charge 2 plus two increments can be used with ERFB, ERFB-BB and all NATO 155 mm projectiles. Each increment is contained in a green combustible case containing triple-base propellant cords. The igniter consists of 60 g of G12 gunpowder. The charge weighs approximately 4 kg, is 289 mm long and the diameter is 164 mm.

The top charge of the modular system is the Charge Propelling 155 mm Modular Charge 3 [M53](#). The charge is contained in a purple (jacaranda) combustible case containing triple-base tubular propellant. The igniter consists of G12 gunpowder. The charge weighs approximately 17.1 kg, is 930 mm long and the diameter is 164 mm.

All charges are ignited by the Tube Percussion [M82](#) which contains 1.4 to 1.5 g of gunpowder. The tube is 49.37 mm long with a diameter over the rim of 15.24 mm.

With this system, the following ballistic performances can be achieved using a 155 mm 45 calibre barrel:

Charge 1 - MV 350 ± 5 m/s - max range 9,100 m

Charge 2 - MV 483 ± 5 m/s - max range 13,400 m

Charge 2 + 1 increment - MV 645 ± 5 m/s - max range 19,000 m

Charge 2 + 2 increments - MV 795 ± 5 m/s - max range 25,400 m

Charge 2 + 2 increments + BB - MV 789 ± 5 m/s - max range 31,000 m

Charge 3, standard shell - MV 897 ± 5 m/s - max range 30,200 m

Charge 3 + BB - MV 895 ± 5 m/s - max range 39,000 m.

Typical range figures for 155 mm ERFB-BB Cargo projectiles fired from 39 calibre barrels is of the order of 30,600 m. When fired from 45 calibre barrels they can reach 39,000 m.

This modular charge system has been replaced by one involving up to six [M62A1](#) combustible modular charges all with the same content and meeting the NATO Joint Ballistics MoU. The charges are produced by [SOMCHEM](#) and can be used with ordnance up to 52 calibres long. Other similar modular charge systems could be employed.

Specifications

155 mm Cluster HE HC [M1A2 Wasp](#)

Weights:

projectile, ERFB - 42.8-45.3 kg
projectile, ERFB-BB - 45.3-47.8 kg
explosive content - 1.288 kg

Lengths:

ERFB - 843 mm

ERFB-BB - 861 mm

Diameter over nubs: 154.81 mm

Diameter over drive band: 157.86 mm

Number of bomblets: 56

Chamber pressure: 3,450 bar

Muzzle velocity:

ERFB - 897 m/s

ERFB-BB - 895 m/s

Max range:

ERFB - 28,000 m

ERFB-BB - 38,300 m

Operational temperature range: -20 to +60°C

Authorised fuzes

MTSQ M577 series

Electronic NINA, ZELAR, Fuchs M8611 and so on

Equivalent projectiles

BELGIUM

Manufacturer

PRB SA

Type: 155 mm NR 269 ERFB-BB Cargo

Description: Specifications as text. No longer in production by PRB but may still be in service. Now produced in France by Giat Industries

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 155 mm ERFB ICM and ERFB ICM BB

Description: Both contain 72 bomblets and are fitted with MTSQ M577 fuze. Maximum range of ERFB ICM BB given as 39,600 m. A variant may be filled with either Type 81 39.2 mm diameter bomblets or 42.5 mm diameter bomblets, with the numbers involved varying between 49 and 56 to suit requirements. This projectile weighs 45.54 kg and is fitted with a MS-200 ET fuze. Muzzle velocity is given as 920 m/s. May no longer be in production

FRANCE

Manufacturer

Giat Industries

Type: 155 mm Cargo ERFB BB NR 269 B1

Description: Originally produced in Belgium by PRB SA (see above). Weight without fuze given as

45.6 kg and overall length without fuze is 861 mm. Contains 56 [M46](#) bomblets. Maximum range when fired from a 52 calibre barrel given as 42,000 m. In production and adopted by several unspecified countries

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm ERFB-BB Cargo

Description: Specifications as text. Available for production. Propelling charge No 16 also produced

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Limited ([NASCHEM](#))

Type: Shell, 155 mm HE HC Cluster M1 and [M1A2 Wasp](#)

Description: Produced primarily for [155 mm G5](#) and G6 artillery systems and marketed by Denel.

Contains 56 bomblets, each capable of penetrating a minimum of 60 mm of armour plate. The bomblets are ejected at an optimum height of 600 m and have a self-destruct element

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[Giat Industries 155 mm Cargo ERFB-BB NR 269 B1](#)



[SWARTKLIP Products \(Denel\) 155 mm Cargo HE HC Cluster M1](#)

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Projectile 155 mm: WP/Smoke, M110, M110A1 and M110A2

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The 155 mm Smoke WP M110 family can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The 155 mm Smoke WP M110 family can also be fired from the self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The 155 mm Smoke WP M110 family of separate loaded projectiles is used to provide screening or marking smoke; there is also a secondary incendiary effect. All three projectiles in the 155 mm Smoke WP M110 family have the same general appearance as the 155 mm HE [M107](#) and have the same design origins. The original 155 mm Smoke WP M110 was developed from the 155 mm WP/Smoke [M105](#) projectile developed for the towed 155 mm Howitzer M1 before the Second World War. The 155 mm WP/Smoke [M105](#) was the 'Americanized' version of a French projectile originally used with the French designed M1917/M1918 series of 155 mm towed howitzers procured during the First World War.

The 155 mm Smoke WP M110 family differs from the [M105](#) mainly in having a wider and heavier driving band to provide a better in-bore gas seal, especially in worn barrels. Despite its age and relative inefficiency compared to more modern projectile designs, the 155 mm Smoke WP M110 family is still in widespread production and service.

The 155 mm Smoke WP M110 uses the [M6](#) burster charge which contains tetrytol. The 155 mm Smoke WP M110A1 and M110A2 both use the M54A1 burster charge containing Composition B5 and may be stored, transported and fired at temperatures up to +63°C; the 155 mm Smoke WP M110 cannot be stored or fired at temperatures exceeding +52°C.

The 155 mm Smoke WP M110 family has been filled with smoke-producing compositions other than White Phosphorus (WP), including titanium tetrachloride.

The Projectile 155 mm, Chemical Agent, H/HD, 155 mm: M110 was identical to the WP/Smoke M110 family, other than its chemical agent filling (H or HD, weight 5.3 kg, both Mustard blister agents). Any of these chemical warfare projectiles still in existence have been withdrawn from service and their contents are scheduled for destruction by incineration. The Projectile, Chemical Agent, 155 mm: M121A1, containing 2.95 kg of GB or 2.72 kg of VX (both nerve agents), has also been withdrawn from service and its contents scheduled for destruction by incineration.

A 155 mm chemical projectile filled with Mustard (H) agent and based on a smoke projectile of the M110 type was developed by [Iraq](#) at the Al Muthanna State Establishment.

The US Army and Marine Corps replacement projectile for the Smoke M110 series is the Projectile, 155 mm: Smoke, WP, M825A1 (see following entry).

Description

The 155 mm WP/Smoke M110, M110A1 and M110A2 are separate loading munitions using a hollow forged steel shell with the same external configuration as that used on the 155 mm HE [M107](#). The shape is ogival (6/12 crh) with a boat tail for aerodynamic efficiency and a welded steel baseplate. Close to the base is a gilding metal drive band protected by a grommet until just before loading. A threaded lifting plug closes the nose fuze cavity for handling and storage.

The shell contains approximately 7.07 kg of White Phosphorus (WP), although other fillings have been used. A centrally located burster charge extends the length of the shell interior. On the 155 mm Smoke WP M110 the burster charge is the [M6](#) containing 186 g of Tetrytol. On the 155 mm Smoke WP M110A1 and M110A2 the burster charge is the M54A1 containing 208 g of Composition B5. On the M110A1 the end of the burster tube is sealed with a plastic plug; on the M110A2 the sealing plug is

aluminium.

The 155 mm Smoke WP M110 family is normally fitted with a nose-mounted point detonation fuze. On impact the fuze ignites the internal burster charge which then ruptures the shell casing to release the WP filling. As it contacts the air the WP ignites to produce thick clouds of white smoke.

When stored, 155 mm Smoke WP series projectiles have to be kept on their bases to prevent migration of the WP which will alter the centre of gravity and possibly cause in-bore explosions when fired.

The 155 mm Smoke WP M110 family is ballistically matched to the 155 mm HE [M107](#) and uses the same propellant charges, other than the Charge 8S [M203](#). Charge 1 ([M3A1](#) green bag) is not normally used on longer barrelled pieces.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required) and the base igniter contains black powder.

The Propelling Charge M4 is a white bag charge, it differs from the [M4A1](#) as it consists of a base charge and two increments only for firing as Charges 5 to 7. The M2 flash reducer pad is used with this charge.

The M3 and M4 series of charges are fired using the MK2A4 or [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn onto the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. A similar charge is produced by Eurometaal NV as the No 13.

When fired from the 155 mm [M1/M1A1](#) Cannon on M114/M114A1 towed howitzers the following ballistic performance can be attained:

Charge 1 (M3 green bag) - MV 207.3 m/s - range 3,900 m

Charge 2 (M3 green bag) - MV 234.7 m/s - range 4,800 m

Charge 3 (M3 green bag) - MV 268.2 m/s - range 6,100 m
Charge 4 (M3 green bag) - MV 310.9 m/s - range 7,800 m
Charge 5 (M3 green bag) - MV 371.9 m/s - range 9,700 m
Charge 3 ([M4A1](#) white bag) - MV 274.3 m/s - range 6,300 m
Charge 4 ([M4A1](#) white bag) - MV 316.4 m/s - range 8,000 m
Charge 5 ([M4A1](#) white bag) - MV 374.6 m/s - range 9,700 m
Charge 6 ([M4A1](#) white bag) - MV 463.3 m/s - range 12,000 m
Charge 7 ([M4A1](#) white bag) - MV 563.9 m/s - range 14,600 m.

When fired from the 155 mm M126/M126A1 Cannon on [M109](#) self-propelled howitzers the following ballistic performance can be attained:

Charge 1 ([M3A1](#) green bag) - MV 207.3 m/s - range 3,900 m
Charge 2 ([M3A1](#) green bag) - MV 236.2 m/s - range 4,900 m
Charge 3 ([M3A1](#) green bag) - MV 275.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 317 m/s - range 8,200 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 269.7 m/s - range 6,200 m
Charge 4 (M4A2 white bag) - MV 313.9 m/s - range 8,000 m
Charge 5 (M4A2 white bag) - MV 373.4 m/s - range 9,800 m
Charge 6 (M4A2 white bag) - MV 461.8 m/s - range 12,000 m
Charge 7 (M4A2 white bag) - MV 562.4 m/s - range 14,600 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers, the 155 mm Smoke WP M110 family can attain the following ballistic performances:

Charge 2 ([M3A1](#) green bag) - MV 237.7 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 277.4 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 318.5 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 292.6 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 336.8 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 393.2 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 475.5 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 565.4 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

When fired from the 155 mm [M119](#) Cannon on the [M198](#) towed howitzer the following ballistic performance can be attained:

Charge 2 ([M3A1](#) green bag) - MV 239.8 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 280.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 322.9 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 380.1 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 296.5 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 340.9 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 398 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 482 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 574.3 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

With the 155 mm M284 Cannon used on the M109A5 and [M109A6](#) Paladin self-propelled howitzers, the 155 mm Smoke WP M110 fired using the M203/M203A1 Charge 8S can attain a maximum range

of 24,000 m.

Giat Industries of France produces a combustible case intended for use with all NATO standard 155 mm weapons. The case consists of a skirt, a base and a cover containing Charges 6 to 9; lower charges are formed using bagged charges. Use of this case system produces a barrel life at maximum charge of 3000 EFC.

The muzzle velocities produced using this combustible case system are as follows:

Charge 6 - 586 m/s

Charge 7 - 705 m/s

Charge 8 - 810 m/s

Charge 9 - 830 m/s.

Charge 9 can fire a standard projectile to a maximum range of 24,000 m.

Chartered Ammunition Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter, and weighs 10 kg.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are in the process of adopting similar modular charge systems.

Specifications

Weights:

complete projectile - 44.675 kg

filling - approx 7.07 kg WP

burst charge, M110, M110A1 - 185 g tetrytol

burst charge, M110A2 - 208 g Comp B5

Lengths:

body - 605.3 mm

with lifting plug - 680.2 mm

with fuze - 698 mm

Max body diameter: 154.89 mm

Diameter over driving band: 157.98 mm

Authorised fuzes

PD M508, M557, M739. May also be used with PD M51A5, M535
MTSQ M564, M582. Prox M732

Equivalent projectiles

BELGIUM

Manufacturer

PRB SA

Type: 155 mm Smoke WP NR-149

Description: Stated to be equivalent to WP/Smoke M110. No longer in production but still in widespread service

FRANCE

Manufacturer

Giat Industries

Type: 155 mm WP/Smoke M110

Description: Standard US specifications. No longer in production but likely to be encountered

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: 155 mm WP/Smoke M110

Description: Standard US specifications

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 155 mm WP/Smoke M110A2

Description: Standard US specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 155 mm Smoke

Description: Based on 155 mm Smoke WP M110 series. Weight 42 kg and WP filling 6 kg. Maximum muzzle velocity 564 m/s and maximum range 15,000 m. Fitted with PD M572 fuze

[IRAQ](#)

Manufacturer

Al Muthanna State Establishment

Type: Chemical - designation unknown

Description: This chemical projectile appears to be of the 155 mm Smoke WP M110 type but its exact designation is not known - no markings were carried. The provenance of the projectile bodies is also uncertain but they appear to have been produced in Europe and exported in an empty but finished form to [Iraq](#) for filling at the Al Muthanna State Establishment, 100 km to the northwest of Baghdad. Each projectile carries 3.5 litres of Mustard (H) agent and a tetryl burster. By mid-1992, a total of 12,694 projectiles had been counted and scheduled for destruction

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 155 mm WP/Smoke M110A2

Description: Standard US specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm IM150

Description: Similar to M116 series. Contains 7 kg of White Phosphorus (WP)

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 155 mm WP/Smoke M110A2

Description: Standard US specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm Smoke WP

Description: Stated to be equivalent to WP/Smoke M110

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries

Type: 155 mm Smoke WP M110

Description: Standard US specifications, although containing 7.1 kg of WP, with unfuzed weight given as 43.6 kg. Propelling Charge M4A2 also produced along with Propelling Charge C20 for use in high-performance ordnance

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: 155 mm WP/Smoke M110

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: 155 mm WP/Smoke ME110A2

Description: Standard US specifications

Manufacturer

FOREX SA

Type: 155 mm WP/Smoke M110

Description: Standard US specifications

[TAIWAN](#)

Manufacturer

Hsing Hua Company

Type: 155 mm WP/Smoke M110

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 155 mm WP/Smoke M110

Description: Standard US specifications. Production on request

UNITED STATES OF AMERICA

Manufacturer

Thiokol Corporation, Scanton Army Ammunition Plant

Type: 155 mm WP/Smoke M110

Description: Standard specifications. No longer in production

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Projectile 155 mm: WP/Smoke, ME110A2, the version of the standard M110A2 produced in Spain by EXPAL

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

0.50 Spotting Rifle

Synonyms:

12.7 × 77 mm; 12.7 × 76 mm

Armament

Spotting Rifle [M8](#), used for targeting with [M40](#) series 106 mm recoilless guns.

Development

This round was developed in the 1950s to be fired from the 0.50 Spotting Rifle [M8](#). The [M8](#) is a purpose-built, semi-automatic, gas-operated rifle, attached to the barrel of the M40/M40A1 recoilless rifle and precisely aligned with it so that the gunner fires the spotting rifle, varying the aim until the incendiary filled bullet strikes the target. The main gun is then quickly fired. The spotting bullet and propelling charge are designed to match the trajectory of the main armament projectile, so that where the spotting bullet hits, the main projectile will also hit if fired almost immediately after the gunner observes the strike of the spotting bullet. The [M40A1](#) is obsolete in US service, but is still in widespread use elsewhere.

Description

The round is a shortened version of the [0.50 Browning](#) machine gun round, using a shorter case, reduced propellant charge and a special bullet. Its ballistics closely match those of the 106 mm

M40/M40A1 recoilless rifles. The current service bullet is the Tracer [M48A2](#), a boat tailed bullet with flat tip. The jacket is brass, with a lead core to the mid and rear sections. The front section is filled with incendiary composition and has a small detonator in the bullet nose; the rear portion is counterbored and filled with tracer composition. The bullet gives a red trace from 100 to 1,300 m range; on striking the target it gives a flash and a smoke puff to indicate a hit.

Specifications

Spotter/tracer [M48A2](#)

Round length: 116.5 mm

Case length: 77 mm

Rim diameter: 20.3 mm

Bullet diameter: 12.96 mm

Bullet weight: 53.6 g

Muzzle velocity: 532 m/s

Muzzle energy: 7,585 J

BELGIUM

Manufacturer

FN HERSTAL SA

Type: Spotter Tracer [M48A1](#): Lead core in brass envelope; tracer at rear, red trace visible from 100-1,300 m; illuminating composition in tip; 53.6 g; MV 532 m/s

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: Spotter tracer [M8C](#): Lead core, gilding metal jacket; dark ignition tracer 90-1,350 m; illuminating composition in tip; 53.7 g; V_{25} 532 m/s

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Spotter tracer [M48A2](#): Lead core, brass envelope; base tracer, illuminating composition in tip; 53.5 g; MV 545 m/s

INDIA

Manufacturer

Ordnance Factory Khamaria

Type: Spotter tracer [M48A2](#): Lead core, brass envelope, base tracer, illuminating composition in tip; 53 g; MV 540 m/s

SOUTH AFRICA

Manufacturer

[PMP](#) (Division of Denel)

Type: Spotter tracer [M48A2](#): Lead core, gilding metal envelope; base tracer, illuminating composition in tip; 53 g; MV 540 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Spotter tracer [M48A2](#): Lead core, brass envelope; base tracer, illuminating composition in tip; 53 g; MV 550 m/s

UNITED STATES OF AMERICA

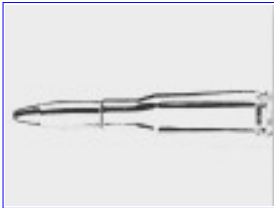
Manufacturer

Government contractors

Type: Spotter tracer [M48A2](#): Lead core in brass jacket; tracer at rear, red trace to 1,300 m; illuminating composition in tip; 53.6 g; MV 532 m/s

Practice tracer T249E1, T249E2: These resemble the service [M48A2](#) but do not have the recessed bullet tip and are inert except for their tracer filling. They simulate the flight of the [M48A2](#) for training purposes

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0.50 Spotting Rifle



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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: APFSDS-T M833

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The 105 mm APFSDS-T M833 may be regarded as an improved version of the M774 and, apart from a longer penetrator assembly, differs mainly in the design of the sabot which was redesigned to reduce weight. The M833 was type classified in 1983. It is a full service round which is normally only fired in time of war.

Foreign Military Sales (FMS) of the 105 mm APFSDS-T M833 were made to [Israel](#) (300), [Jordan](#) (2,130), [Pakistan](#) (10,025), [Saudi Arabia](#) (320), and [Turkey](#) (22,920).

Description

The 105 mm APFSDS-T M833 is a fixed round with the projectile assembly crimped onto an M148A1B1 cartridge case. The projectile assembly consists of a subprojectile and a sabot. The M833 subprojectile consists of a monobloc Depleted Uranium (DU, or staballoy) core acting as the penetrator rod, the front part being sheathed in an aluminium windshield with a steel tip to prevent aerodynamic heating. An aluminium alloy fin assembly is fitted to the rear of the penetrator rod and contains an [M13](#) tracer, which burns for a minimum of 2.5 seconds, held in place by a threaded plug and disc assembly. The sabot is aluminium and consists of three 120° segments assembled around the subprojectile, it is

interfaced with the penetrator body by a series of mating buttress grooves. The sabot differs, as mentioned previously, from earlier designs mainly in the incorporation of gussets in the sabot segments to retain strength and rigidity while reducing weight. A stainless steel bourrelet, containing three shear cuts, is screwed onto the forward face of the sabot. A two-piece nylon obturator and polypropylene seal is assembled around the sabot and a silicone rubber seal is applied over the rear face.

The M148A1B1 cartridge case contains approximately 5.8 kg of loosely packed [M30](#) propellant. An [M120](#) electrical primer is fitted to the base; the primer includes a flash tube extending almost to the tail of the projectile assembly. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case. A barrel wear reducing titanium dioxide liner is secured to the interior wall of the cartridge case.

Muzzle velocity is 1,494 m/s. No details regarding armour penetration performance have been released.

The US Army training round for the M833 is the 105 mm TPDS-T M724A1. The TPDS-T M724A1 is also produced in Belgium by MECAR SA and in [Egypt](#) by the Heliopolis Company for Chemical Industries. **In the USA the main producer of the TPDS-T M724A1 is General Dynamics, Ordnance and Tactical Systems (GD-OTS).**

The main details for the TPDS-T M724A1 are round weight, 14.52 kg and round length, 838.2 mm. Muzzle velocity is 1,539 m/s using a single-base propellant.

Specifications

Weights:

complete round - 17.55 kg

projectile assembly - 6.192 kg

propellant - 5.8 kg [M30](#)

Lengths:

complete round, max - 998.7 mm

projectile assembly - 551.2 mm

cartridge case - 617 mm

Muzzle velocity: 1,494 m/s

Authorised fuzes

None involved

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: 105 mm APFSDS-T M1060 and M1060A1

Description: See separate entry. Also known as the 105 mm TK-APFSDS-T M1060

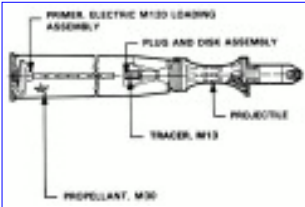
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The 105 mm TK-APFSDS-T M1060, the MECAR equivalent to the Cartridge, 105 mm: APFSDS-T M833



Cross-section of projectile for the Cartridge, 105 mm: APFSDS-T M833



Outline drawing of the Cartridge, 105 mm: APFSDS-T M833 (2000)



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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MECAR A1 Series mortar bomb family

Description

The MECAR A1 Series of 81 mm mortar bombs is used in M1 low-pressure, M29/29A1 medium-pressure and [M252](#) and [L16](#) series high-pressure mortar systems and their equivalents. Five models of bomb are available and may be divided into two groups of ballistically matched bombs, that is M511A1 to M513A1 using a common firing table and M514A1 and M515A1 fired to a second firing table. The bombs available are: Smoke (FM) (TTC) M511A1; HE M512A1; smoke (WP) M513A1; and illuminating M515A1.

Bombs are packed in three-round NATO-approved waterproof polymer containers. HE and smoke bombs have a maximum range of 5,500 m in high-pressure mortars, 4,500 m in medium-pressure and up to 2,500 m in low-pressure mortar systems.

The A1 propulsion system employs a primary cartridge comprising a screw-threaded primer and shotgun-type ignition cartridge and up to five horseshoe-type augmenting charges, the number of charges permitted to be used depending upon the pressure capacity of the mortar. The base augmenting charge is coloured blue, and there are three translucent cased charges and a red coloured supercharge.

Charge 0 = Primary cartridge only

Charge 1 = Primary cartridge and base augmenting charge

Charge 2 = Primary cartridge, base augmenting charge and one translucent case charge
(Charge 2 is the maximum for low-pressure mortars)

Charge 3 = Primary cartridge, base augmenting charge and two translucent case charges

Charge 4 = Primary cartridge, base augmenting charge and three translucent case charges

(Charge 4 is maximum for medium-pressure mortars)

Charge 5 = Primary cartridge, base augmenting charge, three translucent cased charges and the red cased supercharge

(Charge 5 is used only in high-pressure mortar systems)

Specifications

Primary and Augmenting Charges

Primary Cartridge: M519; Augmenting Charges (3) M521 (translucent);
Base Augmenting Charge M520 (blue); Supercharge Increment M522 (red)

81 mm HE bomb M512A1

Length: fuzed, 516 mm

Weight: fuzed, 4.1 kg

Filling: 1.03 kg Comp B

Body: nodular cast iron

Ranges: 100-4,500 m (Ch 0 to 4); to 5,500 m with Supercharge M522

81 mm Smoke (TTC) (FM) bomb M511A1

Length: fuzed, 516 mm

Weight: fuzed, 4.1 kg

Filling: 880 g titanium tetrachloride (FM)

Body: nodular cast iron

Ranges: 100-4,500 m (Ch 0 to 4); to 5,500 m with Supercharge M522

81 mm Smoke (WP) bomb M513A1

Length: fuzed, 516 mm

Weight: fuzed, 4.1 kg

Filling: 880 g WP

Body: nodular cast iron

Ranges: 100-4,500 m (Ch 0 to 4); to 5,500 m with Supercharge M522

81 mm Illuminating bomb M515A1

Length: fuzed, 625 mm

Weight: fuzed, 4.2 kg

Filling: parachute and flare canister

Body: steel

Ranges: 250-4,100 m (Ch 0 to 4); to 4,600 m with Supercharge M522

Manufacturer

MECAR SA.

Status

In production.

NEW ENTRY



*MECAR HE-TP M572A1 81 mm mortar bomb
(1999)*



*MECAR HE M512A1 81 mm mortar bomb
(1999)*



*MECAR Smoke (WP) M513A1 81 mm mortar bomb
(1999)*



*MECAR Illuminating M515A1 81 mm mortar bomb
(1999)*

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FUZES - IMPACT FUZES, BELGIUM

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NR2444

Armament

Mortar projectiles, generally.

Development

By MECAR.

Description

The NR2444 is an impact fuze designed for use with HE mortar bombs. It is constructed of aluminium.

Specifications

Type: impact

Weight: 239.0 g

Length overall: 88 mm

Optional delay: none

Manufacturer

MECAR SA.

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MORTARS - 120 mm MORTARS, BELGIUM

Date Posted: 05 September 2001

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MECAR 120 mm mortar bombs

Armament

All 120 mm smoothbore mortars.

Development

By MECAR SA as an improved performance set of rounds, for the [TDA](#) Type LT mortar and as standard rounds for use in the Royal Ordnance Armoured Mortar System (AMS).

Description

The 120 mm family of mortar bombs is currently in production by Mecar and consists of HE (Composition B), smoke (WP) and illuminating types.

The aerodynamic profile yields ranges in excess of 7,200 m with the [TDA](#) LT mortar and greater than 9,000 m with the Royal Ordnance Armoured Mortar System (AMS). The HE round used in turreted armoured mortar systems can be fitted with a direct-fire fuze that will also function in indirect fire.

The HE and smoke bodies are made from high-fragmentation cast iron. Obturation is achieved by using a split-type plastic ring which fits into a groove behind the bourrelet. A light-alloy tail unit, incorporating the primary cartridge, is screwed onto the body and six interlocking augmenting cartridges, Type M546, are fitted round the tailboom for use in LT mortars. When fired in the Royal Ordnance AMS, a supplementary augmenting cartridge (Ch 7s) Type M553 is added to achieve the 9,200 m range.

The bombs are packaged in two-round NATO-approved polymer containers.

Specifications

HE M530A1

Length, fuze: 780 mm

Weight, fuze: 14.3 kg

Weight and type of payload: 2.6 kg Comp B

Number of charges: Primary M547 + 6 augmenting M546 ([TDA LT](#))

Primary M547 + 6 augmenting M546 + augmenting charge 7s M553 (RO AMS breech loading)

Fuze: impact, SQ and delay

Max range: >9,200 m (AMS)

Muzzle velocity: 440 m/s (AMS)

HE(PRAC) M528A1

The practice round is available for training purposes. It is inert filled and has the same ballistics as the remainder of the 120 mm family of ammunition.

Smoke (WP) M532A1

Length, fuze: 780 mm

Weight, fuze: 14.3 kg

Weight and type of payload: 2.45 kg WP

Number of charges: Primary M547 + 6 augmenting M546 ([TDA LT](#))

Primary M547 + 6 augmenting M546 + augmenting charge 7s M553 (RO AMS breech loading)

Fuze: impact, SQ and delay

Max range: >9,200 m (AMS)

Muzzle velocity: 440 m/s (AMS)

Illuminating M533A1

Length, fuze: 780 mm

Weight, fuze: 14.3 kg

Type of payload: parachute and flare

Number of charges: Primary M547 + 6 augmenting M546 ([TDA LT](#))

Primary M547 + 6 augmenting M546 + augmenting charge 7s M553 (RO AMS breech loading)

Fuze: MTSQ

Illumination intensity: 1 Mcd

Burning time: 50 s

Rate of descent: 5 m/s

Max range: >9,200 m (AMS)

Muzzle velocity: 440 m/s (AMS)

Manufacturer

MECAR SA.

UPDATED



MECAR 120 mm HE bomb M530A1



MECAR 120 mm smoke (WP) bomb M532A1



MECAR 120 mm illuminating bomb M533A1



MECAR 120 mm practice bomb M528A1

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TANK AND ANTI-TANK GUNS

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for Giat 90 mm CN 90 F1 guns

Armament

Giat Industries 90 mm CN 90 F1 and F2 guns fitted to the following vehicles: AML (4 × 4) armoured car with H 90 turret; [ENGESA EE-9](#) (6 × 6) armoured car with H 90 turret; Panhard ERC Lynx (6 × 6) armoured car with Lynx 90 turret; prototype [SIBMAS](#) (6 × 6) vehicle with Lynx 90 turret; X1A1 light tank ([Brazil](#)); GT2 gun fitted to [Eland](#) 90 and [Ratel](#) 90 ([South Africa](#)).

Development

The 90 mm CN 90 F1 gun was originally known as the DEFA D921, so its ammunition is sometimes known as 90 mm DEFA ammunition. The 90 mm CN 90 F1 has also been referred to as the CN90F1. It is a light gun firing fin-stabilised projectiles and is intended for mounting on light vehicles.

The F1 gun was produced in [South Africa](#) as the 90 mm GT2 for mounting in the [Eland](#) 90 and [Ratel](#) 90 combat vehicles. At one time some South African-produced guns were mounted on light field carriages but these are no longer in service.

Description

The ammunition fired by the 90 mm CN 90 F1 and F2 guns is fixed by a single continuous crimping ring, with the projectiles rigidly secured to the straight sided brass cartridge cases. The projectiles are finned and have bodies encircled by copper drive bands. The brass cartridge cases are fitted with percussion primers and have their GBTU 125 multiperforated propellant charges contained inside a silk bag.

The ammunition family for the 90 mm CN 90 F1 and F2 guns includes the following rounds:

90 mm HEAT-T, OCC F1 This anti-armour round uses a steel-nosed, aluminium alloy bodied projectile containing a shaped charge formed from 670 g of RDX/TNT 60:40 located behind a copper cone liner. The warhead can penetrate 120 mm of armour plate set at an angle of 60°, or 300 to 320 mm of armour plate set at a vertical angle. The projectile has a maximum range of 1,500 to 1,800 m but the maximum effective range is approximately 1,100 m. For safety, the base-mounted electrical fuze (referred to in some instances as the G4C) is maintained in a short-circuited state until after firing. It will function instantaneously when the nose-mounted piezoelectric generator strikes a hard target and generates an electric current to detonate the explosive filling.

The Practice round used to simulate the 90 mm HEAT-T OCC F1 is the completely inert 90 mm TP-T BSCC 90 F1 which uses an aluminium bodied projectile with a tracer element in the base.

90 mm HE, OE F1 Intended for general use, the projectile with this round uses a forged steel body filled with 945 g of RDX/TNT 60:40. It produces blast and fragmentation effects at ranges up a maximum of 1,800 m. The nose-mounted fuze, referred to in some instances as the FUIF2, functions on direct and graze action. Some projectiles have tracer elements lasting 4 seconds fitted to the base.

MECAR SA also produce the 90 mm HE-T M631A1, filled with 1 kg of Composition B.

90 mm SMK-WP, OFUM F1 This round may be regarded as a White Phosphorus (WP) filled equivalent to the 90 mm HE OE F1. It employs a similar nose-mounted direct and graze action fuze which functions to burst open the projectile's steel body and release WP creating a smoke screen up to 50 m wide and lasting 20 to 30 seconds. Maximum range is 1,800 m and combat range 800 m. Some of these projectiles may have tracer elements fitted to the base.

90 mm Canister, ODR F1 Intended for use as an anti-ambush and close-in defence anti-personnel round, the 90 mm Canister ODR F1 is fitted with a blunt-nosed, straight sided, thin-walled projectile containing approximately 1,100 lead spheres weighing 4 kg. As the projectile leaves the gun muzzle the projectile casing breaks open to release the lead spheres in a cone-shaped pattern. Maximum effective range is 150 m.

ODR stands for Obus de Defense Rapprochée. This round is no longer available from Giat Industries.

90 mm APFSDS-T, M645 This anti-armour round was developed by MECAR SA specifically for use with the 90 mm F1 gun. It has a tungsten alloy long rod penetrator which is fired with a muzzle velocity of 1,050 m/s to an operational range of more than 1,300 m. It can penetrate 70 mm of Rolled Homogeneous Armour (RHA) at an incidence of 60°. Time of flight to 1,300 m is less than 1.4 seconds. The finned tail assembly contains a tracer which burns for the first 4 seconds of the trajectory. The complete round weighs 6.8 kg of which 1.4 kg is multiperforated propellant. The projectile weighs 2.5 kg and is 425 mm long. The complete round is approximately 645 mm long.

A practice round known as the 90 mm FSDS-TP-T M664 has the same ballistic characteristics as the 90 mm APFSDS-T M645 but uses a steel long rod projectile.

90 mm Blank Produced by Giat Industries with a shortened primer. Weight is 3.4 kg.

Specifications

Type	HEAT-T	HE	SMK-WP	HEAT-TP
Designation	OCC F1	OE F1	OFUM F1	
Weights:				
complete round	7.1 kg	8.95 kg	9.07 kg	7.1 kg
projectile	3.6 kg	5.28 kg	5.4 kg	3.6 kg
filling	670 g	945 g	800 g	None

propellant	680 g	650 g	650 g	680 g
Lengths:				
complete round	654 mm	639 mm	639 mm	654 mm
projectile	500 mm	480 mm	480 mm	500 mm
Muzzle velocity	750 m/s	640 m/s	640 m/s	750 m/s
Max combat range	1,100 m	1,800 m	1,800 m	1,100 m

Authorised fuzes

See text

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: HEAT-T M630, HE-T M631

Description: The HEAT-T round is a high explosive anti-tank round, with an electronic base detonating fuze. Fitted with two independent in - bore safeties. The fuze has a nose switch and graze element. Round weight is a nominal 8.0 kg, propellant weight is 1.0 kg of single base multi-perforations. Combat range is 1,000 m with penetration 120 mm of RHA at 60°. Muzzle velocity is 750 m/s.

The HE-T M631 projectile is filled with a nominal 1 kg of Composition B and fitted with dual-safety electronic PD, graze and delay fuze to MIL-STD-1316. Round weight is a nominal 9 kg, projectile weight 5 kg and propellant weight (single base, multiperforations) 1 kg. Combat range given as 1,000 m with maximum range 1,800 m. Muzzle velocity at 21°C is 650 m/s

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: APFSDS, HEAT-T, HEAT-TP-T, HE-T

Description: Standard specifications

FRANCE

Manufacturer

Giat Industries

Type: HEAT, HE, SMK-WP, HEAT-TP

Description: See text

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: HEAT, HE, TP, Canister

Description: No longer in production but stocks retained for service. Standard specifications for all

rounds other than Canister which is a local development. It contains approximately 1,100 spherical subprojectiles 8.5 mm in diameter, fired at a muzzle velocity of 450 m/s to a range of 200 to 250 m

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: HEAT, HE, SMK-WP

Description: Standard specifications

UPDATED



Ammunition produced by Giat Industries for the 90 mm CN 90 F1 gun, from left: HEAT-T OCC F1; HE OE F1; SMK WP OFUM F1; Canister ODR F1; HEAT-TP-T BSCC F1



90 mm HEAT round produced by [Arm Scor](#) (Denel) for the 90 mm F1 gun



90 mm HE round produced by [Arm Scor](#) (Denel) for the 90 mm F1 gun



90 mm HE-T M631 produced by MECAR SA (1998)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for Cockerill and ENGESA 90 mm guns

Armament

Cockerill Mk II, III and III MA1 guns; ENGESA EC-90 guns.

Development

The development of the first Cockerill 90 mm light gun system began during 1974. The first production gun, the Mk 1, was replaced by the Mk II which had a revised recoil mechanism. The Mk II was eventually joined by the Mk III which uses a triple-baffle muzzle brake, as opposed to the MECAR devised Mk III MA1 which has a single-baffle muzzle brake to enable the gun to fire an APFSDS-T round. The latter features were available as an enhancement for existing Mk II and III Cockerill Guns. Over 2,000 Cockerill Guns were produced for service throughout the world.

Licensed production of the Cockerill Mk II was undertaken in [Brazil](#) by ENGESA Engenheiros Especializados SA. The resultant gun, the EC-90, was further developed by ENGESA with revised recoil lengths. It is fitted to many Brazilian produced armoured vehicles such as the [EE-9 Cascavel](#) reconnaissance vehicle, the [EE-11 Urutu](#) APC and the X1A2 light tank. This gun is no longer produced.

The 90 mm ammunition for the Cockerill Guns is produced by: MECAR SA, Belgium; ENGEQUÍMICA, [Brazil](#); [BAE Systems](#), RO Defence, UK; and Giat Industries, France.

During 1994, MECAR SA released its modernised range of 90 mm ammunition, denoted by the suffix A1. This included the introduction of two independent in-bore safeties on the HEAT-T, HE-T, SMK(WP)-T and HESH-T; well over 100,000 rounds have been produced. MECAR SA now produces only A1 standard rounds.

In late 1990, Royal Ordnance plc (now [BAE Systems](#), RO Defence) signed an agreement with Cockerill Mechanical Industries, of Belgium, to become the sole authorised manufacturers of 90 mm Cockerill Gun Mk III ammunition.

The 90 mm rounds for the Cockerill Gun Mk III, were originally developed by PRB SA of Belgium in co-operation with Cockerill Mechanical Industries (CMI). After qualification by CMI, 90 mm ammunition was produced by PRB SA but, following the demise of that concern, production is now undertaken by Giat Industries of France. Significant stocks of PRB produced 90 mm Cockerill Gun ammunition remain with many users so a checklist of PRB designations is provided in the text, the same designations being used by Giat Industries' products.

Description

All rounds for the 90 mm Mk II and III Cockerill Guns are fixed with the finned steel projectiles, crimped into their cartridge

cases by a 360° crimping ring. The drive bands are gilding metal or copper. Cartridge cases produced by MECAR SA are brass. In all cases, other than the MECAR 90 mm APFSDS-T M652, a cool burning single-base propellant is used along with a percussion primer. The projectiles all have fin assemblies for in-flight stabilisation with each fin assembly having four fixed T-shaped fins.

The 90 mm rounds are provided with special graze action fuzes with two independent safeties which comply with MIL-STD-1316. These fuzes function at very small impact angles, for example as small as 2° incidence, and a tail-mounted tracer element that burns for 4 seconds after firing. In all cases the fuze muzzle safety distance is a minimum of 25 m.

A full listing of 90 mm rounds for the Mk II and III Cockerill Guns follows.

HE-T MECAR M616A1. Intended for general purpose blast and fragmentation, this round has a steel projectile filled with 1.02 kg of Composition B. The round is fitted with a nose-mounted double safety fuze which complies with MIL-STD-1316. This fuze has a switch which can be set by the firer at PD or Delay. Fired at a muzzle velocity of 700 m/s, the projectile has an operational range of 800 m and a maximum effective range of 2,200 m.

The MECAR training round equivalent to the 90 mm HE-T M616A1 is the HE-T (PRAC) M638.

The RO Defence equivalent to this HE-T is the 90 mm HE-T RO 924, which weighs 8.5 kg, and the projectile is filled with TNT/HNS. The round length is 631 mm while maximum effective range is 2,200 m. RO Defence also produced a 90 mm HE-APERS RO 925 round, with which fragmentation of the TNT filled projectile is augmented by the inclusion of a prenotched internal fragmentation sleeve combined with a fast reaction percussion fuze. This round has a maximum effective range of 6,000 m using indirect fire techniques. The HE-APERS RO 925 round weighs 11 kg and is 675 mm long. Muzzle velocity is 330 m/s. This round is no longer marketed.

The 90 mm HE-T round produced by Giat Industries weighs 8.5 kg and is 631.5 mm long. Projectile weight is 5.1 kg and propellant weight 1 kg.

The PRB or Giat Industries designation for the 90 mm HE-T round is HE-T NR501. The PRB equivalent to the HE-T (PRAC) was the HE-TP-T NR558.

SMK(WP)-T MECAR M618A1. Intended to produce smoke for screening, target marking, signalling or incendiary purposes this round contains 1.12 kg of White Phosphorus (WP). The nose-mounted fuze involved is a special double safety fuze (complying with MIL-STD-1316) which ignites an internal burster charge to disperse the smoke producing WP. The ballistics of this round the same as the 90 mm HE-T M616A1. The range is 800 mm and maximum effective range 2,000 m.

The MECAR training round equivalent to the 90 mm SMK(WP)-T M618A1 is the HE-T (PRAC) M638A1.

RO Defence produces the 90 mm Smoke-WP-T RO 932 round weighing 8.5 kg. Round length is 631 mm and muzzle velocity 695 m/s. Maximum effective range is 2,200 m.

The PRB or Giat Industries designation for the Smoke WP round is Smoke-WP-T NR502. The PRB equivalent to the MECAR training round HE-T (PRAC) was the HE-TP-T NR558. This round is no longer in series production by Giat Industries.

HEAT-T MECAR M620A1. This round is intended primarily for use against armoured targets and has a metal lined shaped charge, containing 510 g of Composition A-3 (RDX/Wax 91/9) which can penetrate 300 mm of RHA or 1 m of concrete. Muzzle velocity is 900 m/s. The operational range is 1,000 m and maximum effective range is 1,500 m.

The MECAR training round equivalent to the 90 mm HEAT-T M620A1 is the HEAT-TP-T M623A1.

RO Defence produces the 90 mm HEAT-T RO 907. This round has a 2 kg 60:40 RDX/TNT shaped warhead lined with a copper cone and is 645 mm in length. Round weight is 7.3 kg and muzzle velocity 896 m/s. Maximum effective range is 1,500 m. Royal Ordnance have produced the 90 mm HEAT-TP-T RO 940, a low-cost training round which can be used as a multipurpose training round for the entire Royal Ordnance 90 mm ammunition suite.

The 90 mm HEAT-T round produced by Giat Industries weighs 7.7 kg and is 630 mm long. Projectile weight is 4.1 kg and propellant weight 1.2 kg. A matching HEAT-TP-T round is also produced.

The PRB or Giat Industries designation for the HEAT-T round is HEAT-T NR478. The PRB/Giat Industries equivalent to the HEAT-T (PRAC) is the HEAT-TP-T NR479.

CNT MECAR M621A1. The abbreviation CNT stands for Canister and, as with other rounds of its type, it is a short-range anti-personnel 'shotgun' round containing 1,300 lead spheres, each 8.5 mm in diameter and having a total weight of 5.1 kg. The spheres are contained in a blunt-nosed light steel sheet cylindrical casing with longitudinal grooves in the sides. On firing, a combination of centrifugal and aerodynamic forces cause the casing to split open along the longitudinal grooves and disperse the lead spheres forward in an 18° cone, to a maximum operational range of 200 m. At that range the cone will be 9 m wide. Initial muzzle velocity is 700 m/s.

RO Defence produce the 90 mm Canister RO 933 which fires 1,200 metal spheres to a maximum effective range of 220 m and a muzzle velocity of 200 m/s. The RO 933 round weighs 6.4 kg and is 352 mm long.

ENGEQUÍMICA of [Brazil](#) produces its own design of 90 mm Canister round which is stated to have a muzzle velocity of 600 m/s and a maximum operational range of 700 m. The designation is 90G shrapnel.

The PRB or Giat Industries designation for this type of round is Canister NR125. This round is no longer in series production

by Giat Industries.

HESH-T MECAR M625A1. This round is intended for use against armoured targets, although it is also effective against concrete bunkers and structures. It has a round-nosed thin-walled steel projectile containing 1.3 kg of Composition A-3 (RDX/Wax 91/9). On contact with a target the thin steel projectile walls collapse to spread the explosive filling in a 'plaster' across the target surface before the delayed action BD/Graze fuze functions to detonate the filling. The resultant detonation forces and blast are then directed over the target surface and transmitted through the target material. When used against RHA, the resultant forces are sufficient to create severe internal spalling effects, usually in the form of a fragment weighing approximately 5 kg which travels at a high velocity inside the target. The muzzle velocity of this round is 750 m/s and operational range 800 m. The MECAR training round equivalent to the 90 mm HESH-T M625A1 is the HESH-TP-T M655A1.

RO Defence produces the fin-stabilised 90 mm HESH-T RO 929, described as a multifunction round with an 2.4 kg Composition B warhead. Weight is 7.7 kg and round length 591 mm. Muzzle velocity is 790 m/s and maximum effective range 1,200 m.

The 90 mm HESH-T round produced by Giat Industries weighs 7.5 kg and is 591 mm long. Projectile weight is 4.3 kg and propellant weight 1.15 kg.

The PRB or Giat Industries designation for this type of round is HESH-T NR503.

APFSDS-T MECAR M652A1. This round is used only with the Cockerill Mk III MA1 gun which has a single-baffle muzzle brake. It has a 2.5 kg projectile assembly carrying a monobloc tungsten alloy long rod penetrator. The penetrator is 426 mm long, contained in a three-piece aluminium discarding sabot. It is held in place by a plastic band at the forward end and a plastic obturating band toward the sabot case. A tracer element, which burns for 4 seconds after firing, is located in the penetrator fin assembly. The projectile assembly is crimped to the cartridge case which is filled with 1.8 kg of loose, cool burning, multiperforated propellant. The muzzle velocity is approximately 1,200 m/s and the penetrator can pierce 100 mm of armour set at an angle of 60°, at combat ranges of 1,500 m. Penetrator time of flight to 1,500 m is less than 1.4 seconds. The effective range is more than 1,500 m and accuracy error less than 0.3 mil. The effective operational range of the M652A1 is more than 1,500 m.

The equivalent MECAR training round to the 90 mm APFSDS-T M652A1 is the 90 mm TPFSDS-T M663. It has the same external ballistics as the APFSDS-T M652A1 but the penetrator rod is steel.

ENGEQUÍMICA of [Brazil](#) also developed a 90 mm APFSDS-T round which has been in production since 1988. The penetrator length-to-diameter ratio is 17:1 with a penetrator diameter of 22 mm. Penetrator weight is 2.06 kg and projectile weight (with sabot) is 3.225 kg. Muzzle velocity is 1,150 m/s. It is stated that this round can penetrate a NATO medium tank target at a range of 1,100 m; effective range is up to 3,000 m and accuracy 0.6 mil at 1,000 m.

The RO Defence 90 mm APFSDS round is the RO 964. It has a muzzle velocity of 1,080 m/s and the complete round weighs 6.3 kg. It was designed to defeat 130 mm of RHA at 1,000 m.

The PRB or Giat Industries designation for their APFSDS-T round was the NR232; it is no longer available.

Training devices MECAR SA produces a special subcalibre training device for use with the 90 mm Cockerill Mk II and III guns, known as the TD-20-90 M640. It consists of a one-piece training device resembling a complete 90 mm round with a 20 mm 12-groove right-hand twist barrel running along the centre length of the device. A special 20 mm Target Practice round, the TP-20-90 M634, is hand loaded into a breech in the base of the device which is loaded and fired as if it were a conventional piece of 90 mm ammunition. The 20 mm projectile can be fired to normal combat ranges.

The barrel of the TD-20-90 has a life of several thousand rounds. The device is 700 mm long and weighs 7.3 kg. Muzzle velocity of the 20 mm projectile is 750 m/s. It is fired using a percussion primer initiated by the gun's normal firing mechanism. The TP-20-90 round is 185 mm long and weighs 190 g. It has a tracer which burns for 4 seconds.

CMI (Cockerill Mechanical Industries) markets another subcalibre barrel insert training device based on the use of special Oerlikon Contraves Pyrotec 20 mm TP-T ammunition. The 85-calibre barrel insert occupies the entire length of the barrel and is loaded through the normal breech block. The firing range of 800 to 1,000 m is the same ballistically as for full-calibre ammunition. The TP-T cartridge, the ULA 226 TPT is 203.5 mm long and weighs 320 to 340 g.

Dynamit Nobel also offer a subcalibre training device for 90 mm Mk III guns, this time a 14.5 mm device with a training range of 100 m to allow small training areas to be utilised. The 28-calibre single-shot device is inserted into the open breech of the gun and is loaded with 51 mm long cartridges weighing approximately 70 g. The TP-T cartridges simulate the full calibre HEAT-T and HESH-T projectiles and are fired with a muzzle velocity of 150 m/s to a training range of 100 m.

Specifications

MECAR rounds

Type	HE-T	Smoke (WP)-T	HEAT-T	CNT	HESH-T	APFSDS-T	TPFSDS-T
MECAR designation	M616A1	M618A1	M620A1	M621A1	M625A1	M652A1	M663
Weights:							

round	9.04 kg	9.22 kg	8.3 kg	7.9 kg	8.23 kg	7.2 kg	7.0 kg
projectile	5.1 kg	5.3 kg	4.15 kg	5.1 kg	4.3 kg	2.5 kg	2.5 kg
propellant	1.14 kg	1.13 kg	1.4 kg	1.14 kg	1.2 kg	1.8 kg	1.8 kg
filling	1.02 kg	1.12 kg	510 g	5.1 kg	1.3 kg	n/a	n/a
Filling type	Comp B	WP	Comp A-3	lead balls	Comp A-3	n/a	n/a
Round length	640 mm	640 mm	680 mm	526 mm	600 mm	647 mm	650 mm
Muzzle velocity	700 m/s	695 m/s	900 m/s	700 m/s	800 m/s	1,200 m/s	1,200 m/s
Operational range	800 m	800 m	1,000 m	200 m	800 m	over 1,500 m	n/avail
Effective range	2,200 m	2,000 m	1,500 m	200 m	800 m	n/avail	n/avail

Authorised fuzes

See text

Equivalent rounds

BELGIUM

Manufacturer

MECAR SA

Type: See text

Description: See text and specifications

BRAZIL

Manufacturer

ENGEQUÍMICA

Type: HE-T, HEAT-T, HEAT-TP-T, HESH-T, Smoke (WP)-T, APFSDS-T, Canister

Description: Standard specifications - see text

Manufacturer

FI Indústria e Comércio Ltda

Type: HE-T, HEAT-T, HEAT-TP-T, APFSDS-T

Description: Standard specifications

FRANCE

Manufacturer

Giat Industries

Type: HEAT-T, HEAT-TP-T, HE-T, HESH-T

Description: See text

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: See text

Description: See text

UPDATED



Range of RO Defence 90 mm rounds for Cockerill guns, from left: HESH-T RO 929; HEAT-TP-T RO 940; HEAT-T RO 907; HE-APERSE-FRAG RO 925; Canister RO 983; HE-T RO 924; Smoke WP-T RO 932 and APFSDS-T RO 964



The range of ammunition for 90 mm Cockerill guns produced by MECAR SA of Belgium, from left: APFSDS-T M652A1; HEAT-TP-T M623A1; HESH-T M625A1; SMK(WP)-T M618A1; HESH-TP-T M655A1; HEAT-T M620A1; HE-T M616A1; Canister M621A1



90 mm HE-T M616A1 produced by MECAR SA (2001)



90 mm SMK(WP)-T M618A1 produced by MECAR SA (2001)



90 mm APFSDS-T M652A1 produced by MECAR SA (2001)



90 mm HEAT-TP-T M623A1 produced by MECAR SA (2001)



90 mm HEAT-T M620A1 produced by MECAR SA (2001)



90 mm HESH-T M625A1 produced by MECAR SA (2001)



90 mm HESH-TP-T M655A1 produced by MECAR SA



90 mm Canister (CNT) M621A1 produced by MECAR SA

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IDENTIFICATION OF SMALL ARMS AMMUNITION, BELGIUM

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

HE	yellow
HE-I	yellow with red band superimposed
AP-I	black with red band superimposed
Practice	light blue

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IDENTIFICATION OF SMALL ARMS AMMUNITION, BELGIUM

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Uses NATO standard code

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

FN 5.7 × 28 mm

Synonyms:

5.7 mm P90; FN SS190 5.7 mm

Armament

FN HERSTAL P90 personal weapon and associated Five SevenN pistol.

Development

Developed in the mid-1980s for the P90 personal weapon. The intention was that it should replace the 9 mm Parabellum cartridge with something having better penetrative ability at short range. The bullet will penetrate a standard M1 steel helmet at 150 m range and 48 layers of Kevlar at over 50 m. The stopping power is claimed to be three times that of the 9 mm Parabellum; the bullet does not fragment but gives up its energy very rapidly on impact. **This ammunition is also manufactured in the US by Winchester-Olin.**

Description

The case is rimless, bottlenecked, steel and Berdan primed. The streamlined bullet is composed of a steel and aluminium core within a steel jacket. The Ball SS190 projectile can penetrate body armour (48 layers of Kevlar BS 1500) or a Kevlar helmet at more than 150 m.

Specifications

Ball SS190

Round length: 40.5 mm

Case length: 28.9 mm

Rim diameter: 7.8 mm

Bullet diameter: 5.71 mm

Round weight: 6 g

Bullet weight: 2.02 g

Muzzle velocity: (P90) 715 m/s; (pistol) 650 m/s

Recoil impulse: 1.95 kg m/s

Chamber pressure: <345 MPa

Muzzle energy: 540 J

BELGIUM

Manufacturer

FN Herstal SA

Type: Ball SS190: FMJ; 2.02 g; MV (P90) 715 m/s, (pistol) 650 m/s

Tracer L191: FMJ; red trace; 2.02 g; MV (P90) 715 m/s, (pistol) 650 m/s. Tracer burns from 20-200 m

Subsonic Sb193: FMJ; 3.6 g; 300 m/s

Blank: Brass case, star crimp

UNITED STATES OF AMERICA

Manufacturer

Winchester- Olin

Type: Ball SS190: FMJ; 2.02 g; MV (P90) 715 m/s (5-7 Pistol) 650 m/s

Tracer: FMJ, Red trace; 2.02 g; MV (P90) 715 m/s, (5-7 Pistol) 650 m/s. Burn is from 20-200 m

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5.7 mm FN P90



5.7 × 28 mm ammunition, from left: Ball SS190; Tracer L191; Subsonic Sb193; Blank (1997)

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 30 mm Aden Guns

Armament

All 30 mm Aden Guns; [M230](#) Chain Gun; Boeing [ASP-30](#) cannon.

Development

The Mauser MG 213C revolver cannon had a profound effect on European aircraft gun designers in the years following 1945. Development of the basic German design eventually resulted in two associated 30 mm gun designs, the British Aden Gun series and the French DEFA Series 550 weapons. Following early independent projects, shared development work between the two nations resulted in the 30 × 113 mm B cartridge which is nominally interchangeable between the Aden and DEFA series of guns. Differences between priming, propellant loads and other factors, however, render the two types of ammunition incompatible. 30 mm Aden Gun ammunition is produced in France by Giat Industries.

The 30 mm Aden Gun has been in UK service for over 50 years and remains available for production for installation in aircraft such as the Jaguar and Hawk. Ammunition production totals reached over 30 million some years ago. Development of 30 mm Aden ammunition is still continuing.

[Nammo](#) Raufoss AS of Norway produces a 30 mm MP round for firing from Aden cannon.

Description

All 30 mm Aden Gun rounds are fixed with the projectiles rigidly crimped to their J-type brass cartridge cases; lacquered steel cases have also been used. The cartridge case has a prominent raised belt just

above the extraction rim. All projectiles have copper drive bands. Primers are electrical, the latest being the RD1658 (operating at 24 or 48 V). The propellant used is 46 g of single base cut tubular NRN 141 AB.

Rounds are fed to the revolver loading mechanism on the Aden Gun in belts formed using pressed steel links.

The 30 mm Aden Gun ammunition has been, and is still being, produced in many countries. The listing of types provided here consists of the types currently manufactured in the UK by [BAE Systems](#), RO Defence.

HE Mk 6*Z This has been the standard air-to-air and air-to-ground projectile fired from Aden Guns and used by the Royal Air Force for nearly 30 years. The projectile fired has a cold drawn steel body with a pronounced hemispherical base to maximise the internal volume for explosive filling, in this case 48 g of pour-filled Torpex. On detonation this projectile will produce approximately 950 fragments, with a high blast and incendiary effect to the extent that some manufacturers refer to this round as an HE-I. A nose-mounted 944 post impact delay fuze with a safe arming distance of 2.3 m functions after 0.0005 second and will ensure self-destruct 6 to 12 seconds after firing.

The TP Mk 4Z matches the ballistics of the HE Mk 6*Z. It incorporates a unique inert insert which is claimed to make the round very cost competitive.

A further TP-T Mk 1*Z was developed to meet the specific needs of the Royal Navy. It is matched to the ballistics of the HE Mk 6*Z and is fitted with a tracer which burns for approximately 6 seconds.

HE-I, RO 376 The HE-I RO 376 was specifically designed for use in warm climates, the main change being the explosive charge is 26 g of Hexal as opposed to the Torpex of the HE Mk 6*Z. The design of the projectile body is also changed as the HE-I RO 376 has a machined steel body with a flat base. The new body, which weighs 171 g, produces a smaller number of fragments on detonation (approximately 570) but they are larger and more effective on target. The HE-I RO 376 retains the same 944 post impact delay fuze as the HE Mk 6*Z and the ballistics of the two rounds are essentially similar.

MPT, RO 379 Also known as the 30 mm MPT-LD (MultiPurpose Tracer - Low Drag). The streamlined projectile used with this round lacks a fuze as it utilises a pyrotechnic fuze with a post impact delay function for maximum behind-armour effects. It, therefore, combines penetration, high blast and incendiary features with high fragmentation. Fuze operation is achieved down to an 80° (NATO) angle of impact on aluminium. The projectile has a flat base with an insert for a tracer element and has thick walls made from high-strength steel. The explosive filling is Hexal. This round meets the requirements of MIL-STD-1466 Safety Criteria and Qualification Requirements for Pyrotechnically Initiated Ammunition (PIA).

MP Produced by [Nammo](#) Raufoss AS of Norway, this 30 mm MP projectile will function reliably against a 2 mm dural plate at impact angles between 0 and 87° NATO but will not function against a 0.5 mm dural plate in front of the gun muzzle. No fuze is involved as the MP projectile relies upon a drop safe pyrotechnic ignition train. When impacting against aircraft type targets the projectiles will detonate approximately 300 mm within the aircraft. The distribution of fragments is approximately 20° on each side of the line of fire; the fragments are heavy and optimised to defeat material type targets. The secondary incendiary effects will ignite JP4 and JP5 or heavy diesel oil in self-sealing tanks. Incendiary and blast effects are contained within the target. The tracer element is also designed to act as a partial base bleed to reduce the projectile's base drag.

The length of the [Nammo](#) Raufoss 30 mm MP round is given as 197.2 mm and it weighs 500 g; projectile weight is 225 g. Muzzle velocity is 730 m/s.

AP Mk 1*Z This armour-piercing round is no longer produced by RO Defence but may still be

encountered. It uses a flat-based projectile with a two-part body assembly protected by a light metal windshield over the nose. The two halves of the body are threaded together and contain a heavy metal penetrator core capable of entering up to 25 mm of armour.

Specifications

Weights:

complete round, HE, HE-I, MPT - 496 g

propellant - 46 g

Lengths:

complete round: 198 mm

cartridge case: 113 mm

Muzzle velocity: 785 m/s

Authorised fuzes

See text

Equivalent rounds

BELGIUM

Manufacturer

FN HERSTAL SA

Type: HE-I, HE-I-SD, AP-HE-I-SD, TP

Description: No longer produced but may still be retained in service with some nations. Standard specifications

FINLAND

Manufacturer

Patria Vammas Oy

Type: HEI, HEI-SD, HEI-T, SAPHEI, APHC, TP, TP-T

Description: Standard specifications. Produced by Vammas Defencetec Ltd

FRANCE

Manufacturer

Giat Industries

Type: HE-I, TP

Description: Standard specifications. HEI fitted with MR 3001 PD fuze. Other natures such as AP-T no longer in series production

INDIA

Manufacturer

Indian Ordnance Factories

Type: HE

Description: Produced at Ordnance Factory Khamaria, Jabalpur as 'Upgrade' for Aden Guns. Weight of

complete round 432 ± 20 g and projectile 219 ± 3 g. Muzzle velocity 780.8 m/s

NORWAY

Manufacturer

[Nammo](#) Raufoss AS

Type: MP

Description: See text

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries Pte Ltd

Type: HE-I, SAPHEI, EP (TP)

Description: HE-I and SAPHEI both have Hexal fillings. The base-fuzed SAPHEI has a muzzle velocity of 765 m/s and can penetrate 15 mm of armour plate at normal impact angles

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: HE, HE-I, MP-T, TP, TP-T

Description: See text

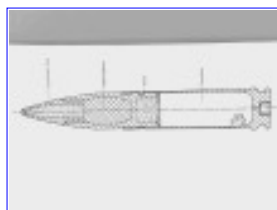
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Types of 30 mm Aden Gun ammunition originally produced by Royal Ordnance



30 mm MP-T rounds for Aden Gun



Cross-section of 30 mm MP-T round for Aden Gun



30 x 113 mm B Aden ammunition produced by Giat Industries; left, TP, right HEI (1999)

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm: L/70 PFHE

Armament

All [40 mm L/70](#) Bofors Guns including: [40 mm L/70](#) BOFI; TRINITY; SAK 40 [L/70](#); SAK 40 [L/70](#) Mk 3; [L/70](#) Combat Vehicle Gun (40/70 B); [Otobreda Twin 40L70 Field Mounting](#); [Otobreda Twin 40L70](#) Compact naval mounting; Otobreda Twin Fast Forty naval mounting; Boeing Company Bushmaster IV. TRIDON [40 mm L/70 self-propelled](#) air defence gun

Development

The first Bofors [40 mm L/70](#) PFHE projectile appeared during 1975; it was first demonstrated in conjunction with the air defence system that became the Bofors 40 mm BOFI. Since then well over one million [40 mm L/70](#) PFHE rounds have been produced for delivery, to approximately 30 different nations, and the design is now in its second generation as the Mk 2 (since 1983). The Mk 2 differs from the original in having revised electronics and enhanced signal processing, providing an improved triggering distance against missiles. The [40 mm L/70](#) PFHE round was originally a joint development between Philips Elektronindustri AB (now CelsiusTech Systems) and Bofors AB.

The introduction of a proximity fuze to the projectile increases the potential target area of a head-on aircraft target by a factor of 50 and a helicopter target by a factor of 80, while the potential target area of a low-flying missile is increased by a factor of at least 350.

A 40 mm L/60 PFHE round has also been produced (see separate entry).

Description

The [40 mm L/70](#) PFHE is a fixed round with a brass cartridge case. The cartridge case is crimped rigidly to the projectile by two 360° crimping bands. A copper drive band encircles the projectile just above the cartridge case/projectile junction.

The [40 mm L/70](#) PFHE projectile uses a curved base ('duck-tailed') shell body manufactured from a special high-fragmentation steel. The explosive content is 120 g of Octol. The shell interior walls are lined with a total of 650 spherical tungsten carbide pellets, each 3 mm in diameter.

The forward end of the streamlined projectile is occupied by the proximity fuze which operates on the Doppler principle. The fuze has an automatic sensitivity control, to prevent initiation by surface objects and sea or ground reflections when passing over them at the low altitudes produced by low gun-barrel elevation angles. It also has a high-sensitivity electrical impact function and an electrical self-destruct device, together with delayed arming and bore and muzzle safeties. In addition to the above the fuze also features Electronic Counter-CounterMeasure (ECCM) circuits to combat jamming. The fuze arming distance is 200 m and proximity enable range 500 m.

[TDA](#) of France produces T40 EMMA M and T40 ER M proximity fuzes for use with [L/70](#) Bofors naval guns.

In the event of a proximity burst the fuze functioning causes the 120 g Octol main charge to detonate, producing a very high blast effect. The force of the detonation causes the projectile body to shatter into approximately 2,400 fragments. Of these, 650 are tungsten carbide pellets that move outwards at a velocity of between 1,000 and 1,500 m/s. Due to their shape and mass the pellets have a low drag factor and can thus inflict considerable damage on target components several metres from the burst. The curved projectile base also increases fragmentation in the event of a late burst. The projectile self-destructs after 8.5 seconds.

When fired against aircraft targets the fuze triggering distance is 6.5 to 7 m. Against missiles, the distance is about 4.5 m. When firing against a target flying at an altitude of approximately 5 m the triggering distance is about 3 m.

The brass cartridge case has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. The propellant charge is approximately 485 g of a flash-reduced, single-base nitrocellulose powder (NC 1066) producing a muzzle velocity of 1,025 m/s.

Specifications

Weights:

- complete round** - 2.4 kg
- projectile** - 880 g
- explosive** - 120 g Octol
- propellant** - approx 485 g
- cartridge case** - 1 kg

Lengths:

- complete round** - 534 mm
- projectile with fuze** - 206 mm
- cartridge case** - 365 mm

Max base diameter: 65 mm

Number of pellets: 650

Pellet diameter: 3 mm

Pellet velocity: 1,000-1,500 m/s

Muzzle velocity: 1,025 m/s

Triggering distance:

- aircraft** - 6.5-7 m

helicopter - 4-7 m

missile - 4.5 m

sea-skimming missile - 3 m

Operating temperature range: -31 to +60°C

Authorised fuzes

Integral proximity fuze, see text

Equivalent rounds

BELGIUM

Manufacturer

FN HERSTAL SA

Type: FN 128 PF/HE-PrF

Description: Standard specifications. No longer in production but may be retained in service

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: PFHE

Description: Standard specifications

Manufacturer

EMGEPROM

Type: PFHE

Description: Standard specifications. Produced for Brazilian Navy.

FINLAND

Manufacturer

Patria Vammass Oy

Type: 40 mm × 365R PFHE

Description: Standard specifications. Includes manufacture of the prefragmented projectiles. Apparently no longer in production

FRANCE

Manufacturer

Giat Industries

Type: PFHE-I

Description: Complete round weighs 2.5 kg with projectile weighing 885 g containing 110 g of Hexal. The fuze has a self-destruct element which functions between 7 and 10 seconds after firing. Otherwise standard specifications. [TDA](#) produces T40 EMMA M and T40 ER M proximity fuzes for use with [L/70](#) Bofors naval guns

GERMANY

Manufacturer

Diehl-Wehrtechnik

Type: HE-T-PF M-DN51, HE-PF M-DN61, HE-T-PF M-DN71, HE-PF M-DN81

Description: These rounds are Diehl developments and do not follow Bofors AB specifications. Round weight is 2.51 kg, projectile weight 960 g and muzzle velocity 1,005 m/s. Filling weights are M-DN51 72 g, M-DN61 83 g, M-DN71 103 g and M-DN81 115 g

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: PFF

Description: Explosive filling is Compound B. Complete round weight is 2.55 kg

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: PFHE K218

Description: Fitted with K585 proximity fuze with self-destruct after 7 to 10 seconds. Filled with Composition A3. Brass K7 case filled with KNC1066 propellant ignited by KM/39SX percussion primer. Otherwise standard specifications.

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries Pte Ltd

Type: PFHE

Description: Standard specifications

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd

Type: PFF, also known as 40 mm Upgrade

Description: Standard specifications

SPAIN

Manufacturer

DEFEX SA

Type: PFHE

Description: Standard specifications

Manufacturer

EXPAL SA

Type: PFHE (PFF)

Description: Standard specifications

Manufacturer

SAPA Placenia

Type: PFHE

Description: Standard specifications

SWEDEN

Manufacturer

Bofors AB

Type: [40 mm L/70](#) PFHE

Description: Standard specifications, as in text

[YUGOSLAVIA](#), FEDERAL REPUBLIC

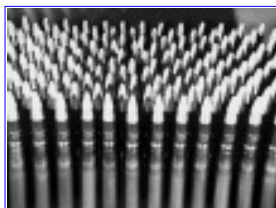
Manufacturer

Yugoimport SDPR

Type: PFHE

Description: May no longer be in production. Standard specifications

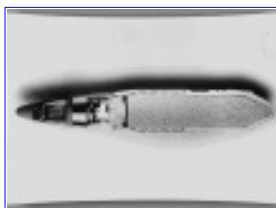
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Bofors [40 mm L/70](#) PFHE rounds awaiting the packing stage



A Bofors [40 mm L/70](#) PFHE Mk 2 projectile



Cross-section of a Bofors [40 mm L/70](#) PFHE Mk 2 projectile

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm: L/70 HE-T

Armament

All [40 mm L/70](#) Bofors Guns including: [40 mm L/70](#) BOFI; TRINITY; SAK 40 [L/70](#); [L/70](#) Combat Vehicle Gun (40/70 B); [Otobreda Twin 40L70 Field Mounting](#); [Otobreda Twin 40L70](#) Compact naval mounting; Otobreda Twin Fast Forty naval mounting; Boeing Company Bushmaster IV. TRIDON [40 mm L/70 self-propelled](#) air defence gun.

Development

The [40 mm L/70](#) HE-T was one of the first rounds developed by Bofors AB, for use with the Bofors [40 mm L/70](#) air defence gun when it was first produced in 1947. The [40 mm L/70](#) gun is basically a longer enhanced performance version of the earlier Bofors 40 mm L/60 and uses ammunition with a longer cartridge case (40 mm × 365 R) containing a more powerful propellant charge for the enlarged projectile. Although Bofors AB maintains a capability to manufacture [40 mm L/70](#) HE-T ammunition to order they regard it as having been superseded by the more versatile and effective [40 mm L/70](#) MPT round (see following entry).

The [40 mm L/70](#) HE-T ammunition is widely produced outside [Sweden](#) and is often referred to as HEI or HEI-T.

Bofors Explosives has developed Low Vulnerability Ammunition (LOVA) which includes LOVA propellant and insensitive components, such as igniters and boosters. LOVA elements can be applied to all 40 mm rounds in production with a view to rendering them even more invulnerable to shock and

high temperatures.

Description

The [40 mm L/70](#) HE-T is a fixed round with the projectile crimped rigidly to the brass cartridge case by two 360° crimping bands. A copper drive band (cupro-nickel is also used) encircles the projectile just above the cartridge case/projectile junction.

The Bofors [40 mm L/70](#) HE-T projectile is a hollow special steel forging with a boat-tailed base and a streamlined ogive. It is filled with 100 g of Hexotonal, comprising 42 per cent TNT, 40 per cent RDX, 15 per cent aluminium powder and 3 per cent desensitiser. Many other fillings have been used, for example cast Tritolital. The base of the projectile contains a tracer element which burns for at least 4 seconds after firing.

Bofors fuzes fitted to the nose include the mechanical PD LI 472 for aircraft targets and the deeper intrusion PD LI 473, for lightly armoured ground targets. The latter incorporates an optional 0.3 µs impact delay, allowing the shell to penetrate and detonate inside the target while the PD LI 472 has an impact sensitivity against 2 mm dural at impact velocities as low as 350 m/s. Both fuzes have a delayed arming device, which prevents arming until the projectile is 55 to 60 m from the muzzle, and a mechanical self-destruct time of 12 seconds; there is also a tropical rain safety. One alternative self-destruct point detonating fuze is the DM 321 produced by Junghans Feinwerktechnik.

The drawn 70:30 brass cartridge case has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. Propellant loads vary from manufacturer to manufacturer but the Bofors [40 mm L/70](#) HE-T uses approximately 485 g of a flash-reduced single-base nitrocellulose powder (NC 1066), producing a muzzle velocity of 1,005 m/s. An alternative charge is multiperforated Type M1 propellant which also produces a muzzle velocity of 1,005 m/s.

The low-cost training equivalent to the [40 mm L/70](#) HE-T is the [40 mm L/70](#) TP or TP-T. This has the same ballistic, weight and dimensional characteristics as the HE-T but lacks any filling or is filled with an inert high-explosive substitute. It is fitted with an inert or dummy PD fuze or a solid nose cap.

Specifications

Weights:

- complete round** - 2.5 kg
- projectile** - 960 g
- explosive** - 100 g Hexotonal
- propellant** - approx 485 g
- cartridge case** - 1 kg

Lengths:

- complete round** - 533.5-534.4 mm
- projectile** - 210 mm
- cartridge case** - 365 mm

Max base diameter: 65 mm

Tracer burn time: at least 4 s

Muzzle velocity: 1,005 m/s

Max horizontal range: 12,600 m

Operating temperature range: -25 to +50°C

Authorised fuzes

Bofors AB: PD Fz 104, LI 472 or PD LI 473

Junghans: PD DM 321

Equivalent rounds

BELGIUM

Manufacturer

FN HERSTAL SA

Type: FN 125 HE-I-SD, FN 123 HE-I-T-SD

Description: Standard specifications. No longer in production but may be retained in service. FN 126 and FN 131 TP and FN 124 TP-T were also produced

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: HE-T, HCHE

Description: Standard specifications. AP-T, TP-T and Spotter rounds also produced

Manufacturer

EMGEPROM

Type: HE-T

Description: Standard specifications. Produced for Brazilian Navy. TP-T also produced

FINLAND

Manufacturer

Patria Vammas Oy

Type: HE-T, HEI-T

Description: Standard specifications. TP and TP-T also produced

FRANCE

Manufacturer

Giat Industries

Type: HE-I-SD, HE-I-T-SD, TP, TP-T

Description: Standard specifications but fitted with PD MR 4071 fuze. This fuze has a self-destruct element that will function from 6.5 to 10.5 seconds after firing

GERMANY

Manufacturer

Diehl-Wehrtechnik

Type: HE-I-T DM 31A3, HE-I-T DM 81A2

Description: DM 31A3 has DM 81A1 fuze; DM 81A2 has DM 321 fuze. TP-T DM 68 also produced

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-I-T M2

Description: Fitted with PD LI 472 fuze and filled with 128 g of cast Tritolital. Propellant is multiperforated M1

INDIA

Manufacturer

Indian Ordnance Factories

Type: HE-T

Description: Standard specifications

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: HE-I-T

Description: Standard specifications but projectile filled with Tritolital. TP-T also produced

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: HEIT K216

Description: Fitted with PD L1472(SD) fuze with self-destruct timed between 7 and 17 seconds. Brass case K7 filled with KNC1066 propellant ignited by KM/39SX percussion primer. Otherwise standard specifications. TP-T K217 also produced.

MACEDONIA

Manufacturer

EUROINVEST

Type: HE-T

Description: Ammunition facility taken over from former Yugoslav SDPR control. Standard specifications with muzzle velocity given as 990 m/s

MALAYSIA

Manufacturer

SME Ordnance SDN BHD

Type: HEI-T DM 31A2

Description: Licenced production from Diehl-Wehrtechnik of Germany. Round weight 2.45 kg, projectile weight 950 g and muzzle velocity 955-1,015 m/s

NETHERLANDS

Manufacturer

Eurometaal NV

Type: HE-T

Description: Standard specifications. TP-T also produced

SINGAPORE

Manufacturer

Chartered Ammunition Industries Pte Ltd

Type: HE-T

Description: Standard specifications. TP-T also produced

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: HE-T

Description: Two types produced, one with a standard length projectile body and the other with a longer projectile body of unspecified length providing increased fragmentation

SPAIN

Manufacturer

DEFEX SA

Type: HE-T, HE-I-T

Description: Standard specifications

Manufacturer

EXPAL SA

Type: HE-T, HE-I-T

Description: Propellant used is single-base GSB-121 and primer is M/39. Otherwise standard specifications. TP and TP-T (E and E-T) also produced

Manufacturer

SAPA Placenia

Type: HE-I, HE-I-T

Description: Standard specifications. TP-T also produced

SWEDEN

Manufacturer

Bofors AB

Type: [40 mm L/70](#) HE-T

Description: Standard specifications, see text

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: [40 mm L/70](#) Break-up

Description: See separate entry

[YUGOSLAVIA](#), FEDERAL REPUBLIC

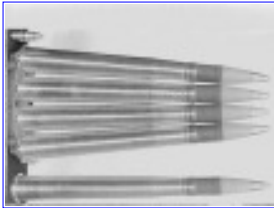
Manufacturer

Yugoimport SDPR

Type: HE, HE-T

Description: May no longer be in production. Standard specifications. TP, TP-T, AP-T and Blank also produced

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Bofors [40 mm L/70](#) HE-T rounds



Cutaway of a Bofors [40 mm L/70](#) HE-T projectile

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm illuminating bomb LR M515A1

Armament

US M1, M29/29A1, [M252](#); UK [L16A1](#) and similar mortars.

Development

By MECAR SA.

Description

A tubular steel bomb body with plastic obturating band at the rear end, a mechanical time fuze, a tailcone and an aluminium tail unit. It is loaded with the usual type of parachute and flare assembly and a black powder expelling charge. The propellant system is the standard MECAR system

At the set time, the fuze ignites the expelling charge. This lights the flare composition and blows off the tailcone of the bomb, allowing the expelling charge to eject the parachute and flare which then descend.

This bomb is ballistically matched to the 81 mm HE Cargo Bomb LR M514A1, uses the same firing table and can be used as a spotting round for the Cargo bomb.

Specifications

Length, fuzed: 630 mm

Weight, fuzed: 4.2 kg

Type of payload: parachute and flare

Number of charges: P + 5

Fuze: time, mechanical, M8104

Min range: 250 m

Max range: 4,100 m, Charge 4; 4,600 m, Super charge

Burst height: 400 or 600 m

Illumination intensity: 500,000 cd-1 Mcd as required

Illumination duration: 30-60 s as required. Burst height, duration and intensity can be adjusted to requirements during production

Manufacturer

MECAR SA.

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MECAR illuminating bomb LR M515A1

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm HE cargo bomb LR M514A1

Armament

US M1, M29/29A1, [M252](#); UK [L16A1](#) and similar mortars.

Development

By MECAR SA.

Description

This uses a tubular steel bomb body with a plastic obturating ring close to the rear end, a tailcone and an aluminium tailboom and fins. The body contains a black powder expelling charge, actuated by a time fuze screwed into the nose and 12 dual-purpose shaped charge/fragmentation submunitions. The standard MECAR propellant system is used.

At the time set on the fuze the expelling charge is ignited. This blows the tail off the bomb and ejects the submunitions that fall freely to the ground. Each has an impact fuze and depending upon the target, functions as an anti-armour or anti-personnel weapon. The shaped charge will penetrate over 60 mm of armour and the anti-personnel lethal radius is approximately 10 m.

Specifications

Length, fuzed: 630 mm

Weight, fuzed: 4.2 kg

Weight and type of payload: 12 submunitions each containing 30.5 g Comp A5

Number of charges: P + 5

Fuze: time, mechanical, M8104

Min range: 250 m

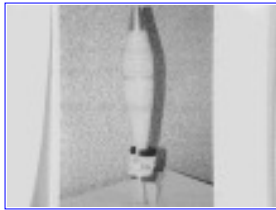
Max range: 4,100 m, Charge 4; 4,600 m, Super charge

Burst height: 600 m

Manufacturer

MECAR SA.

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MECAR 81 mm cargo bomb LR M514A1

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm smoke (TTC) bomb M511A1

Development

By MECAR SA.

Description

This is the same as the WP smoke bomb M513A1, but it is filled with titanium tetrachloride (FM) for situations where a non-phosphorus or non-incendiary smoke bomb is required. The bomb is ballistically matched to the HE bomb, uses the same firing tables and can be used as a spotting round for the HE bomb.

Specifications

Length, fuze: 516 mm

Weight, fuze: 4.1 kg

Weight and type of payload: 880 g FM

Number of charges: P + 5

Fuze: impact SQ M8103

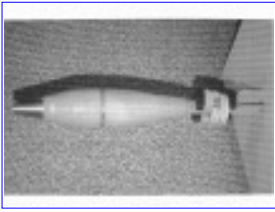
Min range: 100 m

Max range: 4,580 m, Charge 4; 5,500 m, Super charge

Manufacturer

MECAR SA.

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MECAR 81 mm smoke (TTC) bomb M511A1

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm practice bomb M523A1

Armament

81 mm mortars [L16A1](#), [M252](#) and equivalent high-pressure types, and M1, [M29A1](#) and equivalent medium-pressure types.

Development

By MECAR SA, to provide a practice bomb matched to its standard HE and WP Smoke bombs.

Description

This bomb is a similar shape to the M512A1 HE and M513 WP smoke bombs, with a plastic obturating ring and alloy tail unit. Most of the interior is taken up by inert material, except for a small spotting charge which, initiated by the impact fuze, provides sufficient flash and smoke for the impact to be observed. The propulsion system is the same primary and five secondaries as used with the service bombs.

Specifications

Length, fuzed: 516 mm

Weight: 4.1 kg in flight

Weight and type of payload: 1 kg inert filler, 30 g flash smoke composition

Number of charges: P + 5 (Charge 5 only with high-pressure mortars)

Fuze: PDSQ M8102

Min range: 100 m

Max range: 4,500 m, Charge 4, medium-pressure mortars; 5,500 m, Charge 5, high-pressure mortars

Manufacturer
MECAR SA.

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MECAR 81 mm practice bomb M523A1

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm Smoke (WP) bomb M513A1

Armament

US M1m M29/29A1, [M252](#); UK [L16A1](#) and similar mortars.

Development

By MECAR SA, based upon US patterns.

Description

This bomb uses the same body and tail unit as the HE M512A1 described previously but carries a central high-explosive burster, the remainder of the body cavity being filled with White Phosphorus (WP). The same propelling charge unit is used.

Specifications

Length, fuzed: 516 mm

Weight, fuzed: 4.1 kg

Weight and type of payload: 880 g WP

Number of charges: P + 5

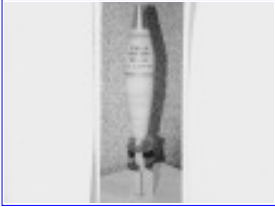
Fuze: impact SQ M8103

Min range: 100 m

Max range: 4,580 m, Charge 4; 5,500 m, Super charge

Manufacturer

MECAR SA.



MECAR 81 mm Smoke (WP) Bomb M513A1



The MECAR family of 81 mm bombs

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MORTARS - 81 mm MORTARS, BELGIUM

Date Posted: 22 September 2000

Jane's Ammunition Handbook 2000-2001

81 mm HE bomb M512A1

Armament

US [M252](#); UK [L16A1](#) and similar mortars.

Development

By MECAR SA, based upon US patterns.

Description

The streamlined body is of high-fragmentation nodular cast iron and is fitted with a plastic obturating ring at the bourrelet. The tail assembly is of extruded aluminium and consists of a tailboom with six fins.

The charge system consists of one primary cartridge fitted in the tailboom and horseshoe plastic secondary charges fitted around the tailboom in front of the fins. There are five increments in the complete charge system. The number of charges permitted depends on the pressure rating of the mortar. Charge 0 is the primary cartridge only; Charge 1 is the Primary plus one secondary increment; Charge 2 is Primary plus two secondary increments. This is the maximum charge permitted in low-pressure mortars, for example the US M1. Charge 3 consists of Primary plus three secondary increments; Charge 4 is Primary plus four increments and is the maximum charge permitted in medium-pressure mortars, for example the US [M29](#). Charge 5, or Super charge, consists of the Primary plus five increments. This is only for use in high-pressure mortars such as the US [M252](#) and UK [L16A1](#). It cannot be fired from low or medium pressure mortars such as the US M1 and [M29](#) types.

Specifications

Length, fuzed: 516 mm

Weight, fuzed: 4.1 kg

Weight and type of payload: 1.03 kg Comp B

Number of charges: P + 5

Fuze: impact SQ M8102 or proximity

Min range: 100 m

Max range: 4,580 m in medium-pressure mortars; 5,500 m in high-pressure mortars

Manufacturer

MECAR SA.

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MECAR 81 mm HE Bomb M512A1

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FIELD ARTILLERY

Date Posted: 10 December 1999

Jane's Ammunition Handbook 1999-2000

Projectile, 155 mm: Smoke, HC, M116, M116B1 and M116A1

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The 155 mm Smoke HC M116 family can also be fired from the following artillery weapons: NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun and [M114S](#) Howitzer; Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; ODE [FH-88 Gun-Howitzer](#); [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 Howitzer, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); Royal Ordnance Light Towed Howitzer; Lockheed Martin LW155; Lewis Tool and Machine Company [Viper](#); [M46/84](#) gun and [M56](#) Howitzer (Federal Republic of [Yugoslavia](#)).

155 mm Smoke HC M116 projectiles can also be fired from the following self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); [PLZ45](#) ([PRC](#)); Giat Industries CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); XK9 ([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); VSEL [AS90](#) and GBT 155.

Development

The 155 mm M116 family of base ejection smoke projectiles are of the same generation as the 155 mm HE [M107](#), having been originally developed before the Second World War. The original 155 mm Smoke HC M116 was developed from the 155 mm [M115](#) Smoke projectile, and was originally intended to be used with the towed 155 mm Howitzer M1 before the Second World War. The [M115](#) was the 'Americanized' version of a French projectile originally used with the French designed M1917/M1918 series of 155 mm towed howitzers procured during the First World War.

The 155 mm Smoke HC M116 is a two-part projectile with a parallel-walled body and a screw-on nose section, plus a thicker and heavier driving band to improve in-bore sealing, especially in worn barrels. The 155 mm Smoke HC M116B1 is a one-piece forging, as is the M116A1 which also features improved smoke canisters. The main difference between the M116A1 and M116B1 is that the latter has cardboard canister separators, instead of aluminium, and the M116B1 fuze cavity is smaller. The 155 mm Smoke HC M116 and M116B1 are limited to the use of the MTSQ M501A1 fuze; the M116A1 can accommodate the MT M565 and MTSQ M577 fuzes.

Various smoke producing fillings have been used over the years, including some coloured smoke mixtures (green, red or yellow) for marking purposes, but the usual filling is HC smoke compound (hexachloroethane-zinc mixture).

The 155 mm Smoke HC M116 is now rarely encountered but the 155 mm Smoke HC M116B and M116A1 are still in widespread production and service. None of the M116 series projectiles remain in production in the USA.

The German Army designation equivalents for the 155 mm Smoke HC M116 family are DM 25, DM 35 and DM 45. Only the latter is now produced (by Buck Technologies).

Description

The M116 family of 155 mm base ejection smoke projectiles are separate loading munitions using hollow steel shell bodies with nose-mounted time fuzes. The original 155 mm Smoke HC M116 used a straight-sided steel body with a screw-on nose section. The 155 mm Smoke HC M116B1 and M116A1 bodies have steel forgings and the same general outline as the 155 mm HE [M107](#). During storage and handling the projectile fuze wells are fitted with lifting plugs.

The 155 mm Smoke HC M116 has a copper base closure disc and carries its 131.5 g black powder expulsion charge in a cloth bag. The 155 mm Smoke HC M116B1 has a 154 g black powder expulsion charge in a polyethylene cup and uses a steel base closure disc. The M116 and M116B1 have cardboard canister separators while the M116A1 uses aluminium spacers. The M116 and M116B1 have small fuze cavities.

The shell interior contains four smoke canisters, the top one smaller than the other three; it has tapered sides to fit into the shell ogive. The canisters are filled with HC smoke compound (hexachloroethane-zinc mixture); the 155 mm Smoke HC M116A1 carries a total weight of 8.7 kg of HC although the total weight with canisters is 11.72 kg.

In operation, the nose-mounted time fuze functions at the preselected time and ignites an expulsion charge containing 154 g of black powder. The resultant internal pressure forces off the projectile's steel baseplate and ejects the canisters. The expulsion charge also transmits a flash down through a perforated channel running through the four canisters and along the entire internal length of the shell. The flash ignites the HC smoke composition in the canisters so that a greyish-white smoke screen is produced

within 30 seconds and lasts for up to 90 seconds (2 minutes with the M116A1); the maximum smoke density is produced 1 minute after canister expulsion.

The 155 mm Smoke HC M116 and M116B1 can be fired using the M3A1/M4A2 bagged charges up to Charge 6. The [M119](#) and [M203](#) series of unitary charges cannot be used with these projectiles.

The 155 mm Smoke HC M116A1 can use the full range of M3A1/M4A2 bagged charges and the [M119](#) unitary charges. The [M203](#) cannot be used with this projectile.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required) and the base igniter contains black powder.

The Propelling Charge M4 is a white bag charge, it differs from the [M4A1](#) as it consists of a base charge and two increments only for firing as Charges 5 to 7. The M2 flash reducer pad is used with this charge.

The M3 and M4 series of charges are fired using the MK2A4 or [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn onto the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The M119A2 charge is produced by Eurometaal NV as the No 13.

When fired from the 155 mm [M1A1](#) Cannon on M114/M114A1 towed howitzers the following ballistic performance can be attained:

Charge 1 (M3 green bag) - MV 207.3 m/s - range 3,900 m

Charge 2 (M3 green bag) - MV 234.7 m/s - range 4,800 m

Charge 3 (M3 green bag) - MV 268.2 m/s - range 6,100 m

Charge 4 (M3 green bag) - MV 310.9 m/s - range 7,800 m

Charge 5 (M3 green bag) - MV 371.9 m/s - range 9,700 m

Charge 3 ([M4A1](#) white bag) - MV 274.3 m/s - range 6,300 m
Charge 4 ([M4A1](#) white bag) - MV 316.4 m/s - range 8,000 m
Charge 5 ([M4A1](#) white bag) - MV 374.6 m/s - range 9,700 m
Charge 6 ([M4A1](#) white bag) - MV 463.3 m/s - range 12,000 m
Charge 7 ([M4A1](#) white bag) - MV 563.9 m/s - range 14,600 m.

When fired from the 155 mm M126/M126A1 Cannon on [M109](#) self-propelled howitzers the following ballistic performance can be attained:

Charge 1 ([M3A1](#) green bag) - MV 207.3 m/s - range 3,900 m
Charge 2 ([M3A1](#) green bag) - MV 236.2 m/s - range 4,900 m
Charge 3 ([M3A1](#) green bag) - MV 275.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 317 m/s - range 8,200 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 269.7 m/s - range 6,200 m
Charge 4 (M4A2 white bag) - MV 313.9 m/s - range 8,000 m
Charge 5 (M4A2 white bag) - MV 373.4 m/s - range 9,800 m
Charge 6 (M4A2 white bag) - MV 461.8 m/s - range 12,000 m
Charge 7 (M4A2 white bag) - MV 562.4 m/s - range 14,600 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers the 155 mm Smoke HC M110 family can attain the following ballistic performances:

Charge 1 ([M3A1](#) green bag) - MV 211.8 m/s - range 4,000 m
Charge 2 ([M3A1](#) green bag) - MV 237.7 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 277.4 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 318.5 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 374.9 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 292.6 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 336.8 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 393.2 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 475.5 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 565.4 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

When fired from the 155 mm [M119](#) Cannon on the [M198](#) towed howitzer the following ballistic performance can be attained:

Charge 2 ([M3A1](#) green bag) - MV 239.8 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 280.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 322.9 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 380.1 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 296.5 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 340.9 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 398 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 482 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 574.3 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

Chartered Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20 and promoted for use with Smoke HC M110 series projectiles, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter, and weighs 10 kg.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the XM231/XM232 Modular Artillery Charge System (MACS). Other nations are currently in the process of adopting similar modular charge systems.

Specifications

Weights:

min/max - 40.9/42.95 kg

filling, M116A1 - 11.72 kg HC

filling, coloured smoke - 7.78 kg

expulsion charge - 154 g black powder

Lengths:

with lifting plug - 678.7 mm

as fired - circa 700 mm

Max body diameter: 154.89 mm

Diameter over drive band: 157.98 mm

Operating temperature range: -32 to +52°C

Authorised fuzes

M116 and M116B1: MTSQ M501 series

M116A1: MT M565. MTSQ M577

Equivalent projectiles

BELGIUM

Manufacturer

PRB SA

Type: 155 mm Smoke BE NR-150

Description: Stated to be equivalent to 155 mm Smoke HC M116. No longer in production but remains in widespread service

CANADA Manufacturer

SNC Industrial Technologies Inc

Type: 155 mm Smoke BE M116

Description: Standard US specifications

GERMANY

Manufacturer

Buck Technologies

Type: 155 mm Smoke HC DM 45 and DM 45A1

Description: Standard US specifications

[GREECE](#) Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 155 mm Smoke HC M116

Description: Standard US specifications

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 155 mm, HC, Smoke Projectile M116A1

Description: Standard US specifications

ITALY Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm HC Smoke IM141

Description: Similar to 155 mm Smoke HC M116 series with four canisters containing HC or coloured smoke mixture (green, red, yellow, violet or black). Weight of smoke canister contents is 8.4 kg (HC) or 5.5 kg (smoke mixture), burning for between 80 and 130 seconds according to local conditions.

Projectile weight is 44 kg (HC) or 41 kg (smoke mixture)

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm HC Smoke IM471

Description: Similar to 155 mm Smoke HC M116 series but with three smoke canisters that contain either HC or coloured smoke mixture (green, red, yellow, violet or black). Weight of smoke canister contents is 5.5 kg (HC) or 3.5 kg (smoke mixture). Projectile weight is 43.5 kg (HC) or 41.5 kg (smoke mixture)

NETHERLANDS Manufacturer

Eurometaal NV

Type: 155 mm Smoke BE

Description: Stated to be equivalent to 155 mm Smoke HC M116 series

SPAIN

Manufacturer

EXPAL SA

Type: 155 mm HC M116A1

Description: Standard US specifications Manufacturer

SANTA BARBARA SA

Type: 155 mm M116C

Description: Based on 155 mm Smoke HC M116 series but contains five smoke canisters. Smoke emission time is 60 seconds, weight 43 kg and length 700 mm. Maximum range is given as 13,500 m

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Outlined diagram of Projectile, 155 mm: Smoke, HC, M116A1



Projectile, 155 mm: Smoke, HC, M116A1

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.62 × 54R mm

Synonyms:

7.62 mm Mosin Nagant; 7.62 × 53R; 7.62 mm Soviet Rimmed; 7.62 mm M1891

Armament

All Russian and Soviet Mosin-Nagant bolt-action rifles; SVD (Dragunov) sniper rifle; [SV-98](#) sniper rifle; DP, DT, [RP-46](#), SG-43, SGM and PK/PKM machine guns.

Development

The 7.62 mm Mosin-Nagant is the oldest cartridge still in first-line service, having been introduced into Russian service in 1891 with the Mosin-Nagant 'Three-Line' rifle. It was adopted as the standard infantry cartridge for subsequent rifles and machine guns, and since it has superior long-range performance over the 7.62 × 39 mm cartridge, has been kept in use for general purpose machine guns and sniper rifles. It has also been adopted by other countries using Russian weapons, particularly [China](#) and [Finland](#), but may now be found anywhere, especially where Soviet or Chinese influences distributed the appropriate weapons.

Description

The case is rimmed, bottlenecked and may be of brass- or copper-coated steel. The base is part-convex with a Berdan or Boxer primer. A variety of bullets have been used over the years, but the current

standards are the boat tail Ball LPS, steel cored with a GMCS jacket and the Heavy Ball D, streamlined and with a lead core in GMCS jacket.

Specifications

Heavy Ball D

Round length: 76.7 mm

Case length: 53.6 mm

Rim diameter: 14.3 mm

Bullet diameter: 7.87 mm

Bullet weight: 11.98 g

Muzzle velocity: 804 m/s

Muzzle energy: 3,814 J

Abridged ballistic table: 7.62 × 54R, 11.98 g ball

Range	Velocity	Energy
0 m	804 m/s	3,814 J
100 m	733 m/s	3,170 J
200 m	667 m/s	2,625 J
300 m	606 m/s	2,167 J

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Unis Igman d.o.o.

Type: Ball M87: FMJ; 9.6 g; V₂₅ 825-840 m/s

Tracer M87: FMJ; 9.4 g, green tip; V₂₅ 800-815 m/s

API B32: FMJ; 10.3 g black/red tip; 800-815 m/s

[BULGARIA](#)

Manufacturer

Kintex

Type: Ball M908/30: FMJ; steel core in lead sheath, GMCS jacket; brass case; 9.6 g; MV 825 m/s

Heavy Ball M1930: Lead core, steel jacket, gilding metal envelope; 12 g; MV 810 m/s

Tracer T-46 Mod 1930: FMJ; lead core, steel jacket, gilding metal envelope; red trace to 1,000 m; 9.6 g; MV 825 m/s

Blank: Steel case, brass-coated, rose crimp

Manufacturer

Arsenal

Type: Ball M1930: FMJ; steel core in lead jacket, cupro-nickel envelope; steel or brass case; 9.6 g; V₂₅ 828 m/s

Tracer T-46 Mod 1930: FMJ; lead core, steel jacket, gilding metal envelope; red trace to 1,000 m; 9.65 g; V₂₅ 797 m/s

Blank: Steel case, brass-coated, rose crimp; charge 1.6 g HPL/P-80

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: Ball Type 53: FMJ; 9.6 g; MV 840 m/s

Ball Type 53: FMJ; steel core; 9.6 g; MV 820-835 m/s

AP-I Type 53: FMJ, AP steel core; 9.95 g; MV 800-815 m/s

Tracer Type 53: FMJ; 9.66 g; MV 800-815 m/s

Incendiary-ranging Type 53: FMJ; 10 g; MV 800 m/s

Manufacturer

State arsenals

Type: Ball, Heavy, D: FMJ; 11.98 g; MV 818 m/s

Ball, Light, LPS: FMJ; 9.65 g; MV 870 m/s

Tracer T46: FMJ; 9.65 g; non-streamlined; MV 870 m/s

Tracer T: FMJ; 9.59 g; dark ignition, tracing to 2,000 m

AP B30: FMJ, SL; hard steel core, lead sleeve, steel jacket, gilding metal envelope; 11.92 g; penetration 10 mm at 700 m

AP-I B32: FMJ, SL; steel core with incendiary composition in the nose; 10.04 g; MV 870 m/s

AP-I BS40: FMJ; non-streamlined, tungsten carbide core with incendiary pellet in the nose; 12.11 g; MV 805 m/s

AP-I-T BZT: FMJ; non-streamlined, steel core with incendiary composition in nose and tracer in base; 9.2 g

Incendiary-Obs ZP: FMJ; non-streamlined, steel jacket with incendiary pellet in nose, explosive primer beneath and an inertia striker; 10.36 g

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 11.7 g; MV 786 m/s

Ball: JSP; 11.7 g; MV 800 m/s

EGYPT

Manufacturer

Aboukir Engineering Industries

Type: Ball: FMJ; 8 g; MV 780 m/s

Tracer: FMJ, rear tracer to 1.5 seconds. MV 800 m/s

Blank: Polyethylene dummy bullet

FINLAND

Manufacturer

Nammo Lapua Oy

Ball FMJ123: FMJ; 8 g; MV 895 m/s

Ball D46: FMJ, SL; 12 g; MV 780 m/s

Ball E375: JSP; 12 g; MV 765 m/s

Ball E415: JSP Mega; 12 g; MV 765 m/s
Ball EX481: JSP Forex; 12 g; MV 785 m/s
Ball D47: FMJ, SL; 12 g; MV 780 m/s

Manufacturer

Sako Ltd

Ball: FMJ; 8 g; MV 890 m/s
Ball: JSP; 10.1 g; MV 845 m/s
Ball: SP; 11.7 g; MV 825 m/s
SP 9.7 g; MV 870 m/s
SP 14.3 g; MV 735 m/s

IRAN

Manufacturer

Ammunition Industries

Type: Ball: FMJ; 9.6 g; MV 835 m/s

POLAND

Manufacturer

Mesko Zaklady Metalowe

Type: Ball: FMJ; 9.6 g; MV 827 m/s
Tracer: FMJ; red trace; 9.6 g; MV 800 m/s
Blank: Brass case, star crimp

ROMANIA

Manufacturer

ROMARM SA

Type: Ball: FMJ; steel core; 9.6 g; MV 827 m/s
Tracer T-46: FMJ; lead core; 9.6 g; MV 790 m/s
API: FMJ, steel core; 10.5 g; MV 850 m/s
Blank: Rose crimped. Cartridge weight 9 g

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Barnaul Machine Tool Building Plant

Type: Ball, High-penetration, 7N13: FMJ; steel core; 9.41 g; MV 830 m/s (SVD)
Tracer, 7T2: FMJ; 9.6 g; MV 830 m/s (SVD)
Sniper ball, 7N14: FMJ; 9.8 g; MV 830 m/s (SVD)
Blank, 57-Kh-340: rose crimp

Manufacturer

Novosibirsk Low Voltage Equipment Works JSC (LVE)

Type: Ball CT: FMJ; steel core; 9.75 g; MV 835 m/s
Tracer T-46: FMJ; 9.9 g; MV 805 m/s

Armour-Piercing Tracer (AP/T), Type BT-90: FMJ, steel core w/green trace; 9.2 g; MV 830 m/s (est)

Sniper ball: FMJ; lead core; 9.9 g; MV 835 m/s

Blank: rose crimp

SWEDEN

Manufacturer

Norma AB

Type: Ball 17634: JSP; 11.6 g; MV 920 m/s

Manufacturer

Nammo Vanasverken AB

Type: Armour Piercing: FMJ; 8.5 g; MV 980 m/s; tungsten carbide core

UNITED STATES OF AMERICA

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ, SL; 11.8 g; MV 810 m/s

Ball: JSP; 11.7 g; MV 805 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball CJ M87: FMJ; steel core; 9.6 g; MV 830 m/s

Light ball M908: FMJ; lead-antimony core in steel jacket, gilding metal envelope; 9.7 g; MV 845 m/s

Heavy ball M30J: FMJ; lead-antimony core; 11.8 g; MV 785 m/s

Tracer T46: Lead-antimony half-core with tracer element encapsulated behind; red trace to 1,000 m; 9.65 g; MV 815 m/s

AP-I B32: Steel core in gilding metal jacket, with incendiary/tracer capsule in base; 10.4 g; MV 815 m/s

Practice M76DT: Bullet has an aluminium core in a short gilding metal envelope so that the point of the core is exposed. The point is sharply tapered, and the combination of light weight and shape gives a maximum range of only 530 m. The standard brass case is used. Restricted to use in machine guns

SGMT and PKT only; 2.3 g; MV 770 m/s

Blank M69: Steel case, crimped

Ball: FMJ; 9.6 g; MV 854 m/s

Ball: FMJ; 9.7 g; MV 869 m/s

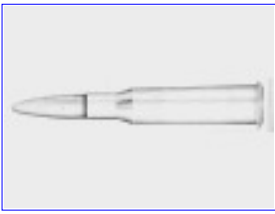
Ball: FMJ; 11.8 g; MV 804 m/s

Ball: JSP; 11.7 g; MV 804 m/s

HP Test M30J Type 1: FMJ; 11.8 g; pressure 3,350 kg/cm²

HP Test M30J Type 2: FMJ; 11.8 g; pressure 4,050 kg/cm²

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$7.62 \times 54R \text{ mm}$

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ARTILLERY ROCKETS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

262 mm LRSV M87 Orkan rockets

Armament

262 mm 12-tube [LRSV M87](#) Orkan MRS.

Development

When the 262 mm 12-tube [LRSV M87](#) Orkan MRS was first displayed publicly in 1988 it was labelled the Ababeel 50 MRS and shown at an Iraqi defence exhibition. With time it emerged that it was a joint Yugoslav-Iraqi project, with most of the development carried out in [Yugoslavia](#) and some manufacture taking place in [Iraq](#); some of the project funding was also provided by [Iraq](#). It was intended that the rocket and MRS would be only part of an overall system that would include command, meteorological, resupply, observation and other support vehicles. During 1994 and 1995 small numbers of [LRSV M87](#) Orkan MRS were used in action during the various conflicts in the Balkans. The type remains in production in Bosnia and Herzegovina.

The [LRSV M87](#) MRS features several advanced fire-control systems including a German video camera tracking system intended to track spotting rockets before the main salvo is fired.

Description

Relatively few details regarding the 262 mm rockets used with the [LRSV M87](#) Orkan MRS are available so the data provided here has to be regarded as provisional. It was claimed that the maximum range is 50,000 m. By the opening and closing of four different lengths of aerodynamic brake, four different maximum ranges can be attained; 24,000, 28,000, 37,000 and 50,000 m. Probable dispersion at

maximum range is claimed as 220 m in range and 175 m in azimuth. Overall length of all rockets is 4.656 m.

The two-stage rocket motor uses double-base propellant. The booster stage uses 10 kg of fuel and burns for 200 ms to generate 8,000 kg of thrust to propel the rocket clear of the launch tube. The second (sustainer) motor then cuts in to burn for 5 seconds and generates 18,000 kg of thrust to produce a maximum velocity of 1,200 m/s. Time of flight to maximum range is 110 seconds.

Several types of warhead were developed. One is an APHE with a inertial type impact fuze with super-quick or graze action. This type of rocket weighs 389 kg with the warhead weighing 91 kg.

A 262 mm rocket carrying a cargo/cluster warhead also weighs 389 kg with the warhead weighing 91 kg and containing 288 dual-purpose bomblets. Each bomblet has a shaped anti-armour charge capable of penetrating over 60 mm of armour, while the anti-personnel fragmentation effects are augmented by approximately 420 small steel spheres which are scattered, along with the usual bomblet fragments, over a lethal radius of 10 m. This warhead is provided with an Electronic Time fuze.

One further 262 mm Orkan rocket with a cargo/cluster warhead weighs 381 kg, 83 kg of which is the warhead carrying 24 scatterable anti-tank mines. Each cylindrical mine has four snap-out vanes which stabilise the mine during descent and orientate the mine on the ground. When detonated the mine can penetrate approximately 40 mm of armour. This warhead is provided with an Electronic Time fuze.

A 262 mm extended range rocket with a maximum range of 70,000 m was under development with the warhead capacity reduced to provide the space for an enlarged rocket motor. Its current status is unknown.

Specifications

Calibre: 262 mm

Weights:

complete, APHE, Cluster DP - 389 kg

complete, Cluster A/T - 381 kg

warhead, APHE, Cluster DP - 91 kg

warhead, Cluster A/T - 83 kg

propellant, booster - 10 kg

propellant, sustainer - 130 kg

Length: 4.656 m

Max range: 50,000 m

Burnout velocity: 1,200 m/s

Average thrust, sustainer: 18,000 kg

Motor burn time, sustainer: 5 s

Authorised fuzes

PD or ET - no information available

Equivalent rockets

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defence, Department of Defence Industry.

Type: [262 mm LRSV M87](#)

Description: Standard specifications as text. Exact rocket types uncertain.

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ARTILLERY ROCKETS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

128 mm M-63 rockets

Armament

[128 mm M-63 Plamen](#) 32-tube MRS; 128 mm Light Rocket Launcher [M-71](#).

Development

The [128 mm M-63](#) artillery rocket was developed for the towed [128 mm M-63 Plamen](#) 32-tube MRS which was at one time produced in significant numbers for the former Yugoslav armed forces. The use of this towed MRS spread to virtually all the combatants in the area. As far as can be determined the [128 mm M-63 Plamen](#), the associated single-tube Light Rocket Launcher [M-71](#) for special forces and their M-63 rockets are not currently in production.

It is understood that the design of the [128 mm M-63](#) rocket was influenced by the Czech 130 mm [M51](#) (qv). In 1988-89 128 mm M-63 rockets were supplied to the Austrian Army for use with their 13 cm Raketwerfer [M51](#), the local designation for the Czech 130 mm [M51](#) MRS.

In 1989, an improved 128 mm rocket known as the [M-87](#) was announced. Although it was intended for use with existing 128 mm launchers its current status is uncertain. However, an essentially similar enhanced range rocket, the 128 mm M93, is in production in [Croatia](#) and Bosnia and Herzegovina - see separate entry.

Description

The steel-bodied [128 mm M-63](#) spin-stabilised rocket is propelled by a solid propellant rocket motor

containing 4.78 kg of electrically ignited nitroglycerine-based rocket propellant exhausting through eight machined venturi in the rocket's exhaust assembly. The electrical Rocket Primer M-63 is used to initiate the motor. Maximum rocket velocity is 420 m/s which enables the projectile to reach a maximum range of 8,580 m, minimum range is 2,000 m. Dispersion at maximum range is 0.56 per cent of range.

The [128 mm M-63](#) rocket weighs 23.1 kg with the steel-cased warhead weighing 7.55 kg, 2.3 kg of which is the trotyl or trotyl-hexogen high-explosive filling. Threaded into the rocket nose is a UT M-63(OV) point detonating or super-quick graze function fuze; the fuze is armed at a distance of 40 to 250 m from the launcher. The M-63 rocket is 814 mm long overall.

An inert practice version of the M-63 was produced. It weighs approximately 23 kg.

The 128 mm [M-87](#) Improved rocket weighed 25.5 kg, with 7.8 kg of solid propellant and an explosive warhead weighing 3.3 kg. Overall length with an [M-84](#) point detonating fuze is 960 mm and maximum range 13,000 m.

Specifications

M-63

Calibre: 128.27 mm

Weights:

complete rocket - 23.1 kg

warhead - 7.55 kg

explosive - 2.3 kg TNT

propellant - 4.78 kg

Lengths:

overall, with fuze - 814 mm

warhead - 250 mm

Max range: 8,580 m

Min range: 2,000 m

Max velocity: 420 m/s

Operating temperature range: -30 to +45°C

Authorised fuzes

PD UT M63(OV)

Equivalent rockets

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defence, Department of Defence Industry

Type: 128 mm [M91](#) and M93

Description: See separate entry

[CROATIA](#)

Marketing agency

R H ALAN doo

Type: 128 mm [M91](#) and M93

Description: See separate entry

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Cross-section of [128 mm M-63](#) rocket

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

122 mm FRAG-HE OF-462

Armament

[122 mm Howitzer M1938 \(M-30\)](#); [NORINCO 122 mm Howitzer Type 54-1](#); [NORINCO 122 mm Howitzer Type 83](#); [122 mm Howitzer D-30](#); [NORINCO 122 mm Howitzer D-30](#); [122 mm Howitzer D-30 RH M94](#); [122 mm Howitzer D-30J](#); [Factory 100 D-30-M](#); [122 mm Saddam Howitzer](#); Hadid [122 mm Howitzer HM40](#).

[NORINCO 122 mm Self-propelled Howitzer Type 54 and 54-1](#); [NORINCO 122 mm Self-propelled Howitzer Type 85](#); 122 mm Self-propelled Howitzer M-1974 (2S1); [Model 89 122 mm Self-propelled Howitzer](#); Hadid 122 mm Self-propelled Howitzer HM51.

Development

The [122 mm Howitzer M1938 \(M-30\)](#) has been in service since before the Second World War. It remains in widespread use throughout the world, although with many armed forces it has now been relegated to reserve or training duties. However, many nations still retain the piece as a first-line weapon, including [China](#) where the original design was copied by NORINCO to produce their [122 mm Howitzer Type 54 and 54-1](#), which differ from the original only in detail.

The 122 mm FRAG-HE OF-462 and the closely related OF-462A are the latest 122 mm projectiles of their type to enter service, being the most modern developments in a line of similar projectiles. The OF-462 is also fired from the gun-howitzer barrels used on the later towed [122 mm Howitzer D-30](#) and

self-propelled M-1974 ([2S1](#) - also known as the SO-122 or Gvozdika), although the ammunition systems involved with these equipments employ more powerful propellant charges in a longer cartridge case.

An improved on-target effect HE projectile is known as the 122 mm 3OF56 - see following entry. This appears to have replaced the OF-462 series of 122 mm FRAG-HE projectiles in production within [Russia](#), although no doubt stockpiles still remain.

The spread of 122 mm ordnance has been sufficiently wide for commercial fuze designs to have been produced. A typical example is the South African Fuchs Electronics M9017A1 radio proximity fuze, which is optimised for 122 mm HE projectiles. Proximity action is factory set to function at a height between 6 and 8 m and there is a secondary super-quick impact feature.

It has been reported that a 122 mm Rocket-Assisted HE Projectile (RAP) was produced for use with the D-30/2S1 series of weapons. Few details are available but apparently the projectile had a maximum range of 21,900 m.

Description

The 122 mm FRAG-HE OF-462 is a separate loading round with the projectile and cartridge case loaded separately so that, where appropriate, the propellant charges can be altered to suit the fire mission. The full designation for a complete round is 53-OF-462.

The body of the 122 mm OF-462 projectile is forged high-fragmentation steel with a relatively short streamlined ogive, a pronounced bourrelet and a distinct boat tail. There is a single copper drive band just under 21 mm wide.

The explosive filling material can vary but is usually a cast TNT/Amatol mixture weighing 3.46 kg; other fillings can include TNT only, with weights usually varying around the 3.5 kg mark.

If a PD fuze is fitted it is usually the RGM-2 with selectable instantaneous or delay features and with a muzzle safety distance of between 5 and 7 m.

[122 mm Howitzer M1938 \(M-30\)](#) ammunition uses a 'multisection' system of propelling charges. The total weight of the nitrocellulose powder charges is 2.2 kg, made up from a system of nine bags. The basic charge, Charge 8, is a single-base charge bag. The system is built up until the Charge 1 stage is reached which is formed by the base charge bag, four equal section bag charges in a lower layer and three equal section bag charges in an upper layer. The Full Charge is produced by adding one further bag charge to the upper layer, making a total of nine bags in all, which are all held in place by a fibre cup. They are all contained in a MK-75 brass cartridge case, 284 mm long and weighing 3.25 kg, with a 25 mm long brass percussion primer housing threaded into the centre of the base. It is possible to use a cartridge case issued with the Full Charge ready packed and with no facility to alter the charges.

This charge system produces a range of muzzle velocities ranging from 205 m/s at the lower end (minimum range 5,350 m) up to the 515 m/s (maximum range 11,800 m) produced by the Full Charge.

When the OF-462 is fired from the [122 mm Howitzer D-30](#) or self-propelled [2S1](#), a longer MK-75 brass or lacquered steel cartridge case (length 447 mm, weight (steel) 3.66 kg) with a base-mounted KV-4 percussion primer is involved. This can contain 12/1 Tr and 12/7 nitrocellulose powder in a 'Reduced Charge' form containing five variable charge bags weighing a total of 2.43 kg, or a single prepacked Full Charge weighing 3.8 kg. The muzzle velocity using the Full Charge is 680 to 690 m/s and the maximum range 17,360 m. The maximum muzzle velocity using the 'Reduced Charge' cartridge is 565 m/s and maximum range 15,300 m.

Two training rounds intended specially for training towed 122 mm [M-30](#) or [D-30](#) and [2S1 self-propelled](#) howitzer crews are the 122 mm VOFT-463 (for the [M-30](#)) and VOFT5 (for the [D-30](#) and [2S1](#)) training rounds, both using the same 122 mm HE-T OFT-462 projectile. With the VOFT5 round the OFT-462 projectile is fired at a muzzle velocity of 690 m/s and emits a No 1 tracer for up to 3 seconds from a

location in the base so that the trajectory can be followed for training assessment and marking purposes. As the projectile passes through a soft target the nose-mounted VS-5 or VUBS-1M super-quick point detonating fuze functions to detonate the projectile's TNT bursting charge less than 5 m behind the target. Should the projectile fail to hit a target it will self-destruct after about 5 to 7 seconds at a maximum range of 15,300 m. The complete 122 mm VOFT5 round weighs 29.5 kg and has a steel cartridge case containing 3.8 kg of 12/7 + 12/1 Tr and VTH10 propellant. The 122 mm VOFT-463 training round for the [M-30](#) operates in a similar manner.

Both these training rounds are marketed by Kintex of [Bulgaria](#).

122 mm blank rounds have also been produced, the MK-463 for the [M-30](#) and the MK-462 for the D-30/2S1.

Specifications

Weights:

complete round - [M-30](#) 27 kg; [D-30](#) Reduced 28.05 kg; [D-30](#) Full 29 kg
projectile - 21.76 kg
explosive - 3.46 kg TNT/Amatol or 3.528 kg TNT
propellant - [M-30](#) Full 2.2 kg, [D-30](#) Reduced 2.43 kg; [D-30](#) Full 3.8 kg
cartridge case (Full Charge) - [M-30](#) 3.25 kg; [D-30](#) 3.66 kg

Lengths:

complete round - [M-30](#) 785 mm; [D-30](#) 1.005 m
projectile, fuzed - nominal 558.8 mm
cartridge case - [M-30](#) 284 mm; [D-30](#) 447 mm

Diameter over cartridge case rim: [M-30](#) 147.46 mm; [D-30](#) 137.2 mm

Max muzzle velocity: [M-30](#) 515 m/s; [D-30](#) 690 m/s

Min muzzle velocity: [M-30](#) 205 m/s; [D-30](#) n/avail

Max chamber pressure: [M-30](#) 2,300 bar; [D-30](#) 2,450 bar

Operating temperature range: -40 to +50°C

Authorised fuzes

PD RGM-2
TSQ D-1, D1U
MTSQ V-90
Prox AR-5

Equivalent rounds

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defence, Department of Defence Industry

Type: 122 mm OF-462

Description: For [D-30](#) and [D-30J](#). Also produced is a [M76](#) projectile but no details are available.

[BULGARIA](#)

Manufacturer

DunaRit

Type: 122 mm OF-462

Description: Complete rounds produced for both [M-30](#) and D-30/2S1 howitzers, the latter with both Full and Reduced propellant charges. Standard specifications

Manufacturer

TREMA JSC

Type: 122 mm OF-462

Description: Complete rounds produced for D-30/2S1 howitzers, the latter with both Full and Reduced propellant charges. Standard specifications

Marketing agency

Kintex

Type: VOFT-463 Prac and VOFT5 Prac

Description: Both training rounds with OFT-462 HE-T projectile - see text

Marketing agency

Kintex

Type: VOF-462

Description: Standard specifications. Round for use with D-30/2S1 is VOF-462 J. Projectiles may be fitted with PD RGM-2 or OFZ-5M fuzes or Proximity RV-2. Cases use Bulgarian KV-U percussion primer. Blank cartridges also produced

Manufacturer

TREMA Limited

Type: 122 mm 3UOF6 round with 53-OF-462 projectile

Description: Standard specifications. For [D-30](#) and [2S1](#) with both Full and Reduced propellant charges

Manufacturer

Vazov Engineering Plants

Type: 122 mm OF-462

Description: Standard specifications. For [D-30](#) and [2S1](#) with both Full and Reduced propellant charges

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 122 mm HE Type 54

Description: Produced primarily for Type 54-1 howitzer. Uses Liu-4 fuze and No 304 primer. Filled with 3.5 kg TNT. Otherwise standard specifications. Also produced in [Pakistan](#)

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 122 mm HE Type 83

Description: An elongated high fragmentation projectile intended for use with [D-30](#) and M-30/Type 54 howitzers. Weight 28.5 kg and length 660 mm. Max muzzle velocity 618 m/s and maximum range 15,600 m

[CROATIA](#)

Manufacturer

RH-ALAN doo

Type: 122 mm HE 462

Description: Produced primarily for [122 mm Howitzer D-30](#) RH [M94](#), the Croatian-produced version of the [D-30](#) (no longer in production). Standard specifications. Can be supplied fitted with PD RGM-2, M557 or M572 fuzes

Manufacturer

RH-ALAN doo

Type: 122 mm HE [M95](#)

Description: Produced primarily for [122 mm Howitzer D-30](#) RH [M94](#), the Croatian-produced version of the [D-30](#) (no longer in production). The main change is a super charge weighing 4.9 kg which increases muzzle velocity to 735 m/s, which increases maximum range to 17,133 m. The standard 122 mm OF-462 (HE 462) projectile is retained. Can be supplied fitted with PD RGM-2, M557 or M572 fuzes

[CZECH REPUBLIC](#)

Manufacturer

Caliber Prague Limited

Type: 122 mm HE for [D-30](#)

Description: Produced for [D-30](#)

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries

Type: 122 mm HE

Description: Produced for both [M-30](#) and [D-30](#) series. Fuze fitted is AU-18

[FINLAND](#)

Manufacturer

Patria Vammas

Type: 122 mm HE

Description: Standard specifications. Produced primarily for [D-30](#) series equipments

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Division

Type: 122 mm HE

Description: For [D-30](#) howitzer. Fitted with PD M577 or M572 fuze. Muzzle velocity 565 m/s and maximum range 15,600 m. Projectile weight is 20.5 kg, containing 3.55 kg of explosive. Propellant weight is 2.407 kg

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 122 mm HE

Description: This is the same round as that produced in [China](#) for Type 54 and 54-1 howitzers. Filled with 3.52 kg of TNT. Licensed production

[POLAND](#)

Manufacturer

State factories

Type: OF-462

Description: Standard specifications. Probably no longer in production

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: 122 mm HE

Description: Standard specifications for [D-30](#) version. Filled with 3.528 kg of TNT

[SLOVAKIA](#)

Manufacturer

Kerametal Company Limited

Type: 122 mm OF-462

Description: Produced for [D-30](#). Available in Full and Reduced Charge versions. Supplied fitted with PD KZ 88 fuze. Marketed by ZVS Dubnica

Manufacturer

VIHORLAT As Snina

Type: 122 mm OF-462

Description: Produced for [D-30](#). Projectile weight 21.8 kg and maximum range given as 15,300 m

Manufacturer

Konstrukta Defence

Type: 122 mm OF-462

Description: Produced for [D-30](#). Available in Full and Reduced Charge versions

UKRAINE

Manufacturer

TACKO

Type: 122 mm OF-462

Description: Produced for D-30/2S1 howitzers. Available in Full and Reduced Charge versions

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: TF-462

Description: Standard specifications. Produced for both [M-30](#) and D-30/2S1. May no longer be in production

Holding Company: Yugoimport SDPR

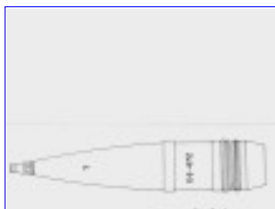
Type: HE Shell [M55](#)

Description: Intended for use with [M-30](#). Virtually identical to standard OF-462 but unfuzed body is slightly shorter at 504 mm. Available in variable charge form only with maximum muzzle velocity 515 m/s and maximum range 11,800 m. May no longer be in production

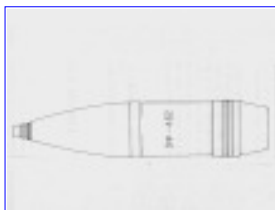
UPDATED



FRAG-HE OF-462 round produced by VIHORLAT As Snina in [Slovak Republic](#) (T J Gander)



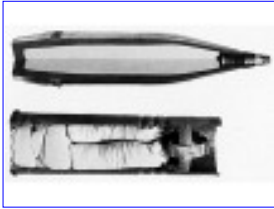
Projectile for 122 mm FRAG-HE OF-472



Variation of projectile for 122 mm FRAG-HE OF-462



122 mm HE round produced in [Iran](#)



Cross-sections of Bulgarian 122 mm FRAG-HE OF-462 J projectile and Full Charge cartridge case for [122 mm 2S1 self-propelled](#) howitzers



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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

76 mm FRAG-HE OF-350 and O-350A

Armament

76 mm Divisional Field Gun M1942 (ZIS-3); [76 mm Mountain Gun GP \(M1966\)](#); D-56T tank gun; NORINCO 76 mm Field Gun Type 54; (OF-350) 76.2 mm Romanian Mountain Guns Models 48B1A5 and 82; Romanian Mountain Howitzer Model 84.

Development

The 76 mm Divisional Field Gun M1942 (ZIS-3) was one of the stalwarts of the Red Army's close artillery support regiments during the 1941-1945 Great Patriotic War and was produced in thousands. The main projectile employed throughout its service life was FRAG-HE, of which the OF-350 and O-350A were the latest types. The OF-350 and O-350A are visually identical although the O-350A is marginally shorter. The 42 calibre ZIS-3 and its ammunition are now generally regarded as obsolete, due mainly to the low projectile weight, although the ZIS-3 and its Chinese equivalent, the 76 mm Type 54, remain in service with some nations, sometimes as an anti-armour weapon. It no longer serves with any of the former Warsaw Pact nations other than as a Blank-firing saluting gun or gate guardian.

Self-propelled carriages such as the SU-76 are no longer in service anywhere, but the 76 mm D-56T tank gun, an updated and lighter development of the ZIS-3 ordnance, is still used on the [PT-76](#) light amphibious tank in service with many nations.

The 76 mm FRAG-HE OF-350 projectile is employed with the Romanian Mountain Guns Models 48B1A5, 82 and 84 in a slightly modified form as the OF-350M (see separate entry for details). The OF-350M is also fired by the Romanian Arsenalul Mountain Howitzer Model 84.

Description

The 76 mm (actual calibre 76.2 mm) FRAG-HE OF-350 and O-350A, are fixed rounds with the projectile rigidly fixed to the cartridge case by a 360° crimping band located in a cannelure close to the single copper drive band which is 13.72 mm wide.

The projectile is a hollow steel forging with a threaded nose cavity for the point detonating fuze. The ogive is long and streamlined and there is a bourrelet and a boat tail. The usual filling is 710 g of TNT although other explosives have been used.

The straight-sided cartridge case is extruded brass (lacquered steel has been used) and contains approximately 1.08 kg of loose-filled 9/7 nitrocellulose powder plus 12 g of S-1 decoppering agent, and a distance piece and obturator to fill the gap between the propellant and the projectile base. A 25 mm brass percussion primer housing is threaded into the base.

The muzzle velocity is 680 m/s, producing a range of approximately 13,300 m. When fired from the Romanian Mountain Howitzer Model 84 at a maximum muzzle velocity of 398 m/s, the maximum range is given as 8,600 m.

A blank MK-354 cartridge was produced for training and saluting purposes. It weighed 1.5 kg and contained 150 g of 9/7 propellant to produce the sound and flash signatures required. Many nations manufacture their own Blank cartridges using fired cartridge cases.

Specifications

Weights:

complete round - 8.98 kg

projectile - OF-350 6.21 kg; O-350A 6.22 kg

explosive - OF-350 640 g TNT; O-350A 523 g TNT/RDX

propellant - 1.08 kg NC

cartridge case - 1.55 kg

Lengths:

complete round - 650 mm

projectile, unfuzed - OF-350 309.63 mm; O-350A 307.34 mm

projectile, fuzed - OF-350 362.2 mm; O-350A 355.9 mm

cartridge case - 385 mm

Muzzle velocity: 680 m/s

Max diameter over cartridge case rim: 90 mm

Max range: approx 13,300 m

Chamber pressure: 2,380 bar

Authorised fuzes

PD KTM-1, KT-1, KTM-1-U, KTMZ-1, KTMZ-1-U, MG-N, V429

Equivalent rounds

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defence, Department of Defence Industry

Type: HE OF-350

Description: For D-56T tank gun. A [M70](#) HE also exists.

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HE OF-350 (OF-350V)

Description: For D-56T tank gun

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE Shell OF-350

Description: Explosive filling is 600 g of Trotyl. Maximum range given as 13,750 m. May no longer be in production

UPDATED



76 mm FRAG O-350A

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

12.7 × 108 mm

Synonyms:

12.7 × 107 mm ; 12.7 Soviet machine gun; 12.7 mm DShK; 12.7 mm Type 54

Armament

Soviet DShK heavy machine guns; RFAS NSV/NSVT heavy machine guns; Chinese Type 77, W-85 and W-89 machine guns; Hungarian 'Gepard', RFAS V-94, V-96 and other anti-materiel rifles.

Development

This cartridge was originally developed for the Degtyarev DK heavy machine gun in the late 1920s, and like its US equivalent the [0.50 Browning](#), leaned heavily upon the German 13 mm TuF round for its inspiration. It was then used for the Degtyarev DShK series of guns and has remained in use to the present, being widely distributed. Manufacture has taken place at various times in [China](#), Czechoslovakia, [Egypt](#), [India](#), [North Korea](#), [Poland](#), [Russia](#), [Syria](#) and the former [Yugoslavia](#). Although the 12.7 × 108 mm cartridge was originally primarily intended for use in machine guns, there are now several anti-matériel rifles chambered for the cartridge and thus match grade precision ammunition for these weapons is now beginning to be manufactured.

Description

The case is rimless and bottlenecked, of brass or varnished steel and Berdan primed. The standard bullet

is a flat-based armour-piercing/incendiary pattern with a steel core inside a steel jacket with gilding metal envelope. The core is shorter than the jacket and the space at the front is filled with incendiary composition.

Specifications

AP-I B32

Round length: 146.8 mm

Case length: 105.9 mm

Rim diameter: 21.6 mm

Bullet diameter: 12.95 mm

Bullet weight: 48.28 g

Muzzle velocity: 840 m/s

Muzzle energy: 15,570 J

BOSNIA-HERZEGOVINA

Manufacturer

Unis Igman d.o.o.

Type: API B32: FMJ; 47.4 g, black/red tip; V₂₅ 810-825 m/s

APIT BZT44: FMJ; 44.8 g, black/purple tip; V₂₅ 810-825 m/s

API M81: FMJ; 23 g, black/red tip; V₂₅ 1000 m/s

BULGARIA

Manufacturer

Arsenal

Type: AP-I B32: FMJ; steel core; bimetal jacket, incendiary mixture in nose; 49 g; V₂₅ 820 m/s

Type: AP-I-T BZT: FMJ; steel core; bimetal jacket, incendiary mixture in nose, tracer capsule in base; 44 g; V₂₅ 820 m/s

Manufacturer

Kintex

Type: AP-I B32: FMJ; steel core; bimetal jacket, incendiary mixture in nose; 49 g; MV 850 m/s

Type: AP-I-T BZT: FMJ; steel core; bimetal jacket, incendiary mixture in nose, tracer capsule in base; 44 g; MV 850 m/s

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: AP-I-T Type 54: FMJ, SL; steel core inside a gilding metal jacket, with incendiary composition in the jacket nose, ahead of the core, and a tracer filling at the rear; 43.2-44.6 g, 1.15 g incendiary filling; trace to 1,550 m; MV 810-825 m/s

AP-I Type 54: Conventional FMJ with solid steel core and a 1.05 g incendiary filling in the jacket nose; 47.4-49 g; MV 810 to 825 m/s; penetrates 20 mm hard steel plate at 100 m range and ignites fuel behind a 15 mm armour plate at 70 m range.

HE-I: The bullet consists of a hollow steel core filled with 2.5 g of explosive and a hardened

penetrative sleeve at the front end of the core containing a detonator, all enclosed in a gilding metal jacket; 44 g; MV 810-825 m/s; will function against a 2 mm dural plate and ignite fuel after penetrating.

APHEI: This ammunition was introduced into Chinese military in December 1995. The bullet will penetrate 10 mm of hardened steel angled at 30 degrees at 800 meters range and then explode after having passed through the plate. Bullet weight is 47.4 - 49 g; MV 810-825 m/s.

APDS Type 54-1: This cartridge has a tungsten penetrator weighing 22.3-22.8 g and is intended for use against armed helicopters and AFVs at under 1,000 m range. MV 1,150 m/s.

Blank: This cartridge is distinguished by having the mouth coned around a rounded cover; this is ejected from the gun muzzle on firing and can be dangerous up to 15 m from the muzzle.

EGYPT

Manufacturer

Shoubra Company

Type: AP-I: FMJ; based on RFAS B32; 49.5 g; MV 815 m/s

AP-I-T: FMJ; based on RFAS BZT; 45.5 g; MV 845 m/s

AP-T B-62: FMJ; tungsten carbide core; red trace to 1,200 m; 62 g; MV 825 m/s

IRAN

Manufacturer

Ammunition Industries

Type: Ball: FMJ; brass case; 49g; MV 870 m/s

ROMANIA

Manufacturer

S.N. ROMARM S.A.

Type: API B 32: FMJ, steel core; 49 g; MV 810-825 m/s

API-T BZT: FMJ, steel core; 47.4-49 g; MV 810-825 m/s

HEI MDZ: FMJ, steel core; 44 g; MV 810-825 m/s

Blank: Steel case, rose crimped. Cartridge weight 54 g

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

LVE Novosibirsk and JSC Barnaul Machine Tool Building Plant

Type: Duplex AP-I 1SL: Originally developed for the YakB aircraft machine gun, the 1SL uses the standard cartridge case but carries two bullets; the first bullet is crimped into the neck in the usual way, and has a recessed base into which the tip of the second bullet fits. This second bullet is supported axially by indents in the body of the cartridge case and is flat-based. The bullets conform to the general design of the AP-I B32, with a hard core and an incendiary charge in the nose. The first bullet weighs about 30 g and has V_{25} of 750 m/s when fired from the YakB; it can penetrate 5 mm of steel at 1,000 m range. Deviation of the second bullet (which weighs 31 g) is not known. MV of the 1SL when fired from the NSV machine gun has been claimed to be 840-860 m/s

Duplex AP-I-T 1SLT: This is essentially the same as the Duplex 1SL round except that tracer bullets similar to those of the BZT-44 round are used, with an average tracer burning time of 2.9 seconds. The bullets weigh about 27 g each. Velocity is the same as that of the 1SL round

AP-I B-32: FMJ; steel core; incendiary composition in nose; 49 g; MV 825 m/s

AP-I-T BZT-44: FMJ; steel core; incendiary composition in nose; base tracer; 44.8 g; MV 825 m/s

AP-I BS: FMJ; tungsten carbide core with incendiary filling in nose; 56.5 g; MV 825 m/s

Blank: Brass case, rosette crimped. Cartridge weight 83 g

Ball: FMJ Sniper; 59.5 g; V_{25} 770-785 m/s

Manufacturer

State arsenals

Type: AP B30: FMJ, SL; steel core; 51.06 g

AP-I B32: FMJ; steel core, incendiary composition in nose; 48.28 g; MV 800 m/s

AP-I-T BZT44: FMJ; steel core, incendiary composition in nose, base tracer; 44.13 g

AP-I: FMJ; steel core, white phosphorus filler; 46.98 g; MV 800 m/s

AP-I BS41: FMJ; tungsten carbide core with incendiary composition in nose; 51.9 g; MV 860 m/s

HE-I MDZ: Fuzed bullet filled with 1.14 g HE and 1.28 g incendiary composition; 42.76 g; anti-aircraft use

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: AP-I B-32: FMJ, AP; steel core; thermite composition in tip; 48 g; MV 825 m/s

AP-I-T BZT-44: FMJ, AP; steel core in lead sleeve, base tracer; thermite composition in tip; red trace to 1,000 m; 44 g; MV 825 m/s

Practice DShK-V: Lead-antimony core in steel jacket; base tracer; 23 g; MV 1,000 m/s

UPDATED



LVE Duplex 12.7 mm round ISL in part-section



12.7 × 108 mm



12.7 mm APDS Type 54-1 produced by NORINCO (1997)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

100 mm FRAG-HE 53-OF-412, 100 mm HE 53-OF-412Zh, 100 mm FRAG 53-O-415

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)); 100 mm field gun BS-3; 100 mm [KS-19](#) anti-aircraft gun; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; [100 mm Field Gun M53](#); 100 mm towed [anti-tank gun M1977](#); 100 mm towed [anti-tank gun M1977 \(Romania\)](#); 100 mm Coast Gun ([Yugoslavia](#)).

Development

These three general purpose explosive filled projectiles are described in the same entry due mainly to the fact that there is little difference between them, despite the differentiation in their designations. One version of the FRAG-HE OF-412 is stated to produce more than 1.9 times the fragmentation of a conventional HE projectile. They mainly vary in the model or type of fuze employed, some outline and dimensional details and the weight of their explosive fillings.

These rounds have been produced in [Bosnia-Herzegovina](#), [Bulgaria](#), [China](#), [Czech Republic](#), [Egypt](#), [Pakistan](#), [Romania](#), [Slovakia](#) and [Yugoslavia](#). [India](#) may also produce one or other of them but no information is available.

One further 100 mm FRAG-HE projectile, the 3OF32, is covered in the following entry.

Description

All three of these 100 mm HE type rounds are fixed. The projectiles are rigidly secured to their brass cartridge cases by a shallow crimping ring located between their twin copper drive bands which are set some 22 mm apart.

The HE 53-OF-412Zh has a less pronounced boat tail base than the other two rounds. All three rounds are steel and have wall thicknesses of approximately 18 to 20 mm at the bourrelet, although the grade of steel does vary. The explosive fillings also differ. The HE 53-OF-412Zh has 2.16 kg of TNT; the FRAG-HE 53-OF-412 has 1.46 kg of TNT and the 53-O-415 has 1.58 kg of TNT/Aluminium. The HE 53-OF-412Zh has a point detonating RGM fuze, the FRAG-HE 53-OF-412 has a point detonating V-429 fuze, while the FRAG 53-O-415 has a mechanical time VM-30 or VM-30L fuze to produce airbursts. It is intended primarily for the [KS-19](#) anti-aircraft gun and always uses a brass case, as do all rounds for the [KS-19](#). All fuzes are threaded directly into a cavity in the projectile nose.

The MK-75 brass cartridge cases (lacquered steel may also be used) may contain one of two possible propellant loads. These vary from type to type but, as an example, the FRAG-HE 53-OF-412 cartridge case may contain a full 5.6 to 5.75 kg or a reduced 2.27 to 2.4 kg charge of NGH or NDT-3 18/1 propellant in bundled stick form; some reduced charges use 9/7 + 12/1 TR propellant. KVU or KV-13U percussion primers are threaded into the bases.

From the two different propellant loads it follows that the muzzle velocity of all three rounds will be 900 or 600 m/s. These velocities correspond to maximum ranges of 20,650 or 11,000 m.

A training round intended specially for training tank crews is the 100 mm UOFT-412 training round with a OFT-412 HE-T projectile. The projectile is fired at a muzzle velocity of 900 m/s and emits a No 1 tracer for up to 5 seconds from a location in the base so that the trajectory can be followed for training assessment and marking purposes. As the projectile passes through a soft target the nose-mounted MG-UchM, VS-5 or VUBS-1M super-quick point detonating fuze, functions to detonate the projectile's TNT bursting charge less than 5 m behind the target. Should the projectile fail to hit a target it will self-destruct after about 5 to 7 seconds at a maximum range of 16,800 m. The complete UOFT-412 round weighs 30.3 kg and has a lacquered steel or brass cartridge case containing 5.75 kg of NDT-3 18/1 propellant.

The 100 mm UOFT-412 training round is marketed by Kintex of [Bulgaria](#).

ROMARM of [Romania](#) also produces an HE-T training round with a self-destruct element functioning to detonate a 1.02 kg explosive charge 3.5 to 4.5 seconds after firing. This equates to a range between 2,500 and 3,000 m. A 3.67 kg propelling charge produces a muzzle velocity of 970 m/s. The projectile weighs 9.2 kg and the complete round is 928 mm long overall.

Another training round equivalent produced for 100 mm anti-armour guns is produced by Zakłady Tworzyw Sztucznych `PRONIT' in [Poland](#). This round (the designation is not known) resembles a normal HE type 100 mm round and can be handled and loaded in the same manner. The projectile has a plastic casing filled with either water or an anti-freeze mixture for when low temperatures are encountered. As the projectile leaves the muzzle after firing the plastic casing disintegrates, scattering fragments and the liquid contents out to a maximum range of 120 m. In the process, the gun produces sound and flash and the gun recoil and other mechanisms will operate. The round is 1.1 m long overall.

Specifications

Weights:

complete rounds, full charge - 30.27 kg

complete rounds, reduced charge - 26.74 kg

projectiles - HE 53-OF-412Zh, 15.91 kg; FRAG-HE 53-OF-412, 15.61 kg; FRAG 53-O-415, 15.44 kg

explosive - HE 53-OF-412Zh, 2.16 kg; FRAG-HE 53-OF-412, 1.46 kg; FRAG 53-O-415, 1.58 kg

propellant - 5.6 or 2.27 kg NGH

cartridge case - 8.5 kg

Lengths:

complete round - 1.095 m

projectiles - HE 53-F-412Zh, 486.05 mm; FRAG-HE 53-OF-412, 489 mm; FRAG 53-O-415, 511.3 mm

cartridge case - 695 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 900 or 600 m/s

Max range: 20,650 or 11,000 m

Chamber pressure: 2,940 or 1,960 bar

Authorised fuzes

HE 53-OF-412Zh - PD RGM

FRAG-HE 53-OF-412 - PD V-429

FRAG 53-O-415 - MT VM-30 or VM-30L

Equivalent rounds

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defense, Department of Defense Industry

Type: 100 mm HE

Description: Understood to use OF-412 projectile

[BULGARIA](#)

Manufacturer

Duna-Rit

Type: 100 mm HE

Description: Understood to use OF-412 projectile

Manufacturer

Kintex

Type: HE UOF-412 or UOF-412U

Description: Available in both Full (UOF-412) or Reduced (UOF-412U) Charge form. Brass or lacquered steel cartridge cases contain 5.75 or 2.4 kg of propellant. The projectile is fitted with a V-429E PD fuze

Manufacturer

Kintex

Type: UOFT-412

Description: Training round - see text

[CZECH REPUBLIC](#)

Manufacturer

ZVS Dubnica

Type: HE JOF

Description: Complete round weighs 26.7 kg and the steel projectile contains 1.46 kg of TNT. Nose fuze is PD V-429 and the cartridge case contains Dgtp or Ngtp propellant in bundled stick form. The percussion primer threaded into the base is a ZS-1a or KV-4. Maximum range is 15,000 m and operating temperature range -40 to +40°C

Manufacturer

Caliber Limited

Type: 100 mm round with OF-412 HE

Description: Propelling charge is 5.75 kg of NDT-3 18/1 and maximum range given as 16,800 m. Otherwise standard specifications

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries

Type: 100 mm FRAG-HE and HE

Description: Specifications as text

[FINLAND](#)

Manufacturer

Sako Limited

Type: HE

Description: Believed to be 53-OF-412Zh

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Division

Type: 100 mm HE

Description: [Iran](#) has been producing ammunition for the 100 mm guns used by the Iranian armed forces. The exact types of round are not known although some form of HE-based round would seem to be very likely. No further information is yet available

[IRAQ](#)

Manufacturer

State factories

Type: 100 mm HE

Description: In 1990 the Iraqis were producing 100 mm HE rounds for their armed forces. The exact type of round is not known and it is probably no longer in production

PAKISTAN

Manufacturer

Pakistan Ordnance Factories (POF)

Type: 100 mm HE/TK P1A1

Description: Appears to be a local variation of 53-OF-412 round as full round weight given as 30.5 kg and round length as 1.09 m. Fuze is PD Liu-5 while the percussion primer is a Type D-5. Projectile filling is TNT

ROMANIA

Manufacturer

SN ROMARM SA

Type: 100 mm HE

Description: Produced with full or reduced propellant charges for Model 77 field gun as well as D-10 series tank guns. Training HE-T also produced - see text

SLOVAKIA

Manufacturer

VIHORLAT As Snina

Type: HE JOF

Description: Complete round weighs 26.7 kg and projectile contains 1.46 kg of TNT. PD fuze is V-429. The brass or lacquered steel cartridge case contains 5.6 kg of Dgpt or Ngtp propellant

YUGOSLAVIA, FEDERAL REPUBLIC

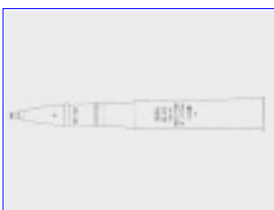
Manufacturer

Yugoimport SDPR

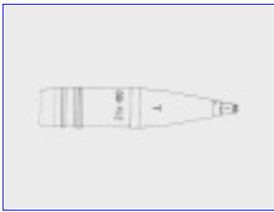
Type: HE M63P1

Description: Produced with full or reduced propellant charges. Equivalent to FRAG-HE 53-OF-412. Also produced is a Prac HE M63P1 containing a 42.5 g Tetryl marker charge in the nose and an otherwise inert filling. [A 100](#) mm Blank [M71](#), containing 400 g of single-base propellant in powder form in a brass stub case 282 mm long, was also produced. Both types are probably no longer in production

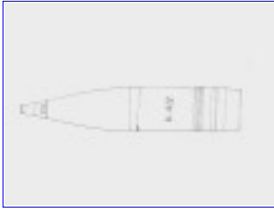
UPDATED



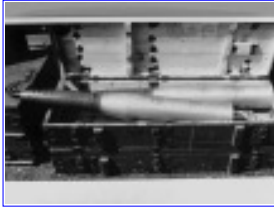
Complete 100 mm FRAG-HE 53-OF-412 round



Projectile for 100 mm FRAG-HE 53-OF-412



Projectile for 100 mm HE 53-OF-412Zh



100 mm JOF HE rounds used by the Czech Army (T J Gander)



100 mm HE/TK P1A1 round produced by [Pakistan](#) Ordnance Factories (POF)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: HE M71 and HE-T M71A1

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm HE [M71](#) round was developed during the Second World War to become the standard time fuzed anti-aircraft projectile for the 90 mm Anti-aircraft Gun M1 and the later M117 and M118 anti-aircraft guns. As such, it was the first item of ammunition for land use to utilise the new VT (Variable Time, the codename for proximity) fuze. The 90 mm HE [M71](#) was also employed by the T13 anti-tank gun series and the T7/M3 series of guns that were used in the [M26](#) Pershing MBTs. Later development of the latter led to the M36 and [M41](#) Cannon used on [M47](#) and [M48](#) MBTs. A lightweight derivative, the M54, was used on the [M56 Scorpion](#) self-propelled anti-tank gun, now long withdrawn from service.

The only guns still using the 90 mm HE [M71](#) and M71A1 are the M36 and the [M41](#), used on the [M47](#) and [M48](#) MBTs respectively. These MBTs and their guns are no longer in service with the US armed forces but are still in service elsewhere. Although it is no longer produced in the USA, 90 mm HE M71/M71A1 ammunition remains in production in various countries (see below).

The main differences between the [M71](#) and M71A1 are: the M71A1 has a tracer element while the [M71](#) does not; the M71A1 uses a different propellant load, giving rise to a revised ballistic performance and reduced barrel wear.

Description

The 90 mm HE [M71](#) and HE-T M71A1 are fixed rounds with the projectile rigidly crimped into the brass cartridge case. A single gilding metal drive band encircles the projectile just forward of the case/projectile junction.

The projectile is a hollow steel forging with a boat-tailed base and a streamlined ogive. Fillings may be cast TNT or Composition B; some early production rounds may be encountered with 50:50 Amatol and a booster surround comprising a small amount of TNT. The 90 mm HE [M71](#) may have a normal or deep cavity under the nose-located fuze well. If a deep cavity is involved a 140 g supplementary charge of TNT in an aluminium liner is inserted into the cavity. An [M10](#) tracer is threaded into the projectile base on the HE-T M71A1.

The 70:30 brass rimmed cartridge case is of the [M19](#) or M19B1 type and uses an M28B2 or M28A2 percussion primer press fitted into the base. The propellant load for the [M71](#) is 3.316 kg of [M15](#) propellant and for the M71A1 is 2.42 kg of multiperforated M1 propellant.

The 90 mm HE [M71](#) has a muzzle velocity of 823 m/s and a maximum range of 17,800 m. The 90 mm HE-T M71A1 has a muzzle velocity of 731 m/s and a maximum range of 15,300 m.

The live firing training equivalent of the 90 mm HE [M71](#) is the TP-T M353A2. It differs from the [M71](#) series in some respects in that it uses [M30](#) propellant which gives a higher muzzle velocity (914.4 m/s) and reaches a greater maximum range (21,000 m). The propellant is ignited by a [M58](#) percussion primer. Complete round weight is 19.92 kg and it is 942.6 mm long overall.

A completely inert dummy round for handling and loading training equivalent to the 90 mm HE M71/M71A1 is known as the Cartridge, 90 mm: Dummy, M12. The M12 uses a one-piece bronze projectile and cartridge case, the M12B1 is iron while the M12B2 is manganese bronze. All use a bronze or steel base and may be fitted with a dummy or inert fuze.

Specifications

Weights:

- complete round, [M71](#)** - 18.68-19 kg
- complete round, M71A1** - 17.6-17.93 kg
- explosive** - 975 g Comp B or 730 g TNT
- supplementary charge, [M71](#)** - 140 g
- propellant, [M71](#)** - 3.316 kg [M15](#) propellant
- propellant, M71A1** - 2.42 kg M1 propellant

Lengths:

- complete round** - 951.5 mm
- projectile with M557 fuze** - 417 mm
- cartridge case** - 615 mm

Muzzle velocity:

- [M71](#)** - 823 m/s
- M71A1** - 731 m/s

Max range:

- [M71](#)** - 15,300 m
- M71A1** - 17,800 m

Operating temperature range: -40 to +52°C

Authorised fuzes

HE [M71](#) - PD M51A5, [M78](#) series, M557; MTSQ M564; Prox M513 series (deep cavity only)
HE-T M71A1 - PD M51A5, M557; MTSQ M564

Equivalent rounds

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Ministry of Defense, Department of Defense Industry

Type: HE [M71](#)

Description: Standard US specifications

[GREECE](#)

Manufacturer

Hellenic Arms Industry (EBO)

Type: HE [M71](#) and HE-T M71A1

Description: Standard US specifications

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE [M71](#) and HE-T M71A1

Description: Standard US specifications. Supplied fitted with PD M577 fuze. Inert filled TP and TP-T equivalents were also produced. Now available only by special order.

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 90 mm HE

Description: Standard US specifications

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: HE [M71](#)

Description: Standard US specifications. TP-T M353A2 also produced

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: HE [M71](#)

Description: Standard US specifications

[TAIWAN](#)

Manufacturer

Hsing Hua Company Ltd

Type: HE [M71](#)

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: HE [M71](#)

Description: Standard US specifications. Production as required

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

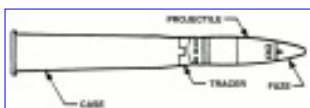
Type: HE [M71](#)

Description: Probably no longer in production. Standard US specifications but filling given as 884 g of Trotyl

UPDATED



Cross-section of Cartridge, 90 mm: HE-T M71A1



*Outline drawing of Cartridge, 90 mm: HE-T M71A1
(2000)*

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MORTARS - 120 mm MORTARS, [BOSNIA-HERZEGOVINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE mortar bomb, M62P3

Armament

All 120 mm smoothbore mortars.

Development

History unknown, but by SOKO-VIT of [Bosnia-Herzegovina](#) presumably to provide an indigenous source of 120 mm mortar ammunition.

Description

The [M62P3](#) is a nearly identical copy of the former Yugoslavian M62P1 and differs only in minor details. It is a conventional bomb with four obturating grooves at the bourrelet. An alloy tailboom assembly is threaded into the rear of the bomb body. There are six secondary increments in plastic horseshoe containers above the 12 tailfins. The [M78](#) fuze is presumably a direct copy of the former Yugoslavian fuze of the same designation.

Specifications

Length, fuzed: 595 mm

Weight, fuzed: 12.6 kg

Weight and type of payload: 2.3 kg TNT

Number of charges: P + 6

Fuze: impact (PD) [M78](#), super-quick and delay

Min range: 275 m

Max range: 6,340 m

Muzzle velocity: 130-322 m/s

Colour/markings: OD/yellow

Manufacturer

SOKO-VIT d.o.o. Mostar.

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MORTARS - 82 mm MORTARS, [BOSNIA-HERZEGOVINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm HE mortar bomb, M68P1

Armament

All 82 mm mortars.

Development

History unknown, by SOKO-VIT presumably to provide an indigenous supply of 82 mm HE mortar ammunition.

Description

The [M68P1](#) is similar to the original RFAS [O-832](#) series, but with several differences. It is a typical teardrop-shaped bomb with cast-iron body and four obturating grooves around the bourrelet. The tailboom assembly is threaded into the base of the bomb body and has four increments above the eight fins. There are two available fuzes, the [M68P1](#) impact (PD) fuze, presumably a copy of the Yugoslavian fuze of the same designation and the M93.

Specifications

Length, fuzed: 340 mm

Weight, fuzed: 3.3 kg

Weight and type of payload: 530 g TNT

Fuze: impact (PD)

Number of charges: P + 4

Min range: 80 m

Max range: 4,220 m

Muzzle velocity: 69.5-265 m/s

Manufacturer

SOKO-VIT d.o.o. Mostar.

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MORTARS - 60 mm MORTARS, [BOSNIA-HERZEGOVINA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm M73 Mortar Bomb

Synonyms

None

Armament

60 mm mortars

Development

By Soko-Vit of [Bosnia-Herzegovina](#) to provide an indigenous 60 mm mortar round.

Description

The [M73](#) is a nearly identical copy of the former Yugoslav [M73](#) and differs from it only in minor details.

Specifications

Length, fuzed: 281 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 230 g TNT

Min range: 80 m

Max range: 2,532 m

Number of charges: P + 4

Muzzle velocity: 74 - 193 m/s

Manufacturer

SOKO-VIT doo Mostar.

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ARTILLERY ROCKETS

Date Posted: 12 July 2001

Jane's Ammunition Handbook 2001-2002

128 mm M91 and M93 FRAG-HE rockets

Armament

128 mm RAK-12 MRS; LOV-RAK, 24/128 mm 4 × 4.

Development

The 128 mm [M91](#) and M93 FRAG-HE rockets were developed within [Croatia](#) using the Yugoslav [128 mm M-63](#) rockets (see separate entry) as a basis. The [M91](#) approximates to the earlier M-63 rocket but the M93 is a longer range variant with a larger and more powerful rocket motor and a slightly heavier FRAG-HE warhead.

Two launchers have been developed within [Croatia](#) to fire these rockets. The 128 mm RAK-12 MRS is a towed system with 12 launch barrels. Two sets of RAK-12 barrels are mounted over the self-propelled LOV-RAK 24/128 mm 4 × 4, based on the hull and chassis of the Croatian LOV-OP APC.

Marketing of these 128 mm rockets and their launchers is carried out in [Croatia](#) by R H ALAN doo of Zagreb. The same rockets are also produced in Bosnia and Herzegovina by SOKO-VIT doo, Mostar.

Description

As the base model of the Croatian 128 mm spin-stabilised rockets, the [M91](#) closely resembles the earlier Yugoslav M-63 (qv) in appearance and general specifications. It weighs 23.5 kg and is powered by a rocket motor weighing 4.5 kg. The steel-cased FRAG-HE warhead weighs 8.5 kg and is understood to

contain TNT. Maximum range is 8,500 m.

The M93 rocket motor weighs 7.8 kg and increases the maximum range to 13,000 m. The weight of the FRAG-HE warhead is also increased, to 9 kg. It is probable that the M93 was also based on earlier Yugoslav design work concerning the 128 mm [M-87](#) rocket which, as far as can be determined, was not produced in other than small numbers.

Both rockets can be provided with locally produced, nose-mounted point detonating super-quick fuzes, the RU RT [M91](#) (understood to be a Croatian copy of the former Yugoslav PD UT M-63(OV)) or the RU TI [M94](#). Both provide a muzzle safety of 30 to 40 m.

Specifications

Model	M91	M93
Calibre	128.27 mm	128.27 mm
Weights		
Complete	23.5 kg	26 kg
Warhead	8.5 kg	9 kg
rocket motor	4.5 kg	7.8 kg
Spin rate	16,000 rpm	26,000 rpm
Max range	8,500 m	13,000 m
Operational		
temperature range	-30 to +45°C	

Authorised fuzes

PD RU RT [M91](#) or RU TI [M94](#)

Equivalent rockets

[BOSNIA-HERZEGOVINA](#)

Manufacturer

SOKO-VIT doo Mostar

Type: 128 mm M91/M93 rockets

Description: See text.

VERIFIED



Croatian 128 mm FRAG-HE [M91](#) rockets; the M93 is similar in appearance

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm FRAG-HE OF-540

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer; 152 mm Howitzer [M1943](#) (D-1); [NORINCO 152 mm Gun-Howitzer Type 66](#); [NORINCO 152 mm Gun-Howitzer](#) Type 37; 152 mm Model 1981 Howitzer ([Romania](#)); 152 mm Model 85 Gun-Howitzer ([Romania](#)); [152 mm Gun-Howitzer M84](#) series ([Yugoslavia](#)).

Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer; [NORINCO Type 83](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer DANA and ONDAVA.

Development

The 152 mm FRAG-HE OF-540 projectile (actual calibre 152.4 mm) is the successor to the earlier OF-530, developed originally for use with the 152 mm Howitzer [M1943](#) ([D-30](#)) - the two projectiles are compatible. The 152 mm FRAG-HE OF-540 is still the projectile most commonly fired from 152 mm ordnance of Chinese and [Russian Federation](#) and Associated States (CIS) origin, and probably outnumbers all other types of 152 mm projectile in operational and production terms, although the OF-540 is no longer produced in [Russia](#), having been replaced by later designs.

Description

The 152 mm FRAG-HE OF-540 forms part of a separate loading item of ammunition consisting of the

projectile and a variable charge system contained in a brass or lacquered steel cartridge case.

The projectile is forged steel with a long streamlined ogive, a boat tail and a shallow bourrelet. A single copper drive band is just over 24 mm wide. The contents are nominally 6.24 kg of TNT although many references quote figures around 5.86 kg. One version of the 152 mm FRAG-HE OF-540, sometimes referred to as the OF-540B, has a two-part construction with which the forward part of the ogive can be unthreaded, apparently to accommodate large time fuzes.

The 152 mm ammunition uses a two-part variable charge system contained in brass or lacquered steel cartridge cases 547.5 mm long. The two parts are the Reduced Charge and the Full Charge, each in its own cartridge case.

The Reduced Charge uses 9/7, 4/1 and 8/1 Trinitrocellulose powder in a series of 12 bags. Charge 6, the lowest, comprises the base bag charge only, to which a series of equal size bags are added creating higher charges. One charge bag is added to the base charge bag to comprise Charge 5, two are added for Charge 4, three for Charge 3 and five for Charge 2. These are all held in place by a fibre cup. The total weight of the Reduced Charge propellant is 4.2 kg. Maximum muzzle velocity produced by the Reduced Charge is 511 m/s.

The Full Charge uses, NDT-3 16/1 or NGH powder in bags together with 150 g of 8/1 UG flash reducing agent plus S-1 decoppering agent. Charge 1 has two base bag charges, one located above the other. To create the Full Charge two further equal size bag charges are added; as mentioned previously a fibre cup holds the charge bags in place. The total weight of the Full Charge propellant is 8.8 kg. Maximum muzzle velocity produced by the Reduced Charge is 655 m/s.

Both charges are initiated by a KV-4 percussion primer in the base of the cartridge case.

With a 152 mm gun-howitzer such as the [D-20](#) the Reduced Charge muzzle velocities vary from 282 to 511 m/s. This produces ranges of 6,710 to 13,400 m. The Full Charge produces a muzzle velocity of 655 m/s and a maximum range of 17,400 m. When fired from the gun-howitzer used on the 152 mm Self-propelled Gun-Howitzer M-1973 ([2S3](#)) the 152 mm FRAG-HE OF-540 is quoted as having a maximum range of 18,500 m. When fired from the 152 mm [2S19](#) Self-propelled Gun-Howitzer or the towed 152 mm Gun-Howitzer [2A65](#) the maximum range is 24,700 m.

A training round intended specially for direct fire training of towed 152 mm ML-20 or [D-20](#) and [2S3](#) or [2S3M](#) self-propelled howitzer crews is the 152 mm VOFT-546 training round with a 152 mm HE-T OFT-540 projectile. The projectile is fired at a muzzle velocity of 655 m/s and emits a No 1 tracer for up to 3 seconds from a location in the base so that the trajectory can be followed for training assessment and marking purposes. As the projectile passes through a soft target the nose-mounted VS-5 or VUBS-1M super-quick point detonating fuze functions to detonate the projectile's TNT bursting charge less than 5 m behind the target. Should the projectile fail to hit a target it will self-destruct after about 4 to 6 seconds at a maximum range of 17,410 m. The complete 152 mm VOFT-540 round weighs 60 kg and has a brass cartridge case containing 8.3 kg of NDT-3, 18/1 and 8/1 UG propellant.

The 152 mm VOFT-540 training round is marketed by Kintex of [Bulgaria](#).

Specifications

Weights:

complete round, nominal - 59.5 kg

projectile, fuzed - 43.51 kg

explosive filling - 6.24 kg TNT

propellant - Full 8.8 kg NGH or NDT-3; Reduced 4.2 kg NC

cartridge case, brass - 7.5 kg

Lengths:

projectile, fuzed - 710 mm

cartridge case - 547.5 mm
Diameter of cartridge case rim: 170 mm
Diameter over drive band: 156 mm
Muzzle velocity, Full Charge: 655 m/s
Max range, Full Charge: 17,400 m
Max chamber pressure: 2,350 bar

Authorised fuzes

PD RGM-2, RGM-2M
MTSQ D-1U
Prox V-90, AR-5

Equivalent projectiles

[BOSNIA-HERZEGOVINA](#)

Manufacturer

Kintex

Type: 152 mm HE OF-540

Description: For [D-20](#) and [M84](#) howitzers. A [M84](#) projectile for the [M84](#) exists but no details are available

[BULGARIA](#)

Manufacturer

Kintex

Type: 152 mm HE OF-540

Description: Filled with 5.86 kg TNT. Projectile weight given as 43.9 kg. Complete round with Full 8.3 kg propelling charge is VOF-546. Reduced charge round with 4.11 kg propelling charge is VOF-546U. Both rounds are for 152 mm [D-20](#), ML-20 and [2S3](#). Blank ammunition is also produced

Manufacturer

Kintex

Type: 152 mm VOFT-546 Prac

Description: Training round with OFT-540 projectile - see text

Manufacturer

Vazov Engineering Plants

Type: 152 mm HE

Description: Available with both Full and Reduced propellant charges. Standard specifications

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 152 mm HE Type 66

Description: Filled with 5.86 kg of TNT. Fitted with Liu-4 or Electronic fuze. Projectile weight given as 43.56 kg and length 706.6 mm. Creates 3,000 fragments on detonation. Maximum range given as

17,230 m

CZECH REPUBLIC

Manufacturer

Caliber Prague Limited

Type: 152 mm HE with Full Charge

Description: Standard specifications

IRAQ

Manufacturer

State factories

Type: 152 mm HE

Description: Exact details not available. May no longer be in production

ROMANIA

Manufacturer

SN ROMARM SA

Type: 152 mm HE OF-540

Description: Available with both Full and Reduced charges. The projectile is understood to be virtually identical to the OF-540 and intended to be fired from 152 mm [D-20](#) series howitzers and the Romanian 152 mm Model 81 Gun-Howitzer. Projectile weight given as 43.56 kg and maximum range 17,000 m. Can be fitted with a PD RGM-2 fuze

SLOVAKIA

Manufacturer

Kerametal Company Limited

Type: 152 mm HE-540

Description: Projectile virtually identical to OF-540. Fired from 28 calibre barrels to a maximum range of 17,400 m using the ZN 546 variable charge system. Maximum muzzle velocity is 655 m/s

Manufacturer

Konstrukta Defence

Type: 152 mm FRAG-HE OF-540

Description: Fired from 28 calibre barrels to a maximum range of 17,400 m using the ZN 546 variable charge system. Maximum muzzle velocity is 655 m/s

Manufacturer

VIHORLAT As Snina

Type: 152 mm EOF

Description: Projectile virtually identical to OF-540

UKRAINE

Manufacturer

MINIMASHPROM

Type: 152 mm FRAG-HE 3BOF32 (Full) and 3BOF33 (Reduced)

Description: FRAG-HE projectile used with both these rounds is the 152 mm 3OF25 weighing 43.56 kg and containing 6.44 kg of explosive. Complete round weighs 60 kg (Full) or 56 kg (Reduced). Ballistic performance as FRAG-HE OF-540

Manufacturer

TACKO

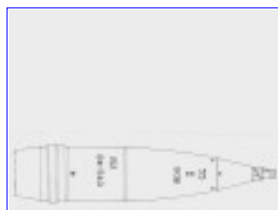
Type: 152 mm HE for [D-20](#), ML-20M and [2S3](#)

Description: Projectile virtually identical to OF-540. Filling is 5.86 kg of TNT

UPDATED



152 mm FRAG-HE OF-540



Variant of 152 mm FRAG-HE OF-540



*NORINCO 152 mm HE Type 66 projectile
(1998)*



Czech Army 152 mm EOF rounds together with their packing (T J Gander)

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 102 mm

Synonyms:

20 mm US M39

Armament

20 mm guns M61A, M39, M50, M61A1, [M168](#), M197 and [M621](#). US GAU-4; GE 120 Mk 29; Mk 22 Mod 2 USN; French F1 ([M621](#)); Phalanx CIWS.

Development

After wartime experience with Hispano-Suiza and Oerlikon cannon in the late 1940s, the USA set about developing a cannon of its own. The resulting weapon was based upon the German Mauser 312 revolver gun and entered service as the M39. It was later improved into the M39A1 and then supplemented by the M61 and [M168](#) Vulcan Gatling pattern guns. A naval version, the Mk 22, was also developed for use in fast patrol boats. The guns and their ammunition spread from the USA to NATO by way of various US aircraft supplied to NATO countries, and the cartridge was adopted by the French for the Mle 621 (F1) gun.

PRIMEX Technologies introduced its 20 mm Improved Ammunition specifically for US high-performance aircraft cannon.

Alliant Techsystems in conjunction with the US Navy developed the MK149-4 Phalanx round with a tungsten penetrator and sabot specifically for use with the Phalanx Close-In Weapon System (CIWS).

Well over 3 million rounds have been produced.

Description

The rimless, bottlenecked case may be of brass or steel and is electrically primed using the M52A3B1 primer. Projectiles are of conventional pattern and weigh from 98 to 105 g, the IMR 7013, WC 870 or WC 872 propellant charge being regulated to give a muzzle velocity of 1,030 m/s.

Specifications

Round weight: (max) 263 g

Round length: 168.2 mm

Case length: 102 mm

Rim diameter: 29.6 mm

Bourellet diameter: 19.9 mm

Projectile weight: 100 g

Muzzle velocity: 1,030 m/s

Muzzle energy: 53.5 kJ

Equivalent rounds

BRAZIL

Manufacturer

Companhia Brasileira de Cartuchos

Type: HE-I M56A3: Steel shell with gilding metal driving band, loaded with 11 g of RDX; nose impact fuze M505A3; 100 g; $V_{7.5}$ 1,000 m/s

TP M55A2: Steel inert projectile; dummy fuze; 99 g; $V_{7.5}$ 970 m/s

TP-T M220: Body of HE-I shell, empty, red tracer; dummy fuze; 96 g; $V_{7.5}$ 970 m/s

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: TP C98: Steel body, inert filled; aluminium nose, copper driving band; brass cartridge case; 99 g; MV 1,030 m/s. Interchangeable with US M55A2

FRANCE

Manufacturer

Giat Industries

Type: HE-I M56A3: Steel body loaded with 11 g Hexal 65/35; impact fuze PD M505A3; 101.4 g; MV 1,040 m/s

HE-I-T M242: As for HE-I but with smaller HE loading and rear of shell bored for red tracer; fuzed MR221 PD with self-destruction between 3.5 and 9 seconds; 102 g; MV 1,040 m/s

AP-I M53: This projectile is unusual; the principal components are a solid AP steel pointed slug forming the main body, surmounted by a hollow alloy ogive filled with incendiary composition. The two are held together by a steel skin which reaches from the shoulder, where it grips the ogive to just above the driving band, where it grips the steel slug. The Tombak driving band is pressed into the steel slug, which continues to form the base of the projectile. Penetration is 10 mm of armour at normal

engagement ranges. 101.2 g; MV 1,040 m/s

AP-HC: Light-alloy body fitted with tungsten carbide penetrator; 95 g; MV 1,050 m/s

AP-T (HC): As for AP-HC above but fitted with tracer

TP M55A2: Steel shell body, empty; dummy fuze; 98.6 g; MV 1,045 m/s

TP-T M220: As for TP but with red tracer; 100 g; MV 1,040 m/s

GERMANY

Manufacturer

Buck Werke GmbH & Co

Type: HE-I DM 23A1: As described above.

Manufacturer

Diehl GmbH

Type: HE-I [M-DN 71](#): Steel-pointed shell with ballistic cap. Shell body contains a 5 g HE charge plus a zirconium incendiary pellet, plus a further incendiary filling in the ballistic cap. The base fuze M-DN 201 is fitted, giving a 200 μ s delay, ensuring target penetration before detonation. 98 g; MV 1,030 m/s

HE-I DM 23A1: Steel-pointed projectile with ballistic cap. The shell body is bored from the rear and filled with an incendiary composition and zirconium sponge pellet. Further incendiary material is in the ballistic cap. The shell will penetrate 25 mm of armour steel at 100 m range. 100 g; MV 1,033 m/s

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-I M56A3: Steel shell with gilding metal driving band, loaded with Hexal 70/30 and an impact fuze M505A3; 101 g; MV 1,030 m/s

TP M55A2: Steel, inert projectile; dummy fuze; 101 g; MV 1,030 m/s

ITALY

Manufacturer

Europa Metalli

Type: TP M55A2: Steel shell with aluminium nose cap representing fuze; no filling. Electric primed. 98.6 g; V_{24} 1,030 m/s

KOREA, SOUTH

Manufacturer

[Daewoo](#) Ammunition Corporation.

Type: HE-I M56A3: Steel shell, loaded Hexal; nose impact fuze M505A3; 101 g; MV 1,030 m/s

HE-I-T [M246](#): Steel two-section shell, HE in forward section, tracer in rear, with heat relay providing self-destruction; nose impact fuze; 100 g; MV 1,030 m/s

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,030 m/s

TP-T M220: Body of HE-I shell, empty, red tracer; dummy fuze; 105 g; MV 1,030 m/s

Manufacturer

Poongsan Metal Corporation

Type: HE-I M56A3: Steel shell, loaded Hexal; nose impact fuze M505A3; 101 g; MV 1,030 m/s

HE-I-T M246: Steel two-section shell, HE in forward section, tracer in rear, with heat relay providing self-destruction; nose impact fuze; 100 g; MV 1,030 m/s

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,030 m/s

TP-T M220: Body of HE-I shell, empty; red tracer; dummy fuze; 105 g; MV 1,030 m/s

NETHERLANDS

Manufacturer

NWM de Kruihoorn BV (now closed)

Type: HE-I M56A3: Steel shell, loaded with Hexal; nose impact fuze M505A3; 101 g; MV 1,030 m/s

HE-I-T-SD M246: Steel two-section shell, HE in forward section, red tracer in rear, with heat relay providing self-destruction; nose impact fuze; 100 g; MV 1,030 m/s

AP: Tungsten core in steel body with light-alloy ballistic cap; 104 g; MV 1,030 m/s

AP-I: Steel core with first incendiary charge in the ballistic cap and second incendiary charge in shell base; 105 g; MV 1,030 m/s

FAP: Frangible tungsten alloy core in steel body; no pyrochemical substances or HE; 102 g; MV 1040 m/s

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,030 m/s

TP-T M220: Steel inert projectile, red tracer; dummy fuze; 100 g; MV 1,030 m/s

NORWAY

Manufacturer

[Nammo](#) Raufoss Technology A/S

Type: Multipurpose M70A2: Steel shell loaded with explosive and incendiary elements, the incendiary extending into the nose cap. Upon impact the ignition chain is started, resulting in delayed functioning inside the target. Equal ballistics to the M50 series ammunition. Projectile 100 g; MV 1,030 m/s

Multipurpose M70 LD (low drag): This is similar to the [M70](#) but has an improved projectile shape to reduce air drag during flight. Equal in ballistics to the US PGU-28/B round. Provides an increased hit probability and penetration compared to the M50 series ammunition. Long-burning Zirconium particles improve the fire start capability. 100 g; MV 1,050 m/s

TP-R³ (Target Practice with Reduced Ricochet Risk): Matches [M70](#) LD ballistically but the inert projectile breaks up on contact with the ground to reduce the risk of ricochets by a factor of at least 10 times

Multipurpose NM140: The exterior of this round conforms to the standard US M2 Ball, but the bullet is a design patented by Raufoss which incorporates penetrative, incendiary and fragmentation effects. NM140 will defeat 16 mm of armour (Brinell 360) at 30° at 400 m; after penetration it will explode and produce about 20 effective fragments inside the target. There will also be a shower of incendiary particles which are still effective 15 m behind the target plate. No mechanical fuze is used because the need for detonators or sensitive high explosives has been eliminated. Muzzle velocity 900 m/s, bullet weight 43 g

Multipurpose NM140A1: This is similar to the NM140 but with some minor changes to meet a US Navy specification

Multipurpose tracer NM160: This is the NM140 but with the addition of a base tracer element. The inclusion of this reduces the effective fragmentation by about 30 per cent but does not affect the penetrative or incendiary performance. The tracer is a dark ignition type which is invisible to 50 m from the muzzle, fully visible from 200 to 1,500 m

AP-S NM173: This has ballistic conformity to US Ball M2 but is characterised by tremendous penetration effect. Penetration of 20 mm armour plate at 0° NATO at 1,000 m and 11 mm armour plate at 30° NATO at 1,500 m

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: HE-I M56A3: Steel shell with gilding metal driving band, loaded H761 composition; nose impact fuze M505A3; 101 g; MV 1,030 m/s

AP-I M53: Steel pointed shell with alloy ballistic cap and incendiary filling; 101 g; MV 1,030 m/s

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,030 m/s

SINGAPORE

Manufacturer

Chartered Industries of Singapore (CIS)

Type: HE-I: Steel shell, loaded Hexal; impact fuze; 101 g; V_{24} 1,030 m/s

HE-I-T: As for HE-I but with red tracer; 105 g; V_{24} 1,030 m/s

AP-I: Pointed steel shot with ballistic cap loaded with incendiary mixture; 100 g; V_{24} 1,030 m/s

TP: Body of HE-I shell, empty; dummy fuze; 100 g; V_{24} 1,030 m/s

TP-T: Body of HE-I-T shell, empty, with red tracer; dummy fuze; 105 g; V_{24} 1,030 m/s

SPAIN

Manufacturer

EXPAL SA

Type: Multipurpose M70A1: The shell body carries a strikerless compression-ignition fuze over an incendiary filling over a high-explosive filling. On impact the nose crushes, causing the fuze to fire and ignite the incendiary composition which then ignites the HE filling, giving a forward blast to the burning incendiary fragments. The round will penetrate 20 mm of steel plate at 200 m range and 12 mm at 1,000 m range. The projected incendiary flame is 1 m long, giving excellent effect against protected fuel tanks. MV 1,030 m/s

TP-T M220: Similar in shape to the M70A1 but with inert filling and base tracer

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: FAP PEA 280: Full calibre, frangible armour-piercing. Tungsten alloy penetrator with integral plastic-moulded ballistic cap and body with a steel rear portion, fitted with driving band. A ricochet free

inert projectile with excellent performance against soft and light armoured targets. For air-to-air and air-to-ground, as well as ground-to-air and ground-to-ground applications. Ballistic match to US PGU-28/B; 102 g; MV 1,040 m/s

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: HE-I M56A3: Steel shell loaded RDX/incendiary composition; fuzed M505A3; 100 g; 1,030 m/s

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,030 m/s

TP-T: Steel shell loaded inert with red tracer; dummy fuze; 103 g; MV 1,030 m/s

UNITED STATES OF AMERICA

Manufacturer

General Dynamics, Ordnance and Tactical Systems

Type: HE-I M56A3: Steel shell loaded RDX/incendiary composition; fuzed PD M505; 101 g; MV 1,027 m/s

HEI-T M242: Two-section shell, front loaded HE/incendiary mixture, rear loaded tracer; nose impact fuze; 102 g; MV 1,030 m/s

AP-I M53: Steel pointed shell with alloy ballistic cap and incendiary filling; 101 g; MV 1,027 m/s

APDS MK149 Mod 4: Similar to AP-I [M53](#) but with the addition of a red tracer; 102 g; MV 1,030 m/s tungsten carbide subprojectile in light alloy sabot; 110 g; MV 1,000 m/s. Specifically for US Navy Phalanx Close-In Weapon System (CIWS) but compatible with all M61 and M197 gun systems

API-T MK 244 Mod 0: This is a companion round for the Optimised Gun Barrel (OGB) programme for the MK15 Phalanx CIWS. Compared with the MK149 the MK249 Mod 0 fires a tungsten alloy penetrator over 50 per cent heavier at essentially the same muzzle velocity

TP M55A2: Steel inert projectile; dummy fuze; 101 g; MV 1,027 m/s

TP-T M220: Body of HE-I shell, empty, with red tracer; dummy fuze; 105 g; MV 1,030 m/s

MP-T-SD M940: Multipurpose; steel body loaded HE with a front covering incendiary mixture. This is covered by a support disk separating it from the nose incendiary mixture. The rear section of the body carries a red tracer with heat relay providing self-destruction; 105 g

SAPHEI PGU-28/B: Steel shell with alloy nose cap. Shell contains a sponge zirconium incendiary in its base, with a main HE (Composition A4) filling above, followed by a body incendiary filling and a nose incendiary filling. 100 g; MV 1,052 m/s

SAPHEI PGU-28A/B: An upgraded PGU-28A with an improved projectile nose/body joint configuration and optimised propulsion/driving band system. The driving band and matching propulsion charge reduces barrel wear and chamber fatigue loads with no alteration in muzzle velocity. 100 g; MV 1,052 m/s

TP PGU-27/B: Inert steel projectile representing PGU-28/B; 100 g; MV 1052 m/s

TP-T PGU-30/B: Inert steel projectile representing PGU-28/B but with tracer; 100 g; MV 1052 m/s

Manufacturer

Alliant Techsystems, Kilgore Operations

Type: M56HEI: Steel shell loaded with RDX or RDX/TNT. PD M505A3 fuze. Also available as training round. Projectile weight, 260 g; MV 1,030 m/s

M221 HEI-T: Virtually identical to HE-I [M56](#) but with tracer element. Projectile weight 260 g; MV

1,030 m/s

M242 HEI-T-SD: As HEIT M221 but with self-destruct function. MV 1,030 m/s. Also available as a training round.

MK149-4 Phalanx: For Phalanx CIWS. Tungsten penetrator held in sabot. WC 859 propellant giving MV of 1,128 m/s. Round weight 253 g. Issued in 200 or 250 round bulk packs. No tracer element

TP M55: Inert steel projectile with dummy fuze. Projectile weight 260 g; MV 1,030 m/s

TP-T M220: As TP [M55](#) but with tracer. MV 1,030 m/s

HPT M54A1: High-Pressure Test round for proof-testing 20 mm gun barrels. Round weight 320 g

PGU-27/B TP: An inert projectile for use as a cost effective training substitute for the PGU-28/B SAPHEI round. Projectile weight 266g; MV 1,039 m/s.

PGU-28/B SAPHEI: Round for use in M61 aircraft cannon against light armoured vehicles. Projectile weight, 264 g; MV 1,039 m/s

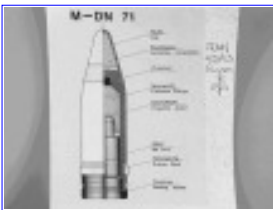
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Giat Industries 20 × 102 mm rounds for French [M621](#) cannon



Giat Industries 20 × 102 mm rounds for US M39/M61 cannon



Diehl [M-DN 71](#) HE/Incendiary shell



Diehl DM 23A1 AP/Incendiary projectile: (1) body; (2) driving band; (3) ballistic cap; (4) base plug; (5) incendiary composition



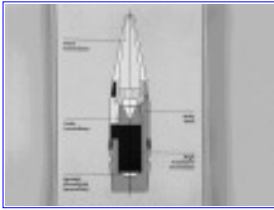
NWM range of 20 × 102 mm ammunition



NWM range of 20 × 102 mm ammunition



Cross-section of Oerlikon Contraves Pyrotec AG 20 × 102 mm FAP PEA 280 projectile



PRIMEX Technologies PGU-28/B multipurpose projectile



PRIMEX Technologies 20 mm Improved Ammunition, from left: TP-T PGU-30/B, SAP-HE-I PGU-28/B; TP PGU-27/B

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 80RB

Synonyms:

20 mm Oerlikon FFM

Armament

Oerlikon FFM and licensed copies.

Development

Developed by Oerlikon Bührle in the mid-1930s, the FFM gun was used during the Second World War by the German Luftwaffe, and in post-war years by several countries, principally Spain. Some guns appear to be still in use in various South American countries for training purposes.

Description

The brass cartridge case is of the familiar Oerlikon rebated rim pattern, percussion primed. It is similar to, but shorter than, the more common 20 × 110RB case. Wartime projectiles included AP shot, solid steel ball, HE, HE-I and Mine HE patterns.

Specifications

Round length: 146 mm

Case length: 80 mm

Rim diameter: 19.2 mm
Bourellet diameter: 19.95 mm
Projectile weight: 130 g
Muzzle velocity: 600 m/s
Muzzle energy: 24.4 kJ

Equivalent rounds

[BRAZIL](#)

Manufacturer

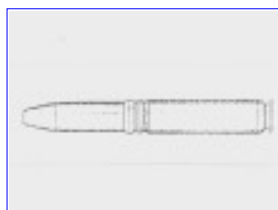
Companhia Brasileira de Cartuchos

Type: HE-SD: Two-section shell, front loaded with HE and rear with red tracer; a heat relay provides self-destruction. Provided with M505A3 PD fuze; 101 g; MV 835 m/s

TP: Inert hollow steel shell; dummy fuze; 123 g; MV 810 m/s

TP-T: Inert hollow steel shell with tracer element in rear; dummy fuze; 125 g; MV 810 m/s

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20 mm Oerlikon FFM

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.44 Magnum

Synonyms:

0.44 Remington Magnum

Armament

Smith & Wesson, Ruger and other suitably chambered revolvers and carbines.

Development

Developed jointly by Smith & Wesson and Remington in 1954 as a more powerful version of the 0.44 Smith & Wesson Special cartridge, it was originally intended as a hunting round but was adopted by a few police agencies in the USA; it never achieved widespread use. The 0.44 Magnum is the world's most powerful, standard production and readily available handgun cartridge and as such is difficult to control, save by exceptionally skilled shooters. Moreover, it delivers terminal ballistics that are too great for standard law enforcement use. The 0.44 Magnum may still be found as a supplementary cartridge in a few US specialised police and security agencies, but it is too powerful for general use.

Description

A rimmed, straight-taper brass case, Boxer primed. The bullet is usually of JHP or FMJ type, as unjacketed bullets give problems with lead fouling in the barrel.

Specifications

Round length: 40.9 mm
Case length: 32.64 mm
Rim diameter: 13.05 mm
Bullet diameter: 10.92 mm
Bullet weight: 15.6 g
Muzzle velocity: 465 m/s
Muzzle energy: 1,683 J

Abridged ballistic table: 0.44 Magnum, 15.6 g ball

Range	Velocity	Energy
0 m	465 m/s	1,683 J
10 m	450 m/s	1,576 J
25 m	430 m/s	1,439 J
50 m	398 m/s	1,233 J

[BRAZIL](#)

Manufacturer

CBC Magtech
Type: Ball: JSP; 15.55 g; MV 536 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd
Type: Ball: JSP; 15.6 g; MV 465 m/s

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)
Type: Ball: JSP; 15.55 g; MV 357 m/s
Ball: JHP; 15.55 g; MV 357 m/s
Ball: JHP; 11.66 g; MV 491 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: FMJ; 15.6 g; MV 420 m/s
Ball: JHP; 13 g; MV 560 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: Lead, SWC; 15.6 g; MV 374 m/s

Ball: JHP; 11.7 g; MV 425 m/s

Ball: JHP; 15.6 g; MV 397 m/s

Ball: SWC; 15.6 g; MV 412 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#), a division of Denel (Pty) Ltd

Type: Ball: JHP; 15.6 g; V₅ 360 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball 11103: JHP; 15.55 g; MV 390 m/s

UNITED STATES OF AMERICA

Manufacturer

3-D

Type: Ball: JHP; 15.55 g; MV 358 m/s

Ball: Lead, SWC; 15.55 g; MV 320 m/s

Manufacturer

Black Hills Ammunition Company

Type: Ball: Lead SWC; 15.5 g; MV 320 m/s

Ball: JHP; 15.5 g; MV 384 m/s

Ball: JHP; 19.4 g; MV 373 m/s

Manufacturer

CCI-Speer

Type: Ball: JHP; 13 g; MV 433 m/s

Ball: SWC; 15.6 g; MV 412 m/s

Shot: 9.75 g; MV 305 m/s

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 10.7 g; MV 396 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: JHP; 15.5 g; MV 396 m/s

Ball: LSWC; 15.5 g; MV 374 m/s

Ball: JHP; 11.6 g; MV 424 m/s

Ball: JHP; 15.5 g; MV 396 m/s

Ball: JSP; 15.5 g; MV 396 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: FMJ; 16.2 g; MV 360 m/s

Ball: JHP; 15.6 g; MV 360 m/s

Ball: JHP; 11.66 g; MV 491 m/s

Manufacturer

Glaser Safety Slug Inc

Type: Ball: Glaser Blue; 8.75 g; MV 564 m/s

Ball: Glaser Silver; 8.75 g; MV 564 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JHP; 11.7 g; MV 491 m/s

Ball: Lead; 15.55 g; MV 305 m/s

Ball: Lead; 15.55 g; MV 448 m/s

Ball: FMJ; 15.55 g; MV 448 m/s

Ball: JHP; 15.55 g; MV 448 m/s

Ball: JHP; 13.6 g; MV 456 m/s

Manufacturer

Winchester-Olin

Type: Ball: Lead, SWC; 15.6 g; MV 411 m/s

Ball: JHP; 13.6 g; MV 381 m/s

UPDATED



0.44 Magnum

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.30-30 Winchester

Synonyms:

0.30 WCF; 7.62 × 51R mm

Armament

Suitably chambered rifles.

Development

In 1895 this was the first US sporting cartridge to use smokeless powder, resulting in its title - 0.30 calibre, 30 grains of smokeless powder. It was widely adopted for lever- and bolt-action rifles throughout the Western hemisphere, for both sporting and law enforcement use and retains its popularity today as a small to medium game cartridge. The performance has been improved over the years, but it remains essentially a short-range round, particularly recommended in the USA for deer hunting. Rifles chambered in this calibre are still widely used by US law enforcement, especially in rural areas. Rifles in this calibre also continue to be widely used in Central and South America, particularly in remote areas.

Description

A rimmed, brass, bottlenecked cartridge, Boxer primed and usually with a jacketed soft point bullet.

Specifications

Round length: 64.26 mm
Case length: 51.56 mm
Rim diameter: 12.75 mm
Bullet diameter: 7.82 mm
Bullet weight: 9.72 g
Muzzle velocity: 725 m/s
Muzzle energy: 2,549 J

Abridged ballistic table: 0.30-30 Winchester, 9.72 g ball

Range	Velocity	Energy
0 m	725 m/s	2,549 J
100 m	598 m/s	1,734 J
200 m	485 m/s	1,141 J
300 m	393 m/s	749 J

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos
Type: Ball: FMJ; 9.7 g; MV 728 m/s

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd
Type: Ball: JHP; 8.5 g; MV 735 m/s

Manufacturer

[Sako Ltd](#)
Type: Ball: FMJ; 6 g; MV 905 m/s
KOREA, SOUTH

Manufacturer

Poonsang Metal Corporation
Type: Ball: JSP; 9.7 g; MV 658 m/s
Ball: JSP; 11 g; MV 599 m/s
Ball, starfire: JHP; 9.7 g; MV 640 m/s

[SWEDEN](#)

Manufacturer

Norma AB
Type: Ball: JSP; 9.7 g; MV 735 m/s
Ball: JSP; 11 g; MV 677 m/s

UNITED STATES OF AMERICA

Manufacturer

Federal Cartridge Company

Type: Ball: PSP; 11 g; MV 671 m/s

Ball: JSP; 9.7 g; MV 728 m/s

Ball: JSP; 11 g; MV 671 m/s

Ball: JSP; 8.1 g; MV 783 m/s

Manufacturer

Hansen Cartridge Company

Type: Ball: JSP; 9.7 g; MV 723 m/s

Ball: JSP; 11 g; MV 672 m/s

Manufacturer

Hornady Manufacturing Corporation

Type: Ball: JSP; 9.7 g; MV 729 m/s

Ball: JSP; 11 g; MV 671 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: JHP; 11.02 g; MV 671 m/s

Ball: JSP; 11.02 g; MV 671 m/s

Ball: JSP; 9.72 g; MV 728 m/s

Ball: Accelerator DS; 3.58 g; MV 1,037 m/s

Ball, extended range: FMJ; 10.4 g; MV 701 m/s

Manufacturer

Winchester-Olin

Type: Ball: JHP; 9.7 g; MV 728 m/s

Ball: JSP; 9.7 g; MV 728 m/s

Ball: JSP; 11 g; MV 671 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: JSP; 9.7 g; MV 725 m/s

UPDATED



0.30-30 Winchester

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.30 Carbine

Synonyms:

7.62 × 33 mm

Armament

Originally for the US Carbine M1. The cartridge will operate in M1, [M1A1](#), M2 and M3 carbines and in commercial copies such as those made by High Standard and other companies. The 0.30 carbine cartridge was also used in the Cristobal carbine. A handful of sub-machine guns, automatic pistols and revolvers have been chambered for this cartridge but none have been very successful, the ballistics not being optimum for short-barrelled weapons.

Development

This cartridge was developed in 1940 by the Winchester Repeating Arms Company, to a specification issued by the US Ordnance Department. It was broadly based upon the 0.32 Winchester Self-Loading rifle round of 1906 and was standardised as the 'Cartridge, Carbine, Cal .30 M1' on 30 September 1941. Production was entirely by government plants until 1945. After the war large numbers of M-1 carbines were disposed of commercially, therefore commercial cartridge manufacture began and has continued ever since. Some 6.2 million carbines were made by US government contractors and several companies have produced commercial copies since the mid-1950s. As a result the weapon is widely distributed and is commonly in use by military and police forces throughout the world. The ballistics of the 0.30 carbine cartridge, however, make it a relatively poor choice for military or law enforcement organisations.

Description

The case is rimless, straight tapered, and usually of brass, though steel cased ammunition was made in the USA in 1942-45. The bullet is blunt-nosed, having a lead core and gilding metal jacket, and flat based.

Specifications

Ball M1

Round length: 42.5 mm

Case length: 32.8 mm

Rim diameter: 9.1 mm

Bullet diameter: 7.82 mm

Bullet weight: 7 g

Abridged ballistic table: [0.30 Carbine Ball M1](#)

Range	Velocity	Energy
0 m	606 m/s	1,303 J
100 m	477 m/s	807 J
200 m	384 m/s	523 J
300 m	315 m/s	352 J
400 m	282 m/s	282 J
500 m	256 m/s	232 J

[BRAZIL](#)

Manufacturer

Companhia Brasileira de Cartuchos

Type: Ball: FMJ; 7.13 g; MV 607 m/s

[ISRAEL](#)

Manufacturer

Kalia [Israel](#) Cartridge Company Ltd

Type: Ball: FMJ; 8.1 g; MV 503 m/s

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 7.13 g; MV 607 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 7.2 g; MV 580 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball PMC30A: FMJ; 7.12 g; MV 588 m/s

MEXICO

Manufacturer

Aguila Industrias Tecnos

Type: Ball: FMJ; 7.13 g; MV 607 m/s

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd

Type: Ball: FMJ; 7.15 g; MV 607 m/s

Ball: SP; 7.15 g; MV 607 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball: JSP; 7.1 g; MV 600 m/s

UNITED STATES OF AMERICA

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: FMJ; 7.1 g; MV 607 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: JSP; 7.1 g; MV 607 m/s

Manufacturer

Government plants

Type: Ball M1: FMJ; see above

Tracer M16: FMJ; lead core, steel jacket; gilding metal envelope; tracer composition; red trace to 500 m; 6.93 g

Tracer M27: FMJ; similar to [M16](#) but with dark ignition 100-375 m; 6.54 g

Manufacturer

Hansen Cartridge Company

Type: Ball: FMJ; 7.1 g; MV 607 m/s

Manufacturer

Remington Arms Company Inc
Type: Ball R30CAR: JSP; 7.13 g; MV 607 m/s

Manufacturer

Winchester-Olin
Type: Ball X30M2: FMJ; 7.1 g; MV 607 m/s
Ball: HSP; 7.1 g; MV 607 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR
Type: Ball: FMJ; 7.1 g; MV 610 m/s
Ball: JSP; 7 g; MV 615 m/s

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 106 mm: HEP-T M346A1

Armament

[M40A1](#), M40A1C and [M40A2](#) cannon.

Development

The 106 mm HEP-T M346A1 was developed for use with the 106 mm (actual calibre 105 mm) [M40](#) series of recoilless (RCL) rifles during the early 1950s. Since its service debut during the mid-1950s, the [106 mm M40](#) series of recoilless rifles has been widely adopted and licence-produced. There is no sign of it passing from favour with many armed forces, although it is no longer in the US inventory. It is even making something of a come-back since its anti-armour projectiles are especially effective against composite armours.

The HEP-T M346A1 is one of the 'base' rounds used with the [106 mm M40](#) series as it is intended for use against armour, the main function of the [M40](#) series. It is only marginally less effective than a conventional HE projectile as an anti-personnel weapon.

Description

The 106 mm HEP-T M346A1 is a fixed round, with the projectile rigidly secured to the perforated steel cartridge case by a crimping groove. The projectile has two indexing buttons 180° apart on the forward bourrelet and a pre-engraved drive band encircles the projectile just forward of the base.

The HEP-T projectile is a thin-walled steel shell with a short curved ogive and a flat base. The base is

fitted with a BD [M91A2](#) fuze and an integral tracer which burns for the initial part of the trajectory. The shell filling is 3.5 kg of Composition A-3 (RDX/Wax 91/9). As the projectile impacts with a target the thin steel walls of the shell rupture, allowing the explosive filling to spread in a 'plaster' over the target surface before the delayed action BD fuze functions. The resultant pressure and detonation waves are then transmitted through the target armour to create internal spalling and other destructive effects.

The M94B1 perforated steel cartridge case has an [M57](#) percussion primer press fitted into the base and contains a 3.58 kg charge of [M26](#) propellant in a rayon and plastic liner. The flash from the primer also ignites the tracer in the base of the projectile.

Maximum range of the HEP-T M346A1 is 6,870 m and muzzle velocity 498 m/s.

An inert drill round used to simulate the HEP-T M346A1 is known as the Cartridge, 106 mm: Dummy, M368. It does not contain explosive and cannot be fired.

A subcalibre training device used for short-range target practice with the [M40](#) recoilless rifle series was developed as the Rifle, Caliber 0.30, Subcaliber: [M9](#). As this device, which resembled an M94B1-type perforated cartridge case but with a centrally mounted 0.30 machine gun barrel along the centre, fires the obsolete 0.30 rifle cartridge it has largely fallen from use. A more modern device is the Portuguese INDEP subcalibre adaptor which again uses a rifle calibre barrel in a 106 mm recoilless rifle cartridge case, but is chambered to accept a standard NATO 7.62 mm ball or tracer cartridge. It may be taken as an example of several other similar devices. The INDEP adaptor weighs 8.5 kg and is 665 mm long.

Giat Industries also produces a subcalibre training round known as the 106 SR NR541 practice system. Originally produced by PRB SA of Belgium, this device fires a 7.62 mm tracer bullet with a muzzle velocity of 515 m/s. Weight of this subcalibre device is 16 kg.

Specifications

Weights:

complete round - 16.95 kg

projectile - 7.96 kg

explosive - 3.5 kg Comp A-3

propellant - 3.58 kg [M26](#)

Length: 967.7 mm

Muzzle velocity: 498 m/s

Max range: 6,870 m

Authorised fuzes

BD [M91A2](#)

Equivalent rounds

[BRAZIL](#)

Manufacturer

ENGEQUÍMICA

Type: 106R HESH CTG [MD1](#)

Description: Standard US specifications

FRANCE

Manufacturer

Giat Industries

Type: HESH-T NR 601

Description: Originally produced in Belgium by PRB and equivalent to the M346A2. Also known as the FSN 1315 C651. Standard US specifications

[IRAQ](#)

Manufacturer

State factories

Type: 106 mm HESH

Description: Exact model not determined. May no longer be in production

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The INDEP 7.62 mm subcalibre training device produced for use with 106 mm recoilless rifles (T J Gander)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Cartridge, 57 mm: HEAT M307 and M307A1

Armament

[M18](#) and [M18A1](#) rifles.

Development

The 57 mm HEAT M307 was one of the original items of American 57 mm recoilless rifle ammunition developed during the Second World War. It was originally developed for use against armoured targets but its deployment extended to bunkers and similar hard targets.

The 57 mm HEAT M307A1 differs from the M307 as it uses a plastic liner to hold the propelling charge inside the cartridge case instead of a paper liner, together with a later model of percussion primer. The 57 mm HEAT M307 is rarely, if ever, encountered today.

Description

The 57 mm HEAT M307 and M307A1 are both fixed rounds with the forged steel projectile crimped rigidly to the perforated steel cartridge case. The thin-walled projectile has a short ogive and is encircled towards the flat base by a single pre-engraved gilding metal drive band.

The projectile has a forward cap carrying a PD [M90](#) or M90A1 fuze. The main body contains a shaped charge formed by 180 g of Composition B or 50-50 Pentolite behind a hemispherical copper liner. A steel sleeve brazed to the neck of the copper liner provides a passage from the fuze to a tetryl booster pellet in the base of the projectile. Thus, as the fuze functions on impact it ignites a small shaped charge, creating a flash jet which passes through the steel sleeve to light the booster pellet and detonate the shaped charge explosive from the rear, thereby improving its efficiency. The high-velocity metal

particle jet produced by the warhead can penetrate up to 76 mm of armour plate.

The cartridge case involved may be the M30A1 or M30A1B1, both are made of steel and have 400 perforations in their sidewalls. The solid base has a central [M60](#) or [M60A1](#) percussion primer. There is approximately 454 g of [M10](#) propellant loosely loaded into a plastic liner inside the cartridge case; the M307 used a paper liner.

Maximum range of the 57 mm HEAT M307/M307A1 is 3,930 m and muzzle velocity 366 m/s.

Specifications

Weights:

complete round - 2.476 kg

projectile - 1.247 kg

explosive - 181 g Comp B or 50-50 Pentolite

propellant - (approx) 454 g [M30](#)

Length: 447 mm

Muzzle velocity: 366 m/s

Max range: 3,930 m

Authorised fuzes

PD [M90](#) series

Equivalent rounds

[BRAZIL](#)

Manufacturer

ENGEQUÍMICA

Type: 57R HEAT CTG [MD1](#)

Description: Standard M307A1 specifications

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 57 mm HEAT Type 7

Description: No longer in production. This round can only be used with the Chinese 57 mm Type 36 recoilless gun and although it resembles the US HEAT M307 in appearance it is not interchangeable with US designed ammunition. Projectile weight is 1.23 kg and explosive weight is 160 g of TNT.

Length unfuzed is 186.6 mm

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TANK AND ANTI-TANK GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Cartridge, 57 mm: HE M306 and M306A1

Armament

[M18](#) and [M18A1](#) rifles.

Development

The first US recoilless rifle was the 57 mm T15 which first appeared, along with its (then) novel ammunition, in late 1943. The T15 was standardised as the [M18](#) while the later [M18A1](#) had its chamber and breech block handle in a different position. Although the [M18](#) and [M18A1](#) have been out of service with the US armed forces for many years and 57 mm RCL ammunition is no longer produced in the USA, the [M18](#) and [M18A1](#) continue to provide good service elsewhere and 57 mm RCL ammunition is still produced by a few manufacturers. At one time it was manufactured in [China](#). A copy of the [M18A1](#) is still produced in [Brazil](#) by Hydroar SA while a Communist Chinese copy of the [M18A1](#) is known as the 57 mm Type 36.

The 57 mm HE M306 was one of the original items of US RCL ammunition developed during the Second World War. The more common M306A1 differs in the type of filling and the design of the crimping groove.

Description

The 57 mm HE M306 and M306A1 are both fixed rounds with the forged steel projectile crimped rigidly to the perforated steel cartridge case. The thin-walled projectile has a short ogive and is encircled

towards the flat base by a single pre-engraved gilding metal drive band.

The 57 mm HE M306 projectile is filled with 250 g of TNT; the M306A1 has 250 g of Composition B. The nose-mounted fuze is either a PD M503, M503A1 or M503A2, all of which function either on impact or graze. Early examples used the PD [M89](#) fuze.

The cartridge case involved may either be an M30A1B1 or M30A1B2. Both are made of steel and have 400 circular perforations in the sidewalls. The solid base has a central [M46](#), [M60](#) or [M60A1](#) percussion primer. Approximately 454 g of [M10](#) propellant is loosely loaded into a plastic liner inside the cartridge case.

Maximum range of the HE M306/M306A1 is 4,508 m and muzzle velocity 366 m/s.

The training round equivalent of the 57 mm HE M306/M306A1 is the Cartridge, 57 mm: TP M306A1. This is virtually identical to the HE rounds but the projectile contains only a small black powder marking charge weighing 31 g, plus 183 g of an inert material. On impact the marker charge produces flash and smoke for spotting purposes.

Specifications

Weights:

complete round - 2.476 kg

projectile - 1.26 kg

explosive - 250 g TNT (M306) or Comp B (M306A1)

propellant - (approx) 454 g [M30](#)

Length, complete round: 445.5 mm

Muzzle velocity: 366 m/s

Max range: 4,508 m

Authorised fuzes

PD M503 series

Equivalent rounds

[BRAZIL](#)

Manufacturer

ENGEQUÍMICA

Type: 57R HE CTG [MD1](#)

Description: Standard M306A1 specifications. TP (57R TP CTG [MD1](#)) also produced

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 57 mm HE

Description: No longer in production. This round can only be used with the Chinese 57 mm Type 36 recoilless gun, and, although it resembles the US HE M306 in appearance it is not interchangeable with US designed ammunition. Projectile weight is 1.29 kg with explosive weight 230 g of TNT. Projectile length unfuzed is 165.46 mm

ITALY

Manufacturer

[Simmel Difesa](#)

Type: 57 mm HE

Description: Explosive filling is Composition B. Other rounds produced include an HE-PFF with the Composition B filling surrounded by heavy metal pellets; a Smoke-HC; and an inert TP. Weight for all rounds is given as 2.46 kg

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57 mm HE M306A1 rounds for 57 mm recoilless rifles

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Alenia Difesa 76 mm High-Explosive OTO Mmunition (HE-OM)

Armament

Otobreda 76/62 MMI; Otobreda 76/62 Compact; Otobreda 76/62 Super Rapid; Otobreda 76/62 Above Deck; 76 mm self-propelled AMRAD OTOMATIC air defence tank.

Development

The 76 mm HE-OM (High-Explosive OTO Mmunition) is the latest version of a series of general purpose high-explosive rounds intended for firing from 76/62 naval guns against a wide range of targets.

There are two versions of this round produced. The HE-OM-1 can accept standard NATO fuzes while the HE-OM-2 accepts standard US fuzes. In the latter case an adaptor ring is fitted to the thread in the projectile body.

This munition is marketed by Alenia Difesa, Otobreda Division.

Description

The 76 mm HE-OM is a fixed round with the projectile rigidly secured to the brass cartridge case by a crimping ring which engages in a groove on the wide copper/gilding metal drive band. The boat-tailed projectile body is a monobloc assembly made from a special high-quality steel. The projectile interior is compression loaded with Composition A-3 (RDX 91 per cent, Wax 9 per cent).

The brass cartridge case (72 per cent copper, 28 per cent zinc) has a base-mounted P85 percussion

primer and is filled with 2.3 kg of [M6](#) + 2 single-base multiperforated (19-hole) propellant. A mixture of wax and titanium in a fabric liner is glued inside the cartridge case to act as an anti-wear additive. The primer is normally protected by a clip which is removed before loading.

The training round used for the 76 mm HE-OM is the TP-OM. This utilises a monobloc steel projectile containing an inert filling. The TP-OM has the same handling and ballistic characteristics as the HE-OM.

To reduce training costs, the South African company [NASCHEM](#) has produced a point-detonating fuze, the PD M9030, to be fitted to 76/62 projectiles in place of proximity fuzes during training.

Specifications

HE-OM-1/HE-OM-2

Weights:

complete round - 12.2 kg/12.325 kg

projectile with fuze - 6.3 kg/6.425 kg

filling - 540 g/600 g Comp A-3

fuze - 930 g/940 g

propellant - 2.3 kg [M6](#) + 2

cartridge case - 3.4 kg

Lengths:

complete round - 907.5 mm/908.5 mm

projectile, total - 355 mm/356 mm

projectile without fuze - 260 mm

cartridge case - 635.5 mm

Centre of gravity from nose: 222.6 mm/221.3 mm

Muzzle velocity: 925 m/s

Authorised fuzes

Prox TB 76, VTPA FB 76, UA 3005/05, UA 3018, AEG MAZ, MK 404 IR, Fuchs M8953A1
PD OP 76 Mod 1, M557, L85, M9030

Equivalent rounds

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: HE

Description: Standard specifications. TP-T also produced

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE

Description: Standard specifications but fitted with TR 54/63 percussion primer. TP and TP-T also produced

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HE

Description: Standard specifications. TP-OM (BL-T) also produced

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: HE K243

Description: Fitted with PD K508 nose fuze and uses brass K6 case with K609 percussion primer. Otherwise standard specifications. TP K245 also produced

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd ([NASCHEM](#))

Type: HE

Description: Nominal weight of complete plugged round is 12 kg and length 815 mm; projectile 5.35 kg and 260 mm. Muzzle velocity 925 to 935 m/s and range 16,000 m. May be fitted with PD M9030 fuze

SPAIN

Manufacturer

DEFEX SA

Type: HE

Description: Standard specifications. TP also produced

Manufacturer

EXPAL SA

Type: HE-VT

Description: Standard specifications

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Cross-section of a typical 76 mm HE-OM round

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Alenia Difesa 76 mm High-Explosive PreFormed OTO Munition (HE-PF-OM)

Armament

Otobreda 76/62 MMI; Otobreda 76/62 Compact; Otobreda 76/62 Super Rapid; Otobreda 76/62 Above Deck; 76 mm self-propelled AMRAD OTOMATIC air defence tank.

Development

The 76 mm HE-PF-OM (High-Explosive - PreFormed OTO Munition), also known at one time as the PreFormed Fragmentation (PFF) OTO Mod.84, is one of a family of improved 76/62 rounds developed by Alenia Difesa, Otobreda Division, (formerly OTO Melara). The intention was to enhance the performance of the 76/62 naval guns against sea-skimming missiles and similar targets, and the 76 mm self-propelled AMRAD OTOMATIC air defence tank. It is mechanically interchangeable with all other types of 76/62 ammunition.

There are two versions of this round produced. The HE-PF-OM-1 accepts standard NATO fuzes while the HE-PF-OM-2 accepts US standard fuzes. In the latter case an adaptor ring is fitted to the thread in the projectile body.

This munition is marketed by Alenia Difesa, Otobreda Division.

Development of a course-correction version of this round was discontinued.

Description

The 76 mm HE-PF-OM is similar in concept to the MOM (see previous entry) and has the same external shape and fuze well in the explosive filling as the standard 76 mm HE-OM (see separate entry). It is, therefore, a fixed round with the projectile rigidly secured to the brass cartridge case by a crimping ring, which engages in a groove on the wide copper/gilding metal drive band. The projectile body is made from high-quality steel. Tungsten alloy cubes acting as preformed fragments are located around the projectile body and held in position by steel liners. The weight of the tungsten alloy cubes alone is 1.47 kg and although the cubes are smaller than those used on the MOM round their number is greater. The projectile interior is compression loaded with 731 g of Composition A-3 (91 per cent RDX, 9 per cent wax).

When the fuze functions the resultant explosion propels the high specific weight tungsten alloy cubes at high velocity, together with the fragments produced by the shell body. The preformed fragments can penetrate 14 mm of dural plate. One possible fuze that could be employed (among many) is the French [TDA](#) UA 3018 multimode proximity.

The brass cartridge case (72 per cent copper, 28 per cent zinc) has a base-mounted P85 percussion primer and is filled with 2.3 kg of [M6](#) + 2 single-base multiperforated (19-hole) propellant. A mixture of wax and titanium in a fabric liner is glued inside the cartridge case to act as an anti-wear additive. The primer is normally protected by a clip which is removed before loading.

To reduce training costs, the South African company [NASCHEM](#) has produced a point-detonating fuze, the PD M9030, to be fitted to 76/62 projectiles in place of proximity fuzes during training.

Specifications

HE-PF-OM-1/HE-PF-OM-2

Weights:

- complete round** - 12.2 kg/12.325 kg
- projectile with fuze** - 6.3 kg/6.425 kg
- explosive** - 731 g Comp A-3
- tungsten alloy cubes** - 1.47 kg
- proximity fuze** - 930-940 g
- propellant** - 2.3 kg [M6](#) + 2
- cartridge case** - 3.4 kg

Lengths:

- complete round** - 907.5 mm/908.5 mm
- projectile, total** - 355 mm/356 mm
- projectile without fuze** - 260 mm
- cartridge case** - 635.5 mm

Centre of gravity from nose: 221 mm/219.8 mm

Muzzle velocity: 925 m/s

Authorised fuzes

Prox TB 76, VTPA FB 76, UA 3005/05, UA 3018, AEG MAZ, MK 404 IR, Fuchs M8953A1
PD M9030

Equivalent rounds

[BRAZIL](#)

Manufacturer

FI Indústria e Comércio Ltda

Type: PFHE

Description: Standard specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 76 mm PFF IM84 HE-HPF

Description: HE-HPF is High Explosive High Performance Fragmentation. Complete round weight given as 12.5 kg and propellant weight 2.45 kg. Otherwise standard specifications

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: VT HE

Description: Basically a HE K243 fitted with a prefragmented sleeve and a nose-mounted VT K586 proximity fuze. Muzzle velocity given as 901 to 919 m/s. Uses brass K6 cartridge case fitted with K609 percussion igniter

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd ([NASCHEM](#))

Type: HE PFF

Description: Nominal weight of complete plugged round is 12 kg and length 815 mm; projectile 5.35 kg and 260 mm. Muzzle velocity: 925 to 935 m/s and range 16,000 m

SPAIN

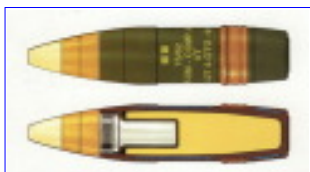
Manufacturer

DEFEX SA

Type: PFHE

Description: Standard specifications

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Alenia Difesa 76 mm HE-PF-OM projectile with cross-sectioned example below



NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 4.5 in naval gun

Armament

Vickers 4.5 in Mk 8 naval gun.

Development

The prototype of the Vickers 4.5 in Mk 8 appeared in 1968. The barrel involved had many features in common with the land service 105 mm gun used on the self-propelled FV433 Abbot. The 4.5 in Mk 8 went on to become the standard main gun armament for Royal Navy frigates and destroyers and many have been exported. Approximately 60 4.5 in Mk 8 guns have been produced.

In common with earlier UK 4.5 in naval guns the calibre is actually 4.45 in (113 mm).

With a view to fulfilling a perceived future gun and ammunition requirement, Vickers Shipbuilding and Engineering Limited (VSEL) associated with PRB SA of Belgium, developed a 4.5 in round with a Base Bleed (BB) capability providing a range capability of 27,500 m. However, PRB ceased trading and it was not until 1993 that tenders were again invited for the development of an increased range 4.5 in round. The extended range ammunition will utilise an optimised fuze and feature improved fragmentation over existing rounds. Royal Ordnance (now [BAE Systems](#), RO Defence), which already produces 4.5 in ammunition, is bidding to obtain a development and production contract for an improved HE round from the UK Ministry of Defence. RO Defence was awarded a £50 million plus design, development and production contract for the extended range HE round in July 1997. Available details for this round are provided below.

The UK Design Authority for 4.5 in naval gun ammunition is RO Defence.

Description

The 4.5 in rounds for the Mk 8 naval gun are fixed, enabling them to be used with mechanical ammunition handling and loading systems. The projectiles are therefore rigidly secured to their brass cartridge cases by a series of three 360° crimping rings. However, some rounds have been produced as either fixed or separate loading rounds.

The projectiles have thin-walled forged steel bodies, flat bases and a wide copper drive band. Short or deep intrusion fuzes can be installed. The rounds are normally delivered and stored inside special containers which can interlock for stacking. A special tool is used to remove the container lid and round.

All 4.5 in rounds use a standard brass cartridge case containing MNLF/2P/M08 triple-base propellant and have an N44 series electrical primer.

All rounds are 1.238 m long overall.

Among the types of round available or in service are the following:

4.5 in HE N1A4, fuzed N97

This is a general-purpose high blast and fragmentation round, usually fitted with a general purpose proximity and direct action fuze. Available as a fixed round only. The French [TDA](#) UA 3020 (USFA) proximity fuze may be used with this round.

The Royal Navy expressed a requirement for 1,548 of these rounds for the FY94-95.

Royal Ordnance 4.5 in HE ER

Royal Ordnance have proposed an improved 4.5 in HE ER round which will embody changes to the projectile to improve the shape and incorporate a Base Bleed (BB) unit to extend the maximum range. Changes to the propellant, projectile steel and the type of fuze are anticipated. It is intended that the fixed round will be compatible with the current ammunition packaging and gun system.

Available details are that the projectile will weigh 20.6 kg and contain 3 kg of RDX/TNT (60/40); the fuze will weigh less than 1 kg. The cartridge case will contain 7.15 kg of propellant producing a muzzle velocity of 869 m/s. Round length will be 1.238 m.

4.5 in Star N4A1, fuzed N9 Mk 1

Fitted with a mechanical time fuze, this round provides target or other illumination for approximately 40 seconds. Known as 'Monica' or, more generally, Star.

4.5 in Radar Echo (RE)

Produced in two forms, RE/J and RE/I, this round fires a projectile which dispenses its chaff payload to jam or confuse enemy radars. Fitted with an N9 Mk 2 mechanical time fuze.

4.5 in Anti-Aircraft Practice (Flash) N5A2, fuzed N97

Known as AAP, this relatively low-cost round is used for anti-aircraft or other practice firings. The normal fuze is a general purpose proximity and direct action type which, on functioning, uses its exploder to produce a small flash to indicate fuze or projectile functioning. The filling is an inert material.

4.5 in Surface-Use Practice N7A2

Intended for practice firing against surface targets, this projectile has the same body as the HE round but is filled with an inert material and a nose plug representing a fuze (PRF). This round is known as SUP.

The Royal Navy expressed a requirement for 1,944 of these rounds for the Fiscal Year 1994-95.

4.5 in Radar Enhanced N13A1

The projectile used with this round is inert but the nose section contains extra radar reflectors enabling it to be used as a simulated anti-ship missile target for training with missile fire-control systems.

4.5 in Ram Rounds

These are completely inert non-firing, one-piece rounds intended for cycling through ammunition feed systems or for general handling training. An inert test fuze for use with fuze setting mechanisms may be fitted.

Specifications

Type	HE	ILL	RE	AAP	SUP
Weights					
complete round	36.54 kg	34.97 kg	36.99 kg	36.54 kg	36.54 kg
projectile	19.97 kg	19.76 kg	20.82 kg	19.52 kg	20.87 kg
propellant, nominal	7.15 kg	6.92 kg	6.92 kg	7.15 kg	7.15 kg
Length					

complete round	1.238 m	1.238 m	1.238 m	1.238 m	1.238 m
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Authorised fuzes

Various - see text

Equivalent rounds

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: HE, SUP, SAP, AAP, Illum

Description: Standard specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: HE, AAP, SUP

Description: Standard specifications

VERIFIED



Complete 4.5 in HE N1A2, fuzed N97 (T J Gander)



Projectile for 4.5 in HE N1A2, fuzed N97 (left) and Star N4A1, fuzed N9 Mk 1 (right) (T J Gander)



Cross-sectioned drawing of an RO Defence proposal for an HE ER 4.5 in naval gun round with a Base Bleed (BB) unit added to the projectile base

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

5 in/38 naval gun ammunition

Armament

Mk 12 5 in naval guns.

Development

The 5 in (127 mm) 38 calibre dual-purpose gun has been one of the US Navy's most trusted dual-purpose (air and surface target) weapons ever since 1935, when the first mountings entered service. During the Second World War, approximately 10 different single and twin mountings were developed specifically for 5 in 38 calibre barrels. In ballistic terms there is nothing particularly outstanding regarding its design criteria, such as projectile weight or muzzle velocity, but general reliability, handling and accuracy were rated as excellent. A measure of its importance to the US Navy can be seen in the fact that it was the first gun for which Proximity (Variable Time - VT) fuzes were developed and issued.

Few 5 in 38 calibre guns now remain in use with the US Navy but the type is still widely used by many other navies, along with many different types of ammunition, although the variety of mountings has now been reduced to, at the most, four types.

Description

The ammunition intended for use in the 5 in 38 calibre dual-purpose (surface target and anti-aircraft) gun is semi-fixed. All rounds use a flat-based forged steel projectile with a single wide copper drive band allied with a cartridge case containing either a Full or Reduced Charge. Nose fuzes are normally

protected by a domed cover until just before loading. The projectile weight for all types is around 25 kg.

The projectile types are listed below but the cartridge cases and charges are common to most so details are provided here.

The brass cartridge cases are straight-sided and rimmed, with a No 13 or No 48 electrical primer threaded into the base; the igniter tube runs virtually the entire length of the case interior. At the top of the propellant, which is held in position by a wad, is a distance-piece. The case mouth is kept closed by a case plug which is removed before loading.

There are four propelling charges, using one or other of three different case mark numbers. They are as follows:

D272, Full Charge - Case Mark number 5, 8 or 10 containing 6.9 kg of SPDN-BE propellant

D264, Full Charge - Case Mark 10 containing 7.8 kg of Universal propellant

D274, Full Charge - Case Mark number 5 or 10 containing 6.9 kg of SPDF-BE propellant

D282, Reduced Charge - Case Mark number 5 or 10 containing 1.6 kg of SPDN-U or SPDN-Y propellant.

As a range table guide, the muzzle velocity for Full Charge when firing a nominal 24.7 kg projectile is 762 m/s. Maximum range against surface targets is 16,500 m, while for air defence the ceiling is 11,400 m. The Reduced Charge produces a muzzle velocity of 350 m/s with the same weight of projectile.

The types of 5 in 38 calibre projectile are as follows:

5 in/38 Calibre Projectile, Common

Although intended for use primarily against naval or other surface targets this projectile can be used as an anti-aircraft projectile; it approximates to the APC-T land equivalent. There are three types, the Mk 32, Mk 38 and Mk 48, all of which are basically similar. All use a forged steel body with an armour-piercing tip hooded behind a light-alloy streamlined ballistic cap. The centre of the penetrator body contains a 930 g Explosive D (ammonium picrate) burster charge. The flat base of the projectile has a base plug into which is threaded a base-detonating fuze which is intended to function only after the projectile has penetrated the target armour; the projectile is intended to penetrate a thickness of armour at least one-third of its calibre, that is approximately 42 mm. To provide an impact marker for spotting purposes the hollow interior of the ballistic cap contains a marker dye container. Available dye colours are orange, red, blue and green.

This projectile is normally fired using the Full Charge only. The nominal muzzle velocity is then 792.5 m/s. Projectile weight is 25 kg and length 526 mm.

5 in/38 High Explosive Projectiles

There are numerous variants of the basic 5 in 38 calibre high-explosive projectile, all of which are essentially the same yet vary according to the presence or absence of a cavity in the base to accommodate a base fuze or the type of steel used for the body (all body types use ductile steel while the Mk 51 and 66 use high-fragmentation steel). All body types have the same basic outline, are 533 mm long and have a nominal weight of 25 kg. These projectiles may use either Full or Reduced Charges. As a general guide, base detonating projectiles are filled with Explosive D (ammonium picrate), while point detonating projectiles use Composition A-3 (RDX/Wax 91/9).

5 in/38 Anti-Aircraft Common - AAC

This uses a mechanical time fuze (typically a Mk 349 Mod 1), fitted to the nose along with an auxiliary detonating fuze located in a cavity behind the nose fuze, and a base detonating fuze (typically a Mk 31 or [M91A2](#)). The AAC body types likely to be encountered are the Mk 35, 49, 52 and 56, all of which contain 3.4 kg of Explosive D (ammonium picrate) - the Mk 52 may also be encountered filled with 3.8 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 HE-MT

This is essentially similar to the AAC but lacks the base-detonating fuze facility. Where appropriate the base fuze cavity is closed by a threaded plug. The body types involved are the Mk 35, 47, 49 and 51, all containing 5.5 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 HC

Intended for use against surface targets, this type of projectile uses a point-detonating fuze, an auxiliary detonating fuze located in a cavity behind the nose fuze and a base-detonating fuze. The HC body types likely to be encountered are the Mk 35, 49 and 52, all of which contain 3.4 kg of Explosive D (ammonium picrate) - the Mk 52 may also be filled with 3.8 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 HE-PD

This is essentially the same as the HC but lacks the base detonating fuze. Where appropriate the base fuze cavity is closed by a threaded plug. The body types involved are the Mk 35, 47, 49 and 52, all containing 3.4 kg of Explosive D (ammonium picrate), and the Mk 51 or 66 containing 5.5 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 VT

This projectile uses a radio proximity fuze which may or may not have a self-destruct element. With this projectile the base fuze hole is plugged. Body types likely to be encountered are the Mk 34, 35, 47, 49, 93 and 94, all containing 5.5 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 HE-CVT

This is fitted with only a radio proximity fuze (an infra-red proximity fuze was used at one time but was withdrawn) which is normally fitted with a fuze liner for safety. The body types likely to be used are the Mk 35, 47, 49 and high-fragmentation Mk 56 and 66. All contain 5.5 kg of Composition A-3 (RDX/Wax 91/9).

5 in/38 Calibre Projectile, Illuminating

This is a conventional illuminating round. There are four types, the Mk 30, 44, 50 and 87. The latter two use the Mk 11 illuminating load which weighs 7.39 kg and produces 600,000 candlepower for 50 seconds. The other two use the earlier Mk 4 Mod 0 illuminating load which weighs 7.68 kg and produces 275,000 candlepower for 60 seconds. In both cases the illuminating load is ejected from the

projectile base by a 77.8 g black powder charge located behind the nose-mounted mechanical time fuze. The illuminating load (which uses 1.344 kg of powdered magnesium mixed with an oxidiser) then descends suspended from a 940 mm parachute.

The Mk 30 and Mk 44 illuminating projectiles both weigh 25.08 kg and are 509.8 mm long. The Mk 50 and 86 both weigh 25.06 kg and are 528.1 mm long. Full or Reduced Charges can be used.

5 in/38 Calibre Projectile, Chaff

Chaff projectiles are used as a basic Electronic CounterMeasure (ECM), by filling a volume of air with a large number of small metallised glass fibre needles. These produce a large radar cross-section to confuse enemy radars or missiles. The Mk 78 uses a Mk 21 (S-band) chaff load while other projectiles may use Mk 15 (X-band) or Type A (S-band) loads. Chaff projectiles have their body interiors optimised in volume to accommodate the chaff payloads and use mechanical time fuzes such as the Mk 349 Mod 0, sometimes with the addition of an auxiliary detonating fuze. Payloads are ejected through the projectile base by a small ejection charge located behind the nose-mounted fuze(s).

A typical 5 in/38 Chaff projectile weighs 25.1 kg and is 528 mm long. The nominal muzzle velocity is 796 m/s and maximum range is 15,790 m. Full or Reduced Charges can be used.

5 in/38 Calibre Projectile, WP/Smoke

This projectile uses an unusual smoke production system, in that a [M5](#) canister containing 3.2 kg of White Phosphorus (WP) is ejected from the base of the carrier projectile once the nose-mounted Mk 73 point detonating (over land), or Mk 74 mechanical time (over sea) fuze has functioned. The canister, which is 305 mm long, is ejected by the internal pressures created by a 124.4 g expulsion charge located beneath the fuze well. The same charge also initiates a delay element in the top of the canister. After the delay is complete, the delay element detonates a burster tube running through the centre of the canister and breaks it open to disperse the WP. The WP then creates a grey/white screening smoke cloud which, in still air conditions, is approximately 45 m in diameter and persists for up to 7 minutes. With this projectile the WP is coated with synthetic rubber to improve its shelf life - the coated product is called TWP (plasticized white phosphorus).

The projectile weighs 24.7 kg and is 508 mm long. It is normally fired using Full Charge only. Muzzle velocity is then 792.5 m/s.

Practice projectiles (5 in/38) with inert fillings and dummy fuzes have also been produced along with completely inert handling training or 'ramming' rounds.

Specifications

Type	Common	HE	Illum	Smoke
Weight	25 kg	25 kg	25.06 kg	25.1 kg
Filling	930 g	5.5 kg	7.39 kg	3.2 kg WP
Length	526 mm	533 mm	509.8 mm	508 mm

Authorised fuzes

Several types - see text

Equivalent rounds

[BRAZIL](#)

Manufacturer

FI Indústria e Comércio Ltda

Type: HE-CVT, HE-MT, HE-PD, HE-MT, HE-VT-SD, AAC, BL-T/P (Prac with Tracer)

Description: Standard US specifications

SPAIN

Manufacturer

DEFEX SA

Type: HE-VT, HE-MT

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: HE-VT, HE-MT

Description: Standard US specifications except that propellant is 7 kg of single-base flashless GSB-120

TURKEY

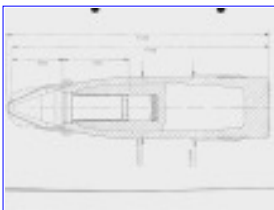
Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

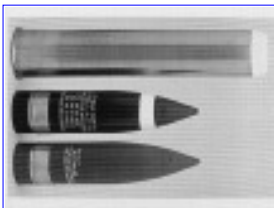
Type: HE-AAC (MKE MOD 205) and TP (MKE MOD 202 BL/P)

Description: Standard US specifications. Production as required

VERIFIED



5 in/127 mm HE-VT naval projectile as produced in Spain by EXPAL



The 5 in/38 rounds produced in [Turkey](#) by [MKEK](#) with the propelling charge and case (left), the HE-AAC (MKE MOD 205) in the centre and TP (MKE MOD 202 BL/P) on the right

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MORTARS - 81 mm MORTARS, [BRAZIL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb TIR AE M7

Armament

All 81 mm mortars.

Development

By [CEV](#).

Description

This is a more modern design of the long streamlined bomb, with an aluminium alloy tail unit. The longer shape and greater weight give it a better ballistic performance and greater lethality than the M4 bomb. There is a primary cartridge in the tail tube and six increments that clip round the tail tube in horseshoe containers.

Specifications

Length, fuzed: 400 mm

Weight, fuzed: 3.875 kg

Weight and type of payload: 600 g TNT

Number of charges: P + 6

Fuze: impact SQ EO V M4 [CEV](#)

Max range: 5,200 m

Manufacturer

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MORTARS - 81 mm MORTARS, [BRAZIL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb TIR AE M4

Armament

All 81 mm mortars.

Development

By [CEV](#), based broadly on the US [M43](#) pattern.

Description

A teardrop-shaped bomb in cast iron, with four gas check rings around the bourrelet and a welded steel tail unit. A primary cartridge fits into the tail tube and up to four increments can be clipped between the fins, and a further two fitted around the tail tube in horseshoe containers.

Specifications

Length, fuzed: 335 mm

Weight, fuzed: 3.345 kg

Weight and type of payload: 500 g TNT or Comp B

Number of charges: P + 6

Fuze: impact SQ EO V M4 [CEV](#)

Max range: 4,050 m

Manufacturer

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MORTARS - 60 mm MORTARS, [BRAZIL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb TIR 60 AE M3

Armament

All types of 60 mm mortars.

Development

By [CEV](#) for general use.

Description

The bomb body is of cast iron and the usual teardrop shape, with a steel tail unit and six fins screwed into the rear of the body. The propelling charge consists of a shotgun type primary cartridge in the tail tube and four secondary charges which clip to the fins.

Specifications

Length, fuzed: 245 mm

Weight, fuzed: 1.37 kg

Weight and type of payload: 150 g TNT or Comp B

Number of charges: P + 4

Fuze: impact SQ

Max range: 1,800 m

Manufacturer

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [BRAZIL](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses the old USA standard system

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.44-40 Winchester

Synonyms:

0.44-40 WCF

Armament

Suitably chambered revolvers and sporting rifles.

Development

Introduced in 1873 with the Winchester 73 lever-action rifle and carbine. It was then adopted for a Colt revolver, after which almost every gunmaker produced either rifles or revolvers or both. Its ability to function as a personal defence cartridge in a revolver and a medium game cartridge in a rifle gave it universal acceptance in the western USA, but it has seen less acceptance in Europe other than in weapons intended for export to the USA. The cartridge has regained some of its original popularity in recent years for use in rifles, carbines and revolvers.

Description

A rimmed, brass case with slight bottleneck, Boxer primed. Every type of bullet, from spherical ball to FMJ and birdshot has been loaded into this cartridge at one time or another.

Specifications

Round length: 39.37 mm

Case length: 33.15 mm

Rim diameter: 13.33 mm
Bullet diameter: 10.85 mm
Bullet weight: 12.96 g
Muzzle velocity: 399 m/s (rifle); 268 m/s (revolver)
Muzzle energy: 1,029 J (rifle); 465 J (revolver)

Abridged ballistic table: 0.44-40 WCF, 12.96 g rifle ball

Range	Velocity	Energy
0 m	399 m/s	1,029 J
100 m	321 m/s	666 J
200 m	281 m/s	510 J
300 m	253 m/s	414 J

[BRAZIL](#)

Manufacturer

CBC Magtech
Type: Ball: Lead, flat tip; 12.96 g; MV 368 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition Company
Type: Ball: Lead FP; 12.96 g; MV 244 m/s

Manufacturer

Remington Arms Company Inc
Type: Rifle Ball: JSP; 12.96 g; MV 399 m/s
Pistol Ball: JSP; 12.96 g; MV 297 m/s

Manufacturer

Winchester-Olin
Type: Rifle Ball: JSP; 13 g; MV 399 m/s
Pistol Ball: JSP; 13 g; MV 297 m/s

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm: L/70 AP-T

Armament

All [40 mm L/70](#) Bofors Guns including: [40 mm L/70](#) BOFI; TRINITY; SAK 40 [L/70](#); [L/70](#) Combat Vehicle Gun (40/70 B); [Otobreda Twin 40L70 Field Mounting](#); [Otobreda Twin 40L70](#) Compact naval mounting; Otobreda Twin Fast Forty naval mounting; Boeing Company Bushmaster IV. TRIDON [40 mm L/70 self-propelled](#) air defence gun.

Development

The [40 mm L/70](#) AP-T is no longer available from Bofors AB as it considers developments such as the [40 mm L/70](#) MPT rounds (qv) are now more effective for the attack of armoured targets. However, several other manufacturers continue to offer [40 mm L/70](#) AP-T which may be regarded as an upgraded version of the 40 mm L/60 AP-T.

At one time Bofors also produced an [L/70](#) APC-T with a small amount of explosive inside a recess in the base. This round is no longer available.

Description

The [40 mm L/70](#) AP-T is a fixed round with the projectile crimped rigidly to the brass cartridge case by two 360° crimping bands. A copper drive band encircles the projectile just above the cartridge case/projectile junction.

The Bofors [40 mm L/70](#) AP-T projectile has a forged hardened steel penetrator body with the nose cap of cold-rolled steel covered by a thin steel windshield crimped onto the penetrator body. The base of the projectile is machined to accept a tracer element which burns for at least 4 seconds after firing.

The drawn 70:30 brass cartridge case has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. Propellant loads vary from manufacturer to manufacturer but the usual load is approximately 480 to 485 g of a flash-reduced, single-base nitrocellulose powder (NC 1066), producing a muzzle velocity of 1,025 m/s.

The [40 mm L/70](#) AP-T can penetrate from 40 to 50 mm of armour plate set at an angle of 60° at a range of 100 to 150 m.

Specifications

Weights:

complete round - 2.45 kg

projectile - 930 g

propellant - approx 485 g

cartridge case - 1 kg

Lengths:

complete round - 497 mm

cartridge case - 365 mm

Max base diameter: 65 mm

Tracer burn time: at least 4 s

Muzzle velocity: 1,025 m/s

Operating temperature range: -25 to +50°C

Authorised fuzes

None involved

Equivalent rounds

BRAZIL

Manufacturer

EMGEPROM

Type: AP-T

Description: Standard specifications. Produced for Brazilian Navy.

FRANCE

Manufacturer

Giat Industries

Type: AP-T

Description: Standard specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: AP-T

Description: Standard specifications

KOREA, SOUTH

Manufacturer

Poonsang Corporation

Type: AP-T K219

Description: Brass K7 case containing KNC873 propellant ignited by KM/39SX percussion primer. Overall cartridge length 502.5 mm. Otherwise standard specifications.

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: AP-T

Description: May no longer be in production. Standard specifications

UPDATED



The [40 mm L/70](#) AP-T round produced by Giat Industries is on the far right. The other rounds are (from left): TP; TP-T; HE-I; HE-I-T; and PFHE, known as PF HE-I.

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm: L/70 HCHE

Armament

All [40 mm L/70](#) Bofors Guns including: [40 mm L/70](#) BOFI; TRINITY; SAK 40 [L/70](#); [L/70](#) Combat Vehicle Gun (40/70 B); [Otobreda Twin 40L70 Field Mounting](#); [Otobreda Twin 40L70](#) Compact naval mounting; Otobreda Twin Fast Forty naval mounting; Boeing Company Bushmaster IV. TRIDON [40 mm L/70 self-propelled](#) air defence gun.

Development

The [40 mm L/70](#) High Capacity High Explosive (HCHE) is a further development of the standard Bofors [L/70](#) HE-T round, intended as a multipurpose projectile with good anti-armour effects. It is no longer in regular production in [Sweden](#) as Bofors AB now considers the [40 mm L/70](#) MPT (see separate entry) to be a more viable and effective round. Other nations, however, continue to deploy the [L/70](#) HCHE.

Description

The [40 mm L/70](#) HCHE is a fixed round with a brass cartridge case. The cartridge case is crimped rigidly to the projectile by two 360° crimping bands. A copper drive band encircles the projectile just above the cartridge case/projectile junction.

The [40 mm L/70](#) HCHE projectile uses a special grade of steel, strong enough to penetrate armour plate up to approximately 20 mm thick without being damaged beyond utility. The explosive contents are 165 g of Octonal with an aluminium additive to increase the incendiary effects, all ignited by a

nose-mounted Fz 104 M12 point detonating fuze with a delay element. The delay ensures that the maximum blast, fragmentation and incendiary effects can be obtained on and inside a target.

The drawn 70:30 brass cartridge case has a semi-rimmed base and is fitted with a percussion primer with a sinoxide detonator. The propellant used is a low-erosion, flash reduced, single-base nitrocellulose tubular powder (NC 1066) producing a muzzle velocity of 1,030 m/s.

Specifications

Weights:

projectile - 870 g

explosive - 165 g Octonal

cartridge case - 1 kg

Lengths:

complete round - 534 mm

cartridge case - 365 mm

Max base diameter: 65 mm

Muzzle velocity: 1,030 m/s

Operating temperature range: -25 to +50°C

Authorised fuzes

PD Fz 104 M12

Equivalent rounds

BRAZIL

Manufacturer

FI Indústria e Comércio Ltda

Type: HCHE

Description: Standard specifications. AP-T, TP-T and Spotter rounds also produced

Manufacturer

EMGEPROM

Type: HCHE

Description: Standard specifications. Produced for Brazilian Navy.

SPAIN

Manufacturer

EXPAL SA

Type: HCHE

Description: Standard specifications

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm: L/60 PFHE

Armament

All 40 mm L/60 Bofors Guns.

Development

The 40 mm L/60 PFHE round is the L/60 counterpart to the [40 mm L/70 PFHE](#) (qv). It was developed by Bofors AB to provide 40 mm L/60 Bofors Gun users with a capability to update the weapons for use against fast low-flying strike aircraft, helicopter and missile targets. The 40 mm L/60 PFHE makes use of the considerable experience gained during the development and use of the [40 mm L/70 PFHE](#) and employs a second-generation proximity fuze. As far as is known this round has yet to enter series production.

Description

The 40 mm L/60 PFHE is a fixed round with a brass cartridge case. The cartridge case is crimped rigidly to the projectile by two 360° crimping bands. A copper drive band encircles the projectile just above the cartridge case/projectile junction.

The 40 mm L/60 PFHE projectile follows the same general lines as the [40 mm L/70 PFHE](#) (see separate entry), and uses a curved base ('duck-tailed') shell body manufactured from a special high-fragmentation steel. The explosive content is 90 g of Octol. The shell interior walls are lined with a total of 600 spherical tungsten carbide pellets, each 3 mm in diameter.

The forward end of the streamlined projectile is occupied by the proximity fuze which operates on the Doppler principle. The fuze has an automatic sensitivity control preventing initiation of the fuze by surface objects and sea or ground reflections when passing over them at the low altitudes, produced by low gun barrel elevation angles. The fuze also has a high-sensitivity electrical impact function and an electrical self-destruct device, together with delayed arming and bore and muzzle safeties.

In the event of a proximity burst the Octol charge produces a very high blast effect. The shell body fragments while the blast also spreads the 600 tungsten carbide spheres. Due to their high initial velocity and high inertia, the pellets are capable of inflicting great damage to aircraft and missile components at ranges of up to several metres. This is in addition to the damage caused by the shell body fragments. The effective range against aircraft and helicopters is up to 5.5 m and against missiles 1 to 2 m. This provides an increased on-target effect up to 12 times and a greatly increased target area when compared to point detonating ammunition.

The brass cartridge case, which can be reused several times if required, has a semi-rimmed base and is fitted with an [M80](#) percussion primer. The propellant charge is flash reduced NC 1281 single-base nitrocellulose powder producing a muzzle velocity of 860 m/s.

The 40 mm L/60 PFHE ballistics match those of other 40 mm L/60 projectiles.

Specifications

Weights:

complete round - 2.15 kg

projectile - 980 g

explosive - 90 g Octol

cartridge case - 760 g

Lengths:

complete round - 447 mm

cartridge case - 310.8 mm

Max case diameter: 62 mm

Propellant: NC 1281 single-base nitrocellulose powder

Muzzle velocity: 860 m/s

Number of tungsten pellets: 600

Tungsten pellet diameter: 3 mm

Triggering distance:

aircraft - up to 5.5 m

missiles - 1-2 m

Operating temperature range: -30 to +60°C

Authorised fuzes

Integral proximity fuze, see text

Equivalent rounds

[BRAZIL](#)

Manufacturer

FI Indústria e Comércio Ltda

Type: PFHE

Description: Standard specifications

VERIFIED



Comparison of 40 mm L/60 PFHE with [40 mm L/70 PFHE Mk 2](#) (centre) and TRINITY 3P (bottom)

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

Ammunition for 30 mm 2A42, 2A38 and 2A72 cannon

Armament

[30 mm 2A42](#) cannon fitted to [BMP-2](#) and Sarath ([India](#)) MIFVs and Bulgarian BMP-30 IFV; 30 mm 2A72 cannon fitted to [BMP-3](#) IFV; 30 mm 2A38 and 2A38M cannon mounted on the 2S6 quad 30 mm/SA-19 2K22 Tunguska self-propelled air defence system; 2A38 cannon mounted on Sosna twin-axle trainer; 30 mm 2A38M (GM) cannon mounted on Brams self-propelled air defence system ([Slovakia](#)); 30 mm [M86](#) and [M89](#) cannon ([Yugoslavia](#)).

Development

The [30 mm 2A42](#) dual-feed cannon first appeared in public during 1982. Intended to be used against lightly armoured targets at ranges up to 1,500 m, the [2A42](#) cannon is also for use against low-flying aerial targets such as helicopters. The [30 mm 2A42](#) has a dual-feed system and two rates of fire; the slowest is 200 - 300 rds/min while the faster rate is a minimum of 550 rds/min. By contrast the 30 mm 2A72 cannon is lighter and has a fixed fire rate of around 330 rds/min; the dual-feed feature is retained. The 2A38 and 2A38M air defence cannon have a rate of fire of 1,950 to 2,500 rds/min.

The 30 mm ammunition for all these cannon is known to be in production in [Russia](#), the [Czech Republic](#), [Slovakia](#), [Ukraine](#) and [Yugoslavia](#), although it is probable that production has now ceased in the latter region. Oerlikon Contraves Pyrotec AG of Switzerland, are developing a 30 mm subcalibre

family of ammunition for [2A42](#) cannon which is intended to defeat both air and ground targets.

It is possible that some or all of these 30 mm rounds are already being produced in [India](#). A new munitions plant is being built at Bolangir in Eastern [India](#) which, when fully operational, will be able to produce 'substantial quantities' of 30 mm ammunition every year.

Description

30 × 165 mm ammunition for the [2A42](#) cannon is fixed. The projectile is rigidly secured to the tapered cartridge case by two rows of spaced crimps engaging in cannelures in the projectile. The projectiles have a pronounced 'waist' just behind the bourrelet and forward of the drive bands, which can be either copper/gilding metal or sintered iron. Cartridge cases for [2A42](#) guns are usually lacquered or corrosion-treated steel and contain 6/7P-5 BPfl propellant. Rounds are fed into the cannon involved, joined together with 9H623 stamped steel links.

HE-I (OFZ, also known as HEFI) projectiles carry 123 g of A-IX-2 (desensitised RDX/Aluminium) explosive and are fitted with A-670M point-detonating fuzes with a self-destruct device functioning between 7.5 and 14.5 seconds, although some manufacturers quote between 13 and 19 seconds. Tracer burn time is not less than 3.5 seconds and may be as long as 4.5 seconds. An HE-T (also known as FT) round also exists, with the tracer element burning for at least 9 seconds.

The AP-T (BT) projectile weighs 400 g, contains 127 g of explosive and is stated to be able to penetrate up to 18 mm of armour plate set at 60° at a range of 1,000 m (25 mm at 750 m). Penetration at the maximum effective range of 1,500 m is 15 mm, or 20 mm at 700 m. The tracer element burns for 3 seconds.

There is also an APDS-T round with a tungsten-based alloy subprojectile, also known as HVAP, with a muzzle velocity of 1,120 m/s and an armour penetration capability of 25 mm of armour plate set at 60° at a range of 1,500 m. The armour-piercing sub-projectile weighs 222 g. The tracer element burns for 1.5 seconds. This round is also referred to as a 'Kerner' cartridge.

All cartridge cases are lacquered or corrosion-treated (usually zinc plated) steel and contain 125 g of pyroxyline powder propellant ignited by a KV-3 primer. The cases are 164 mm long and weigh 328 g.

[30 mm 2A42](#) ammunition produced in the [Russian Federation](#) and Associated States (CIS) is intended for operation over a temperature range of -50 to +50°C.

TP, TP-T and inert drill rounds are available for both the HE-I and AP rounds.

Specifications

Type	HE-I	HE-T	AP-T	APDS-T
Weights				
complete round	842 g	835-837 g	858 g	765 g
projectile	390 g	368 g	304 g	400 g
Lengths				
complete round	291 mm	291 mm	291 mm	291 mm
cartridge case	164 mm	164 mm	164 mm	164 mm
Muzzle velocity	950-970 m/s	950-970 m/s	960-980 m/s	1,120 m/s
Self-destruct time	7.5-14.5 s	7.5-14.5 s	7.5-14.5 s	7.5-14.5 s

Authorised fuzes

HE-I and HE-T, PD A-670M

Equivalent rounds

BULGARIA

Manufacturer

Arsenal

Type: HE-T OT, HEI OFT, AP-T BT

Description: HE-T OT complete round weighs 833 g with projectile 389 g containing 118 g of A-IX-2; muzzle velocity 940-960 m/s. HEI OFT has A-670 nose fuze and contains 123 g of A-IX-2; muzzle velocity 950-970 m/s. AP-T weighs 853 g with projectile 400 g; muzzle velocity 960-980 m/s.

Manufacturer

Arminex plc

Type: AP-T, HEI, TP

Description: Standard specifications

CZECH REPUBLIC

Manufacturer

MOEX Vlárské strojnirny Slavcin

Type: HE-T, TP-HE-T, HE-I, AP-T

Description: Developed by Prototypa, sp Brno in co-operation with VZU(A) 010 PVVV Slavcin, these rounds differ in some respect from the RFAS original specification, especially the AP-T which can penetrate up to 36 mm of armour set at 0° at 1,000 m. Propellant loads are of the order of 120 to 128 g, using an unspecified type of propellant producing a lower than usual pressure curve

IRAN

Manufacturer

Defence Industries Organisation

Type: AP-T, HEI-T

Description: Intended for firing from [2A42](#) cannon. Weights vary considerably from standard as complete round weight given as 830 g for both natures and projectile weight for both as 120 g

SLOVAKIA

Manufacturer

Zavody vseobecneho strojarstva

Type: Jalovec (TP-T)

Description: Length of round 291.8 mm and complete round weight 835 g. Muzzle velocity 960 m/s with tracer burning for 6 seconds. The projectile has a self-destruct element

Manufacturer

ZVS JSC

Type: JPSv APFSDS-T

Description: For [2A42](#) cannon. Penetrator has chrome-molybdenum steel tip. Can penetrate 200 mm of RHA at 150 m. No further details available.

Manufacturer

ZVS JSC

Type: JOS_v HE-T

Description: For [2A42](#) cannon. Effective range given as up to 11,000 m. Impact fuze also has a self-destruct function. No further information available.

Manufacturer

ZVS JSC

Type: TP JOC_vS_v and TP-T JNhS_v

Description: TP JOC_vS_v has an A-390 fuze modified to ensure the projectile self-destructs via two independent trains at a range of up to 5,000 m; the round is effective ballistically up to 2,500 m. The A-390 fuze has no impact function. The TP-T JNhS_v has a dummy fuze and an inert filling.

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: FAPDS-T, APFSDS-T

Description: Under development. FAPDS-T PMC 304 for soft and lightly armoured targets; MV 1,220 m/s; projectile weight 235 g; APFSDS-T PMC 303 reportedly with 'excellent' performance against armoured targets; MV 1,325 m/s; projectile weight 195 g and TPFDS-T PMC 324 for training; MV 1,250 m/s; projectile weight 210g.

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

SSIE 'PRIBOR'

Type: HE-I, HE-T, AP-T, APDS-T

Description: Standard specifications as in text and Specifications table

Manufacturer

VO GED, General Export for Defence

Type: HE-I, HE-T, AP-T, APDS-T

Description: Standard specifications as in text and Specifications table

TATARSTAN

Manufacturer

Federal State Unitary Enterprise 'Zavod Imeni Sergo'

Type: HEFI, AP-T, F-T, APDS-T (HVAP)

Description: Standard specifications as in text and Specifications table

[UKRAINE](#)

Manufacturer

MINMASHPROM

Type: HE-T, TP-HE-T, HE-I

Description: Standard specifications as in text and Specifications table. Note that APDS-T is not

produced

[YUGOSLAVIA](#), FEDERAL REPUBLIC

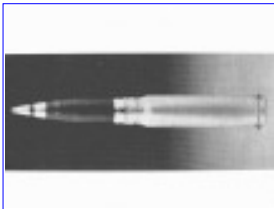
Manufacturer

Yugoimport SDPR

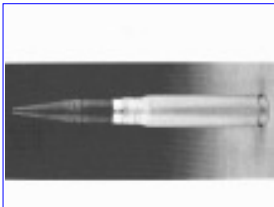
Type: HE-I-T, HE-I, HE, HE-T, AP-T, AP, TP-T, TP

Description: Probably no longer in production but in service with the armed forces of Serbia and Montenegro. Can be used with 30 mm [M86](#) and [M89](#) cannon

UPDATED



RFAS produced 30 mm HE-I [2A42](#) round



RFAS produced 30 mm AP-T round



[30 mm 2A42](#) TP rounds (and 7.62 mm machine gun belts) and packaging; note link filling machine in foreground (T J Gander)



Oerlikon Contraves Pyrotec AG 30 mm FAPDS-T PMC 283



Oerlikon Contraves Pyrotec AG 30 mm APFSDS-T PMC 304

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

23 × 115 mm

Synonyms:

23mm Soviet NS

Armament

Aircraft guns Goryunov-Shpagin GSh-23L and GSh-23LU; Nudelman-Kalashnikov NK-23 Gatling; Nudelman-Richter AM-23 and NT-23; Nudelman-Suranov NS-23. Chinese aircraft guns Types 1, 2 and 2H.

Development

This round was developed during the Second World War, for the Nudelman-Suranov NS-23 aircraft cannon, used by Soviet ground attack fighters; it was a recoil-operated weapon scaled down from a previous 37 mm NS design. After the war it was supplemented by the gas-operated AM-23 and GSh-23 guns and later by the NK-23 Gatling-pattern gun.

Description

The case is rimless and bottlenecked, brass and percussion primed. Projectiles are of conventional design and weigh about 175 g. However, the rounds for early and later guns are not identical. Ammunition for the earlier NS gun was loaded to a lower velocity (690 m/s), while rounds for the AM, NT, GSh and NK series used a more powerful primer and an improved propellant to achieve 740 m/s.

These latter rounds had the projectiles marked with a white band, but it seems that the only country now using the lower velocity round is the [People's Republic of China](#), while other countries appear to have moderated the performance and settled on a somewhat lower velocity for the later guns.

Specifications

Round length: 198.6 mm
Case length: 114.8 mm
Rim diameter: 26.97 mm
Bourellet diameter: 22.93 mm
Projectile weight: 174 g
Muzzle velocity: 740 m/s
Muzzle energy: 47.9 kJ

Equivalent rounds

[BULGARIA](#)

Manufacturer

Arsenal

Type: HEI: Steel shell with copper drive band, filled with AIX-2. Projectile tip coloured yellow. Brass case containing 4/7 CGR propellant and KV-3 primer. B-23 or B-23A PD nose fuze. Round weight 329 g, projectile weight 174 g; MV 690 m/s

API: Solid steel projectile with copper drive band. Projectile tip colored silver. Round weight 321 g, projectile 156 g; MV 690 m/s

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HE-I Type 2: Steel shell filled RDX; nose impact fuze with self-destruction; 180 g; MV 680 m/s (Type 1 gun), MV 705 m/s (Type 2, 2H)

HE-T: Steel shell filled with RDX; nose impact fuze with self-destruction; cartridge weight 450 g; MV 970 m/s

[CZECH REPUBLIC](#)

Manufacturer

State arsenals

Type: HE-I-T OZT: Steel shell with HE filling, as Soviet pattern but with sintered iron driving band; K-20M nose impact fuze; 175 g; MV 740 m/s

[EGYPT](#)

Manufacturer

Maasara Company for Engineering

Type: HE-I-T: Appears to be based on the Soviet OZT; no details

INDIA

Manufacturer

Indian Ordnance Factories, Ordnance Factory Khamaria

Type: HE-I: No details available as preparing for full production

API: No details available as preparing for full production

TP-T: No details available as preparing for full production

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: HE-I: Steel shell, loaded RDX/Aluminium, and red tracer; nose impact fuze AP-24; 175 g; MV 720 m/s

AP-I: Steel shell with alloy ballistic cap, filled incendiary composition; Unfuzed; 173 g; MV 720 m/s

TP: HE-I shell body filled inert; dummy fuze; 173 g; MV 720 m/s

MACEDONIA

Manufacturer

Euroinvest

Type: HE M78: Appears to be local derivative of a former Yugoslav round. Projectile weight 174 g; MV 720 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Kemerovo Mechanical Plant

Type: AP-I-T: Steel body and ballistic cap with copper rotating band; 175 g; MV 690 m/s

Manufacturer

PRIBOR

Type: HE-I-T OZT: Boat tailed steel shell with HE filling (11 g RDX/Al) and K-20M nose impact fuze. Copper driving band. 175 g; MV 740 m/s

HE-I-T-SD OZT/NZ: Similar to the OZT but using a flat-based shell of greater internal capacity and fitted with the NZ-231-A nose impact fuze with self-destruction after 17 seconds flight; 188 g; MV 700 m/s

HE-I OZ: Boat tailed steel shell loaded RDX/Al; nose fuze K-20M; 175 g; MV 740 m/s

HE-I OZ: Similar to the previous model OZ but with a stud on the base of the shell to which a short length of lead wire is twisted to act as a decoppering agent, the shell being marked with a yellow band to indicate this. Fuzed K-20M or B-23 impact

HE-I OZ/VU: Similar to the OZT/NZ but without tracer and with a delay unit beneath the B-23 fuze to permit the shell to penetrate before detonation.

AP-I BZ: Solid steel body with hard steel core and light steel ballistic cap containing incendiary composition; 200 g; MV 740 m/s

AP-I-T BZ-A: Pointed steel shot with incendiary filling inside the light alloy ballistic cap; 195 g; MV 740 m/s

APE: Contains 47 g of an unspecified explosive; 182 g; MV 720 m/s

CC Cargo Carrying: Hollow steel shell containing 24 solid sub-projectiles each weighing 2 g to be ejected forward through the nose by a fixed time (1.4 to 1.8 seconds) VM-23 ejector assembly in the projectile base. Round weight 338 g; projectile 184 g; MV approx 700 m/s

Radar jamming: Contains radar-jamming chaff dispensed through the projectile base over a period of 7 to 9 seconds. Projectile weight 184 g; MV 700 m/s

IR Radiation: Radiates electro-magnetic waves in the 1.8 to 5 micron range to jam optical proximity fuzes and infra-red (IR) sensors. Time of waves generation is 0.8 to 1.2 seconds after firing for a duration of at least 3.8 seconds. Projectile weight 174 g; MV 700 m/s

UKRAINE

Manufacturer: MINIMASHPROM

Type: HEI OFE: 184 g; MV 700 m/s

AP-I BT: 190 g; MV 690 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE M85: Steel shell loaded 16.3 g RDX/Aluminium; self-destroying fuze; 174 g; MV 720 m/s

HE-T M85: Two-section steel shell, 12 g RDX/Aluminium in front, red tracer in rear; nose impact self-destroying fuze; 175 g; MV 720 m/s

HE-I M85: Steel shell loaded 16.3 g RDX/Aluminium; self-destroying fuze; 174 g; MV 720 m/s

HE-I-T M85: Two-section shell loaded 12 g RDX/Aluminium in front, red tracer in rear; nose impact fuze with self-destruction; 175 g; MV 720 m/s

AP-I M85: Steel-pointed shell with incendiary mixture in ballistic cap and body filling of TNT/Al; base fuze; 174 g; MV 720 m/s

AP-I-T M85: As for AP-I but with red tracer; 174 g; MV 720 m/s

TP M85: Body of HE shell, empty; dummy fuze; 174 g; MV 720 m/s

TP-T M85: Body of HE-T shell, front section empty, rear section red tracer; dummy fuze; 174 g; MV 720 m/s

UPDATED



23 mm Soviet NS

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FIELD ARTILLERY

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

130 mm FRAG-HE OF-482M

Armament

[130 mm Field Gun M-46](#); 130 mm Field Gun Type 59 and Type 59-1; [Factory 100 M59-1M](#); [130 mm Gun Model 1982](#). 130 mm Self-propelled Gun (Catapult); NORINCO 130 mm Self-propelled Gun.

Development

The Soviet [130 mm Field Gun M-46](#) was developed during the early 1950s from a series of 130 mm naval guns; at one time it was known in the West as the M-1954. The 130 mm M-46 was widely used throughout the former Warsaw Pact nations, but it has now been largely withdrawn from RFAS use and replaced by more modern 152 mm equipment or by ammunition produced to 3OF66 standard (see following entry). However, the M-46 remains in widespread use elsewhere to the extent that its ammunition is still being manufactured by several nations. Conversion kits converting 130 mm M-46 carriages to accommodate 39 calibre 155 mm barrels firing NATO standard ammunition have been marketed by Soltam of [Israel](#) and have been ordered by the Indian Army.

Konstrukta Defence of the [Slovak Republic](#) has produced a version of the OF-482M with a Base Bleed (BB) unit, increasing the maximum range to 32,500 m. An identical round is produced in the Slovak Republic by Kerametal.

Nations such as [Israel](#) and [South Africa](#) have seen fit to produce 130 mm HE ammunition ([South Africa](#) also produces a Base Bleed (BB) round - see separate entry), while [China](#) has developed its own particular family of 130 mm rounds. This 'commercial' market has extended to electronic fuzes for both

[Israel](#) and [South Africa](#), and also produces proximity and other fuzes intended for 130 mm M-46 ammunition. In [Israel](#), Reshef Technologies produces EPSILON [M139](#) MOD 2 while in [South Africa](#) Fuchs Electronics produces the M85R13A1. Both designs are optimised for 130 mm ammunition, as is the MINNIE proximity fuze produced by [TDA](#) of France.

Throughout its service life the 130 mm M-46 has used several types of ammunition which are now no longer in service. One type was a 130 mm RAP used by [Syria](#) and at least two 130 mm chemical projectiles were in service at one time. One contained 1.6 kg of Sarin (GB) and the other 1.4 kg of VX, both nerve agents. Both projectiles weighed 33.4 kg and contained a TNT burster charge. These chemical warfare agent munitions are scheduled for destruction.

The 130 mm FRAG-HE OF-482M is a modified version of the OF-482. The 130 mm FRAG-HE 3OF3 has an AP-30 fuze.

Description

The 130 mm FRAG-HE OF-482M is a separate loading munition, allowing the variable charges contained in a brass cartridge case to be varied to suit a particular fire mission.

The projectile is forged steel and uses a conventional long-nosed streamlined outline with a nose fuze. There are two cupro-nickel drive bands, each 20.07 mm wide and spaced 9.14 mm apart, encircling the body close to the flat base, which has a very slight boat tailed profile. The body walls vary from approximately 29.5 mm to just under 28 mm in thickness and contain a TNT payload weighing 3.6 kg; the TNT has a flash additive for spotting purposes. The point detonating nose fuze is usually an RGM-2 but the PD RGM-6 or V-429 may be encountered. Czech and Slovak 130 mm rounds utilise the PD KZ 88 with a muzzle safety distance of 100 m.

The 70:30 drawn brass cartridge case is issued in two versions, both with a KV-U or KV-5U percussion primer threaded into the base. The first one is a Full Charge version while the other has a Reduced propellant load. The Full Charge contains 13.5 kg of NDT-3 23/1 propellant loaded in a lower and upper bag, together with 2.5 kg of loose propellant in bundled stick form. An increment completes the Full Charge while removal of this increment creates Charge 1. The Reduced charge uses mainly 9/7 and 12/1 Tr propellant, weighs 6.75 kg complete and is supplied in a separate cartridge case. The top charge in the Reduced category is formed using the full complement of a base charge and two equal sized bags, forming Charge 2. Removal of one of the equal bags creates Charge 3 while removal of both equal bags, leaving only the base charge, creates Charge 4. A KV-U percussion primer is pressed into the cartridge case base to ignite both Full and Reduced propellant loads.

On Reduced Charge cartridge cases the propellant is held against the base of the projectile (the top of the case) by a wide flash tube.

The Full Charge produces a muzzle velocity of 930 m/s and provides a maximum range of 27,490 m. The Reduced charge, Charge 2, produces a muzzle velocity of 705 m/s and a range of 19,130 m.

Specifications

Weights:

complete round - Full 59.1 kg; Reduced 51.8 kg

projectile - 33.24 kg

explosive - 3.64 kg TNT

propellant - Full 13.5 kg; Reduced 6.75 kg

cartridge case - 11.35 kg

Lengths:

projectile, fuzed - 660-676 mm

projectile, unfuzed - 609.85 mm

cartridge case - 846 mm

Diameter of cartridge case rim: 185 mm
Muzzle velocity: Full 930 m/s; Reduced 705 m/s
Max range: Full 27,490 m; Reduced 19,130 m
Chamber pressure: Full 3,150 bar; Reduced 2,700 bar
Operating temperature range: -40 to +50°C

Authorised fuzes

PD RGM-2, RGM-6, RV-2, V-429
Prox AR-5, Reshef EPSILON [M139](#) MOD 2, Fuchs Electronics M85R13A1, TSA MINNIE

Equivalent rounds

[BULGARIA](#)

Marketing agency

Kintex

Type: HE VOF-482B and VOF-482VU

Description: Available in Full (VOF-482B) and Reduced (VOF-482VU) propellant charge versions, both with OF-482B projectile. Otherwise standard specifications. Blank rounds also produced

Manufacturer

Vazov Engineering Plants

Type: 130 mm HE

Description: Available in Full and Reduced propellant charge versions. Standard specifications

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 130 mm HE or HEI Type 59

Description: Standard specifications. Fitted with Liu-5 fuze. For 130 mm Type 59 and 59-1 guns

[CROATIA](#)

Manufacturer

RH-ALAN doo

Type: 130 mm HE 482 M

Description: Projectile weight 33.5 kg. Otherwise standard specifications

[CZECH REPUBLIC](#)

Manufacturer

Caliber Prague Limited

Type: 130 mm HE Full Charge

Description: Standard specifications

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries (F.81)

Type: 130 mm M/46 HE

Description: Standard specifications. Fitted with AU-18 fuze

[FINLAND](#)

Manufacturer

Patria Vammass

Type: 130 mm HE

Description: Standard specifications

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 130 mm HE

Description: Fitted with PD M572 nose fuze. Projectile is 561 mm long and weighs 32.5 kg, with explosive weighing 4 kg

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 130 mm HE BB

Description: See separate entry

[IRAQ](#)

Manufacturer

State factories

Type: 130 mm HE

Description: No information available. Probably no longer in production

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 130 mm HE

Description: This round was produced to be used with captured M-46 field guns and is identical to the RFAS original other than the nose cavity being threaded to accommodate a PD M739 fuze. Probably no longer in production

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 130 mm HE

Description: Licence-produced version of Chinese HE round. Uses Liu-5 or PF1A fuze and Di-5 percussion primer. Complete round weight given as 58.42 kg. For Type 59-1 guns

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: 130 mm HE

Description: Available in both full and reduced charge variants with ranges of 26,800 and 22,000 m respectively. Provided with V-429 fuze. Also used with Romanian 130 mm Model 82 gun

[SLOVAKIA](#)

Manufacturer

Kerametal Company Limited

Type: 130 mm OF-482-BB

Description: Modification of FRAG-HE OF-482M to accommodate a Base Bleed (BB) unit, increasing maximum range to 32,500 m. Projectile weighs 33.4 kg, contains 3.6 kg of explosive and has a muzzle velocity of 950 m/s. The BB unit weighs 1.52 kg, is 82 mm long and has a diameter of 110 mm. Used with standard OF-482M cartridge case. Fitted with PD KZ-88 nose fuze. Standard 130 mm FRAG-HE OF-482M also produced

Manufacturer

Konstrukta Defence

Type: 130 mm OF-482-BB

Description: Modification of FRAG-HE OF-482M to accommodate a Base Bleed (BB) unit, increasing maximum range to 32,500 m. Projectile weighs 33.4 kg, contains 3.6 kg of explosive and has a muzzle velocity of 950 m/s. The BB unit weighs 1.52 kg, is 82 mm long and has a diameter of 110 mm. Used with standard OF-482M cartridge case. Fitted with PD KZ-88 nose fuze. Standard 130 mm FRAG-HE OF-482M also produced

[UKRAINE](#)

Manufacturer

TACKO

Type: 130 mm HE for M-46

Description: Standard specifications. Offered for export sales.

[YUGOSLAVIA, FEDERAL REPUBLIC](#)

Manufacturer

Yugoimport SDPR

Type: HE Shell M79

Description: Standard specifications. May no longer be in production

UPDATED



Projectile and cartridge case for 130 mm FRAG-HE OF-482M



The 130 mm HE round produced by the [Pakistan](#) Ordnance Factories



NORINCO 130 mm HE rounds



Diagrammatic outlines of NORINCO 130 mm HE projectile produced for 130 mm Field Gun Type 59 and Type 59/1



Cutaway 130 mm OF-482-BB produced by Konstrukta Defence (T J Gander)

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

NITI Model PKS 12 rubber buckshot round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Niti Corporation to provide less than lethal shotgun shells for crowd control, training, guards and peacekeeping operations.

Description

The Niti PKS 12 is a conventional 12 gauge buckshot round intended for use at distances of 7 to 15 m. It is filled with 16 rubber pellets.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Approx 9.0 g total

Muzzle velocity: Approx 160 m/s

Muzzle energy: Approx 17 J

Max range: Approx 50 m
Max effective range: 15 m

[BULGARIA](#)

Manufacturer

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[Bulgaria](#)

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

NITI Model PKK 12 rubber baton round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Niti Corporation to provide less than lethal shotgun shells for crowd control, training, guards and peacekeeping operations.

Description

The Niti PKK 12 rubber baton round fires a rubber ball to an effective range of 25 m. Like most less than lethal rounds, it can cause severe injuries at close ranges, in this instance, the recommended minimum range is 20 m.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Approx 9 g

Muzzle velocity: Approx 150 m/s

Muzzle energy: Approx 112 J
Max range: Approx 50 m
Max effective range: Approx 25 m

[BULGARIA](#)

Manufacturer

Niti Kasanlak

[Bulgaria](#)

Tel: (+359 431) 431 95/248 84

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FUZES - IMPACT FUZES, [BULGARIA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

M-5A

Armament

82 mm mortar bombs.

Development

Development history unknown.

Description

The M-5A is a direct action impact fuze without delay option. It is constructed of aluminium and is otherwise a copy of the Russian [M-5](#).

Specifications

Type: impact

Weight: 110 g

Length overall: 66 mm

Diameter: approx 40 mm

Optional delay: none

Arming distance: unknown

Manufacturer

[Bulgaria](#) state arsenals, probably Kintex.

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ARTILLERY ROCKETS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

RFAS 122 mm BM-21 Grad series rockets

Armament

All [122 mm BM-21](#) Grad (9K51) series MRS, plus similar MRS produced in the [People's Republic of China](#) (Type 90 and 90A, Type 83, Type 81, Type 81-1 and truck-mounted Type 83 24-round launcher), [Croatia](#) ([Typhoon M96](#)), the former Czechoslovakia (RM-21, RM-40, [RM-70](#) and the updated Mod 70/85), [Egypt](#) ([122 mm SAKR](#) series), [India](#) (LRAR), [Iran](#) (Hadid 40-tube mobile launcher and 8-tube naval launcher), [Iraq](#), [North Korea](#) (BM-11), [Pakistan](#), [Romania](#) (40 APRA, 12 ARO plus other truck, light vehicle and trailer-mounted launchers, 40-round naval and coastal defence launchers, including 40 APRN) and [Turkey](#) ([T-122](#)). To these can be added the RFAS 'Damba' coastal defence rocket system, although these usually carry special underwater target rockets.

The [122 mm BM-21](#) series of rockets can also be launched from 122 mm 9A51 Prima 50-round launchers.

Naval 122 mm launchers with 20 tubes have been produced; NORINCO produces a naval 40-tube 122 mm MRS while [Iran](#) produces a naval 8-tube launcher.

Development

Initial development work on the Soviet 122 mm artillery rockets commenced during the late 1940s to supplement and eventually replace the Great Patriotic War era 82 mm and 132 mm 'Katyusha' MRS from the mid-1950s onwards. Splav of Tula was the main design bureau under the leadership of A Ganichev, with the final development being completed during 1963. The number of 122 mm MRS types

developed gradually until, by 1964, the standard version had become the [122 mm BM-21](#) Grad (Hail) series with its 40-tube launcher array. This is carried on [ZIL-131](#), [Ural-375D](#) or [Ural-4320](#) 6 × 6 trucks, although there have been many other types of vehicle and launcher combinations. These include the 122 mm [BM-21V](#) (Grad-V) 12-launcher system mounted on [GAZ-66](#) 4 × 4 trucks and the 122 mm 9P132/BM-21-P man-portable single-tube launchers for use by special forces. (The latter launch the special shorter 122 mm 9M28/DKZ-B rockets that can also be launched from standard multiple-tube launchers.)

The main producer of the [122 mm BM-21](#) Grad rocket series is the State Research and Production Association 'Splav' at Tula.

In June 1996, it was announced that CELERG of France and Splav of [Russia](#) had completed joint designs for enhanced range [BM-21](#) Grad rockets. It was anticipated that the new designs will have a maximum range of 36,000 m, using composite propellants, and will feature increased accuracy. Little has been heard of this programme of late, although in 2000 Splav announced a range of 122 mm enhanced performance rockets (see later in entry).

The [BM-21](#) Grad MRS is in service in one form or another in some 50 countries, with licence production or copying widespread.

Description

The base model of the [BM-21](#) Grad (Hail) 9K51 series of 122 mm rockets is the 9M22, a FRAG-HE fin-stabilised rocket with a steel tube body, a high-explosive fragmentation warhead in the pointed nose section and an electrically ignited rocket motor in the tail. Stabilisation during flight is provided by four spring-out stabiliser vanes at the tail, mounted at an angle of 1° to the longitudinal. When fully open the fins have a span of 226 mm.

On the base model 122 mm 9M22 the warhead is the M-21-OF containing 6.4 kg of TAG-F high explosive detonated by a 9A210 or MPB point detonating fuze, which is inertially armed only after travelling some 150 to 400 m from the launch point. Other types of warhead can be installed in place of the FRAG-HE including Chemical (VX or GB nerve agent - see under Equivalent projectiles, HE-Incendiary and Smoke).

The rocket motor consists of 20.5 kg of RSI-12M double-base solid propellant, although single-base propellants have been used in the past. Total weight of the 9M22 at launch is 66 kg.

Lengths vary. The basic 9M22 and essentially similar 9M22M are 2.87 m long. The 122 mm 9M22U/DB-1B is 3.226 m long and is heavier at 77.5 kg. All have a maximum range of around 20,750 m. With the basic 122 mm 9M22, two diameters of spoiler ring can be fitted over the nose to reduce range. The larger ring is fitted for ranges from 1,400 to 12,000 m and the smaller ring for 12,000 to 15,900 m. 122 mm rockets fired without the nose rings can reach 15,900 to 20,750 m. Maximum burnout velocity is 699 m/s without a nose ring. At maximum range the probable range error is 168 m in range and 80 m in azimuth.

When detonated the M-21-OF warhead creates approximately 3,150 fragments which are scattered over a lethal radius of about 28 m.

The 122 mm 9M28 rocket, also known as the M-14-OF or DKZ-B, can be used with 9P132 single-round launchers, is a derivative of the 122 mm 9M22 but is shorter at 1.905 m and weighs 45.8 kg. Maximum range is 10,800 m and maximum burnout velocity approximately 450 m/s. A variant of this rocket with an extra motor has a maximum range of 17,000 m.

The [122 mm BM-21](#) rocket types produced in [Russia](#) include 9M28K cargo projectiles carrying three PGMDM anti-tank mines (weight complete 57.7 kg) or five [POM-2S](#) anti-personnel mines (3M16 - weight complete 56.4 kg). Both have a maximum range of 13,400 m. Each is 3.019 m long. Enhanced range versions with ranges up to 32,000 m are under development.

Also available is a 9M43 Smoke rocket containing five smoke canisters, each weighing 800 g. Ten rockets can create a smoke screen 1,000 m long and 800 m deep. Each rocket weighs 66 kg and is 2.949 m long. Maximum range is 20,200 m.

As a check list of current [BM-21](#) rockets, the following summary outlines the main types:

9M22 HE-FRAG. Range 4,000 to 20,000 m

9M22U HE-FRAG. Range 4,000 to 20,100 m

9M28F HE-FRAG. Range 2,000 to 15,000 m

9M53F HE-FRAG. Range 5,000 to 20,000 m

9M43 Smoke. Range 5,000 to 20,000 m

9M42 Illumination. Range 1,000 to 5,000 m

9M28K Anti-tank mine. Range 4,000 to 13,400 m

3M16 Anti-personnel mine. Range 4,000 to 13,400 m

9M22M Cargo. Range 4,000 to 32,000 m

Also in production by Splav and available for export sales are a series of enhanced range and performance 122 mm rockets powered by composite propellant motors. Known examples of these enhanced performance rockets include the following types.

9M519 Jammer. This designation covers a set of eight projectiles intended to jam HF and VHF radio communications operating in the 1.5 to 120 MHz bands. Each jammer warhead can, after impact, jam communications over a radius of 700 m for 60 minutes. A single warhead weighs 18.4 kg and the projectile 66 kg. Maximum range is 18,500 m. This rocket has been referred to as the 9M519-1-7 Lilya-2.

9M521 HE-FRAG. Range is 40,000 m carrying 21 kg of high explosive. Total weight of complete projectile is 66 kg.

9M522 HE-FRAG. On this rocket the warhead is separable from the motor and descends onto the target under a small parachute. This allows the warhead to fall almost vertically onto its target, providing scope for the use of proximity fuzes. The 25 kg warhead is claimed to be six times more effective than that of the standard 9M22U HE-FRAG. Total rocket weight is 70 kg and maximum range 37,500 m.

9M217 Self-targeting Submunition. This contains two unspecified self-targeting submunitions to be dispensed from the rocket warhead and descend under the control of a small parachute. As each submunition descends it seeks a target below and projects a self-forming fragment downwards into the target's top armour. The warhead weight is 25 kg and total rocket weight is 70 kg. Each submunition can penetrate 60 to 70 mm of homogeneous armour set at an angle of 30°. Maximum range is 30,000 m. The submunition involved may be the 122 mm Universal Smart Munition.

9M218 Cargo. Contains 45 dual-purpose submunitions containing a total of 25 kg of high explosive. Total rocket weight is 70 kg and maximum range is 30,000 m.

One possible future submunition for 122 mm Grad series rockets is the 122 mm Universal Smart Munition. A 122 mm Grad series rocket could carry two of these anti-armour munitions which descend under a parachute and use a side-mounted target sensor to search for a target. If a target is sensed a self-forming fragment is fired from the optimum distance. The warhead can penetrate 60 to 70 mm of Rolled Homogeneous Armour (RHA). The 122 mm Universal Smart Munition is not yet in production. Although it is not confirmed, these munitions may be the ones involved with the 9M217.

Fuchs Electronics of [South Africa](#) produce the [BM21](#) and BM36 proximity fuzes optimised for [122 mm BM-21](#) rockets.

The 122 mm rockets are normally transported packed in individual plywood chests but can be carried ready-loaded in their launch tubes for up to one year. Part of the [BM-21](#) Grad system is a reload vehicle carrying reload rockets in 9F37 racks.

The 122 mm 9M22U rocket is used for training purposes. Few details are available although it is understood that the warhead contains a flash/bang/smoke element only.

Specifications

9M22

Calibre: 122 mm

Weights:

complete - 66 kg

warhead, complete - approx 18.3 kg

warhead, explosive - 6.4 kg

rocket motor - 20.5 kg

Length overall: 2.87 m

Fin span, open: 226 mm

Max burnout velocity: 699 m/s

Max range: 20,750 m

Operating temperature range: -40 to +50°C

Authorised fuzes

PD 9A210, MRV, MRV-U, Junghans PD 111R or equivalents; Fuchs [BM21](#) Prox; Fuchs BM36 Prox

Equivalent rockets

[BULGARIA](#)

Manufacturer

Vazov Engineering Plants

Type: 122 mm M-21 OF

Description: Intended for launching from [BM-21](#) Grad. Complete rocket weighs 66 kg and is 2.75 m long. The steel-cased warhead weighs 19.9 kg and is 749 mm long filled with TGAF5 (RDX/TNT); the fuze is either a PD MRV-U or MRV. The electrically ignited rocket motor contains 20.65 kg of RSI-12M propellant. Maximum velocity given as 660 m/s and range a precise 20,217 m. Each warhead can cover a lethal area of 1,050 m².

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: [122 mm Type 81](#) series rockets

Description: Fired from the 40-tube launcher carried on Type 83 tracked MRS, the truck-mounted Type 90 or Type 81 and the truck-mounted Type 83 24-tube launcher; a single-tube launcher also exists. Rocket types, with composite propellant rocket motors, include a standard FRAG-HE with a 18.3 kg RDX-filled warhead, HE-Incendiary, HE-Canister using a steel subprojectile payload, HE-Incendiary-Canister with a steel subprojectile payload and Cargo carrying 39 Type 90 40 mm calibre dual-purpose bomblets. Weight of the Cargo rocket is 60.5 kg and length 2.927 m; maximum range is 20,000 m. There is also an extended range HE rocket with a maximum range of 30,000 m (weight 61 kg, length 2.757 m). Also available are two types of minelaying rocket, one with a range of 7,000 m and another with a range of 15,000 m, both capable of carrying mixes of anti-tank and anti-personnel mines. All these 122 mm rockets weigh ca 60 kg and can be fired from standard [BM-21](#)

Grad type launchers.

Manufacturer

[China](#) North Industries (NORINCO)

Type: 122 mm Type 90A series rockets

Description: Intended for use with the Type 90A 40-barrel MRS. There are four rockets in the series, three with a maximum range of 32,700 m and a minimum range of 12,700 m. The three are: HE; Steel High Explosive Incendiary (SHEI) containing 3,400 steel balls; and Steel High Explosive (SHE) containing 4,044 steel balls. In each case the rocket weighs 61 kg and is 2,757 m long; warhead weight is 18.3 kg. The fourth round is a Cargo round containing 39 42.2 mm bomblets or an unspecified number of 114 mm diameter mines. This Cargo rocket has a maximum range of 32,000 m, weighs 60.5 kg and is 2.927 m long. Warhead weight is 19 kg. For all four rocket types the maximum flight velocity is 1,050 m/s and time of flight to maximum range is 110 seconds.

Manufacturer

[China](#) North Industries (NORINCO)

Type: 122 mm Shrapnel

Description: Developed as an adjunct to existing [BM-21](#) Grad type MRS, this rocket has a 19.25 kg warhead containing 6 kg of RDX surrounded by approximately 4,100 steel spheres. A complete rocket weighs 66.8 kg and is 2.87 m long. Propellant weight is 20.6 kg and maximum range is 20,000 m. Also known as Rocket Steel Ball Shell.

CROATIA

Marketing agency

R H ALAN doo

Type: M-21-OF and RAK 122 M93

Description: M-21-OF has standard specifications while RAK 122 M93 is a locally developed variant. Launched from [Typhoon M96](#) MRS on TATRA 813 truck chassis. PD fuze is RUTU M93 (MRV-U).

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: Rocket 122 mm Grad FRAG-HE

Description: Similar to reverse-engineered [122 mm SAKR](#) rockets (see separate entry). Rocket bodies are supplied by Vickers (UK), composite propellant by Bayern Chemie (Germany), rocket motor by CELERG (France). Proximity fuzes are supplied by Simpa (France). Warheads are produced by the Abu Zaabal Company for Speciality Chemicals Factory No 18 where the warheads are filled with 6.4 kg of RDX:TNT.

Manufacturer

SAKR Factory for Developed Industries

Type: [122 mm SAKR](#) Rockets

Description: See separate entry

INDIA

Manufacturer

Armament Research and Development Establishment

Pune

Type: 122 mm LRAR

Description: A locally developed long-range version of the basic 122 mm 9M22 with a 18 kg warhead containing TNT. Launched from 40-tube MRS carried on [Shaktiman](#) 6 × 6 5 tonne truck. Uses a double-base solid propellant motor.

IRAN

Manufacturer

Defence Industries Organisation

[Islamic Republic of Iran](#) (Parchin Missile Industries)

Type: 122 mm Arash

Description: Essentially similar to 122 mm 9M22 but understood to be derived from Chinese NORINCO designs. Used with 40-tube launchers. Data provided states that weight complete is 65 kg, 18.38 kg of which is the warhead. Length is 2.815 m and maximum velocity is 710 m/s. Maximum range is 21,500 m. Fuze is PD SAEIR-F72.

Manufacturer

Defence Industries Organisation

[Islamic Republic of Iran](#) (Parchin Missile Industries)

Type: 122 mm Noor

Description: A short version of the 122 mm Arash launched from both single-tube and 40-tube launchers. Weight is 45 kg, 18.35 kg of which is the warhead. Length is 2.05 m and maximum velocity 720 m/s. Maximum range is 18,000 m. Fuze is PD SAEIR-F72.

Manufacturer

Defence Industries Organisation

[Islamic Republic of Iran](#) (Parchin Missile Industries)

Type: 122 mm Long Range Rocket (Arash)

Description: Lengthened version of 122 mm Arash with maximum range of 29,000 m. Length is 3.2 m and weight 72 kg with 18 kg warhead. Maximum velocity 1,050 m/s. Fuze is PD SAEIR-F72.

Manufacturer

Defence Industries Organisation

[Islamic Republic of Iran](#) (Parchin Missile Industries)

Type: [122 mm Fadjr 6](#)

Description: A Cargo round carrying eight anti-armour or anti-personnel mines. Weight 63 kg, length 2.83 m and weight of payload 32 kg. Minelaying range is 3,500 to 6,000 m.

KOREA, NORTH

Manufacturer

State factories

Type: 122 mm FRAG-HE

Description: Derived from 122 mm 9M22 and launched from locally produced BM-11 30-tube

launchers. A second 122 mm rocket system is understood to exist but no details are available.

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: 122 mm HE Yarmuk

Description: Derived from 122 mm 9M22 and used with 30-tube launcher derived from the North Korean BM-11 MRS. Weight complete with 20.4 kg of a double-base propellant is 66 kg. Warhead contains 6 kg of Composition B and weighs 19.4 kg fuzed. Length overall is 2.875 m. Maximum range is 20,580 m.

Manufacturer

Dr A Q Khan Research Laboratories

Type: 122 mm FRAG-HE

Description: Maximum range 20,380 m.

POLAND

Manufacturer

Tlocznia Metali Pressta Spolka Akcyjna

Owinska

Type: [122 mm BM-21](#) rockets

Description: Three types of rockets produced, HE (GRAD), FRAG-HE (SPALL) and Minelaying (PLATAN), all to be fired from standard [BM-21](#) MRS. GRAD and SPALL are 2.753 m long, weigh 66.18 kg and have a maximum range of 20,130 m. A SPALL warhead burst creates 6,500 fragments and can be used with a proximity fuze to form air bursts. PLATAN carries five anti-tank mines to a range of 18,000 m. Rocket weight is 75.1 kg and length is 3.285 m.

Manufacturer

Presta

Type: [122 mm BM-21](#) rockets

Description: Three types of rocket produced: [M21](#) FRAG-HE, M21-OF FRAG-HE and Minelaying, the latter carrying five anti-tank mines. Maximum range of this variant is 18,000 m. Rocket weight is 75.1 kg and length is 3.285 m.

ROMANIA

Marketed by

SN ROMARM SA

Type: 122 mm HE

Description: Same as 122 mm 9M22. Launched from 40 APRA truck- and trailer-carried launchers. An M21-OF-S short version, 1.927 m long and weighing 46.6 kg, is intended for launching from a 1-L P-122 single-tube manpack or horse-portable launcher having a range of 12,700 m. The rocket motor weighs 11.1 kg.

Manufacturer

SN ROMARM SA

Type: 122 mm M21-OF-FP and M21-OF-S

Description: Equate to M-21-OF (9M22) and M-14-OF (9M28). Standard specifications.

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

State factories

Type: 122 mm Chemical

Description: At least two 122 mm Chemical warheads were produced for the [BM-21](#) Grad MRS, one containing 2.9 kg of liquid VX and the other 3.1 kg of liquid Sarin (GB), both nerve agents. The VX warhead weighs 19.3 kg and has a Proximity fuze igniting a TNT burster charge. The GB warhead also weighs 19.3 kg and has a PD fuze igniting the TNT burster charge. A HCN filled warhead was also reported to exist. These warheads have been withdrawn from service and are scheduled for destruction.

Manufacturer

State Research and Production Enterprise 'Splav'

Tula

Type: 122 mm HE

Description: Intended for use with the Damba coastal defence 40-round anti-underwater platform system, which has an obvious affinity with the [BM-21](#) MRS. Damba rockets, that are fuzed to operate at depths of 3 to 200 m, are 2.756 m long and weigh 75.3 kg, 20 kg of which is warhead explosive. Range is 300 to 5,000 m.

Manufacturer

State Research and Production Enterprise 'Splav'

Tula

Type: 122 mm 9M53F

Description: Intended primarily for the 50-round 9K59 Prima MRS mounted on the 9A51 truck platform, the 9M53F rocket uses an enhanced preformed fragment and blast warhead weighing 26 kg which, as it approaches a target area, separates from the rocket body under electronic fuze control to be suspended from a parachute. This ensures the warhead has a near vertical approach angle allowing a proximity fuze to function at an optimum height of several metres above the ground. On detonating its 1.8 kg explosive filling each warhead produces 2,500 preformed fragments to be spread in a circular pattern. Each 122 mm 9M53F rocket weighs 70 kg and is 3.037 m long. Range is from 5,000 to 20,500 m.

[SLOVAKIA](#)

Manufacturer

Konstrukta Defense

Type: 122 mm AGAT/JRKK-G

Description: Can be supplied either as an AGAT warhead to be fitted to existing [122 mm BM-21](#) Grad rocket bodies by a customer, or as a complete 122 mm JRKK-G projectile weighing 68 kg. Fitted with a nose-mounted TM120 time fuze the warhead can deliver 56 38 mm dual-purpose bomblets over a range band of 6,500 up to 16,500 m. Each bomblet weighs 280 g and can penetrate 110 to 130 mm of homogeneous armour. A self-destruct fuze is fitted to each bomblet. An incendiary bomblet is also available. A version with a revised rocket motor has a range of 33,000 m. Marketed by Technopol.

Manufacturer

Konstrukta Defense

Type: 122 mm LR

Description: Although designed to be launched from four-tube LRM-122 launch pods carried by aircraft or helicopters, the 122 mm LR rocket may also be used in the ground-to-ground role, when it has a maximum range of 12,000 m. The 122 mm LR rocket weighs 46.25 kg, 12 kg of which is the steel warhead containing 6.4 kg of TGAF-5 (RDX/TNT) and 11.3 kg of Ng Tr solid propellant. Length overall is 1.94 m. The nose fuze is a PD LZMH-1 with two optional delays; the fuze is 215 mm long and weighs 970 g. Marketed by Technopol.

Manufacturer

Konstrukta Defense

Type: 122 mm Trnovnik

Description: This is a 122 mm cargo warhead rocket, that can carry 63 dual-purpose bomblets to a maximum range of 17,500 m. Rocket length overall is 2.78 m and weight 65.8 kg. Total warhead weight is 14.85 kg with each 38 mm diameter bomblet weighing 131 g; armour penetration is 100 mm. Marketed by Technopol.

Manufacturer

VCHZ Synthesia, sp, Vupch and MOEX

Type: 122 mm EXR-122

Description: 9M22 extended range derivative weighing 70.8 kg with a maximum range of 24,600 m. Warhead weight is 20 kg and propellant weight 24.5 kg. Developed by Prototype, s.p. Brno.

Manufacturer

ZVS Dubnica

Type: 122 mm JROF and 122 mm JROF-K

Description: FRAG-HE launched from the RM 21 or [RM-70](#) and Mod 70/85 launchers. Essentially similar to RFAS 9M22 but the weight is 65.8 kg and length 2.881 m, with a nose-mounted MRV-u point detonating fuze. Warhead payload is 6.4 kg of TNT. The shortened 122 mm JROF-K is 1.932 m long, weighs 46.3 kg and has a maximum range of 11,000 m.

SOUTH AFRICA

Manufacturer

[Mechem](#), a member of the Denel Group

Type: RO 122 PFHE

Description: This 122 mm rocket has been developed to the 'ready for production' stage for use with [BM-21](#) series launchers. The PFHE warhead, described as a FRAG-HE, contains 9,800 steel spheres encased in a cast epoxy resin sleeve around the warhead explosive. A Fuchs [BM21](#) radio proximity fuze is fitted.

Manufacturer

[Mechem](#), a member of the Denel Group

Type: 68 mm Subcalibre Training Device

Description: [Mechem](#) have developed a 68 mm Subcalibre Training Device for 122 mm rocket systems

using 68 mm aircraft rockets (see separate entry in this section). The device outwardly resembles a full-scale 122 mm rocket and is loaded and fired in the same manner. This system led to savings of US\$2.5 million per annum for the SANDF.

TURKEY

Manufacturer

Rocketsan

Type: [TR-122](#) 122 mm Extended Range Artillery Rocket

Description: Intended to be fired from locally produced 40-tube launchers, the [TR-122](#) can also be launched from [BM-21](#) Grad launchers. Maximum range is over 40,000 m and minimum 10,000 m. Warhead types are HE and fragmentation (steel ball), each weighing 18.4 kg. Weight complete is 65.9 kg and length 2.9 m. Developed for the Turkish armed forces, the [TR-122](#) is in production.

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: 122 mm FRAG-HE [M88](#)

Description: 122 mm 9M22 type rocket 2.87 m long with impact-fuzed warhead having 6.4 kg of explosive surrounded by 2,780 6.35 mm steel spheres. Total weight is 66 kg of which 20.4 kg is propellant producing a maximum velocity of 690 m/s. Maximum range given as 20,400 m. Probably no longer in production.

UPDATED



Cutaway example of 122 mm 9M22 (M-21-OF) rocket



The Czech 122-JROF-K 122 mm rocket, the Czech equivalent of the RFAS 122 mm 9M28



The Czech 122 mm Trnovik cargo warhead rocket



Cross-section of South African [Mechem](#) RO 122 PFHE warhead showing steel spheres cast in an epoxy resin sleeve around the explosive warhead filling; also visible is a cross-sectioned Fuchs Electronics [BM21](#) radio proximity fuze



Warhead of [NORINCO 122 mm](#) Shrapnel rocket, also known as Rocket Steel Ball Shell, containing 4,100 steel balls



Croatian 122 mm RAK 122 M93 FRAG-HE rocket with packing/transport cases



Cutaway example of the South African [Mechem](#) 68 mm subcalibre training device for 122 mm rocket systems



Mock-up of a Lilia-2 electronic jammer rocket warhead produced jointly by Splyav of [Russia](#) and Electron Progress of [Bulgaria](#) (T J Gander)



The warhead for a 122 mm AGAT/JRKK-G cargo warhead marketed by Technopol of the [Slovak Republic](#) (2001)



A model of the 122 mm Universal Smart Munition, two of which could be carried in a 122 mm Grad rocket (T J Gander)



The Turkish Rocketsan [TR-122](#) 122 mm extended range rocket (Christopher F Foss) (1998)



The Splyav 122 mm 9M218 extended range rocket carrying 45 dual-purpose submunitions (2001)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

125 mm FRAG-HE(FS) 3OF19 and 3OF26

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun on [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B towed anti-tank](#) gun.

Development

The general purpose 125 mm FRAG-HE(FS) 3OF19 and 3OF26 projectiles may be regarded as scaled-up equivalents of the 115 mm 3OF-18 and 3OF-27, even though the 125 mm 3OF26 is referred to as a second-generation projectile with a preformed fragment warhead. The two 125 mm projectiles differ in other details such as body wall thicknesses, outline and filling but the differences are not readily detectable externally.

The 3OF19 is the projectile for the 3VOF22 round, whereas the 3OF26 is the projectile for the 3VOF36 round.

For a typical example, the [T-72](#) usually carries a combat load of 39 rounds, 21 of which are FRAG-HE(FS).

It is known that 125 mm tank gun ammunition is produced in [India](#) but no information is available. A new munitions plant is to be built at Bolangir in Eastern [India](#) which, when fully operational, will be able to produce 150,000 rounds of 125 mm ammunition every year; this will presumably include FRAG-HE(FS) ammunition.

A 1991 RFAS reference mentions a 125 mm anti-personnel flechette projectile but no information is yet available.

Description

In common with the rest of the 125 mm ammunition range, the FRAG-HE(FS) 3OF19 and 3OF26 are separate loading munitions. They are automatically loaded into the breech followed by a semi-combustible propellant case.

The 3OF19 and 3OF26 are both steel-bodied projectiles with conventional outlines. The bodies have boat tails and their bases thread into a slender curved steel extension assembly, with four forward-folding steel fins which snap out once the projectile has left the gun muzzle (overall fin span is 356 mm). There are two copper driving bands spaced 77 mm apart. The front band is 13 mm wide, with the rear band 7 mm wide.

The explosive fillings vary. The 3OF19 contains 3.1485 kg of TNT while the 3OF26 contains 3.14 kg of A-IX-2 (RDX/Aluminium/Wax) surrounded by preformed steel fragments. The OF-19 projectile uses a nose-mounted point impact fuze known as the V-429E and made of steel, threaded into a steel nose adaptor.

The prefragmented multipurpose and anti-helicopter 3OF26 FRAG-HE round fitted with an MTSQ fuze weighs 33 kg complete, with the OF-26 projectile weighing 23.2 kg. On detonation, the projectile creates between 600 and 2,000 fragments. Maximum range that can be selected with the fuze is 5,000 m and maximum possible range is 9,700 m. Muzzle velocity is 850 m/s.

The 3OF19 projectiles are fired using a semi-combustible charge case known as the Zh40, weighing 5.885 kg; the 3OF26 uses the Zh52 case weighing 10 kg and containing 5 kg of 15/1 Tr VA and 12/7 VA propellant plus S-1 decoppering agent. The cases are nitrocellulose impregnated with TNT. Priming is electrical using a GUV-7 primer 24 mm long. After firing, a steel stub case weighing 3.4 kg remains to be automatically ejected, although manual ejection may be employed. The case, made of BW 11 steel, is 140 mm long with the flange diameter being 171.9 mm.

The muzzle velocity of both projectiles is 850 m/s. Maximum range is 9,400 m for the 3OF19 and 12,200 m for the 3OF26.

It is claimed that all these types of round have a service life of up to three years in a tank gun autoloader. Normal shelf life under controlled conditions is of the order of 10 years.

A training round intended specially for training tank crews is the 125 mm VOFT22 training round with an OFT-19 HE-T projectile. The projectile is fired at a muzzle velocity of 850 m/s with a No 1 tracer element burning for up to 3 seconds from a location in the base so that the trajectory can be followed for training assessment and marking purposes. As the projectile passes through a soft target, the nose-mounted VUBS-1M super-quick point detonating fuze functions to detonate the projectile's Trotyl bursting charge less than 5 m behind the target. Should the projectile fail to hit a target it will self-destruct after about 4 to 6 seconds at a maximum range of 12,220 m. The complete VOFT22 round weighs 32.5 kg.

The 125 mm VOFT22 training round is marketed by Kintex of [Bulgaria](#).

A short-range training round known as IDA is produced in both the [Czech Republic](#) and [Slovakia](#). Equipped with a tracer, the DZ 75 AU base time fuze round will self-destruct 4.5 seconds (± 0.5 second) after firing, equating to a range of 2,700 to 3,300 m. The IDA contains a bursting charge weighing 3.05 kg. This round requires a safety template 5,000 m long

Specifications

Weights:

complete round - 3VOF19, 32.5 kg; 3VOF36, 33 kg

projectile - 3OF19, 23 kg; 3OF26, 23.2 kg

filling - 3OF19, 3.1485 kg TNT; 3OF26, 3.14 kg (A-IX-2)

propellant - 3OF19, 5.885 kg; 3OF26, 5 kg

stub case - 3.4 kg

Lengths:

projectile - 3OF19, 670 mm; 3OF26, 675 mm

propellant assembly - 408 mm

Diameter over extended fins: 3OF19, 354 mm; 3OF26, 353 mm

Muzzle velocity: 850 m/s

Chamber pressure: 3OF19, approx 3,000 bar

Max range: 3OF19, 9,400 m; 3OF26, 12,200 m

Operating temperature range: -40 to +50°C

Authorised fuzes

OF-19, PD V-429E; OF-26, MTSQ, type not yet known

Equivalent rounds

BULGARIA

Marketed by: Kintex

Type: 125 mm HE 3VOF22

Description: Projectile is 3OF19 with filling 3.15 kg TNT. Standard specifications

Manufacturer

Kintex

Type: VOFT22 Prac

Description: Training round - see text

Manufacturer

Trema Limited

Type: 125 mm HE 3VOF 22

Description: Projectile is 3OF19 with filling 3.15 kg TNT. Standard specifications

CZECH REPUBLIC

Manufacturer

Konstrukta Defence

Type: 125 mm HE SMRK

Description: Equivalent to 3OF19. Also produced is a short-range training round known as 'IDA' - see text

Manufacturer

PS (Policke strojirny)

Type: 125 mm HE

Description: Probably 3OF 19, Filled with 3.15 kg of TNT

IRAN

Manufacturer

Defence Industries Organisation, Ammunition Division

Type: 125 mm Anti-personnel (SAFIR)

Description: Exact model uncertain, but probably based on 3OF19. Charge weight given as 3.4 kg TNT. Otherwise standard specifications

IRAQ

Manufacturer

State factories

Type: 125 mm HE

Description: May be 3OF19 but this is not confirmed. May no longer be in production

POLAND

Manufacturer

Zakłady Produkcji Specjalnej Sp zoo (ZPS)

Type: 125 mm HE

Description: Exact model not known - probably 3OF19. Projectile weight given as 23 kg and containing 3.15 kg of TNT. Uses W-429 (V-429) PD fuze

Manufacturer

Presta

Type: 125 mm HE

Description: Probably 3OF19. Projectile length, unfuzed, given as 617 mm.

ROMANIA

Manufacturer

SN ROMARM SA

Type: 125 mm Fugas

Description: Probably 3VOF19

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Rosoboronexport

Type: 125 mm 3UOF36 FRAG-HE(FS) round with 3OF26 projectile

Description: Standard specifications - see text

Manufacturer

Spetsvneshtekhnika, Moscow

Type: 125 mm 3OF26

Description: Standard specifications - see text

SLOVAKIA

Manufacturer

Technopol Military and Police Group

Type: 125 mm HE SMRK

Description: Equivalent to 3OF19 although maximum range given as 12,200 m. Also produced is a short-range training round known as 'IDA' - see text

Manufacturer

VIHORLAT As Snina

Type: 125 mm HE EOF

Description: Similar to 3OF19

Manufacturer

ZVS Dubnica - KERAMETAL

Type: 125 mm HE SMRK (EOK)

Description: Equivalent to 3OF19 although maximum range given as 12,200 m. Also produced is a short-range training round known as 'IDA' - see text

UKRAINE

Manufacturer

Donetsky Rubber and Chemical Products Plant

Type: 125 mm FRAG-HE

Description: Exact model uncertain. Projectile weight 23 kg and length 615 mm

Manufacturer

MINMASHPROM

Type: 125 mm 3UOF36 FRAG-HE(FS) round with 3OF26 projectile

Description: Standard specifications - see text

YUGOSLAVIA, FEDERAL REPUBLIC

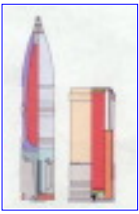
Manufacturer

Yugoimport SDPR

Type: 125 mm HE

Description: Understood to be 3OF19. Complete round weight given as 48.5 kg. May no longer be in production

UPDATED



125 mm FRAG-HE produced in [Poland](#) by ZPS with Zh40 propelling charge on right



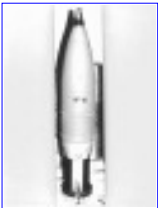
Cutaway example of 125 mm HE EOF produced by VIHORLAT As Snina of the [Slovak Republic](#) (T J Gander)



Cutaway demonstration model of 125 mm FRAG-HE(FS) 3OF26 with fins folded (T J Gander)



Left, 125 mm FRAG-HE(FS) as produced by ZPS in [Poland](#) with their 125 mm HEAT on right (T J Gander)



125 mm FRAG-HE(FS) 3OF19 (T J Gander)



125 mm Anti-personnel (SAFIR) round produced by Defence Industries Organisation, Ammunition Division, of [Iran](#) and probably based on 3OF19 (2000)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

125 mm HEAT-FS ammunition

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun carried by [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B towed anti-tank](#) gun.

Development

There are currently six known types of 125 mm HEAT-FS ammunition although the earliest, the 3BK12M, is now unlikely to be encountered. A checklist of the rounds and projectiles involved is provided below:

Round	Projectile
3VBK7	3BK12M
3VBK10	3BK14M
3VBK16	3BK18M
3VBK17	3BK21B
3VBK25	3BK29M
n/avail	3BK37

The HEAT-FS 3BK14M is an improved version of the earlier 3BK12M and replaced it in service. Unlike earlier similar HEAT-FS projectiles of [Russian Federation](#) and Associated States (CIS) origin the 3BK14M uses a standoff spike nose to carry the piezoelectric contact sensor for the base fuze.

The 3BK18M is a heavier enhancement of the 3BK14M and uses a copper liner for the shaped charge. By contrast the 3BK21M has a Depleted Uranium (DU) liner which improves penetration performance. The 3BK29 reverts to a copper liner for the shaped charge which is optimised for the penetration of active armours.

The 3BK37 projectile was first seen during 1993 and is unusual in having three HEAT charges; one in the nose as a preliminary charge, one in the centre to act as a fuze preliminary charge, and the main charge in the base together with a wave shaper charge, each activated in succession from the nose backwards. As far as is known the 3BK37 is still at the development stage. It has been proposed that the techniques employed with this projectile could be carried over to 100 and 120 mm projectiles.

As a typical example, the [T-72](#) usually carries a combat load of 39 rounds, of which only six are HEAT-FS. This reflects the accepted ballistic limitations of the HEAT-FS projectile to the extent that it has been almost entirely replaced by APFSDS-T projectiles for most anti-armour fire missions.

A new munitions plant is to be built at Bolangir in Eastern [India](#) which, when fully operational, will be able to produce 150,000 rounds of 125 mm ammunition every year. This will presumably include HEAT-FS projectiles.

Description

In common with the rest of the 125 mm ammunition range, HEAT-FS is a separate loading munition. The projectile is automatically loaded into the breech followed by a semi-combustible propellant case.

Projectile bodies are steel and encircled by a single sintered iron driving band 6.86 mm wide. The front of the projectile carries a standoff spike inside which is a piezoelectric contact sensor connected by an internal wire to a base-mounted fuze. The fuze used on the 3BK14M is the V-15 or VG-15 while later models use the 3B15 (3BK18M) or VU-729 (3BK21P). When the fuze functions it ignites the main explosive filling which varies from model to model, resulting in hard target penetration plus fragmentation effects. The explosive filling (usually A-IX-1 or OCFOL) forms a conical shaped charge set behind a liner. The rear of the projectile body carries an extension on which are carried six forward-folding steel fins. The hinged fins snap out once the projectile has left the gun muzzle.

The triple-charge warhead 3BK37 weighs 19 kg and has a direct fire range of 1,010 m; maximum aimed range is 4,000 m. Penetration against 60° armour is given as 350 mm following the destruction of reactive armour.

Projectiles are fired using a semi-combustible charge case known as the Zh52 and weighing 10 kg; the charge case for the 3BK14M weighed only 5.885 kg. The cases are nitrocellulose impregnated with TNT. A GUV-7 electrical primer is fitted. After firing, a steel stub case weighing 3.4 kg remains to be automatically ejected, although manual ejection may be employed. The case, made of BW 11 steel, is 140 mm long with the flange diameter being 171.9 mm.

Most HEAT-FS projectiles have a muzzle velocity of 905 m/s. The 3BK14M warhead can defeat up to 220 mm of armour at 1,000 m, although at that range the probability of a first time hit on a static target has been calculated as 73 per cent. At 1,500 m the hit probability falls to 36 per cent. The maximum direct fire range is around 4,000 m, although at that range accuracy is negligible.

The penetration performance of the 3BK18M is not known for certain (a penetration of 260 mm of armour has been estimated) and neither is that for the 3BK21B or the 3BK29. It is known that the 3BK29 is fired with an increased muzzle velocity of 915 m/s and it has been estimated that the 3BK29 warhead could penetrate 300 mm of armour following the detonation of active armour. It has been claimed that the triple-charge warhead 3BK37 can penetrate 350 mm of Rolled Homogeneous Armour (RHA) at an angle of 60°.

It is claimed that all these types of round have a service life of up to three years in a tank gun autoloader. Normal shelf life under controlled conditions is of the order of 10 years.

The training round used for the latest types of HEAT-FS projectiles is the HEAT-FS-TP 3VP11 using the 3P11 projectile; earlier models used the 3VP5 with the 3P11 projectile. The HEAT-FS-TP 3P11 projectile does not contain explosive but is an exact ballistic match for operational projectiles such as the 3BK18M out to a range of 4,000 m. Weight of the training round is 29 kg complete, 19 kg of which is the projectile. The normal Zh52 propelling charge is employed and handling and loading procedures are identical to those for operational rounds.

Specifications

Weights:

complete round - 3BK14M, 29.58 kg; 3BK18M, 29 kg; 3BK21P 29 kg; 3BK29, 28.4 kg

projectile - 3BK14M, 19.08 kg; 3BK18M, 19 kg; 3BK21P, 19 kg; 3BK29, 18.4 kg

filling - 3BK14M, 1.85 kg; 3BK18M, 1.76 kg; 3BK21P 1.85 kg; 3BK29, 1.64 kg

propellant - 3BK14M, 5.885 kg; all others, 10 kg

stub case - 3.4 kg

Lengths:

projectile - 3BK14M, 676.55 mm; 3BK18M, 680 mm; 3BK21P, 680 mm; 3BK29, 680 mm

propellant charge - 408 mm

Diameter over extended fins: 342.9 mm

Muzzle velocity: 905 m/s; 3BK29 915 m/s

Chamber pressure: approx 3,000 bar

Operational temperature range: -40 to +40°C

Authorised fuzes

PIBD V-15, 3V15 or VU-729

Equivalent rounds

BULGARIA

Manufacturer

Kintex

Type: 125 mm VBK10 round with BK14M hollow charge projectile

Description: Essentially as described in text but projectile weight given as 19 kg and length 628 mm.

Manufacturer

Duna-Rit

Type: 125 mm HEAT

Description: Exact model uncertain but probably 3BK18M. Weight of projectile 19 kg, muzzle velocity 905 m/s and fitted with PIBD V-15 fuze. Armour penetration given as 200 mm with armour set at 60°.

IRAN

Manufacturer

Defence Industrial Organisation, Ammunition Group

Type: 125 mm HEAT-T

Description: Exact model uncertain and weights as other data differ considerably from those from other

countries of origin. Specifications provided state that total round weight is 33 kg with the projectile weighing 23 kg. The shaped charge weight is given as 3.4 kg of RDX. Muzzle velocity is 850 m/s. This round may be a local development.

POLAND

Manufacturer

Zakłady Produkcji Specjalnej Sp Zoo (ZPS)

Type: HEAT-T

Description: Believed to be equivalent to the 3BK18M. Weight of projectile is 9.5 kg, fitted with PIBD W-15 (V-15) fuze, and contains 1.52 kg of explosive. Muzzle velocity is 905 m/s. Accuracy spread at 1,000 m is 0.3×0.3 m and 0.6×0.6 m. The round can penetrate 400 mm of RHA plate at between 80 and 100 m

Manufacturer

Presta

Type: 125 mm HEAT-T

Description: Exact model uncertain but believed to be equivalent to 3BK18M.

ROMANIA

Manufacturer

SN ROMARM SA

Type: 125 mm HEAT-FS-T BK-14M

Description: Standard specifications.

RUSSIA

Manufacturer

Rosoboronexport

Type: HEAT-FS 3VBK16 round with 3BK18M projectile; 3VBK25 round with 3BK29M projectile

Description: Standard specifications, see text

UKRAINE

Manufacturer

TACKO

Type: HEAT-T 3VBK10 and 3VBK16

Description: Standard specifications. HEAT Practice also available.

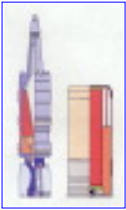
YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

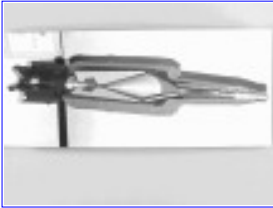
Yugoimport - SDPR

Type: [M88](#) with HEAT-T

Description: Explosive filling is 1.75 kg of F04P (HMX). Fuze is UT-PE, [M87](#) and primer KT-UE, [M84](#). Muzzle velocity given as 905 m/s. Intended for use on [M-84](#) and [M-84A](#) tanks, the Yugoslav versions of the [T-72](#). May no longer be in production



125 mm HEAT round produced in [Poland](#) by Pronit with Zh52 propellant case on right



Cutaway demonstration model of 125 mm HEAT-FS 3BK18M projectile (T J Gander)



Inert 125 mm HEAT-FS 3BK29 projectile (T J Gander)



Inert 125 mm HEAT-FS 3BK21P projectile (T J Gander)



125 mm HEAT-FS-TP 3P11 projectile (T J Gander)



125 mm HEAT-T produced by Defence Industrial Organisation, Ammunition Group of [Iran](#) (2000)

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

14.5 × 114 mm

Synonyms:

14.5 mm Soviet machine gun; [14.5 mm KPV](#); 14.5 mm Type 56; 14.5 mm Vladimirov

Armament

Soviet PTRS and PTRD anti-tank rifles; KPV heavy machine gun; Chinese Type 75-1 machine gun; Hungarian 'Destroyer' heavy rifle; AEROTEK NTW 14.5 anti-materiel rifle.

Development

Developed in the late 1930s for the contemporary anti-tank rifles. After the rifles became obsolete the round was carried over to the KPV heavy machine gun and has remained in use with this weapon. The gun and ammunition have been widely distributed and ammunition has been made in [China](#), [Egypt](#), [North Korea](#) and [Romania](#) at various times.

Description

The case is rimless, bottlenecked and of brass, Berdan primed. The standard bullet is an armour-piercing/incendiary pattern with steel core and incendiary composition in the nose.

Specifications

AP-I B-32

Round length: 155.8 mm
Case length: 114.3 mm
Rim diameter: 26.9 mm
Bullet diameter: 14.5 mm
Bullet weight: 63.44 g
Muzzle velocity: 976 m/s
Muzzle energy: 30,215 J

BULGARIA

Manufacturer

Arsenal

Type: AP-I B-32: FMJ; steel core, incendiary composition in the nose; 64.1 g; V_{25} 990 m/s

AP-I-T BZT: FMJ; 59.6 g; V_{25} 1,000 m/s

Manufacturer

Kintex

Type: API B-32: FMJ; steel core, pyrotechnic composition in the nose; 64.1 g; V_{25} 987 m/s

API BZT: FMJ; steel core, pyrotechnic mixture in the nose; 59.6 g; V_{25} 976 m/s

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: API Type 56: FMJ; steel core, incendiary composition in the nose. Appears to be based upon the Soviet B-32 pattern; 64 g; MV 980-995 m/s; penetrates 20 mm of armour at 20° at 300 m; ignites fuels behind a 20 mm armour plate at 100 m; cartridge case may be of brass or varnished steel

API-T Type 56: FMJ; steel core, tracer capsule at rear, incendiary material in nose; 59 g; MV 995-1,015 m/s; penetration and incendiary performance as for the API Type 56. Brass or steel cartridge case

HE-I: Bullet consists of a hollow steel core closed at the rear end and filled with explosive, pressed in two increments with a booster increment on top. The core is closed at the front end by a coned steel plug carrying a detonator and surmounted by a steel striker plug which protrudes from the nose of the bullet. The bullet envelope is of steel with a gilding metal jacket; 59 g; MV 1,000-1,015 m/s; ignites fuels 400 mm beyond a 2 mm dural plate at 200 m and 100 mm behind the plate at 1,500 m range, with considerable fragmentation. Brass or steel cartridge case

Blank: Similar to the 12.7 × 107 mm Blank, in that the mouth of the steel case is coned around a metal closing cup which is ejected from the muzzle and has a danger area of 25 mm from the muzzle

EGYPT

Manufacturer

Shoubra Company

Type: AP-I: FMJ; based on RFAS B32; 64.2 g; MV 985 m/s

AP-I-T: FMJ; based on RFAS BZT; 59.5 g; MV 1,000 m/s

POLAND

Manufacturer

Mesko Zaklady Metalowe

Type: AP-I: FMJ; appears to be based on the RFAS B-32 round but loaded to a higher velocity; 65.1 g; MV 995 m/s

AP-I-T: FMJ; appears to be based on the RFAS BZT round but loaded to a higher velocity; 61.3 g; MV 1,015 m/s

ROMANIA

Manufacturer

S.N. ROMARM S.A.

Type: API (B 32): 64 g; MV 980-995 m/s

API-T (BZT): 59 g; MV 995-1015 m/s

HEI (MDZ): 59.6 g; MV 1000-1100 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Ulyanovsk Machine Production Association ; Barnaul Machine Tool Building Plant

Type: AP-I 57-BZ-561S with B32 projectile: FMJ; steel core; incendiary composition in nose; 64 g; MV 976 m/s; penetration 38 mm at 100 m

AP-I BS41: FMJ; tungsten carbide core; incendiary composition in nose; 64.41 g; MV 976 m/s

AP-I-T 57-BZ-561S with BZT projectile: FMJ; steel core; incendiary in nose, tracer in base; 60 g; MV 945-990 m/s

Incendiary 7-Z-1 with MDZ projectile: FMJ; smaller steel core; greater incendiary filling, tracer; 58 g; MV 945-1,006 m/s

Blank: Cartridge weight 114 g

VERIFIED



14.5 mm Soviet machine gun

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

100 mm HEAT-FS BK-5M

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)); 100 mm field gun BS-3; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; [100 mm Field Gun M53](#); 100 mm towed [anti-tank gun M1977](#); 100 mm towed [anti-tank gun M1977 \(Romania\)](#); 100 mm Coast Gun ([Yugoslavia](#)).

Development

The 100 mm HEAT-FS BK-5 projectile was first issued during the 1950s. In its later BK-5M form it is still carried by many T-54/T-55 tank units as a small proportion of the combat load, usually only three rounds out of a total load of 34 ([T-54](#)) or 43 ([T-55](#)). The BK-5M has been referred to as the ZBK-5M, although the complete round designation is 3UBK-4. Tank units of the [Russian Federation](#) and Associated States (CIS) now use an improved version of this projectile known as the 3BK17M (see following entry).

The BK-5M has also been produced in [Bulgaria](#), [China](#) (Type 73), [Czech Republic](#), [Romania](#), [Slovakia](#) and [Yugoslavia](#). In [Bulgaria](#) and [Yugoslavia](#) it was known as the HEAT-T M69 (probably no longer in production).

Description

The 100 mm HEAT-FS BK-5M is used with a fixed round, with the finned steel projectile rigidly

secured to the brass cartridge case by a single shallow crimping ring.

The base of the projectile, inside the cartridge case, is supported on a steel slip band seat while the projectile body is encircled by two copper drive bands set 21.6 mm apart. The front of the projectile has a conical ogive with the nose carrying a piezoelectric impact sensor connected internally to a VP-9 or GPV-2 super-quick base detonating fuze. When the fuze functions it ignites the explosive filling of 1.038 kg (nominal) of A-IX-1 (RDX/Wax). The filling is set behind a conical internal liner, to form a shaped charge producing a high-temperature particle jet capable of penetrating up to 380 mm of armour at any range. The base of the projectile carries an extension boom mounting six forward-folding steel fins. The fins snap out for flight stabilisation once the projectile has left the gun muzzle; when extended they have a diameter of 368.08 mm. The tailboom also contains a No 12 tracer element.

The brass cartridge case (lacquered steel may also be used) contains approximately 4.65 kg of 18/1 Tr and 14/7 propellant in stick and powder form. A KW-13U percussion primer is threaded into the base. Brass cases are made of MK-75 brass and weigh 8.5 kg. The flange diameter is 147.5 mm.

The 100 mm HEAT-FS BK-5M has a muzzle velocity of 900 m/s. Although it can penetrate up to 380 mm of armour set at 0° and 190 mm set at 60°, it has been calculated that the hit probability against a static tank sized target at 1,000 m is only 43 per cent. At 2,000 m the hit probability is reduced to a negligible 2 per cent. Maximum possible range is approximately 3,000 m.

Specifications

Weights:

- complete round** - 25.5 kg
- projectile** - 12.38 kg
- explosive** - 1.038 kg RDX/Wax
- propellant** - approx 4.65 kg
- cartridge case** - 8.5 kg

Lengths:

- complete round** - 1,094 mm
- projectile, fuzed** - 634.5 mm
- projectile, unfuzed** - 578.87 mm
- cartridge case** - 695 mm

Diameter over extended fins: 368.08 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 900 m/s

Max effective range: 1,000 m

Chamber pressure: 2,350 bar

Authorised fuzes

PIBD VP-9, GPV-2 or GPV-2R

Equivalent rounds

BULGARIA

Manufacturer

Kintex

Type: Hollow charge UBK-4

Description: BK5 projectile length, fuzed, given as 460.6 mm and Hexogen explosive filling as 990 g. Propellant is 4.65 kg of MBL and cartridge case may be lacquered steel or brass. Muzzle velocity is 900

m/s

Manufacturer

Vazovski Machinostroitelni Zavodi

Type: Hollow charge round

Description: Understood to be HEAT-FS BK-5M. Armour penetration given as 300 mm. Fitted with PIBD GPV-2 fuze

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HEAT-T Type 73

Description: Understood to be based on BK-5M but may be completely original design. Round weight 24 kg and length overall 1.071 m. Projectile weight 10.05 kg and length 587 mm. Muzzle velocity 1,000 m/s. Tracer burns for more than 2 seconds. Direct fire range 1,000 m

[CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Manufacturer

ZVS Dubnica

Type: HEAT-FS PrSv

Description: Projectile weighs 9.52 kg and contains 961 g of RDX/TNT. Uses cylindrical steel body with standoff nose spike and only four stabilising fins. Fin span, opened, is 257.8 mm. Steel cartridge case contains 4.47 kg of Dgtp propellant

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: HEAT

Description: Appears to be an Iranian development with a modified 105 mm HEAT-T M456 series projectile allied to a 100 mm cartridge case. Total weight is 21.7 kg and explosive warhead weight is 1.2 kg; propellant weight is 5 kg. Muzzle velocity 1,000 m/s. Length overall 1.06 m. Fitted with PIBD M509A1 fuze. Offered for export sales

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HEAT-T BR-412R

Description: Intended for use with D-10 series guns only. Virtually identical to BK-5M but without streamlined give. Complete round weight is 24.1 kg with projectile weighing 13.475 kg. Otherwise specifications almost identical to BK-5M

[YUGOSLAVIA](#), FEDERAL REPUBLIC

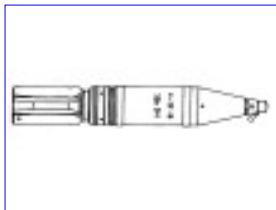
Manufacturer

Yugoimport SDPR

Type: HEAT-T M69

Description: Probably no longer in production. Weight given as 26 kg

VERIFIED



Projectile for 100 mm HEAT-FS BK-5M, with fins folded



Iranian 100 mm HEAT round showing modified US M456 series projectile allied to a 100 mm cartridge case



Cross-section and outline of 100 mm HEAT-FS BK-5M round



Czech Army 100 mm HEAT-FS PrSv rounds (T J Gander)



Czech PrSn projectile (T J Gander)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

115 mm HE-FRAG(FS) 3OF18, 3OF27 and 3OF28

Armament

115 mm U-5TS (2A20) tank gun; Royal Ordnance (now RO Defence) 115 mm tank gun.

Development

The general purpose 115 mm HE-FRAG(FS) 3OF18 projectile is referred to in Eastern Bloc literature as an extended range projectile. It replaced the earlier 3OF11 but has now been joined by what are described as third-generation HE-FRAG(FS) known as the 3OF27 and 3OF28. Compared to the 3OF18, these have a slightly revised outline, thinner body walls and a heavier filling consisting of a more powerful explosive. Many early models of the [T-62](#) tank may not be able to use the 3OF27 or 3OF28 due to fire control system limitations.

The 3OF18 projectile is utilised with the 3UOF6 round while the 3OF27 is used with the 3UOF37 round. The earlier 3OF11 was used with the 3UOF1 round. The 3UOF37 round appears to be the only version in this series in current production. Manufacturing is carried out by the Engineering Research Institute (NIMI) based in Moscow.

Out of its normal combat load of 40 rounds a [T-64](#) normally carries 19 HE-FRAG(FS) rounds.

Description

The 115 mm HE-FRAG(FS) 3OF18, 3OF27 and 3OF28 projectile assemblies are crimped into brass cartridge cases to form fixed rounds.

The projectiles are steel and conventional in body outline but the 3OF27 and 3OF28 have a slightly longer streamlined ogive. The wall thickness of the 3OF18 is 13.34 mm at the bourrelet while the 3OF27 is 12.62 mm. The single copper drive band on the 3OF18 is 10.92 mm wide, while on the 3OF27 it is 11.33 mm wide.

Bodies have a boat-tailed base with the bases threading into a steel boom extension carrying four steel forward-folding fins. The fins snap out once the projectile has left the muzzle; the diameter is 325.12 mm.

The explosive filling for the 3OF18 is 2.788 kg of TNT, for the 3OF27 it is 3.062 kg, while for the 3OF28 it is 3.1 kg. In the last two cases the explosive is A-IX-20 (75 per cent RDX, 22 per cent Aluminium and 3 per cent Wax). Projectiles are fitted with a nose-mounted V-429E point detonating fuze made of steel.

The rimmed brass (4G10A) or lacquered steel (4G9) cartridge case has an unusual shape as it is necked approximately halfway along its length. The contents consist of 4.65 kg of DG-4 15/1 propellant. The base is fitted with a KV-5-U electrical primer with a long flash tube.

The muzzle velocity of the 3OF18 is 750 m/s; for the 3OF27 and 3OF28 it is 800 m/s. Maximum effective combat range is between 1,500 and 2,000 m and the maximum possible range is of the order of 9,500 m, although accuracy at that range will be minimal.

A training round intended specially for training tank crews is the 115 mm 3UOFT6 training round with a 3OFT18 HE-T projectile. The projectile is fired at a muzzle velocity of 800 m/s and emits four independent No 1 tracers for up to 5 seconds from a location in the base so that the trajectory can be followed for training assessment and marking purposes. As the projectile passes through a soft training target the nose-mounted VUBS-1M super-quick point detonating fuze functions to detonate the projectile's TNT bursting charge less than 5 m behind the target. Should the projectile fail to hit a target it will self-destruct after about 4 to 6 seconds at a maximum range of 12,230 m. The complete 3UOFT6 round weighs 30.8 kg and has a steel cartridge case containing 4.65 kg of DG-4 15/1 propellant.

The 115 mm 3UOFT6 training round is marketed by Kintex of [Bulgaria](#).

Specifications

Weights:

complete round - with 3OF18, 30.75 kg; with 3OF27, 30.7 kg; with 3OF28, 30.7 kg

projectile - 3OF18, 17.72 kg; 3OF27, 18 kg; 3OF28, 18 kg

filling - 3OF18, 2.8 kg TNT; 3OF27, 3.062 kg RDX/Alu/Wax; 3OF28, 3.1 kg RDX/Alu/Wax

propellant - 4.65 kg

Length, complete round: with 3OF28, 1.069 m

Projectile length: 3OF18, 1.0645 m; 3OF27, n/avail

Diameter over extended fins: 325.12 mm

Muzzle velocity: 3OF18, 750 m/s; 3OF27 800 m/s; 3OF28, 800 m/s

Max range: approx 9,500 m

Operating temperature range: -40 to +50°C

Authorised fuzes

PD V-429E

Equivalent rounds

[BULGARIA](#)

Manufacturer

Kintex

Type: UOFT6 Prac

Description: Training round - see text

Manufacturer

KAS Engineering Company

Type: 3UOF6 with 3OF18

Description: Max range given as 12,230 m. Steel or brass cases available

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: HE-FRAG(FS)

Description: Believed to be equivalent of 3OF18. Muzzle velocity given as 800 m/s. Fitted with AU-20 E fuze. In [Egypt](#) the U-5TS gun is known as the Y5TC-T62. Many Egyptian T-62s now have British-manufactured 115 mm barrels

IRAQ

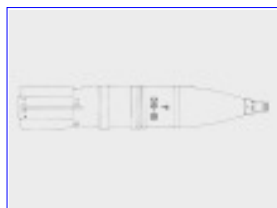
Manufacturer

State factories

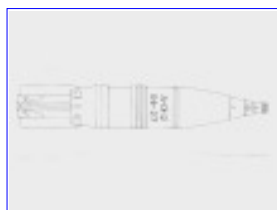
Type: 115 mm HE

Description: Believed to be HE-FRAG(FS) 3OF18 but may be the earlier 3OF11. No further information available but probably no longer in production

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Projectile for 115 mm HE-FRAG(FS) 3OF18



Projectile for 115 mm HE-FRAG(FS) 3OF27



15 mm HE-FRAG(FS) 3OF18 produced by Egyptian Heliopolis Company for Chemical Industries



115 mm HE-FRAG(FS) 3OF18 round

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MORTARS - 81 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm mortar bomb GMO-8PE A1

Armament

All 81 mm mortars.

Development

By Arsenal for general use and international sale.

Description

The GMO-8PE A1 is an extended range, streamlined, cast-iron long body mortar bomb with six stabilising fins and eight propelling increments. It is similar in appearance to other bombs of this type manufactured elsewhere.

Specifications

Length, fuzed: 489 mm

Weight, fuzed: 4.63 kg

Weight and type of payload: 740 g TNT

Number of charges: P + 8

Fuze: Impact, PD & SQ

Min range: 100 m

Max range: 6,500 m

Muzzle velocity: 67-353 m/s

Manufacturer

Arsenal Company.

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MORTARS - 60 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm practice bomb

Armament

Bulgarian 60 mm mortars and similar mortars.

Development

By Arsenal company for Bulgarian military and international sales.

Description

A conventional teardrop shaped mortar bomb of cast iron and steel construction for training use.

Specifications

Length: 300 mm

Weight: 1.6 kg

Payload: Inert, 200 g

Maximum range: 3,130 m

Muzzle velocity: 222 m/s

Fuze: Inert

Manufacturer

Arsenal Company.

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MORTARS - 60 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb GMO-6PE A2

Armament

Bulgarian 60 mm and similar mortars.

Development

By Arsenal for Bulgarian military and export sales.

Description

The GMO-6PE A2 is similar to the GMO 6PE A1 in construction and external appearance, but it is longer, heavier and has greatly increased range and improved lethality. It is of conventional design and appearance.

Specifications

Length, fuzed: 351 mm

Weight, fuzed: 1.86 kg

Weight and type of payload: 330 g TNT

Number of charges: P + 6

Fuze: Impact, delay and super-quick

Minimum range: 200 m

Maximum range: 4,000 m

Muzzle velocity: 89-258 m/s

Manufacturer

Arsenal Company.

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MORTARS - 60 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb GMO-6PE A1

Armament

Bulgarian 60 mm mortar and similar weapons.

Development

By Arsenal Company for general use.

Description

The bomb body is of cast iron and is of the usual teardrop shape. The tail unit has six stabilising fins with an internal shotgun type propelling charge and four secondary charges which surround the tail boom. The bomb body is prefragmented and breaks into approximately 500 fragments upon detonation. The fuze is the conventional impact and super-quick type.

Specifications

Length, fuzed: 300 mm

Weight, fuzed: 1.6 kg

Payload: TNT, 200 g

Number of charges: P + 1

Fuze: Impact, delay and SQ

Muzzle velocity: 57 m/s, P only; 95 m/s, P + 1

Max range: 800 m

Manufacturer

Arsenal Company.

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FUZES - PROXIMITY FUZES, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

RV-1

Armament

120 mm smoothbore mortar bombs.

Development

By Bulgarian ordnance to a Bulgarian military requirement.

Description

The RV-1 is a relatively large proximity fuze with a mechanical impact back-up feature. The plastic nose cover may be found in several different colours. The body of the fuze is made of plastic, aluminium and steel.

Specifications

Type: proximity (radio frequency); impact back-up

Weight: 572 g

Length:

overall - 157 mm

visible - 111 mm

Diameter: 40 mm

Manufacturer

Kintex.

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*RV-1 proximity fuze
(1998)*

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FUZES - IMPACT FUZES, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

O-4M

Armament

82 mm fragmentation mortar bombs.

Development

Development history not known but presumed to be after a Russian original design.

Description

A simple impact nose fuze, armed on setback. It does not appear to have any bore safety shutter device.

Specifications

Type: impact, SQ

Weight: 183 g

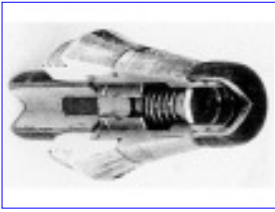
Length overall: 84.5 mm

Diameter: 40 mm

Arming distance: 6-25 m

Export Agency: Kintex.

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Impact fuze O-4M

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MORTARS - 120 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb OF-843A/FE-843B

Armament

All 120 mm smoothbore mortars.

Development

Based upon Soviet/RFAS 120 mm [OF-843A](#) bomb, with some slight changes in fin contours.

Description

The [OF-843A](#) is a streamlined conventional bomb for general bombardment purposes. The body is of ferro-steel, with six gas check grooves around the bourrelet and threaded at the nose for a fuze and at the rear for the tail unit. The tail unit is of welded steel, with eight fins, and the primary cartridge is inserted into the rear. Up to six secondary increments may be clipped around the boom. The Bulgarian export firm of KAS Engineering began showing this round with a new designation, FE-843B, in 1998. Other than the new designation, it is identical to the earlier [OF-843](#). The M12 fuze is apparently a copy of the RFAS fuze of the same designation.

Specifications

Weight, as fired: 16 kg

Length, fuzed: 665 mm

Fuze: impact (PD), super-quick or delay

Weight and type of payload: 1.6 kg TD-50

Muzzle velocity: 279 m/s

Max pressure: 103×10^5 Pa

Min range: 430 m

Max range: 5,820 m

Colour/markings: grey/black

Manufacturer: Dunarit Ltd.

Export Agency: Kintex / KAS Engineering.

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120 mm HE bomb [OF-843A](#)

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MORTARS - 82 mm MORTARS, [BULGARIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm fragmentation bomb O-832DU

Armament

All 82 mm mortars.

Development

Development history is not known but the appearance of this bomb suggests a copy of the Soviet/RFAS [O-832DU](#) bomb.

Description

The [O-832DU](#) fragmentation bomb is a conventional teardrop-shaped bomb, with a ferro-steel body and a welded steel tail unit with 10 fins. The body has five gas check rings around the bourrelet and is screwed at the nose for a fuze and at the rear end for the tail unit. The primary cartridge fits into the tailboom, and the secondary charges clip around the boom in horseshoe containers.

Specifications

Weight as fired: 3.18 kg

Length: 330 mm

Weight and type of payload: 400 g TNT

Muzzle velocity: 225 m/s

Max pressure: 450×10^5 Pa

Min range: 85 m
Max range: 3,040 m

Manufacturer

Dunarit, Ltd.

Export agency: Kintex and KAS Engineering.

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82 mm fragmentation bomb O-832A

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CANNON

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

23 × 152B mm

Synonyms:

23 × 152B; 23 mm Soviet VYa

Armament

[ZU-23](#) and [ZSU-23-4](#) anti-aircraft guns; MvIkov-Yarzev VYa-23 aircraft guns; subcalibre devices.

Development

The 23 × 151 mm cartridge was developed in 1940 for the VYa aircraft cannon, a weapon widely adopted by the Soviet Air Force, notably in the Ilyushin Il-2 'Stormovik' ground-attack fighter. The VYa cannon was replaced by other types, but the basic cartridge was adapted for the [ZU-23](#) cannon, which first appeared as an aircraft gun but is now used solely as an air defence ground gun. The ZSU-23, as the ground gun is known, and its self-propelled variant the [ZSU-23-4](#), were both widely distributed throughout the former Warsaw Pact and many other countries.

In 1993 it was revealed that the South African Defence Force (SADF, now the SANDF) had acquired numbers of [ZU-23](#) weapons during the Angolan conflict, and that these had been assimilated into South African service as self-propelled anti-aircraft guns. As a result, manufacture of the appropriate ammunition now takes place in [South Africa](#).

Oerlikon Contraves Pyrotec AG of Switzerland introduced a 23 × 152B FAPDS-T round during 1997. It is understood that this round forms part of a 23 mm ZSU-23 air defence gun upgrade package

proposed by Sako of [Finland](#).

Description

The case is rimless, belted, bottlenecked and of brass or, more usually, steel. While dimensionally similar, ammunition for the VYa and [ZU-23](#) guns is not functionally interchangeable. Cartridges for the VYa gun had brass cases and a screwed-in percussion primer. Those for the [ZU-23](#) use steel cases and an extended-tube KV-3 primer which is pressed in and cannot be removed. Brass or steel cases are manufactured for the subcalibre training device for tank guns.

The following are the most commonly encountered types of this ammunition:

HEI: Also known as HEFI. The projectile consists of a steel shell filled with AIX-2 explosive ignited by a PD MG-25 nose fuze. The projectile has a copper drive band. The steel case contains approximately 77 g of 5/7 [CFL](#) propellant in powder form ignited by a KV-3 primer to provide an initial muzzle velocity of 970 to 980 m/s. This provides an effective horizontal range of 2,500 m or 1,500 m in altitude.

HEI-T: Also known as HEFI-T. As HEI but with tracer burning for at least 5 seconds.

API-T: Solid steel projectile body with steel ballistic cap and tracer assembly in the base. The steel case contains approximately 76 g of 5/7 [CFL](#) propellant in powder form ignited by a KV-3 primer to provide an initial muzzle velocity of 970 to 980 m/s. This provides an effective horizontal range of 2,500 m or 1,500 m in altitude. The tracer burns for at least 5 seconds. The projectile can penetrate 10 mm of armour, assuming an impact angle of 30° and an impact velocity of 530 m/s.

TP-T: As HEI-T but the projectile is filled with an inert mixture.

Subcalibre AP-T: Intended for use with a subcalibre barrel insert intended for low-cost gunnery training. The round closely resembles that for the API-T but has a silver tip painted on the nose and the propellant charge is reduced to 73 g of 5/7 [CFL](#) propellant in powder form. The slightly reduced propellant charge in the brass or steel case results in a muzzle velocity of 910 m/s and the round weight is 447 g. Horizontal range is 1,800 m.

Blank: This cartridge consists of the steel case only with the mouth crimped over. The contents are 35 g of VTJ powder ignited by a KV-3 primer.

Specifications

Round length: 234.95 mm

Case length: 151.5 mm

Rim diameter: 33.15 mm

Bourellet diameter: 22.93 mm

Projectile weight: 188.5 g

Projectile length: 108.2 mm

Muzzle velocity: 970-980 m/s

Muzzle energy: 92.5 kJ

Equivalent rounds

[BULGARIA](#)

Manufacturer

Arsenal

Type: HEI-T: Round weight 450 g; projectile 188.5 g; MV 970 m/s

HEI-T Inert: Training round identical to HEI-T, except for inert warhead. Round weight 449 g;

Projectile weight, 188.5 g; MV 970 m/s

API-T: Round weight 450 g; projectile 190 g; MV 970 m/s

TP-T: Round weight 450 g; projectile 188.5 g; MV 970 m/s

Subcalibre: Round weight 447 g; projectile 190 g; MV 910 m/s

Blank: Steel case containing 35 g of VTJ powder

EGYPT

Manufacturer

Maasara Company for Engineering

Type: HE-I-T: Probably based on the Serbian HE-I-T round; no details

AP-I-T: Probably based on the Serbian AP-I-T round; no details

Subcalibre: Solid shot, with tracer and ballistic cap; brass case with screwed-in primer. No details of performance. For use in tank gun subcalibre insert barrels

IRAN

Manufacturer

Ammunition Industries Organisation

Type: HE-AP-I: In spite of the Iranian designation, this appears to be a conventional HE-I shell with nose impact fuze. It also has a red tracer. MV 970 m/s

POLAND

Manufacturer

Zakłady Metalowe Mesko

Type: HEI-T BZT: Projectile weight 188.5 g; MV 970 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Kemerovo Mechanical Plant

Type: AP-I-T: Steel shell and ballistic cap with copper rotating band; 175 g; Mv 970 m/s

Manufacturer

State arsenals

Type: HE-I-T OZT: Steel shell filled 18 g HE; copper driving band. Mk 25 nose impact fuze; 183 g; MV 970 to 990 m/s

AP-I BZ: Steel-pointed shell with alloy ballistic cap filled with incendiary mixture; 192 g; MV 1,000 m/s

Manufacturer

PRIBOR

Type: HEI-T: Known as HEFI-T. See text

HEI: Known as HEFI. See text

AP-T: See text

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd ([PMP](#))

Type: HEI: Steel shell loaded Hexal P30 and with soft iron driving band, steel case, Boxer primed, self-destruction 5 to 12 seconds; nose impact fuze; 187 g; MV 975 m/s

APC-I-T: Steel shot with ballistic cap, incendiary filling inside the cap, soft iron driving band, base tracer to 5 seconds minimum; steel case, Boxer primed; 187 g; 975 m/s; penetration 50 mm

SAPHEI: Base fuzed; under development

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: FAPDS-T PMA 276: Subcalibre, frangible armour-piercing discarding sabot with tracer. Tungsten alloy penetrator with integral plastic moulded ballistic cap and tracer, with full plastic moulded discarding sabot; 150 g; MV 1,180 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE: Steel shell loaded 19.6 g RDX/Aluminium; nose impact fuze; 190 g; MV 970 m/s

HE-T: Steel shell loaded 16.3 g RDX/Aluminium, with tracer in rear and heat relay giving self-destruction after 3.5 seconds; nose impact fuze; 190 g; MV 970 m/s

HE-I: Steel shell loaded 19.6 g RDX/Aluminium; nose impact fuze; 182 g; MV 970 m/s

HE-I-T: Steel shell loaded 16.3 g RDX/Aluminium, with tracer in rear and heat relay giving self-destruction after 3.5 seconds; nose impact fuze; 190 g; MV 970 m/s

AP-I: Steel-pointed shell loaded 5 g TNT/Aluminium with incendiary filling in ballistic cap; base delay fuze; 190 g; MV 970 m/s

AP-I-T: As for AP-I but with red tracer; 190 g; MV 970 m/s

TP: HE shell body, empty; dummy fuze; 182 g; MV 970 m/s

TP-T: HE-T shell body, forward section empty, rear section red tracer; dummy fuze; 190 g; MV 970 m/s

UPDATED



23 mm Soviet VYa



Cross-section example of Oerlikon Contraves Pyrotec AG 23 × 152B FAPDS-T PMA 276

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm 3RB30 VHF Radio Jammer Cargo Projectile

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer.

Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3M](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer.

Development

The 152 mm 3RB30 VHF Radio Jammer Cargo projectile 3RB30 is intended for the jamming of tactical communication networks and is used with the latest generation of [Russian Federation](#) and Associated States (CIS) 152 mm long-barrelled Gun-Howitzers. As with other projectiles in this ammunition generation, it is issued together with a choice of three preloaded cartridge cases of varying lengths containing the variable propellant charges. The complete rounds are combined under the designation 3VRB38. There is also a Full Charge and a Reduced Charge.

This 3RB30 projectile was developed as part of a joint Russian-Bulgarian association. The 3RB30 round appears to have been the result of the Russian part of the association, the Bulgarian contribution being the rounds for the earlier series of 152 mm artillery pieces (see following entry).

There are equivalent Russian projectile and rounds intended primarily for firing from [D-20](#) and [2S3M](#) howitzers. The projectile remains the same as for the long-barrelled howitzers but only two propellant charges and rounds are involved. The Full Charge round is the 3VRB37 and the Reduced Charge round the 3VRB38. Ballistic performances will vary accordingly.

Description

As with other rounds in the 152 mm family, the 152 mm VHF Radio Jammer Cargo Projectile 3RB30 is a separate loading munition. It uses the same carrier projectile as the 152 mm ICM 3-O-23 (see separate entry in this section).

The steel carrier body has relatively thin steel walls, a long streamlined ogive, single copper drive band and a base unit with a hollow boat-tail outline secured to the base. The interior contains a single VHF radio jammer body which is ejected through the base when the nose-mounted time fuze functions at the preselected time igniting an expulsion charge inside the ogive. The jammer body will then be ejected to fall to the ground, stabilised in flight by four tail-mounted pop-out fins. This ensures the jammer body falls nose first, so that the nose spike enters the ground allowing a folded antenna to unfurl upwards from within the rear of the tail unit.

There are seven ready-loaded jammer bodies to choose from, covering a frequency range of 1.5 to 120 MHz; 3NS30 projectiles are apparently issued in sets of seven. Each VHF radio jammer transmitter body weighs 8.2 kg and can transmit jamming signals over a radius of 700 m for 1 hour.

The cartridge cases involved with the three propellant charges are lacquered steel with a KV-4 percussion primer in the base. No information is available regarding the weights and types of propellant involved although it is known that there are three charges available, the maximum possible range being 22,000 m.

Specifications

Weights:

projectile - 43.56 kg

jammer body - 8.2 kg

Length, projectile: 818 mm

Max range: 22,000 m

Frequency range: 1.5-120 MHz

Jamming radius: 700 m

Jamming duration: 1 h

Operating temperature range: -50 to +50°C

Authorised fuzes

MT - type not specified

Equivalent projectiles

[BULGARIA](#)

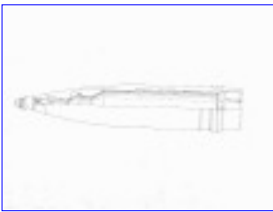
Marketing agency

Kintex

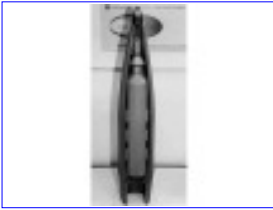
Type: 152 mm VRS-546 VHF Radio Jammer Cargo Projectile

Description: See following entry

VERIFIED



Cutaway drawing of the 152 mm VHF Radio Jammer Cargo Projectile 3RB30



*Demonstration model of the 152 mm VHF Radio Jammer Cargo Projectile 3RB30
(T J Gander)*



*Cutaway example of the 152 mm Radio Jamming Cargo Projectile 3RB30 (right) with,
from left, Reduced Charge, Full Charge, Long Range Charge
(1998)*

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

122 mm HEAT-FS-T BK-13

Armament

[122 mm Howitzer D-30](#); [NORINCO 122 mm Howitzer D-30](#); [122 mm Howitzer D-30 RH M94](#); [122 mm Howitzer D-30J](#); [Factory 100 D-30-M](#); [122 mm Saddam Howitzer](#); Hadid [122 mm Howitzer HM40](#).

[NORINCO 122 mm Self-propelled Howitzer Type 85](#); 122 mm Self-propelled Howitzer M-1974 ([2S1](#)); [Model 89 122 mm Self-propelled Howitzer](#); Hadid 122 mm Self-propelled Howitzer HM51 ([Thunder 1](#)).

Development

The 122 mm HEAT-FS-T BK-13 is the latest model of fin-stabilised HEAT projectile intended for firing from towed [D-30](#) and self-propelled [2S1](#) howitzers. The complete round is known as the 3UBK-9. There is also a BK-13M projectile for use with [2S1 self-propelled](#) howitzers. A projectile similar to the BK-13M has been produced in [Poland](#) as the BK-13MP.

Description

The 122 mm HEAT-FS-T BK-13 projectile is normally fired as a fixed round, the 3UBK-9, although it is apparently possible to separate the projectile and its cartridge case. The 3UBK-9 round uses its own particular type of cartridge case loaded with a fixed propellant charge.

The steel body of the 122 mm HEAT-FS-T BK-13 projectile has straight sides and a blunt nose with

a central boom carrying the fuze impact sensor. A solid slipping drive band 28.19 mm wide is made of copper. A tubular boom assembly carrying six forward-folding fins protrudes from the base. These fins snap out once the projectile has left the muzzle and when fully deployed have a span of 369.16 mm. The boom assembly carries a tracer element.

The steel projectile body contains 1.8 kg of A-IX-1 (RDX/Wax) explosive formed behind a conical metal liner. An internal connection from the nose-mounted piezoelectric impact sensor to the V-15 point impact base detonating fuze will detonate the main charge and utilise a wave shaper to create a high-temperature particle jet estimated to be capable of penetrating approximately 400 mm of armour at any range.

Unlike most other projectiles in the 122 mm D-30/2S1 range, the 122 mm HEAT-FS-T BK-13 projectile is combined with its own specific 447 mm long lacquered steel cartridge case with a fixed propellant load consisting of 3.8 kg of 12/7, 12/7 Tr and VTH-10 propellant ignited by a KV-U or KV-4 percussion primer. This produces a muzzle velocity of 690 m/s and a maximum effective range of 1,000 m.

Specifications

Weights:

complete round - 26 kg

projectile - 18.2 kg

explosive - 1.8 kg RDX/Wax

propellant - 3.8 kg

Lengths:

fuzed - 628 mm

cartridge case - 447 mm

Diameter over cartridge case rim: 147.46 mm

Body diameter: 121.62 mm

Fin span: 396.16 mm

Muzzle velocity: 690 m/s

Max effective range: 1,000 m

Authorised fuzes

PIBD V-15

Equivalent rounds

[BULGARIA](#)

Manufacturer

Vazov Engineering Plants

Type: 122 mm Hollow Charge Round

Description: Equivalent to BK-13. Standard specifications. BK-13M equivalent also produced

Marketing agency

Kintex

Type: HEAT-FS 3UBK-9

Description: Standard specifications

CZECH REPUBLIC

Manufacturer

Caliber Prague Limited

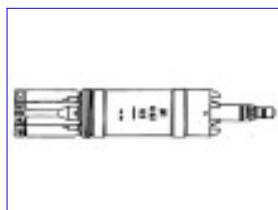
Type: 122 mm HE

Description: Standard specifications

VERIFIED



Complete 122 mm 3UBK-9 round with HEAT-FS BK-13 projectile on left



122 mm HEAT-FS BK-13 projectile with stabilising fins folded

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Terry J Gander

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

73 mm ammunition for SPG-9 recoilless gun

Armament

[73 mm SPG-9](#) and SPG-9M Kopye recoilless guns.

Development

The [73 mm SPG-9 Kopye](#) (Spear) recoilless gun was developed as a light and highly mobile anti-tank gun for use by airborne and special forces although it is now more likely to be deployed as a general purpose fire support weapon. It is still widely deployed throughout Eastern Bloc and other armed forces and is still in production in several nations. The ammunition was used as the basis for the rounds fired by the 2A28 gun (see previous entry) and in many instances the projectiles and warheads involved are identical between the two guns; only the propelling system differs.

Description

The base round fired from the [73 mm SPG-9](#) gun is the HEAT-FS PG-9V or PG-9VN with, respectively, the HEAT-FS PG-9 or PG-9N rocket projectile. The projectiles differ in the warhead explosive employed. The PG-9 has a Hexogen A-IX-1 (RDX:Wax) shaped charge weighing 332 g while the PG-9N has 340 g of the more powerful OKFOL-3.5 (95 per cent HME: 5 per cent Wax).

The 4BN27 propellant charge, employed on both projectiles, is the PG-9PR secured to the tail of the projectile just behind the six forward-folding fins which spring out once the projectile has left the muzzle. On target, the shaped warhead is initiated by a VP-9 piezoelectric point impact fuze via an igniter in the base of the shaped charge. The PG-9 warhead can penetrate 300 mm of armour while the PG-9N can penetrate 400 mm. Maximum range of both projectiles is 1,300 m while the direct fire range at a target 2 m high is 800 m. Muzzle velocity in both cases is 435 m/s.

The latest round is the PG-9VS for which the maximum direct fire range is increased to 1,300 m. No armour penetration figures have been released regarding this round although the shaped charge can penetrate at least 1.5 m of brick and 1 m of reinforced concrete.

Also available is the 73 mm HEAT-FS PG-9VNT with the PG-9NT rocket projectile. This round is effective against Explosive Reactive Armour (ERA) as it has tandem warheads actuated by a VP-9 piezoelectric point impact fuze. Warhead performance is stated to be 550 mm of RHA with behind-armour effects; 400 mm of armour behind ERA; 1 m of reinforced concrete or brick; and 1.8 m of logs and earth. Maximum effective range is 700 m while maximum range is 1,200 m; initial velocity is 400 m/s. A complete round weighs 3.2 kg and overall length is 920 mm. The span of the fully opened guidance fins is 190 mm.

By contrast, the basic 73 mm FRAG-HE rounds, a later development, do not have a rocket motor. There are two basic types of FRAG-HE round, the OG-9V and OG-9VM, differing only in the weight and type of explosive in the 309 mm long cast-iron warhead on the projectile. The OG-9 FRAG-HE projectile warhead used with the OG-9V round contains 753 g of TNT while the OG-9M projectile used with the OG-9VM round contains 655 g of TD-50 (TNT/dinitronaphthalene). In both cases the explosive is ignited by a nose-mounted GO-2 or O-4M point detonating fuze. Flight stabilisation is provided by six fixed fins on the end of a perforated steel tailboom which also contains a tracer element. **The propellant employed is 4BN40.**

The latest FRAG-HE round is the OG-9VM1 with a total weight of 5.35 kg.

Two further 73 mm FRAG-HE rounds are Bulgarian developments, the OG-9BG and OG-9BG1, with OG-9G and OG-9G1 projectiles respectively. The usual streamlined outline of the 750 g explosive warhead is replaced by a cylinder with serrated wire rings around the explosive to enhance fragmentation, although late production variants do have a more pointed nose profile and fragmentation is augmented by the inclusion of 1,200 2 g metal pellets. The point detonating fuze employed is the O-4M in both cases.

The OG-9BG (weight 6.9 kg) has a muzzle velocity of 250 m/s and a maximum range of 7,500 m. The OG-15BG1 round (weight 4.48 kg) has a muzzle velocity of 316 m/s and a maximum range of 4,200 m. The direct fire ranges are 400 and 350 m respectively.

Specifications

Type	HEAT-FS	HEAT-FS	FRAG-HE	FRAG-HE
Round	PG-9V	PG-9VNT	OG-9V	OG-9VM
Projectile	PG-9	PG-9NT	OG-9	OG-9V
Weight, round	4.39 kg	3.2 kg	5.35 kg	5.35 kg
Length, round	920 mm	920 mm	1.062 m	1.062 m
Muzzle velocity	400 m/s	400 m/s	316 m/s	316 m/s

Authorised fuzes

HEAT-FS - PIBD VP-9

FRAG-HE - PD GO-2 or OM-4M

Equivalent rounds

BULGARIA

Manufacturer

Arsenal

Type: 73 mm HEAT-FS, FRAG-HE

Description: Standard specifications, see text

Manufacturer

Vazov Engineering Plants

Type: HEAT-FS PG-15V, PG-15VN, PG-15NT; FRAG-HE OG-15V, OG-15VM, OG-15BG, OG-15BG1

Description: See text

Manufacturer

Vazovski Machinostroitelni Zavodi

Type: HEAT-FS PG-9, PG-9N; FRAG-HE OG-9, OG-9M

Description: Standard specifications, see text

IRAN

Manufacturer

Defence Industries Organisation

Type: 73 mm PG-9

Description: Standard specification, see text

ROMANIA

Manufacturer

SA ROMARM SN

Type: 73 mm HEAT-FS, FRAG-HE

Description: May no longer be in series production. One version of the two types of FRAG-HE utilises a cast mortar bomb body design for the warhead

UPDATED



*73 mm PG-9VN HEAT round
(1999)*



*73 mm PG-9VNT HEAT round with tandem warhead
(1999)*



*Bulgarian produced 73 mm OG-9BG FRAG-HE round with OG-9G projectile
(1999)*

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

30 mm NR-30 aircraft cannon ammunition

Armament

30 mm Nudelmann-Richter NR-30 Cannon; 30 mm Automatic Aircraft Gun Type 1.

Development

The 30 mm Nudelmann-Richter NR-30 was the standard Soviet aircraft cannon from 1955 onwards, but it was superseded by later designs. It is now only used on the older types of fighter aircraft, such as the MiG-19, supplied to states receiving [Russian Federation](#) and Associated States (CIS) military aid and is now little encountered in the RFAS. The 30 mm NR-30 is still employed and manufactured in [China](#) as the 30 mm Automatic Aircraft Gun Type 1. The 30 mm Type 1 is the standard gun fitted to the Chinese F-6, the much modified Chinese version of the MiG-19, and has a rate of fire of approximately 900 rds/min. The rounds, some of which have been developed locally, are formed into belts using pressed steel links.

Description

There are seven main types of 30 mm NR-30 ammunition, HEFI, HEFI-T, HE-I, APE, AP-T, CC and Anti-radar. All of these rounds are fixed with the projectiles rigidly secured to their brass cartridge case by two 360° crimping rings fitting into cannelures in the projectile body. A raised belt is located just in front of the wide extraction groove at the base of the cartridge case.

Projectile bodies are forged steel and are fitted with a copper or gilding metal drive band. On the HEFI and HEFI-T a weatherproof A-30 or B-30 point detonating fuze is fitted to the nose. The explosive filling is 36.9 g of A-IX-2 (desensitised RDX/Aluminium).

The HEI is a high-explosive incendiary round which equates to the Western Bloc SAPHEI. Intended for use against sensor-carrying balloons and similar lightly constructed aerial platforms. It is provided with a highly sensitive nose fuze provided with a self-destruct element operating from 12 to 20 seconds after firing. The fuze is armed at a distance of from 30 to 250 m from the gun muzzle.

The APE uses a VLM-30 base detonating fuze to ignite the 25 g explosive payload. The fuze also contains a self-destruct element functioning 14 to 20 seconds after leaving the gun muzzle. Armour penetration at 700 m is 20 mm of armour set at

an angle of 60°. The same penetration performance is achieved by the AP-T projectile on which the tracer element burns for 2 seconds.

The CC (Cargo Carrying) round carries a 'multiple element projectile' containing 28 bullet-shaped heavy metal subprojectiles, each weighing 35 g. The subprojectiles are ejected forwards from 1.1 to 1.5 seconds after firing to form a destructive cone effective against personnel and soft-skinned targets on the ground.

The Anti-radar round carries a projectile from which approximately six radar jamming chaff particles are ejected while the projectile is still in flight. Two different lengths of chaff element are available to suit the types of radar likely to be encountered. Ejection takes place from 6 to 8 seconds after the projectile leaves the gun muzzle so that after 30 seconds the chaff will form an effective reflective cloud covering 14 to 18.5 m².

A TP cartridge is completely inert and has a plug in place of the nose fuze. At one point various TP rounds were produced for air or ground targets, apparently with different types of target strike indication elements.

The cartridge case is drawn brass and contains 95 g of a single base propellant known as 5/7 B/A or 6/7 FL. There is a percussion primer in the base.

The muzzle velocity of this round is 795 to 800 m/s but the effective range is stated to be limited to 800 m. The 'direct fire range' is 600 m. Maximum useful range is 2,000 m.

Specifications

Types	HEFI	HEFI-T	HE-I	APE	AP-T	CC	Anti-radar
Weights							
round	840 g	840 g	840 g	839 g	841 g	844 g	847 g
projectile	400 g	402 g	400 g	401 g	403 g	404 g	405 g
Length, complete round	264-267 mm	264-267 mm	264-267 mm	264-267 mm	264-267 mm	264-267 mm	264-267 mm
Muzzle velocity	780 m/s	780 m/s	780 m/s	780 m/s	785 m/s	780 m/s	780 m/s

Authorised fuzes

HEFI and HEFI-T - A-30 or B-30 PD

APE - VLM-30 BD

Type 1 HE-I - Pào-yin-2 PD

Equivalent rounds

BULGARIA

Manufacturer

Arsenal

Type: Not specified, believed to be HEFI

Description: Weight given as 848 g and muzzle velocity 791-807 m/s

Manufacturer

Arminex

Type: Not specified, believed to be HEFI

Description: Described as for HP-30 aircraft gun. Cartridge weight given as 848 g and projectile weight 406 g. Muzzle velocity is 799 m/s (±8 m/s)

CHINA, PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: APHE-SD, HE-I-SD, HEI-T-SD.

Description: HE-I fitted with Pào-yin-2 PD fuze. May be fitted with brass or steel cartridge cases

[EGYPT](#)

Manufacturer

Maasara Company for Engineering

Type: TP, TP-T

Description: Standard specifications as text

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: HE-I, API, Ball (TP)

Description: Licence-produced versions of Chinese 30 mm Type 1 ammunition. Standard specifications as text

VERIFIED



30 mm TP-T round as produced in [Egypt](#) by the Maasara Company for Engineering



NORINCO 30 mm Type 1 APHE-SD round

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 100 mm T-12 and MT-12 anti-tank guns

Armament

100 mm [T-12 \(2A19\)](#) and [MT-12 \(2A29\)](#) anti-tank guns; [100 mm M87](#) towed [anti-tank gun TOPAZ \(Yugoslavia\)](#).

Development

The 100 mm [T-12 \(2A19\)](#) towed anti-tank gun, which entered service in 1960, differs from other 100 mm guns of [Russian Federation](#) and Associated States (CIS) origin by having a smoothbore barrel in place of the usual rifling. The [T-12](#) therefore fires a different family of ammunition, as does a later variant with a revised carriage known as the [MT-12](#) Rapira (Rapier) or [2A29](#).

The [100 mm M87](#) towed [anti-tank gun TOPAZ](#) was developed in [Yugoslavia](#). It is a combination of the ordnance from the RFAS [MT-12 \(2A29\)](#) and the carriage of the locally produced 122 mm [D-30J](#) towed howitzer. It does not appear to have entered production.

Although the Chinese NORINCO 100 mm Type 73 and Type 86 towed anti-tank guns are understood to be based on the T-12/MT-12 designs, it is not confirmed that their ammunition is interchangeable.

The rounds outlined in the text are the latest production versions produced by the Engineering Research Institute based in Moscow. The 100 mm T-12/MT-12 rounds produced in [Bulgaria](#) are earlier models which vary slightly in weights and performance but are essentially similar. The Kastet round is

not produced in [Bulgaria](#).

Description

All 100 mm T-12/MT-12 rounds are fixed, with the projectiles rigidly secured to the lacquered steel cartridge cases. In general terms the projectiles differ from other similar 100 mm projectiles, by their ability to be fired from smoothbore barrels. The cartridge cases also have a revised outline with a pronounced neck two-thirds of the way up from the base, thereby indicating the development from the 115 mm calibre.

There are four main types of anti-armour projectile: the guided Kastet; an APFSDS-T; a HEAT-T; and a HE-FS.

The T-12/MT-12 can fire the 3UBK10 and UBK10M Kastet gun-launched guided missile round with a projectile virtually identical to the 9M117 projectile, intended for rifled 100 mm and 115 mm guns (qv). The 9M117 was originally developed for use with the T-12/MT-12 anti-tank guns and is part of the 9K116 Bastion system. The Kastet is fired towards its intended target by the normal gun crew but once in flight the projectile is guided by an operator located close to the gun and using a 9S53 laser target designator. This enables the gun crew to engage another target immediately after the Kastet has been fired. The maximum range is 4,000 m and minimum range 100 m. Armour penetration behind reactive armour is claimed to be between 650 and 700 mm but is more likely to be of the order of 275 and 550 mm. **Weight of a complete Kastet round is 24.5 kg, of which 18.4 kg is the 9M117 missile, although some reference state these figures are 25 kg and 17.6 kg respectively.**

In 1996, the 100 mm 9M117M missile, part of the 3UBK10M round, was announced. The main change from the standard 9M117 missile is the introduction of a tandem warhead capable of defeating from 275 to 550 mm of active armour or 600 mm of conventional armour. The projectile weight is increased to 19.4 kg. Weight of a complete 3UBK10M round is 27.5 kg. Time of flight to 4,000 m is 13.5 seconds.

The APFSDS-T, also referred to as a HVAPFSDS-T, has the designation 3UBM10 and fires the 3BM-24 projectile assembly weighing 4.55 kg. The projectile assembly is essentially similar to that employed with the 100 mm UBM-8 APFSDS-T round, fired from D-10 series tank guns. The cartridge case contains 8.75 kg of propellant. With a muzzle velocity of 1,548 m/s the 3BM-24 can penetrate 406 mm of armour set at an angle of 0° at 500 m and 225 mm at 1,000 m. Maximum effective range has been estimated at 2,000 m.

The fin-stabilised HEAT-T has the designation 3UBK-8 and has the 3BK-16M projectile weighing 9.5 kg with a shaped warhead using A-IX-1 (RDX/Wax) explosive initiated by a GPV-2 PIBD fuze. The cartridge case contains 4.69 kg of propellant which produces a muzzle velocity of 1,075 m/s. The warhead can penetrate 400 mm of armour.

The designation of the HE-FS round, also known as FRAG-HE-FS, is 3UOF-12, with a 3OF-35 projectile. It weighs 28.9 kg of which 16.7 kg is the projectile. It has a muzzle velocity of 700 m/s to provide a maximum indirect fire range of 8,200 m. The nose-mounted PD fuze is a V-429E.

Specifications

Type	APFSDS-T	HEAT-T
Designation		
Weights:	3BM-24	3UBK-8
complete round	19.9 kg	23.1 kg
projectile	4.55 kg	9.5 kg
propellant	8.75 kg	4.69 kg

Muzzle velocity:

1,548 m/s

1,075 m/s

Authorised fuzes

Kastet - integral PD 9E256 APFSDS-T - none involved

HEAT-T - PIBD GPV-2

HE-FS - PD V-429E

Equivalent rounds

BULGARIA

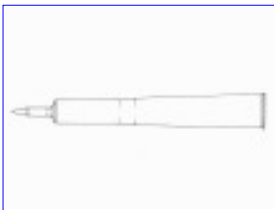
Manufacturer

Duna-Rit

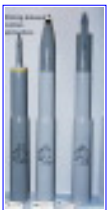
Type: APFSDS-T, HEAT-T and HE-FS

Description: Earlier models of rounds mentioned above but otherwise essentially similar

UPDATED



100 mm APFSDS-T 3BM-2 round for [T-12](#) and T-12A anti-tank guns



100 mm T-12/MT-12 rounds produced in [Bulgaria](#), from left: APFSDS-2 3BM-2; FRAG-HE-FS 3UOF-12; HEAT-T UBK-2 (T J Gander) (1998)



100 mm HEAT-T UBK-2 round for [T-12](#) and T-12A anti-tank guns

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

100 mm 3UBK10-1 and 3UBK10M-1 rounds with 9M117/9M117M gun-launched missiles

Armament

100 mm D-10 series gun on [T-55AM2P](#), [T-55AM2B](#) and [T-55AMV](#) MBTs.

Development

The 100 mm 3UBK10-1 round with 9M117 gun-launched missile (also known by the NATO codename of AT-10 `Stabber'), is one component of the 9K116-1 Bastion gun-launched missile system fitted to the [T-55](#) AM2B tank and others in the same series. The 9K116-1 Bastion system can be retrofitted to early models of [T-55](#) tanks. The 100 mm 9M117 missile is a laser beam-riding missile that can be fired from a conventional rifled 100 mm D-10 series gun barrel. It is guided towards its target by the 1K13 fire-control sight. Each [T-55 MBT](#) can carry six 100 mm 9M117 gun-launched missile rounds.

In 1996, the 100 mm 9M117M missile, part of the 3UBK10M-1 round, was announced. The main change from the standard 9M117 missile, is the introduction of a tandem warhead capable of defeating active armour.

During 1999 the 9M117M1 Arkan round was introduced with a potential range increase to 5,000-5,500 m, once a few minor modifications have been made to the existing fire-control system and guidance units.

The 9K116-1 Bastion system was developed by the KBP design bureau (Design Bureau for Instrument Building) at Tula, also known as Tulamashzavod.

An adaptation of the Bastion system for 105 mm tank guns has been proposed capable of producing a hit probability of 0.8 over ranges of 100 to 5,000 m. Known as Spear, this 105 mm version is marketed in conjunction with Diehl and Krauss Maffei of Germany (see separate entry).

Description

The complete 100 mm 3UBK10-1 gun-launched missile round resembles a piece of conventional ammunition. It is a fixed round with the missile projectile secured to the cartridge sleeve by a crimping ring just behind the copper drive band on the projectile body. However, the body of the missile extends almost to the base of the cartridge sleeve and the missile contains its own rocket motor.

The 100 mm 3UBK10-1 gun-launched missile round is handled and loaded in the same manner as a conventional round. Once it is chambered, the laser section of the fire-control system, including the 1K13 tracker unit with a built-in missile guidance laser channel, is used to select and track a target and the missile is fired electrically. A 12/1 tubular ejection charge, containing a high nitrogen content in the cartridge sleeve, propels the missile along the barrel so that, once clear of the muzzle and after 1.5 seconds, a sustainer rocket motor cuts in to provide propulsion for approximately 6 seconds. During the early part of its trajectory and once a base unit has been jettisoned, stabilising fins at the tail unfold while small control fins are deployed pyrotechnically from the nose portion. Internal gyros are used to control the trajectory.

The 9M117 missile can only be launched once the infra-red laser section of the fire-control system is switched on. The gunner places his aiming point on the target and maintains it there before and after the gun is fired. Laser receivers on the missile tail receive encoded trajectory correction signals. These are processed to alter the position of the nose-located control fins and thus guide the missile towards its target.

The 9M117 missile has a 9H136M shaped charge warhead, formed from OKFOL-3.5 (HMX/Wax 95/5), located in the portion of the missile body behind the nose and control fin area and ignited by a 9E256 point detonation/graze actuated fuze.

No confirmed details are available regarding the penetration capability of the 9H136M warhead but it is understood to be 650 mm of passive armour; a more conservative reference quotes 550 mm (which seems the more likely, especially as one Russian sales brochure quotes only 275 mm).

The maximum engagement range of the 9K116 Bastion system is 4,000 m and minimum range 100 m. Time of flight to 4,000 m is 12 to 13 seconds. If the 9M117 missile misses its target it will self-destruct after an interval of 26 to 41 seconds.

The 9M117M missile used with the 3UBK10M-1 round differs in having a tandem warhead formed by a precursor charge and a main shaped charge. The missile length is increased to 1.106 m although the missile weight remains at 18.4 kg. Armour penetration performance is quoted as 550 mm of rolled homogeneous armour and it is capable of defeating reactive armour. All other operating and other details are identical to those of the standard 9M117 missile. The exact production status of the 9M117M missile is uncertain although sales brochures promote it as part of a [T-55 MBT](#) update package along with upgraded armour.

The 9M117M1 Arkan missile, introduced during 1999, has a potential maximum effective range of 5,000 to 5,500 m, once minor modifications have been made to the fire-control system and guidance units. Without the modifications the maximum effective range remains at 4,000 m. Armour penetration performance is given as 700 to 750 mm, although a complete penetration of Explosive Reactive Armour (ERA) is not assured. At least two hits are required to penetrate ERA. The 9M117M1 Arkan missile can be used with all other 100 mm gun/launcher systems, including the 2A70 used on the [BMP-3](#) IFV.

Specifications

3UBK10-1 round with 9M117 missile

Weights:**complete round** - 24.5 kg**missile** - 17.6 kg**cartridge case** - 5.5 kg**propellant** - 635 g OKFOL-3.5**Lengths:****complete round** - 1.098 m**projectile** - 1.084 m**cartridge case** - 695 mm**Fin span:** 255 mm**Diameter of cartridge case over rim:** 147.5 mm**Muzzle velocity:** 267 m/s**Flight velocity:** (average) 370 m/s**Operational range:** 100-4,000 m**Operational temperature range:** -50 to +50°C**Authorised fuzes**

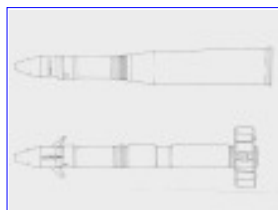
Integral PD 9E256

Equivalent rounds**BULGARIA****Marketing agency**

Kintex

Type: 100 mm 3UBK10-1 round with 9M117 guided projectile**Description:** Specifications as text**Manufacturer**

Vazovski Machinostroitelni Zavodi

Type: 100 mm 3UBK10-1 round with 9M117 guided projectile**Description:** Specifications as text**VERIFIED**

Left, 100 mm 9M117 gun-launched missile with complete round right (not to same scale)



Cross-section drawing of 3UBK10-1 100 mm gun-launched missile round

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

73 mm ammunition for 2A28 gun

Armament

2A28 Grom gun on [BMP-1](#) IFV; BPTU-73 towed anti-tank gun ([Bulgaria](#)).

Development

There are two basic natures of round for the 73 mm 2A28 Grom gun mounted in the turret of the [BMP-1](#) IFV; HEAT-FS and FRAG-HE. The HEAT-FS is derived from the PG-9V projectile used with the towed [73 mm SPG-9](#) recoilless gun (see following entry) while the FRAG-HE is a derivative of the OG-9V projectile used with the same gun. For the 2A28 Grom gun a stub cartridge case is added to the tail of the projectile to propel it from the barrel. Once the projectile is clear of the muzzle a rocket motor cuts in on the HEAT-FS to propel it towards the target.

[Sweden](#) has adopted the 2A28 gun as the main armament of [BMP-1](#) (Pbv-501) IFVs procured from former East German stocks. The ammunition for these guns is understood to have been taken from former East German stockpiles and has undergone an upgrade programme within [Sweden](#) - see under Description for details.

The Bulgarian BPTU-73 towed anti-tank gun consists of the 2A28 Grom gun mounted on a modified 23 mm ZPU-23 twin-barrelled air defence gun carriage.

Description

The main round fired from the 73 mm 2A28 Grom gun is the HEAT-FS PG-15V or PG-15VN with, respectively, the HEAT-FS PG-9 or PG15, and PG-9N or PG-15N rocket projectile. It would appear that 73 mm rounds produced in [Bulgaria](#) continue to utilise the original SPG-9 derived projectiles with the 2A28 gun. The projectiles differ in the warhead explosive employed. The PG-9/PG15 has a Hexogen A-IX-1 (RDX:Wax)

shaped charge weighing 332 g while the PG-9N/PG-15N has 340 g of the more powerful OKFOL-3.5 (95 per cent HME:5 per cent Wax).

The rocket motor employed on both projectiles weighs 1.56 kg and is 380 mm long, containing 460 g of NDSI-2K propellant. In both cases the rocket motor is ignited after firing by a VPZ-9M pyrotechnic delay weighing 35 g. Once the projectile leaves the muzzle it is stabilised by six spring-loaded forward-folding fins.

On target, the shaped warhead is initiated by a VP-9 piezoelectric point impact fuze via an igniter in the base of the shaped charge. The PG-15 warhead can penetrate 300 mm of armour while the PG-15N can penetrate 400 mm. Maximum range of both projectiles is 1,300 m while the direct fire range at a target 2 m high is 800 m. Muzzle velocity in both cases is 400 m/s, increasing to between 680 and 700 m/s after the rocket motor ignites.

Also available is the 73 mm HEAT-FS PG-15VNT with the PG-15NT rocket projectile. This round is effective against Explosive Reactive Armour (ERA) as it has tandem warheads actuated by a VP-9 piezoelectric point impact fuze. Warhead performance is stated to be 550 mm of RHA with behind-armour effects; 400 mm of armour behind ERA; 1 m of reinforced concrete or brick; and 1.8 m of logs and earth. Maximum effective range is 700 m while maximum range is 1,200 m; initial velocity is 400 m/s. A complete round weighs 3.2 kg and overall length is 920 mm. The span of the fully opened guidance fins is 190 mm.

In order to allow the PG-15 rounds imported from former East German stocks to meet Swedish handling, transport and other safety requirements, [Nammo LIAB AB](#) undertook an update programme on all stocks of 73 mm ammunition. This involved replacing the ignition system for the sustainer rocket motor and the safety and arming system. At the same time, the propellant was replaced to extend the storage life of the rounds. [NAMMO LIAB](#) is also developing an enhanced anti-armour warhead for the PG-15 round. A minimum penetration performance of 450 mm has been mentioned.

The charge used to propel projectiles from the 2A28 barrel is the 4BN34 (also written as BN34) contained in a steel cartridge case 102 mm long and weighing 875 g; the case alone weighs 390 g. The rimmed stub case (flange diameter 83 mm with mouth internal diameter 63 mm) is crimped onto the projectile tail and contains a perforated disc which creates a high/low-pressure situation to impart a low-pressure impulse to launch the projectile and initiate the VPZ-9M pyrotechnic delay train for the rocket motor. The case is made of BW 11 steel.

By contrast, the basic 73 mm FRAG-HE rounds, a later development, do not have a rocket motor. There are two basic types of FRAG-HE round, the OG-15V and OG-15VM, differing only in the weight and type of explosive in the 309 mm long cast-iron warhead on the projectile. The OG-15 FRAG-HE projectile warhead used with the OG-15V round contains 753 g of TNT while the OG-15M projectile used with the OG-15VM round contains 655 g of TD-50 (TNT/dinitronaphthalene). In both cases the explosive is ignited by a nose-mounted GO-2 or O-4M point detonating fuze. Flight stabilisation is provided by six fixed fins on the end of a perforated steel tailboom which also contains a tracer element. Again, Bulgarian-produced 73 mm rounds intended for use with the 2A28 gun continue to employ the OG-9 and OG-9M projectiles but overall performance is the same as the OG-15/OG-15M equivalents.

Two further 73 mm FRAG-HE rounds, which may be purely Bulgarian developments, are the OG-15BG and OG-15BG1, with OG-9G and OG-9G1 projectiles respectively. On early production examples, the usual streamlined outline of the 750 g explosive warhead is replaced by a cylinder with serrated wire rings around the explosive to enhance fragmentation, although late production variants do have a more pointed nose profile and fragmentation is augmented by the inclusion of 1,200 2 g metal pellets. The point detonating fuze employed is the O-4M in both cases.

The OG-15BG (weight 6 kg) has a muzzle velocity of 230 m/s and a maximum range of 7,500 m. The OG-15BG1 round (weight 4.57 kg) has a muzzle velocity of 316 m/s and a maximum range of 4,200 m. The direct fire ranges are 400 m and 350 m respectively.

The OG-15 and OG-15M FRAG-HE projectiles are propelled by a 4BN41 charge, weighing 890 g, in a steel stub cartridge case crimped onto the projectile tail. The muzzle velocity is 290 m/s and maximum possible range is given as 4,500 m; operational ranges are much shorter than that as the projectile trajectory is prone to be influenced by even light side winds.

Under development by [Nammo LIAB](#) of [Sweden](#) is a HE-FRAG warhead, with the fragmentation effects

augmented by a layer of steel balls. Also under development is an improved rocket motor providing an extended range of 2,000 m.

Polické Strojirny (PS) of the [Czech Republic](#) produces a 73 mm Blank round for training purposes. The round is loaded in the same manner as a conventional round and projects a blunt-nosed projectile to approximately 100 m from the gun muzzle where it detonates and breaks up to produce simulated gunfire sounds. The Blank round is known as the 73PG-15V-Cv or simply as the PG-15V.

Specifications

Type	HEAT-FS	HEAT-FS	FRAG-HE	FRAG-HE
Round	PG-15V	PG-15VN	OG-15V	OG-15VM
Projectile	PG-15	PG-15N	OG-15	OG-15V
Weights:				
round	3.49 kg	3.505 kg	4.57 kg	4.57 kg
projectile	2.615 kg	2.63 kg	3.68 kg	3.68 kg
warhead	900 g	940 g	2.135 kg	2.215 kg
explosive	322 g	340 g	753 g	655 g
rocket motor	1.56 kg	1.56 kg	n/a	n/a
propelling charge	875 g	875 g	890 g	890 g
Lengths:				
round	872 mm	872 mm	825 mm	825 mm
projectile	745 mm	780 mm	725 mm	725 mm
warhead	358 mm	380 mm	309 mm	309 mm
rocket motor	380 mm	380 mm	n/a	n/a
Muzzle velocity	400 m/s	400 m/s	290 m/s	290 m/s

Authorised fuzes

HEAT-FS - PIBD VP-9

FRAG-HE - PD GO-2 or OM-4M

Equivalent rounds

[BULGARIA](#)

Manufacturer

Arsenal

Type: 73 mm HEAT-FS, FRAG-HE

Description: Standard specifications - see text. Also produced at one time was a variant of the OG-15VB FRAG-HE which contained 990 prefragmented pellets around the TNT explosive filling. Weight of the Bulgarian OG-15VB variant is 4 kg

Manufacturer

Vazov Engineering Plants

Type: HEAT-FS PG-15V, PG-15VN, PG-15NT; FRAG-HE OG-15V, OG-15VM, OG-15BG, OG-15BG1

Description: See text

Manufacturer

Vazovski Machinostroitelni Zavodi

Type: HEAT-FS PG-9, PG-9N; FRAG-HE OG-9, OG9M

Description: Standard specifications, see text

CZECH REPUBLIC

Manufacturer

Caliber Prague Ltd

Type: HEAT-FS PG-15VN, FRAG-HE OG-15VN

Description: Standard specifications, see text

Manufacturer

Polické Strojirny (PS)

Type: TP PG-15V

Description: Inert warhead for practice firing - see also text

ROMANIA

Manufacturer

SN ROMARM SA

Type: 73 mm HEAT-FS, FRAG-HE

Description: May no longer be in series production. One version of the two types of FRAG-HE utilises a cast mortar bomb body design for the warhead

SWEDEN

Manufacturer

Nammo LIAB

Type: 73 mm HEAT-FS, FRAG-HE

Description: See text.

UPDATED



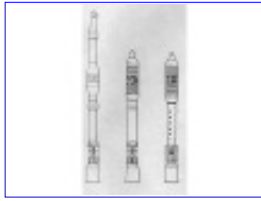
73 mm PG-15VN HEAT round with fins extended but with cartridge case still attached



73 mm OG-15 FRAG-HE round for 2A28 gun mounted in turret of [BMP-1](#) IFV



Bulgarian-produced 73 mm OG-15V FRAG-HE round with OG-9 projectile



From top: 73 mm PG-15VNT round with safety element attached to the nose of the tandem warhead; 73 mm OG-15BG FRAG-HE; 73 mm OG-15BG1 FRAG-HE (L Haywood)

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for Russian Federation and Associated States (CIS) 57 mm anti-aircraft guns

Armament

57 mm automatic [anti-aircraft gun S-60](#); 57 mm automatic anti-aircraft gun SZ-60; [NORINCO Type 59 anti-aircraft](#) gun.

NORINCO 57 mm Type 59 naval mounting; Type 66 twin-barrel naval mounting; Type 76 twin-barrel naval mounting.

S-68 gun on [ZSU-57-2](#) twin 57 mm self-propelled anti-aircraft gun system; [NORINCO Type 80 twin 57 mm self-propelled](#) anti-aircraft gun system.

Development

The 57 mm [anti-aircraft gun S-60](#) first appeared in 1960 and has remained in widespread service ever since, usually with the later benefit of added radar-based fire-control systems. The most commonly used ammunition for these guns is usually of the FRAG-T type although armour-piercing ammunition has been developed. The 57 mm [S-60](#) and its ammunition have been produced in [China](#), where the gun is known as the Type 59; naval variants have been developed by NORINCO. The [S-60](#) has also been manufactured (with some slight variations) in [Hungary](#), where it is known as the 57 mm SZ-60, and it is assumed that ammunition has also been produced there. However, no information is available. [S-60](#) ammunition was at one time produced in the former Czechoslovakia. It appears that 57 mm air defence ammunition is no longer in production within [Russia](#).

Description

The 57 × 348 mm ammunition for the [S-60](#) anti-aircraft gun series is fixed, with the projectile rigidly crimped to the cartridge case by two crimping bands engaging into two prominent cannelures on the projectile. The slightly tapered forged steel projectiles use a wide pressed copper or cupro-nickel driving band (over 26 mm wide) with a complex indented outline. The cartridge cases are lacquered steel or drawn 70:30 brass and use a KV-U or KV-5U (KB-5Y) base-mounted percussion primer to ignite their 11/7SW or 14/7 nitrocellulose powder propellant contents weighing 1.18 to 2 kg (nominal).

Rounds are fed into the gun in clips, each holding four rounds.

All projectiles have a muzzle velocity of around 1,000 m/s.

The main types are as follows:

FRAG-T, UOR-281 and UOR-281U These two rounds use OR-281 or OR-281U forged steel projectiles which are virtually identical apart from variations in the shape of their ogives. The OR-281U ogive is more rounded and the walls are thicker producing increased fragmentation. The explosive filling on both types of projectile is A-IX-2 (RDX/Aluminium), with the OR-281 containing 168 g and the OR-281U 154 g (both weights are nominal). The OR-281 projectile weighs 2.81 kg and the OR-281U weighs 2.85 kg. Both projectiles can use either an MG-57 or MGZ-57 point detonating fuze threaded into the nose. Both types of fuze, which are made of steel, weigh 316 g and have a self-destruct mechanism which operates between 13 and 17 seconds after firing. A protruding tracer element housing (burn time is a minimum of 10 seconds) is threaded into the base of each projectile.

APC-T, BR-281 and BR-281U These two armour-piercing projectiles are virtually identical with the BR-281U differing from the BR-281 only in the type of steel used for the armour-piercing body. Both projectiles have relatively short rounded ogives covered by a pressed-on light steel ballistic cap to preserve the ballistic outline. Both use an MD-10 base detonating fuze (delay time 0.005 second) to ignite the explosive payload which is 13 to 20 g of A-IX-2 (RDX/Aluminium), enhancing behind-armour effects (the BR-281U contains 10 g). The rear of each projectile also houses a protruding No 22 tracer housing which is threaded into the base; the tracer burns for a minimum of 2 seconds. Both types of projectile weigh 2.82 kg. Both types of round have an increased load of 14/7 propellant weighing between 1.45 and 1.54 kg.

Both projectiles can penetrate 96 mm of armour set at 0° obliquity at 1,000 m. At 500 m the penetration is 106 mm.

TP-T, UOR-281U Carrying a nose-mounted MG-57 ZAST dummy fuze, this training round weighs 6 kg complete with an inert projectile weighing 2.8 kg.

Recoil cartridge, WBK-81 This round is intended to provide a recoil force for the testing and maintenance of gun recoil systems and consists of a standard sized cartridge case containing a sealed package containing water to produce the mass to provide the required recoil. The round/cartridge case weighs 3.5 kg complete, of which 1.07 kg is the Nc7p 8, 7/14-11/7 propellant charge. When the round is fired the water payload emerges from the muzzle in a fine mist, so this round can be fired over restricted ranges or areas without risk of harm to personnel or structures.

Blank, MK-281 This Blank round is contained in a truncated 57 mm cartridge case and weighs 3 kg complete. The sound and flash producing filling is 560 g of Nctp 1, 2X0, 4/1,2-KF.

Specifications

Type	FRAG-T	FRAG-T	APC-T	APC-T
Designation	OR-281	OR-281U	BR-281	BR281-U
Weights				

complete round	6.36 kg	6.40 kg	6.36 kg	6.36 kg
projectile	2.81 kg	2.85 kg	2.82 kg	2.82 kg
propellant	1.18 kg	1.18 kg	1.18 kg	1.18 kg
filling	168 g	154 g	18-20 g	10 g
Lengths				
complete round	536 mm	536 mm	536 mm	536 mm
projectile	259.2 mm	261.4 mm	231.1 mm	235.7 mm
Muzzle velocity	1,000 m/s	1,000 m/s	1,000 m/s	1,000 m/s
Chamber pressure	3,180 bar	3,180 bar	3,180 bar	3,180 bar

Authorised fuzes

PD MG57, MGZ-57. BD MD-10

Equivalent rounds

BULGARIA

Marketed by

Kintex

Type: FRAG-T, UOR-281 or UOR-281U

Description: Fitted with MG-57 or MGZ-57 PD fuze. May be produced with the option of a brass or steel cartridge case. Complete round weight given as 6.35 kg and length of complete round 535 mm. Production as required

Manufacturer

DUNARIT JSCo

Type: FRAG-T

Description: Appears to be similar to OUR-281 or UOR-281Z. Projectile weight 2.8 kg and muzzle velocity 1,000 m/s

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: HE-T, AP-T

Description: HE-T has virtually identical specifications to 57 mm FRAG-T OR-281U. Uses Liu-2 PD fuze. AP-T complete round weighs 6.45 kg and is 537 mm long. A special HE-T is produced specifically for the 57 mm Type 76 water-cooled, twin-barrel naval gun; weight is 7.4 kg (complete round) and length overall 591 mm. Maximum range is 15,000 m; MV 1,000 m/s

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: HE-T, AP-T

Description: Weight of complete round given as 6.309 kg and projectile weight as 3.309 kg. Filling is 153 g of Hexal

[MACEDONIA](#)

Manufacturer

EUROINVEST

Type: HE-T [M66](#)

Description: Intended primarily for 57 mm S-68 guns carried on [ZSU-57-2](#) self-propelled anti-aircraft gun system. Equates to FRAG-T OR-281U. Standard specifications.

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: Cartridge cases

Description: Brass, standard specifications. Production may include complete rounds but no information available.

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

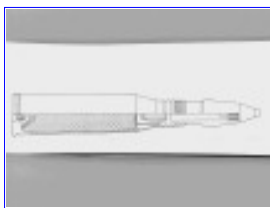
Type: HE-T, HE

Description: May no longer be in production. Equivalent to FRAG-T OR-281U, with or without a tracer element

VERIFIED



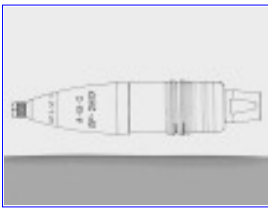
NORINCO 57 mm HE-T round for [NORINCO Type 59 anti-aircraft gun](#)



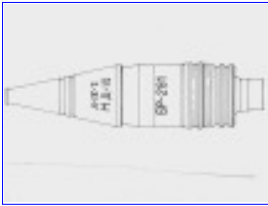
Cross-section of Yugoslav produced 57 mm HE-T round



Projectile for 57 mm FRAG-T OR-281



Projectile for 57 mm FRAG-T OR-281U



Projectile for 57 mm APC-T BR-281



NORINCO 57 mm HE-T round for twin-barrel naval gun Type 76

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.303 British

Synonyms:

7.7 × 56R; 0.303 Lee-Enfield; 7.7 Arisaka; 7 mm Type 89

Armament

All British service Lee-Enfield rifles, Vickers, Maxim, and Bren machine guns, modified Browning M1919 and M2 machine guns.

Development

One of the earliest small calibre rifle rounds, this appeared in 1889 and remained the standard British service round until replaced by the 7.62 × 51 mm NATO cartridge in the 1960s. A powerful round, its sole defect was its rim, which complicated the design of automatic weapons and demanded care in loading magazines. Innumerable variations in cartridge and bullet design took place during its life, but the final standard ball rounds were the Mks 7, 7Z, 8 and 8Z. The [0.303 British](#) cartridge was adopted by the Japanese Navy in 1929 as the Type 89 to replace the 6.5 × 50SR mm round then in use, but they subsequently considered that the rimmed design might cause feeding problems and so changed to the 7.7 × 58SR mm design. They later changed again, this time to the 7.7 × 58 mm rimless cartridge, thus creating a logistics nightmare of no less than three different 7.7 mm cartridges.

Description

A rimmed, bottlenecked brass case with Berdan or Boxer primer. The 0.303 bullet was a compound design using a core of part lead and part aluminium in order to obtain the correct centre of mass, in a copper, gilding metal or GMCS jacket. The round was most usually loaded with Cordite propellant, but nitro-cellulose propellants gradually appeared; these all have the Mark number followed by the letter Z. The propellant makes no difference to the shooting, but is indicated for storage and accounting purposes.

Specifications

Ball Mk 7

Round length: 77.47 mm

Case length: 54.61 mm

Rim diameter: 13.46 mm

Bullet diameter: 7.9 mm

Bullet weight: 11.27 g

Muzzle velocity: 749 m/s

Muzzle energy: 3,170 J

Abridged ballistic table: [0.303 British](#), 11.27 g ball

Range	Velocity	Energy
0 m	749 m/s	3,170 J
100 m	679 m/s	2,605 J
200 m	614 m/s	2,130 J
300 m	554 m/s	1,734 J

CANADA

Manufacturer

SNC Industrial Technologies Inc

Type: Ball CDN Mk 8: FMJ; 11.4 g; MV 730 m/s

[EGYPT](#)

Manufacturer

Aboukir Engineering Industries

Type: Ball: FMJ, non-streamlined; MV 720 m/s

[GREECE](#)

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: Ball: FMJ; 11.3 g; MV 732 m/s

[INDIA](#)

Manufacturer

Ammunition Factory, Khadki, Pune

Type: Ball: FMJ; Cartridge, 0.303 Ballistite Mark 1Z: bulletless cartridge used to discharge 36M rifle

grenade to a range of 185 m; a 7.62 mm version is also made. Loaded with double base propellant.
Blank: crimped mouth; contains double base propellant

PAKISTAN

Manufacturer

[Pakistan](#) Ordnance Factories

Type: Ball Mk 7: FMJ; 11.2 g; MV 732 (± 12) m/s

PORTUGAL

Manufacturer

INDEP

Type: Ball M378: FMJ; lead/aluminium core; 11.3 g; MV 780 m/s; Berdan primed

Ball: FMJ; lead/aluminium core; 11.3 g; MV 780 m/s; Boxer primed

SOUTH AFRICA

Manufacturer

[PMP](#), A Division of Denel (Pty) Ltd

Type: Bullet type Soft Point; weight 9.7 g; V₅ 800 m/s

Type: Bullet type FMJBT; weight 11.3 g; V₅ 747 m/s

Type: Bullet type Soft Point; weight 11.3 g; V₅ 747 m/s

SWEDEN

Manufacturer

Norma AB

Type: Ball 17712: JSP; 9.7 g; MV 829 m/s

UNITED STATES OF AMERICA

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)

Type: Ball: FMJ; 11.2 g; MV 739 m/s

Ball Match: HPBT; 11.2 g; MV 739 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: SP; 11.7 g; MV 750 m/s

Manufacturer

Winchester-Olin

Type: Ball: JSP; 11.6 g; MV 750 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball Mk 7Z: FMJ; 11.27 g; MV 732 m/s

Ball Mk 8Z: FMJ, SL; 12.4 g; MV 732 m/s

Ball: FMJ; 11.3 g; MV 749 m/s

Ball: FMJ; 12.4 g; MV 748 m/s

Ball: JSP; 11.7 g; MV 748 m/s

UPDATED



[0.303 British](#)



*Indian 0.303 Ballistite Mark 1Z grenade launching cartridge
(1997)*

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

35 × 228 mm Oerlikon ammunition

Armament

All Oerlikon Contraves 35 mm KD series cannon including: GDF-001, [GDF-002](#) and [GDF-005](#) automatic anti-aircraft guns (Switzerland); Gepard (Germany) and CA 1 (Netherlands) twin 35 mm self-propelled anti-aircraft guns; [Type 87 twin 35 mm self-propelled](#) anti-aircraft gun ([Japan](#)); [Loara](#) twin 35 mm self-propelled anti-aircraft gun; ZA-35 twin 35 mm self-propelled anti-aircraft gun ([South Africa](#)); Denel 35DPG naval gun ([South Africa](#)); [LIW](#) EMAK ([South Africa](#)); Marconi Marksman twin 35 mm anti-aircraft turret (UK); OE/OTO 35 mm naval mounting (Italy); Boeing Company Bushmaster III (USA); GMD-A twin 35 mm naval mounting (Switzerland); 35/1000 revolver cannon; Millenium 35/1000 naval gun system (UK); [SkyShield 35](#); Skoda 35 mm SPAAG ([Czech Republic](#)).

35 × 228 mm TP rounds are fired from the Turkish [MKEK](#) 35 mm barrel insert system.

NORINCO of [China](#) manufactures the Twin 35 mm Towed AA Gun System, a licence-produced version of the Oerlikon Contraves [GDF-002](#).

Development

Development of the Oerlikon Contraves Pyrotec AG 35 × 228 mm ammunition for air defence guns commenced during the late 1950s. The 35 mm KD gun and its ammunition became one of the most successful of all post-war air defence gun systems. Originally there were four types of round in the family but subsequent development has expanded the range of available natures considerably, the latest being the Frangible Armour-Piercing Discarding Sabot (FAPDS) and a 35 × 228 mm APFSDS-T.

Alliant Techsystems (ATK) is the exclusive US licensee for 35 × 228 mm Oerlikon ammunition, the

technology transfer being successfully completed during 1982. [The Boeing Company](#) 35/50 mm Bushmaster III cannon is one of the weapons under consideration for the Bradley IFV mid-life improvement programme. Current development work is concentrating on the 35 mm version of this ammunition.

For information regarding the next-generation series of 35 × 228 mm Oerlikon air defence ammunition, codenamed Advanced Hit Efficiency And Destruction (AHEAD), see following entry.

Oerlikon Contraves, including Oerlikon Contraves Pyrotec AG, is now a member of [Rheinmetall DeTec AG](#).

Description

All Oerlikon Contraves Pyrotec AG 35 × 228 mm ammunition involves fixed rounds with the projectiles rigidly secured to their low-carbon, drawn steel cartridge cases by eight crimping points. These engage in a cannellure around the body of the boat-tailed projectile. Soft iron drive bands are used.

The ballistics and trajectories of all the TP, HE-I and SAPHEI rounds are identical. Those for the FAPDS, APDS-T and APFSDS-T armour-piercing rounds differ. In all cases the propellant involved is from 330 to 333 g of NC 01 T 35 single-based powder. Maximum average chamber pressure is 3,800 bar and muzzle rotation speed is 1,200 rps. A ZSD 304 percussion primer with a boxer primer cap is threaded into the cartridge case base. Some cartridge cases have grooves to facilitate the use of belt links.

The projectiles involved, all secured to the same 228 mm long cartridge case with a 55 mm diameter base, are as follows:

HE-I(NF) Oerlikon designation PMD 042. This projectile has been described in Oerlikon Contraves literature as a mine and uses a cold-forged steel streamlined body filled with 112 g of Hexal P30 (with aluminium additives). The nose-located fuze well is occupied by a KZD 338 self-destruct delayed action point detonating fuze (the Junghans Feinwerktechnik PD DM 331 is an alternative), with an arming distance of 60 m and a delayed action time of 150 to 250 µs. The fuze will self-destruct the projectile after a range of 4,000 m or after a trajectory time of flight of 6 to 12 seconds. To ensure effective hits against aircraft or other targets, the fuze will function at angles of incidence down to 5°. The HE-I projectile can produce a large number of fragments and intensive blast effects. Maximum possible range is 11,000 m.

HE-I-T(NF) Oerlikon designation PMD 040. This projectile is similar to the HE-I but includes a tracer element screwed into the base. This reduces the explosive filling to 98 g of Hexal P30. The tracer will burn for a minimum of 5 seconds, corresponding to a range of over 3,100 m.

HE-I(BF) Oerlikon designation PMD 048. The projectile of this round uses a hardened steel body with an enlarged wall thickness and is filled with 65 g of Hexal P15 combined with 20 g of incendiary composition. The base-located BZD 357 mechanical impact fuze has an arming distance of 60 m and a delayed action time of approximately 500 µs. The fuze will self-destruct the projectile after a range of 4,000 m or after a trajectory time of 6 to 12 seconds. A powerful blast effect is combined with optimised fragmentation and an 'extremely high' armour penetration.

TP-T Oerlikon designation PMD 034. This is a relatively low-cost training and target practice projectile with an inert filling. The fuze is replaced by an aluminium plug. A tracer element is fitted in the base to burn for up to 4 seconds, corresponding to a range of over 4,000 m. The maximum possible range is 11,000 m.

TP This is the same as the TP-T but lacks the tracer element. A threaded base plug takes the place of the tracer.

SRTP-T This round uses the same practice projectile as the TP-T combined with a special nose piece to reduce the maximum possible range to below 9,000 m

SAPHEI-T Oerlikon designation PMD 044. This round was developed to provide an armour-piercing capability against land or naval targets. It has a relatively thick-walled hardened steel HE projectile, with an armour-piercing nose intended to penetrate target armour at virtually any angle of incidence. An aluminium alloy nose cap acts as a ballistic windshield. The 22 g filling of Hexal P30 is detonated by a BZD 342 self-destruct delayed action impact base fuze. The fuze will self-destruct the projectile after a range of 4,000 m or after a trajectory time of flight of 6 to 12 seconds. At a range of 1,000 m this projectile can penetrate 40 mm of armour plate set at an angle of 0° NATO (90°) and then detonate to produce a large number of fragments and blast.

APDS-T Oerlikon designation PMD 049. Intended primarily for use against armoured land and/or naval targets, this round uses a heavy metal subcalibre penetrator weighing 302 g carried in a discarding plastic sabot with a high-grade aluminium alloy base. The projectile has a muzzle velocity of 1,440 m/s. A tracer element burning for a minimum of 1.6 seconds (corresponding to a range of 2,000 m) is located in the penetrator base. The penetrator can pierce 90 mm of armour plate set at an angle of 0° NATO (90°) at 1,000 m.

FAPDS Oerlikon designation PMD 055. The projectile for this round follows the same general lines as the APDS-T but is arranged so that the penetrator is designed to produce a large number of fragments once the outer armour layer of the target has been penetrated. It has been demonstrated that in air defence terms this provides the projectile with destructive effects similar to those of the HE-I projectile but deeper inside a target.

APFSDS-T Oerlikon designation PMD 060. The fin-stabilised penetrator used with this round has a muzzle velocity of 1,417 m/s. The complete round weighs 1.455 kg and the projectile assembly 388 g. It is foreseen that this round will replace the APDS-T round, reaching a growth potential of approximately 25 per cent on penetration.

AHEAD See following entry.

Rh 503 ammunition See separate entry under Tank and Anti-tank Guns section.

Specifications

Type	HE-I(NF)/HE-I(BF)	HE-I-T(NF)	SAPHEI-T
Weights			
complete round	1.58 kg	1.565 kg	1.58 kg
projectile	550 g	535 g	550 g
explosive	112 g/85 g	98 g	22 g
Lengths			
complete round	387 mm	387 mm	387 mm
cartridge case	228 mm	228 mm	228 mm
Muzzle velocity	1,175 m/s	1,175 m/s	1,175 m/s
Flight time			
to 1,000 m	0.96 s	0.96 s	0.96 s
to 2,000 m	2.18 s	2.18 s	2.18 s
to 3,000 m	3.80 s	3.80 s	3.80 s
to 4,000 m	6.06 s	6.06 s	6.06 s
Type	TP	TP-T	SRTP-T

Weights			
complete round	1.58 kg	1.58 kg	1.575 kg
projectile	550 g	535 g	545 g
explosive	None	none	none
Lengths			
complete round	387 mm	387 mm	387 mm
cartridge case	228 mm	228 mm	228 mm
Muzzle velocity	1,175 m/s	1,175 m/s	1,175 m/s
Flight time			
to 1,000 m	0.96 s	0.96 s	0.99 s
to 2,000 m	2.18 s	2.18 s	2.38 s
to 3,000 m	3.80 s	3.80 s	4.41 s
to 4,000 m	6.06 s	6.06 s	7.40 s

Type	APDS-T	APFSDS-T	FAPDS
Weights			
complete round	1.445 kg	1.455 kg	1.44 kg
projectile	380 g	388 g	375 g
Lengths			
complete round	340 mm	340 mm	340 mm
cartridge case	228 mm	228 mm	228 mm
Muzzle velocity	1,440 m/s	1,417 m/s	1,440 m/s
Flight time			
to 1,000 m	0.73 s	0.70 s	0.73 s
to 2,000 m	1.54 s	1.42 s	1.54 s
to 3,000 m	2.38 s	2.21 s	2.44 s
to 4,000 m	3.34 s	3.05 s	3.45 s

Authorised fuzes

See text

Equivalent rounds

CANADA

Manufacturer

SNC TEC

Type: HE-I C123, TP-T C122

Description: Standard specifications. AHEAD and Break-up ammunition also manufactured (see separate entries).

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HE-I, HE-I-T, TP-T

Description: Intended primarily for the NORINCO Twin 35 mm Towed AA Gun System, a locally produced version of the Oerlikon Contraves [GDF-002](#), these rounds are dimensionally and ballistically identical to their Oerlikon Contraves Pyrotec AG equivalents. The delayed action PD nose fuze for the HE-I and HE-I-T is given as the KZD338. The production status of these rounds is uncertain.

FINLAND

Manufacturer

Patria Vammass Oy

Type: HEI, HEI-T, TP, TP-T. SRTP-T

Description: Standard specifications. Produced by Vammass Defencetec Ltd

FRANCE

Manufacturer

Giat Industries

Type: HE-I/SD, HE-I-T/SD, SAPHEI-T, TP, TP-T, TP-T/SR

Description: Projectiles containing explosive fuze with PD MR3501 (HE-I) or BD MR3505 (SAPHEI). TP-T/SR is a Short Range Target Practice tracer round. Otherwise standard specifications

GERMANY

Manufacturer

Diehl-Wehrtechnik

Type: [DM 31](#) MP

Description: Fitted with DM 821 base fuze. Muzzle velocity is 1,180 m/s

Manufacturer

Diehl-Wehrtechnik

Type: Ammunition for TPGID

Description: See separate entry

Manufacturer

[Rheinmetall DeTec AG](#)

Type: HETF and APFSDS-T

Description: For use with Rheinmetall MK 35/50 Rh 503. For details see separate entry

Manufacturer

[Rheinmetall DeTec AG](#)

Type: FAPDS DM 33

Description: For details see separate entry

Manufacturer

Mauser-Werke

Type: FAPDS

Description: See separate entry

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: HE-I, HE-I-T, TP, TP-T

Description: Standard specifications

IRAN

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: HE

Description: Standard specifications. TP may also be produced

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: HE-I, TP-T

Description: Standard specifications

Manufacturer

Poongsan Corporation

Type: HEI-SD K202 KA1, TP-T K203

Description: Some slight differences from original to suit local production facilities. For instance a steel K2 case is used together with a K603 primer. The nose fuze is a PD K504KA1 (M504A1). Otherwise standard specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: HE-I-T, APHE, TP-T

Description: Standard specifications. Now part of Rheinmetall DeTec but Eurometaal stocks still widely held.

PAKISTAN

Manufacturer

[Pakistan](#) Ordnance Factories

Type: HE-I, HE-I-T, SAPHEI-T, TP, TP-T

Description: Standard specifications

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)

Type: HE-I, TP-T

Description: Standard specifications. Marketed by Denel. See also separate entry for details of [PMP](#) 35 × 228 mm new generation ammunition

SPAIN

Manufacturer

DEFEX SA

Type: HE-T, TP-T

Description: Standard specifications

Manufacturer

SANTA BARBARA SA

Type: HE-I, SAPHEI-T, TP-T

Description: Standard specifications

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: See text

Description: See text

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: 35 mm Break-Up

Description: See separate entry

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kumuru ([MKEK](#))

Type: HE-I, TP-T

Description: Standard specifications. TP-T also used with the [MKEK](#) 35 mm barrel insert system for tank gunnery training.

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: Clip fed; HE-I, HE-I-T, SAPHEI, APDS, TP-T; belt fed; TP

Description: Standard specifications

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems (ATK)

Type: APFSDS-T, HEI, TP, TPDS-T

Description: Developed for possible use in the 35/50 mm Bushmaster III gun for the Bradley IFV mid-life improvement programme. The APFSDS-T has an MV of 1,400 m/s with a projectile weight of 365 g. The HEI has an MV of 1,175 m/s with a 550 g projectile containing 112 g of explosive; the nose fuze could be the PD [M760](#). The TP matches the HEI ballistically but is inert. The final form of the TPDS-T is under consideration

VERIFIED



A selection of current 35 × 228 mm ammunition projectiles produced by Oerlikon Contraves Pyrotec AG, from left: APFSDS-T; FAPDS; APDS-T; SAPHEI-T; AHEAD (see separate entry) (2001)



35 × 228 mm ammunition as produced by Giat Industries, from left: TP; TP-T; TP-T/SR; HE-I/SD; HE-I-T/SD; SAPHEI; SAPHEI-T



Projectile assembly for Oerlikon Contraves Pyrotec AG 35 × 228 mm APFSDS-T

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 84 mm Carl Gustaf recoilless guns

Armament

All 84 mm Carl Gustaf M2/M3 recoilless guns.

Development

The Carl Gustaf 84 mm recoilless guns were developed following experimental work carried out in [Sweden](#) during the early and mid-1940s. Following the development of a 20 mm model, the first prototypes of the 84 mm Carl Gustaf appeared in 1946 and the first service model was ready in 1948. Since then the 84 mm Carl Gustaf has been produced in a series of basically similar models, all relying on the controlled venting of propelling gases through a rear-mounted venturi to eliminate recoil forces.

The original versions were produced by the Swedish state-owned Gevärsmåleriet, but production eventually switched to FFV Ordnance which also produced the ammunition. FFV Ordnance is now Bofors Carl Gustaf, part of Bofors AB. The 84 mm Carl Gustaf guns are in service with armed forces all over the world, including the USA, and production continues. The guns were originally developed as anti-tank weapons but ammunition development converted them into a portable multipurpose weapon capable of fulfilling many infantry fire-support functions efficiently.

Description

All 84 mm Carl Gustaf ammunition is fixed with the projectiles rigidly secured to their light alloy cartridge cases. The cases have a countersunk, side-located percussion cap used with an igniter composition (black powder NOA 91) to ignite the double-base propellant which is in strip form. The round is breech-loaded; a notch on the rim of the case ensures the round can only be loaded in such a way that the percussion cap ends up opposite the firing pin. The case is closed at the rear by a plastic baseplate. Rounds are normally issued and carried in two-round plastic-based containers.

Ammunition development is still continuing for the 84 mm Carl Gustaf; only the current production versions are mentioned here.

The following types of round are available:

84 mm HE 441B The projectile used with the 84 mm HE round has an unusual shape. The rounded nose is actually a 447 combined MT and impact fuze with the thin-walled shell body having a pronounced boat tail base with a rounded end. The steel body encloses two neoprene rubber inserts, each containing approximately 800 steel spheres that considerably add to the fragmentation effects produced when the 400 g RDX/TNT filling is detonated. The shell body is designed so the danger area for rearward travelling fragments is relatively small, allowing the round to be used at combat ranges as close as 40 m. The maximum practical range is 1,000 m although the fuze can be set for ranges between 40 and 1,250 m.

The mechanical range/time fuze is set before firing by turning the entire front portion of the round from a 'Safe' position to any range required in steps of 10 m divisions from 40 to 1,250 m. The 447 fuze uses a modified Thiel clockwork mechanism with transport, handling and bore safeties, requiring both setback and spin to arm. The fuze will function on impact down to impact angles of approximately 5°. The arming distance from the muzzle is over 20 m but less than 70 m.

The 447 fuze is also produced by Micron Instruments of Chandigarh, [India](#); a fuze alternative is the Junghans Feinwerktechnik MTSQ No 504.

The muzzle velocity of the 84 mm HE 441B round is 240 m/s and time of flight to 700 m is 3.4 seconds.

84 mm HEAT 551 The 551 HEAT round is one of the latest of a line of 84 mm HEAT rounds. It differs in that it employs a rocket motor that cuts in after firing to provide a flat trajectory and reduced time of flight, both of which increase the hit probability. Early versions of 84 mm HEAT rounds lacked the rocket motor and can be readily recognised by the long standoff nose spike. On the 551 this standoff spike is protected by a plastic ballistic cap.

The 84 mm 551 HEAT projectile has a light-alloy body enclosing a 500 g Octol bursting charge behind a cone-shaped copper liner. The front edge of the standoff spike under the ballistic cap contains a steel 'biting edge', ensuring the projectile does not slip away from an impact point. The standoff spike acts as a shock generator, transmitting the force of an impact to a piezoelectric generator connected by internal wires to a detonator. This ignites a tetryl booster to light the main shaped charge. Behind the shaped charge is a rocket motor in a light-alloy casing. The rocket motor consists of 300 g of smokeless double-base propellant venting through a closure at the rear. The light-alloy closure has a nozzle and contains a delay unit and an ignition charge. The delay unit is ignited by the propellant gases and delays rocket motor ignition by 45 ms until the projectile has travelled approximately 15 m from the gun muzzle. The motor then burns for 1.5 seconds, developing a thrust of 325 N.

A teflon slipping ring is located between the rear closure and the stabilising unit. The latter is fitted around the rocket motor and consists of six folding aluminium fins and a plunger with two throttling orifices.

Due to the rocket motor the 84 mm 551 HEAT has a muzzle velocity of 255 m/s, but after a range of 500 m the velocity is 330 m/s. Maximum effective range is 700 m and the time of flight to that range is 2.2 seconds. Standard dispersion at 700 m is 700 × 700 mm. The shaped charge warhead can penetrate approximately 400 mm of hard armour.

A typical example of an earlier (non-rocket-assisted) 84 mm HEAT round weighs 2.585 kg, 1.7 kg of which is the projectile. Muzzle velocity is 311 m/s.

84 mm HEAT 751 The 84 mm HEAT 751 round features a rocket-assisted tandem warhead projectile, intended to defeat Explosive Reactive Armour (ERA) and penetrate over 500 mm of conventional armour. The round has a long conical nose to support the standoff fuze and uses a tandem warhead. The first charge (known as a precharge and weighing 300 g) destroys the reactive armour to enable the second shaped charge, weighing 1.5 kg, to penetrate up to 500 mm of rolled homogeneous armour. The effective range is given as up to 500 m. The complete round weighs 3.8 kg and the projectile 2.9 kg; propellant weight is 400 g. Muzzle velocity is 210 m/s while maximum velocity after rocket ignition is 340 m/s. The maximum height of the projectile trajectory for a range of 700 m is approximately 7 m.

This round is in production.

84 mm HEDP 502 This round is intended to be a dual-purpose round for use against lightly armoured vehicles or solid structures and troops in the open, or with a delayed action against field fortifications and similar targets likely to be engaged when Fighting In Built-Up Areas (FIBUA). The round has a dual-mode fuze function with the Instant or Delayed mode selected at the instant of loading by the orientation of the cartridge case with the firing mechanism. Markings on the base (I and D) signify the correct alignment.

The shell body is manufactured from high-fragmentation steel, and is surmounted by an aluminium nose cap covering the shaped charge liner which is of a 'special material' ensuring behind-armour effects. The explosive charge is 580 g of HMX/TNT with a pressed tetryl and RDX booster. An aluminium alloy fin assembly with six fins is located behind the shell body. The fins are folded forward inside the cartridge case and are unfolded once the projectile leaves the gun muzzle by using residual propellant gas pressure retained by a plunger arrangement.

The integral fuze system is a combination piezoelectric impact or pyrotechnic delay arrangement, with the mode selected by the orientation of the cartridge case. The alignment of the case alters the alignment of a fuze mode selector device which either short-circuits the piezoelectric system to obtain a 0.1 second delay after impact function, or else cancels the short-circuiting feature to ensure instantaneous functioning on impact. Arming distance is between 15 and 40 m from the gun muzzle.

The 84 mm 502 HEDP can penetrate approximately 150 mm of armour. Muzzle velocity is 230 m/s and the maximum effective range against moving hard targets is 300 m. Against field fortifications or similar targets the maximum effective range is 500 m but this range increases to 1,000 m against troops in the open.

The Bofors Light Multipurpose Assault Weapon (LMAW), currently under development, is a one-shot shoulder-fired weapon containing a modified 84 mm FFV 502 HEDP projectile.

84 mm Smoke 469B Intended to create rapid battlefield screening or marker smoke, the 84 mm 469B smoke round uses a light-alloy projectile. It is filled with 800 g of a smoke composition consisting of titanium tetrachloride adsorbed by pulverous synthetic hydrous calcium silicate; the composition is non-toxic. At the front of the body shell is a light-alloy adaptor into which the 957 direct action and graze fuze is threaded. The shell is encircled by a single copper driving band and is enclosed by a light-alloy baseplate. The internal walls of the shell are provided with longitudinal vanes to increase structural strength.

On impact the fuze will function to ignite a centrally located burster charge. The smoke composition creates smoke the instant the shell body is ruptured to produce a non-toxic smoke screen 10 to 15 m wide.

Maximum effective range of the 84 mm Smoke 469B is 1,300 m and muzzle velocity 240 m/s.

84 mm Illuminating 545 This round is intended to provide rapid battlefield illumination of target areas in support of direct fire weapons and guided missiles. The projectile has a light-alloy body and base and is encircled by a single copper drive band. A pyrotechnic time fuze, covered by a rubber hood with a ring-pull removal tab during transport, is mounted on the projectile body and fitted with a graduated setting ring adjusted by a fuze setting key or the fuze safety pin. Inside the projectile body is a canister filled with 500 g of an illuminating composition and a folded nylon parachute canopy, shroud lines and riser.

Before firing the fuze is set using the graduated setting ring, with graduations in 50 m divisions from 200 to 2,300 m, after the hood has been removed along with the fuze safety pin. There are also three preselected click settings for short (600 m), medium (1,100 m) and long range (1,700 m). An alternative fuze, the DM 42 produced by Junghans Feinwerktechnik, has five settings for 500, 800, 1,100, 1,400 and 1,700 m.

The 84 mm Illuminating projectile is fired with the gun muzzle, elevated 20 to 25° to ensure the projectile and fuze function at a height at least 200 m above the ground. When the fuze functions it ignites a small expulsion charge which creates an internal overpressure to shear six fixing screws holding the baseplate in position. The illuminating canister is ejected to be suspended beneath the parachute. The expulsion charge also ignites the illuminating composition to produce a sodium light with a candle power of approximately 650,000 candela and an average burning time of 30 seconds. Rate of descent is approximately 5 m/s. The initial illuminated area can have a diameter of approximately 400 to 500 m.

Muzzle velocity of the 84 mm Illuminating 545 is 260 m/s and maximum range of burst is 2,100 m.

84 mm TP-T 141 and TP-T 552 Both these rounds are used during training, although the TP-T 141 is no longer in production. Its replacement, the TP-T 551, is generally similar to the earlier round, containing no fuze, booster or bursting charge. The propellant charge and rocket motor provide the same ballistic performance as the HEAT 551.

For short-range marksmanship training with 84 mm Carl Gustaf M2/M3 recoilless guns on indoor and outdoor ranges, Bofors produces a series of subcalibre adaptors that are loaded into the weapon concerned in the same manner as a conventional round. The first of these devices was the 6.5 mm SubCalibre Adaptor 217 (British Army designation [L10A1](#)) and others have since been produced to fire 0.22 training ammunition. The device for the Carl Gustaf M2 resembles a standard 84 mm HEAT round, with a barrel located along the centreline. The device for the Carl Gustaf M3 is essentially the same but resembles the outline of the 84 mm HEAT 551 round. This device is the SubCalibre Adaptor 553B which fires 7.62 mm tracer rounds. With this device a back blast charge may be added to simulate the back blast of the operational round.

With the Adaptor 217, a 6.5 mm tracer round with ballistic characteristics similar to those of 84 mm HEAT projectiles (up to ranges of approximately 350 m), is fitted into a firing mechanism which is then screwed into the base of the training adaptor before loading. Firing is via the weapon's normal firing mechanism. Special low-power 'gallery' rounds for use on indoor miniature ranges have been produced for use with this adaptor.

Specifications

Type	HE	HEAT	HEAT	HEDP	Smoke	Illuminating
Designation	441B	551	751	502	469B	545
Weights:						
round	3.1 kg	3.2 kg	3.8 kg	3.3 kg	3.1 kg	3.1 kg
projectile	2.3 kg	2.4 kg	2.9 kg	2.5 kg	2.2 kg	2.2 kg
filling	400 g	500 g	1.8 kg	580 g	800 g	500 g
propellant	400 g	400 g	400 g	340 g	400 g	400 g
Muzzle velocity	240 m/s	255 m/s	210 m/s	230 m/s	240 m/s	260 m/s

Authorised fuzes

Various - see text

Equivalent rounds

CANADA

Manufacturer

SNC TEC

Type: HEAT 551 (C49), TP-T 552 (C46)

Description: Standard specifications

INDIA

Manufacturer

Indian Ordnance Factory Khamaria

Jabalpur

Type: HE, HEAT, Illuminating, TP-T

Description: HEAT round is of early non-rocket-assisted type with weight (complete) 2.6 kg and projectile 1.8 kg. Muzzle velocity is 305 m/s. Maximum effective range against stationary targets is 550 m and against moving targets 450 m. The 447 fuze for the HE round is produced by Micron Instruments of Chandigarh

SWEDEN

Manufacturer

Bofors Carl Gustaf

Type: See text

Description: See text

UPDATED



84 mm ammunition for the Carl Gustaf, from left: TP-T 141; Smoke 469B; Illuminating 545; HEAT 751; HEDP 502; HE 441B; (foreground) HEAT 551 (2001)



84 mm HE 441B



84 mm HEAT 551



84 mm HEDP 502



84 mm Smoke 469B



84 mm Illuminating 545



6.5 mm SubCalibre Adaptor 217



7.62 mm SubCalibre Adaptor 553B

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IDENTIFICATION OF SMALL ARMS AMMUNITION, CANADA

Date Posted: 16 July 2001

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All types:

Uses NATO standard code

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ARTILLERY ROCKETS

Date Posted: 12 July 2001

Jane's Ammunition Handbook 2001-2002

70 mm HYDRA 70 rockets

Armament

Rapid Deployment Multiple Rocket Weapon System (RD-MRWS); [MAKSAM](#) RA 7040 40-tube launcher.

Development

The 70 mm HYDRA 70 rocket was developed from the standard 2.75 in Mk 4-Mod 10 by the US Army and BEI Defense Systems of Fort Worth, Texas, (later Lockheed Martin Ordnance Systems and now [General Dynamics Armament Systems](#)), to enable aviation air-to-ground rockets to be fired accurately from helicopter platforms or ground mountings using an enhanced efficiency fire-control system. The ground mountings are formed by mounting up to six multiple lightweight rocket pods (seven-tube M260 or the more usual 19-tube M261), on otherwise obsolete towed [M91](#) 115 mm chemical rocket launchers or modified towed 105 mm artillery carriages. HYDRA 70 rockets can also be fired from helicopters.

The programme included the development of a new higher impulse rocket motor and several forms of warhead enabling the HYDRA 70 to carry out various types of fire support function for rapid deployment or special forces when conventional artillery support would be limited or non-existent.

In April 1993, the US Army had 189,000 [M151](#) HE HYDRA 70 rockets and 41,000 with M261 multipurpose warheads. At that time a single [M151](#) HE HYDRA 70 rocket was quoted as costing US\$365, while a multipurpose rocket was US\$1,424.

Since 1965, BEI Defense Systems and (later) [General Dynamics Armament Systems](#) have produced

well over 40 million rocket motors, warheads, ordnance components and electronic systems for HYDRA 70 air-to-air and air-to-ground applications; production has been carried out at facilities in Camden, Arkansas, and Fort Worth, Texas. **Production continues to meet a series of continuation orders for the US Army, Air Force, Navy and some overseas military users. Total contract value stood at US\$391.7 million in early 2001, with the maximum potential contract value being US\$1.2 billion over a five-year period.**

Description

The 70 mm HYDRA 70 fin-stabilised rocket is powered by an electrically ignited Mk 66 rocket motor originally developed by the US Navy, to enhance accuracy and range compared to earlier models such as the Mk 40; the rocket motor also produces a more subdued exhaust signature than earlier models. The aluminium-bodied rocket has three wraparound fins, a fluted exhaust nozzle and an AA2 (MK90) double-base propellant which achieves 635 kg of thrust in 38 ms; motor burn time is 1.07 seconds. The fluted nozzle spins the rocket up to 600 rpm in the launcher and 2,100 rpm after launch. Weight of the rocket motor alone is 6.16 kg complete and it is 1.062 m long.

The Mk 66 MOD 3 rocket motor is the standard US Army motor. The Mk 66 MOD 2 motor is used by the US Navy, US Air Force and US Army Special Operations Forces and contains an electronic device intended to prevent radio frequencies from igniting the rocket motor.

The Canadian CVR-7 C16 rocket motor has a fluted exhaust nozzle which is compatible with the HYDRA 70 system. The C17 rocket motor, a joint Bristol Aerospace/Talley Defense Systems development, has a new propellant grain geometry, a non-asbestos insulation material and modified fins. Developed from 1987 onwards, it is intended primarily for helicopter use (see under Canada below).

Numerous types of warhead can be attached to the HYDRA 70 rocket motor. The most numerous is the [M151](#) HE.

[M151](#) The [M151](#) HE weighs 4.67 kg and contains 1.04 kg of Composition B-4 explosive in a prefragmented cast-iron 411 mm long warhead. It is fitted with the nose-mounted M433 remotely set multifunction (impact/delay) fuze, which can provide for variable depth penetration of forest canopy, buildings or bunkers - it also has a super-quick graze function. The M433 impact/delay fuze weighs 816.5 g. An alternative is the essentially similar remotely set M432 airburst fuze. There is also a M429 proximity fuze. Neither of these latter fuzes are in production in the USA. Helicopter-launched [M151](#) HE rockets utilise the M423/M427 point detonating fuzes, the former intended for helicopters and the latter for aircraft - they differ only in the arming time.

The [M151](#) HE rocket has a maximum range of 10,400 m and a velocity of 1,517 m/s. Weight at launch is 10 kg. From 2,000 m to maximum range, accuracy is such, that the average circular error of probability is 80 m. For practice there is the M274 containing a smoke spotting charge or the completely inert WTU-1/B, the latter normally used for the ballistic testing of rocket motors. **The latter are both 411 mm long and both weigh 4.2 kg.**

M229 Although mentioned in some references the M229 FRAG-HE warhead, intended to provide an anti-personnel and anti-materiel capability, does not appear to have been manufactured in any quantity for the HYDRA 70 system, although it continues to be marketed. The M229 warhead weighs 7.62 kg and is 677 mm long; explosive content is 2.18 kg of Composition B-4 in a prefragmented cast-iron warhead casing.

M261 First fielded in 1990, the M261 warhead carries a payload of nine [M73](#) multipurpose submunition grenades intended for use against personnel, materiel, armour and helicopters. **It has been described as a MPSM HE (MultiPurpose Sub-Munition High Explosive).** The M261 warhead has a high-impact plastic nose and an aluminium alloy body with an internal base-mounted M439 remotely

set fuze (weight 108.9 g). Alternatives are the M442 or M446 motor burnout fuzes that allow the M261 warhead to be used with MK4-Mod 40 rocket motors.

As the base fuze functions, the nine [M73](#) submunitions are ejected over the target area. On ejection a ram-air decelerator (a small drogue parachute) is deployed to arm the submunition's impact fuze while decelerating and stabilising the body in descent. As the fuze functions on impact the submunition's shaped 100 g Composition B charge (plus a 13 g LX-14 booster) disrupts the steel body, which is prescored internally, to create its anti-personnel effects. A single M261 warhead can distribute its submunitions over an area roughly the size of a football field.

The M261 multipurpose rocket has a maximum range of 8,080 m and a velocity of 1,500 m/s. Warhead weight is 6.12 kg and it is 683 mm long. An M267 Practice warhead containing smoke-filled submunitions can be used for training.

M255A1 Another payload-carrying warhead is the M255A1 anti-personnel, carrying approximately 1,200 60 grain flechettes and three tracers, again utilising the remote set M439 base fuze for timing the release point against massed infantry targets. **Warhead weight is 5.7 kg and length 683 mm.** It was first fielded in 1993.

M247 The M247, described as a multipurpose warhead, has a unitary shaped Composition B charge weighing approximately 1 kg for employment against armour. It has an M438 base-mounted impact fuze activated by a piezoelectric element in the warhead nose. It is no longer produced.

M264 The M264 Smoke warhead can generate screening smoke for up to 5 minutes and is activated by a remote set M439 fuze. The normal smoke composition involved with the earlier [M259](#) rocket was White Phosphorus (WP) - the M264 uses a Red Phosphorus (RP) based filling of 72 presaturated pellets. **Warhead weight is 4.2 kg and length 683 mm.** An M156 smoke warhead has also been produced. From eight to 10 rockets are required to form a complete screen.

[M262](#) The [M262](#) Illuminating warhead is also activated by a remote set M439 fuze and can produce 1 million candlepower illumination for approximately 2 minutes. The intention for this warhead/rocket motor combination is that they can be fired individually under the automatic control of a digital remote timer unit. One launcher fully loaded with six 19-tube M261 launch pods, can produce constant illumination of a selected area for up to 2 hours 30 minutes. The [M262](#) is no longer produced.

M257 The M257 Illuminating warhead has replaced the earlier [M262](#). It is 739 mm long and weighs 4.9 kg.

M278 The M278 is generally similar to the M257 in operation but emits infra-red light to illuminate targets to be viewed by night vision equipment. It is 729 mm long and weighs 6.5 kg.

M245 References have been found to an M245 Chemical warhead but it is assumed that any of these remaining have been withdrawn from service and are scheduled for destruction.

LCPK LCPK refers to Low Cost Precision Kill and is the subject of an advanced technology demonstrator contract for a semi-active, laser-guided version of a 2.75 in rocket. The contract was awarded to Marconi Aerospace Defense Systems of Austin, Texas, and Raytheon Systems of Tucson, Arizona. The project is funded by the US Army and the US Marine Corps. It is understood that the programme is intended to improve helicopter-launched rockets and will be issued as a retrofit kit to be added to existing rockets.

Specifications

[M151 HE](#)

Calibre: 69.85 mm/2.75 in

Weights:

complete rocket - 10 kg

rocket motor - 6.16 kg

HE warhead - 4.67 kg

HE warhead explosive - 1.04 kg Comp B-4

Lengths:

complete rocket - 1.4 m

rocket motor - 683 mm

warhead - 411 mm

Max range: 10,400 m

Max velocity: 1,517 m/s

Rocket motor average thrust: 642 kg

Rocket motor total impulse: 687 kg

Time of burning: 1.07 s

Operational temperature range: -45 to +65°C

Authorised fuzes

See text

Equivalent rockets

CANADA

Manufacturer

Bristol Aerospace Limited

Type: Various - see below

Description: Developed for use with the Canadian Rocket Vehicle (CVR-7) Advanced Rocket System developed by the Canadian Department of National Defense and manufactured by [British Aerospace](#).

The 2.75 in CVR-7 was developed along the same lines as the HYDRA 70, but the C15 (RLU-5002/B) rocket motor has a case-bonded, high-energy, solid-propellant fuel using an Hydroxy-Terminated-Poly-Butadiene (HTPB) binder with an 88 per cent solids content of ammonium perchlorate and ferric oxide. The motor delivers 970 kg of thrust for 1.8 seconds and has a maximum range of 14,000 m. Available warheads include: the 4.3 kg [M151](#) HE as used with the HYDRA 70; the M229 FRAG-HE; the [M249](#) HEDP; the M156 Incendiary/WP; the M257 Illuminating; and a long-range Mk 1 HE warhead weighing 2.7 kg. Although these rockets and warheads are in production for air-to-ground applications they have yet to be procured for the ground-to-ground role. The CVR-7 C16 rocket motor has a fluted exhaust nozzle which is compatible with HYDRA 70 motors.

Manufacturer

Bristol Aerospace Limited

Type: C17

Description: The C17 is the latest in the CRV7 rocket series optimised for use from helicopters, such as the AH-64D Apache, and has been selected by the UK MoD. Compared to earlier models, propellant weight is increased to 3.81 kg while total rocket weight is reduced to 5.8 kg. Burn time is 0.9 second. Speed performance is stated to be 36 per cent faster than earlier models, with 40 per cent less ballistic dispersion. Standard HYDRA 70 warheads can be installed. Talley Defense Systems is the CVR7 series licensee for the USA.

KOREA, SOUTH

Manufacturer

Hanwha Corporation

Type: 2.75 in [M151](#)

Description: Mainly for helicopter applications. K99 high-performance rocket motor also produced.

NORWAY

Manufacturer

Raufoss Technology A/S

Type: 2.75 in RA79 HEISAP

Description: Primarily produced for helicopters and aircraft, the RA79 is a multipurpose rocket warhead compatible with all 2.75 in rockets. It is designed to detonate only after penetrating a target exterior, combining blast and incendiary effects. The warhead weighs 5.91 kg and contains Composition A3 and zirconium. The RA82 is a Practice warhead. The RA79 is in service with Denmark, Norway and the UK.

[TURKEY](#)

Manufacturer

Elroksan, [MKEK](#)

Type: 2.75 in Rocket System

Description: Primarily produced for helicopters but also launched from [MAKSAM](#) RA 7040 40-tube ground-to-ground rocket launcher with a range of 7,400 m. Involves full range of HYDRA 70 warheads.

UPDATED



Typical 70 mm HYDRA 70 rocket



70 mm M261 multipurpose submunition warhead, one of several warhead options for 70 mm HYDRA 70 rockets

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Projectile, 155 mm: Illumination, M485, M485A1 and M485A2

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS; XM777 Lightweight Towed Howitzer.

The 155 mm Illumination M485 series can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The 155 mm Illumination M485 series can also be fired from the self-propelled artillery weapons: TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The M485 series of 155 mm illumination projectiles have virtually taken the place of the earlier M118 series of illumination projectiles, although the M118 series may still be encountered in service with various nations (see previous entry). The 155 mm Illumination M485A2 is now the standard 155 mm illumination projectile used by the US and most NATO armed forces. Although this series is no longer in production in the USA, some production capability remains.

Description

The M485 series of 155 mm illumination projectiles are separate loading munitions using a hollow forged steel body with a steel base plug press fitted to the rear of the projectile and held in place by shear pins and twist pins. The exterior is fitted with a single gilding metal drive band and a plastic obturating band. The shell interior contains a primary expulsion charge, a canister assembly and a drogue parachute. The canister assembly contains a secondary expulsion charge, a delay holder, an illumination composition and the main parachute.

On the 155 mm Illumination M485 the base plug is secured to the body by shear pins only. This projectile is no longer produced but may be encountered in service.

The 155 mm Illumination M485A1 has the base plug secured by shear pins and twist pins. The M485A1 is no longer produced but may be encountered in service.

The 155 mm Illumination M485A2 has a revised canister assembly and the canister fins are perforated to decrease the rate of deceleration before the main parachute deploys; the 155 mm Illumination M485A2 is the standard US armed forces variant of the M485 series and is the only one now in production anywhere.

In operation the nose-mounted time fuze functions at the preselected time and ignites the primary expulsion charge. The resultant pressure forces the drogue parachute and canister against the baseplate, rupturing the base pins and expelling the canister assembly and its parachute. Once out of the shell body the drogue parachute deploys to decelerate the canister assembly while fins deploy to stop rotation. The primary expulsion charge also ignites the delay element in the nose of the canister assembly. After 8 seconds delay and once rotation has ceased, the secondary expulsion charge ignites the illuminating composition and expels the main parachute and the flare body from the canister assembly. The main parachute deploys and, with the flare candle suspended from shrouds, the illuminating body descends at a rate of 4.5 to 5 m/s. The flare will burn for up to 2 minutes, producing approximately 1 Mcd.

The 155 mm Illumination M485A2 can be fired using the M3A1/M4A2 bagged charges although Charge 1 is not normally used. The [M119](#) series unitary charges can be used but not the [M203](#). It is not recommended that 155 mm Illumination M485A2 projectiles are fired with mechanical fuze settings below 10 seconds.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required) and the base igniter contains black powder.

The Propelling Charge M4 is a white bag charge differing from the [M4A1](#) as it consists of a base charge and two increments only for firing as Charges 5 to 7. The M2 flash reducer pad is used with this charge.

The M3 and M4 series of charges are fired using the MK2A4 or [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn onto the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The M119A2 charge is produced by Eurometaal NV as the No 13.

The [M119](#) series of propellant charges should be fired using the Primer [M82](#) only.

When fired from the 155 mm [M1/M1A1](#) Cannon on M114/M114A1 towed howitzers the following ballistic performance can be attained:

Charge 1 (M3 green bag) - MV 212 m/s - range 2,788 m
Charge 2 (M3 green bag) - MV 241 m/s - range 3,858 m
Charge 3 (M3 green bag) - MV 275 m/s - range 5,121 m
Charge 4 (M3 green bag) - MV 318 m/s - range 6,908 m
Charge 5 (M3 green bag) - MV 381 m/s - range 8,675 m
Charge 3 ([M4A1](#) white bag) - MV 279 m/s - range 5,324 m
Charge 4 ([M4A1](#) white bag) - MV 322 m/s - range 6,993 m
Charge 5 ([M4A1](#) white bag) - MV 382 m/s - range 8,670 m
Charge 6 ([M4A1](#) white bag) - MV 472 m/s - range 10,962 m
Charge 7 ([M4A1](#) white bag) - MV 576 m/s - range 13,648 m.

When fired from the 155 mm M126/M126A1 Cannon on [M109](#) self-propelled howitzers the following ballistic performance can be attained:

Charge 1 ([M3A1](#) green bag) - MV 211.4 m/s - range 2,949 m
Charge 2 ([M3A1](#) green bag) - MV 239.1 m/s - range 3,923 m
Charge 3 ([M3A1](#) green bag) - MV 282.5 m/s - range 5,587 m

Charge 4 ([M3A1](#) green bag) - MV 324.7 m/s - range 7,236 m
Charge 5 ([M3A1](#) green bag) - MV 385.6 m/s - range 8,816 m
Charge 3 (M4A2 white bag) - MV 275 m/s - range 5,293 m
Charge 4 (M4A2 white bag) - MV 320.7 m/s - range 7,057 m
Charge 5 (M4A2 white bag) - MV 380 m/s - range 8,635 m
Charge 6 (M4A2 white bag) - MV 473.6 m/s - range 10,993 m
Charge 7 (M4A2 white bag) - MV 576.5 m/s - range 13,586 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers the 155 mm Illumination M485A2 can attain the following ballistic performances:

Charge 2 ([M3A1](#) green bag) - MV 240.3 m/s - range 3,933 m
Charge 3 ([M3A1](#) green bag) - MV 281 m/s - range 5,569 m
Charge 4 ([M3A1](#) green bag) - MV 323.3 m/s - range 7,155 m
Charge 5 ([M3A1](#) green bag) - MV 381.7 m/s - range 8,721 m
Charge 3 (M4A2 white bag) - MV 309.8 m/s - range 6,746 m
Charge 4 (M4A2 white bag) - MV 353.2 m/s - range 7,949 m
Charge 5 (M4A2 white bag) - MV 408.4 m/s - range 9,317 m
Charge 6 (M4A2 white bag) - MV 488.9 m/s - range 11,304 m
Charge 7 (M4A2 white bag) - MV 576.5 m/s - range 13,586 m
Charge 8 ([M119/M119A1](#)) - MV 696.7 m/s - range 17,086 m.

When fired from the 155 mm [M119](#) Cannon on the [M198](#) towed howitzer the following ballistic performance can be attained:

Charge 2 ([M3A1](#) green bag) - MV 239.8 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 280.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 322.9 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 380.1 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 296.5 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 340.9 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 398 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 482 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 574.3 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - MV 684.3 m/s - range 18,100 m.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are currently in the process of adopting similar modular charge systems.

Specifications

Weights:

fuzed - 42.48 kg
unfuzed - 41.73 kg
contents - 2.63 kg

Length:

fuzed - 722.6 mm
body - 604.3 mm

Max body diameter: 154.89 mm

Diameter over drive band: 158.75 mm

Flare burning time: 120 s

Descent rate: 4.5-5 m/s

Operating temperature range: -32 to +52°C

Authorised fuzes

MT M577 M565 series

MTSQ M577

ET M724

Equivalent projectiles

CANADA

Manufacturer

SNC Industrial Technologies Inc (SNC TEC)

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

FRANCE

Manufacturer

Giat Industries

Type: 155 mm Illuminating M485A2

Description: Standard US specifications. No longer in production but still likely to be encountered

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Illuminating IM470A1

Description: Similar to 155 mm Illumination M485A2. Illuminating unit weighs 2.5 kg

KOREA, SOUTH

Manufacturer

Hanwha Corporation

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

Manufacturer

Korea Explosives Company

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm NR 109

Description: This is basically identical to the 155 mm Illuminating M483A1 but with a flare body producing 2.18 Mcd burning for 69 seconds, with a rapid rise in intensity immediately after ignition. Weight given as 46.5 kg. This projectile is also produced by the Thiokol Corporation in the USA

SPAIN

Manufacturer

EXPAL SA

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: 155 mm Illuminating M485A2

Description: Standard US specifications

UNITED STATES OF AMERICA

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: 155 mm Illuminating M485A2

Description: Standard specifications

Manufacturer

Thiokol Corporation

Type: 155 mm Illuminating M485A2

Description: Standard specifications. 155 mm NR 109 also produced (see under Netherlands)

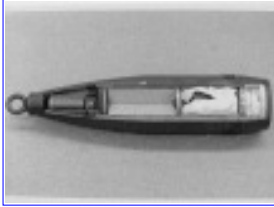
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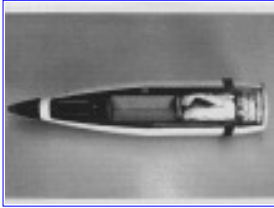
Projectile, 155 mm: Illuminating, M485A2 as produced by Giat Industries



Projectile, 155 mm: Illuminating, M485A2 (right) compared to 155 mm HE [M107](#) (left); both projectiles are manufactured by the Hanwha Corporation of [South Korea](#) (1999)



Cross-sectioned Projectile, 155 mm: Illuminating, M485A2



The Eurometaal 155 mm NR 109, a revised version of the 155 mm Illuminating M485A2

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Giat Industries Ammunition for 105 mm LG1 Guns

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence [M119A1](#) Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178](#) ([South Korea](#)); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) (Modified) Germany; [105 mm Howitzer M56](#) (Federal Republic of [Yugoslavia](#)).

Development

With the introduction of the [105 mm LG1](#) light towed gun Giat Industries developed a new family of 105 mm ammunition. This new family is based around the use of an enhanced range 105 mm HE projectile with a Base Bleed (BB) unit. The entire family of six rounds, produced by Giat Industries, can be fired from 105 mm artillery pieces with standard chambers but to take full advantage of the range increases made possible with the new 105 mm family they are meant to be fired from the longer barrelled (33 or 34 calibre) and modernised 105 mm artillery systems. The full family is optimised for firing from the 30-calibre barrel of the Giat Industries [105 mm LG1](#) Mk II.

One component of this family, the 105 mm HE ER G1, is licence produced in Canada. See later in entry for details.

Description

There are six rounds in the Giat Industries [105 mm LG1](#) ammunition family, two fitted with Base Bleed (BB) units, two with base bleed units and increased propellant charges, and two with drag-reducing Boat Tail (BT) units. The rounds fitted with base bleed units are fixed rounds as they have a single fixed single base propellant charge. With these rounds the projectile is secured to the brass cartridge case by a single crimping ring. The two BT rounds are semi-fixed with the cartridge cases containing variable propellant charges for zones 6 to 10. Percussion primers are employed.

The two base bleed rounds have a maximum range of 17,500 m when fired from the [105 mm LG1](#) Mk II gun or one of the longer barrelled 105 mm systems (such as the Giat Industries [105 mm M101A1](#) Modernised). Firing the hollow base projectiles from the same guns the maximum range is 15,000 m. For details of the increased propellant charge rounds, see below.

The rounds in the [105 mm LG1](#) family follow.

105 mm HE ER G1

The HE projectile used with this fixed round has a high-fragmentation steel body filled with 2.5 kg of TNT, and is fitted with a base bleed unit containing 500 g of Propergol providing a maximum range of 17,500 m when fired from the [LG1](#) and similar weapons. As with all the rounds in the [105 mm LG1](#) family the 105 mm HE ER G1 round is 850 mm long overall, the 13 kg projectile is 569 mm long. The complete round weighs 18 kg. Muzzle velocity when fired from the [LG1](#) gun is 685 m/s.

105 mm HE ER G2

This extended range HE round is generally similar to the 105 mm HE ER G1 but has a heavier (2.2 kg) propellant charge to enable it to be fired with a muzzle velocity of 710 m/s. When fired from the [LG1](#) Mk II light gun it has a maximum range of 18,100 m.

This round is licence produced in Canada by SNC Technologies as the Cartridge, 105 mm HE C132. It is fired by Canadian Armed forces [LG1](#) Mk II light guns and C3 howitzers, the latter having a 33-calibre barrel enabling it to reach a range of 18,800 m. The round utilises a C20 primer and a C12 (modified [M14](#)) brass cartridge case. Various types of nose-mounted fuze can be used, including the PD M739.

105 mm WP ER G1

As with the 105 mm HE ER G1, the 105 mm WP ER G1 Smoke round is fixed with the projectile having a base bleed unit. The projectile weighs 13.1 kg and is filled with 2.3 kg of White Phosphorus (WP). Other dimensions and performance figures are as for the 105 mm HE ER G1. Muzzle velocity when fired from the [LG1](#) Mk II gun is 685 m/s.

105 mm Smoke BB G2

Corresponding to the 105 mm HE ER G2, this round has an increased propellant charge (2.2 kg) to enable it to attain a muzzle velocity of 710 m/s. This produces a maximum range of 18,100 m when

fired from the [LG1](#) Mk II light gun. It is otherwise identical to the 105 mm WP ER G1 Smoke round.

105 mm HE BT G1

This HE round is semi-fixed as the brass cartridge case contains variable charges for zones 6 to 10. The high-fragmentation steel projectile weighs 13 kg and contains 2.5 kg of TNT. Maximum range when fired from the [LG1](#) gun or a similar artillery piece is 15,000 m. Other weights and dimensions are as for the 105 mm HE ER G1. Muzzle velocity when fired from the [LG1](#) gun is 675 m/s.

105 mm WP BT G1

This round is the Smoke equivalent of the 105 mm HE BT G1 with the 13.1 kg projectile containing 2.3 kg of White Phosphorus (WP). The complete round weighs 18 kg. Other details are as for the 105 mm WP BT G1.

Maximum ranges of the HE and Smoke BT projectiles when fired from the Giat [105 mm LG1 Mk II Light Gun](#) are as follows:

- Charge 6 - 6,250 m
- Charge 7 - 9,400 m
- Charge 8 - 11,000 m
- Charge 9 - 13,100 m
- Charge 10 - 15,000 m.

Specifications

Type	HE BB	Smoke BB	HE BT	Smoke BT
Designation	HE ER G1	WP ER G1	HE BT G1	WP BT G1
Weights: complete round	18 kg	18 kg	18 kg	18.2 kg
projectile	13 kg	13.2 kg	13 kg	13.1 kg
filling	2.5 kg TNT	2.5 kg WP	2.5 kg TNT	2.5 kg WP
Lengths: complete round	850 mm	850 mm	850 mm	850 mm
projectile, fuzed	569 mm	569 mm	569 mm	569 mm
Propellant charge	fixed	fixed	variable	variable
Propellant charge weight	2.2 kg	2.2 kg	2.2 kg	2.2 kg
Muzzle velocity	685 m/s	685 m/s	675 m/s	675 m/s
Max range	17,500 m	17,500 m	15,000 m	15,000 m

Authorised fuzes

Standard fuzes as required

Equivalent rounds

CANADA

Manufacturer

SNC TEC

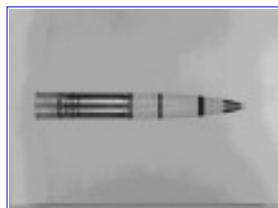
Type: HE ER C132

Description: See data for HE ER G2 in text. Also produced is RP Smoke XMR102 (see separate entry).

UPDATED



*105 mm HE ER G1 HE round for [LG1](#) gun
(1998)*



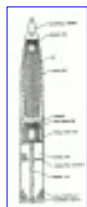
105 mm WP ER G1 Smoke round for [LG1](#) gun



105 mm HE BT G1 HE round for [LG1](#) gun



*Giat Industries ammunition for [105 mm LG1](#) gun with projectiles, from left: HE ER G2; HE ER G1; Smoke BB G2; HE BT G1; WP ER G1
(1999)*



*Cross section outline drawing of Canadian Cartridge, 105 mm HE C132 as licence produced by SNC Technologies
(1999)*

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

35 × 228 mm Oerlikon Contraves Pyrotec AG Break-Up ammunition

Armament

All Oerlikon Contraves 35 mm KD series cannon including: [GDF-002](#) and [GDF-005](#) automatic anti-aircraft guns (Switzerland); Gepard (Germany) and CA 1 (Netherlands) twin 35 mm self-propelled anti-aircraft guns; [Type 87 twin 35 mm self-propelled](#) anti-aircraft gun ([Japan](#)); ZA-35 twin 35 mm self-propelled anti-aircraft gun ([South Africa](#)); Denel 35DPG naval gun ([South Africa](#)); [LIW](#) EMAK ([South Africa](#)); Marconi Marksman twin 35 mm anti-aircraft turret (UK); OE/OTO 35 mm naval mounting (Italy); Boeing Company Bushmaster III (USA); GMD-A twin 35 mm naval mounting (Switzerland); 35/1000 revolver cannon; Millenium 35/1000 naval gun system (UK); [SkyShield 35](#); Skoda 35 mm SPAAG ([Czech Republic](#)).

NORINCO of [China](#) manufactures the Twin 35 mm Towed AA Gun System, a licence-produced version of the Oerlikon Contraves [GDF-002](#).

Development

The 35 × 228 mm Oerlikon Contraves Pyrotec Break-Up ammunition was originally designed and developed by NWM De Kruithoorn to provide training for Oerlikon Contraves 35 mm air defence gun crews in the handling, feeding and firing of live ammunition without the corresponding requirement for large ranges and safety areas. Production and sales rights have now been taken over by Oerlikon

Contraves Pyrotec AG. Factors such as sound, flash and smoke are the same for real ammunition and gun mechanisms function normally. Simulated targets, such as live aircraft, can be fired at without any danger of the target being hit as the projectiles fired break up into harmless plastic fragments and powder particles after travelling a maximum distance of less than 100 m.

Oerlikon Contraves, including Oerlikon Contraves Pyrotec AG, is now a member of [Rheinmetall DeTec AG](#).

Description

The Oerlikon Contraves Pyrotec Break-Up round, used to simulate operational 35 × 228 mm Oerlikon rounds, resembles a TP round in appearance and handling. It is therefore a fixed round using a steel cartridge case and the usual primer, together with the usual propellant charge.

The 35 mm Break-Up projectile consists of a thin plastic jacket made from two parts, friction welded together. The core of the projectile contains specially treated pressed iron powder in tablet form for much of the shell body interior and loose in the base. The nose of the projectile contains a polystyrene foam core. The projectile is glued into the cartridge case mouth after the insertion of a felt disc to provide a separation between the propellant and the glue and to protect the base of the projectile against heat when firing.

On firing, the projectile passes up the bore and initial spin is imparted by a moulded white nylon drive band. As centrifugal forces increase, the iron powder filling attempts to migrate outwards but the barrel walls supporting the projectile's plastic jacket prevent any outward movement. The projectile jacket remains intact until it leaves the muzzle. Internal forces then cause the jacket to rupture longitudinally along fluted serrations. The serrations cause the jacket to open up completely and create maximum drag so that it will only travel a short distance. The iron powder filling flows from the ruptured jacket and spreads over the ground close to the gun muzzle. The maximum safety area in front of the gun muzzle required by the 35 mm Break-Up round is 100 m long and 45 m wide.

Specifications

Weights:

complete round - 1.5 kg

projectile - 520 g

Projectile filling: pressed iron powder

Lengths:

complete round - 387 mm

cartridge case - 228 mm

Authorised fuzes

None involved

Equivalent rounds

CANADA

Manufacturer

SNC TEC

Type: Break-Up C121

Description: Standard specifications.

UPDATED



The break-up sequence, from left to right, of a typical Oerlikon Contraves Pyrotec Break-Up projectile; this sequence is typical for all calibres of Oerlikon Break-Up ammunition

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

35 × 228 mm AHEAD ammunition

Armament

All Oerlikon Contraves 35 mm KD series cannon including: GDF-001, [GDF-002](#) and [GDF-005](#) automatic anti-aircraft guns (Switzerland); Gepard (Germany) and CA 1 (Netherlands) twin 35 mm self-propelled anti-aircraft guns; [Type 87 twin 35 mm self-propelled](#) anti-aircraft gun ([Japan](#)); ZA-35 twin 35 mm self-propelled anti-aircraft gun ([South Africa](#)); Denel 35DPG naval gun ([South Africa](#)); [LIW](#) EMAK ([South Africa](#)); Marconi Marksman twin 35 mm anti-aircraft turret (UK); OE/OTO 35 mm naval mounting (Italy); Boeing Company Bushmaster III (USA); GMD-A twin 35 mm naval mounting (Switzerland); 35/1000 revolver cannon; Millennium 35/1000 naval gun system (UK); [SkyShield 35](#); Skoda 35 mm SPAAG ([Czech Republic](#)).

NORINCO of [China](#) manufactures the Twin 35 mm Towed AA Gun System, a licence-produced version of the Oerlikon Contraves [GDF-002](#).

Development

The codename AHEAD (Advanced Hit Efficiency And Destruction), refers to a new generation of 35 × 228 mm ammunition. It was intended to expand the defensive capability of medium calibre air defence guns in response to the anticipated threat from precision-guided munitions, missiles and other high-technology weaponry. Although originally developed for the 35 mm calibre the concept could be expanded to other calibres. The AHEAD concept also has applications against armoured land targets

such as APCs and similar vehicles.

Development of the AHEAD concept by Oerlikon Contraves Pyrotec AG commenced during the late 1980s, with the first public presentation of the concept being given in mid-1991. By October 1992, the first firing demonstration was given, followed by a further live firing demonstration against towed air targets in September 1993. More successful live firing demonstrations against drone targets followed.

AHEAD is fully developed and in production, available for use with the 35/1000 revolver cannon which is part of the Oerlikon Contraves [SkyShield 35](#) air defence system and the Millennium 35/1000 naval air defence system.

During 1996, Canada became the first NATO customer for AHEAD, when it acquired upgrade kits for its 20 [GDF-005](#) air defence guns; with the Canadian air defence batteries it was initially intended that AHEAD ammunition will replace HEI in the air defence role. [Oman](#) is known to be another AHEAD user. The AHEAD round remains one of the ammunition types under consideration for use with the South African Denel 35DPG dual-purpose naval gun. AHEAD ammunition is also proposed for use with the Czech Skoda 35 mm SPAAG on a TATRA T815 8 × 8 wheeled chassis; this system carries an unmanned mounting similar to that used by the Oerlikon Contraves [SkyShield 35](#).

Trials have been held to determine the effects of AHEAD ammunition on armoured ground targets.

Oerlikon Contraves Pyrotec AG have proposed that AHEAD technologies could form part of future modernisation programmes involving both air defence and ground-to-ground 30 mm cannon systems. See entry on the 30 × 173 mm Air Bursting Munition (ABM) in the Cannon section. [AHEAD technology is also involved in the time-fuze system employed with the 40 mm Air Bursting Munition System \(ABMS\) for a wide range of 40 mm automatic high-velocity grenade launchers. The ABMS is produced by Singapore Technologies Kinetics \(ST Kinetics\).](#)

Oerlikon Contraves, including Oerlikon Contraves Pyrotec AG, is now a member of [Rheinmetall DeTec AG](#).

Description

35 mm AHEAD rounds are fixed, as other 35 × 228 mm Oerlikon ammunition and are handled and loaded in the same way.

The 35 × 228 mm AHEAD round, Oerlikon designation PMD062, uses a heavy metal payload projectile with a programmable base fuze. The fuze contains an advanced high-precision timer that will detonate a forward firing ejection charge according to how it is programmed. The timer is programmed after it has passed through a triple-coil muzzle velocity gauge as the projectile leaves the gun muzzle. Muzzle safety for the projectile is more than 60 m.

As the projectile passes through the first two coils, set 100 mm apart, its exact velocity is determined and processed together with target information supplied by the fire-control system computer. The exact projectile flying time is calculated to thousandths of a second and imparted by electro-induction to the programmable base fuze as the projectile passes through a third coil. The high-precision time module in the fuze will then signal the fuze to function and detonate the less than 1 g ejection charge at a given distance in front of the target, forming a cone of 152 tungsten alloy subprojectile pellets which are directed towards the target. One 25-round burst can produce a 'swarm' containing 3,800 tungsten alloy pellets covering an expected target position. If the fuze fails to function for any reason, it will self-destruct after 8.19 seconds, an equivalent range of approximately 5,000 m.

The spin-stabilised subprojectiles (the spin rate is about 1,000 rps) were design calculated to be capable of defeating any missile, drone or remotely piloted vehicle by kinetic energy alone, whatever front-end armour they might possess. Each cylindrical tungsten alloy subprojectile weighs 3.3 g. The complete payload is stacked in eight layers, with each layer containing 19 subprojectiles.

A practice round with a totally inert projectile is available for gun testing.

Specifications

Weights:

complete round - 1.77 kg

projectile - 750 g

payload - 500 g (152 subprojectiles)

subprojectile, each - 3.3 g

Lengths:

complete round - 387 mm

cartridge case - 228 mm

Muzzle velocity: 1,050 m/s

Number of subprojectiles: 152

Flight time

to 1,000 m - 1.05 s

to 2,000 m - 2.34 s

to 3,000 m - 3.98 s

Temperature range: -30 to +50°C

Authorised fuzes

ET - integral, see text

Equivalent rounds

CANADA

Manufacturer

SNC TEC

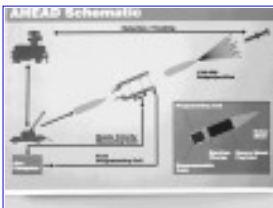
Type: AHEAD C141

Description: Standard specifications.

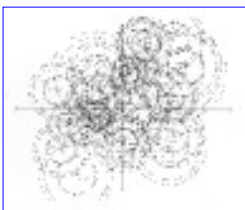
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Cross-section of an Oerlikon Contraves Pyrotec AG 35 × 228 mm AHEAD projectile



Schematic showing the general principle of the AHEAD projectile as used with the Skyguard fire-control system and a 35 mm air defence gun system



A typical distribution pattern of subprojectiles produced from a short burst of AHEAD rounds; each AHEAD projectile contains 152 heavy metal projectiles



Cross-section of a complete Oerlikon Contraves Pyrotec AG 35 × 228 mm AHEAD round (1998)



The effect of a single 35 × 228 mm AHEAD projectile on an aircraft cockpit canopy (1998)

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MORTARS - 120 mm MORTARS, [CHILE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb 44/66

Armament

All 120 mm smoothbore mortars.

Development

By [FAMAE](#), based upon the [TDA](#) M44/66 pattern.

Description

A forged steel bomb of conventional shape, with light-alloy tailboom and fins. The nose is threaded for the fuze and a light exploder container is pressed into the filling. A primary cartridge fits into the tailboom and seven secondary increments fit around it in horseshoe containers.

Specifications

Length, fuze: 679 mm

Weight, fuze: 13 kg

Type of payload: TNT

Number of charges: P + 7

Fuze: impact SQ [V19P](#)

Min range: 500 m

Max range: 6,650 m

Manufacturer

[FAMAE.](#)

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[FAMAE 120 mm 44/66 HE bomb](#)

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MORTARS - 81 mm MORTARS, [CHILE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M57

Armament

All 81 mm mortars.

Development

By [FAMAE](#), based upon [TDA M57](#) pattern.

Description

A cast-iron, teardrop-shaped bomb with an ogival nose closed by an adaptor forming the exploder container. The 10-fin tail unit is of extruded aluminium alloy and contains a primary cartridge in the tail tube and up to six secondary charges in horseshoe-shaped plastic containers, which clip around the tail tube above the fins.

Specifications

Length, fuzed: 365 mm

Weight, fuzed: 3.2 kg

Type of payload: TNT

Number of charges: P + 6

Fuze: impact SQ [V19P](#) or [V19PA](#)

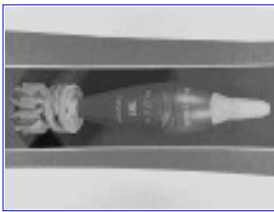
Min range: 100 m

Max range: 4,200 m

Manufacturer

[FAMAE.](#)

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81 mm HE bomb [M57](#)

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MORTARS - 60 mm MORTARS, [CHILE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb M61A

Armament

Any 60 mm mortar.

Development

By [FAMAE](#), based on the Hotchkiss-Brandt ([TDA](#)) M61 pattern.

Description

A cast-iron bomb of teardrop shape. The nose is rather more ogival than is common in this shape, and has five gas check grooves at the bourrelet. The tail unit is of extruded and machined aluminium alloy and screws into the rear of the body. The usual primary cartridge fits into the tail tube and four secondary charges in plastic capsules clip into slots in the forward edges of the fins; a further secondary charge in horseshoe form fits around the short tailboom in front of the fins.

Specifications

Length, fuze: 310 mm

Weight, fuze: 1.72 kg

Weight and type of payload: TNT

Number of charges: P + 5

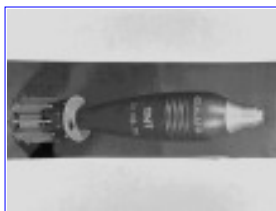
Fuze: impact SQ V9

Max range: 1,050 m, Charge 2, in Commando and short mortars; 2,050 m Charge 4 in standard length mortars

Manufacturer

[FAMAE.](#)

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[FAMAE](#) 60 mm HE bomb M61A

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.62 × 25 mm

Synonyms:

7.62 mm Tokarev ; 7.62 Soviet pistol; 7.62 Russian; 0.30 Mauser; 7.63 × 25mm

Armament

Tokarev [TT33](#) automatic pistol; various obsolete Soviet sub-machine guns (PPD, PPSH, [PPS](#)); Chinese Type 85 sub-machine gun and Type 80 pistol. Current pistols and submachine guns chambered for this cartridge include the Russian A-7.62. Most pistols and sub-machine guns chambered for the 7.63 mm Mauser cartridge will probably operate satisfactorily with this round and vice versa.

Development

This cartridge actually began life as the 7.63 mm Mauser automatic pistol cartridge. It was taken into use by the Russian forces in the early 1900s and the pistol remained popular with the Bolshevik armies, one model being produced specifically for the Soviet government. As a result manufacture of the Mauser cartridge began in [Russia](#), and when in due course the Tokarev automatic pistol was developed, it was designed around the Mauser cartridge. For manufacturing convenience the barrel of the Tokarev was 7.62 mm calibre, thus the Soviet cartridge lost its Mauser designation and became known as the 7.62 mm Tokarev. The dimensional differences between the Soviet round and the original Mauser specifications are minute and largely due to the manufacturing processes. It can therefore be expected that any weapon originally using the Mauser cartridge will work with the Soviet pattern and vice versa.

This cartridge has been manufactured in [China](#) and various countries of the former Warsaw Pact, but always to the Soviet specification. The Chinese pattern (below) is stated to be for the automatic pistols Type 54 and Type 80 and for the [Type 85 light sub-machine](#) gun. Like the 7.63 × 25 mm cartridge from which it is derived, the 7.62 × 25 mm performs very well against soft body armour and light metal, such as automobile bodies. This cartridge has seen new interest in [Russia](#) in recent years because it has excellent capability against soft body armour.

Description

The case is rimless and bottlenecked. The standard ball bullet is round-nosed and lead cored with a steel jacket.

Specifications

Ball Type P

Round length: 34.55 mm

Round weight (nominal): 10.65 g

Case length: 25.14 mm

Rim diameter: 9.91 mm

Bullet diameter: 7.82 mm

Bullet weight: 5.57 g

Muzzle velocity: 505 m/s

Muzzle energy: 709 J

Abridged ballistic table: 7.62 mm Tokarev, 5.57 g ball

Range	Velocity	Energy
0 m	505 m/s	709 J
10 m	500 m/s	695 J
25 m	496 m/s	684 J
50 m	485 m/s	654 J

CHINA, PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: Type 51: FMJ; 5.6 g; MV 420 m/s

AP Type 64: FMJ; cartridge weight 12.13-13.03 g; MV 285-305 m/s; specifically for use in Type 64 and 85 sub-machine guns

CZECH REPUBLIC

Manufacturer

Sellier & Bellot

Type: Ball: FMJ; 5.5 g; MV 420 m/s

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer

Government arsenals

Type: Ball P: FMJ; 5.57 g; MV 455 m/s

AP incendiary P-41: For sub-machine guns; 4.79 g; steel-jacketed bullet with hard steel core and incendiary composition in the nose

Tracer PT: Also for sub-machine guns; lead-cored bullet with base tracer

[SOUTH AFRICA](#)

Manufacturer

New Generation Ammunition (Pty) Ltd

Type: Ball: FMJ; 5.57 g; MV 442 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 5.5 g; MV 520 m/s

Ball: JHP; 5.5 g; MV 522 m/s

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7.62 × 25 mm Soviet Pistol

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TANK AND ANTI-TANK GUNS

Date Posted: 23 January 2002

Jane's Ammunition Handbook 2002-2003

85 mm HEAT-FS BK-2M

Armament

[85 mm Divisional Gun D-44](#); 85 mm Auxiliary-propelled Field Gun [SD-44](#); 85 mm [M1944](#) ZIS-S-53 tank gun; [85 mm Field Gun Type 56](#); [85 mm Field Gun M52](#) and [M52/55](#).

Development

First appearing in 1969, the 85 mm HEAT-FS BK-2 and BK-2M were the first of the Soviet HEAT-FS rounds to be issued. The BK-2M does not appear to have been distributed on a large scale within the former Soviet armed forces and is apparently no longer in service with them.

This round is still available from [Romania](#) where it has been manufactured by ROMARM, although series production is no longer carried out. A generally similar round is produced in [China](#) by NORINCO. Also likely to be encountered are the generally similar HEAT-FS BR-367P and BR-367PZ, developed in [Poland](#). These rounds have projectiles weighing 5.3 kg and can penetrate 180 mm of armour at 1,000 m. All these rounds have a secondary function against fixed structures such as field fortifications.

Description

The 85 mm HEAT-FS BK-2M is normally loaded as a fixed piece of ammunition, although it is apparently possible to remove the projectile from its brass cartridge case on some versions - other versions have the projectile assembly crimped to the cartridge case. The body of the projectile is steel

and is provided with a single 24.7 mm wide slipping drive band made of sintered iron.

The nose of the 85 mm HEAT-FS BK-2M is conical and carries a prominent impact sensor. The steel body contains 920 to 970 g of A-IX-1 (RDX/Wax) contained behind a conical metal liner. An internal connection between the nose-mounted impact fuze and the GPV-2 base detonating element is used to initiate the main charge and form a high-temperature particle jet to penetrate the target. The base of the projectile carries a tubular steel boom carrying six forward-folding fins which snap out to provide a fin span of 336.55 mm for flight stabilisation. The ends of the fins have angled vanes which impart a slow rotation to assist in aerodynamic stabilisation. A No 9 tracer element housing is located in the base of the tubular boom.

The lacquered steel or brass cartridge case contains 2.047 kg of 12/1 Tr and 11/7 stick and granular propellant providing a muzzle velocity of 840 to 850 m/s. It has been stated that the warhead can penetrate approximately 300 mm of armour at any range. The maximum practical direct fire range is stated to be 910 m.

Other 85 mm rounds produced that are likely to be encountered include the 85 mm Smoke D-367, the Smoke D-2 (complete round weight 16 kg, projectile weight 9.54 kg), TP/Prac PBP-367 and Blank MK-365. Also produced were water-filled cartridges fired to make gun recoil mechanisms operate in maintenance or confined areas, examples being the 85 mm Zh-365 and the East German HOF-1.

Specifications

Weights:

complete round - 13.35 kg

projectile - 7.35 kg

explosive - 920-970 g RDX/Wax

propellant - 2.047 kg

Lengths:

complete round - 1.038 m

projectile, unfuzed - 568.2 mm

projectile, fuzed - 624 mm

Diameter over cartridge case rim: 112 mm

Fin span, open: 336.55 mm

Muzzle velocity: 840-850 m/s

Authorised fuzes

PIBD GPV-2

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 85 mm HEAT-FS

Description: Developed for use with 85 mm gun Type 56. The projectile weighs 12.5 kg, 647 g of which is the RDX/TNT 50:50 filling. Muzzle velocity is 845 m/s and direct fire range 970 m. The warhead can penetrate 100 mm set at an angle of 65°. Fitted with PIBD Dian-1A fuze

[ROMANIA](#)

Manufacturer

SN ROMARM SA

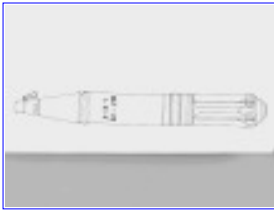
Type: HEAT BK-2M

Description: No longer in series production. Standard specifications

VERIFIED



85 mm HEAT-FS produced by NORINCO for the 85 mm gun Type 56



Projectile for the 85 mm HEAT-FS BK-2M, with fins folded

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

155 mm extended range full-bore illuminating projectiles

Armament

Towed 155 mm howitzers: NORICUM GH [N-45](#); CITEFA CALA 30/2; SRC International GC 45; [NORINCO Type](#) WA 021 and Type [GM-45](#); Patria Vammas 155 GH 52 Howitzer; Giat Industries TR and 155/52 guns and M114F Howitzer; [FH-70](#); Soltam Model 839P, 845P, Upgraded M-46 and [M114S](#); Otobreda 155/39; [KH179](#); RDM [M139](#) and [M114/39](#); STK [FH-88](#) and FH-2000; [LIW](#) G5; SITECSA 155/45 ST 012, [M114](#) 155/45 and [M114](#) 155/39; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers; Bofors [FH-77B](#); Extended Range Gun ([Taiwan](#)); XM777 Lightweight Towed Howitzer; [M46/84](#) (Federal Republic of [Yugoslavia](#)).

Self-propelled 155 mm howitzers: TAMSE VCA 155; NORINCO [PLZ45](#) Self-propelled Gun-Howitzer; Giat Industries CAESAR 155/52; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Majnoon ([Iraq](#)); Soltam Rascal and Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; [XT-69](#) ([Taiwan](#)); [AS90](#) and [Braveheart](#); M109A4, M109A5 and [M109A6](#) Paladin; XM2001/XM2002 [Crusader](#) AFAS.

Development

The 155 mm ERFB Illuminating projectiles are variants of the 155 mm ERFB Cargo projectile but contain a single parachute-suspended flare body, the output of which varies from manufacturer to

manufacturer. For example, 'European' 155 mm Illuminating projectiles produced by Eurometaal NV are claimed to produce 2 Mcd while South African projectiles produce a nominal 1 Mcd.

During 1996, [India](#) placed a contract with Denel of [South Africa](#) for a total of 50,000 rounds of 155 mm ERFB ammunition. The contract was worth approximately Rs840 million (US\$24.1 million) and included 5,000 Illuminating rounds at a reported price of US\$800-900 each.

Description

While the outline of the 155 mm ERFB Illuminating projectile is the same as the 155 mm HE ERFB, the Illuminating projectile is manufactured in three parts. The main body is manufactured in two halves, with the aluminium forward section threading into the main forged steel body without disturbing the constant outline of the streamlined ogive. On the 155 mm ERFB Illuminating the base unit is a steel drag reduction boat tail component with a cavity. The 155 mm ERFB-BB Illuminating projectile base is closed by a Base Bleed (BB) unit.

The hollow interior of the projectile body contains the flare body, the main parachute compressed into a light metal liner and a drogue parachute. These are all contained in a cylindrical light metal sleeve to assist smooth ejection. The nose of the projectile is normally occupied by a lifting plug but this is replaced by an MT, MTSQ or electronic fuze before firing.

As the fuze functions it ignites an expulsion charge beneath the fuze body. As the expulsion charge detonates it also produces 'spit back' through the hollow interior of the upper ogive and ignites a small pellet on an adaptor, part of an assembly screwed over the base of the flare body to form a top cover for the outer light metal sleeve. The pellet in its turn initiates a pyrotechnic delay, this burns as the internal pressures created by the expulsion charge push the contents downwards on the baseplate or base bleed unit to force it from the body. As the light metal sleeve and its contents emerge from the base, the drogue parachute deploys to ensure the rest of the sleeve assembly and its contents are pulled clear of the projectile body while at the same time providing an initial anti-spin and orientation function. After a short delay the pyrotechnic train reaches a black powder igniter pad, which detonates to initiate the magnesium-based flare composition and ejects the flare body and the main parachute from the sleeve assembly. The main parachute deploys and suspends the flare body as it starts to burn creating a wide area of illumination for a minimum of 90 seconds.

South African 155 mm ERFB projectiles may be converted in the field, to remove boat tails from ERFB projectiles and fit base bleed units to produce ERFB-BB projectiles. The process is carried out using a projectile clamping table. The same table can also be used to remove damaged obturators and fit new ones. The table can be folded flat and weighs 25 kg.

To take full advantage of the range potential of 155 mm ERFB and ERFB-BB Illuminating projectiles they are usually fired with high-energy charges, typically the NATO [M3A1](#) (zones 3, 4 and 5), M4A2 (zones 3, 4, 5, 6 and 7), [M119A1](#) (zone 8), [M203](#) (zone 9) or the [M11](#) (zone 10), the latter being restricted to 45 calibre or longer barrels.

The propelling system for the [LIW 155 mm G5](#) and G6 gun-howitzers originally involved a three-charge cloth bag system. This has been replaced by a modular system, developed by [SOMCHEM](#), involving combustible cases with a built-in charge retaining device. The system may be used with ERFB and (above the basic Charge 2) ERFB-BB projectiles and all NATO 155 mm projectiles.

The lowest charge for the Denel modular charge system is the Charge Propelling 155 mm Modular Charge 1 [M51](#). The combustible container for this charge is red and contains single-base granular propellant. The igniter is a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 2.3 kg, is 211 mm long and the diameter is 164 mm.

The next charge is the Charge Propelling 155 mm Modular Charge 2 [M52](#). The combustible case is blue and houses triple-base propellant cords. The diameter at the front of the case is reduced to allow it

to friction fit into the rear of a Charge 2 increment (see below). The igniter is a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 5.6 kg, is 373 mm long and has a diameter of 164 mm.

This modular system continues with the Charge Propelling 155 mm Modular Increment [M52](#). One or two of these increments can be added to the normal Charge 2. Charge 2 plus one increment can be used with boat tailed ERFB and all NATO 155 mm projectiles. Charge 2 plus two increments can be used with ERFB, ERFB-BB and all NATO 155 mm projectiles. Each increment is contained in a green combustible case which consists of triple-base propellant cords. The igniter contains 60 g of G12 gunpowder. The charge weighs approximately 4 kg, is 289 mm long and has a diameter of 164 mm.

The top charge of the modular system is the Charge Propelling 155 mm Modular Charge 3 [M53](#). The charge is contained in a purple (jacaranda) combustible case containing triple base tubular propellant. The igniter contains G12 gunpowder. The charge weighs approximately 17.1 kg, is 930 mm long and has a diameter of 164 mm.

All charges are ignited by the Tube Percussion [M82](#) containing 1.4 to 1.5 g of gunpowder. The tube is 49.37 mm long with a diameter over the rim of 15.24 mm.

With this system the following ballistic performances can be achieved using a 45 calibre barrel:

Charge 1 - MV 350 ± 5 m/s - max range 9,100 m

Charge 2 - MV 483 ± 5 m/s - max range 13,400 m

Charge 2 + 1 increment - MV 645 ± 5 m/s - max range 19,000 m

Charge 2 + 2 increments - MV 795 ± 5 m/s - max range 25,400 m

Charge 2 + 2 increments + BB - MV 789 ± 5 m/s - max range 31,000 m

Charge 3, standard shell - MV 897 ± 5 m/s - max range 30,200 m

Charge 3 + BB - MV 895 ± 5 m/s - max range 39,000 m.

This modular charge system has now been replaced by one involving up to six [M62A1](#) combustible modular charges all with the same content and meeting the NATO Joint Ballistics MoU. The charges are produced by [SOMCHEM](#) and can be used with ordnance up to 52 calibres long. Other similar modular charge systems could be employed.

A typical range for the 155 mm ERFB Illuminating projectile when fired from 45 calibre barrels is 30,000 m and a typical 155 mm ERFB-BB Illuminating projectile can reach 39,000 m.

Specifications

Weights:

ERFB projectile with fuze - 45.5 kg

ERFB-BB projectile with fuze - 47 kg

M1 ILLUM ERFB, nominal - 43.9 kg

Lengths:

ERFB - 843 mm

ERFB-BB - 861 mm

Diameter over nubs: 154.69 mm

Diameter over drive band: 157.86 mm

Candlepower:

Eurometaal projectile - 2 Mcd

South African M1 Ill - 1 Mcd

Burning time:

nominal - 120 s

min - 90 s

Chamber pressure (typical): 3,500 bar

Muzzle velocity:

ERFB - 897 m/s

ERFB-BB - 895 m/s

Max range:

ERFB - 30,000 m

ERFB-BB 38,000 m

Operating temperature range: -20 to +60°C

Authorised fuzes

MTSQ M577 series

Electronic NINA, ZELAR, Fuchs M8611 and so on

Equivalent projectiles

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 155 mm ERFB-BB Illuminating

Description: Provides more than 1.3 Mcd for 80 seconds (yellow light). Maximum range 24,000 m and muzzle velocity 792 m/s (Zone 9). Projectile is 960 mm long and weight 45.8 kg. Fitted with MTSQ M577 fuze. A variant, which may be a later development, produces 1.15 Mcd for approximately 75 seconds while descending at a velocity of around 4.5 m/s; this version weighs 46.23 kg

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm ERFB and ERFB-BB Illuminating

Description: Specifications as text. Available for production. Propelling charge No 16 also produced

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Limited (SWARTKLIP)

Type: Shell 155 mm Illuminating BE M1

Description: Specifications as text. Produced for [LIW 155 mm G5](#) and G6 artillery systems and marketed by Denel

SWITZERLAND

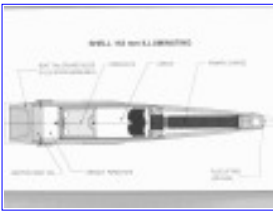
Manufacturer

NORICUM

Type: SEN-155 mm Illuminating

Description: Marketed by T & T Technology Trading Limited. Produces 2 Mcd for 90 seconds. Weight 48.5 kg and length 957 mm

VERIFIED



Cross-sectional drawing of Shell 155 mm Illuminating BE M1



In this quartet of 155 mm ERFB carrier projectiles produced by Denel (Pty) Limited of [South Africa](#) the second from the right is a Shell 155 mm Illuminating BE M1; the others are (left) Smoke BE, (second left) HE and (right) Red Phosphorus (RP)



[NORINCO 155 mm](#) ERFB-BB Illuminating projectile

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

155 mm extended range full-bore smoke WP projectiles

Armament

Towed 155 mm howitzers: NORICUM GH [N-45](#); CITEFA CALA 30/2; SRC International GC 45; [NORINCO Type](#) WA 021 and Type [GM-45](#); Patria Vammas 155 GH 52 Howitzer; Giat Industries TR and 155/52 guns and M114F Howitzer; [FH-70](#); Soltam Model 839P, 845P, Upgraded M-46 and [M114S](#); Otobreda 155/39; [KH179](#); RDM [M139](#) and [M114/39](#); STK [FH-88](#) and FH-2000; [LIW](#) G5; SITECSA 155/45 ST 012, [M114](#) 155/45 and [M114](#) 155/39; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers; Bofors [FH-77B](#); Extended Range Gun ([Taiwan](#)); XM777 Lightweight Towed Howitzer; [M46/84](#) (Federal Republic of [Yugoslavia](#)).

Self-propelled 155 mm howitzers: TAMSE VCA 155; NORINCO [PLZ45](#) Self-propelled Gun-Howitzer; Giat Industries CAESAR 155/52; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Majnoon ([Iraq](#)); Soltam Rascal and Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; [XT-69](#) ([Taiwan](#)); [AS90](#) and [Braveheart](#); M109A4, M109A5 and [M109A6](#) Paladin; XM2001/XM2002 [Crusader](#) AFAS.

Development

The 155 mm ERFB Smoke WP is a bursting projectile, developed alongside the 155 mm HE ERFB projectiles as they use what is virtually the same body. The 155 mm ERFB and ERFB-BB versions are

produced in Europe by Eurometaal while those once produced in [South Africa](#) are now available on an 'as required' basis. Chartered Ammunition Industries of [Singapore](#) also produce a 155 mm ERFB Smoke WP, as does the Austrian NORICUM.

Description

The 155 mm ERFB Smoke WP has the same general outline and overall dimensions as other 155 mm ERFB projectiles, and uses a one-piece high-grade steel body. The streamlined ogive reaches almost to the copper or gilding metal drive band and plastic obturator band close to the base. The drag reduction base unit is a steel component with an external cavity on the ERFB version while the base on the ERFB-BB is occupied by a steel base bleed unit.

The fuze well at the nose is normally occupied by a lifting plug during storage, transport and handling. On the 155 mm Smoke WP versions of the ERFB, the fuze well takes the form of a steel adaptor screwed into the nose of the body at the base of which is threaded a steel or light-alloy burster tube running the entire length of the body interior. The burster tube contains an explosive, typically 234 g of Composition B5 which, when detonated by the functioning of the PD fuze (typically a PD M572), is sufficient to break open the steel casing of the projectile body dispersing the contents, typically 7.6 kg of WP. As the WP contacts the air it ignites to produce a dense cloud of white smoke which lasts for approximately 60 seconds.

South African 155 mm ERFB projectiles may be converted in the field, to remove boat tails from ERFB projectiles and fit base bleed units to produce ERFB-BB projectiles. The process is carried out using a projectile clamping table. The same table can also be used to remove damaged obturators and fit new ones. The table can be folded flat and weighs 25 kg.

To take full advantage of the range potential of 155 mm ERFB and ERFB-BB Smoke WP projectiles they are usually fired with high-energy charges, typically the NATO [M3A1](#) (zones 3, 4 and 5), [M4A2](#) (zones 3, 4, 5, 6 and 7), [M119A1](#) (zone 8), [M203](#) (zone 9) or the [M11](#) (zone 10), the latter being restricted to 45 calibre barrels or longer.

The propelling system for the [LIW 155 mm G5](#) and G6 gun-howitzers originally involved a three-charge cloth bag system. This has been replaced by a modular system involving combustible cases, developed by [SOMCHEM](#), with a built-in charge retaining device. The system may be used with ERFB and (above the basic Charge 2) ERFB-BB projectiles and all NATO 155 mm projectiles.

The lowest charge for the Denel modular charge system is the Charge Propelling 155 mm Modular Charge 1 [M51](#). The combustible container for this charge is red and contains single-base granular propellant. The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 2.3 kg, is 211 mm long and has a diameter of 164 mm.

The next charge is the Charge Propelling 155 mm Modular Charge 2 [M52](#). The combustible case is blue and houses triple-base propellant cords. The diameter at the front of the case is reduced to allow it to friction fit into the rear of a Charge 2 increment (see below). The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 5.6 kg, is 373 mm long and the diameter is 164 mm.

This modular system continues with the Charge Propelling 155 mm Modular Increment [M52](#). One or two of these increments can be added to the normal Charge 2. Charge 2 plus one increment can be used with boat tailed ERFB and all NATO 155 mm projectiles. Charge 2 plus two increments can be used with ERFB, ERFB-BB and all NATO 155 mm projectiles. Each increment is contained in a green combustible case containing triple-base propellant cords. The igniter consists of 60 g of G12 gunpowder. The charge weighs approximately 4 kg, is 289 mm long and the diameter is 164 mm.

The top charge of the modular system is the Charge Propelling 155 mm Modular Charge 3 [M53](#). The charge is contained in a purple (jacaranda) combustible case containing triple-base tubular propellant.

The igniter consists of G12 gunpowder. The charge weighs approximately 17.1 kg, is 930 mm long and the diameter is 164 mm.

All charges are ignited by the Tube Percussion [M82](#) which contains 1.4 to 1.5 g of gunpowder. The tube is 49.37 mm long with a diameter over the rim of 15.24 mm.

With this system the following ballistic performances can be achieved using a 45 calibre barrel:

Charge 1 - MV 350 ± 5 m/s - max range 9,100 m

Charge 2 - MV 483 ± 5 m/s - max range 13,400 m

Charge 2 + 1 increment - MV 645 ± 5 m/s - max range 19,000 m

Charge 2 + 2 increments - MV 795 ± 5 m/s - max range 25,400 m

Charge 2 + 2 increments + BB - MV 789 ± 5 m/s - max range 31,000 m

Charge 3, standard shell - MV 897 ± 5 m/s - max range 30,200 m

Charge 3 + BB - MV 895 ± 5 m/s - max range 39,000 m.

This modular charge system has now been replaced by one involving up to six [M62A1](#) combustible modular charges all with the same content and meeting the NATO Joint Ballistics MoU. The charges are produced by [SOMCHEM](#) and can be used with ordnance up to 52 calibres long. Other similar modular charge systems could be employed.

One-piece Combustible Cartridge Cases (CCC) have been developed for use with 155 mm ERFB projectiles. A typical example is the C30 charge manufactured by Chartered Ammunition Industries of [Singapore](#). The C30 contains 14 kg of triple-base propellant, is 770 mm long and has a diameter of 160 mm. It will provide a range of 30,000 m using a 39 calibre barrel and 40,000 m using a 45 calibre barrel.

One further charge developed for use with 39 and 45 calibre barrels firing 155 mm ERFB projectiles is the Propelling Charge No 16 produced by Eurometaal NV of the Netherlands. This is a separate loading single-bag charge of single-base nitrocellulose CH21 propellant with a 50 g clean-burning igniter in a red cloth bag sewn onto the base. The charge incorporates a central igniter core and a flash reducer containing 250 g of potassium sulphate. A wear-reducing and decoppering liner are sewn to the inner surface of the bag. The complete charge weighs 13.12 kg of which 12.12 kg is the CH21 propellant. It is 764 mm long.

A typical range for the 155 mm ERFB Smoke WP when fired from 45 calibre barrels is 30,000 m. When fired from 45-calibre barrels a typical 155 mm ERFB-BB Smoke WP projectile can reach 39,000 m.

Specifications

Weights:

ERFB projectile with fuze - 47.7 kg

ERFB-BB projectile with fuze - 50 kg

M1 WP ERFB, nominal - 47.7 kg

filling - 7.6 kg WP

Lengths with fuze:

ERFB - 938 mm

ERFB-BB - 958 mm

Diameter over nubs: 154.69 mm

Diameter over drive band: 157.86 mm

Chamber pressure (typical): 3,500 bar

Muzzle velocity:

ERFB - 897 m/s

ERFB-BB - 895 m/s

Max range:

ERFB - 30,000 m

ERFB-BB 38,000 m

Operating temperature range: -20 to +60°C

Authorised fuzes

PD M557, [M78](#) series, M572, M739 and Fuchs PD M841

MTSQ M564, M582A1

Prox M514 series, Fuchs M8513

Electronic NINA, ZELAR, Fuchs M8611 and so on

Equivalent projectiles

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 155 mm ERFB Smoke WP

Description: Fitted with PD M739 fuze. Emits smoke for 55 to 65 seconds. Projectile weight is 46.5 kg and muzzle velocity 795.5 m/s. Maximum range given as 26,000 m (ERFB)

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm ERFB and ERFB-BB Smoke WP

Description: Specifications as text. Available for production. Propelling charge No 16 also produced

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries

Type: 155 mm ERFB-HB-WP, ERFB-BB-WP

Description: Standard specifications. C30 unitary CCC also produced. ERFB-HB-WP range from 39-calibre barrels given as 24,400 m. ERFB-BB-WP range from 39 calibre barrels given as 30,500 m

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Limited (SWARTKLIP)

Type: 155 mm ERFB or ERFB-BB M1 WP

Description: Specifications as text. Developed for [LIW 155 mm G5](#) and G6 artillery systems.

Production as required

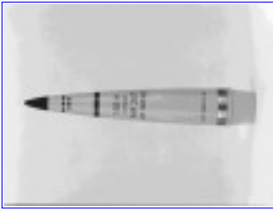
SWITZERLAND

Manufacturer

NORICUM

Type: SEN-155 mm WP-Smoke

Description: Marketed by T & T Technology Trading Limited. Weight with boat tail 48 kg and BB 50 kg. Fuzed PD M739 or ET DM 52



[Giat Industries 155 mm](#) Smoke WP ERFB-BT NR 267



In this display of cross-sectioned 155 mm ERFB projectiles produced by Eurometaal NV of the Netherlands, the Smoke WP is second from the left; the others are HE ERB-BB (left), Smoke BE (second from right) and Illuminating (right)

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

130 mm Illuminating SP-46

Armament

[130 mm Field Gun M-46](#); 130 mm Field Gun Type 59 and Type 59-1; [Factory 100 M59-1M](#); [130 mm Gun Model 1982](#).

130 mm Self-propelled Gun (Catapult); NORINCO 130 mm Self-propelled Gun.

Development

The 130 mm Illuminating SP-46 projectile is little changed from when it was introduced into service at the same time as the [130 mm Field Gun M-46](#) during the early 1950s. It has been produced with some slight variations, for example some early projectiles used two drive bands, but it is no longer manufactured in the RFAS. However, a variant is still manufactured by NORINCO of [China](#) for the 130 mm Type 59-1 gun.

Description

The body of the 130 mm Illuminating SP-46 is forged steel and it is shorter than other 130 mm projectiles. The nose is long and streamlined and the bourrelet is more pronounced than on other 130 mm projectiles. A single copper driving band, 23.87 mm wide, encircles the body. The base is flat and there is no boat tail. The projectile baseplate is held in place by two shear pins and the base has three balancing holes, creating an imbalance to ensure a clean removal from the projectile rear when required.

The nose fuze cavity is occupied by an aluminium TM-16L or VM-60 time fuze. When the fuze

functions, ideally 700 m over the target area, it ignites a 780 g black powder ejector charge in a light metal container located under the fuze well. The resultant internal pressures force down on the contents to push off the projectile base and eject the illuminating flare, which is also ignited by the ejector charge. Once the flare is out of the projectile body a single main parachute deploys to stabilise the flare canister and descend at a rate of approximately 10 m/s. The flare contains 2.38 kg of a magnesium-based illuminating composition which creates a white light with an intensity of 500,000 candela for up to 40 seconds.

The 70:30 drawn brass cartridge case is issued in two versions; Full Charge and Reduced propellant load. Full Charge contains 13.5 kg of propellant loaded in a lower and upper bag, together with 2.5 kg of loose propellant in bundled stick form. An increment completes the Full Charge while removal of this increment creates Charge 1. The Reduced Charge weighs 6.75 kg and is supplied in a separate cartridge case. The top charge in the Reduced category is formed using the full complement of a base charge and two equal sized bags, forming Charge 2. Removal of one of the equal bags creates Charge 3 while removal of both equal bags, leaving only the base charge, creates Charge 4. A percussion primer is pressed into the cartridge case base to ignite both Full and Reduced propellant loads.

The Full Charge produces a muzzle velocity of 930 m/s and provides a maximum range of 27,490 m. The maximum range at which the flare can be deployed is approximately 25,000 m, and the minimum is about 6,000 m.

Specifications

Weights:

projectile - 25.8 kg

flare - 2.38 kg

ejector charge - 780 g

propellant - Full 13.5 kg; Reduced 6.75 kg

Lengths:

projectile, fuzed - 573 mm

projectile, unfuzed - 443 mm

cartridge case - 846 mm

Diameter of cartridge case rim: 185 mm

Max muzzle velocity: 930 m/s

Authorised fuzes

MT TM-16L or VM-60

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 130 mm Illuminating Type 59

Description: Developed by NORINCO for the 130 mm Type 59-1 gun, this projectile is based on the 130 mm FRAG-HE body and is therefore longer (663 mm) than the 130 mm Illuminating SP-46, with two copper drive bands. Weight is 29.1 kg and the illuminating flare (magnesium, barium nitrate and binder) weighs 1.96 kg, burning for at least 40 seconds. Muzzle velocity given as 950 m/s and maximum range 24,500 m. Fitted with Shi-1 or [MS-1](#) time fuze

IRAN

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 130 mm Illuminating

Description: Projectile weight given as 32.5 kg. Otherwise standard specifications

IRAQ

Manufacturer

State factories

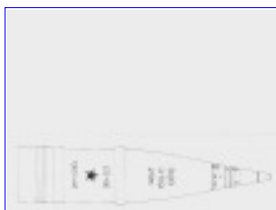
Type: 130 mm Illuminating

Description: Apparently standard specifications. May no longer be in production

VERIFIED



130 mm Illuminating projectile produced by NORINCO



Projectile for 130 mm Illuminating SP-46

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

130 mm Smoke DTs-1

Armament

[130 mm Field Gun M-46](#); 130 mm Field Gun Type 59 and Type 59-1; [Factory 100 M59-1M](#); [130 mm Gun Model 1982](#).

130 mm Self-propelled Gun (Catapult); NORINCO 130 mm Self-propelled Gun.

Development

The 130 mm Smoke DTs-1 projectile is described as a Target Marker Smoke projectile and is entirely orthodox in construction and operation, unlike its Chinese NORINCO equivalent which relies on a system of 24 smoke canisters released on target. As far as can be determined, the 130 mm Smoke DTs-1 is no longer in production other than in [Egypt](#), [Iran](#) and (possibly) [Iraq](#), although stocks may remain in service with many [130 mm Field Gun M-46](#) users.

The former Soviet Union developed at least two types of 130 mm Chemical projectile based on the 130 mm Smoke DTs-1. One projectile contained 1.6 kg of liquid GB (Sarin) scattered by a TNT burster charge after the nose-mounted impact fuze functioned. The other 130 mm Chemical projectile had a nose-mounted proximity fuze and contained 1.4 kg of VX. Both projectiles weighed 33.4 kg. Any remaining projectiles are scheduled for destruction.

A 130 mm Chemical projectile filled with Mustard (H) agent and based on the standard 130 mm DTs-1 Smoke projectile, was developed by [Iraq](#) at the Al Muthanna State Establishment, but it did not reach the full production stage.

Description

The 130 mm Smoke DTs-1 is a separate loading munition, allowing the variable charges contained in a brass cartridge case to be varied to suit any particular fire mission.

The projectile is forged steel and uses a conventional long-nosed streamlined outline with a nose fuze. There are two copper drive bands, each 25.4 mm wide and spaced 8.6 mm apart, encircling the body close to the flat base, which has a very slight boat-tailed profile. The filling is 3.23 kg of White Phosphorus (WP). When the all-steel point-detonating V-429 nose fuze strikes the ground, it ignites an RDX and Tetryl bursting charge in a tubular housing extending some two-thirds of the way down the projectile cavity. This breaks open the body walls and releases the white phosphorus which comes into contact with the atmosphere clouds and grey/white smoke is produced.

The 70:30 drawn brass cartridge case is issued in two versions; Full Charge and Reduced propellant load. The Full Charge contains 13.5 kg of propellant loaded in a lower and upper bag, together with 2.5 kg of loose propellant in bundled stick form. An increment completes the Full Charge while removal of this increment creates Charge 1. The Reduced Charge weighs 6.75 kg and is supplied in a separate cartridge case. The top charge in the Reduced category is formed using the full complement of a base charge and two equal sized bags, forming Charge 2. Removal of one of the equal bags creates Charge 3 while removal of both equal bags, leaving only the base charge, creates Charge 4. A percussion primer is pressed into the cartridge case base to ignite both Full and Reduced propellant loads.

The Full Charge produces a muzzle velocity of 930 m/s and provides a maximum range of 27,490 m. The Reduced charge, Charge 2, produces a muzzle velocity of 705 m/s and a range of 19,130 m.

Specifications

Weights:

projectile - 32.8 kg

filling - 3.23 kg WP

propellant - Full 13.5 kg; Reduced 6.75 kg

Lengths:

projectile, fuzed - 672.94 mm

projectile, unfuzed - 557 mm

cartridge case - 846 mm

Diameter of cartridge case rim: 185 mm

Max muzzle velocity: 930 m/s

Chamber pressure: Full 3,090 bar; Reduced 2,648 bar

Authorised fuzes

PD V-429

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 130 mm Smoke WP Type 59

Description: Developed by NORINCO for the 130 mm Type 59-1 gun, this projectile uses 24 smoke canisters containing White Phosphorus (WP) with a minimum burning time of 200 seconds. The projectile weighs 32.47 kg and is 663 mm long. Muzzle velocity is 935 m/s and maximum range 27,000

m. Fitted with a SHI-1 fuze. NORINCO also produce a 130 mm Smoke WP projectile, with a unitary WP payload, weighing 33.4 kg and with a PD Liu-5 fuze. It can emit smoke for at least 48 seconds and create a smoke cloud 50 m wide

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries (F.81)

Type: 130 mm M/46 Smoke

Description: Complete round weighs 58.7 kg and the projectile 33.4 kg. Filled with 3.35 kg of White Phosphorus (WP). Fitted with AU-18 fuze

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 130 mm Smoke

Description: Projectile weight given as 32.5 kg. Otherwise standard specifications

[IRAQ](#)

Manufacturer

State factories

Type: 130 mm Smoke

Description: Standard specifications. May no longer be in production

Manufacturer

State factories

Type: 130 mm Chemical

Description: A 130 mm Chemical projectile containing a Mustard (H) agent was developed at the Al Muthanna State Establishment, 100 km to the northwest of Baghdad. This projectile was developed to the preproduction stage but was not mass produced. Any remaining examples are scheduled for destruction

VERIFIED



*Iranian 130 mm Smoke projectile and cartridge case
(2000)*

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

122 mm Illuminating S-463

Armament

[122 mm Howitzer M1938 \(M-30\)](#); [NORINCO 122 mm Howitzer Type 54-1](#); [NORINCO 122 mm Howitzer Type 83](#); [122 mm Howitzer D-30](#); [NORINCO 122 mm Howitzer D-30](#); [122 mm Howitzer D-30 RH M94](#); [122 mm Howitzer D-30J](#); [Factory 100 D-30-M](#); [122 mm Saddam Howitzer](#); Hadid [122 mm Howitzer HM40](#).

[NORINCO 122 mm Self-propelled Howitzer Type 54 and 54-1](#); [NORINCO 122 mm Self-propelled Howitzer Type 85](#); 122 mm Self-propelled Howitzer M-1974 ([2S1](#)); [Model 89 122 mm Self-propelled Howitzer](#); Hadid 122 mm Self-propelled Howitzer HM51 ([Thunder 1](#)).

Development

Originally developed for use with the [122 mm Howitzer M1938 \(M-30\)](#), the 122 mm Illuminating S-463 can also be used with 122 mm gun-howitzers of the [D-30](#) and self-propelled M-1974 ([2S1](#) - also known as the SO-122 or Gvozdika) type.

Essentially similar 122 mm carrier projectiles containing propaganda leaflets are known as the 122 mm G-462 and G-463. These remain available from SN ROMARM SA of [Romania](#).

Description

The 122 mm Illuminating S-463 is a separate loading round, with the projectile and cartridge case

loaded separately so that, where appropriate, the propellant charges can be altered to suit the fire mission.

The body of the 122 mm Illuminating S-463 projectile is forged steel with a relatively short streamlined ogive, a pronounced bourrelet and a distinct boat tail. There is a single copper drive band just under 21 mm wide. The main recognition of the S-463 compared with other 122 mm projectiles is the long [T-7](#) mechanical time fuze threaded into the fuze cavity in the nose. The fuze is normally kept protected by a conical cover until it is required for setting.

The [T-7](#) mechanical time fuze is set to function as the 122 mm Illuminating S-463 projectile reaches a height of about 450 m above the target area. As the fuze functions it ignites a 20 g expulsion charge in a container inside the hollow ogive. The resultant pressure forces the illuminating body and its suspension parachute from the projectile, forcing off the base in the process, after retaining shear pins have been broken. The expulsion charge also ignites the illuminating compound. The illuminating body weighs 1 kg and burns for up to 25 seconds, producing white light with an intensity of 450,000 candela, as it descends. Rate of descent of the illuminating body is a maximum of 10 m/s.

The [122 mm Howitzer M1938 \(M-30\)](#) ammunition system uses a 'multisection' system of propelling charges. The total weight of the nitrocellulose powder charges is 2.2 kg, made from a system of nine bags. The basic charge, Charge 8, is a single-base charge bag. The system is built up until the Charge 1 stage is reached which is formed by the base charge bag, four equal section bag charges in a lower layer and three equal section bag charges in an upper layer. The Full Charge is produced by adding one further bag charge to the upper layer, making a total of nine bags in all, which are all held in place by a fibre cup. They are all contained in a brass cartridge case, 284 mm long and weighing 3.25 kg, with a brass percussion primer housing, 25 mm long, threaded into the centre of the base. It is possible to use a cartridge case issued with the Full Charge ready packed and with no facility to alter the charges.

This charge system produces a range of muzzle velocities ranging from 205 m/s at the lower end (minimum range 5,350 m) up to the 515 m/s (maximum range 11,800 m) produced by the Full Charge. However, the maximum airburst/ejection range is 11,000 m.

When the S-463 is fired from the [122 mm Howitzer D-30](#) or self-propelled [2S1](#) a longer brass or lacquered steel cartridge case (length 447 mm, weight (steel) 3.66 kg) is involved. This can contain nitrocellulose powder in a 'Reduced Charge' form, containing five variable charge bags weighing a total of 2.43 kg, or a single prepacked Full Charge weighing 3.8 kg. The muzzle velocity using the Full Charge is 680 to 690 m/s and the maximum range 17,360 m. The maximum muzzle velocity using the 'Reduced Charge' cartridge is 565 m/s and maximum range 15,300 m. Maximum airburst/ejection range will be less than these two figures.

Specifications

Weights:

projectile - 21.96 kg

illuminating body - 1 kg

illuminating compound - 0.91 kg

propellant - [M-30](#) Full 2.2 kg, [D-30](#) Reduced 2.43 kg; [D-30](#) Full 3.8 kg

cartridge case - [M-30](#) 3.25 kg; [D-30](#) 3.66 kg

Lengths:

projectile, fuzed - 551 mm

cartridge case - [M-30](#) 284 mm; [D-30](#) 447 mm

Diameter over cartridge case rim: 147.46 mm

Max muzzle velocity: [M-30](#) 515 m/s; [D-30](#) 690 m/s

Max chamber pressure: [M-30](#) 2,300 bar; [D-30](#) 2,450 bar

Authorised fuzes

MT [T-7](#)

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 122 mm Illuminating Type 54

Description: Intended primarily for use with 122 mm Type 54 and Type 54-1. Uses Shi-2 time fuze. Muzzle velocity given as 496 m/s. Otherwise standard specifications

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 122 mm Illuminating for [D-30](#)

Description: Intended primarily for use with 122 mm towed [D-30](#) series and [2S1 self-propelled](#) howitzers. Projectile weight is 21 kg and maximum projectile length 573 mm. The magnesium, sodium nitrate and binder illuminating body can produce 660,000 candela of yellow light for at least 60 seconds, descending at a rate of 7 m/s. Muzzle velocity is 683 m/s and maximum deployed range 14,500 m (minimum 4,000 m). Fitted with MT Shi-1 fuze

[EGYPT](#)

Manufacturer

Heliopolis Industry for Chemical Industries (F.81)

Type: 122 mm Illuminating

Description: Intended primarily for use with [122 mm Howitzer M1939 \(M-30\)](#). Complete round weighs 29.804 kg and projectile 21.76 kg. Maximum range at muzzle velocity of 515 m/s is 11,800 m. Fitted with [T-7](#) fuze. Produces 500,000 candela. May no longer be in production

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 122 mm Illuminating

Description: Intended primarily for use with [122 mm Howitzer D-30](#). Projectile weight given as 20.5 kg

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: 122 mm Illuminating

Description: Intended for use with [D-30](#). Produces 800,000 candela. Also available is a 122 mm Propaganda projectile for firing from [M-30](#) series howitzer; it carries 1 kg of leaflets

VERIFIED



The 122 mm Illuminating projectile and cartridge case produced by NORINCO for the [122 mm Howitzer Type 54](#)



Projectile for the 122 mm Illuminating S-463



Projectile for the 122 mm Propaganda Shell A-462

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

122 mm Smoke D-462

Armament

[122 mm Howitzer M1938 \(M-30\)](#); [NORINCO 122 mm Howitzer Type 54-1](#); [NORINCO 122 mm Howitzer Type 83](#); [122 mm Howitzer D-30](#); [NORINCO 122 mm Howitzer D-30](#); [122 mm Howitzer D-30 RH M94](#); [122 mm Howitzer D-30J](#); [Factory 100 D-30-M](#); [122 mm Saddam Howitzer](#); Hadid [122 mm Howitzer HM40](#).

[NORINCO 122 mm Self-propelled Howitzer Type 54 and 54-1](#); [NORINCO 122 mm Self-propelled Howitzer Type 85](#); 122 mm Self-propelled Howitzer M-1974 ([2S1](#)); [Model 89 122 mm Self-propelled Howitzer](#); Hadid 122 mm Self-propelled Howitzer HM51 ([Thunder 1](#)).

Development

Originally developed for use with the [122 mm Howitzer M1938 \(M-30\)](#), the 122 mm Smoke D-462 is also used with 122 mm gun-howitzers of the [D-30](#) and self-propelled M-1974 type ([2S1](#) - also known as the SO-122 or Gvozdika).

There are two known 122 mm Chemical projectiles, both essentially similar to the 122 mm Smoke D-462. As far as is known they were intended to be fired only by the 122 mm D-30/2S1 series of howitzers. One projectile, equipped with a point detonating fuze, weighs 22.2 kg and contains 1.3 kg of Sarin (GB), a nerve agent. The other, equipped with a time fuze, weighs 23.1 kg and contains 3.3 kg of thickened Lewisite (L), a blister agent. Both types have been withdrawn from service and are scheduled for destruction.

Description

The 122 mm Smoke D-462 is a separate loading round, with the projectile and cartridge case being loaded separately so that, where appropriate, the propellant charges can be altered to suit the fire mission.

The body of the 122 mm Smoke D-462 projectile is forged steel with a relatively short streamlined ogive, a pronounced bourrelet and a distinct boat tail. There is a single copper drive band just over 20 mm wide.

The 122 mm Smoke D-462 contains a nominal 3.6 kg of White Phosphorus (WP). A burster charge, extending halfway down the body interior from behind the fuze well, is occupied by a burster tube containing 160 g of TNT. When the nose-mounted point detonating KTM-2 fuze functions, the burster charge detonates to break open the shell body and scatter the contents. As the White Phosphorus contents come into contact with the air they start to produce a grey/white smoke cloud. No definite information regarding the smoke production duration is available but is probably 40 to 50 seconds.

The [122 mm Howitzer M1938 \(M-30\)](#) ammunition system uses a 'multisection' system of propelling charges. The total weight of the nitrocellulose powder charges is 2.2 kg, made up from a system of nine bags. The basic charge, Charge 8, is a single-base charge bag. The system is built up until the Charge 1 stage is reached which is formed by the base charge bag, four equal section bag charges in a lower layer and three equal section bag charges in an upper layer. The Full Charge is produced by adding one further bag charge to the upper layer, making a total of nine bags in all, which are all held in place by a fibre cup. They are all contained in a brass cartridge case, 284 mm long and weighing 3.25 kg, with a brass percussion primer housing, 25 mm long, threaded into the centre of the base. It is possible to use a cartridge case issued with the Full Charge ready packed and with no facility to alter the charges.

This charge system produces a range of muzzle velocities from 205 m/s at the lower end (minimum range 5,350 m) up to the 515 m/s (maximum range 11,800 m) produced by the Full Charge.

When the 122 mm Smoke D-462 is fired from the [122 mm Howitzer D-30](#) or self-propelled [2S1](#) a longer brass or lacquered steel cartridge case (length 447 mm, weight (steel) 3.66 kg) is involved. This can contain nitrocellulose powder in a 'Reduced Charge' form containing five variable charge bags weighing a total of 2.43 kg, or a single prepacked Full Charge weighing 3.8 kg. The muzzle velocity using the Full Charge is 680 to 690 m/s and the maximum range 17,360 m. The maximum muzzle velocity using the 'Reduced Charge' cartridge is 565 m/s and maximum range 15,300 m.

Specifications

Weights:

projectile - 22.55 kg

contents - 3.6 kg WP

propellant - [M-30](#) Full 2.2 kg, [D-30](#) Reduced 2.43 kg; [D-30](#) Full 3.8 kg

cartridge case - [M-30](#) 3.25 kg; [D-30](#) 3.66 kg

Lengths:

projectile, fuzed - 545.34 mm

cartridge case - [M-30](#) 284 mm; [D-30](#) 447 mm

Diameter over cartridge case rim: 147.46 mm

Max muzzle velocity: [M-30](#) 515 m/s; [D-30](#) 690 m/s

Max chamber pressure: [M-30](#) 2,300 bar; [D-30](#) 2,450 bar

Authorised fuzes

PD KTM-2

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 122 mm Smoke Type 54

Description: Intended primarily for use with 122 mm Type 54 and Type 54-1. Uses Yan-2 fuze. Produces smoke for 40 to 50 seconds. Otherwise standard specifications

[EGYPT](#)

Manufacturer

Heliopolis Industry for Chemical Industries (F.81)

Type: 122 mm Incendiary

Description: Intended primarily for use with [122 mm Howitzer D-30](#). Weight of projectile given as 21.76 kg with filling weight (WP) 3.8 kg

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

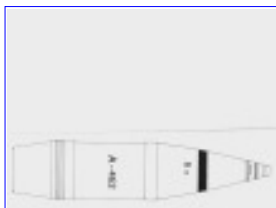
Type: 122 mm Smoke

Description: Intended primarily for use with [122 mm Howitzer D-30](#). Projectile weight given as 20.81 kg. Contains 2.2 kg of an unspecified smoke-producing material to produce smoke for a minimum of 50 seconds. Maximum range given as 15,600 m

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The 122 mm Smoke projectile and cartridge case produced by NORINCO for the [122 mm Howitzer Type 54](#)



Projectile for the 122 mm Smoke D-462

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FUZES - IMPACT FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

TYPE 100-3

Armament

HE mortar bombs.

Development

By NORINCO to Chinese People's Liberation Army requirement.

Description

The TYPE 100-3 is a steel and bakelite fuze developed specifically for mortar bombs. It has only one safety - a shear wire that blocks the firing pin. An aluminium version of this fuze is also used in rocket projectiles as well as mortar bombs.

Specifications

Type: impact

Weight: 133 g

Length overall: 68 mm

Diameter: 40 mm

Optional delay: none

Arming distance: unknown

Manufacturer

NORINCO.

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FUZES - IMPACT FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MP-1A

Armament

60, 81, and 82 mm mortar bombs.

Development

By NORINCO to Chinese Peoples Liberation Army requirement.

Description

The MP-1A has a bakelite fuze body with a steel nose cap that functions in super-quick mode only. It has probably been superseded in Chinese service by the MP-1B.

Specifications

Type: impact

Weight: 107 g

Length overall: 72 mm

Diameter: max 40 mm

Optional delay: none

Arming distance: unknown

Manufacturer

NORINCO.

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MORTARS - 60 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm long-range mortar bomb, Type W89

Armament

60 mm long range mortar, Type W89.

Development

By NORINCO to Chinese People's Liberation Army requirement for a long range platoon and company level lightweight mortar.

Description

This is a streamlined bomb similar to the Denel ([South Africa](#)) M8917 series of mortar bombs. The W89 has a forged steel body with an alloy tailboom assembly screwed into the rear. The tailboom houses a primary cartridge and is fitted with nine secondary increments in plastic horseshoe containers above the eight tail fins. The muzzle safety distance is 40 m.

Specifications

Weight, fuzed: 2.3 kg

Length, fuzed: approx 375 mm

Number of charges: primary + 9

Fuze: impact (PD), super-quick or delay

Max range: 5,500 m

Muzzle velocity: 313 m/s

Colour/markings: green/white

Manufacturer

[China](#) North Industries Corporation (NORINCO)

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MORTARS - 120 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE/HEAT mortar bomb

Armament

120 mm Mortar, Type [W86](#)

Development

Developed by Norinco for use in attacking armoured formations.

Description

The 120 mm HE/HEAT mortar bomb is a conventionally shaped steel bomb with alloy tailboom and fins. The warhead is dual-purpose according to Chinese sources and is effective against both personnel and armoured vehicles. There is no guidance and other than incorporating a dual-purpose warhead with both a shaped charge and fragmentation effect, the round is of conventional design. Unlike the older designs, the HE/HEAT round has a single obturating ring at the bourrelet. The Chinese have released little information on this round and the data contained herein is therefore provisional.

Specifications

Length, fuzed: approx 670 mm

Weight, fuzed: approx 15 kg

Max range: 7,000 m

Muzzle velocity: approx 275 m/s

Manufacturer: [China](#) North Industries Corporation (NORINCO)

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Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MS-12

Armament

81 mm illuminating mortar rounds.

Development

By NORINCO for export sales.

Description

The MS-12 is a powder train selective time fuze used with 81 mm base ejecting illuminating mortar rounds. It is similar to, and interchanges with, the US [M84](#) and M84A1.

Specifications

Type: powder train selective time

Weight: 826 g

Length overall: 97.8 mm

Manufacturer

NORINCO.

VERIFIED



*MS-12 fuze
(1998)*

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Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M-12

Armament

82 and 120 mm HE and WP mortar bombs.

Development

By NORINCO for the Chinese People's Liberation Army mortar ammunition.

Description

The M-12 is generally similar to the Soviet/RFAS M-12 and the Chinese MP-4 fuze, with which it may be interchanged. It has delay or super-quick settings and is used with 82 and 120 mm HE and WP mortar bombs.

Specifications

Type: Impact, delay or super-quick

Weight: 511.1 g

Length:

overall - 118 mm

visible - 74 mm

Diameter: 50 mm

Optional delay: unknown

Manufacturer

NORINCO.

VERIFIED



*Impact fuze M-12
(1998)*

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Date Posted: 05 September 2001

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MS-10

Armament

82 mm canister (steel ball) mortar bomb.

Development

By NORINCO for Chinese People's Liberation Army requirement.

Description

The MS-10 is designed for use in NORINCO's 82 mm canister mortar bomb which uses steel balls rather than conventional fragmentation to achieve terminal effects. The fuze can be set for time or impact function. The MS-10 uses a powder train delay to select the time.

Specifications

Type: Impact or powder time delay

Weight: 600 g

Length overall: 111.73 mm

Manufacturer

NORINCO.

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*MS-10 fuze
(1998)*

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Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MP-7A

Armament

60 and 81 mm HE mortar bombs generally.

Development

By NORINCO for export sales.

Description

The MP-7A is designed for use in Western 60 and 81 mm HE mortar bombs. It functions in super-quick only and is muzzle safe to 30 m. The fuze body is aluminium.

Specifications

Type: impact, super-quick

Weight: 230 g

Length:

overall - 90 mm

visible - 49 mm

Diameter: 49 mm

Optional delay: none

Manufacturer

NORINCO.

VERIFIED



*MP-7A impact and super-quick fuze
(1998)*

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FUZES - IMPACT FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MP-6

Armament

60 and 82 mm mortar bombs generally.

Development

By NORINCO for the Chinese People's Liberation Army.

Description

The MP-6 is designed as a replacement for the MP-1A and MP-1B, which lack modern safety features. The MP-6 uses a pyrotechnic delay for arming and is muzzle safe to 20 m. It has super-quick function only. Like other current NORINCO designs, the MP-6 is constructed of aluminium.

Specifications

Type: impact, super-quick

Weight: 115 g

Length:

overall - 74.47 mm

visible - 38 mm

Diameter: 40 mm

Optional delay: none

Manufacturer

NORINCO.

VERIFIED



*MP-6 impact and super-quick fuze
(1998)*

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FUZES - IMPACT FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MP-5B

Armament

60 and 81 mm mortar bombs generally.

Development

By NORINCO for export sales.

Description

The MP-5B is designed for export sales and is intended to interchange with Western fuzes such as the Borletti PDB332, the US M525 and similar fuzes. It is a mechanical impact fuze that functions only in super-quick mode. A pyrotechnic delay is used for arming. Muzzle safe distance is 30 m. The fuze body is aluminium.

Specifications

Type: impact, super-quick

Weight: 234.2 g

Length:

overall - 95.7 mm

visible - 69 mm

Diameter: 49 mm

Optional delay: none

Manufacturer

NORINCO.

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*MP-5B
(1998)*

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FUZES - IMPACT FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MS-3A

Armament

82 mm illuminating and leaflet mortar rounds.

Development

By NORINCO to a Chinese People's Liberation Army requirement.

Description

The MS-3A is a powder train selective time fuze used with base ejecting illuminating and cargo (leaflet) 82 mm mortar rounds. There is a protective aluminium fuze cover that screws on over the fuze body. The fuze body is of aluminium and phenolic construction and has an in-flight arming delay of 3 seconds.

Specifications

Type: powder train selective time

Weight: 462 g

Length:

overall - 97 mm

visible - 67 mm

Diameter: 66 mm

Manufacturer

NORINCO.

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*MS-3A selective time fuze
(1998)*

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FUZES - MORTAR FUZES, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MP-1B

Armament

60, 81 and 82 mm mortar bombs generally.

Development

By NORINCO to Chinese People's Liberation Army requirement.

Description

The MP-1B is derived from the earlier MP-1A and is functionally identical to the earlier fuze, with which it may be interchanged. The body is of Bakelite with a steel nose cap and the fuze functions in super-quick mode only.

Specifications

Type: impact, super-quick

Weight: 110.9 g

Length:

overall - 74 mm

visible - 37 mm

Diameter: 40 mm

Optional delay: none

Manufacturer

NORINCO.

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MORTARS - 120 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm Illuminating bomb Type 55

Armament

Chinese Type 55 and other 120 mm smoothbore mortars.

Development

By [China](#) North Industries Corporation as standard projectile for the Type 55 mortar.

Description

This bomb uses a cylindrical body with ogival head, closed at the rear by a tailcone to which a very long tailboom and fin assembly is screwed. The tailboom contains the usual primary cartridge and six increments, the same propulsion system as that used by the HE and smoke bombs.

The body contains a flare canister and parachute. A time fuze ignites an expelling charge which forces down the flare canister and blows off the tailcone. The burning canister is expelled and falls away, pulling the parachute out of the tailcone.

Specifications

Length, fuzed: 791.9 mm

Weight, fuzed: 15.84 kg

Weight and type of payload: 2.045 kg parachute and flare

Number of charges: P + 6

Fuze: time

Max range: 5,200 m

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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MORTARS - 120 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb Type 55

Armament

Chinese Type 55 and other 120 mm smoothbore mortars.

Development

By [China](#) North Industries Corporation for the Type 55 mortar.

Description

This bomb is the partner to the HE Bomb Type 55 and uses the same body, tail unit and propulsion system. The nose is closed by an adaptor which carries a deep burster tube and burster charge and receives the impact fuze. The body cavity is filled with a white phosphorus smoke mixture.

Specifications

Length, fuzed: 669.3 mm

Weight, fuzed: 16.9 kg

Weight and type of payload: 1.547 kg WP

Number of charges: P + 6

Fuze: impact SQ

Max range: 5,598 m

Muzzle velocity: 265 m/s

Manufacturer

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MORTARS - 120 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Type 55

Armament

Chinese Type 55 and other 120 mm smoothbore mortars.

Development

By [China](#) North Industries Corporation as standard projectile for the Type 55 mortar.

Description

A conventional streamlined steel bomb with alloy tailboom and fins. There are four gas check grooves around the bourrelet. The nose is closed by an adaptor which acts as an exploder container and receives the fuze. A primary cartridge fits into the rear of the tailboom and six cloth covered split-ring secondary increments fit around the boom in front of the fins.

Specifications

Length, fuzed: 664.1 mm

Weight, fuzed: 16 kg

Weight and type of payload: 1.36 kg TNT

Number of charges: P + 6

Fuze: impact SQ

Max range: 5,700 m

Muzzle velocity: 272 m/s

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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MORTARS - 100 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

100 mm HE bomb Type 71

Armament

Chinese [100 mm Type 71](#) mortar.

Development

No details known.

Description

This is a cast-steel bomb of conventional teardrop shape, with four gas check grooves around the bourrelet and a welded steel tail unit and fins. A primary cartridge is inserted into the tailboom and up to six secondary increments, in cloth-covered split ring form, can be attached to the tailboom.

The mortar has a maximum range of 4,750 m and muzzle velocity of 250 m/s. In addition to the HE bomb, smoke, illuminating and practice bombs are also manufactured.

Specifications

Length, fuzed: 532.6 mm

Weight, fuzed: 8 kg

Weight of payload: 961 g

Number of charges: P + 5

Fuze: PD Pia-4

Max range: 4,750 m

Max muzzle velocity: 250 m/s

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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MORTARS - 82 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm leaflet bomb Type 53

Armament

All 82 mm mortars.

Development

Chinese ordnance authorities.

Description

This uses the same body, tail unit and propulsion system as the illuminating bomb described beforehand. Internally it has a small ejection charge under the fuze which, by means of thrust plates, will shear off the tail unit at the requisite time. The leaflets are rolled and inserted into the body before firing, by unscrewing the tail unit. They are ejected by the charge after the tailcone has been sheared off.

No details of performance or dimensions are known.

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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MORTARS - 82 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm illuminating bomb Type 53

Armament

All 82 mm mortars.

Development

Chinese ordnance authorities.

Description

This is a cylindrical bomb, with tapering tailcone, tailboom and fin unit. A primary cartridge is inserted into the tailboom and up to three secondary increments, in cloth-covered split rings, fit around the boom. There is an expelling charge beneath the fuze, and beneath this is the flare unit; the parachute occupies the tailcone of the bomb. The time fuze ignited the expelling charge which blows the tubular section of the bomb away from the tailcone. This causes the parachute to deploy, pulling the burning flare canister from the body section.

Specifications

Length: 584 mm

Weight: fuzed, 5.335 kg

Filling: 750 g parachute and flare

Muzzle velocity: 180 m/s

Range: max effective, 2,210 m; min, ca 350 m

Intensity: 250,000 cd

Emission time: >22 s

Fuze: Shi-3 MT

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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[82 mm Type 53](#) illuminating mortar bomb

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MORTARS - 82 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm smoke bomb Type 53

Armament

All 82 mm mortars.

Development

By Chinese ordnance authorities.

Description

This is the same as the HE bomb Type 53 described previously except that the interior is filled with White Phosphorus (WP) smoke mixture. The propulsive system and ballistic performance are the same.

Specifications

Length: 312 mm

Weight, fuzed: 3.49 kg

Weight and type of payload: 386 g WP

Fuze: Pai-1A impact SQ

Muzzle velocity: 70-200 m/s

Max range: 2,900 m

Status: Available.

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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[82 mm Type 53](#) smoke bomb

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MORTARS - 82 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm HE bomb Type 53

Armament

Chinese Type 53 and 67 and other 82 mm mortars.

Development

Chinese development, apparently based upon the US 81 mm [M43](#).

Description

A teardrop-shaped cast-steel bomb with welded tail unit. A primary cartridge fits into the tailboom and three secondary increments, in cloth-covered split rings, fit around the tailboom in front of the fins.

Specifications

Length, fuzed: 330 mm

Weight, fuzed: 3.16 kg

Weight and type of payload: 392 g TNT/Dinal 42

Number of charges: P + 3

Fuze: Pai-1A impact SQ

Max range: 3,040 m

Muzzle velocity: 70-211 m/s

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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[82 mm Type 53 HE mortar bombs](#)

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MORTARS - 82 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm incendiary bomb Type 53

Armament

All 82 mm mortars.

Development

Chinese ordnance authorities.

Description

This uses the same body, fuze, tail unit and propulsion system as the HE bomb Type 53 but is filled with an unidentified incendiary agent (probably red phosphorus) in the form of pellets. A burster charge beneath the fuze breaks open the bomb on impact, allowing the burning pellets to be scattered. It is presumed that the ballistic performance is the same as that of the HE bomb.

Manufacturer

Not known.

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MORTARS - 81 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE/Fragmentation Bomb

Armament

Most older types of 81 mm mortars; Chinese and similar 82 mm mortars.

Development

Chinese development, copied from the US [M43](#) bomb.

Description

This is a slightly modified copy of the US [M43](#) 81 mm bomb. A teardrop-shaped, cast-iron bomb with four gas check grooves around the bourrelet and a welded steel tail tube and fins. The propelling system consists of a primary cartridge in the tail tube and three secondaries which clip in between the fins. Although nominally an 81 mm bomb, it is fired from the Chinese Types 20 and 53 82 mm mortars.

Specifications

Length, fuze: 310 mm

Weight, fuze: 3.22 kg

Weight and type of payload: 560 g TNT

Number of charges: P + 3

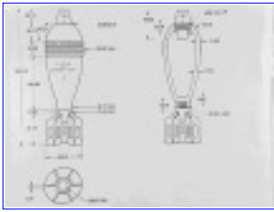
Fuze: impact SQ

Max range: 2,800 m

Manufacturer

Chinese government arsenals.

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81 mm HE/fragmentation bomb

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MORTARS - 60 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb

Armament

Chinese Type 63 mortar and others.

Development

[China](#) North Industries Corporation.

Description

A simple cast-iron bomb of teardrop shape, with four gas check grooves round the bourrelet. The 10-fin tail unit is of welded steel and carries the usual primary cartridge in the tail tube with three horseshoe secondaries fitted round the tailboom above the fins.

Specifications

Type of payload: TNT

Number of charges: P+3

Fuze: impact SQ Type 54

Min range: 137 m

Max range: 1,470 m

Muzzle velocity: 45-134 m/s

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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Chinese 60 mm HE bomb for Type 63 mortar

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MORTARS - 60 mm MORTARS, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb M-83

Armament

Chinese 60 mm Mortar [M-83A](#) and other similar mortars.

Development

[China](#) North Industries Corporation.

Description

The body is teardrop shaped and cast from rare earth spheroidal graphite iron; there is a gas check groove around the bourrelet and also, shortly below, a second groove carrying a plastic obturating ring. The tail unit is of extruded and welded carbon steel. Propulsion is by a primary cartridge in the tail tube and three secondary charges in horseshoe containers that wrap around the tailboom. These may be of plastic or fabric construction.

Specifications

Length, fuzed: 241 mm

Weight, fuzed: 1.33 kg

Weight and type of payload: TNT

Number of charges: P + 3

Fuze: impact SQ

Min range: 72 m

Max range: 2,655 m

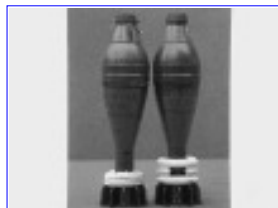
Muzzle velocity: 80-204 m/s

Chamber pressure: 290 kg/cm²

Manufacturer

[China](#) North Industries Corporation (NORINCO).

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Chinese 60 mm [M-83](#) bombs showing fabric and plastic secondary charges

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CANNON

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

25 × 218 mm

Synonyms:

25 mm Soviet 2-M3 and 2-M8

Armament

Naval air defence guns, also Chinese Type 61 naval gun.

Development

The round appears to have been developed from the 25 × 205 mm round described previously. The case is simply lengthened and adopts a more conventional pattern of extraction groove and rim. There was no increase in ballistic performance, and the change was probably made to simplify ammunition production and gun design. It is used with a 25 mm naval air defence gun, widely employed in the [Russian Federation](#) and Associated States (CIS) fleet, usually in the form of twin mountings. It was then distributed to other countries receiving RFAS patrol boats and other vessels. In addition to Russian and Chinese production, described below, it is probably also manufactured in [North Korea](#), though no information is available. As far as can be determined this ammunition is no longer produced within [Russia](#) itself.

Description

The case is rimless and bottlenecked, with a long neck crimped over the lower driving band of the

projectile. The projectile of the 23 × 205 mm round, having three driving bands, was originally used and may still be copied, while later projectiles have two driving bands. The cartridge case may be of brass or steel.

Specifications

Round length: 292 mm

Case length: 218.7 mm

Rim diameter: 34.9 mm

Bourellet diameter: 24.7 mm

Projectile weight: 288 g

Muzzle velocity: 900 m/s

Muzzle energy: 116.6 kJ

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HE-I-T: Steel shell loaded 11.5 g RDX; nose impact fuze, probably with self-destruction; 282 g; Mv 880 m/s

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

State arsenals

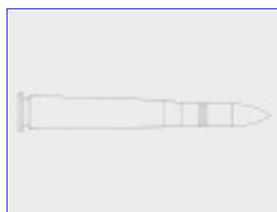
Type: HE-I-T UOZR-132: Steel shell filled TNT and fitted with base tracer, three copper driving bands; nose impact fuze; 288 g; MV 900 m/s

HE-I-T: Steel shell filled TNT and fitted with base tracer, two copper driving bands; nose impact fuze; 285 g; Mv 900 m/s

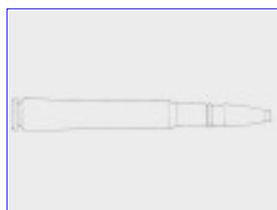
Type: HE-I OZR-85M: Steel shell filled 11 g A-IX-2 high-explosive/incendiary composition; nose impact fuze MG-25; 250 g; MV 900 m/s

Type: AP-T BR-85: Pointed steel shot with base tracer; 260 g; MV 900 m/s

UPDATED



25 mm Soviet M1940



25 mm Soviet 2-M3 and 2-M8

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CANNON

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

25 mm Naval cartridge for 110 Series Naval Guns

Synonyms:

None

Armament

M-110 and 110-PM automatic naval guns on 2M3, 2M3M and 2M8 mountings; [NORINCO Type 61](#) twin barrel naval gun.

Development

This cartridge was developed for use in a twin-barrel 80-calibre naval gun that first appeared soon after 1945. The automatic dual-role gun appeared on numerous mountings and was widely used on light patrol craft and heavier craft distributed to many countries receiving Soviet military aid. It was manufactured in the [People's Republic of China](#) as the Type 61 twin-barrel naval gun, also widely exported. The guns are intended for use against both air and surface targets, being effective to ranges of 2,200 m against surface targets and 1,500 m against air targets.

Description

This round uses a rimless, bottlenecked-lacquered steel case with a sharply stepped shoulder. Two main types of round are known to have been manufactured and they are still in production.

One is known as Fragmentation Incendiary - Tracer (FIT), also referred to as HEI-T. The steel

projectile incorporates a copper or gilding metal rotating band with a point-detonating all-weather nose fuze containing a self-destruct element. The tracer burns for at least 3 seconds.

The second round is an AP-T. The solid steel projectile weighs 281 g and contains a tracer element that burns for at least 4 seconds.

It is assumed that training rounds are also available.

Specifications

Round length: 291 mm

Round weight: FIT, 640 g; AP-T, 642 g

Projectile weight: FIT, 280 g; AP-T, 281 g

Projectile length: approx 291 mm

Muzzle velocity: 890-900 m/s

Range, surface:

(max) 2,745 m

(effective) 2,200 m

Range, air targets:

(max) 2,800 m

(effective) 1,500 m

Operational temperature range: -40 to +50°C

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

NORINCO

Type: HEI-T: Round weight 630 g; MV 890 m/s

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

PRIBOR

Type: FIT: See text

AP-T: See text

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NORINCO 25 mm HEI-T naval cartridge for Type 61 naval gun

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [CHINA](#), PEOPLE'S REPUBLIC

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition: 7.62mm - 14.5mm

NOTE: Chinese ammunition colour coding changed in 1967. Designations herein indicating `old', are pre-1967 colour codes.

7.62 × 39 mm cartridges

Ball, Type 56	none
Tracer, Type 56	green tip
API, Type 56 (old)	black tip, red band
API, Type 56 (current)	black tip, black primer annulus

7.62 × 54R cartridges

Ball, Type 53 (mild steel core) (old)	white or silver tip
Ball, Type 53, (current)	none
API, Type 53 (old)	black tip, red band
API, M1953 (current)	black tip

12.7 × 108 mm cartridges

API, Type 54 (old)	black tip, red band
API, Type 54 (current)	black tip
API-T, Type 54 (old)	violet tip, red band
API-T, Type 54 (current)	violet tip

14.5 × 114 mm cartridges

API, Type 56 (old)	black tip, red band
API, Type 56 (current)	black tip
Incendiary Tracer (I-T), Type 56	red tip

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 17 mm

Synonyms:

7.65 × 17 mm; 7.62 mm Type 64; [7.62 mm Type 84](#)

Armament

7.62 mm Mini-Pistol Type 84; 7.62 mm Pistol Type 80; 7.62 mm Silenced Pistol, Types 64 and 67; Type 77 pistol.

Development

This cartridge was developed in the 1960s for use in suppressed pistols and first became known in the West after weapons chambered for it were used in [Vietnam](#). It was originally described as 7.65 mm calibre, but NORINCO now describes it as 7.62 × 17 mm. A recent development in this calibre is the Type 84 cartridge for use in the NORINCO Mini Pistol of the same designation.

Description

The 7.62 × 17 mm is a conventional rimless design resembling the [7.65 mm Browning](#) although the Chinese round is a true rimless cartridge rather than semi-rimmed. The two rounds are therefore not interchangeable. The case is brass, straight tapered and Berdan primed. The Type 64 cartridge and the standard 7.62 × 17 mm cartridges fire a full metal jacket bullet. The Type 84 fires a semi-jacketed bullet with a protruding core that is said to be incapable of penetrating the passenger compartment of an

aircraft at a range of 2 m, but is capable of killing a human from 15 m. The cupro-nickel jacket of the Type 84 has striations at the juncture of the truncated cone penetrator to optimise expansion and tissue destruction.

Specifications

Round length: 24.5 - 24.9 mm

Case length: 16.75 - 17 mm

Rim diameter: 8.42 mm

Round weight: 5.6 - 7.65 g

Bullet weight: 4.8 g (Type 64)

Muzzle velocity: 160 - 310 m/s

Muzzle energy: 284 J (standard ball)

Chamber pressure (max): 700 - 1,200 kg/cm²

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: Reduced charge ball Type 64: FMJ; 4.8 g; MV 160 m/s

Ball: FMJ; 4.72 - 4.87 g; MV 290 - 310 m/s

Ball Type 84: 3 g; MV 200 m/s

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*Type 84
(1997)*

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

155 mm extended range full-bore smoke BE projectiles

Armament

Towed 155 mm howitzers: NORICUM GH [N-45](#); CITEFA CALA 30/2; SRC International GC 45; [NORINCO Type](#) WA 021 and Type [GM-45](#); Patria Vammas 155 GH 52 Howitzer; Giat Industries TR and 155/52 guns and M114F Howitzer; [FH-70](#); Soltam Model 839P, 845P, Upgraded M-46 and [M114S](#); Otobreda 155/39; [KH179](#); RDM [M139](#) and [M114/39](#); STK [FH-88](#) and FH-2000; [LIW](#) G5; SITECSA 155/45 ST 012, [M114](#) 155/45 and [M114](#) 155/39; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers; Bofors [FH-77B](#); Extended Range Gun ([Taiwan](#)); XM777 Lightweight Towed Howitzer; [M46/84](#) (Federal Republic of [Yugoslavia](#)).

Self-propelled 155 mm howitzers: TAMSE VCA 155; NORINCO [PLZ45](#) Self-propelled Gun-Howitzer; Giat Industries CAESAR 155/52; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Majnoon ([Iraq](#)); Soltam Rascal and Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; [XT-69](#) ([Taiwan](#)); [AS90](#) and [Braveheart](#); M109A4, M109A5 and [M109A6](#) Paladin; XM2001/XM2002 [Crusader](#) AFAS.

Development

The 155 mm ERFB Smoke BE projectile was the first of the ERFB 'cargo' rounds to be developed. The basic 155 mm ERFB outline is retained but the method of manufacturing the shell body differs from the

'one-piece' ERFB projectiles and there are differences in the payload configurations between European and South African produced designs.

During 1996, [India](#) placed a contract with Denel of [South Africa](#) for a total of 50,000 rounds of 155 mm ERFB ammunition. The contract was worth approximately R840 million (US\$24.1 million) and included 5,000 Smoke rounds (type unspecified) reportedly offered at a cost of US\$800 to 900 each.

Description

While the outline of the 155 mm ERFB Smoke BE is the same as that for the 155 mm ERFB HE, the 155 mm ERFB Smoke BE projectile is manufactured in three parts. The main high-grade steel body is manufactured in two halves with the forward aluminium section threading into the main forged steel body without disturbing the constant outline of the streamlined ogive. On the 155 mm ERFB Smoke BE the base unit is a steel drag reducing boat tail component with a cavity. The 155 mm ERFB-BB Smoke BE base is closed by a Base Bleed (BB) unit.

The smoke composition used with these projectiles is enclosed in a number of cylindrical metal canisters with a flash channel running through their centres. On 'European' 155 mm ERFB and ERFB-BB Smoke BE projectiles, such as those produced by Eurometaal NV, the number of canisters carried is five, two small and three large. South African 155 mm M1 SCM projectiles contain four canisters weighing 13.2 kg and a Hexachloroethane (HC) type composition.

Before firing, the usual transport and handling lifting plug is removed and replaced by a MTSQ fuze, such as the M577A1, or an electronic time fuze. When the fuze functions at the selected time after firing, ideally at an optimum height of 400 mm over the target area, it detonates an expulsion charge which creates internal pressures forcing the payload down against the base to remove the base burn or base bleed unit. The same expulsion charge also creates flash to ignite the smoke canister contents so that they burn as soon as they are ejected from the base.

The type of smoke produced is usually dense grey/white screening smoke. As a typical example the smoke canisters used with the Eurometaal produced projectiles have two lengths of smoke production time. The two small canisters produce smoke for 60 seconds and the three largest for 120 seconds, sufficient to lay a smoke screen 200 m long, 50 m wide and 30 m high (depending on conditions). The smoke produced by the South African M1 SCM may be white, red, yellow or blue for marking purposes as well as screening.

South African 155 mm ERFB projectiles may be converted in the field to remove boat tails from ERFB projectiles and fit base bleed units to produce ERFB-BB projectiles. The process is carried out using a projectile clamping table which can also be used to remove damaged obturators and fit new ones. The table can be folded flat and weighs 25 kg.

To take full advantage of the range potential of 155 mm ERFB and ERFB-BB Smoke BE projectiles they are usually fired with high-energy charges, typically the NATO [M3A1](#) (zones 3, 4 and 5), [M4A2](#) (zones 3, 4, 5, 6 and 7), [M119A1](#) (zone 8), [M203](#) (zone 9) or the [M11](#) (zone 10), the latter being restricted to 45 calibre or longer barrels.

The propelling system for the [LIW 155 mm G5](#) and G6 gun-howitzers originally involved a three-charge cloth bag system. This has been replaced by a modular system, developed by [SOMCHEM](#), involving combustible cases with a built-in charge retaining device. The system may be used with ERFB (above the basic Charge 2), ERFB-BB projectiles and all 155 mm NATO projectiles.

The lowest charge for the Denel modular charge system is the Charge Propelling 155 mm Modular Charge 1 [M51](#). The combustible container for this charge is red and contains single-base granular propellant. The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs approximately 2.3 kg, is 211 mm long and has a diameter of 164 mm.

The next charge is the Charge Propelling 155 mm Modular Charge 2 [M52](#). The combustible case is

blue and houses triple-base propellant cords. The diameter at the front of the case is reduced to allow it to friction fit into the rear of a Charge 2 increment (see below). The igniter consists of a combination of 20 g G12 gunpowder and 40 g CBI. The charge weighs 5.6 kg, is 373 mm long and the diameter is 164 mm.

This modular system continues with the Charge Propelling 155 mm Modular Increment [M52](#). One or two of these increments can be added to the normal Charge 2. Charge 2 plus one increment can be used with boat tailed ERFB and all NATO 155 mm projectiles. Charge 2 plus two increments can be used with ERFB, ERFB-BB and all NATO 155 mm projectiles. Each increment is contained in a green combustible case containing triple-base propellant cords. The igniter consists of 60 g of G12 gunpowder. The charge weighs approximately 4 kg, is 289 mm long and the diameter is 164 mm.

The top charge of the modular system is the Charge Propelling 155 mm Modular Charge 3 [M53](#). The charge is contained in a purple (jacaranda) combustible case containing triple-base tubular propellant. The igniter consists of G12 gunpowder. The charge weighs 17.1 kg, is 930 mm long and the diameter is 164 mm.

All charges are ignited by the Tube Percussion [M82](#) which contains 1.4 to 1.5 g of gunpowder. The tube is 49.37 mm long with a diameter over the rim of 15.24 mm.

With this system the following ballistic performances can be achieved using a 155 mm 45 calibre barrel:

Charge 1 - MV 350 ± 5 m/s - max range 9,100 m

Charge 2 - MV 483 ± 5 m/s - max range 13,400 m

Charge 2 + 1 increment - MV 645 ± 5 m/s - max range 19,000 m

Charge 2 + 2 increments - MV 795 ± 5 m/s - max range 25,400 m

Charge 2 + 2 increments + BB - MV 789 ± 5 m/s - max range 31,000 m

Charge 3, standard shell - MV 897 ± 5 m/s - max range 30,200 m

Charge 3 + BB - MV 895 ± 5 m/s - max range 39,000 m.

A typical range for the 155 mm ERFB Smoke BE when fired from 45 calibre barrels is 30,000 m. When fired from the same calibre length barrel a typical 155 mm ERFB-BB Smoke BE projectile can reach 39,000 m.

This modular charge system has now been replaced by one involving up to six [M62A1](#) combustible modular charges all with the same content and meeting the NATO Joint Ballistics MoU. The charges are produced by [SOMCHEM](#) and can be used with ordnance up to 52 calibres long. Other similar modular charge systems could be employed.

One-piece Combustible Cartridge Cases (CCC) have been developed for use with 155 mm ERFB projectiles. A typical example is the C30 charge manufactured by Chartered Ammunition Industries of [Singapore](#). The C30 contains 14 kg of triple-base propellant, is 770 mm long and has a diameter of 160 mm. It will provide a range of 30,000 m using a 39 calibre barrel and 40,000 m using a 45 calibre barrel.

One further charge developed for use with 39 and 45 calibre barrels firing 155 mm ERFB projectiles is the Propelling Charge No 16 produced by Eurometaal NV of the Netherlands. This is a separate loading single-bag charge of single-base nitrocellulose CH21 propellant with a 50 g clean-burning igniter in a red cloth bag sewn onto the base. The charge incorporates a central igniter core and a flash reducer containing 250 g of potassium sulphate. A wear-reducing and decoppering liner are sewn to the inner surface of the bag. The complete charge weighs 13.12 kg, 12.12 kg of which is the CH21 propellant. It is 764 mm long.

A variant of the 155 mm ERFB Smoke BB produced in [South Africa](#), the Shell 155 mm Leaflet BE M2, can be used to carry 3,500 leaflets for propaganda or information purposes - see following entry.

Specifications

Typical

Weights:

ERFB projectile with M577A1 fuze - 45.5 kg

ERFB-BB projectile with fuze - 47.2 kg

Lengths:

ERFB - 843 mm

ERFB-BB - 861 mm

Diameter over nubs: 154.69 mm

Diameter over drive band: 157.86 mm

Chamber pressure (typical): 3,500 bar

Muzzle velocity:

ERFB - 897 m/s

ERFB-BB - 895 m/s

Max range:

ERFB - 30,000 m

ERFB-BB 38,000 m

Operating temperature range: -20 to +60°C

Authorised fuzes

MTSQ M577 series

Electronic NINA, ZELAR, Fuchs M8611 and so on

Equivalent projectiles

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 155 mm ERFB Smoke BE

Description: Carries two smoke canisters with total weight of 10.9 kg. Larger pot emits smoke for 120 seconds and a smaller pot for 65 seconds. Maximum range given as 26,000 m. A variant, which may be a later development, carries five smoke containers which produce smoke for 100 seconds. Weight of this variant is 44.85 kg and maximum range given as 25,000 m. Fuze is MS-200 ET or MTSQ M577A1

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm ERFB and ERFB-BB Smoke BE

Description: Specifications as text. Available for production. Propelling charge No 16 also produced

[SOUTH AFRICA](#)

Manufacturer

[SWARTKLIP Products](#)

Type: Shell 155 mm Screening Smoke BE M2

Description: Specifications as text. Marketed by Denel

SWITZERLAND

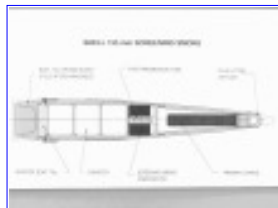
Manufacturer

NORICUM

Type: SEN-155 mm HC-Smoke

Description: Marketed by T & T Technology Trading Limited. Contains four HC smoke canisters, Weight with boat tail 46.5 kg and BB 48.5 kg

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Cross-sectional drawing of South African 155 mm Screening Smoke BE M2



South African 155 mm Screening Smoke BE M2

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm Smoke D-540

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer; 152 mm Howitzer [M1943](#) (D-1); [NORINCO 152 mm Gun-Howitzer Type 66](#); [NORINCO 152 mm Gun-Howitzer](#) Type 37; 152 mm Model 1981 Gun-Howitzer ([Romania](#)); 152 mm Model 85 Gun-Howitzer ([Romania](#)); 152 mm Howitzer [M84](#) series (Federal Republic of [Yugoslavia](#)). Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer; [NORINCO Type 83](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer DANA and ONDAVA.

Development

The 152 mm Smoke D-540 (actual calibre 152.4 mm) is the successor to the earlier D-530 developed originally for use with the 152 mm Howitzer [M1943](#) ([D-30](#)) - the two projectiles are compatible. The Smoke D-540 does not appear to remain in production in [Russia](#).

There were two 152 mm chemical rounds based on the design of the D-540. One projectile weighed 40 kg and contained 2.8 kg of Sarin (GB) nerve agent dispersed by a TNT burster charge. The other projectile weighed 42.5 kg and contained 5.4 kg of thickened Lewisite (L) blister agent, also dispersed in vapour and aerosol form by a TNT burster charge. Both types have been withdrawn from service and are scheduled for destruction.

Description

The 152 mm Smoke D-540 is a separate loading ammunition, consisting of the projectile and a variable charge system contained in a brass or lacquered steel cartridge case.

The projectile is forged steel with a long streamlined ogive, a boat tail and a shallow bourrelet. A single copper drive band is just over 24 mm wide. The contents are a nominal 6.626 kg of White Phosphorus (WP), this is released when the projectile body is burst open by an internal burster charge following detonation, via an unspecified model of point detonating fuze. When the WP contents contact the atmosphere they start to create clouds of grey/white screening smoke.

The 152 mm ammunition uses a two-part variable charge system contained in brass or lacquered steel cartridge cases 547.5 mm long. The two parts are the Reduced Charge and the Full Charge, each in its own cartridge case.

The Reduced Charge uses nitrocellulose powder in a series of 12 bags. Charge 6, the lowest comprises the base bag charge only, to which a series of equal size bags are added to create higher charges. One charge bag is added to the base charge bag to comprise Charge 5, two are added for Charge 4, three for Charge 3 and five for Charge 2. These are all held in place by a fibre cup. The total weight of the Reduced Charge propellant is 4.2 kg.

The Full Charge uses NGH or NDT-3 powder in bags. Charge 1 has two base bag charges, one located above the other. To create the Full Charge two further equal size bag charges are added. A fibre cup holds the charge bags in place. The total weight of the Full Charge propellant is 8.8 kg.

Both charges are initiated by a KV-4 percussion primer in the base of the cartridge case.

With a 152 mm gun-howitzer such as the [D-20](#) the Reduced Charge muzzle velocities vary from 282 to 511 m/s. This produces ranges from 6,710 to 13,400 m. The Full Charge produces a muzzle velocity of 655 m/s and a maximum range of 17,400 m.

Specifications

Weights:

complete round, nominal - 59.5 kg

projectile, fuzed - 43.526 kg

filling - 6.626 kg WP

propellant - Full 8.8 kg NGH or NDT-3; Reduced 4.2 kg NC

cartridge case - 7.5 kg

Lengths:

projectile - 689.7 mm

cartridge case - 547.5 mm

Diameter of cartridge case rim: 170 mm

Diameter over drive band: 156 mm

Muzzle velocity, Full Charge: 655 m/s

Max chamber pressure: 2,350 bar

Authorised fuzes

PD - type not specified

Equivalent projectiles

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: Smoke for 152 mm Type 66

Description: Creates a smoke screen 40 to 50 m high and 30 to 45 m wide for 50 to 60 seconds. Fitted with Yan-2 fuze. Otherwise standard specifications

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 152 mm Marker Smoke

Description: Produces a dense red smoke cloud visible by eye at a range of 7,000 m and lasting at least 50 seconds. Projectile weighs 43.5 kg, is a maximum of 707.14 mm long and is fitted with a WC410 impact fuze. Maximum range is 17,200 m

VERIFIED



NORINCO 152 mm Smoke Type 66 projectiles

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm ICM 3-O-23

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer.

Self-propelled equipments include: 152 mm [2S19](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer ONDAVA.

Development

The 152 mm ICM 3-O-23 projectile (described in marketing literature as a Cluster HEAT-Bomblet projectile) is intended for use with the latest generation of [Russian Federation](#) and Associated States (CIS) 152 mm long-barrelled gun-howitzers. It is issued with a choice of two preloaded cartridge cases containing the variable propellant charges. The complete round with a long-range Full charge is the 3VO28. The Reduced charge is the 3VO29.

There is also a 152 mm ICM 3-O-13 round carrying eight fragmentation submunitions - see following entry.

Description

As with other rounds in the 152 mm family, the 152 mm ICM 3-O-23 projectile is a separate loading munition.

The steel carrier body has relatively thin steel walls, a long streamlined ogive, single copper drive

band and a Base Bleed (BB) unit with a boat-tail outline secured to the base. The hollow interior contains 42 dual-purpose bomblets in six layers of seven, ready to be ejected through the base when the nose-mounted mechanical time fuze functions at a preselected time, igniting an expulsion charge inside the ogive. This should ideally occur at a height of 400 m. The bomblets will then be ejected to fall inside a ground area with dimensions of 145 m along the line of the carrier projectile's trajectory, and approximately 90 m wide.

Each dual-purpose steel bomblet packed into the carrier is 62.5 mm long, has a diameter of 44 mm and weighs 350 g. As the bomblet is dispensed, a stabilising ribbon tail is released from the base which serves to ensure it falls warhead first and arms the impact fuze. The latter is achieved by using the bomblet's in-flight spin to turn a screw driving the bottom half of the body over the upper portion in a telescopic fashion. As the lower half strikes the ground the impact fuze functions and the bomblet detonates instantly. It uses an internal shaped charge, weighing 45 g, to penetrate up to 100 mm of homogeneous armour at an angle up to 30° from the normal. The steel body also creates anti-personnel fragments.

The cartridge cases involved with the three propellant charges are lacquered steel with a KV-4 percussion primer in the base. No information is available regarding the weights and types of propellant involved, although one reference quotes a Full charge as containing 8.1 kg of NgTp (NDT-3).

Maximum muzzle velocity is not known although maximum range is 26,500 m.

Specifications

Weights:

projectile - 42.8 kg

bomblet, each - 350 g

bomblet explosive, each - 45 g

Lengths:

projectile - 820 mm

bomblet - 62.5 mm

Bomblet diameter: 44 mm

Contents: 42 dual-purpose bomblets

Max range: 26,500 m

Authorised fuzes

MT - type not specified

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 152 mm Type 66 cargo projectile

Description: See separate entry

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 152 mm DP-ICM M351 (CL 3162) and ER-DP-ICM M350 (CL 3150)

Description: See separate entry

SLOVAKIA

Manufacturer

Konstrukta Defence

Type: 152 mm Cargo Projectile Trnovnik

Description: Originally known as the 152 mm ICM EKK, the Trnovnik is virtually identical to the 152 mm ICM 3-O-23 and uses the same three cartridge case propellant system. A new design of dual-purpose bomblet has been developed for use with this projectile

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

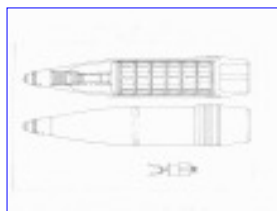
Yugoimport SDPR

Type: 152 mm HE/ICM

Description: Developed and produced primarily for use with the [152 mm Gun-Howitzer M84](#) series.

Contains 63 KB-2 bomblets, each weighing 40 g and containing 35 g of FH-5 explosive. Muzzle velocity is 810 m/s and maximum range 22,500 m. Weight is 43.6 kg and length 842 mm. Fitted with an electronic fuze. May no longer be in production

UPDATED



152 mm ICM 3-O-23 projectile with cutaway on right; on the left is a bomblet for size comparison



Sectioned demonstration model of Czech 152 mm Cargo Projectile Trnovnik with Base Bleed (BB) unit (left) and (right) a Reduced charge cartridge case (T J Gander)



On the right is a typical dual-purpose bomblet as used with the [Russian Federation](#) and Associated States (CIS) 152 mm ICM 3-O-23 and the Czech 152 mm Trnovnik, with (centre) two examples of the bomblet developed for use with the Trnovnik. On the left is a 100 mm armour block perforated by one of the new bomblets (T J Gander)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm FRAG-HE 3OF45

Armament

152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B).

Self-propelled equipments include: 152 mm [2S19](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer ONDAVA.

Development

The 152 mm FRAG-HE 3OF45, may be regarded as the latest [Russian Federation](#) and Associated States (CIS) FRAG-HE ammunition development intended for general operational use with the latest generation of RFAS 152 mm long-barrelled gun-howitzers. It consists of three rounds which vary in the preloaded propellant charge involved. The 3VOF72 uses a long cartridge case with a Long Range charge. The 3VOF73 has a shorter cartridge case containing a Reduced charge. The 3VOF58 uses the same length case as the 3VOF73 but containing the Full Charge.

Artillery pieces firing 152 mm 3OF45-type rounds can also fire existing rounds such as the 152 mm FRAG-HE OF-540.

A 152 mm nuclear projectile was developed for the towed 152 mm [D-20](#) and self-propelled [2S3](#) and [2S19](#). This projectile has a yield of 0.2 kT.

RH-ALAN of Zagreb, [Croatia](#), market a 152 mm HE [M84](#) round which resembles the FRAG-HE 3OF45 projectile but which is allied with a revised propellant system providing a muzzle velocity of 920 m/s and a maximum range of 24,400 m.

Description

The 152 mm FRAG-HE 3OF45 is a separate loading item of ammunition, consisting of the projectile and a variable charge system contained in a brass or lacquered steel cartridge case.

The relatively thin-walled projectile is forged high-fragmentation steel with a long streamlined ogive, a hollow-based boat tail and a shallow bourrelet. A single copper drive band encircles the projectile just forward of the boat tail. The contents are nominally 7.65 kg of A-IX-2 (RDX 72 per cent, Aluminium 23 per cent, Wax 4 per cent). This explosive payload, combined with the high-fragmentation steel body, is claimed to provide the 152 mm FRAG-HE 3OF45 with an on-target effect 1.5 to 2 times that of the 152 mm FRAG-HE OF-540 (see previous entry), even though the projectile weights are virtually identical. The nose of the projectile is threaded to accept a variety of fuzes but no firm information is yet forthcoming regarding the models or types involved; mention has been made of PD KZ-88 and RGM-2 delay (0.027 to 0.055 second) fuzes.

The cartridge cases involved with the three propellant charges are lacquered steel with a KV-4 percussion primer in the base. The Full Charge is 8.17 kg of NgTp (NDT-3); the Reduced Charge weighs 4.14 kg. The Reduced charge is made up of a base charge plus five increments, all in linen or cambric bags.

Maximum muzzle velocity using the Long Range propellant charge is 810 m/s and maximum range 24,700 m. Corresponding figures for the Full Charge are 667 m/s and 19,400 m, while for the Reduced Charge they are 516 m/s and 14,370 m.

Specifications

Weights:

complete round - Full 60 kg; Reduced 56 kg; Long Range n/avail

projectile - 43.56 kg

explosive filling - 7.65 kg A-IX-2

propellant - Full 8.17 kg; Reduced 4.14 kg; Long Range n/avail

cartridge case - 7.5 kg

Lengths:

projectile - 864 mm

cartridge case - 547.5 mm

Muzzle velocity:

Long Range Charge - 810 m/s

Full Charge - 667 m/s

Reduced Charge - 516 m/s

Max range:

Long Range Charge - 24,700 m

Full Charge - 19,400 m

Reduced Charge - 14,370 m

Operating temperature range: -50 to +50°C

Authorised fuzes

PD KZ-88 and RGM-2

Equivalent projectiles

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries Corporation (NORINCO)

Type: 152 mm HE Type 83

Description: Developed for use with the [152 mm Gun Type 83](#). The projectile weighs 48 kg, is 830 mm long and uses a cartridge case 960 mm long (weight approx 16 kg) which weighs 38 kg with a Full charge. The maximum muzzle velocity is 955 m/s and range 30,124 m

[CROATIA](#)

Manufacturer

RH-ALAN

Type: 152 mm HE [M84](#)

Description: Can be fired from the 152 mm [M84](#) and M93 howitzers using a revised propellant system giving a muzzle velocity of 920 m/s and a maximum range of 24,400 m. Can be fitted with the PD M557 fuze as well as the RGM-2 and locally produced UTIU [M72](#). Total round weight is 70 kg

[CZECH REPUBLIC](#)

Manufacturer

Konstrukta Defence

Type: 152 mm FRAG-HE

Description: This round, also known as 152 mm HE M1 BB, is part of a family of 152 mm ammunition developed for use with the ONDAVA self-propelled gun-howitzer. (Other projectiles include a FRAG-HE-BB similar to the RFAS 3OF61 and the EOF, the Czech FRAG-HE OF-540.) The FRAG-HE projectile weighs 40.6 kg complete and contains 7.9 kg of TNT/RDX. Muzzle velocity is 882 m/s and maximum range 32,150 m when fired from a 47 calibre ONDAVA barrel, using a special propellant charge. The base bleed unit for the 152 mm HE M1 weighs 2.15 kg, is 110 mm long and has a diameter of 116 mm

[FINLAND](#)

Manufacturer

Patria Vammas

Type: 152 mm HE

Description: Muzzle velocity given as 673 m/s and maximum range 18,500 m. It is assumed that these figures are derived from use of the Full propellant charge

Manufacturer

Patria Vammas

Type: 152 mm ERFB and ERFB-BB

Description: See separate entry

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: 152 mm HE OF-550

Description: Intended primarily for use with the Romanian 152 mm Model 81 Gun-Howitzer. Projectile length is 831 mm and the weight 43.56 kg. A muzzle velocity of 825 m/s produces a range of

24,000 m. Fitted with a PD RGM-2 fuze. May no longer be available

SLOVAKIA

Manufacturer

Kerametal Company Limited

Type: 152 mm HE-BT

Description: This round, also known as the 152 mm HE M1 BB, is part of a family of 152 mm ammunition developed for use with the ONDAVA self-propelled Gun-Howitzer. (Other projectiles include an HE M2 BB similar to the [Russian Federation](#) and Associated States (CIS) 3OF61 and the HE-540, equivalent to the FRAG-HE OF-540.) The FRAG-HE projectile weighs 40.6 kg complete and contains 7.9 kg of TNT/RDX. Muzzle velocity is 882 m/s and maximum range 32,150 m when fired from a 47 calibre ONDAVA barrel using a special propellant charge. The base bleed unit for the 152 mm HE M1 weighs 2.15 kg, is 110 mm long and has a diameter of 116 mm

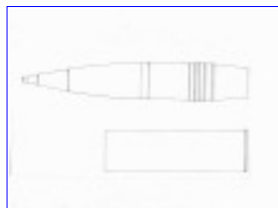
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Projectile for 152 mm FRAG-HE 3OF45 (T J Gander)



The NORINCO 152 mm HE Type 83 projectile with its elongated cartridge case for use with the 45 calibre [NORINCO 152 mm Gun Type 83](#)



Projectile for 152 mm FRAG-HE 3OF45 with Long-Range cartridge case



NORINCO 152 mm Type 83 projectile with a muzzle velocity of 955 m/s and a maximum range of 30,124 m when fired from the NORINCO 152 mm Type 83 gun



Cross-sectioned 152 mm FRAG-HE 3OF45 projectile on right with, from left: Reduced charge; Full charge; and Long Range charge (1998)

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

30 mm ammunition for AK-230

Armament

AK-230 Twin 30 mm mounting; NN-30 naval gun; twin barrel-mounted naval gun 30 mm Type 69 twin-barrel naval gun.

Development

The 30 mm AK-230 was developed during the late 1950s and entered service in 1960. It is a water-cooled, twin-barrelled weapon system intended for the short-range defence of warships or as the main armament of small vessels; the rate of fire is 1,000 rds/min from both barrels. It is possible that the guns involved were developed from aircraft cannon. The 30 mm AK-230 is used extensively and has been equally widely exported. It has been produced in [China](#) as the 30 mm Type 69 twin-barrel naval gun.

Description

The 30 mm ammunition, for the AK-230, is fixed with the projectile rigidly secured to the cartridge case by two 360° crimping rings. These engage in cannellures on the projectile, just behind two copper or gilding metal drive bands. The rimless cartridge cases are necked and have a wide extraction groove. There are two operational rounds produced, both with KB-2 electrical primers in the cartridge base. Muzzle velocity for both rounds is 1,050 m/s and effective slant range is 4,000 m.

UOF-83 D HE The streamlined projectile involved with this round is the OF-83 D which weighs 270

g and contains 30 g of A-IX-2 explosive (a desensitised RDX/TNT mixture); the point impact fuze employed is the MG-30. The cartridge case contains 190 g of BPGR propellant. The Chinese 30 mm Type 69 only fires a locally produced variant of this round.

UBR-83 AP-T The projectile involved with this round is the BR-83 which has a conical armour-piercing ogive; it does not contain explosive so does not have a fuze. The projectile weighs 350 g while the cartridge case contains 190 g of BPGR propellant.

Inert practice and drill rounds are known to exist.

Specifications

Type	HE	AP-T
Designation	OF-83 D	BR-83
Weights		
Complete round	1.13 kg	1.12 kg
Projectile	270 g	350 g
Explosive	30 g	n/a
Propellant	190 g	190 g
Muzzle velocity	1,050 m/s	1,050 m/s

Authorised fuzes

PD MG-30 - HE only

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HE-T, HEI, TP

Description: Offered for export sales. Standard specifications. HE-T tracing time is more than 8 seconds

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HE OF-83, HE F-83, AP-T BR-83

Description: HE F-83 differs only in having a MD-30 fuze and is marginally heavier than the HE OF-83. Otherwise standard specifications

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

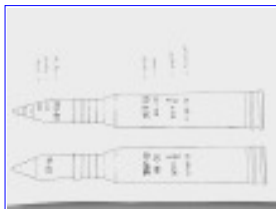
Yugoimport SDPR

Type: HE-I, TP

Description: Probably no longer in production but retained for service. Explosive payload is 31.1 g of

an RDX/Aluminium mixture. Complete round weighs 1.066 kg and projectile 356 g; complete round length is 304 mm. A self-destruct element operates 12 to 17 seconds after firing. The inert TP round ballistically matches the HE-I.

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Outlines of 30 mm rounds for AK-230 gun system: left AP-T BR-83; right 30 mm HE OF-83 D



NORINCO HEI round for Type 69 twin-barrel naval gun

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

100 mm FRAG-HE 3UOF-10 and 3UOF-11 rounds

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)); 100 mm field gun BS-3; 100 mm [KS-19](#) anti-aircraft gun; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; [100 mm Field Gun M53](#); 100 mm towed [anti-tank gun M1977](#); 100 mm towed [anti-tank gun M1977 \(Romania\)](#); 100 mm Coast Gun ([Yugoslavia](#)).

Development

Although these two 100 mm FRAG-HE rounds could theoretically be fired from almost any 100 mm rifled gun, they are intended primarily to be fired from 100 mm D-10 series tank guns and the 100 mm BS-3 field gun. This replaces the large array of HE and FRAG-HE rounds previously available (see previous entry). Both rounds employ the 100 mm FRAG-HE 3OF-32 projectile, the same as that used on the FRAG-HE 3UOF-17 round, employed with the 100 mm 2A70 gun/launcher carried by the [BMP-3](#) MIFV (qv). As far as can be determined only the 3UOF-10 round is in current production. Production is by the Engineering Research Institute (NIMI) based in Moscow.

Description

The 100 mm FRAG-HE 3UOF-10 and 3UOF-11 rounds are fixed. The projectiles rigidly secured to the cartridge cases by a shallow crimping ring. The two rounds differ only in propellant load; both carry the 100 mm FRAG-HE 3OF32 projectile.

The 100 mm FRAG-HE 3OF-32 projectile weighs 15.7 kg and contains 1.7 kg of Hexagen (A-IX-2,

desensitised RDX/Aluminium) initiated by a PD V-429 fuze or a close derivative. TNT is an alternative filling.

The cartridge cases (lacquered steel or brass may be used) can contain one of two possible propellant loads. From the limited information available to date it would appear that the 3UOF-10 round contains sufficient propellant to produce a muzzle velocity of 900 m/s and a maximum range of 16,800 m. The 3UOF-11 round has a maximum range of 20,600 m.

Specifications

3UOF-10 round

Weights:

complete round - 30 kg

projectile - 15.6 kg

explosive - 1.7 kg A-IX-2

cartridge case - 6 kg

Lengths:

complete round - 1.097 m

cartridge case - 695 mm

Diameter of cartridge case over rim: 147.5mm

Muzzle velocity: 900 m/s

Max range: 16,800 m

Operating temperature range: -40 to +50°C

Authorised fuzes

PD V-429 or equivalent

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: 100 mm HE-T Type 73

Description: Round length 1.106 m and weight 30 kg. Projectile is 580 mm long and weighs 15 kg. Muzzle velocity is 900 m/s and maximum range at a barrel elevation of 38° is 13,705 m. Tracer burns for 1.4 seconds

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

82 mm ammunition for B-10 recoilless gun

Armament

[82 mm B-10](#) recoilless gun; NORINCO 82 mm recoilless gun Type 65 and 65-1.

Development

The Soviet [82 mm B-10](#) smoothbore recoilless gun first appeared during the 1950s and is now rarely encountered other than, perhaps, with special forces. Some B-10 guns were exported to nations such as [Egypt](#) and [Syria](#) but most of them have now been withdrawn. The Chinese NORINCO concern, however, copied the basic B-10 design to produce the Type 65 and the later Type 65-1 which incorporates some slight alterations to lighten the carriage. For both Type 65 and Type 65-1 the ammunition remains the same. The Type 65-1 is apparently still in production and has been offered for export sales. Some have been exported to [Pakistan](#) and [Tanzania](#). At one time [82 mm B-10](#) ammunition was manufactured in [North Korea](#) and [Poland](#).

The later NORINCO [82 mm Type 78](#) recoilless gun employs different ammunition (see following entry).

Description

The [82 mm B-10](#) recoilless gun rounds resemble mortar bombs and are produced in two forms, HEAT and FRAG-HE. There are two types of HEAT. One is the BK-881 and the other the BK-881M which has a slightly more powerful warhead.

On both 82 mm HEAT rounds the pear-shaped body is made of cast steel with a long tubular boom threaded into the base. Around the base of the boom is placed the propellant charge in a manner similar to that used with mortar bombs but under the ring-shaped charge, which is held in position by two spoked rings, is a multiperforated steel disc through which the propellant gases are vented when the round is fired. The resultant muzzle velocity for the BK-881 is reported to be 322 m/s.

The shaped warhead for the BK-881 contains 460 g of RDX. That for the BK-881M contains 550 g of RDX. The BK-881 is provided with a PIBD GK-2 while the BK-881M has a PIBD GK-2M. The BK-881M also has a slightly larger propelling charge.

Both HEAT warheads are effective only up to combat ranges of about 400 m although the maximum possible range is greater. Up to 400 m both warheads can penetrate about 240 mm of armour under ideal conditions but accuracy can be affected by light side winds.

The 82 mm O-881A FRAG-HE round follows the same general outline as the HEAT, with a fragmenting cast iron body containing 470 g of TNT and dinitronaphthalene. Muzzle velocity is increased to 400 m/s and maximum range is a possible 4,500 m although effective combat ranges are much shorter. The nose fuze is a PD GK-2.

Specifications

Type	HEAT	HEAT	FRAG-HE
Designation	BK-881	BK-881m	O-881A
Weights:			
round	3.87 kg	4.11 kg	3.90 kg
explosive	460 g	550 g	470 g
Length, overall	683.51 mm	705.79 mm	608.33 mm
Muzzle velocity	322 m/s	n/avail	400 m/s

Authorised fuzes

HEAT - PD GK-2 or GK-2M

FRAG-HE - PD GK-2

Equivalent rounds

[CHINA](#), PEOPLE'S REPUBLIC

Manufacturer

[China](#) North Industries (NORINCO)

Type: HEAT, FRAG-HE

Description: Chinese 82 mm Type 65 rounds differ significantly from the Soviet original. The HEAT weighs 3.45 kg, is 583 mm long and has a muzzle velocity of 247 m/s. At 300 m the RDX 94 warhead can penetrate 120 mm of armour set at 65°. The FRAG-HE warhead contains between 777 and 782 steel spheres, creating a lethal radius of more than 20 m when the warhead detonates. The round weighs 4.6 kg and is 528.8 mm long. Muzzle velocity is 175 m/s and maximum range 1,750 m

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NORINCO 82 mm HEAT rounds for the Type 65 and Type 65-1 recoilless guns

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MEDIUM CALIBRE AIR DEFENCE GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for 37 mm automatic anti-aircraft guns

Armament

37 mm automatic [anti-aircraft gun M1939](#); [NORINCO Type 55](#), Type 61, Type 65, Type 74, Type 74 SD, Type [P793](#) and Type 80 weapon system. 70-K single, B-11-M and W-11-M naval mountings.

Development

The original 37 mm automatic [anti-aircraft gun M1939](#) was developed before the Second World War at the Design Bureau of Artillery Plant No 8 at Kaliningrad. It was a scaled-up version of a Swedish Bofors design for a 25 mm anti-aircraft gun dating from 1933. The basic 37 mm [M1939](#) was thereafter produced in huge numbers and it remains in service with many nations all around the world in both single- and twin-barrel versions and in naval form. It is still in production in [China](#), in both towed and self-propelled versions and has been considerably updated by the provision of various modern fire control systems. At one time the 37 mm [M1939](#) was produced in [Poland](#).

Over its service life, ammunition for the 37 mm [M1939](#) series has undergone gradual development and numerous variations have been reported. The types mentioned below are the later types only. **There are several current proposals to update and upgrade both single- and twin-barrelled 37 mm [M1939](#) guns and their Chinese equivalents, including proposals from [Pakistan](#) and NORINCO of [China](#), but as far as is known none of these proposals affect the ammunition involved.**

The data used in the Specifications table relates to rounds produced in [Yugoslavia](#). They are probably no longer in production but many 37 mm guns and their associated ammunition remain in service in that region.

Description

All rounds fired by the 37 mm automatic [anti-aircraft gun M1939](#) series are fixed. The projectiles are rigidly crimped to the cartridge cases by two 360° crimping rings seating into two pronounced cannelures towards the projectile base. The forged steel projectiles are fitted with a single wide drive band (over 12 mm) pressed into place and, where applicable, are fitted with nose fuzes made of steel. The cartridge cases are lacquered steel or 70:30 drawn brass and are fitted with base-mounted Type T-1 or KV-2 percussion primers. The propellant load is usually 200 to 207 g of 7/14 granular single-base propellant plus 4 g of S-1 decoppering agent.

The 37 mm automatic anti-aircraft gun rounds of [Russian Federation](#) and Associated States (CIS) origin, most of which are now out of production but still in widespread use, are as follows:

FRAG-T, OR-167 This round uses a projectile weighing 730 g with a high-fragmentation forged steel body. The projectile walls are relatively thick and the otherwise solid base houses a No 5 tracer element. The two types of fuze that may be threaded into the nose are the MG-8 or the MG-37. Both fuzes are point detonating with self-destruct devices operating between 8 and 12 seconds. The explosive filling is between 35 and 40 g of A-IX-2 (RDX/Aluminium).

FRAG-T, OR-167N This is an improved version of the FRAG-T OR-167, differing mainly in the design of the internal cavity. The OR-167N cavity is larger and the walls of the forged steel projectile are thinner, enabling the explosive filling to be increased to over 400 g of A-1Kh-2 (RDX/Aluminium/Wax). The nose fuze is a B-37 point detonating fuze made of steel although a modified MG-37 may be fitted, neither of them having a self-destruct function. The projectile weight for Yugoslav -produced rounds is given as 710 g but an OR-167N round originally produced for the East German Navy used a projectile weighing 1.024 kg. With the latter round the explosive filling was 37 g of A-IX-2 (RDX/Aluminium) and the cartridge case contained 210 g of 7/14 propellant; muzzle velocity was 880 m/s.

AP-T, BR-167 This round is now rarely encountered other than with 37 mm naval mountings. The projectile has a solid, heat-treated, heavy steel body with the blunt nose protected by a pressed-on light steel windshield to preserve ballistic properties. A No 5 tracer element is threaded into the projectile base, although this is not always fitted. The UBR-167 projectile, which weighs 1.19 kg, can penetrate 47 mm of armour at 0° obliquity at 500 m and 37 mm at 1,000 m. The BR-167 has a flat base but a version with a boat tail was produced at one time. A naval version of this round, originally produced for East Germany used 210 g of 7/14 single-base propellant and the projectile weighed a stated 1.19 kg; muzzle velocity was 880 m/s.

Inert TP and TP-T practice rounds were produced to ballistically match the above mentioned rounds.

Specifications

Type	HE-I-T	HE-I	API-T, AP-T	TP-T, TP
Weights				
complete round	1.48 kg	1.48 kg	1.5 kg	1.48 kg
Projectile	732 g	732 g	760 g	732 g
Propellant	200 g	200 g	200 g	200 g
Explosive	35.6 g	48 g	none	none
Length, complete round	382 mm	382 mm	382 mm	382 mm
Muzzle velocity	866 m/s	866 m/s	866 m/s	866 m/s
Self-destruct time	8-12 s	8-12 s	none	none

Authorised fuzes

See text

Equivalent rounds

CHINA, PEOPLE'S REPUBLIC

Manufacturer

China North Industries (NORINCO)

Type: HE, HE-T, AP-T, APHE

Description: Produced with some changes from the specifications provided above, for example HE complete round length is given as 386 mm, AP-T is from 381.4 to 384.62 mm long overall, weighs 1.444 kg for the complete round and muzzle velocity is 880 m/s

EGYPT

Manufacturer

Maasara Company for Engineering

Type: HE-I-T

Description: No longer in production. No data available but standard specifications assumed

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: HE-T

Description: Similar specifications to FRAG-T OR-167N but uses a drawn 70:30 brass cartridge case. Complete round weight given as 1.417 kg and length as 381 to 384 mm. Projectile weight is 732 g and filling 36 g of RDX/Aluminium. TP-T also produced

YUGOSLAVIA, FEDERAL REPUBLIC

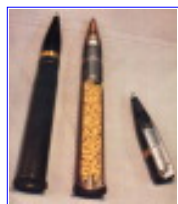
Manufacturer

Yugoimport SDPR

Type: HE-I-T, HE-I, API-T, AP-T, TP-T, TP

Description: May no longer be in production. See specifications table and text

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337 mm HE ammunition for the Chinese anti-aircraft gun Type 55 series produced by NORINCO



37 mm AP-T rounds and their packing, as produced by NORINCO for the Type 55 series cannon



Projectile for 37 mm FRAG-T OR-167



Projectile for 37 mm FRAG-T OR-167N



Projectile for 37 mm AP-T BR-167

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MORTARS - 60 mm MORTARS, [CZECH REPUBLIC](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm mortar bomb, Mk 98

Armament

Standard 60 mm mortars

Development

By Military Institute for Weapon and Ammunition Technology (VTUVM) for use by the Czech military and for export

Description

The Mk 98 constitutes a family of 60 mm mortar bombs, including high explosive fragmentation (HEF), high explosive incendiary (HEI) and white phosphorus (WP) smoke varieties. There are also three types of training rounds. All are typical teardrop-shaped bombs similar in appearance to the M49A2. There are no separate charges; the bomb is launched by a shotgun-type propulsion cartridge. Only data for the HEF version were available for this edition of JAH.

Specifications

Length, overall: 286 mm

Weight, overall: 1.45 kg

Weight and type of payload: HE, 0.28 kg

Max range: 1,350 m

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MORTARS - 120 mm MORTARS, [CZECH REPUBLIC](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb OF-A

Armament

All 120 mm smoothbore mortars.

Development

By Czech Army ordnance, for use in Soviet-pattern 120 mm mortars in Czech service and for export.

Description

Although generally adhering to a Soviet pattern, this bomb has signs of Czech variation to the design. It is of a conventional teardrop shape in cast iron, with three deep gas check rings at the bourrelet and has a steel tailboom and 12 fins. A primary cartridge fits into the tail and six secondary increments, in cloth bags, are tied around the tailboom.

Specifications

Length, fuzed: 664 mm

Weight, fuzed: 15.33 kg

Weight and type of payload: 2.04 kg TNT

Number of charges: P + 6

Fuze: impact, SQ MZ-30AV

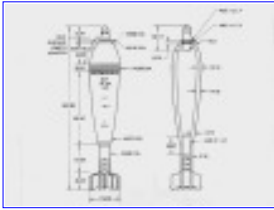
Max range: 5,750 m

Muzzle velocity: 275 m/s

Manufacturer

State arsenals.

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120 mm HE bomb OF-A

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.38 Super Auto

Synonyms:

0.38 Super ACP

Armament

Colt and other automatic pistols; some Thompson sub-machine guns and other experimental sub-machine guns.

Development

In the late 1920s the Colt company improved its 0.38 automatic pistol and developed this cartridge to go with it. Identical in dimensions to the 0.38 Auto, the 0.38 Super Auto is more powerful, very accurate and is very popular in the western hemisphere, although less common in Europe. Although it will chamber in pistols of 0.38 Auto calibre, it should not be used in them as they are not designed for the higher pressures.

Description

A semi-rimmed, brass, straight-taper case, Boxer primed. The standard bullet is an 8.42 g jacketed round-nose pattern.

Specifications

Round length: 32.51 mm
Case length: 22.86 mm
Rim diameter: 10.29 mm
Bullet diameter: 9.09 mm
Bullet weight: 8.42 g
Muzzle velocity: 398 m/s
Muzzle energy: 666 J

Abridged ballistic table: 0.38 Super Auto, 8.43 g ball

Range	Velocity	Energy
0 m	398 m/s	666 J
10 m	390 m/s	640 J
25 m	369 m/s	573 J
50 m	355 m/s	530 J

[CZECH REPUBLIC](#)

Manufacturer

Sellier & Bellot
Type: Ball: FMJ; 8.43 g; MV 398 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA
Ball: FMJ; 8.4 g; MV 366 m/s

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball: JHP; 7.5 g; MV 340 m/s
Ball: FMJ; 8.4 g; MV 333 m/s

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd
Type: Ball: FMJ; 8.4 g; MV 317 m/s

UNITED STATES OF AMERICA

Manufacturer

Cor-Bon Ammunition
Type: Ball +P: JHP; 7.5 g; MV 457 m/s
Ball +P: JHP; 8.1 g; MV 411 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammo)

Type Ball: FMJ; 8.4 g; MV 332 m/s

Ball: JHP; 7.5 g; MV 340 m/s

Manufacturer

Remington Arms Company Inc

Type Ball: JHP; 7.5 g; MV 396 m/s

Ball: FMJ; 8.42 g; MV 390 m/s

Manufacturer

Winchester-Olin

Type Ball: JHP; 8.1 g; MV 370 m/s

Ball: FMJ; 8.4 g; MV 322 m/s

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0.38 Super Auto

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 45 mm Czech M1952

Synonyms:

7.62 × 45 mm; 7.62 mm Czech Short

Armament

This cartridge was unique to the Czech [Models 52](#) and 56/57 assault rifles and Model 52 light machine gun.

Development

Developed in Czechoslovakia in 1949-50 as a local alternative to the Soviet [M43](#) round. The M1952 was a somewhat better performer than the [M43](#), but Warsaw Pact standardisation swept it away and by 1960 the 7.62 × 39 mm cartridge had been adopted in its place. The weapons and cartridge stocks went into reserve and were later dispersed to various countries, notably Africa and the USA, where they may still be encountered.

Description

The case is rimless and bottlenecked, Berdan primed and may be found in brass or lacquered steel; the latter being more common. The bullet is streamlined, with a steel core inside a gilding metal jacket.

Specifications

Ball [M52](#)

Round length: 70.5 mm

Case length: 44.92 mm

Rim diameter: 11.2 mm

Bullet diameter: 7.81 mm

Bullet weight: 8.40 g

Muzzle velocity: 744 m/s

Muzzle energy: 2,324 J

[CZECH REPUBLIC](#)

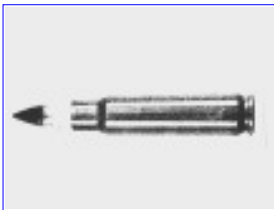
Manufacturer

State arsenals

Type: Ball [M52](#): see above

Tracer [M52](#): 8.4 g; green trace; non-streamlined bullet

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7.62 mm Czech M1952

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

125 mm Blank 4X33

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun on [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B towed anti-tank](#) gun.

Development

The 125 mm Blank 4X33 round used with [Russian Federation](#) and Associated States (CIS) 125 mm tank guns consists mainly of a Zh53 propelling charge, allied to a further charge simulating the auxiliary propellant used with APFSDS rounds. These rounds are fired for battle training or saluting purposes.

Description

The main charge for the 125 mm Blank 4X33 is a 4Zh52 semi-combustible propellant charge case. This is loaded as normal together with a projectile simulator formed by a cylindrical board and paper case containing a further amount of explosive. Priming is electrical. After firing a stub cartridge case base remains to be automatically or manually ejected from the chamber. The case, made of BW-11 steel, weighs 3.4 kg. It is 140 mm long and has a flange diameter of 171.9 mm.

The complete 125 mm Blank 4X33 round weighs 13.4 kg.

Specifications

Weights:

complete round - 13.4 kg

4Zh52 charge - 9.4 kg

stub case - 3.4 kg

Lengths:

4Zh52 charge - 408 mm

training projectile assembly - 398 mm

Authorised fuzes

None involved

Equivalent rounds

[CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Manufacturer

VOP015 State Enterprises, Novaky

Type: Blank 125ECV-D81

Description: Although designated a Blank, this round fires a blunt-nosed projectile which disintegrates into small fragments a maximum of 100 m from the muzzle. The round produces a loud sound signature and produces sufficient recoil to operate the gun recoil and breech opening mechanisms. It is possible that the concern manufacturing this round has been renamed

[POLAND](#)

Manufacturer

Zaklady Tworzyw Sztucznych `Pronit' SA

Type: 125 mm ISA

Description: With this sound- and flash-producing round, a plastic projectile filled with either water or an anti-freeze mixture is fired to permit firing in confined maintenance areas or over short ranges. When fired the plastic projectile immediately breaks up to release its fluid contents and fragments within a maximum range of 100 m while the recoil forces involved allow gun recoil mechanisms to operate for test or other purposes

[RUSSIA](#)

Manufacturer

State Scientific Research Institute of Chemical Products

Kazan

Type: 125 mm Blank 4X33

Description: Complete round weight given as 13 kg. Produced in association with The State Kazan Scientific Industrial Enterprise named after Lenin

[UKRAINE](#)

Manufacturer

MINMASHPROM

Type: 125 mm Blank 4X33

Description: Standard specifications - see text

VERIFIED



[Russian Federation](#) and Associated States (CIS) 125 mm tank gun 4X33 Blank ammunition with main charge (left) and simulated projectile (right) (T J Gander)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

125 mm APFSDS ammunition

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun fitted to [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B](#) towed anti-tank gun.

Development

The first Eastern Bloc MBT to carry a 125 mm smoothbore main gun was the [T-64](#), carrying a gun known as the 2A45. This gun has a vertical ammunition stowage system and was only fitted into [T-64](#) series tanks and a few early examples of the [T-72](#). The more numerous and widely used D-81 and D-81M (2A46 and 2A46M respectively), also referred to as the Rapira 3 (Rapier 3) and fitted to the [T-72](#) and early production [T-80](#) tanks, employ a rotary carousel-type ammunition feed system. The [T-80](#) and [T-90E](#) MBTs use the 2A46M1 gun. These guns all fire the same separate loading ammunition, including APFSDS projectiles.

There is one further 125 mm gun, a towed 125 mm anti-tank gun, called the [2A45M Sprut-B](#), which fires the same ammunition as the 125 mm tank guns to a direct fire range of over 2,000 m (against a 2 m high target).

A listing of 125 mm APFSDS projectiles of [Russian Federation](#) and Associated States (CIS) origin includes eight known variants: the 3BM9, 3BM12, 3BM15, 3BM17, 3BM22, 3BM32, 3BM42 and 3BM44. The base model for the series is the 3BM9, which may be regarded as a scaled-up version of

the 115 mm BM-6 (qv). As the 125 mm APFSDS projectiles and rounds have separate designations, a checklist is provided:

Round	Projectile
3VBM3	3BM9
3VBM6	3BM12
3VBM7	3BM15
3VBM8	3BM17
3VBM9	3BM22
3VBM13	3BM32
3VBM17	3BM42
n/avail	3BM44

The 3VP6 is a training round, as is the generally similar 3VP5.

In addition to the above it has been proposed that a Russian 125 mm APFSDS development (no designation yet forthcoming) could be the basis for some form of joint development lasting a period of about two years. This round weighs 20.3 kg with the projectile assembly, with incremental propellant charge, weighing 10.7 kg. Firing a tungsten alloy penetrator with an aluminium alloy sabot at a muzzle velocity of 1,750 m/s, the following penetration performances are forecast:

- a seven-layer target at 30° (penetration route 630 mm) at 4,000 m
- a seven-layer target at 60° (penetration route 620 mm) at 4,500 m
- a three-layer target at 65° (penetration route 1.83 m) at 3,500 m
- a 300 mm thick homogeneous target at 60° at 2,000 m.

As a typical example, the [T-72](#) usually carries a combat load of 39 rounds, 12 of which are APFSDS.

It is known that 125 mm tank gun ammunition is produced in [India](#) but no information is available. A new munitions plant is being built at Bolangir in Eastern [India](#) which, when fully operational, will be able to produce 150,000 rounds of 125 mm ammunition, presumably including APFSDS rounds, every year.

Description

In common with the rest of the 125 mm ammunition range, the 125 mm APFSDS rounds are all separate loading munitions. They are automatically loaded into the breech, surrounded behind the sabot assembly by an attached combustible propellant charge increment in a combustible case, followed by the 4Zh63 main charge in a separate semi-combustible propellant case.

On both the 3BM9 and 3BM15 the sabot assembly is of the ring type and is made of steel. It is short and interfaces to the penetrator rod via a series of mating buttresses. There are three 120° sabot segments and the entire sabot is encircled by a slipping copper drive band, 5.08 mm wide on the 3BM9 and 5.23 mm wide on the 3BM15. The 3BM12 differs only in detail from the 3BM9.

With the 3BM9 the monobloc penetrator rod is hard steel and has a blunt nose covered by a light alloy ballistic cap. By contrast, the longer hard steel penetrator used with the 3BM15 has a nose insert containing a tungsten carbide slug weighing 270 g. In both cases the penetrator rod tapers towards the rear where a five-fin assembly is threaded into position.

The 3BM9 is quoted as having a muzzle velocity of 1,800 to 1,825 m/s, with penetration of 350 mm of Rolled Homogeneous Armour (RHA) set at an angle of 60° at a range of 1,000 m. At 3,000 m the penetration is 245 mm. The slightly heavier 3BM15 appears to have a muzzle velocity of 1,785 to 1,800 m/s and is quoted as being able to penetrate 250 mm of armour at 2,000 m. The maximum effective

combat range for both projectile types is 2,200 m.

The 3BM17 is a variant of the 3BM15 with a heavier (3.045 kg) steel penetrator. The 3BM42 penetrator used with the 3VBM17 round has a tungsten penetrator with the complete projectile assembly weighing 7.05 kg.

The 3BM22 used with the 3VBM9 round has an enamel-coated steel body weighing 2.48 kg with a light steel windscreen.

The 3BM32 projectile used with the 3VBM13 round differs from the earlier projectiles by having a Depleted Uranium (DU) penetrator. In contrast to many other penetrator designs produced elsewhere, the 3BM32 is relatively short at 486 mm. The fin assembly is steel, the sabot aluminium alloy, the obturator rubber and the sealing band a polyamide material. The 3BM32 is fired with a muzzle velocity of 1,700 m/s instead of the 1,800 to 1,825 m/s of the earlier models.

A range of penetration performances can be quoted for the 3BM32. It will penetrate a 250 mm homogeneous armour target set at 60° at 2,000 m. A seven-layer target at 30° obliquity can be defeated at 3,200 m, producing a penetration route 630 mm long. If the same target is engaged at the same range, with the obliquity changed to 60°, the penetration route is 620 mm long. A three-layer spaced target set at an obliquity of 65° can be defeated at a range of more than 5,000 m with a penetration route 1,830 mm long.

The 3BM42, used with the 3VBM17 round, has a tungsten alloy penetrator 571 mm long and the projectile body is made from high-strength maraging steel. Again the fin assembly is steel, the sabot aluminium alloy, the obturator rubber and the sealing band a polyamide material. Muzzle velocity is 1,700 m/s.

As with the 3BM32, a range of penetration performances can be quoted for the 3BM42. It will penetrate a 230 mm homogeneous armour target set at 60° at 2,000 m. A seven-layer target at 30° obliquity can be defeated at 3,300 m, producing a penetration route 630 mm long. If the same target is engaged at 3,800 m, with the obliquity changed to 60°, the penetration route is 620 mm long. A three-layer spaced target set at an obliquity of 65° can be defeated at a range of 2,000 m with a penetration route 1,830 mm long.

The designation used for the round with the 3BM44 projectile is not known. The 3BM44 projectile weighs 7.05 kg and the muzzle velocity is 1,700 m/s.

Projectiles are fired using a main semi-combustible charge case known as the 4Zh63 and weighing 9.6 kg, plus an increment attached to the projectile assembly and weighing a further 4.1 kg. The combustibles are formed using nitrocellulose impregnated with TNT. Priming is electrical using a GUV-7 primer. After firing, a steel stub case weighing 3.4 kg remains to be automatically ejected, although manual ejection may be employed. The case, made from BW 11 steel, is 140 mm long and has a flange diameter of 171.9 mm.

To simulate the above projectiles during training there is a relatively low-cost APFSDS-TP round known as the 3VP6, using the 3P31 projectile. The 3P31 projectile is fired at a high initial muzzle velocity (1,830 m/s) using the normal, main and incremental charges, but the penetrator assembly is a blunt steel rod which follows the operational APFSDS trajectory out to a range of 2,000 m, after which it rapidly decelerates, becomes unstable and falls to the ground. Maximum range with the gun barrel at an elevation of 3° is no more than 9,000 m. The complete round weighs 19.5 kg and the projectile 5.2 kg; it is 535 mm long. Weight of the projectile assembly complete with its propelling charge is 9.5 kg.

Specifications

3BM9 and 3BM15

Weights:

complete round - 3VBM8, 19.7 kg

complete projectile, with sabot - 3BM9, 5.62 kg; 3BM15, 5.93 kg

penetrator - 3BM9, 3.6 kg; 3BM15, 2.898 kg

propellant, total - 9.98 kg

stub case - 3.4 kg

Lengths:

projectile assembly - 3BM9, 517.47 mm; 3BM15, 547.38 mm

penetrator - 3BM9, 409.32 mm; 3BM15, 479.3 mm

Max diameter of penetrator body: 3BM9, 43.97 mm; 3BM15, 41.85 mm

Diameter over fins: 3BM9, 128.19 mm; 3BM15, 125.18 mm

Muzzle velocity: 3BM9, 1,800-1,825 m/s; 3BM15, 1,785-1,800 m/s

Chamber pressure: approx 4,600 bars

3BM32 and 3BM42

Weights:

complete round - 3BM32, 20.55 kg; 3BM42, 20.4 kg

projectile with incremental charge - 3BM32,
10.95 kg; 3BM42, 10.8 kg

projectile - 3BM32, 7.05 kg; 3BM42, 7.05 kg

main propelling charge - 9.6 kg

stub case - 3.4 kg

Lengths:

projectile with incremental charge - 3BM32,
585 mm; 3BM42, 621 mm

projectile - 3BM32, 486 mm; 3BM42, 571 mm

main propelling charge - 408 mm

Muzzle velocity: 1,700 m/s

Operating temperature range: -40 to +50°C

Authorised fuzes

None involved

Equivalent rounds

[CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Manufacturer

Konstrukta Defence

Type: APFSDS

Description: Probably 3BM15 but no confirmation available. Muzzle velocity given as 1,800 m/s.

Manufacturer

Synthesis as

Type: 125 mm KE

Description: Uses third-generation tungsten projectile weighing 6.7 kg and 678 mm long, in conjunction with Z62 KE CZ combustible cartridge which reduces barrel wear and erosion; front charge weight 3.3 kg, rear 5.5 kg. Offered as part of [T-72 MBT](#) upgrade package

[IRAQ](#)

Manufacturer

State factories

Type: APFSDS

Description: Probably 3BM9 but no information available. Probably no longer in production

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: 125 mm APFSDS-T M711

Description: See separate entry

POLAND

Manufacturer

Zakłady Produkcji Specjalnej Sp zoo

Type: 125 mm APFSDS-T

Description: See separate entry

ROMANIA

Manufacturer

SN ROMARM SA

Type: 125 mm APFSDS-T BM-9 and APFSDSHC-T BM-15

Description: BM-9 fired using supplementary charge BM-10. BM-15 fired using supplementary charge BM-18

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Marketing agency: Rosobornexport

Type: 125 mm APFSDS 3VBM17

Description: Standard specifications - see text. 125 mm 3VP6 training round also available.

Manufacturer

Spetsvneshtekhnika, Moscow

Type: 125 mm APFSDS

Description: Projectile assembly uses tungsten alloy long rod penetrator in 'Western style' aluminium alloy sabot. Weight of complete round is 20.4 kg. Armour penetration at 60° incidence is more than 300 mm (no range given)

Manufacturer

Engineering Research Institute (NIMI)

Moscow

Type: 125 mm APFSDS 3VBM17

Description: Standard specifications

Manufacturer

State Scientific Research Institute of Chemical Products
Kazan

Type: 125 mm APFSDS 3VBM17

Description: Standard specifications. Produced in association with The State Kazan Scientific Industrial Enterprise named after Lenin, Kazan

SLOVAKIA

Manufacturer

ZVS jsc

Type: 125 mm APFSDS (PpSv)

Description: Understood to be 3VBM15. A 125 mm APFSDS-T Tapna fires a tungsten alloy penetrator weighing 3.4 kg and is stated to be able to penetrate 550 mm of armour.

UKRAINE

Manufacturer

MINMASHPROM

Type: 125 mm APFSDS 3VBM17

Description: Standard specifications - see text. MINMASHPROM has also announced a locally designed advanced APFSDS round with the projectile designated as the 3BM44U. There is also a 3BM44U1 projectile with an elongated penetrator rod provided with bore-riding distance pieces on the four-segment sabot. No details are available regarding these two rounds. 3VP6 APFSDS-TP round also manufactured

Manufacturer

TACKO

Type: 125 mm APFSDS 3VBM7, 3VBM9, 3VBM13 and 3VBM17

Description: Standard specifications - see text

YUGOSLAVIA, FEDERAL REPUBLIC

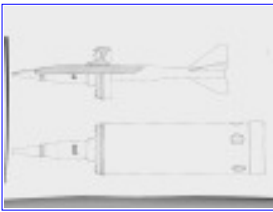
Manufacturer

Yugoimport SDPR

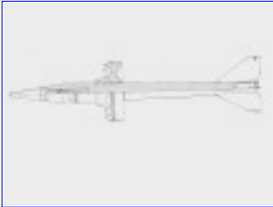
Type: [M88](#) with KE-T projectile

Description: Appears to be based on 3BM15. Projectile weight, presumably with sabot, given as 10 kg. Intended for use on [M-84](#) and [M-84A](#) tanks, the Yugoslav versions of the [T-72](#). May no longer be in production

UPDATED



Left, complete 125 mm APFSDS 3BM9 projectile and incremental charge assembly with projectile assembly (right)



Cross-section of 125 mm APFSDS 3BM15 projectile assembly



Complete 125 mm 3VBM13 APFSDS round with 3BM32 projectile, showing main propellant charge (to rear) with incremental propelling charge with projectile assembly (T J Gander)



125 mm 3BM32 APFSDS projectile assembly with Depleted Uranium (DU) penetrator (T J Gander)



125 mm 3BM42 APFSDS projectile assembly with tungsten alloy penetrator (T J Gander)



125 mm 3P31 APFSDS - TP projectile assembly used to simulate 125 mm APFSDS projectiles at ranges up to 2,000 m (T J Gander)



Two 125 mm APFSDS projectiles from MINMASHPROM of the [Ukraine](#) - no information is forthcoming regarding these two projectiles (T J Gander) (1998)

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Uses the RAFS system with two national codes:

Observing	green tip over white band
Incendiary	yellow tip

UPDATED

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for Czech 30 mm M53 and M53/59 anti-aircraft guns

Armament

30 mm automatic [anti-aircraft gun M53](#); [M53/59](#) and [M53/70](#) twin 30 mm self-propelled anti-aircraft gun systems.

Development

The 30 × 220 mm cartridge was originally developed in Czechoslovakia for the [M53](#) towed anti-aircraft gun, but was also later adopted for the self-propelled [M53/59](#) wheeled anti-aircraft gun system. These guns have now been withdrawn from front-line service, due mainly to a lack of any form of modern fire-control system and a low rate of fire, within the [Czech Republic](#) and [Slovakia](#) but is still held in reserve. The 30 mm [M53/70](#) gun was an export version, with an improved fire-control system, which does not appear to have been produced on a large scale. The [M53](#) and [M53/59](#) remain in service with the armed forces of [Libya](#), [Romania](#), Serbia and [Vietnam](#). The ammunition also remained in production in the former [Yugoslavia](#) (Serbia and Montenegro) until recently. Yugoslav guns are known as the 30/2 mm [M53](#) and 53/59 (CS).

Description

The 30 × 220 mm is a fixed round, with the projectile rigidly secured to the necked, lacquered steel

cartridge case by a crimping ring which fits into a pronounced cannelure at the base of the projectile. A steel percussion primer, 27 g weight and 73 mm length, is fitted in the base of the cartridge case. The heat-treated steel projectile has a single copper drive band. The propellant utilised is 195 g of a nitrocellulose-based powder.

All 30 × 220 mm rounds (apart from the Blanks) are 331 mm long and have a muzzle velocity of 997 m/s.

Ammunition for the 30 mm [M53](#) gun is fed in 10-round clips. The [M53/59](#) gun is loaded from a 50-round vertical box magazine using 10-round clips. Czechoslovakian-produced ammunition originally included API and HE-I rounds. These are no longer produced but available information is provided in the text. The Yugoslav-produced rounds were limited to HE-T, TP-T and Blank.

API The projectile for this round weighs 450 g and has a muzzle velocity of 1,000 m/s. It can penetrate 55 mm of armour at an incidence of 0° at 500 m. It contains a small amount of incendiary mixture of incendiary mixture to create incendiary effects behind the target armour. This round is no longer in production but may still be encountered.

HE-I The projectile used with this round weighs 450 g and contains approximately 35 g of RDX. The filling includes a small incendiary element to add to the blast effects. This round is no longer in production but may still be encountered.

HE-T This round was still produced in [Yugoslavia](#) until the recent disturbances, where it is known as the 30 mm HE-T M69. The steel projectile contains 35.7 g of RDX/Aluminium and has a nose-mounted impact super-quick action fuze with a mechanical self-destruct device, the latter operating between 6 and 30 seconds after leaving the gun muzzle. The projectile base houses a tracer element which burns for 4 seconds.

Also produced in [Yugoslavia](#) was a TP-T round ballistically matching the HE-T M69 but it did not contain an explosive filling, a tracer element or a fuze.

Blank Produced in [Yugoslavia](#), this round is referred to as the [M78](#). There is no projectile as the round case has a crimped mouth and relies on the 195 g nitrocellulose powder propellant filling to produce a sound signature for battlefield simulation and other training purposes.

A training and test cartridge, apparently still in production by EUROINVEST of [Macedonia](#), fires a 250 g break-up projectile containing sintered iron powder within a high-density polyethylene casing. Once fired the projectile breaks up to release its contents before it has travelled more than 120 m. This cartridge is dimensionally identical to the operational HE-T round. Maximum chamber pressure is 1,760 bar.

Specifications

Type	HE-T	TP-T	Blank
Weights			
Complete round	1.14 kg	1.14 kg	960 g
Projectile	435 g	435 g	250 g
Filling	35.7 g	none	None
Propellant	195 g	195 g	195 g
Length			
Complete round	331 mm	331 mm	220 mm
Muzzle velocity	997 m/s	997 m/s	n/a

Authorised fuzes

Integral on HE-T - see text

Equivalent rounds

[CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Manufacturer

State factories

Type: API, HE-I, TP

Description: See text - no longer in production

[MACEDONIA](#)

Manufacturer

Euroinvest

Type: Training and Test

Description: See text under Blank

[YUGOSLAVIA](#), FEDERAL REPUBLIC

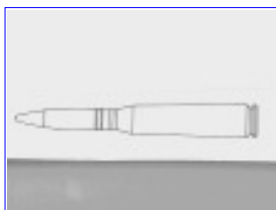
Manufacturer

Yugoimport SDPR

Type: HE-T, TP-T, Blank

Description: See text

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Outline of Czech 30 mm × 220 HE-I round

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

85 mm AP-T BR-365 and BR-365K

Armament

[85 mm Divisional Gun D-44](#); 85 mm Auxiliary-propelled Field Gun [SD-44](#); 85 mm [M1944](#) ZIS-S-53 tank gun; 85 mm [Anti-aircraft Gun M1939](#) and [M1944](#); [85 mm Field Gun Type 56](#); [85 mm Field Gun M52](#) and [M52/55](#).

Development

The first of the full calibre 85 mm AP-T rounds was the BR-365. This was replaced by the later and generally improved 85 mm AP-T BR-365K. Although superseded by the more powerful 85 mm HVAP-T BR-365P and BR-365PK (see previous entry), the 85 mm AP-T BR-365K remains in service with some former Warsaw Pact nations and nations to whom Soviet military aid was extended, but it is generally regarded as obsolete.

The type is still available from [Romania](#) where it has been manufactured for export sales by ROMARM; although series production is no longer carried out. Production facilities were also available in [Egypt](#) although it is understood that production there has ceased.

Description

The 85 mm AP-T BR-365K (complete round designation is UBR-365K) is a fixed round with the projectile rigidly fixed to the cartridge case by a single 360° crimping ring engaging in a cannellure located to the rear of the twin copper drive bands.

The 85 mm AP-T BR-365K projectile body is a solid hardened steel assembly with a relatively short ogive and two distinctive cannelures set into the body forward of the pressed copper drive bands. The centre of the projectile base is recessed to accommodate a small (48 g) two-part A-IX-2 (desensitised RDX/Aluminium) bursting charge, the MD-8 base fuze and a No 7 tracer assembly in a protruding housing.

The brass cartridge case (lacquered steel has been used) has a percussion primer threaded into the base and contains 2.6 kg of stick and granular propellant (14/7 CB and 18/1 TPCB), plus S-1 decoppering and wear additives, providing a muzzle velocity of approximately 800 m/s. This enables the 85 mm AP-T BR-365K to penetrate 94 mm of armour plate set at an angle of 0° at the maximum direct fire range of 970 m.

Specifications

Weights:

complete round - 16 kg

projectile - 9.266 kg

explosive - 48 g

propellant - 2.6 kg

cartridge case - 3.75 kg

Lengths:

complete round - approx 822 mm

projectile (with tracer) - approx 300 mm

Diameter over cartridge case rim: 112 mm

Muzzle velocity: approx 800 m/s

Authorised fuzes

MD-8 BD

Equivalent rounds

[CZECH REPUBLIC](#) AND [SLOVAKIA](#)

Manufacturer

State factories

Type: AP-T PSv-cs

Description: Used by both the former Czechoslovak and East German armed forces. Round weight 15.9 kg and projectile weight 9.2 kg; muzzle velocity 820 m/s. No longer in production

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: AP

Description: Standard specifications. 85 mm AP (type unspecified but probably AP-T) produced for 85 mm tank guns. Projectile weight with ballistic shield is 9.155 kg, containing 55 g of Hexogen ignited by an MD-8 fuze. Muzzle velocity is 800 m/s and maximum possible range 16,100 m. No longer in production

ROMANIA

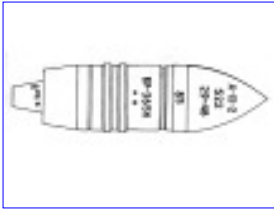
Manufacturer

SN ROMARM SA

Type: AP-T

Description: Not in series production. Equates to BR-365K. Standard specifications

VERIFIED



Projectile for the 85 mm AP-T BR-365K

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IDENTIFICATION OF SMALL ARMS AMMUNITION, DENMARK

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard codes

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ARTILLERY ROCKETS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

NORINCO 107 mm rockets

Armament

[107 mm Type 63](#), Type 63-1 and Type 81 MRS ([China](#)); Type 85 ([China](#)); RO 107 MRS and Inflict ([South Africa](#)); PRL 81 ([Egypt](#)); 107 mm 12-tube Launcher, 107 mm Monotube Launcher, 107 mm Double-tube Launcher and 107 mm Naval Rocket Launcher ML 2 and ML 4 (all [Iran](#)).

Development

107 mm artillery rockets were originally developed during the late 1950s by NORINCO and have been exported widely, usually in association with the towed Type 63 12-tube launcher. The spread has been such that the South African [Mechem](#) concern decided to reverse-engineer the Type 63 launcher and develop its own upgraded 107 mm PFHE rocket which has also been exported. Copies or derivatives of the Chinese 107 mm rockets are also produced in [Iran](#) (as the Haseb, or [Fadjr](#) 1), [Iraq](#), [North Korea](#) and [Turkey](#).

Description

NORINCO 107 mm artillery rockets, often referred to as Type 63 rockets, are spin-stabilised by seven venturi in the base to generate a maximum spin rate of 22,000 rpm (366 rps). They were originally manufactured in two main versions, HE and Incendiary, although updated versions of these have since been produced along with some special purpose rockets (see below).

The Type 63-II HE version is 841 mm long, with a cast-iron warhead weighing 8.33 kg, 1.26 kg of

which is the TNT main charge. This is detonated by a Jiàn-1 point detonating fuze (also referred to as the MJ-1 and a modified version of the Russian V-25), which has optional graze and delayed action functions; proximity fuzes may also be employed. On detonation, the warhead produces approximately 1,214 fragments spread over a lethal radius of 12.5 m. Maximum range is 8,500 m and total weight 18.837 kg. Maximum velocity is 372 m/s after a launch velocity of 32 m/s, with a maximum spin rate of 22,000 rpm. At maximum range 80 per cent of rockets will fall within an area measuring 150 × 200 m.

If necessary this rocket can be fired direct from a sloped earth mound or a similar improvised launcher but accuracy will then be minimal. Minimum launch angle is +4°. The single-tube Type 85 launcher was developed for special forces and weighs 22.5 kg; it can be broken down into manpack loads. The Egyptian PRL 81 single-tube launcher is essentially similar.

A Type 63-III HE rocket has an enhanced maximum range (10,000 m), a smaller warhead and the option of an unspecified radio frequency proximity fuze. With the proximity fuze fitted the overall length is increased to 947 mm (897 mm with a conventional impact fuze). Lethal radius on impact is 12.5 m.

Also reported is a FRAG-HE rocket with 1,600 6.35 mm steel spheres packed around the explosive warhead. This version weighs 18.9 kg and has a range of 7,800 m. Another essentially similar rocket is known as a Steel Ball Rocket Shell and has a range of 8,500 m. An enhanced version of this type of warhead is available from [Mechem](#) in [South Africa](#) (see below).

The Incendiary 107 mm Type 63-I rocket is 915.2 mm long and contains an inflammable material of an incendiary agent plus White Phosphorus (WP) in its 7.54 kg warhead; total rocket weight is 18.7 kg. The material burns at a temperature of over 700°C for more than 40 seconds. Maximum range is 8,000 m and minimum range 3,000 m. Launch velocity is 34 m/s, increasing to a maximum of 383 m/s.

A [107 mm Type 63](#) HE-Incendiary rocket contains incendiary pellets which are spread over a casualty radius of 21 m on detonation. This rocket has a range of 8,000 m and weighs 18.8 kg; it is 915 mm long. Production of this version appears to have ceased.

One of the latest forms of NORINCO 107 mm rocket is a Cargo round. The contents are 16 Type 81 dual-purpose bomblets, each with a diameter of 39.2 mm and weighing 214 g, 29.5 g of which is the RDX shaped charge. Each bomblet has a lethal radius of 7 m and can penetrate 80 mm of carbon steel armour. When scattered from the rocket in flight under the control of a MS-13 time fuze the bomblets will cover an area of 4,000 m². The 107 mm Cargo round has a maximum range of 8,000 m and weighs 18.9 kg; length is 928 mm.

There is also a 107 mm electronic jammer rocket, which ejects a jammer body in flight to allow the jammer to descend by parachute and operate for up to 15 minutes. The area covered by the jamming will measure 500 × 1,200 m after 5 minutes. This version weighs 18.3 kg, is 920 mm long and has an operational range of from 1,000 to 7,800 m.

Reference has been made to a 107 mm Illuminating rocket but no details are available.

Specifications

HE

Calibre: 106.7 mm

Weights:

complete rocket - 18.84 kg

warhead - 8.33 kg

explosive - 1.26 kg TNT

Length: 841 mm

Max range: 8,500 m

Max velocity: 375 m/s

Initial velocity: 32 m/s

Max spin rate: 22,000 rpm

Operating temperature: -40 to +50°C

Authorised fuzes

Jiàn-1 (MJ-1) PD - see also text

Equivalent rockets

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: 107 mm HE

Description: Intended for use with the PRL 81 single-tube launcher as well as other standard launchers. Weight is 18.7 kg of which 1.26 kg is TNT; the complete fragmentation warhead weighs 8.33 kg. Impact fuze is M491. Maximum range given as 8,500 m.

IRAN

Manufacturer

Aerospace Industries Organisation

Type: 107 mm Haseb ([Fadjr 1](#))

Description: Copy of HE version of Chinese Type 63 launched from a 12-tube launcher carried on a 6 × 6 truck or Jeep type vehicle. Other launchers include single- and double-tube launchers and two types of naval launcher. Total weight is 18.6 kg, weight of warhead 6.39 kg, length 838 mm and maximum velocity 375 m/s. Maximum range 8,500 m. At one time this rocket was manufactured and marketed by Shahid Bagheri Missile Industries.

IRAQ

Manufacturer

State factories

Type: 107 mm HE

Description: Described as being a local development but a close copy of the original Chinese [107 mm Type 63](#) or its North Korean derivative. Some launchers have been mounted on armoured vehicles. Maximum range given as 8,000 m.

KOREA, NORTH

Manufacturer

State factories

Type: 107 mm HE

Description: North Korean ordnance factories produced over 3,500 examples of the towed [107 mm Type 63](#) and their associated rockets, mounting some launchers on YW531 APCs. Many were exported to [Lebanon](#), [Iran](#) and organisations such as the PLO.

SOUTH AFRICA

Manufacturer

[Mechem](#), a member of the Denel Group

Type: 107 mm PFHE

Description: Developed for use with the towed or palletised RO 107 12-tube launcher, a Type 63 clone, and the single-tube Inflict launcher. This rocket has a Composition B explosive warhead, surrounded by approximately 5,200 steel spheres cast in an epoxy resin sleeve, ready to be detonated by an RO 107 turbine-powered radio proximity fuze weighing 275 g (the fuze has a point detonating back-up function) and manufactured by Fuchs Electronics. The resultant lethal radius is over 20 m with the fragment density stated to be eight times more than for conventional warheads; the average fragment velocity is 900 m/s. Weight of the 107 mm PFHE rocket is 19 kg with the warhead weighing 7.6 kg. Overall length is 920 mm. The 107 mm PFHE rocket can be fired using standard range tables.

[Mechem](#) are understood to be developing a 107 mm rocket with a range of 11,000 m.

TURKEY

Manufacturer

Rocketsan

Type: [TR-107](#) 107 mm Extended Range Rocket

Description: Weight 19.5 kg and length 840 mm. HE, fragmentation (steel ball) and incendiary warheads available, each weighing 8.4 kg. Range band from 3,000 to over 11,000 m. In volume production for service with the Turkish armed forces.

UPDATED



NORINCO 107 mm Incendiary Type 63-I rocket



107 mm HE rockets manufactured by NORINCO



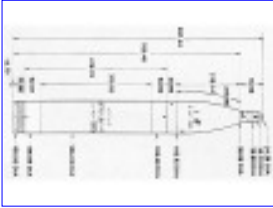
Updated 107 mm PFHE rocket as produced by South African [Mechchem](#)



Cross-section of South African [Mechem](#) 107 mm PFHE warhead showing steel spheres cast in an epoxy resin sleeve around the high-explosive warhead filling



The launch of a South African 107 mm PFHE rocket from an RO 107 MRS (1998)



Outline drawing of NORINCO 107 mm HE rocket showing dimensions

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

115 mm APFSDS-T 3UBM-5 round

Armament

115 mm U-5TS (2A20) tank gun; Royal Ordnance (now RO Defence) 115 mm tank gun.

Development

The 115 mm U-5TS (2A20) smoothbore tank gun was developed during the latter half of the 1950s and entered service in the early 1960s, mounted on the [T-62](#) tank series. The [T-62](#) therefore became the first in-service main battle tank to feature an APFSDS round, the 3BM-3, in its armoury. The later 3BM-6, often referred to as an HVAPFSDS-T, became the standard APFSDS-T projectile on the 3UBM-5 round for the U-5TS gun tanks. There are now few references to the earlier 3BM-3. The 3BM-3 used a similar projectile assembly to the 3BM-6 but fitted with a tungsten carbide nose slug. Another difference is that the 3BM-3 used a separate loading system with the propellant arranged in the same manner as that used on equivalent rounds for 125 mm tank guns. The interim 3BM-4 was a fixed round.

The 115 mm APFSDS-T 3BM-6 is unusual among its kind as it uses a hard steel penetrator. A variant of the 3BM-6 with an armour-piercing cap is known to have existed.

Also in existence are two further and presumably more recent 115 mm APFSDS rounds, the 3UBM-9 and the 3UBM-13, the latter having a Depleted Uranium (DU) alloy 3BM-28 penetrator weighing 4.36 kg. The 3UBM-9 round weighs 23.5 kg with the 3BM-21 tungsten-steel alloy projectile weighing 6.26 kg. Complete round length is 990 mm and muzzle velocity is 1,600 m/s. The 3UBM-9 round appears to be the current production version and is manufactured by the Engineering Research Institute based in Moscow.

Out of its normal combat load of 40 rounds a [T-64](#) normally carries 14 APFSDS-T rounds.

Description

The 115 mm 3UBM-5 APFSDS-T round is fixed, with the 3BM-6 sabot and projectile assembly crimped into its brass cartridge case. The sabot assembly is of the ring type and made of steel. It is short and interfaces to the penetrator rod via a series of mating buttresses. There are three 120° sabot segments and the entire sabot is encircled by a slipping copper drive band 4.32 mm wide. The projectile is hard steel and is 548.64 mm long; maximum diameter is 41.91 mm. It is fitted with a pointed light alloy ballistic cap covering the blunt front end of the penetrator while a six-finned assembly, also made of steel and with a maximum diameter over the forward-folding fins of 115.06 mm, is threaded on at the rear. A T-20-1 tracer element is carried in the rear of the fin assembly.

A variant with an armour-piercing cap over a more pointed penetrator nose is known to exist; it is 549.66 mm long in total and the projectile with sabot weighs 5.4 kg.

The rimmed brass cartridge case has an unusual shape as it is necked approximately halfway along its length. It is filled with 6 kg of 12/7 and 18/1 Tr propellant in stick and granular form. The base is fitted with a KV-5-U electrical primer which has a long flash tube.

The 3BM-6 APFSDS-T has a muzzle velocity of 1,680 m/s and its maximum effective range is 3,000 m, although most accounts of effective combat range mention 1,500 m. Maximum possible range is 12,230 m. The projectile can penetrate up to 228 mm of armour set at 0° at 1,000 m or 199 mm of armour set at 60° at the same range.

Specifications

Weights:

complete round - 22.5 kg

projectile assembly - 5.39 kg

penetrator - 3.9 kg

propellant - 6 kg

Projectile length: 548.64 mm

Projectile diameter: max 41.91 mm

Muzzle velocity: 1,680 m/s

Operating temperature range: -40 to +50°C

Authorised fuzes

None involved

Equivalent rounds

[EGYPT](#)

Manufacturer

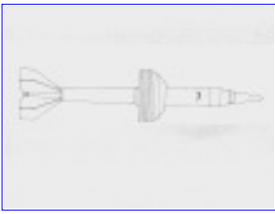
Heliopolis Company for Chemical Industries

Type: 115 mm APFSDS

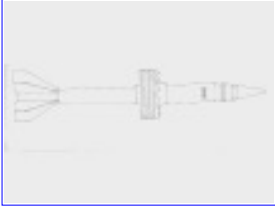
Description: Muzzle velocity given as 1,610 m/s. In [Egypt](#) the U-5TS gun is known as the Y5TC-T62.

Many Egyptian T-62s now have Royal Ordnance 115 mm barrels

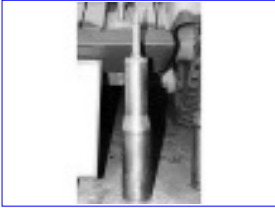
VERIFIED



Projectile assembly for 115 mm APFSDS-T 3UBM-6



Variant of projectile assembly for 115 mm APFSDS-T 3UBM-6



115 mm APFSDS-T 3UBM6 round (T J Gander)

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: APFSDS-T M735 and M735A1

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The 105 mm APFSDS-T M735 was one of the first rounds of its type to be issued on any large scale to US armed forces tank units. It is still widely used by many other armed forces but has been supplemented by the later M735A1 which utilises a Depleted Uranium (DU, or staballoy) penetrator core in place of the tungsten alloy core used on the M735. Production of the M735/M735A1 ceased in the USA during the 1980s but continues in [Egypt](#).

Known Foreign Military Sales (FMS) exports of the M735 were made to [Egypt](#) (14,105), [Greece](#) (83,957), [Japan](#) (400), [Jordan](#) (1,400), [South Korea](#) (8,577), [Lebanon](#) (7,052), [Morocco](#) (4,210), Muscat and [Oman](#) (5,376), [Pakistan](#) (5,000), [Saudi Arabia](#) (5,062), [Taiwan](#) (3,333), [Thailand](#) (14,656), [Tunisia](#) (1,674) and [Turkey](#) (12,136). Smaller sample batches of less than 100 units were also passed to Austria, Switzerland and the UK.

Description

The 105 mm APFSDS-T M735 and M735A1 have the same basic construction, consisting of a fixed round with the projectile assembly crimped onto an M148A1B1 cartridge case. The projectile assembly consists of a subprojectile and a sabot.

The M735 subprojectile consists of a nickel-steel (maraging steel) body containing a blunt-nosed tungsten alloy core 35 mm in diameter towards the tip, with a pronounced taper towards the tail. The M735A1 has a Depleted Uranium (DU, or staballoy) core. The front part of the body has an aluminium windshield with a steel tip to prevent aerodynamic heating. An aluminium fin assembly is fitted to the rear of the body and contains an [M13](#) tracer, which burns for a minimum of 2.5 seconds, held in place by a threaded plug and disc assembly.

The sabot is aluminium and has three 120° segments assembled around the subprojectile body and interfaced with the penetrator body by a series of mating buttress grooves. A stainless steel bourrelet, containing three shear cuts, is screwed onto the forward face of the sabot. A nylon obturator and polypropylene seal is assembled around it and a urethane seal is applied over the rear face.

The brass M148A1B1 cartridge case contains approximately 5.67 kg of [M30](#) propellant. An [M120](#) electrical primer is fitted to the base; the primer includes a flash tube extending almost to the tail of the projectile assembly. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case. A barrel wear reducing titanium dioxide liner is secured to the interior wall of the cartridge case.

The 105 mm APFSDS-T M735 and M735A1 have a muzzle velocity of 1,501 m/s. The M735A1 penetrator can penetrate approximately 370 mm of armour set at 0° at 1,000 m.

The US Army training round for the 105 mm M735/M735A1 is the TPDS-T M724A1. The TPDS-T M724A1 is also produced in Belgium by MECAR SA and in [Egypt](#) by the Heliopolis Company for Chemical Industries. **In the USA the main producer of the TPDS-T M724A1 is General Dynamics, Ordnance and Tactical Systems (GD-OTS).**

The main details for the TPDS-T M724A1 are round weight, 14.52 kg and round length, 838.2 mm. Muzzle velocity is 1,539 m/s using a single-base propellant.

Specifications

Weights:

complete round - 17.92 kg

projectile assembly - 5.797 kg

propellant - 5.67 kg [M30](#)

Lengths:

complete round, max - 963.72 mm

projectile assembly - 484.02 mm

cartridge case - 617 mm

Muzzle velocity: 1,501 m/s

Authorised fuzes

None involved

Equivalent rounds

[EGYPT](#)

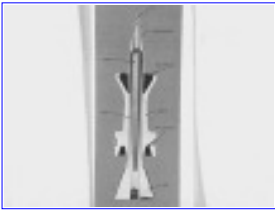
Manufacturer

Heliopolis Company for Chemical Industries

Type: APFSDS-T M735

Description: Standard US specifications

UPDATED



Cross-section of the projectile assembly for the Cartridge, 105 mm: APFSDS-T M735

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [EGYPT](#)

Date Posted: 16 July 2001

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All types:

Uses RAFS code

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

100 mm AP-T 53-BR-412 and 53-BR-412B

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)); 100 mm field gun BS-3; 100 mm [KS-19](#) anti-aircraft gun; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; [100 mm Field Gun M53](#); 100 mm towed [anti-tank gun M1977](#); 100 mm towed [anti-tank gun M1977 \(Romania\)](#); 100 mm Coast Gun ([Yugoslavia](#)).

Development

For many years the 100 mm AP-T 53-BR-412 and its improved variant the AP-T 53-BR-412B, were the main anti-armour projectiles fired from D-10 series tank guns. The 53-BR-412 was introduced into service together with the D-10 gun, while the 53-BR-412B first appeared during the 1950s and replaced the earlier model. It is very likely that these two rounds are no longer in production. However, the 53-BR-412B is still marketed by [Egypt](#) and [Romania](#), while in [Yugoslavia](#) the 53-BR-412B was offered for export sales as the AP-T [M65](#), although the status of this round is now uncertain.

The complete round using the 53-BR-412B projectile is the 53-UBR-412. A later round using the same projectile is known as the 3UBR-3. Romanian rounds in this calibre include the AP-T BR-412B and the so-called APC-T BR-412D.

Description

The 100 mm AP-T 53-BR-412 and 53-BR-412B rounds are both fixed, with the projectile rigidly

secured to the brass cartridge case by a single 360° crimping ring, engaging in a single cannelure located between the two copper drive bands on the projectile.

The two projectiles mainly differ in their hardened steel body shapes. The 53-BR-412 has a pointed solid nose while the 53-BR-412B has a blunt nose concealed under a light-alloy windshield, to preserve the ballistic outline. Both projectiles have a small internal cavity close to the base which contains 64 g of A-IX-2 (RDX/Aluminium) for behind-armour effects, ignited after a short delay by a base detonating MD-8 fuze made of steel. A protrusion from the base houses a tracer element.

The brass or lacquered steel cartridge case contains approximately 5.5 kg of NGH propellant in stick form. A KW-13 or KW-13U percussion primer is threaded into the base. Brass cases are made from MK-75 brass and weigh 8.5 kg. The flange diameter is 147.5 mm.

Both projectiles have a muzzle velocity of approximately 900 m/s. The 53-BR-412 can penetrate 135 mm of vertical armour at 1,000 m and the 53-BR-412B penetration at the same range is 185 mm.

[A 100 mm AP-T 53-BR-412B](#) projectile has a 77 per cent chance of hitting a static tank sized target at a range of 1,800 m under ideal conditions; performance under combat conditions may be much lower.

Specifications

Weights:

complete round - 53-BR-412, 30.3 kg; 53-BR-412B, 30.5 kg

projectile - 53-BR-412, 15.7 kg; 53-BR-412B, 15.89 kg

explosive - 64 g RDX/Alu

propellant - approx 5.5 kg NGH

cartridge case - 8.5 kg

Lengths:

complete round - 1.02 m

projectile - 53-BR-412, 361.82 mm; 53-BR-412B, 403.61 mm

cartridge case - 695 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 887-900 m/s

Chamber pressure: 2,940 bar

Authorised fuzes

BD MD-8, MD-8M1 or DBR-2

Equivalent rounds

[EGYPT](#)

Manufacturer

Heliopolis Company for Chemical Industries

Type: AP-T

Description: Exact model uncertain but believed to be based on 53-BR-412B. Projectile weight is 14.74 kg, containing 54 g of Hexal initiated by a DER-2 BD fuze, with complete round weight being 29.6 kg. Muzzle velocity is 925 m/s, using 5.72 kg of an unspecified propellant. An inert training round is available

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: AP-T BR-412B, APC-T BR-412D

Description: AP-T BR-412B complete round length given as 992 mm. Propellant for both is NDT 3 18/1. Armour penetration for AP-T BR-412B given as 150 mm at 1,000 m while that for the APC-T BR-412D given as 185 mm at 1,000 m.

[YUGOSLAVIA](#), FEDERAL REPUBLIC

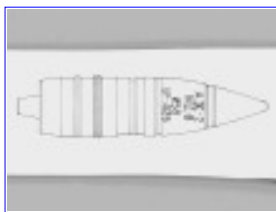
Manufacturer

Yugoimport SDPR

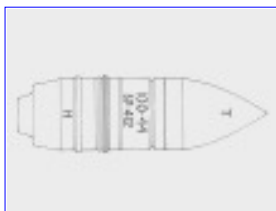
Type: AP-T [M65](#)

Description: Probably no longer in production. Standard specifications for 53-BR-412B

VERIFIED



Projectile for 100 mm AP-T 53-BR-412B



Projectile for 100 mm AP-T 53-BR-412



The 100 mm AP-T round produced in [Egypt](#) is shown on the right with, for comparison, a 100 mm HE intended for use with 100 mm anti-aircraft guns (centre) and a 100 mm FRAG-HE (left)

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

85 mm FRAG O-365K

Armament

[85 mm Divisional Gun D-44](#); 85 mm Auxiliary-propelled Field Gun [SD-44](#); 85 mm [M1944](#) ZIS-S-53 tank gun; 85 mm [Anti-aircraft Gun M1939](#) and [M1944](#); [85 mm Field Gun Type 56](#); [85 mm Field Gun M52](#) and [M52/55](#).

Development

From the 85 mm [M1939](#) anti-aircraft gun onwards, the 85 mm calibre became a virtual all-purpose calibre for the Soviet Union and its later Warsaw Pact allies. It was applied to field, anti-tank, tank and anti-aircraft guns, all firing essentially similar ammunition. The 85 mm calibre weapons are still in service with many nations (including [China](#), where many of the Soviet artillery designs were copied), usually as a towed anti-armour weapon which can double as a field gun, for example the 85 mm Divisional Field Gun [D-44](#) or its Czech counterpart the [85 mm Field Gun M52](#). For this latter role the 85 mm FRAG O-365K, often referred to as a FRAG-HE, acts as the latest in a line of similar general purpose HE rounds. For instance, the earlier and similar FRAG O-365 was produced in two-part form. The upper portion of the ogive could be unthreaded to allow a T-5 powder train time fuze to be installed for firing from anti-aircraft guns.

The 85 mm FRAG O-365K is still available from ROMARM of [Romania](#) although it is no longer in series production.

Standard 85 mm projectiles were used with the 85 mm anti-tank gun D-48 and the 85 mm D-70 gun

used on the ASU-85 air-portable self-propelled anti-tank gun. These rounds have 100 mm cartridge cases necked down to 85 mm to provide the high muzzle velocities produced by their increased propellant loadings.

Polish equivalents include the O-365Z and O-365ZW with sintered iron drive bands and cast-iron projectiles. Other similar rounds include the O-367A, O-367AZ and O-367AZW.

Description

The 85 mm FRAG O-365K is a fixed round for anti-aircraft guns. The projectile is rigidly fixed to the cartridge case by two 360° crimping rings engaging in two cannelures located under the twin gilding metal or copper drive bands, one 12.2 mm wide and the other 11.2 mm wide.

The 85 mm FRAG O-365K body is made from forged steel; it has relatively thick walls, a bourrelet and a boat tail. The filling is 780 g of cast TNT, although other explosives have been used. One version of the FRAG O-365K was produced in two-part form, with which the upper portion of the ogive could be unthreaded to enable powder train time fuzes to be employed when firing from anti-aircraft guns.

An 85 mm FRAG O-367A round was in service with the East German Army. The complete round weighed 15.9 kg and the projectile 9.54 kg. Muzzle velocity was 805 m/s with a full propellant charge (2.77 kg) or 655 m/s with a reduced (1.52 kg) propellant charge.

The cartridge case is usually brass, although lacquered steel has been used. It contains 2.6 kg of 14/7 stick and powder propellant plus S-1 decoppering agent and wear additives, to provide a muzzle velocity of 793 m/s, although some reduced propellant loads were developed and produced. A percussion primer is threaded into the base and surrounded internally by a black powder priming charge. The muzzle velocity of 793 m/s can produce a maximum range of 15,650 m when fired from the [85 mm Divisional Gun D-44](#).

For training use over short ranges a special variant of the 85 mm FRAG O-365K was developed. This reduced range version contains a self-destruct assembly threaded into, and protruding from, the projectile base and containing a tracer element burning for 2 to 6 seconds. The self-destruct device operates between 3.5 and 5 seconds after firing, equating to a range between 2,000 and 3,400 m. This training round is otherwise identical in appearance and external ballistics to the operational 85 mm FRAG O-365K, including the retention of the nose-mounted fuze. It is still produced in [Romania](#) where it is marketed by SN ROMARM SA.

Specifications

Weights:

complete round - 16.15 kg

projectile - 9.62 kg

explosive - 780 g TNT

propellant - 2.6 kg

cartridge case - 3.75 kg

Lengths:

complete round - max 964 mm

projectile fuzed - 387.17 mm

projectile unfuzed - 344.37 mm

Diameter over cartridge case rim: 112 mm

Muzzle velocity: 793 m/s

Authorised fuzes

PD KTM-1, KTM-1U, KTM3-1Y

MT WM-16 or Time T-5

Equivalent rounds

EGYPT

Manufacturer

Heliopolis Company for Chemical Industries

Type: HE and FRAG-HE

Description: Standard specifications. No longer in production

ROMANIA

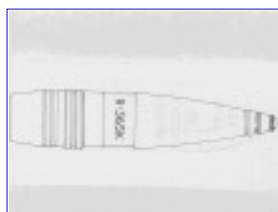
Manufacturer

SN ROMARM SA

Type: HE and Reduced Range HE O-365KV

Description: No longer in series production. HE identical to FRAG O-365K. For details of Reduced Range HE see text

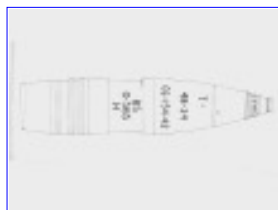
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85 mm FRAG O-365K



85 mm FRAG O-365



Variation of 85 mm FRAG O-365K

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.65 × 21 mm

Synonyms:

[7.65 mm Parabellum](#); 7.65 mm Luger; 0.30 Luger

Armament

Parabellum (Luger) pistols of 7.65 mm calibre; some Beretta, Ruger, SIG, Walther and Bernardelli pistols.

Development

This is a shortened version of the 7.63 mm Mauser cartridge developed by Georg Luger for the original 1900 Luger pistol. For many years it was the standard pistol cartridge of [Brazil](#), [Finland](#), [Latvia](#), Portugal, Switzerland and other countries. Although not currently used by any army, it can still be found in use with some police and security forces.

Description

The brass case is rimless and bottlenecked, Berdan or Boxer primed. Many commercial bullet types are to be found, and the original military bullet was a cylindro-conoidal flat-tipped jacketed type. The current military standard is a jacketed round-nose bullet of 6.02 g weight.

Specifications

Round length: 29.21 mm
Case length: 21.6 mm
Rim diameter: 9.93 mm
Bullet diameter: 7.82 mm
Bullet weight: 6.02 g
Muzzle velocity: 360 m/s
Muzzle energy: 389 J

Abridged ballistic table: 6.02 g ball

Range	Velocity	Energy
0 m	360 m/s	389 J
10 m	355 m/s	378 J
25 m	345 m/s	357 J
50 m	330 m/s	327 J

[FINLAND](#)

Manufacturer

[Nammo](#) Lapua Cartridge Factory Ltd
Type: Ball 4317530: FMJ; 6 g; MV 405 m/s

GERMANY

Manufacturer

Dynamit Nobel (Geco)
Type: Ball: FMJ; 6 g; MV 385 m/s

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: FMJ; 6 g; MV 360 m/s
Ball: JSP; 5.9 g; MV 350 m/s

PORTUGAL

Manufacturer

INDEP
Type: Ball: FMJ; 6 g; MV 350 m/s

[SOUTH AFRICA](#)

Manufacturer

[PMP](#)
Type: Ball: FMJ; 4.86 g; MV 300 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball: FMJ; 6 g; MV 375 m/s

SWITZERLAND

Manufacturer

SM (Swiss Munition Enterprise)

Type: Ball: FMJ; 6 g; MV 374 m/s

UNITED STATES OF AMERICA

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 6 g; MV 372 m/s

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7.65 mm Parabellum

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Ammunition for 57 mm L/70 Bofors guns

Armament

Bofors SAK 57 [L/70](#) Mk 1; Bofors SAK 57 [L/70](#) Mk 2; Bofors SAK 57 [L/70](#) Mk 3.

Development

The first Bofors 57 mm automatic naval gun was an L/60 gun developed during the 1920s. Development of a longer [L/70](#) version began in 1964, leading to the Bofors SAK 57 [L/70](#) Mk 1 which entered service in mid-1966. A more advanced version, the 57 mm [L/70](#) Mk 2, using a lightweight mounting and with the capability to be effective against sea-skimming anti-ship missiles, appeared in prototype form in 1981. The first example of the 57 mm [L/70](#) Mk 2 entered service in 1985, together with a new family of operational and training ammunition, enabling the gun to carry out the anti-ship missile defence role. About 25 57 mm [L/70](#) Mk 2 guns were produced. Most of the rounds fired from the 57 mm [L/70](#) Mk 2 gun can be used with the [L/70](#) Mk 1, in some cases after a minor modification has been incorporated.

The 57 mm [L/70](#) Mk 3 ordnance is identical to the 57 mm [L/70](#) Mk 2 but the mounting incorporates state-of-the-art 'stealth' technology for the mounting on which the gun remains hidden until exposed for firing.

There are two new rounds, the 57 mm 3P and HCER-BB (see below), under development for this gun. 5,000 rounds of the 3P round are scheduled for delivery to the Swedish Defence Matèriel Administration (FMV) during 2001. The order, announced during April 1998, includes options for

further quantities. These rounds are primarily for use with Bofors 57 mm Mk 3 guns on 'Visby' class corvettes.

Bofors Explosives has developed Low Vulnerability Ammunition (LOVA, also known as Insensitive Munitions or IM), which includes LOVA propellant and insensitive components such as igniters and boosters. These can be applied to all 57 mm [L/70](#) rounds in production with a view to rendering them even more invulnerable to shock and high temperatures.

The US Coast Guard has expressed an interest in procuring a 57 mm naval gun system. From the outlined requirement statement it appears that the 57 mm [L/70](#) Bofors naval gun is likely to be the only candidate.

A tank version of the 57 mm [L/70](#) Bofors naval gun was developed during the late 1970s, along with an associated APDS round. Both appeared in prototype form only.

Description

All Bofors 57 mm [L/70](#) rounds are fixed, with the projectiles rigidly crimped to the 437 mm long brass cartridge cases by two crimping rings engaging in two cannelures close to the projectiles' bases. Most rounds have conical or hemispherical base outlines to improve aerodynamics and to optimise the internal volume. Drive bands are copper and priming is electrical.

Ammunition currently available includes the following:

57 mm PFHE

This round is intended for use against air targets, including sea-skimming anti-ship missiles. It uses a projectile with a prefragmented high-quality steel body fitted with a proximity fuze. The fuze operates on the Doppler principle and includes the same electronics used in the proximity fuze fitted to the [40 mm L/70](#) PFHE Mk 2 round (qv), thus providing increased triggering distances and increased resistance to ECM.

When the fuze functions, either as a proximity fuze or on impact, the projectile body detonates to produce approximately 3,500 fragments, 1,200 of which are integral 3 mm tungsten pellets with high penetration capabilities. The pellets are carried around the inner wall of the projectile body, packed around the filling which is 380 g of Hexotonal. The fuze triggering distance is 7 m against aircraft or helicopters at an altitude of 40 m or more, and up to 4.5 m against small missiles. Against targets at lower altitudes an automatic sensitivity control in the fuze reduces the sensitivity level, so when firing against a target flying at 5 m altitude the triggering distance is up to 3 m.

If required, the proximity fuze can be used against surface targets by disconnecting the proximity function, therefore converting the fuze to a point-detonating type. When used in the proximity mode the fuze also has an integral point-detonating function. In either case the fuze will initiate a self-destruct function after approximately 17 seconds.

A complete 57 mm [L/70](#) PFHE round weighs 6.1 kg, 2.4 kg of which is the projectile. Muzzle velocity is 1,020 m/s. The maximum effective range, when used in the proximity fuze mode, is 7,500 to 7,600 m, while maximum possible range in the point detonating mode is 13,200 m.

[TDA](#) of France produce a multimode proximity fuze, the 57 MM, for 57 mm [L/70](#) projectiles.

For training with 57 mm [L/70](#) PFHE rounds and other purposes, a special 57 mm Target Practice Proximity fuzed (TPPX) round is produced. This round is ballistically matched to the 57 mm [L/70](#) PFHE but the filling is restricted to a 65 g charge of Hexotol, sufficient to provide a visual burst indication of the proximity fuze functioning. As an alternative, an inert 57 mm [L/70](#) TP round may be used.

57 mm 3P

The 57 mm 3P round is a scaled-up version of the 40 mm 3P programmable round employed on TRINITY and suitably modified [40 mm L/70](#) air defence guns (qv). The 3P (Prefragmented, Programmable, Proximity-fuzed) projectile weighs 2.4 kg and carries 460 g of Octonal surrounded by approximately 2,400 3 mm diameter tungsten carbide pellets.

The nose-mounted fuze can be programmed to provide six fuze modes on this round. By means of a Proximity Fuze Programmer (PFP), connected to a gun fire-control computer, 3P fuzes can be individually programmed as they are fed into the gun chamber.

Programming is carried out in two steps. In the first, a DC voltage is transmitted to the fuze to initiate its electronics and to make an initial selection of the required mode. In the second step, taken only milliseconds before firing, a high-frequency data message containing additional mode information and predicted time of flight to the target is transmitted to the fuze. The following modes can be selected:

Auto mode 1. Range gated proximity function with impact function and self-destruct at the end of the gate

Auto mode 2. Range gated proximity function with impact priority and self-destruct at the end of the gate

Time mode. Accurate time function

Impact mode. Impact function with post-impact delay (0.3 ms) and self-destruct after about 15 seconds

Armour mode. Armour-piercing function

Proximity mode. Normal proximity function with impact function and self-destruct.

In the Auto modes, the range to the predicted future point of the target is transmitted to the 3P fuze and the fuze ignores all signals until it comes to the gate. This provides immunity against Electronic Counter Measures (ECM) and natural disturbances outside the absolute proximity of the fuze. In Auto mode 2, the proximity function is delayed to give priority to a possible impact function.

As the 3P fuze ignores all signals outside the range gate the sensitivity of the fuze is increased to up to 10 m against aircraft and helicopters and 5 m against missiles. This increased sensitivity together with the increased number of fragments and 3 mm diameter tungsten carbide pellets greatly increases the kill effect against all types of aerial target.

The time function causes the 3P fuze to act as a normal time fuze. The accuracy of the time setting is less than 0.5 per cent of the time of flight and typically 0.2 per cent. For a typical example, the clock's accuracy (together with the deviation in muzzle velocity) gives a dispersion of 7 m at a range of 1,500 m.

The Impact mode is selected when a high-hit probability is expected. There is a 0.3 ms post impact delay permitting the projectile to penetrate the target before detonating.

In the Armour mode the safety/arming device is prevented from arming, so that on impact with a hard target the 3P projectile will shock ignite with a delayed low order detonation. The fuze will operate on targets such as a 2 mm dural plate.

When no mode selection is made or the range to a target is not known, the 3P fuze will operate as a conventional proximity fuze with an impact function.

The 3P fuze has two major parts, an electronics unit and a pyromechanical safety and arming section.

The electronics unit contains a clock, central processor unit for programming the fuze, a signal processor, the ECCM circuits and triggering circuits including the impact function devices.

The safety and arming device is controlled by the integral clock. About 200 ms after firing (about 200 m from the muzzle) the clock ignites an electric detonator which, together with the spin, arms the safety and arming device; the device also contains mechanical devices for transport and bore safety.

The 3P Continuous Wave (CW) Doppler fuze is powered by a battery initiated by setback. Full power is established after a few milliseconds, after which the fuze starts to emit, using the shell as an antenna.

As the 3P fuze functions the 460 g Octonal filling produces a powerful blast effect. Fragments, including the 2,400 tungsten carbide pellets, will travel outwards at velocities as high as 1,500 m/s. Due to their shape and mass the pellets will be able to cause significant component damage on targets several metres away. With the 57 mm 3P projectile some of the pellets are arranged behind the ogive and are thus distributed over a wider area than 57 mm [L/70](#) PFHE projectiles.

57 mm HCER

The 57 mm [L/70](#) High Capacity Extended Range (HCER) round is in production for use against a variety of naval targets. The projectile has a streamlined outline with a hemispherical base, providing a good aerodynamic outline and a maximum range of 17,000 m. The special steel projectile weighs 6.5 kg and contains 410 g of Octonal. The nose of the projectile is occupied by a point detonating fuze with a post-impact delay of 5 ms to provide maximum behind-armour effects, even against targets protected by up to 15 mm of armour. Muzzle velocity is 950 m/s.

The 57 mm [L/70](#) HCER round was designed for use in the SAK 57 [L/70](#) Mk 2 naval gun but it can be fired from the Mk 1 gun after a minor modification has been incorporated. It may also be fired from the 57 mm [L/70](#) Mk 3 naval gun.

For training purposes a special 57 mm [L/70](#) Target Practice Extended Range (TPER) is produced with the same ballistic characteristics as the 57 mm [L/70](#) HCER round. It has no filling and is fitted with a dummy fuze.

57 mm HCER-BB

Still under development, this round may be used with both the 57 mm [L/70](#) Mk 2 and Mk 3 naval guns. A complete projectile weighs 2.85 kg, of which 310 g is the Octonal explosive filling. The muzzle velocity will be 950 m/s and maximum range 21,000 m. An impact fuze with an optional post-impact delay function is provided. Advantages claimed for this round include low dispersion, an extremely short time of flight, a flatter trajectory giving a large 'danger zone', and reduced influence from atmospherics. Test firings have been made but type classification is still 'some time off'.

57 mm HE

This is a general purpose round with a projectile machined from bars of special steel. The explosive filling is 450 g of Hexotonal, detonated by a point detonating fuze with no delay element; the fuze is armed approximately 70 m from the gun muzzle. Weight of propellant is 1.126 kg. Proximity fuzes may be employed if required ([TDA](#) of France produces a multimode proximity fuze, the 57 MM, for 57 mm [L/70](#) projectiles). Muzzle velocity is 1,020 m/s and maximum range 13,800 m.

For training purposes an inert 57 mm [L/70](#) TP round is produced with the same ballistic characteristics as the 57 mm [L/70](#) HE round. It has no filling and is fitted with a nose plug in place of a fuze.

Specifications

Type	PFHE	HCER	HE	TPPX	TPER	TP
Weights						

complete round	6.1 kg	6.5 kg	6.1 kg	6.1 kg	6.5 kg	6.1 kg
projectile	2.4 kg	2.8 kg	2.4 kg	2.4 kg	2.8 kg	2.4 kg
explosive filling	380 g	410 g	450 g	65 g	none	none
Lengths						
complete round	675 mm	675 mm	675 mm	675 mm	672 mm	672 mm
projectile	311.6 mm	341.2 mm	309.4 mm	310.7 mm	340.2 mm	307.2 mm
cartridge case	437 mm	437 mm	437 mm	437 mm	437 mm	437 mm
Muzzle velocity	1,020 m/s	950 m/s	1,020 m/s	1,020 m/s	950 m/s	1,020 m/s
Max range	7,600 m*	17,000 m	13,800 m	7,600 m*	16,900 m	13,800 m

*in proximity fuze mode

Authorised fuzes

See text

FINLAND

Manufacturer

Sako Limited

Type: 57 mm × 438 TP

Description: Standard specifications

MALAYSIA

Manufacturer

SME Ordnance Sdn Bhd

Type: 57 mm L/70 TP LAP 3

Description: Standard specifications

NORWAY

Manufacturer

Nammo Raufoss AS

Type: 57 mm PFHE, 3P, HCER, HCER-BB, HE

Description: Standard specifications

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Projectile for Bofors 57 mm HE



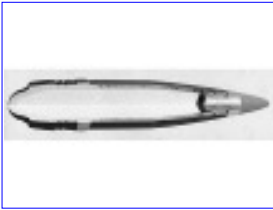
Projectile for Bofors 57 mm HCER



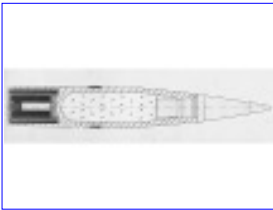
Projectile for Bofors 57 mm PFHE



Projectile for Bofors 57 mm Prac



Cutaway example of a 57 mm 3P projectile



Cross-section of 57 mm HCER-BB projectile

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Lapua 12 gauge rubber slug round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Lapua to provide less than lethal shotgun shells for use in crowd control, peacekeeping and similar situations where lethal force is not appropriate.

Description

The Lapua rubber slug is intended for use at greater distances than the rubber shot shells described previously against point-type targets. The round can be 'skip fired' to lessen its lethality and minimise the chances for severe injury. This round can cause severe injuries when fired against personnel at ranges of less than 20 m and can be fatal at ranges of less than 10 m.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 4.7 g

Muzzle velocity: V10 175 m/s

Muzzle energy: 146 J

Max range: Approx 75 m

Max effective range: 35-40 m

[FINLAND](#)

Manufacturer

Patria Lapua Oy

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Tel: (+358 6) 431 01 11

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Lapua 12 gauge rubber shot shells

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Lapua to provide less than lethal shotgun shells for use in crowd control, peacekeeping and similar situations where lethal force is not appropriate.

Description

Lapua manufactures two rubber shot shells, one in conventional 00 buckshot (8 mm) loaded with 12 pellets and one loaded with 300 pellets of rubber Nr. 5 (3 mm) shot. The latter shell is intended for close range use, as the velocity and energy of the small pellets rapidly fall off to virtually nil within 20 m.

Specifications (figures for 3 mm shell in parentheses)

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 6.8 g total

Muzzle velocity: Approx 160 m/s

Muzzle energy: 263 J (1,053 J)

Max range: Approx 50 m

Max effective range: 25 m (15 m)

[FINLAND](#)

Manufacturer

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MORTARS - 120 mm MORTARS, [FINLAND](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Vammas 120 mm HE bombs

Description

The 120 mm mortar bomb TAM 12.8 was originally designed by Tampella Defence Division and has been upgraded by Vammas. The long-range bomb VAM 14.9 was designed by Vammas and is under test. Both can be used in Tampella 120 mm smoothbore mortars.

The body of the TAM 12.8 bomb is made from a steel casting and machined to shape. That of the VAM 14.9 bomb is made from forged steel. The tail unit of both bombs is of extruded aluminium.

Specifications

	Standard TAM 12.8	Long-range VAM 14.9
Min range	300 m	300 m
Max range	8,500 m	9,500 m
Min velocity	112 m/s	105 m/s
Max velocity	444 m/s	450 m/s
Length	665 mm	795 mm
Weight	12.8 kg	14.9 kg
Filling (TNT)	2.1 kg	2.6 kg
Charges	8	8



Vammam 120 mm TAM 12.8 HE mortar bomb

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Charles Q Cutshaw

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MORTARS - 81 mm MORTARS, [FINLAND](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb TAM 4.2

Armament

All 81 mm smoothbore mortars.

Development

This bomb was originally designed by Tampella Defence Division (which was merged with Vammas in 1991) and upgraded by Vammas.

Description

The bomb body is made from a steel casting and machined to shape. The tail unit is made from extruded aluminium.

Specifications

Length: 504 mm

Weight: 4.25 kg

Weight and type of filling: 520 g TNT

Min range: 150 m

Max range: 6,500 m

Min velocity: 76 m/s

Max velocity: 321 m/s

Charges: 7

Status: Available.

Service: Finnish defence forces.

Manufacturer

Vammass Oy.

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[*Vammass 81 mm HE bomb TAM 4.2*](#)

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[1 Image](#)

MORTARS - 60 mm MORTARS, [FINLAND](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Vammas 60 mm HE bombs

Description

These bombs were originally designed by Tampella Defence Division (which was merged with Vammas in 1991) and upgraded by Vammas. They can be used in 60 mm smoothbore Tampella mortars.

The bomb body is made from a steel casting and machined to shape. The tail unit is made from extruded aluminium.

Specifications

	Standard TAM 1.6	Long range TAM 1.8
Min range	150 m	150 m
Max range	2,600 m	4,000 m
Min velocity	66 m/s	62 m/s
Max velocity	199 m/s	268 m/s
Total length	294 mm	315 mm
Bomb weight	1.6 kg	1.8 kg
Filling (TNT)	220 g	200 g

Charges	5	5
----------------	---	---

Status: Available.

Service: Finnish defence forces.

Manufacturer

Vammass Oy.

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Vammass 60 mm TAM 1.8 HE mortar bomb

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [FINLAND](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Tracer	white
AP	blue
AP-I	black over red ring
Observing	red
Incendiary	yellow

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm FRAG-HE-BB 3OF61

Armament

152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B).

Self-propelled equipments include: 152 mm [2S19](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer ONDAVA.

Development

The 152 mm FRAG-HE-BB 3OF61 projectile may be regarded as the long-range counterpart of the 152 mm 3OF45 and is a close design relation to the other 152 mm ammunition developments. It is intended for general operational use with the latest generation of [Russian Federation](#) and Associated States (CIS) long-barrelled 152 mm gun-howitzers. The 152 mm FRAG-HE 3OF61 is issued with a single cartridge case to form the 3VOF91 round.

The 152 mm FRAG-HE-BB 3OF61 is marketed by VO GED, Moscow.

Description

The 152 mm FRAG-HE 3OF61 projectile is a separate loading item of ammunition consisting of the projectile and a charge system contained in a lacquered steel cartridge case.

The relatively thin-walled projectile is of high-fragmentation steel with a long streamlined ogive and a shallow bourrelet. The main projectile body is basically the same as that for the FRAG-HE OF-43 and is 1.5 to 2 times more effective on target than the 152 mm FRAG-HE OF-540. A single copper drive

band encircles the projectile just forward of the screw-on Base Bleed (BB) tail unit. The contents are nominally 7.8 kg of A-IX-2 (RDX 72 per cent, Aluminium 23 per cent, Wax 4 per cent). This payload, combined with the high-fragmentation steel body, is claimed to provide the 152 mm FRAG-HE 3OF61 with an on-target effect 1.5 to 2 times that of the 152 mm FRAG-HE OF-540 (see separate entry). The nose of the projectile is threaded to accept a variety of fuzes but no firm information is yet forthcoming regarding the models or types involved; mention has been made of KZ-88 point impact and RGM-2 delay (0.027 to 0.055 second) fuzes.

The cartridge case involved is lacquered steel with a KV-4 percussion primer in the base. No information is available regarding the weight and type of propellant involved.

Maximum muzzle velocity is 828 m/s and maximum range 29,000 m.

Specifications

Weights:

projectile - 42.86 kg

explosive filling - 7.8 kg A-IX-2

Length, projectile: 864 mm

Muzzle velocity: 828 m/s

Max range: 29,000 m

Operating temperature range: -50 to +50°C

Authorised fuzes

PD KZ-88 and RGM-2 (not confirmed)

Equivalent projectiles

[FINLAND](#)

Manufacturer

Patria Vammias

Type: 152 mm HE BB

Description: Muzzle velocity given as 690 m/s and maximum range 23,000 m

[SLOVAKIA](#)

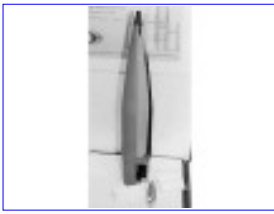
Manufacturer

Konstrukta Defence

Type: 152 mm FRAG-HE-BB OFd M1

Description: This round is part of a family of 152 mm ammunition developed for use with the ONDAVA Self-propelled Gun-Howitzer. (Other projectiles include a boat tailed 152 mm FRAG-HE similar to the RFAS 3OF45 and the EOF (the Czech OF-540)). The 152 mm FRAG-HE-BB OFd M1 projectile weighs 42.8 kg complete and contains 7.9 kg of TNT/RDX. Muzzle velocity is 882 m/s and maximum range 32,000 m

UPDATED



152 mm FRAG-HE-BB 3OF61 projectile (T J Gander)



*152 mm FRAG-HE-BB 3OF61 projectile and cartridge case
(1998)*

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 128 mm

Synonyms:

[20 mm Oerlikon KAA](#)

Armament

Oerlikon KAA (204GK), KAB (5TG), GAM-B01; Spanish Meroka.

Development

This round was developed by Oerlikon in the 1950s, for various designs of cannon and anti-aircraft guns. The same range of projectiles is also used for the 20 × 139 mm ammunition for the [Hispano Suiza HS820](#) gun.

Description

The case is of lacquered steel, with a percussion primer. Projectile weights vary between 125 and 128 g, but charges are regulated to give a muzzle velocity of 1,050 m/s in an 85 calibre length barrel (KAA) or 1,100 m/s in a 105 calibre barrel (KAB).

Specifications

Round length: 203 mm

Case length: 128.7 mm

Rim diameter: 32 mm
Bourellet diameter: 19.9 mm
Projectile weight: 125-128 g
Muzzle velocity: 1,050 m/s
Muzzle energy: 68.9 kJ

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel shell, filled Hexal; fuzed MR207 impact fuze with self-destruction between 5 - 9 seconds; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

HE-I-T: Steel two-section shell, front loaded Hexal, rear loaded red tracer; nose impact fuze MR207 giving self-destruction between 5 - 9 seconds; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

AP (HC): Light-alloy body with tungsten carbide penetrator; 110 g; MV 1,150 m/s (KAA); MV 1,200 m/s (KAB)

AP-T (HC): As for AP (HC) above but with red tracer

SAP-HE-I: Pointed shell with ballistic cap; shell filled HE-Incendiary mixture and fuzed MR208 base fuze with short delay and self-destruction between 5 - 9 seconds; 128 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

SAP-HE-I-T: As SAP-HE-I with the addition of red tracer

TP: HE-I shell body, empty; dummy fuze; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

TP-T: HE-I-T shell body with front section empty, rear section filled tracer; dummy fuze; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

NETHERLANDS

Manufacturer

NWM de Kruithoorn (now closed)

Type: Break-up Shot MN13: Plastic shell body containing dust shot. Disintegrates by centrifugal action outside the muzzle. Used for training, practice in confined areas and gun testing. 125 g; MV 1,050 m/s

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Mine HE-I: Steel thin-walled shell, loaded 18 g Hexal; fuzed KZA-199 nose fuze with self-destruction; electric primed

SAP-HE-I: Steel pointed shell with alloy ballistic cap, loaded 5.4 g Hexal; fuzed BZ-0144 base fuze with self-destruction; electric primed

TP-T: Steel shell with forward section empty and dummy fuze, rear section loaded red tracer; electric primed

SWITZERLAND

Manufacturer

Type: HE-I (NF): A steel-bodied shell filled 10 g Hexal and fitted with a nose impact fuze which also provides self-destruction after 4 - 9 seconds; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

HE-I-T (NF): A steel-bodied shell in two sections, the front section filled with 5.6 g Hexal and the rear section filled with tracer composition; nose fuze providing self-destruction after 4 - 9 seconds; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

HE-I (BF): An optimised steel-bodied shell to defeat modern air targets. Filled with 6.4 g Hexal and 2.5 g incendiary composition; base delay fuze providing self-destruction after 4 - 9 seconds; 128 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

AP-I-T: Light-alloy body carrying a tungsten carbide penetrator with incendiary composition, and a rear tracer; 128 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB). Optimised mix with HE-A (BF)

SAP-HE-I: Pointed steel shell with light-alloy ballistic cap, filled 4.7 g Hexal; base delay fuze providing self-destruction after 4 - 9 seconds; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

SAP-HE-I-T: As for SAP-HE-I above but with red tracer; 125 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

TP: Steel shell with empty cavity plugged with dummy fuze; 128 g; MV 1,050 m/s (KAA); MV 1,100 m/s (KAB)

TP-T: Similar to the TP but a two-section shell, the rear section being filled with tracer composition. Weight and velocities as for TP

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Giat Industries 20 × 128 mm rounds



Oerlikon Contraves Pyrotec AG range of projectiles for the KAA and KAB cannon

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CANNON

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

20 × 82 mm

Synonyms:

[20 mm MG151](#)

Armament

MG 151; ML60; AML Bitube; [GA1](#); [Mechem](#) NTW 20.

Development

This was developed by the Mauser company in the 1930s as a possible anti-tank projectile, but was eventually used in the aircraft cannon and light anti-aircraft guns used by both Germany and [Japan](#). In post-war years the cannon was manufactured in France and used to arm light armoured vehicles. Manufacture ceased in about 1970 but a number of guns still exist, notably in various African states. The ammunition is still manufactured by Manurhin.

Manufacture, in [South Africa](#), of the [GA1](#) cannon commenced in the late 1980s. The South African cartridge has minor dimensional differences to the original but chambers and functions in the MG 151 and similar weapons. The cartridge has recently been introduced into service, in a modified form, as an anti-materiel round.

Description

A short, rimless, bottlenecked brass case, percussion primed. The wartime projectiles were usually those

of the 20 × 80RB Oerlikon gun, and post-war production generally followed current Oerlikon designs. South African projectiles use soft iron driving bands to minimise barrel wear.

Specifications

Round length: 147 mm
Case length: 81.7 mm
Rim diameter: 25.1 mm
Bourellet diameter: 19.9 mm
Projectile weight: ca 110 g
Muzzle velocity: 720 m/s
Muzzle energy: 28.5 kJ

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: HE-I: Steel shell filled Hexal 70/30, nose impact fuze 16/18 Mle 61; 112 g; MV 720 m/s

HE-I: As above but with nose impact fuze MR21

HE-I-T: Steel two-section shell, front-filled Hexal 70/30; nose impact fuze 16/18 Mle 61; rear-filled red trace to 1,200 m; 112 g; MV 720 m/s

HE-I-T: As above but with nose impact fuze MR21

AP-I: Pointed steel shell filled incendiary composition from base; 120 g; MV 720 m/s

AP-T: Pointed steel shell with cavity partly filled inert, remainder filled red trace to 1,500 m; 120 g; MV 720 m/s; penetration 20 mm RHA at normal engagement ranges

TP: Pointed, flat-nosed shell, empty, 112 g; MV 720 m/s

TP-T: As above but cavity part filled inert, remainder with red tracer

SOUTH AFRICA

Manufacturer

PMP a Division of Denel (Pty) Ltd

Type: HE-I: Steel shell filled Hexal 30; nose impact fuze; soft iron driving band; 110 g; MV 720 m/s

HE-I-T: Two-section steel shell, front section filled Hexal P30, rear section red tracer; nose impact fuze; 110 g; MV 720 m/s

SAP-HE-I: Pointed shell filled Hexal P30; ballistic cap and base fuze; 110 g; MV 720 m/s; penetration 15 mm armour plate (110 kg/m²) at 100 m range

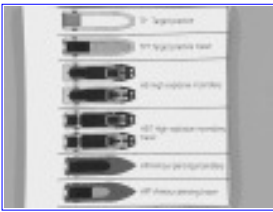
TP: HE-I shell body filled inert; dummy fuze; 110 g; MV 720 m/s

TP-T: As for TP but with tracer; 110 g; MV 720 m/s

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20 mm MG151



Giatt Industries 20 mm MG 151 projectiles



Giatt Industries 20 mm MG 151 complete rounds

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

7.5 × 54 mm

Synonyms:

7.5 mm French; 7.5 mm MAS; 7.5 mm Mle 1929

Armament

The 7.5 mm Mle 1929 cartridge was originally developed for the Mle 1924/29 Chatellerault light machine gun by Manufacture d'Armes de Saint Etienne (MAS). The original round had a case length of 58 mm but was shortened to 54 mm in 1929. Cases are usually of brass, but parkerised steel cases were used shortly after WW II and lacquered steel cases were used between 1952 and the end of the 1960's. The M1924C bullet, with a cannelure, was adopted in 1934. The jacket of this bullet may be cupro-nickel or gilding metal clad steel. It remained the standard French service cartridge until the adoption of the 7.62 × 51 mm NATO cartridge in the 1970s. It remained in service because of the large number of 7.5 mm weapons still in use and since 1985 has been loaded with a standard 7.62 mm NATO bullet, which has the same diameter. The cartridge was also adopted by French colonial forces and when these countries became independent the weapons in this caliber were retained, although in most cases the 7.5 × 54 mm has now been superseded by other calibres. Military production was by both government factories and commercial manufacturers. The cartridge continues in production in small quantities.

Description

The case is rimless and bottlenecked, Berdan or Boxer primed and made of brass or lacquered steel or,

for short-range target ammunition, aluminium alloy. The ball bullet is non-streamlined and of conventional construction, using a lead core and steel jacket. Tracer, AP and AP/T variants were also in service.

Specifications

Balle M1933

Round length: 75.95 mm

Case length: 53.59 mm

Rim diameter: 12.24 mm

Bullet diameter: 7.82 mm

Bullet weight: 12.31 g

Muzzle velocity: 670 m/s

Muzzle energy: 2,753 J

Abridged ballistic table: 7.5 × 54 mm, 9 g ball

Range	Velocity	Energy
0 m	835 m/s	3,138 J
100 m	740 m/s	2,464 J
200 m	651 m/s	1,907 J
300 m	568 m/s	1,452 J

FRANCE

Manufacturer

Giat Industries

Type: Balle ordinaire: FMJ; 9.25 g; MV 825 m/s

Balle M1933 or F1: see above

Balle T (Tracer): FMJ; red trace; 8.95 g; MV 820 m/s

Plastic short-range: Brass case, plastic bullet; 8.1 g; MV 810 m/s

Blank: Brass case, rose crimp

Manufacturer

SFM Défense

Type: Ball: MV 830 m/s

Tracer: no details

TR reduced charge: Plastic; ? g; MV 675 m/s

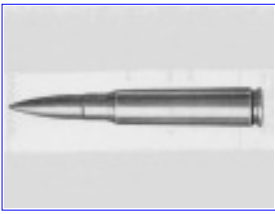
[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 9 g; MV 835 m/s

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7.5 mm French Service

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Giat 105 mm Smoke - OFUM PH 105 F1

Armament

CN105F1 series tank guns; 105 mm 105 G2 gun; 105 mm 105 G1 gun; all 105 mm L7, Rh 105 and [M68](#) series tank guns and South African GT7 tank gun.

Development

The 105 mm Smoke WP OFUM PH 105 F1 contains White Phosphorus (WP) and is virtually identical, visually and ballistically, to the HE OE 105 F1 (see previous entry) so is often employed as a training round in its place. This round is no longer in production.

Description

The 105 mm Smoke WP OFUM PH 105 F1 is a fixed round, with the projectile rigidly secured to the brass or steel cartridge case by a single crimping ring. This engages in a pronounced cannellure on the projectile just to the rear of the copper or gilding metal drive band.

The projectile is steel and is filled with 1.77 kg of White Phosphorus (WP). A point detonating FUI 56 fuze is threaded into the nose fuze cavity; the PD [M51](#) may also be used. When the fuze functions on impact it ignites a centrally located burster tube filled with Hexolite 50:50. The resultant internal pressure fractures the steel body and exposes the WP contents to the atmosphere, producing clouds of grey/white smoke for approximately 40 seconds, forming a smoke screen 75 m wide.

The round uses an M1e F2 brass or steel cartridge case (of the M148 or M150 type - length 617 mm)

with a TPA electrical primer in the base. The charge is a nominal 2.4 kg of multiperforated LB-7 T-70 single-base propellant. This propellant load produces a muzzle velocity of 695 m/s.

The 105 mm Smoke WP OFUM 105 F1 produces a muzzle velocity of 695 m/s. Maximum effective combat range is 925 m.

Specifications

Weights:

complete round - 21 kg

projectile - 12.8 kg

filling - 1.77 kg WP

propellant, nominal - 2.4 kg LB-7 T-70

Lengths:

complete round - 998 mm

projectile - 444 mm

cartridge case - 617 mm

Muzzle velocity: 695 m/s

Max combat range: 925 m

Authorised fuzes

BD FUI 56 or [M51](#)

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: 105 mm OFUM PH [Mle F1](#)

Description: See text

SPAIN

Manufacturer

SANTA BARBARA SA

Type: OFPH 105 F2

Description: Standard specifications for full power round. Uses brass cartridge case

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The complete range of L7/M68 105 mm tank gun ammunition produced by Giat Industries. These rounds can also be fired from the Giat 105 mm CN105F1 tank guns. From left: APFSDS-T 105 F1; APFSDS-T 105 G2; HE OE 105 F1; Illuminating OECL 105 F1; Smoke OFUM WP OFUM PH 105 F1; TP-T 105 F1; HEAT-TP-T 105 F2

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Giat 105 mm Illuminating - OECL 105 F1

Armament

CN105F1 series tank guns; 105 mm 105 G2 gun; all 105 mm L7, Rh 105 and [M68](#) series tank guns and South African GT7 tank gun.

Development

The 105 mm Illuminating OECL 105 F1 is intended to illuminate areas at ranges between 1,000 and 2,500 m from the tank. This round is no longer in production.

Description

The OECL 105 F1 is a fixed round, with the projectile rigidly secured to the brass or steel cartridge case by a single crimping ring. This engages in a pronounced cannellure on the projectile just to the rear of the wide copper or gilding metal drive band.

The projectile is steel and has a plug in the flat base. An FU DE F1 mechanical time fuze is threaded into the fuze well at the nose and below that is a small expulsion charge in a cavity. The hollow interior contains a flare container assembly and a parachute, both under a piston plate. When the time fuze functions at a range between 100 and 2,500 m from the gun muzzle, ideally at an altitude of about 350 m, it ignites the expulsion charge which creates sufficient internal pressure to push down on the piston plate and contents to force off the projectile's base plug. The expulsion charge also ignites a short delay train which ignites two separate flare containers in the flare assembly; the illuminating composition weighs 460 g. As the flare assembly is ejected the parachute deploys to stabilise the assembly and slow down the rate of descent. The flares burn for approximately 35 seconds, illuminating an area with an

initial diameter of 900 m.

The OECL 105 F1 uses an M1e F2 brass or steel cartridge case of the M148 or M150 type with a TPA electrical primer in the base. The charge is a nominal 1.25 kg of multiperforated single-base propellant. This propellant load produces a muzzle velocity of 290 m/s. Maximum effective combat range is 825 m.

Specifications

Weights:

complete round - 18.25 kg

projectile - 11.5 kg

propellant, nominal - 1.25 kg single base

illuminating composition - 460 g

Lengths:

complete round - 990 mm

projectile - 444 mm

cartridge case - 617 mm

Muzzle velocity: 290 m/s

Max combat range: 825 m

Authorised fuzes

MT FU DE F1

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: 105 mm OECL

Description: No longer in production. See text

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 106 mm: HEAP M-DN 11

Armament

[M40A1](#), M40A1C and [M40A2](#) cannon.

Development

This 106 mm (actual calibre 105 mm) recoilless rifle HEAP round is produced in Spain by SANTA BARBARA SA and DEFEX SA. It is primarily intended for anti-matériel or anti-personnel use and contains 1,000 steel pellets.

Description

The 106 mm HEAP [M-DN 11](#) is a fixed round with the projectile rigidly secured to the perforated steel cartridge case by a crimping groove. The projectile has two indexing buttons 180° apart on the forward bourrelet and a pre-engraved copper drive band encircles the projectile just forward of the base.

The projectile is a thin-walled aluminium shell with a conical ogive, filled with 770 g of hexogen with 5 per cent wax. The internal surfaces of the shell body are lined with 1,000 steel pellets set in resin. A nose-mounted M-DN 121 fuze may be preset for either instant impact functioning or delayed action. In either instance the usual blast effects are enhanced by the scattering of the 1,000 steel pellets.

The perforated steel cartridge case may either be M93B1 or M94B1, both with an [M57](#) percussion primer press fitted to the base. The propelling charge is 3.65 kg of [M26](#) propellant powder in multiperforated cylindrical grain form, known in Spain as Fil 349.

This round has a maximum effective range of 1,500 m, although the maximum range possible is 7,640 m. Muzzle velocity is 560 m/s.

Specifications

Weights:

complete round - 16.4 kg

projectile - 3.6 kg

filling - 770 g hexogen plus 1,000 steel pellets

propellant - 3.65 kg [M26](#)

Length: 908 mm

Muzzle velocity: 560 m/s

Max effective range: 1,500 m

Max range: 7,640 m

Authorised fuzes

PD M-DN 121

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: HE-APERS NR 483

Description: Originally produced in Belgium by PRB. Weight of the complete round is 16.5 kg and projectile weight is 7.8 kg. The explosive involved is Composition A-3. Muzzle velocity is 500 m/s and maximum possible range 6,400 m. The anti-personnel pellets have a lethal radius of up to 40 m. In production

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HE-PFF

Description: Complete round weight given as 18.7 kg and fuzed projectile weight 9.89 kg. Explosive filling is Composition B surrounded by layers of pellets

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Giat Industries 105 mm OFL 105 G2 APFSDS-T

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The forerunner of the 105 mm APFSDS-T OFL 105 G2, the OFL F1, was announced in June 1979 and entered production in 1981. Although intended for use in all L7, Rh 105, [M68](#) and CN105F1 guns, the utility of the OFL 105 F1 was mainly confined to French produced CN105F1 guns fitted to the [AMX-30](#) series of main battle tanks. The OFL 105 F1 is now out of production, other than to special order, having been replaced by the OFL 105 G2. However, stocks of OFL 105 F1 rounds remain available for service.

The 105 mm APFSDS-T OFL 105 G2 uses a heavier penetrator rod than the OFL 105 F1 and, although it only has a slightly higher muzzle velocity, it is able to produce a 20 per cent better penetration performance than the OFL 105 F1.

Giat Industries also produces a 105 mm APFSDS-T OFL 105 E2 with a Depleted Uranium (DU) penetrator rod - see under Equivalent rounds for details.

Description

The 105 mm APFSDS-T OFL 105 G2 is a fixed round, with the projectile assembly crimped onto a M148A1B1-pattern cartridge case. The projectile assembly consists of a subprojectile and a sabot. The

OFL 105 G2 subprojectile consists of a monobloc tungsten alloy core acting as the penetrator rod, the front part of which has an aluminium windshield with a steel tip to prevent aerodynamic heating. Length-to-diameter ratio is around 26:1. A six-finned aluminium fin assembly is fitted to the rear of the penetrator rod and contains a tracer element.

The penetrator rod is held in the three-segment, aluminium sabot assembly in a slip band arrangement, interfaced by mating buttresses (also referred to as drive splines). The slip band reduces the amount of spin assimilated by the penetrator rod during its passage down the gun bore after firing. Once the projectile assembly has left the muzzle the three sabot segments break away, taking the slip band with them.

The cartridge case is 70:30 brass (steel may also be used), an electrical primer is also fitted into the base. Before loading the primer is normally protected by a metal clip over the base of the cartridge case. The propellant charge is 5.85 kg of an unspecified double-base multiperforated (19-hole) propellant.

The OFL 105 G2 has a muzzle velocity of 1,525 m/s; residual velocity at 2,000 m is 1,387 m/s. It can penetrate a NATO single heavy tank target at 7,400 m and a NATO triple heavy tank target at 9,000 m. Time of flight to 2,000 m is 1.38 seconds. The maximum effective combat range is stated to be 2,000 m.

Specifications

Weights:

complete round - 18 kg

projectile assembly - 6.25 kg

penetrator - 4 kg

propellant - 5.85 kg

Lengths:

complete round - 985 mm

cartridge case - 617 mm

Muzzle velocity: (nominal) 1,525 m/s

Authorised fuzes

None involved

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: APFSDS 105 E2

Description: In production for in-service 105 mm CN105F1 guns fitted to French Army AMX-30B2 MBTs. This round has a Depleted Uranium (DU) penetrator understood to penetrate 540 mm of RHA at 2,000 m. Round weight is 18 kg and the projectile assembly weighs 6.25 kg. Round length is 990 mm overall. Muzzle velocity is 1,525 m/s. Available with brass or steel cases

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*Giat Industries 105 mm APFSDS-T OFL G2 (T J Gander)
(1998)*



Giatt Industries 105 mm APFSDS-T OFL G2 (left) compared to APFSDS-T E2 (centre) and HEAT-TP-T F2 (right) (T J Gander) (1999)

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Terry J Gander

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm Illuminating bomb M77A

Armament

[TDA](#) and other 81 mm mortars, including British L16A1/A2.

Development

By [TDA](#).

Description

The [TDA](#) M77A illuminating round was specifically developed for the company's 81 mm light mortar, but can be used in virtually any 81 mm mortar. The M77A projectile provides a light intensity of 1 Mcd, a rate of fall of 5 to 7 m/s and an operating time of 55 s. With a burst height of 340 m, initial illumination covers an area with a diameter of approximately 1,250 m, with 5 lux over an area of 780 m diameter and two lux on the outer edges. As the flare approaches the end of its descent, the illuminated area increases to 1,400 m diameter having 5 lux over an area with a diameter of 870 m and 2 lux at the outer edges. An Infra-Red (IR) version is also available.

Specifications

Type: illumination

Length, fuzed: 476 mm

Weight, fuzed: 4 kg

Type of payload: parachute and flare

Type of charges: P+8

Fuze: time, programmable from 7 to 55 s

Min range: 200 m

Max range: 5,100 m

Colour/markings: OD/white

Status

In production, available.

Manufacturer

[TDA.](#)

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M96

Armament

[TDA](#) mortars and other 81 mm mortars.

Development

By [TDA](#).

Description

The M 96 is a conventional elongated teardrop shaped bomb with a body of malleable perlitic cast iron. The body has a single gas check ring, a light aluminium alloy tailboom with horseshoe shaped propellant increments. White phosphorus smoke, practice and inert rounds of identical ballistic characteristics are also available.

Specifications

Type: HE, WP smoke, practice, inert

Length: fuze: 449 mm

Weight: fuze: 4.560 kg

Type of Payload: Tolite, WP or inert

Type of Charges: P+8

Fuze: Impact SQ, delay, or proximity

Min range: 250 m

Max range: 5,700 m (MO 81 LLR)

Colour/Markings: HE, OD/yellow; WP smoke, grey/red; practice, blue/red

Status

In production, available. In service with the French Army.

Manufacturer

[TDA.](#)

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm Illuminating bomb M 63

Armament

All 60 mm light mortars.

Development

By [TDA](#) to provide an improved illuminating round for lightweight 60 mm mortars.

Description

The M 63 is probably an improvement to the earlier Mk 63 (*qv*). The round is cylindrical in shape with a conical nosecone and tapered rear section that contains a programmable time fuze that can be adjusted to function from 5 to 35 seconds after setback. Rate of fall is 4 m/s over 35 seconds. With a burst height of 200 m, initial illumination covers an area of 390 m diameter with 5 lux illumination and an area of 710 m diameter with 2 lux illumination. The M 63 has a lightweight alloy tailboom with eight fins and four secondary charges clipped between the forward edges of the fins. A horseshoe shaped super charge surrounds the tailboom forward of the fins.

Specifications

Type: illumination

Round length: 320 mm

Round weight: 1.5 kg

Payload: magnesium flare and parachute

Number of charges: P+4+Super

Max Range: 2,050 m (MO 60L mortar)

Min range: 100 m

Colour/markings: OD/white

Status

In production, available. In service with the French Army.

Manufacturer

[TDA.](#)

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE Bomb M 61

Armament

All 60 mm mortars.

Development

By [TDA](#) for its 60 mm Commando mortar and MO 60 Series.

Description

The M 61 appears to be an improvement on the Mk 61 (*qv*). The M 61 is a teardrop shaped bomb made of malleable perlitic cast iron. This construction provides more homogenous fragmentation, thus increasing the projectile's effectiveness against unprotected troops. The projectile explosive fill is tolite. The M 61 can be equipped with either impact or proximity fuzes. With an impact angle of 70°, the lethal area with impact fuzing is 431 m, while the optimal burst height of 3 m using the proximity fuze gives a lethal area of approximately 500 m. Like the Mk 61, the M 61 has a light-alloy tailboom with eight fins and four secondary charges, with a horseshoe shaped super charge above the secondary charges. Smoke, Practice and Inert rounds with identical ballistics are available.

Specifications

Type: HE

Length, fuzed: 343 mm

Weight, fuzed: 1.730 kg

Type of Payload: HE, Tolite

Type of Charges: P+4, + super
Fuze: impact or proximity.
Max range: 2,050 m (MO 60L)
Colour/markings: OD, yellow

Status

In production, available. In service with French Army.

Manufacturer

[TDA.](#)

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Sauvestre 12 gauge Balle Fleche sabot tactical shotgun slug

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Sauvestre to provide a high-penetration shotgun slug with enhanced accuracy at long range.

Description

Although originally developed as a hunting round, the Sauvestre *Balle Fleche* round is used by many agencies because of its high velocity, penetration and enhanced accuracy over conventional slugs fired from smoothbore shotguns. The *Balle Fleche* round is similar in design to APFSDS rounds fired from smoothbore tank cannon, reflecting the background of the inventor, Jean-Claude Sauvestre, who for many years designed APFSDS anti-armour ammunition. The solid lead projectile is approximately 11 mm in diameter and is encased in a plastic sabot that separates from the slug as it leaves the muzzle of the shotgun. The slug's fins are shaped like small airfoils to produce a low-pressure area on one side and thus, spin the projectile for enhanced accuracy. While not as accurate as slugs fired from rifled barrel

shotguns, the *Balle Fleche* round is far more accurate than conventional slugs and achieves greater penetration. Both 70 and 76 mm versions are available, although most agencies will opt for the 70 mm version.

Specifications (all figures are for the 70 mm version)

- Calibre:** 12 gauge
- Round length:** 70 mm (2.75 in)
- Rim diameter:** 22 mm
- Projectile weight:** 26 g
- Muzzle velocity:** 511 m/s
- Muzzle energy:** 3,382 J
- Max range:** 150 m
- Max effective range:** 100 m

FRANCE

Manufacturer

Thifan - Industrie S.A.R.L.
275 Rue de Malitorne
St. Doulichard
France
Web: <http://www.sabot-slug.com>

UNITED STATES OF AMERICA

Manufacturer

Keng's Firearms Specialty
875 Wharton Drive
Atlanta, [Georgia](#) 30336-1405
USA
Tel: (+1 404) 691 76 11
Fax: (+1 404) 505 84 45

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*Sauvestre 12 gauge sabot slug (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

SAE ALSETEX ALCA 12 12 gauge windscreen penetrating round.

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By SAE ALESTEX to provide a penetrating tear gas shell for use by law enforcement and military organisations.

Description

The ALCA 12 fires a fin stabilised projectile that penetrates automobile windscreens and then bursts, spreading a cloud of tear agent inside to incapacitate the occupants, thus making them easier to subdue.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Approx 6 g

Muzzle velocity: Approx 155 m/s
Muzzle energy: N/A
Max range: Approx 75 m
Max effective range: Approx 30 m

FRANCE

Manufacturer

SAE ALESTEX (Societe d'Armement et d'Etudes)
Usine de Malpaire BP5
72304 Precigne
France
Tel: (+33 2) 43 92 81 00
Fax: (+33 2) 43 95 41 13

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FUZES - TIME FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FH81 B

Armament

Ejection-type mortar projectiles.

Development

By SNEM.

Description

Aluminium body with mechanical time setting to a maximum of 75 seconds.

Specifications

Type: MT

Length:

overall - 68 mm

exposed - 57 mm

Diameter: 77 mm

Weight: 967 g

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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FUZES - TIME FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FR55 B

Armament

Ejection-type mortar projectiles.

Development

By SNEM. History unknown.

Description

Aluminium body with mechanical time setting to a maximum of 55 seconds.

Specifications

Type: MT

Length:

overall - 110 mm

exposed - 96 mm

Diameter: 66 mm

Weight: 494 g

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALTA 81

Armament

For 81 mm bombs.

Development

By SAE Alsetex as a private venture.

Description

This uses a delayed arming mechanism to ensure muzzle safety and the cap rotates so that the fuze can be set to `safe' or `fire' positions. It is a highly sensitive super-quick fuze and has visual indication of whether or not it is armed.

Specifications

Type: impact, SQ

Weight: 150 g

Length overall: 75 mm

Diameter: 48 mm

Optional delay: none

Arming requirement: 800 g

Arming distance: 40 m

Manufacturer

SAE Alsetex.

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Alsetex Alta 81 impact fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FM 64

Armament

HE bombs with suitable thread.

Development

By SNEM for overseas sales.

Description

This is generally the same fuze as the SC14 but differs in dimensions and thread.

Specifications

Type: impact, SQ and graze

Weight: 305 g

Thread: 36.22 mm × 10 tpi (BSW)

Length overall: 87 mm

Intrusion: 32.55 mm

Diameter: 36.5 mm

Optional delay: none

Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FM 40

Armament

HE shells with BSW thread.

Development

By SNEM for overseas sale.

Description

This uses a similar mechanism to the SC14 fuze, a direct action striker backed up by an inertia graze action. Safety is ensured by means of an inertia block, which releases an arming escapement and by a rack-and-pinion mechanism to bring the primary detonator in line with the striker during flight. The fuze has a movable cap which is supplied set to 'S' for safe and is moved to 'F' for fire before loading.

Specifications

Type: impact, SQ and graze

Weight: 175 g

Thread: 36.22 mm × 10 tpi (BSW)

Length overall: 87 mm

Intrusion: 32.55 mm

Diameter: 36.5 mm

Optional delay: none

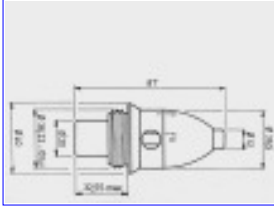
Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM FM 40 impact fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

V19P, V19PA

Armament

81 and 120 mm smoothbore HE, WP smoke and practice mortar bombs.

Development

This fuze was originally designed by Hotchkiss-Brandt/TDA and has since been licensed for manufacture to many countries.

Description

This fuze has a steel rear body and an aluminium nose cap, which can be rotated by hand to the safe or fire positions. A turnscrew in the side of the fuze permits delay setting. In the SQ mode the striker in the nose is driven into a detonator on impact and fires the magazine. When the screw is turned for delay, the direct path to the magazine is closed and the flash is directed via a delay element.

The [V19P](#) and [V19PA](#) differ only in construction. The [V19PA](#) is made entirely of aluminium and thus weighs less.

Specifications

Type: impact, SQ and delay

Weight: 381 g, [V19P](#); 208 g, [V19PA](#)

Length:

overall - 106 mm
visible - 81 mm
Diameter: 48 mm
Optional delay: 0.05 s
Arming distance: 50-245 m

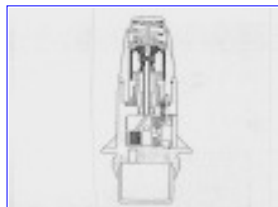
Manufacturers

[TDA.](#)

Alsons Industries (Pvt) Ltd.

Denel (Pty) Ltd.

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[VI9P](#) fuze shown in the armed, delay, position



*[VI9P](#) impact and delay fuze
(1998)*

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

SC16

Armament

HE bombs with suitable thread.

Development

By SNEM for overseas sale.

Description

This uses the same mechanisms as the SC16G but has a different external contour, a stepped conical shape rather than the rounded shape of other SNEM designs. It also differs in dimensions and thread.

Specifications

Type: impact, SQ and graze

Weight: 540 g

Thread: 35.7 × 2 mm

Length overall: 103.95 mm

Intrusion: 28.85 mm

Diameter: 44 mm

Optional delay: none

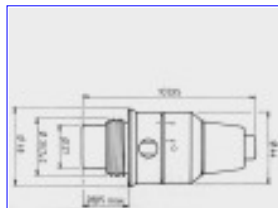
Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC16 DA and graze impact fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC14P

Armament

HE bombs with US standard thread.

Development

By SNEM for overseas sale.

Description

This is the same SC14 DA and graze mechanism, differing only in thread, intrusion and magazine dimensions.

Specifications

Type: impact, SQ and graze

Weight: 305 g

Thread: 1.5 in 12 tpi

Length overall: 83 mm

Intrusion: 29 mm

Diameter: 36.5 mm

Optional delay: none

Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC14G

Armament

HE bombs with suitable thread.

Development

By SNEM for French Army under nomenclature FU. I. MO.81. F1.

Description

This is the same as the SC14 but with different thread and intrusion.

Specifications

Type: impact, SQ and graze

Weight: 245 g

Thread: 23.5 × 200

Length overall: 111.45 mm

Intrusion: 57.4 mm

Diameter: 36.5 mm

Optional delay: none

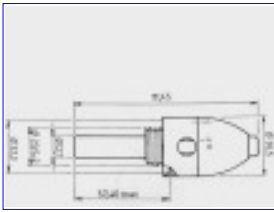
Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC14G DA and graze impact fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC14

Armament

81 mm HE bombs with suitable thread.

Development

By SNEM to order.

Description

The SC14 is similar to the SC12 but has no delay option, other than the inherent delay during graze action.

Specifications

Type: impact, SQ and graze

Weight: 119 g

Thread: 35.7 × 200 mm

Length overall: 77 mm

Length, visible: 54 mm

Intrusion: 29 mm

Max diameter: 46 mm

Optional delay: none

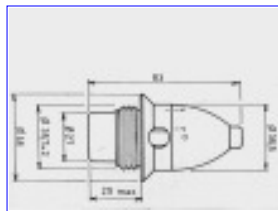
Arming requirement: 1,600 g

Arming distance: 40 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC14 DA and graze impact fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC12B

Armament

HE mortar bombs with suitable fuze well thread.

Development

By SNEM to fit bombs in service with foreign armies.

Description

This uses the same mechanical system as the previous SC12 series but differs in its thread and intrusion. It also has a long and narrow magazine.

Specifications

Type: impact, SQ and delay

Weight: 160 g

Thread: 33 × 2 SI

Length overall: 113.65 mm

Intrusion: 61.7 mm

Diameter: 36.5 mm

Optional delay: graze plus 0.05 s

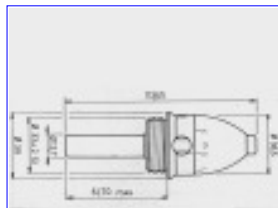
Arming requirement: 2,000 g

Arming distance: 5-20 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC12B impact, SQ and delay fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

SC12P1

Armament

HE mortar bombs with suitable fuze well thread.

Development

By SNEM to suit mortars with US fuze well gauge.

Description

This uses the same mechanical arrangements as the previous SC12 models but differs in having a US thread and a wider magazine.

Specifications

Type: impact, SQ and delay

Weight: 200 g

Thread: 1.5 in 12 tpi (UNF-1A)

Length overall: 80 mm

Intrusion: 27.5 mm

Diameter: 36.5 mm

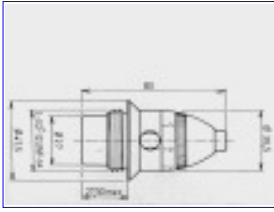
Optional delay: graze plus 0.05 s

Arming requirement: 2,000 g

Arming distance: 5-20 m

Manufacturer: SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC12P1 impact, SQ and delay fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC12G

Armament

HE mortar bombs with suitable fuze well thread.

Development

By SNEM for French Army under nomenclature FU. I. DT. MO.60. F3.

Description

This is to the same basic design as the SC12 but made with a different thread and a deeper intrusion.

Specifications

Type: impact, SQ and delay

Weight: 150 g

Thread: 20.95 × 1 SI

Length overall: 94.95 mm

Intrusion: 39 mm

Diameter: 36.5 mm

Optional delay: graze plus 0.05 s

Arming requirement: 2,000 g

Arming distance: 5-20 m

Manufacturer

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC12I

Armament

For practice bombs with suitable fuze well thread.

Development

By SNEM for French Army under nomenclature FU. I. DT. X. F1.

Description

This is the same as the SC12 described previously, differing only in the depth of intrusion.

Specifications

Type: impact, SQ and delay

Weight: 145 g

Thread: 30 × 2 SI

Length overall: 72.95 mm

Intrusion: 20.95 mm

Diameter: 36.5 mm

Optional delay: graze plus 0.05 s

Arming requirement: 2,000 g

Arming distance: 5-20 m

Manufacturer

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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SC12

Armament

HE mortar bombs with suitable fuze well thread.

Development

By SNEM for use by French Army under nomenclature FU. I. DT. MO.60. F1.

Description

A direct action and graze fuze with selectable action. The cap of the fuze is movable with respect to the body and can be turned to one of three settings: L for long delay (that is, graze action plus a short delay); C for SQ and graze action; and S for safe. Arming safety is controlled by an inertia block and a mechanical escapement system which moves the primary detonator in line with the striker.

Specifications

Type: impact, SQ and delay

Weight: 150 g

Thread: 30 × 2 SI

Length overall: 73.15 mm

Intrusion: 21.35 mm

Diameter: 36.5 mm

Optional delay: graze plus 0.05 s

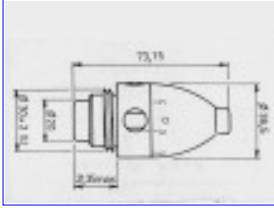
Arming requirement: 2,000 g

Arming distance: 5-20 m

Manufacturer

SNEM: Société Nouvelle d'Etudes et de Mécanique.

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SNEM SC12 impact, SQ and delay fuze

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FUZES - IMPACT FUZES, FRANCE

Date Posted: 05 September 2001

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V9

Armament

60 mm HE, smoke and practice bombs.

Development

By SNEM to a French military requirement.

Description

This generally resembles the better-known V19 series of fuzes, using a similar arming and direct action mechanism, but without any optional delay facility. The fuze has an aluminium rear body and a nose cap which can be turned by hand between the safe and fire positions. This fuze has been widely copied and is produced by Denel in [South Africa](#).

Specifications

Type: impact, SQ

Weight: 136 g

Length:

overall - 115 mm

visible - 53 mm

Diameter: 38 mm

Arming time: <4 s

Manufacturers

SNEM: Société Nouvelle d'Etudes et de Mécanique.
Denel (Pty) Ltd.

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*V9 impact and super-quick fuze
(1998)*

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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120 mm smoke bomb

Armament

120 mm [TDA](#) rifled mortar MO-120-RT, Mortar M61R.

Development

By [TDA](#) to provide a smoke projectile for rifled mortars in French service.

Description

This projectile uses the same body and cartridge container as the PR14 HE bomb, but is fitted with a central burster and a main filling of White Phosphorus (WP). It is ballistically matched to the PR14 bomb.

Specifications

Length, fuzed: 897 mm

Weight, fuzed: 18.6 kg

Type of payload: WP

Number of charges: P + 11

Fuze: impact, SQ and delay

Min range: 1,100 m

Max range: 8,100 m

Manufacturer

[TDA.](#)

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm long-range HE projectile

Armament

120 mm [TDA](#) rifled mortar MO-120-RT.

Development

Developed by [TDA](#) to provide an HE mortar bomb capable of a 17,000 m range.

Description

This projectile uses a long cylindrical body with a tapering ogive and a slight boat tail at the rear. In distinction to all other bombs for the 120 mm rifled mortar, it does not have a prerifled driving band, although it does carry a plastic obturating ring. Instead, there are six spring-out fins at the rear of the boat tail which, until the bomb is in flight, are locked in the folded-in position by an attachment at the end of the cartridge container tube. The cartridge container carries the usual primary and 11 secondary increments.

In addition, the centre of the bomb carries a rocket motor which has an exit venturi in the bomb's base. This is sealed by a plug which carries a pyrotechnic delay.

On firing, the bomb is launched by the propelling charge in the usual way. On leaving the muzzle, the cartridge container is discarded allowing the fins to spring out into the airstream and stabilise the bomb's flight. The explosion of the charge ignites the delay, after a further period of time the rocket motor is ignited, while the bomb is still on the upward leg of the trajectory. The plug is blown out of the venturi, the rocket efflux takes effect and the trajectory is consequently extended.

Specifications

Length, fuzed: 954 mm

Weight, fuzed: 24.45 kg

Type of payload: TNT

Number of charges: P + 11

Fuze: impact SQ and delay; or proximity

Min range: 5,000 m

Max range: 17,000 m

Manufacturer

[TDA.](#)

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating projectile PRECLAIR

Armament

[TDA](#) 120 mm rifled mortar MO-120-RT, Mortar 2R2M.

Development

By [TDA](#) to provide an illuminating projectile for the rifled mortar.

Description

The PRECLAIR resembles the PR14 HE bomb, with a similar body shape, prerifled driving band, obturating ring and tailboom that detaches in flight. However, the boat tail is slightly different in contour and the latter part of it is a separate component pinned to the main body. The interior contains a parachute and flare container. A time fuze ignites an expelling charge which blows off the rear of the boat tail, allowing the contents of the body to be ejected. At 420 m height of burst, the PRECLAIR's initial illumination covers an area of 1,500 m diameter with 5 lux over a 700 m diameter area, tapering to 2 lux at the outer edges. In the final stage of descent, the illuminated area expands to a diameter of 1,700 m, with 5 lux over an 1,080 m area, tapering to 2 lux at the outer edges.

Specifications

Length, fuzed: 890 mm

Weight, fuzed: 18.4 kg

Type of payload: parachute and flare

Number of charges: P + 11

Fuze: mechanical time FR 55B.

Min range: 1,300 m

Max range: 7,900 m (discharge); 8,150 m (illuminated)

Illumination intensity: 1.5 Mcd

Rate of descent: 5 m/s

Burning time: 55 s

Manufacturer

[TDA.](#)

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120 mm illuminating projectile PRECLAIR

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm ACED cargo bomb

Armament

120 mm [TDA](#) rifled mortar MO-120-RT and 2R2M.

Development

Under development by [TDA](#) to provide a submunitions projectile for rifled mortars.

Description

Full details of this round have not been released, but it uses a body similar to that of the PRECLAIR illuminating round, with a pinned base. Two GENERIC ACED submunitions are carried inside the bomb and ejected through the base by means of a time fuze and expelling charge. The submunitions incorporate MilliMetre Wave radar (MMW) and Infra-Red (IR) seekers to obtain and home in on targets. When the submunitions are ejected above the target zone, each adopts a ballistic trajectory during which its velocity and spin are progressively slowed before its parachute opens at a preset altitude. When the parachute opens, the MMW/IR seeker is activated and scans for targets. The seekers are countermeasure resistant and once they have homed onto a target, an explosively formed penetrator is fired through the top of the target vehicle. The propulsion system uses the standard discarding cartridge container, primary cartridge and 11 secondary increments. Ballistics are identical to the PRECLAIR illumination round.

Specifications

Length, fuzed: 563.5 mm

Weight, in flight: 15.8 kg

Type of payload: 2 GENERIC ACED submunitions

Number of charges: P + 11

Fuze: FUCHSIA ET

Max range: 7,500 m

Manufacturer

[TDA.](#)

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[TDA](#) 120 mm bombs for the rifled mortar: the ACED cargo bomb is shown on the right

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE anti-armour projectile PR AB

Armament

[TDA](#) 120 mm rifled mortar MO-120-RT, Mortar M61R.

Development

By [TDA](#) to provide a means for mortars to engage light armoured vehicles.

Description

The PR AB projectile resembles the PR14 HE bomb in appearance, with the same pre-engraved driving band, obturating ring and tailboom. However, the body is made of prefragmented steel alloy and filled with RDX/TNT. On detonation at the target the resulting high-velocity fragments are capable of penetrating 8 to 15 mm of armour plate at greater than 10 m from the point of burst, each penetration being approximately 25 mm in diameter.

Specifications

Length, fuze: 897 mm

Weight, fuze: 18.6 kg

Type of payload: RDX/TNT

Number of charges: P + 11

Fuze: impact SQ and delay; a proximity fuze may be used for top attack

Min range: 1,100 m
Max range: 8,135 m

Manufacturer

[TDA.](#)

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120 mm HE anti-armour bomb PR AB

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb 120ED

Armament

All 120 mm smoothbore mortars.

Development

By [TDA](#) for mortars in French service and general use.

Description

This bomb has a cylindrical body with a short tapered nose carrying a time fuze. The tailfins are attached immediately behind the body and hinged so they can fold sideways for storage and loading, they are larger than the mortar's calibre when extended, giving excellent stability in flight. The cartridge container extends behind the fins and carries the usual primary cartridge in its end. The secondary increments fit around the container, supported by a cast plate with four arms at the end of the container.

The interior of the body contains the usual magnesium flare container and parachute. The time fuze ignites an expelling charge which blows off the tail of the bomb and allows the contents to be ejected.

Specifications

Length, fuzed: 800 mm

Weight, fuzed: 13.65 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: mechanical time FH 81B

Max range: 5,100 m

Manufacturer

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb PR14

Armament

120 mm [TDA](#) rifled mortar MO-120-RT, Mortar 2R2M.

Development

By [TDA](#).

Description

The body of the PR14 bomb resembles an artillery shell. It has a tapering ogive, parallel-walled section, a pre-engraved driving band and a boat tailed section at the rear. There is a pre-engraved driving band and a plastic obturating ring at the boat tail. A tubular tailboom is attached to the base of the projectile. This carries a primary cartridge in its base and has 11 horseshoe shaped secondary propellant increments clipped around it. The increments are colour-coded; four red, five white and two blue.

The bomb is drop loaded by engaging the pre-engraved driving band with the rifling at the muzzle. Upon the explosion of the propelling charge, the obturating ring is driven up the boat tail and lodges behind the driving band to act as a seal. A delay element in the forward end of the tailboom is ignited. Shortly after the bomb has left the muzzle the delay burns through and ignites a small charge which blows off the tailboom, so that it lands about 100 m from the mortar.

With an angle of fall of 69°, the lethal area for a ground burst is approximately 1,290 m² and for an airburst at 3 m height 1,530m².

There are three versions in addition to the HE bomb, all of which have identical ballistics. These are White Phosphorous (WP) smoke, practice and inert.

Specifications

Length, fuzed: 897 mm

Weight, fuzed: 18.6 kg

Type of payload: Tolite

Number of charges: P + 11

Fuze: impact SQ and delay VG-29; or proximity

Min range: 1,100 m

Max range: 8,100 m

Colour/markings: HE, OD/yellow, WP smoke, grey/red; practice, blue/red; inert, orange/black.

Manufacturer

[TDA.](#)

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120 mm HE bomb PR14

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb Mle 44

Armament

All 120 mm smoothbore mortars.

Development

By [TDA](#) for mortars in French service and for general use.

Description

This uses the same body, tail unit and propelling charge system as the Mle 44/66 HE bomb, but differs in being filled with white phosphorus smoke composition. The nose is closed by an adaptor carrying a long central burster loaded with explosive and the remainder of the body cavity is filled with the smoke composition.

Specifications

Length, fuze: 664 mm

Weight, fuze: 13 kg

Type of payload: WP

Number of charges: P + 7

Fuze: impact SQ

Min range: 500 m

Max range: 7,000 m

Manufacturer

[TDA.](#)

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket-assisted HE bomb PR PA

Armament

120 mm [TDA](#) rifled mortar MO-120-RT, Mortar, 2R2M.

Development

By [TDA](#) to increase the range of the rifled mortar.

Description

The PR PA is generally similar to the PR14 HE bomb described previously, with a similar body, pre-engraved driving band, plastic obturating ring and tailboom that separates in flight. The same primary cartridge and 11 colour-coded secondary increments as the PR 14 are used.

An internal rocket motor is positioned centrally in the body and insulated from the surrounding filling. This terminates in a venturi in the base of the projectile. In this venturi is a plug carrying a delay element. After firing, a short delay unit blows off the tailboom, as with the PR14 bomb and after a 10 seconds delay (from the time of firing), a second delay unit burns through and ignites the rocket motor. This blows out the plug and the rocket efflux then takes effect, extending the vertex of the trajectory and thus the maximum range. The PR PA is in service with the French Army and several other armies

Specifications

Length, fuzed: 918 mm

Weight, fuzed: 18.6 kg
Type of payload: RDX/TNT, 2.7 kg
Number of charges: P + 11
Fuze: impact, SQ and delay VG-29; or proximity
Min range: 1,100 m
Max range: 13,000 m with rocket assistance

Manufacturer

[TDA.](#)

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*120 mm HE bomb PRPA
(1998)*

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb M852

Armament

All [TDA](#) 120 mm smoothbore mortars.

Development

This bomb represents the first of the 'new-generation' designs from [TDA](#) intended to improve the performance of current mortars.

Description

This is of the same general shape as the M1e 44/66, but is somewhat more rounded in the nose and with five gas check grooves at the bourrelet. The body is of malleable pearlitic cast-iron and the tailboom and fins are of alloy. The charge system, though still consisting of a primary cartridge and seven horseshoe shaped propellant increments on the tailboom, is slightly different in composition and has the secondary charges colour-coded.

There are several versions of this round with identical ballistic characteristics. These are White Phosphorous (WP) smoke, practice and inert rounds.

Specifications

Length, fuzed: 684 mm

Weight, fuzed: 14.26 kg

Type of payload: TNT

Number of charges: P + 7

Fuze: impact, SQ and delay; or proximity

Min range: 500 m

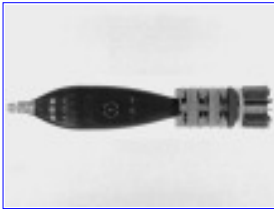
Max range: 7,500 m (MO120 LT)

Colour/markings : HE, OD/yellow; WP smoke, grey/red; practice, blue/red; inert, orange/black

Manufacturer

[TDA.](#)

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120 mm HE bomb M852

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket-assisted HE bomb PEPA-LP

Armament

120 mm smoothbore [TDA](#) Mortar MO-120-LT, MO-120-M65 and MO-120-AM50 mortars. It may also be used in the light mortar MO-120-L up to Charge 4.

Development

By [TDA](#) to extend the maximum range of current mortars.

Description

This is a similar design of bomb to the PEPA described previously but is lighter, giving a lower recoil blow to the mortar and a greater maximum range. The construction and operation is exactly the same.

Specifications

Length, fuze: 758 mm

Weight, fuze: 13.42 kg

Type of payload: RDX/TNT

Number of charges: P + 7

Fuze: impact SQ or proximity

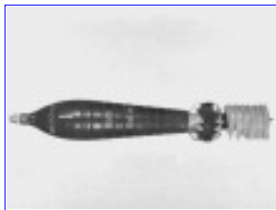
Min range: 1,200 m

Max range: 8,950 m

Manufacturer

[TDA.](#)

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120 mm HE bomb PEPA-LP

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket-assisted HE bomb PEPA

Armament

[TDA](#) 120 mm Light Mortar MO-120/60.

Development

By [TDA](#) to extend the range of existing mortars.

Description

This bomb consists of a steel body, HE filling, an internal solid-fuel rocket motor and the V19 P fuze. The standard propelling charge is at the rear. The body is made in two parts, screwed together, with the tail assembly screwed onto the rear part of the body.

The HE content is 2 kg of RDX/TNT cast inside the cavity and around the solid-fuel motor. The solid-fuel motor, of star-shaped section, is housed in a tube, externally inhibited, with a venturi at the end. The venturi is secured at the tail end by an obturator containing an optional delay and a selection lock, this allows the use of the solid-fuel propulsion unit if required. A spring catch holds the selection lock in the required position.

The propulsion charge consists of the primary cartridge and up to seven secondary increments. The tube holding the primary cartridge contains the flash-holes communicating with the secondary charges and is ejected after the bomb is fired.

In use the order of events is as follows. The bomb is removed from the container and the charge

system adjusted by the removal of unrequired secondaries. If the rocket assistance is required, the tube containing the primary cartridge is rotated clockwise. The fuze V19 P is then set for instantaneous action or delay. The bomb is drop loaded and fired in the usual manner. If rocket assistance has been selected the flash from the primary cartridge ignites the delay unit, this burns through and lights the rocket motor as the bomb approaches the vertex of its trajectory. The rocket thrust thus drives the bomb to a new vertex and increases the range.

Specifications

Length, fuze: 758 mm

Weight, fuze: 19.8 kg

Weight and type of payload: 2 kg RDX/TNT

Number of charges: P + 7

Fuze: impact SQ

Min range: 500 m

Max range: 4,250 m without rocket assistance; 6,550 m with rocket assistance

Muzzle velocity: 240 m/s

Ballistic performance:

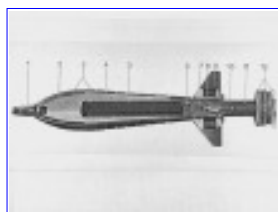
(R indicates rocket assistance)

Charge	Elevation	Max range
1	45°	1,350 m
2	45°	1,900 m
3	45°	2,560 m
4	45°	3,175 m
5	45°	3,560 m
6	45°	4,250 m
3R	55°	4,800 m
4R	55°	5,500 m
5R	50°	6,100 m
6R	45°	6,550 m

Manufacturer

[TDA.](#)

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120 mm rocket-assisted bomb PEPA: (1) Fuze; (2) HE filling; (3) Body; (4) Rocket tube; (5) Rocket motor; (6) Venturi; (7) Rocket ignition delay; (8) Rocket assistance selector; (9) Fin; (10) Tail tube; (11) Primary cartridge; (12) Secondary increments

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Mle 44/66

Armament

All 120 mm smoothbore mortars.

Development

By [TDA](#) for 120 mm mortars in French service and for general use. Originally developed by Hotchkiss-Brandt, it was manufactured for the French Army until 1966 and since then for French service by other contractors. It has also been licensed to various other countries.

Description

This is a conventional streamlined bomb, with four gas check rings around the waist and an alloy tailboom and fins. The body may be of steel or of pearlitic malleable cast iron. Propulsion is by a primary cartridge in the tailboom and seven secondary increments in horseshoe containers that fit around the boom in front of the fins.

A variant of this bomb has the HE content mixed with dye so as to produce a coloured smoke cloud on detonation, enabling observers to distinguish the fall of shot from a particular mortar or sub-unit when several weapons are firing on the same target.

Specifications

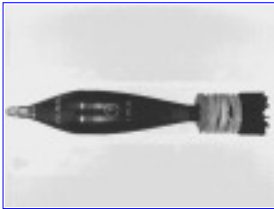
Length, fuzed: 664 mm

Weight, fuzed: 13 kg
Type of payload: TNT
Number of charges: P+7
Fuze: impact, SQ and delay
Min range: 500 m
Max range: to 7,000 m depending upon the mortar

Manufacturer

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120 mm HE bomb Mle 44/66

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm practice bomb Mk 44

Armament

All 120 mm smoothbore mortars.

Development

By SAE Alsetex to accompany the Mk 44 HE bomb.

Description

This uses the body, tail unit and propulsion system of the Mk 44 HE bomb but is largely filled with inert ballast. There is a small pyrotechnic composition beneath the fuze which produces a cloud of smoke for target marking.

Specifications

Length, fuze: 680 mm

Weight, fuze: 13 kg

Type of payload: ballast, with pyrotechnic spotting charge

Number of charges: P + 7

Fuze: impact, graze

Min range: 500 m

Max range: 7,000 m

Manufacturer

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm high-efficiency HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Alsetex for [TDA](#) mortars in French service and for general use.

Description

This is of the same general form as the Mk 44 bomb described previously, but has the body made of high-grade steel and incorporates approximately 600 spherical preformed fragments in the cast Hexolite filling. Fuzing and propulsion are the same as those for the Mk 44 bomb.

Specifications

Length, fuzed: 665 mm

Weight, fuzed: 13 kg

Type of payload: cast Hexolite

Number of charges: P + 7

Fuze: impact, graze

Min range: 500 m

Max range: 7,000 m

Manufacturer

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MORTARS - 120 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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120 mm HE bomb Mk 44

Armament

All 120 mm smoothbore mortars.

Development

By Alsetex for French service [TDA](#) mortars and general use.

Description

A conventional streamlined steel bomb, with four gas check rings at the waist and an alloy tailboom and fins. The main filling is of cast explosive and the propulsion system is the usual primary cartridge in the tailboom. There are seven secondary increments in horseshoe containers that fit around the boom in front of the fins.

Specifications

Length, fuze: 680 mm

Weight, fuze: 13 kg

Weight and type of payload: 2.5 kg cast TNT

Number of charges: P + 7

Fuze: impact, graze

Min range: 500 m

Max range: 7,000 m

Manufacturer

SAE Alsetex.

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120 mm Alsetex HE bomb Mk 44

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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81 mm illuminating bomb M68

Armament

Any 81 mm mortar.

Development

By [TDA](#) for French Army.

Description

The bomb has a cylindrical body with a time fuze in the head, a tailcone with tailboom and fin assembly at the rear. The body contains the customary parachute and flare assembly, ejected through the nose by a spring after the small burster charge has been fired by the time fuze. This charge ignites the flare and removes the fuze and adaptor from the bomb nose. The tail unit contains a primary cartridge and six or eight secondary increments in horseshoe containers are fitted around the tailboom; six are used in 1.15 m barrels, eight in 1.45 m barrels.

Specifications

Length, fuzed: 417 mm

Weight, fuzed: 3.5 kg

Type of payload: parachute and flare

Number of charges: P + 6 or 8

Fuze: time, mechanical, FH 81B

Min range: 600 m

Max range: 3,400 m, 1.15 m barrel; 4,100 m, 1.45 m barrel

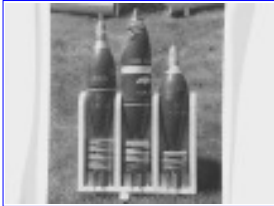
Illumination intensity: 600,000 cd

Illumination duration: 35 s

Manufacturer

[TDA.](#)

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[TDA](#) 81 mm bombs HE [M82](#), illuminating [M77](#) and HE [M57D](#)

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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81 mm HE bomb M82

Armament

[TDA](#) and other 81 mm mortars and gun-mortars.

Development

By [TDA](#).

Description

Similar to the M61 but longer and of greater capacity. The body is of malleable pearlitic cast-iron with a light-alloy tail unit attached. The tail unit carries a primary cartridge and up to nine secondary increments in horseshoe containers around the tailboom. White phosphorus smoke, practice and inert versions having identical ballistic characteristics are also available. This round is currently in service with the French Army.

Specifications

Length, fuze: 449 mm

Weight, fuze: 4.56 kg

Type of payload: Tolite

Number of charges: P + 9

Fuze: impact SQ, delay, or proximity

Max range: 5,700 m (MO 81 LLR)

Min range: 250 m

Manufacturer

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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81 mm HE bomb M61

Armament

[TDA](#) and other 81 mm mortars and gun-mortars.

Development

By [TDA](#).

Description

A malleable pearlitic cast-iron bomb, of somewhat more streamlined shape than the [M57](#) and with a plastic obturating ring in a groove below the bourrelet. A light-alloy tailboom and fins are attached to the rear end and carries a primary cartridge. A total of four secondary increments in horseshoe containers fit around the tailboom above the fins.

Specifications

Length, fuzed: 414 mm

Weight, fuzed: 4.2 kg

Type of payload: TNT

Number of charges: P + 4

Fuze: impact SQ and delay [V19P](#)

Max range: 4,800-6,100 m depending upon the type of mortar and length of barrel

Manufacturer

[TDA.](#)

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M57D

Armament

[TDA](#) and other 81 mm mortars and gun-mortars.

Development

By [TDA](#) for their range of 81 mm mortars.

Description

A conventional design teardrop-shaped bomb with a body of malleable perlitic cast-iron and four gas check grooves around the bourrelet. A short light-alloy tailboom and fin unit is attached to the rear of the body and contains a primary cartridge. A total of four horseshoe shaped secondary increments are fitted around the tailboom. A smoke version of the [M57D](#) with identical ballistic characteristics and white phosphorus fill is also available.

Specifications

Length, fuze: 381 mm

Weight, fuze: 3.2 kg

Type of payload: Tolite

Number of charges: P + 4

Fuze: impact SQ, delay, or proximity

Max range: 4,550 m (MO 81 LLR)

Manufacturer

[TDA.](#)

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm long-range HE bomb LP

Armament

[TDA 81 mm long-range mortar](#) MO 81 LP or long-range gun-mortar MCB 81.

Development

By [TDA](#), for the above specified mortars, to produce a target effect comparable to that of a 120 mm mortar bomb.

Description

A streamlined bomb with a long parallel-walled body section and long tailboom with fins. The one-piece body is of malleable pearlitic cast iron and the tail unit of extruded aluminium alloy. A primary cartridge fits into the tail tube and up to nine secondary cartridges in horseshoe containers fit around the tailboom.

Specifications

Length, fuzed: 580 mm

Weight, fuzed: 7.1 kg

Weight and type of payload: 1 kg TNT

Number of charges: P + 9

Fuze: impact SQ and delay [V19P](#)

Max range: 7,600 m from MO 81 LP mortar; 8,000 m from MCB 81 gun-mortar

Manufacturer

[TDA.](#)

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb LU-81

Armament

All 81 mm mortars.

Development

By Luchoire as a private venture.

Description

This bomb uses a swaged steel body, lined with a coil of notched steel wire to provide preformed fragments. This gives the bomb a lethal efficiency of the average 105 mm artillery shell. The body is unusual as it is formed to provide a substantial bourrelet which also acts as the gas check; there are no gas check grooves and no form of obturating ring. The tail unit is of alloy and contains the usual primary cartridge, with up to six secondary increments that fit around the tailboom in horseshoe containers.

Specifications

Length, fuzed: 390 mm

Weight, fuzed: 3.6 kg

Weight and type of payload: 670 g TNT

Number of charges: P + 6

Fuze: impact SQ or FURAX [SM1](#) optronic proximity

Max range: approx 4,600 m depending upon mortar used

Manufacturer

Luchoire Defense.

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm inert practice bomb Mk 32

Armament

All 81 mm mortars.

Development

By Alsetex.

Description

This uses the same body, tail unit and propelling charge as the other Alsetex bombs but is filled with inert ballast and has a dummy fuze.

Specifications

Weight, fuzed: 3.5 kg

Type of payload: inert ballast

Number of charges: P + 2

Fuze: dummy

Max range: 3,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm inert practice bomb PL PN Mk F1

Armament

All 81 mm mortars.

Development

By Alsetex.

Description

Similar to the foregoing bombs but filled with an inert ballast material and a small powder charge which, on impact, simulates detonation and provides sufficient smoke and dust enabling fire adjustment to be made.

Specifications

Weight, fuzed: 3.5 kg

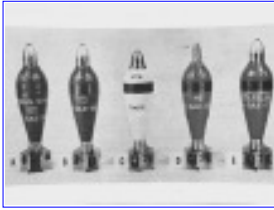
Type of payload: inert ballast and small burster

Number of charges: P + 2

Fuze: impact SQ SNEM Mk F1

Max range: 3,000 m

Manufacturer



Alsetex range of 81 mm bombs: (A) HE OE-81; (B) HE Mk 32; (C) inert Mk 32; (D) smoke Mk 51; (E) practice PLPN F1

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm practice smoke bomb Mk 51

Armament

All 81 mm mortars.

Development

By Alsetex.

Description

This uses the same body as the HE bombs but is filled with a smoke generating composition.

Specifications

Weight, fuzed: 3.5 kg

Type of payload: smoke composition

Number of charges: P + 2

Fuze: impact SQ SNEM Mk F1

Max range: 3,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb Mk 32

Armament

All 81 mm mortars.

Development

By Alsetex.

Description

A teardrop-shaped bomb, with four gas check grooves below the bourrelet and a welded steel tail unit. The tail unit carries a primary cartridge and three or six secondary increments can be clipped between the fins to give two operating charges.

Specifications

Weight, fuzed: 3.5 kg

Weight and type of payload: 550 g cast TNT

Number of charges: P + 2

Fuze: impact SQ SNEM Mk F1

Max range: 3,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 81 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm high-efficiency HE bomb OE-81

Armament

Any 81 mm mortar.

Development

By Alsetex for general use.

Description

This bomb, like the others in this group by Alsetex, is based on the standard French Army FA Mk 32 bomb design. The body is of cast steel, with a welded steel fin assembly. The tail tube contains a primary cartridge and three or six secondary increments can be clipped in between the fins to give two operating charges.

Specifications

Weight, fuzed: 3.5 kg

Type of payload: cast hexolite incorporating approx 300 spherical preformed fragments

Number of charges: P + 2

Fuze: impact SQ SNEM Mk F1

Max range: 3,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm canister

Armament

60 mm [TDA](#) gun-mortar.

Development

By Lacroix for French Army gun-mortars.

Description

This is a steel canister containing an expelling charge, a percussion primer and 135 steel balls, 8 to 9 mm in diameter. The round is loaded into the gun-mortar and is intended to be fired as a close-range anti-personnel weapon. On firing, the cap ignites the expelling charge which ejects the balls from the gun muzzle to an effective range of about 60 m. Immediately afterwards the entire empty canister is also ejected from the muzzle to fall to the ground a few metres in front of the gun.

Specifications

Length, fuzed: 235 mm

Weight: 1.44 kg

Weight and type of payload: 520 g steel balls

Number of charges: 1

Fuze: none

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm canister

Armament

[TDA](#) 60 mm gun-mortars.

Development

By Thomson Brandt (now [TDA](#)) in the 1970s in order to provide a suitable short-range anti-personnel round for the [TDA](#) 60 mm gun-mortars.

Description

This round is a one-piece cylindrical unit which is breech loaded into the gun-mortar. It contains a propelling charge and 132 hardened lead shot each 8.7 mm in diameter. On firing, the crimped mouth of the case is blown open and the shot ejected. Once the shot has left the gun, the empty casing is ejected through the muzzle. At 50 m range the shot charge covers an area of about 25 m² and most have sufficient remaining velocity to pierce 27 mm pine boards. The shot will not perforate 5 mm thickness of mild steel at 5 m range, so that it may be fired to remove attacking infantry from a nearby armoured vehicle without danger to the vehicle's crew.

Specifications

Length: 217 mm

Weight: 1.125 kg

Type of payload: 132 hardened lead shot

Number of charges: 1

Fuze: none

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb Mk 63

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

By [TDA](#) for its 60 mm mortar range.

Description

The bomb is cylindrical in shape, with a domed nosecone and tapered rear section which contains a mechanical time fuze. An alloy tail unit similar to that used with the Mk 61 HE bombs, is screwed into the tail of the bomb body.

The cylindrical body houses a container filled with flare composition and a parachute; the two are connected by a metal cable.

The nosecone is attached to the body by copper pins, which are sheared when the ejection charge in the rear of the body is ignited and the flare and parachute are forced forward. The nosecone is forced off and the flare and parachute are ejected through the opening.

The mechanical time fuze is set by a movable ring in the tapered rear section of the bomb body. The ring is graduated from 1 to 35 seconds in 0.25 second intervals.

A plastic obturating ring is fitted around the rear of the bomb body to reduce windage and ensure consistent muzzle velocities.

Specifications

Type of payload: parachute and flare
Min brilliance: 150,000 cd
Bursting height: 200 m
Duration of illumination: 30 s
Area of illumination: 300 m diameter
Number of charges: P + 4
Fuze: integral mechanical time

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm practice bombs Mk 61 and Mk 72

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

By [TDA](#) for its 60 mm mortar range.

Description

These practice bombs resemble the HE Mk 61 and Mk 72 bombs in shape, the Mk 61 has five gas check grooves and the Mk 72 a plastic obturating ring in addition to the gas check grooves. They are available in two forms, Practice Inert or Practice Bursting. The Practice Inert bomb is filled with an inert naphthalene/tar mixture and a dummy V9 fuze but carries live primary and secondary cartridges. It can also be supplied with only a primary cartridge and thus the bomb may be recovered after use, re-cartridged and used again.

The Practice Bursting bombs are fitted with a burster container similar to that used in the smoke bombs Mk 61 and Mk 72 described previously. The upper part of the bomb body is filled with 45 g of black powder and the remainder of the cavity with inert ballast material. The bomb is fuzed V9 and bursts on impact, but with a very limited danger area.

The dimensions and ballistic performance are the same as the respective HE bombs Mk 61 or 72, to which reference should be made.

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb Mk 72

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

By [TDA](#) for its 60 mm mortar range.

Description

This resembles the smoke bomb Mk 61 described previously, except for the addition of a plastic obturating ring around the body just below the gas check grooves. This reduces windage and creates a more efficient gas seal, so providing a better and more consistent muzzle velocity. The internal arrangements and operation of the bomb are the same.

Specifications

Length, fuzed: 321 mm

Weight, fuzed: 1.74 kg

Type of payload: FM or WP

Number of charges: P + 4 + Super

Fuzes: V9LD or V9SD impact SQ

Min range: 100 m

Max range: 2,590 m

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb Mk 61

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

By [TDA](#) for its 60 mm mortar range.

Description

The Smoke Bomb Mk 61 is the same size, shape and weight as the HE bomb Mk 61 and has a matching ballistic performance. A burster container filled with 8 g of Tetryl is screwed into the nose of the bomb and accepts an impact fuze. The cavity of the bomb body is filled with titanium tetrachloride (FM), a volatile liquid which, when dispersed by the explosion of the burster charge, combines with atmospheric moisture to form dense white smoke. Alternatively the bomb may be filled with White Phosphorus (WP).

Specifications

Length, fuzed: 321 mm

Weight, fuzed: 1.74 kg

Type of payload: FM or WP

Number of charges: P + 4 + Super

Fuzes: V9LD or V9SD impact SQ

Min range: 100 m

Max range: 2,050 m

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm APFSDS F601

Armament

[TDA](#) 60 mm long-range gun-mortar.

Development

By [TDA](#) to provide a high-velocity anti-armour round for gun-mortars.

Description

This does not resemble a conventional mortar projectile. It is a complete round of fixed ammunition, consisting of a cartridge case into the mouth of which is fixed an armour-piercing, fin-stabilised, discarding sabot projectile based upon standard tank gun practice. The projectile consists of an arrow-like finned subprojectile carried in a lightweight sabot of bore diameter.

Specifications

Length: 510 mm

Number of charges: 1, fixed

Fuze: none

Muzzle velocity: 900 m/s

Remaining velocity at 1,000 m: 800 m/s

Penetration: 25 mm RHA at 45° incidence

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm anti-tank bomb CC

Armament

[TDA](#) 60 mm gun-mortars.

Development

Developed by Thomson Brandt Armements (now [TDA](#)) in the late 1970s, to provide a suitable direct fire anti-armour projectile for the [TDA](#) 60 mm gun-mortars.

Description

In shape, this generally resembles the Mk 61 or Mk 72 bombs, a blunt teardrop, but it differs in having no gas check grooves and only one groove with a plastic obturating ring at the bourrelet. The nose is formed into an elongated tubular probe which is fitted with a special piezoelectric fuze, modified from that used on the 68 mm aircraft rocket. The filling is a shaped charge; the bomb will penetrate about 200 mm of armour or reinforced concrete and yet still has an excellent anti-personnel effect.

Specifications

Length, fuzed: 321 mm

Weight, fuzed: 1.73 kg

Type of payload: RDX/TNT shaped charge

Number of charges: P + 4 + Super

Fuze: special; see text

Operational range, moving target: 300 m

Operational range, stationary target: 500 m

Manufacturer

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[TDA](#) 60 mm anti-tank bomb CC

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm long-range HE bomb 60LP

Armament

[TDA](#) 60 mm mortars and long-range gun-mortars.

Development

By [TDA](#).

Description

This bomb is longer than usual for the calibre, it is streamlined and fitted with a single plastic obturating ring in a groove at the bourrelet. The body is of malleable pearlitic cast iron and an extruded aluminium tail unit is screwed to the rear end. The tail unit carries the usual primary cartridge inside the tail tube and up to six secondary charges in horseshoe containers that clip around the tailboom above the fins.

Specifications

Length, fuzed: 381 mm

Weight, fuzed: 2.2 kg

Type of payload: TNT

Number of charges: P + 6

Fuze: impact, graze action, V9TL

Max range: 5,000 m

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm coloured HE bomb Mk 72

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

Developed by [TDA](#) for its 60 mm mortar range.

Description

This is the same bomb as the HE Mk 72, but is filled with a small quantity of coloured smoke composition in addition to the TNT bursting charge. This is useful in identifying the fall of shot from a particular mortar when several weapons are firing on the same target.

Specifications

Length, fuzed: 321 mm

Weight, fuzed: 1.74 kg

Type of payload: TNT and coloured smoke composition

Number of charges: P + 4 + Super

Fuzes: V9LD or V9SD impact SQ

Manufacturer

[TDA](#).

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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60 mm HE bomb Mk 72

Armament

[TDA](#) 60 mm mortars and gun-mortars.

Development

Developed by [TDA](#) for its 60 mm mortar range.

Description

The body of the Mk 72 is similar to that of the Mk 61 described previously, but with the addition of a plastic obturating ring around the body behind the gas check grooves. This reduces windage and creates a more efficient gas seal so providing a higher and more consistent muzzle velocity. The tail unit is generally similar although the fins have a slightly different contour. The propellant charge system is the same; a primary cartridge in the tail unit, four secondaries in celluloid capsules that clip into the forward edges of the fins, and a Super charge in the form of a horseshoe container which clips around the tail tube.

Specifications

Length, fuzed: 321 mm

Weight, fuzed: 1.74 kg

Type of payload: TNT

Number of charges: P + 4 + Super

Fuzes: V9LD or V9SD impact SQ

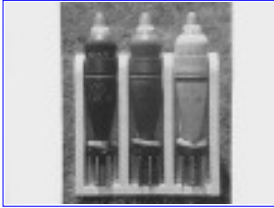
Min range: 100 m

Max range: 2,590 m

Manufacturer

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[TDA](#) 60 mm [M72](#) bomb family

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm inert practice bomb Mk 47

Armament

All 60 mm mortars.

Development

By Alsetex for French Army and general use.

Description

This uses the body, tail unit and propelling charge of the standard HE Mk 47 bomb but is completely inert and fitted with a dummy fuze.

Specifications

Length, fuzed: 240 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 150 g ballast

Number of charges: P + 4

Fuze: dummy

Min range: 100 m

Max range: 1,000 m

Manufacturer



Alsetex 60 mm bombs: (A) high efficiency; (B) HE; (C) inert practice; (D) smoke; (E) practice

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

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60 mm HE bomb Mk 47

Armament

All 60 mm mortars.

Development

By Alsetex, for French Army and general use.

Description

A teardrop-shaped cast-steel bomb with four gas check grooves at the waist. A welded steel tail unit is screwed into the tail of the body. A shotgun type primary cartridge fits into the tail unit and celluloid secondaries clip between the fins, secured by tags into holes in each fin.

Specifications

Length, fuze: 240 mm

Weight, fuze: 1.35 kg

Weight and type of payload: 150 g TNT

Number of charges: P + 4

Fuze: impact SQ SNEM Mk F1

Min range: 100 m

Max range: 1,000 m

Manufacturer

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb Mk 51

Armament

All 60 mm mortars.

Development

By Alsetex for French Army and general use.

Description

This uses the same body, tail unit and propelling charge as the HE bomb Mk 47 but has a filling of White Phosphorus (WP), with a small explosive burster under the fuze.

Specifications

Length, fuzed: 240 mm

Weight, fuzed: 1.35 kg

Type of payload: WP

Number of charges: P + 4

Fuze: impact, SQ, SNEM Mk F1 or Mle 21/28

Min range: 100 m

Max range: 1,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm practice bomb OX 60 PLT Mk F1

Armament

All 60 mm mortars.

Development

By Alsetex for French Army and general use.

Description

This uses the standard HE bomb body, tail unit and propelling charge but is largely filled with ballast and relies upon the fuze booster to detonate on impact and provide sufficient indication for spotting.

Specifications

Length, fuzed: 240 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 150 g inert ballast

Number of charges: P + 4

Fuze: impact SQ, SNEM Mk F1 or Mle 21/28

Min range: 100 m

Max range: 1,000 m

Manufacturer

SAE Alsetex.

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MORTARS - 60 mm MORTARS, FRANCE

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm high-efficiency HE bomb

Armament

All 60 mm mortars.

Development

By Alsetex for French Army and general use.

Description

This is to the same design as the standard HE bomb Mk 47, but is filled with RDX/TNT into which some 350 spherical preformed fragments are mixed so as to increase the lethal area.

Specifications

Length, fuzed: 240 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 150 g RDX/TNT plus fragments

Number of charges: P + 4

Fuze: impact SQ SNEM Mk F1

Min range: 100 m

Max range: 1,000 m

Manufacturer

SAE Alsetex.

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IDENTIFICATION OF SMALL ARMS AMMUNITION, FRANCE

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Tracer	red bullet tip
AP	black bullet tip
Incendiary	blue bullet tip
AP-I	silver bullet tip
AP-T	black tip over red ring
AP-I-T	silver tip over red ring
Observing	yellow bullet tip
Incendiary-T	blue tip over red ring
Observing-T	yellow tip over red ring

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IDENTIFICATION OF SMALL ARMS AMMUNITION, FRANCE

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

HE	yellow
HE-I	yellow with red ring
SAP-HE-I	black body with red over yellow rings
APDS	black with red markings
TP and TP-T	blue

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

8 × 50R mm Lebel

Synonyms:

8 mm French; 8 mm Lebel

Armament

All French service rifles and machine guns from 1886 to the mid-1930s, although it remained in decreasing use for some time afterwards. Also used by ex-French colonies and by [Vietnam](#).

Development

Developed in 1886, this was the first small calibre smokeless military rifle cartridge and accompanied the Lebel rifle of the same year. Subsequent rifles and machine guns were chambered for it, although the shape was not well suited to automatic weapons. It was for this reason gradually replaced by the rimless 7.5 mm cartridge after 1929. Nevertheless, many weapons remained in use until 1940 in France and to the late 1960s in former colonies. It is believed to be still in reserve in [Vietnam](#) and some African countries.

Description

Rimmed, bottlenecked, with a considerable degree of taper and at a casual glance easily confused with the Soviet 7.62 × 54 mm cartridge. The case is of brass and is Berdan primed. The bullet was originally the solid copper `Balle D', replaced after 1920 with the lead-cored, steel-jacketed `Balle N' which remained the standard.

Specifications

Balle N

Round length: 74.98 mm

Case length: 48.69 mm

Rim diameter: 15.97 mm

Bullet diameter: 8.3 mm

Bullet weight: 12.9 g

Muzzle velocity: 732 m/s

Muzzle energy: 3,357 J

FRANCE

Manufacturer

State arsenals

Type: Balle N: FMJ, SL; 12.9 g; MV 732 m/s

Balle P: FMJ; hard steel armour-piercing core

Balle T: FMJ; red trace; 11.28 g; MV 745 m/s

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.65 mm MAS

Synonyms:

7.65 × 19.8 mm

Armament

French SACM Mle 1935A and 1935S pistols; MAS 38 sub-machine gun; various French commercial automatic pistols.

Development

This cartridge is unique to French forces, having been designed for the French SACM Model 1935A and 35-S automatic pistols and subsequently used in the Manufacture d'Armes de St Etienne (MAS) sub-machine gun. It was replaced in military use by the 9 × 19 mm cartridge in 1950, but is still used by French police forces and may still be encountered in military reserve. The cartridge may also be encountered in North America, where many surplus French military pistols were sold, and in any area where there has been French military influence.

Description

This round uses a rimless, straight taper, brass or steel case, Berdan primed; the standard bullet has an ogival metal-jacketed pattern.

Specifications

French Service Balle L

Round length: 30.23 mm

Case length: 19.81 mm

Rim diameter: 8.56 mm

Bullet diameter: 7.85 mm

Bullet weight: 5.5 g

Muzzle velocity: 366 m/s

Muzzle energy: 368 J



7.65 mm MAS (Long)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

NORINCO 130 mm ERFB/HB HE and ERFB/BB HE

Armament

[130 mm Field Gun M-46](#); 130 mm Field Gun Type 59 and Type 59-1; [Factory 100 M59-1M](#); [130 mm Gun Model 1982](#).

130 mm Self-propelled Gun (Catapult); NORINCO 130 mm Self-propelled Gun.

Development

The NORINCO 130 mm ERFB/HB HE and ERFB/BB HE projectiles were designed specifically for the 130 mm Type 59-1 gun, but may also be fired from the original [130 mm Field Gun M-46](#) or the NORINCO 130 mm Type 59 (the 130 mm Type 59-1 is a lighter and more manageable version of the 130 mm Field Gun M-46/Type 59). In appearance the 130 mm ERFB/HB HE and ERFB/BB HE projectiles resemble scaled-down versions of their 155 mm equivalents (qv).

There are two further versions of these projectiles, the 130 mm ERFB HE (Nubb) and ERFB-B. These differ in the ability to take full advantage of the variable 130 mm charge system whereas the ERFB/HB HE and ERFB/BB HE are normally only used with the Full Charge to take maximum advantage of their enhanced range performance. The ERFB-HB version has not appeared in recent NORINCO literature and may no longer be available. By 1999, only the full 130 mm ERFB/HB HE was being marketed, so it is assumed that all other types are no longer available.

Description

The NORINCO 130 mm ERFB HE projectiles are separate loading munitions with their propelling charges contained in brass cartridge cases.

The bodies of all these 130 mm ERFB HE projectiles are high-grade steel and are streamlined to the extent that almost the entire length is taken up by the ogive down to the twin copper drive bands. There are four riding nubs provided. The ERFB/HB HE uses a boat tail hollow base while the ERFB/BB HE is fitted with a Base Bleed (BB) unit to provide increased range; maximum range is 37,000 to 38,000 m. The explosive filling for these projectiles is usually 3.3 kg of TNT. Weight of the ERFB/HB HE projectile is 32.7 kg while the ERFB/BB HE weighs 32 kg. The ERFB HE (Nubb) weighs 32.41 kg. The weight for the ERFB-B has not been released.

The nose-located fuze employed on the 130 mm ERFB/HB HE is the ML-5, ML-7A or ML-7B while that on the ERFB/BB HE is the ML-5 which can be set to super-quick, short or long delay. The ERFB/BB HE may also be fitted with an electronic fuze of unspecified type.

These ERFB projectiles do not employ a special charge system but instead are used with the usual 130 mm variable charge system. The 70:30 drawn brass cartridge case involved is issued in two versions, a Full Charge version and a Reduced Charge propellant load. The Full Charge contains 13.5 kg of propellant loaded in a lower and upper bag, together with 2.5 kg of loose propellant in bundled stick form. An increment completes the Full Charge while removal of this increment creates Charge 1. The Reduced Charge weighs 6.75 kg and is supplied in a separate cartridge case. The top charge in the Reduced category is formed using the full complement of a base charge and two equal sized bags, forming Charge 2. Removal of one of the equal bags creates Charge 3 while removal of both equal bags, leaving only the base charge, creates Charge 4. A percussion primer is pressed into the cartridge case base to ignite both Full and Reduced propellant loads.

The 130 mm ERFB/HB HE and ERFB/BB HE are normally only used with the Full Charge to take maximum advantage of their enhanced range performance. The ERFB/HB HE has a muzzle velocity of 940 m/s and can reach 32,000 m; the maximum range for the ERFB HE (Nubb) is also 32,000 m but the maximum muzzle velocity is given as 944 m/s. The muzzle velocity of the ERFB/BB HE is also 940 m/s but it can reach 37,000 to 38,000 m.

Specifications

Type	ERFB/HB HE	ERFB/BB HE	ERFB HE (Nubb)	ERFB-B
Weight				
Complete round*	58.4 kg	59 kg	58.01 kg	58.4 kg
Projectile	32.7 kg	32.3 kg	32.41 kg	not released
Filling, TNT	3.3 kg	3.75 kg	3.3 kg	3.3 kg
Length, projectile	774 mm	800 mm	799 mm	774 mm
Muzzle velocity	940 m/s	947 m/s	944 m/s	940 m/s
Max range	30,000 m	38,000 m	32,000 m	30,700 m

*Full Charge

Authorised fuzes

ERFB and ERFB-B ML-7A; ERFB-BB ML-5 or Electronic; ERFB HE (Nubb) ML-5

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: 130 mm HE ERFB BB NR 353

Description: Originally produced in Belgium by PRB SA. Weight with fuze is 31 kg and the explosive contents are 3.3 kg of TNT. Length with fuze is 729 mm. When fired from a 130 mm M-46 type barrel the

maximum range is 36,000 m. Development complete. Available for production

[SOUTH AFRICA](#)

Manufacturer

[NASCHEM](#)

Type: 130 mm HE [M1A1](#) ERFB and ERFB-BB

Description: See following entry

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NORINCO 130 mm ERFB HE projectile and the associated cartridge case (T J Gander)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: Blank, M395

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Otobreda 105/14 Pack Howitzer (L5); RO Defence [M119A1](#) Towed Howitzer; Howitzer, Light, Towed: [105 mm KH178 \(South Korea\)](#); Giat Industries [LG1](#) Mk I and Mk II Light Gun and [M101A1](#) Modernised (France); Type 75 self-propelled howitzer ([Japan](#)); NDSB SAKTI [105 mm Light Gun \(Malaysia\)](#); RDM [105 mm M101/33](#) (Netherlands); 105 mm m/26 (Spain); [T64](#) 105 mm Howitzer ([Taiwan](#)); [M101](#) Modified (Germany); [105 mm Howitzer M56](#) (Federal Republic of [Yugoslavia](#)).

Development

The Cartridge, 105 mm: Blank, M395 is used for saluting purposes and to simulate battlefield noise. Many users produce their own Blank cartridges by converting suitably modified spent brass [M14](#) cases.

Prior to the beginning of FY98 about 284,000 M395 cartridges had been procured by the US armed forces. There will be no further scheduled procurement until some time during FY00 when \$6,721 million has been allocated for the procurement of about 124,000 cartridges.

Description

The Cartridge, 105 mm: Blank, M395 consists of a shortened cartridge case known as the [M15](#). The [M15](#) case is 70:30 brass, the M15B1 steel and the M15B2 aluminium. For early examples of the 105 mm Blank M395, black powder was contained in a cloth bag and held in position by a closing cup or plug assembly consisting of two pulp-board discs glued either side of a hard felt disc and cemented in

position about 13 mm from the mouth of the case. Renovated or newly manufactured 105 mm Blank M395 cartridges are assembled with a loose 770 g black powder charge retained by a glass fibre closing wad and a polystyrene closing cup glued in place by an epoxy resin. The base of the case is fitted with an M61 percussion element and an [M1A2](#) or M1B1A2 primer.

Detonation of the case contents creates sound, flash and smoke.

Specifications

Weights:

cartridge - 2.83 kg

filling - 770 g black powder

Length: 153 mm

Authorised fuzes

None involved

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: Blank for HM2

Description: Weight given as 4.2 kg. Uses shortened primer

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: Blank

Description: Cartridge weight 2.8 kg, containing 900 g of black powder

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: Blank M395

Description: Standard specifications

PAKISTAN

Manufacturer

[Pakistan](#) Ordnance Factories

Type: Blank

Description: Cartridge weight 3.75 kg, containing G-12 black powder. Cartridge length 372 mm

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

30 mm RARDEN gun ammunition

Armament

RARDEN 30 mm gun L21A1 and [L21A2](#) fitted to FV107 [Scorpion](#) and Sabre, [Warrior](#) MCV, 4K 7FA MICV 30/1 (Austria, prototype). The Boeing [30 mm Bushmaster II](#) Chain Gun can also accommodate RARDEN ammunition.

Development

The first 30 mm RARDEN gun appeared in 1966 and the first service examples, the L21A1, followed during the early 1970s. The design philosophy called for an anti-armour gun with the emphasis on accuracy, as opposed to high rates of fire, combined with the ability to be mounted in light turrets. The ammunition selected for the RARDEN was based on that developed in Switzerland for the 30 mm Hispano-Suiza 831 L (now the Oerlikon Contraves KCB) cannon family, but subsequent development has resulted in what may be regarded as a separate ammunition family. KCB ammunition can be fired from RARDEN guns although RARDEN ammunition cannot be fired from KCB series cannon.

The UK Design Authority for 30 mm RARDEN ammunition is [BAE Systems](#), RO Defence.

Description

All 30 mm RARDEN ammunition involves fixed rounds, the projectiles are crimped to the necked drawn brass cartridge cases by a crimping ring engaging in a cannelure, just above the boat tailed base on the projectile. In most cases the drive bands are sintered iron pressed into place. The rounds are issued and loaded in charger clips of three.

The brass cartridge cases are 170.3 mm long and have an [L16](#) (RO 673) percussion primer filled with 0.97

g of gunpowder G20 threaded into the base; the rim diameter is 42.9 mm. The cartridge case is filled with variable amounts of granular NRN 141/RDN propellant.

Ammunition available for the 30 mm RARDEN gun includes the following types:

HE-T L13A2 The original HE-T round was the L8A1 but this was been replaced by the L13A1; the latest version is the L13A2 incorporating the RO 673 low-cost primer which was originally developed specifically for use with training ammunition. The projectile involved is machined from steel bar and contains 25.6 g of Torpex 2. An L86A2 impact fuze is threaded into the projectile nose while the shell base is occupied by an L11 tracer element which burns for a distance of over 2,000 m (time 2.6 seconds) after leaving the gun muzzle.

APSE-T L5A2 The hardened steel pointed projectile used with this round has no fuze and is fitted with an anodised aluminium ballistic cap. It relies, for its secondary effects, on a payload formed by a pyrotechnic mixture of explosive and CS5390 smoke composition which is ignited by friction once the projectile has penetrated light armour. An [L10A1](#) tracer is fitted in the base and burns for a range of approximately 1,500 m. This round is now rarely encountered.

APDS-T L14A2 and L14A3 This APDS-T round was jointly developed by Royal Ordnance (now RO Defence) and PATEC of the USA. Introduced in 1980, it uses a plastic sabot with a lateral cross-section at the nose. Once the projectile leaves the gun muzzle the sabot breaks into four lateral segments, leaving the tungsten penetrator to complete its trajectory, marked for ranges out to at least 2,000 m by a tracer element in the penetrator base. Further result assessment is provided by a pyrophoric cap on the penetrator nose which provides a flash on impact with a hard target. The penetrator can pierce a 40 mm RHA plate angled at 45° out to a range of 1,500 m. Accuracy is stated to be half the dispersion of the HE-T round. Figures of 0.5 mil vertical and horizontal at 1,000 m have been quoted.

The APDS-T L14A3 has a new type of tungsten penetrator in a plastic sabot and was introduced in 1986, the same year that a lower barrel wear propellant was first produced. The penetrator can pierce a 40 mm RHA plate angled at 45° out to ranges in excess of 1,500 m.

One further round developed for the armour-piercing role was the APHC [L6A1](#) carrying a tungsten carbide core; it is no longer manufactured.

APFSDS-T An APFSDS-T round for use with the 30 mm RARDEN gun was developed with Radway Green as the lead facility. In April 1996, it was announced that this round had been selected to be developed and manufactured as the new 30 mm Armour-Piercing Enhanced Performance (APEP) to meet British Army Staff Requirement (Land) 4053. Under the terms of an April 1996 contract, Royal Ordnance was to have supplied around 225,000 APEP rounds between the years 1998 and 2000. It was planned that a DSRR round would be developed to match the APFSDS round for training purposes.

In November 1998, it was announced that the APEP contract with Royal Ordnance (now [BAE Systems](#), RO Defence) had been cancelled as the APEP did not meet the user's specifications. The requirement for a 30 mm APEP for RARDEN guns remains outstanding.

TP-T L18A2 This round replaces the earlier [L12A1](#) and L7A4 and uses a hollow machined steel body with an aluminium fuze plug. It matches the HE-T round ballistically, having the same propelling charge, and has a tracer burning for 2.6 seconds after leaving the gun muzzle. This round incorporates the low-cost RO 673 primer. In 1996, the British Army had a requirement for 55,500 of these rounds.

DSRR L15A1 Originally known as the 30 mm Reduced Range Training Round (RRTR) RO 275, the L15A1 Discarding Sabot Reduced Range (DSRR) was developed to provide a low-cost training round for use on ranges with limited areas. It was originally designed to ballistically match the 30 mm L14A2 APDS-T round during the early part of its trajectory. The L15A1 DSRR is produced by RO Defence for the British Army order and is in service. The original order called for 660,000 units

The 30 mm L15A1 DSRR is a fixed round with a tubular projectile carried inside a sabot similar to that used on the 30 mm L14A2 APDS-T. After firing, the sabot falls away leaving the tubular projectile to closely

follow the trajectory of the L14A2 APDS-T projectile out to a range of approximately 1,500 m. At that range the projectile velocity will have fallen from an initial 1,300 m/s to around 700 m/s, and an aerodynamic effect comes into play to effectively choke the flow of air through the interior of the tube. The projectile then becomes unstable and falls to the ground after travelling approximately 2,000 m. The resultant range safety trace is thus considerably reduced. For example, the safety trace for an L14A2 APDS-T projectile is 11,900 m long and nearly 4,000 m wide. For the L15A1 DSRR the safety trace is 4,500 m long and 2,260 m wide. The L15A1 DSRR incorporates an annular tracer remaining effective out to 1,500 m.

Although the 30 mm L15A1 DSRR is matched to the 30 mm L14A2 APDS-T, the same projectile design can be configured to match the 30 mm HE-T and APFSDS (still under development) projectiles. The changes required for such matching involve a change in the launch velocity, minor profile changes to the tubular projectile to alter the coefficient of drag and, in the case of the APFSDS, a change in the pusher material, which will be an aluminium alloy.

The technology employed with the 30 mm L15A1 DSRR is also being considered for the 40 mm RRTR-T CTA round (qv).

Specifications

Type	HE-T	APDS-T	TP-T	DSRR
Designation	L13A1	L14A3	L18A2	L15A1
Weights				
Complete round	904 g	822 g	904 g	760 g
Projectile	360 g	300 g	360 g	240 g
Filling	25.6 g	none	none	none
Propellant	160 g	160 g	160 g	160 g
Cartridge case	365 g	365 g	365 g	365 g
Lengths				
Complete round	285.55 mm	285.55 mm	285.55 mm	285.55 mm
Cartridge case	170.3 mm	170.3 mm	170.3 mm	170.3 mm
Muzzle velocity	1,070 m/s	1,170 m/s	1,070 m/s	1,305 m/s

Authorised fuzes

See text

Equivalent rounds

FRANCE

Manufacturer

Giat Industries

Type: HE-I/SD, HE-I-T/SD, TP, TP-T

Description: HE-I/SD and HE-I-T/SD fitted with MR302 PD fuze with self-destruct after 7 to 12 seconds.

Otherwise standard specifications

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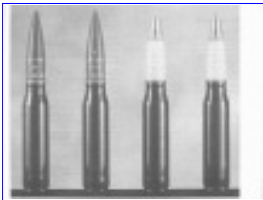
30 mm APDS for the RARDEN gun



30 mm RARDEN gun ammunition produced by [BAE Systems](#), RO Defence



30 mm L15A1 Discarding Sabot Reduced Range (DSRR) training rounds



30 mm RARDEN gun ammunition produced by Giat Industries: from left, TP; TP-T; HE-I/SD; HE-I-T/SD

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FUZES - TIME FUZES, GERMANY

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

MTSQ M772

Armament

81 mm HC smoke and illuminating ammunition.

Development

Developed by Junghans to meet military specifications. Type classified by the US Army for use with 81 mm smoke ammunition [M819](#) and illuminating ammunition M853.

Description

A mechanical time and impact fuze, with a clockwork timing mechanism. Functioning of this fuze is identical to that of the Junghans MTSQ DM93/M776. Only the size and shape of the fuze body are different.

Specifications

Type: mechanical time and super-quick

Weight: 950 g

Thread: 2.4-18NS-1A

Length overall: 97.65 mm

Intrusion: 13.06 mm

Diameter: 80.5 mm

Operating time: 4-55 s in 0.5 s increments; a 67 s max time is available if desired

Arming setback requirement: > 650 g

Arming Distance: >40 m

Manufacturer

Junghans Feinwerktechnik GmbH KG

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[M772](#) mechanical time and percussion fuze

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FUZES - TIME FUZES, GERMANY

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

MTSQ DM123

Armament

51 to 120 mm mortar bombs.

Development

By Junghans for mortars in German Army service.

Description

A mechanical time and impact fuze. Clockwork driven with an out of alignment rotor locked by a pull-wire which is driven into alignment after firing by the clockwork mechanism operating through an escapement. It is essentially the same as the DM93, but has a detonator filled with tetryl rather than black powder. There is a relay charge between the detonator and the booster charge.

Specifications

Type: mechanical time and super-quick; impact

Weight: 225 g

Thread: 1.5 -12 UNF

Length overall: 87.6 mm

Intrusion: 27.5 mm

Diameter: 49 mm

Operating time: 6-54 s in 0.5 s increments; can be extended to 67 s by special order

Arming setback requirement: 650 g

Arming Distance: > 40 m.

Manufacturer

Junghans Feinwerktechnik

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FUZES - TIME FUZES, GERMANY

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

MTSQ DM93/M776

Armament

51 to 120 mm mortar smoke and illuminating ammunition.

Development

By Junghans for mortars in German NATO and other Armed Forces worldwide. It is type classified as the M776 in US Army service.

Description

This is a Mechanical Time and Percussion Fuze (MTSQ), the timing being performed by a clockwork mechanism. When the fuze is set in `S' or `AZ' position, the fuze will function on impact only. The safety pin is removed immediately before loading in the weapon. When the round is fired and an acceleration of 650 g is reached, the setback sleeve withdraws, allowing the setback pins to retract, unlatching the pallet of the escapement. The setback pins' lower collars disengage, setting the spring-loaded detonator housing free to turn after the detonator housing locking shaft extension has turned out of the slot in the detonator housing. The escapement barrel continues to turn until the gap in its crown aligns with the tongue of the firing lever. At this point, the striker bushing spring forces the striker bushing downward and, in turn, the firing lever and release lever apart, disengaging the claws, striking the firing pin head, thrusting it into the detonator, thus initiating the firing train at the preset time. The M776 is similar except for a few minor differences.

A modified version of the DM93, the DM93 Mod is settable by hand and has been modified to endure

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FUZES - IMPACT FUZES, GERMANY

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

Fuze, PD DM111A4/A5

Armament

51 to 160 mm smoothbore mortar ammunition.

Development

By Junghans to meet German Army requirements.

Description

These are impact fuzes with optional delay which can be brought into action by means of a turnscrew on the side of the fuze. Safety is ensured by a rotor, the movement of which is controlled by a mechanical escapement. The rotor carries two detonators, one for super-quick action, the other with a delay function. According to the setting of the turnscrew, the rotor may move far enough to position either of these detonators beneath the firing pin. The DM111A4 is more sensitive on impact than the DM111A5. The fuzes are otherwise similar.

Specifications

Type: impact, SQ and delay

Weight: 208 g

Thread: 1.5 in × 12 UNF - 1A

Length:

overall - 87.5 mm
visible - 60 mm
Intrusion: 27.5 mm
Diameter: 49 mm
Optional delay: 0.06 s
Arming requirement: > 650 g
Muzzle safety: > 40 m

Manufacturer

Junghans Feinwerktechnik GmbH KG

UPDATED



Junghans DM111A4 impact, SQ and delay fuze

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FUZES - PROXIMITY FUZES, GERMANY

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

Optical Mortar Proximity Fuze, PX581

Armament

Any 60, 81 or 120 mm mortar bomb with standard fuze wells.

Development

Jointly by Junghans Feinwerktechnik and Noptel Oy to provide a new countermeasure resistant proximity fuze.

Description

The PX581 proximity fuze is independent of calibre and can be mounted on any 60, 81 or 120 mm bomb without adjustment. Because it is optronic, there are no known countermeasures. The PX581 is specifically intended for bursting at low altitudes to provide optimal terminal effects. Operating power is obtained through a windwheel generator that also provides a secondary arming function. The PX581 has a point detonating backup function. Optics are hermetically sealed and protected from temperature fluctuations to prevent accumulation of condensation. The fuze recognises ground surface, but does not react to clouds, mist, snow or rain. The fuze uses laser based ranging technology and sends out light pulses at the rate of 500 per second while the receiver constantly measures the distance to the target. The 'smart' fuze recognises the target and detonates the bomb at the pre-programmed height with an accuracy of ± 1 m. The fuze is fully compliant with MIL-STD-1316D, MIL-STD-331B, STANAG 4157 and STANAG 2916. There are both mechanical and electronic safety measures. A double bolt system and the windwheel assure mechanical compliance while the MIL-STD-1316A sensor electronically secures the fuze until it reaches its trajectory apex. Operating temperature range is from -40° to $+60^{\circ}\text{C}$

exposed and from -55° to +71°C in packaging.

Specifications

Type: Proximity, opto-electronic

Weight: 300 g ±10 g

Length overall: 108 mm

Diameter: 49.1 mm

Intrusion: 28 mm

Burst height: 1-5 m in 1 m increments

Arming requirement: >650 g setback; >200 revolutions of windwheel (>100 m)

Manufacturers

[Junghans Feinwerktechnik GmbH & Co KG](#)

Noptel Oy

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FUZES - IMPACT FUZES, GERMANY

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

PD 583, windwheel

Armament

51 to 120 mm HE bombs in smoothbore mortars.

Development

By Junghans to add further safety to the DM 111 design and eliminate the need for safety wires.

Description

This is basically the same mechanism as the DM 111, but instead of locking the mechanism by a safety wire, which has to be removed before firing, this fuze has an internal lock which is withdrawn by means of a wind vane in the nose of the fuze. At rest the rotor of the fuze is positively locked; once the bomb is fired, wind flow through the vane rotates it and unlocks the rotor. This locking action is in addition to the escapement controlling the rotor, which has also to be unlocked by acceleration. There are, therefore, two entirely independent forces required to arm this fuze.

Specifications

Type: impact, SQ and delay

Weight: 208 g

Thread: 1.5 in - 12 UNF -1A

Length:

overall - 88.3 mm
exposed - 60.8 mm
Intrusion: 27.5 mm
Diameter: 49 mm
Optional delay: 0.06 s
Arming requirement: > 650 g, $V_0 > 60$ m/s
Arming distance: 40 m

Manufacturer

Junghans Feinwerktechnik.

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Junghans PD 583 impact, SQ and delay fuze

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FIELD ARTILLERY

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

Projectile, 155 mm: DP, Improved Conventional Munition, M864

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The Projectile, 155 mm: DP, Improved Conventional Munition, M864 can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The Projectile, 155 mm: DP, Improved Conventional Munition, M864 can also be fired from the following self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The 155 mm DPICM M864 may be regarded as a logical development of the 155 mm DPICM M483A1 (see separate entry), as it features a base burn (base bleed) unit that enhances range without introducing the inherent inaccuracy limitations of rocket assistance motors. The projectile is stored, transported and handled in exactly the same manner as the 155 mm DPICM M483A1 and it is claimed that no special instructions or training are required in its use. Production commenced during FY87. Approximately 30,000 of these projectiles were sent to the Persian Gulf for Operations Desert Shield and Storm but they were not used operationally due to the omission of the appropriate software in the US Army's Battery Computer System (BCS). It should be noted that the DPICM M864 continues to utilise the same grenades as the earlier M483A1 so the lack of a self-destruct mechanism for dud dual-purpose grenades imposes training and other operational limitations.

The 155 mm DPICM M864 is a joint development and marketing operation between the Chamberlain Manufacturing Corporation and Talley Defense Systems. Chamberlain produces the metal components used for the 155 mm DPICM M864, together with the associated grenades, at the Scranton Army Ammunition Plant, Pennsylvania. Production is also carried out by General Dynamics, Ordnance and Tactical Systems (GD-OTS).

Talley Defense Systems is responsible for the Base Bleed/Base Burn (BB) unit produced since 1991, under US Army agreement at the Army Ammunition Plant at Joliet, Illinois, following low-rate initial production in Mesa, Arizona. The Joliet facility is capable of producing 15,000 units a month, although all production in the USA is currently in abeyance. Talley Defense Systems have delivered nearly one million BB assemblies.

Description

The 155 mm DPICM M864 is a separate loading munition with a streamlined forged steel ogive, a low-drag steel body (1340 or 4190 alloy) profile and a steel base closure (4340). The body rear is encircled by a gilding metal drive band. The nose is occupied during storage, transit and handling by a threaded energy absorbing lifting plug screwed into the fuze well. Before firing the plug is replaced by an M577 MTSQ fuze. The base of the fuze intrusion is surrounded inside the ogive by a booster charge, below which is a pressure plate.

The projectile base is occupied by a two-piece Base Bleed Base Burn (BB) unit filled with a barrel-shaped Hydroxyl Terminated PolyButadiene (HTPB) composite propellant grain, developed by Talley Defense Systems, to be ignited by propellant gases on firing. The inhibited HTPB burns slowly for approximately 22 seconds in such a manner that the resultant gases fill the vacuum created by the aerodynamic air flow behind the shell. This reduces drag behind the projectile, therefore enhancing range.

In operation, the M577A1 time fuze functions at the selected instant during the projectile's trajectory and initiates the booster charge located at the base of the fuze well. This initiates the expulsion charge formed by 90.7 g of [M10](#) propellant. The resultant increase in internal pressure against the pressure plate and the contents forces the base closure outwards to push off the base burn unit. The shell contents

are then ejected. Centrifugal forces disperse the entire grenade load radially from the projectile line of flight.

The dual-purpose grenades are of two types, the [M42](#) and [M46](#). The 155 mm DPICM M864 carries 72 of them; 48 [M42](#) and 24 [M46](#). Both types of grenade are identical, although the wall of the [M46](#) is heavier and thicker than that of the [M42](#). Serrations are embossed into the inner wall of the [M42](#) grenades to enhance fragmentation; [M46](#) grenades are not embossed. The grenades are unarmed while inside the projectile and are armed mechanically by spin after ejection. While in flight they are stabilised and orientated for impact by the deployment of a nylon ribbon streamer which also creates the spin to arm the grenade.

The grenades detonate on impact under the control of an integral M337A1 graze fuze which mechanically initiates an [M55](#) detonator. Each grenade contains 30.5 g of Composition A5 formed into a shaped charge with a 60° angle which is directed downwards to produce an anti-armour jet capable of penetrating approximately 70 mm of homogeneous armour plate. Fragmentation of the grenades' steel bodies produces anti-personnel effects. Both types of grenade are 82.55 mm long. The [M42](#) weighs 208 g and the [M46](#) 213 g. The [M42](#) and [M46](#) grenades do not feature self-destruct mechanisms.

The 155 mm DPICM M864 can also be fired in a fire registration mode. In this mode the expulsion charge is replaced by a shaped charge. When the fuze functions the resultant high-order detonation causes all 88 grenades to detonate, causing the projectile to fragment in the same manner as a conventional HE projectile and provide an airburst marker for fire registration.

The 155 mm DPICM M864 can be used with the full range of propellant charges, including the [M203](#), apart from the basic [M3A1](#) (green bag) and [M119](#) charges. The [M3A1](#) charge cannot take full advantage of the full potential range of the 155 mm DPICM M864 while the [M119](#) is unable to ignite the base burn unit with sufficient reliability.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required), the base igniter contains black powder.

The Propelling Charge [M119A1](#) is a white bag charge with an igniter pad at the base and a ring-shaped flash reducer pad located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119A1](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The similar charge to the M119A2 is produced by Eurometaal NV as the No 13.

The Propelling Charges [M203](#) and M203A1 (Charge 8S) were developed primarily for use in the 155 mm M284 cannon used with the M109A5 and [M109A6](#) Paladin self-propelled howitzers, although they can be used with other similar long-barrelled pieces such as the CN79 Cannon used on the South Korean [155 mm KH179](#) Towed Howitzer. The M203/M203A1 is a single red bag charge encased in a tight fitting lacing jacket for strength. The bag has an igniter sewn to the base, a central core igniter extending through the centre of the charge and a flash reducer in front of the charge. The M203A1 differs from the [M203](#) by producing cooler burning to increase barrel life, together with a reduction in

blast and muzzle flash.

When firing the 155 mm DPICM M864 from the M109A5 and [M109A6](#) Paladin self-propelled howitzers and the [M198](#) towed howitzer, a version of the Charge, Propelling, 155 mm: M203A1 with a rigid combustible case may be used. This version of the M203A1 weighs 14.06 kg, is 768 mm long overall and contains 12.7 kg of cool-burning M31A1E1 stick propellant. The combustible case and end cap contains a talc wear-reducing additive while the contents include a further wear-reducing additive and 156 g of lead foil to act as a decoppering agent. The use of this charge results in reduced flash and muzzle blast.

The [M119](#) series and [M203](#) propellant charges should be fired using the Primer [M82](#) only.

Using the full M4A2 charge (white bag, Charge 7), the 155 mm DPICM M864 fired from the 155 mm [M1A2](#) Cannon used on the [M114A2](#) Towed Howitzer has a maximum range of 17,200 m.

Using the M119A2 charge, the 155 mm DPICM M864 fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers, has a maximum range of 22,100 m.

Using the M203A1 charge, the 155 mm DPICM M864 fired from the 155 mm M284 Cannon used on the M109A5 and [M109A6](#) Paladin self-propelled howitzers, has a maximum range of 29,400 m. A similar range is attained when the 155 mm DPICM M864 is fired from the 155 mm [FH-70](#) Howitzer using the full L10 propelling charge.

Giat Industries of France produces a combustible case intended for use with all NATO standard 155 mm weapons. The case consists of a skirt, base and cover containing Charges 6 to 9; lower charges are formed using bagged charges. Use of this case system produces a barrel life at maximum charge of 3000 EFC.

The muzzle velocities produced using this combustible case system are as follows:

Charge 6 - 586 m/s

Charge 7 - 705 m/s

Charge 8 - 810 m/s

Charge 9 - 830 m/s.

Charge 9 can fire a projectile fitted with a base bleed unit to a range of 30,400 m.

Chartered Ammunition Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter and weighs 10 kg.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other countries are in the process of adopting similar modular charges.

Specifications

Weights:

projectile, unfuzed - 46.3 kg

expulsion charge - 90.7 g [M10](#)

Length, fuzed: 899 mm

Payload: 72 grenades; 48 [M42](#), 24 [M46](#)

Operating temperature limits: -20 to +60°C

Storage temperature limits: -40 to + 70°C

Authorised fuzes

MTSQ M577 or M577A1; ET M762

Equivalent projectiles

GERMANY

Manufacturer

Rheinmetall DeTech GmbH

Type: 155 mm DM 652

Description: Ballistically matched to the 155 mm DPICM M864, the 155 mm DM 652 cargo projectile carries 49 DM 1383 bomblet/grenades, each with a self-destruct element. The DM 1383 bomblet trumpet-shaped charge has a diameter of 42 mm and is stated to produce a superior armour penetration compared to the M42/M46

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm DPICM M864

Description: Standard US specifications. Available for production

UNITED STATES OF AMERICA

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: 155 mm DPICM M864

Description: Standard specifications

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Cross-section illustration of Projectile, 155 mm: DPICM, M864

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SMALL ARMS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

7.5 × 55 mm

Synonyms:

7.5 mm Swiss; 7.5 mm Schmidt-Rubin; 7.5 mm [M1911](#)

Armament

The 7.5 mm Swiss cartridge is unique to the Swiss Army and has been used in various Schmidt-Rubin bolt-action rifles, the Stgw 57 and [SG510](#) automatic rifles and Swiss machine guns. Although the Swiss adopted a 5.56 mm rifle in 1990, the 7.5 mm weapons are still widely distributed and are likely to remain in service for many years.

Development

In its original form the 7.5 mm round was adopted by the Swiss in 1889, one of the first small calibre military rifle cartridges to see service. It was originally used in the Schmidt-Rubin straight pull bolt action rifle, adopted in the same year as the cartridge. The original bullet was round nosed and paper patched, but by 1911, after several improvements, the ogival bullet design was standardised and remained the standard thereafter. The name `Schmidt-Rubin' commemorates the rifle design of Colonel Schmidt and the cartridge design of Major Rubin, who was instrumental in perfecting the small calibre jacketed bullet concept, along with the rifle in which it was originally used.

Description

The cartridge case is rimless and bottlenecked and is currently made of brass, although steel has been used in the past; aluminium alloy cases have been produced in trial quantities and may be encountered. The bullet is of conventional compound form, with a lead alloy core, steel jacket and copper envelope. The standard Ball GP11 is of streamlined form. Commercial loadings in this calibre are to sporting specification, with soft-nosed bullets, since numbers of earlier Schmidt-Rubin bolt-action rifles were disposed of as surplus.

Specifications

Ball GP11

Round length: 77.5 mm

Case length: 55.4 mm

Rim diameter: 12.6 mm

Bullet diameter: 7.81 mm

Bullet weight: 11.34 g

Muzzle velocity: 780 m/s

Muzzle energy: 3,450 J

Abridged ballistic table: 7.5 × 55 mm, 11.6 g ball

Range	Velocity	Energy
0 m	808 m/s	3,780 J
100 m	739 m/s	3,161 J
200 m	675 m/s	2,537 J
300 m	613 m/s	2,175 J

GERMANY

Manufacturer

Dynamit Nobel (RWS)

Type: Ball CP: FMJ, cone point; 9.72 g; MV 870 m/s

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball 17511: JSP; 11.6 g; MV 808 m/s

SWITZERLAND

Manufacturer

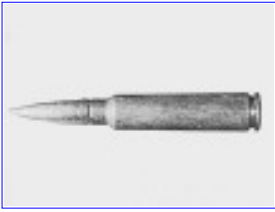
SM Swiss Munition Enterprise

Type: Tracer L11: Non-streamlined; 10.11 g

AA tracer FlaB11: Streamlined; 9.54 g

AP StK11: Streamlined; 11.34 g

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7.5 mm Swiss Service

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Brenneke 12 gauge low-recoil shotgun slug round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Brenneke to provide a reduced-recoil slug round that enables quick accurate follow-up shots at relatively close ranges.

Description

The Brenneke reduced-recoil slug round is not specifically designed for tactical use, but due to its inherent characteristics, it is ideally suited for military and law enforcement agencies seeking a tactical slug load. The Brenneke slug incorporates the company's proven proprietary slug design that ensures accuracy and optimises terminal effects. The Brenneke slug round is for use only in smoothbore guns and is most effective when fired from guns with cylinder or improved cylinder bores.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 28.3 g
Muzzle velocity: 350 m/s
Muzzle energy: 1,741 J
Max range: Approx 200 yd
Max effective range: 100 yd

GERMANY

Manufacturer

Brenneke GmbH
PO Box 1646
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Germany
D-30837
Tel: (+49 511) 97 26 20
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Web: <http://www.brenneke.de>

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FUZES - TIME FUZES, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MTSQ 93

Armament

51 to 120 mm ejection-type mortar bombs.

Development

By Junghans for mortars in German service and general use. Development history unknown.

Description

Generally similar to DM93A1 except for thread pitch, size and depth of intrusion into the fuze well.

Specifications

Length:

overall - 90 mm

exposed - 60 mm

Diameter: 49 mm

Weight: 241 g

Manufacturer

Junghans Feinwerktechnik.

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FUZES - PROXIMITY FUZES, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M-DN 14

Armament

120 mm (or larger) fin-stabilised mortar bombs.

Development

By Diehl, to produce a proximity fuze resistant to ECM, snow, rain and other weather effects.

Description

This is an electro-optic fuze relying upon triangulation principles to detonate the fuze at the selected distance above the target. The burst height is factory-set and may be within the range 1 to 3 m. Burst height is maintained, irrespective of the nature of the ground.

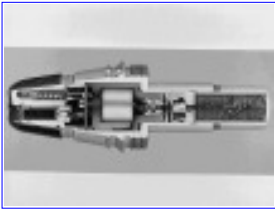
The few electronic components are of monolithic and hybrid structure. A reliable thermal battery and a rugged mechanical safety system are incorporated. Arming is by setback and can be factory-set for a specified launch acceleration. A back-up impact function is fitted and, by simply leaving the protective cap on, to 'blind' the electro-optical function, the fuze can be set for impact detonation.

No dimensions are available, other than the approximate weight of 450 g.

Manufacturer

Diehl GmbH.

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Diehl M-DN 14 optronic proximity fuze

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FUZES - IMPACT FUZES, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

DM 111A5

Armament

51 to 160 mm smoothbore mortar bombs.

Development

By Junghans to meet German Army requirements.

Description

This is almost the same as the [DM 111A4](#), the difference being that the firing pin in this fuze is set into the nose and covered by a diaphragm. This makes it slightly less sensitive and highly applicable to use in wooded country such as jungle, since it is less likely to be set off by leaves.

Specifications

Type: impact, SQ and delay

Weight: 201 g

Thread: 1.5 in × 12 tpi UNF

Length:

overall - 87.4 mm

visible - 61 mm

Intrusion: 27.4 mm

Diameter: 49 mm

Optional delay: 0.06 s

Arming requirement: ≥ 650 g

Arming distance: 40 m

Manufacturer

Junghans Feinwerktechnik.

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MORTARS - 120 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Buck 120 mm mortar ammunition

Description

These new-generation mortar bombs will function with all types of modern 120 mm mortar including Tampella and [TDA](#) types. As with the smaller calibres, the object has been to produce bombs which are capable of delivering the requisite tactical effect with less expenditure of ammunition.

Specifications

	120 mm smoke	120 mm smoke/incendiary	120 mm illuminating	120 mm practice
Weight	12.9 kg	12.9 kg	12.9 kg	12.9 kg
Length	590 mm	590 mm	583 mm	582 mm
Range	6,000 m	-	-	-
Luminance	3 min	-	1.2 Mcd/50 s	-
Payload	3.65 kg	submunition	1.71 kg	Spotting charge

Status: In production.

Manufacturer

Buck Werke GmbH & Co.

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Buck family of mortar ammunition

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MORTARS - 120 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE improved bomb HE-L

Armament

All NATO 120 mm smoothbore mortars and can be optimised for the US Army 120 mm mortar system.

Development

By Rheinmetall for high-efficiency top attack against semi-hard targets or field emplacements.

Description

A streamlined, pointed bomb with alloy tailboom and fins. The head of the body is threaded and fitted with a proximity sensor. Beneath this is a curved heavy metal plate of prefragmented spherohexagonal tungsten fragments and the interior of the body is prefragmented. The body cavity is filled with high explosive and a base detonating fuze is inserted into the rear of the body and retained by the tailboom.

At the optimum distance from the target, the Kongsberg P424 proximity sensor ignites an acceleration charge and the ogive is separated and accelerated forward, to clear the way for the tungsten fragments. The impulse of the separation decelerates the bomb so that the base fuze initiates the main explosive charge. The detonation wave then blows the heavy plate forward in a cloud of fragments that have penetrative effect against semi-hard targets. At the same time the body is fragmented and distributed in the usual pattern to provide anti-personnel fragments. As an option, the fuze may be set to PD to provide a groundburst.

Specifications

Length, unfuzed: 586 mm

Weight, fuzed: 13 kg

Type of payload: HE and tungsten disc

Fuze: Bofors BD with Kongsberg P424 nose proximity sensor

Ignition height: ca 17 m

Max range: 6,200 m

Chamber pressure: 1,200 bar

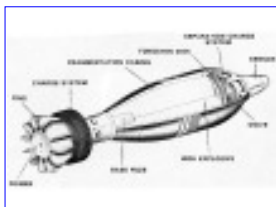
Delayed arming: >2 s

Temperature limits, function: -40 to +63°C

Manufacturer

Rheinmetall Industrie AG.

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120 mm improved HE bomb HE-L



Internal arrangements of the Rheinmetall 120 mm HE-L bomb

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MORTARS - 81 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb

Armament

All 81 mm mortars.

Development

By Buck GmbH for general use.

Description

This bomb uses the same cylindrical body and tail unit as the previous bombs, but has the nose closed by an adaptor which receives the time fuze. The interior is filled with the usual parachute and flare assembly and a spring to eject them. When the time fuze functions a small charge is exploded to ignite the flare and also remove the nose adaptor and fuze, allowing the spring to eject the parachute and flare.

Specifications

Length, fuzed: 635 mm

Weight, fuzed: 4.4 kg

Type of payload: parachute and flare

Fuze: time

Max range: 5,400 m

Illumination intensity: 600,000 cd or 1 Mcd as requested

Duration of illumination: 35 s

Manufacturer

Buck Werke GmbH & Co.

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MORTARS - 81 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm incendiary/smoke bomb

Armament

All 81 mm mortars, though best suited to high-pressure types such as the UK [L16A1](#).

Development

By Buck GmbH for general use.

Description

This uses the same bomb body, tail unit and charge system as the smoke bomb described previously, but is loaded with a subprojectile containing a Red Phosphorus (RP) incendiary/smoke composition. This subprojectile is ejected on impact to act as a fire raiser and smoke generator.

Specifications

Length, fuzed: 630 mm

Weight, fuzed: 3.9 kg

Type of payload: RP submunition

Fuze: impact SQ

Max range: 5,600 m

Manufacturer

Buck Werke GmbH & Co.

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MORTARS - 81 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb

Armament

Any 81 mm mortar, though more particularly for high-pressure types such as the UK [L16A1](#).

Development

By Buck GmbH for general use.

Description

The steel bomb body is cylindrical; the nose is closed by an adaptor which carries a burster container and into which the fuze is screwed. The rear end of the body has a plastic obturating ring in a groove and is closed by a coned section to which the light-alloy tailboom and fin unit is screwed. The burster contains a small explosive charge and the remainder of the cavity is filled with a Red Phosphorus (RP) smoke mixture. The tail tube contains a primary cartridge, secondary charges in horseshoe form and can be fitted around the tailboom.

Specifications

Length, fuze: 630 mm

Weight, fuze: 3.9 kg

Weight and type of payload: 1.4 kg RP

Fuze: impact SQ

Max range: 5,600 m

Emission time: 2.5 min

Manufacturer

Buck Werke GmbH & Co.

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MORTARS - 60 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb

Armament

US [M224](#) and other 60 mm mortars.

Development

By Buck GmbH for general use.

Description

This uses the same cylindrical bomb body as the smoke bombs described previously but contains the usual type of parachute and flare illuminating unit. A time fuze is fitted which causes the parachute and flare to be ejected from the nose of the bomb at the desired point.

Specifications

Length, fuzed: 467 mm

Weight, fuzed: 2.3 kg

Type of payload: parachute and flare

Fuze: time

Max range: 1,600 m

Illuminating power: 450,000 cd

Burning time: 35 s

Manufacturer

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MORTARS - 60 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm incendiary/smoke bomb

Armament

US [M224](#) and other 60 mm mortars.

Development

By Buck GmbH for general use.

Description

This uses the same bomb body and tail unit as the smoke bomb described previously, but is filled with a submunition which is ejected from the bomb on impact and acts as both a fire raiser and a source of smoke.

Specifications

Length, fuzed: 467 mm

Weight, fuzed: 2.3 kg

Type of payload: submunition

Fuze: impact SQ

Max range: 1,900 m

Manufacturer

Buck Werke GmbH & Co.

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MORTARS - 60 mm MORTARS, GERMANY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb

Armament

US [M224](#) and other 60 mm mortars.

Development

By Buck GmbH for general use.

Description

A cylindrical cast-steel bomb body with an extruded alloy tail unit and six fins screwed into the rear. The smoke composition is based upon Red Phosphorus (RP) and delivers considerably more smoke than the usual smoke bombs of this calibre.

Specifications

Length, fuzed: 467 mm

Weight, fuzed: 2.3 kg

Weight and type of payload: 400 g RP

Fuze: impact SQ

Max range: 1,900 m

Emission time: 2 min

Manufacturer

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IDENTIFICATION OF SMALL ARMS AMMUNITION, GERMANY

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

HE	yellow
AP	black with white lettering
AP-T	black with red lettering
AP-HE	black with yellow lettering
TP	blue

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IDENTIFICATION OF SMALL ARMS AMMUNITION, GERMANY

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Uses NATO standard code

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Shell, 155 mm, Smoke, DM 105

Armament

This projectile can be fired from the following self-propelled 155 mm howitzers: TAMSE VCA 155; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Soltam Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); [AS90](#) and [Braveheart](#); M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS.

This projectile can be fired from the following towed 155 mm howitzers: [FH-70](#) and [FH-70 R](#); GH [N-45](#); CITEFA CALA 30/2; Patria Vammas 155 GH 52 Howitzer; Soltam M-46; Otobreda 155 mm 155/39 TM; RDM [155 mm M139](#) and [M114/39](#); SANTA BARBARA 155 mm SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114/39](#); Bofors [FH-77B](#); M199 Cannon for [M198](#) Towed Howitzer; XM777 Lightweight Towed Howitzer.

Development

The 155 mm Smoke DM 105 projectile is one of the three projectiles developed as a result of the tripartite agreement entered into by Germany, Italy and the UK to develop the 155 mm [FH-70](#) towed howitzer and its associated ammunition. The 155 mm Smoke DM 105 projectile was developed by Rheinmetall W & M GmbH (now Rheinmetall DeTec) and is manufactured by Buck Werke GmbH & Co of Bad Reichenhall.

Rheinmetall DeTec has an Infra-red Smoke projectile under development. This projectile is ballistically matched to the DM 642 (RB 63) Cargo projectile and produces dense smoke for 4 minutes.

A version which produces combined infra-red and millimetre-wave screening characteristics will also be available.

The British Army have issued an Endorsed Staff Target (ST(L)4082) for an improved 155 mm Multi-Spectral Screening Smoke Shell to provide obscuration in the visual and near/far infra-red wavebands. A feasibility study commenced during 1995.

Royal Ordnance (now [BAE Systems](#), RO Defence) are developing a 155 mm Multi-Spectral Smoke Shell (MSSS) as a replacement for the existing 155 mm Smoke DM 105. It will supply a smoke screen to operate in the near and far infra-red wavebands, will be compatible with the Joint Ballistics MoU, and will ballistically match M483A1/DM 642 projectiles.

Description

The 155 mm Smoke DM 105 projectile is a separate loading, base ejection carrier shell with a high-grade forged steel body. Normally fitted with a mechanical time fuze, the 155 mm Smoke DM 105 contains (from the nose) a booster, an ejection mechanism and four smoke units stacked inside the projectile body. The base is recessed and held in place by six slotted pins. Located just above the base is a single drive band pressed into a preprepared ribbed groove. The nose and body sections are internally fitted with a steel support tube and an inner sleeve, this presents a smooth surface for the ejection of the smoke units.

As the nose-mounted time fuze functions the flash from the fuze initiates the ignition train which is transmitted to the booster, a pelleted 6.5 g charge of black powder. The booster initiates the ejection mechanism which commences with the ignition of 15 g of black powder in a silk gauze bag inside a cylindrical metal case. The resultant internal pressure forces a plunger plate downwards to create pressure on the shell base. The slotted pins shear so that the base falls away enabling the four smoke units to be ejected. The flash from the ejection mechanism's black powder charge also travels down a centrally located flash tube to each of the four smoke units, igniting one or more of the three ignition cartridges in each unit so that the smoke mixture has been ignited approximately 4.5 seconds after ejection; that is, by the time each unit reaches the ground. Each unit contains hexachloroethane/zinc (HC) white smoke mixture in a cylindrical metal case. Each unit burns for 3 to 3.5 minutes (dependent on conditions) to create the smoke cloud which can be up to 200 m long, 50 m wide, and 10 to 15 m high at a distance of 150 m from the burst (under normal atmospheric conditions).

The charge system used with the tripartite family of 155 mm ammunition is known colloquially as the 'three cartridge' system. As its name implies the system is made up of three cartridges, the first two with a base charge and a number of increments. Cartridge 3 (Charge 8) is a unitary charge.

Cartridge 1, the Charge Propelling, 155 mm, Howitzer, Charge 2, L2A1 consists of the Charge 1 and Charge Propellant Increment 2 combined to form Charge 2. The two weigh 1.21 kg and use SC/202 propellant. They are stitched together and should not be separated.

Charge 1 [L1A1](#) consists of a salmon pink cloth bag, containing 783 g of propellant SC/Z008 with an Igniter L19A1 containing 67 g of NC/200 and 18 g of G20 gunpowder stitched to its base. The forward part of the bag is recessed to contain the Charge Propellant Increment 2, a white cloth bag containing 311 g of propellant SC/Z008.

Cartridge 2, the Charge Propelling, 155 mm, Howitzer Charge 7, L8A1 is made up from Charge 3 L4A1 and Charge Propellant Increments 4 to 7. Total weight is 7.55 kg.

The Charge Propelling 155 mm, Howitzer, Charge 3, L4A1 consists of a smoke grey cloth bag containing 1.39 kg of NO25 propellant divided into two equal bundles. The charge bag is stitched into a combustible sleeve which in turn is secured in a smoke grey main charge bag. The sleeve and main charge bag are large enough to receive the propellant increments 4 to 7 which, when assembled with Charge 3, form the Charge 7 L8A1. The Igniter L20A1 containing 80 g of propellant NC/200 and 18 g of G20 gunpowder is fitted on the base of the main charge bag, and the mouth is fitted with a Velcro

loop and hook.

The Charge Propellant Increment 4 consists of an orange cloth bag containing 529 g of NO25 propellant.

The Charge Propellant Increment 5 consists of a grass green cloth bag containing 1.56 kg of N/S 134-040 propellant together with a flash inhibitor pack. This pack contains 125 g of potassium sulphate powder and is positioned in the centre of the propellant. Wrapped and secured around the front end of the propellant is 17 g of lead foil.

The Charge Propellant Increment 6 consists of a dark violet cloth bag containing 2.42 kg of N/S 134-040 propellant divided into two equal bundles, each of which has lead foil strip wrapped and secured around its front end.

The Charge Propellant Increment 7 consists of a beige cloth bag containing 1.49 kg of N/S 134-040 propellant divided into three equal bundles, each of which has lead foil wrapped and secured around its front end.

Cartridge 3 is the Charge, Propelling, 155 mm, Howitzer, Charge 8, [L10A1](#). This consists of a brown combustible main case and a pink combustible end cap. The end cap contains an Igniter, Propelling, Charge L23A1 mounted on a perforated disc. The propellant charge bundle consists of 12.48 kg of N/S 54.14 propellant sticks tied in five places using polyester/cotton thread and incorporating lead foil positioned under the top layer of sticks.

All charges are ignited by the Primer Percussion DM191A1 which contains a primary charge of 1.25 g of nitrocellulose S536.

When fired from the 155 mm [FH-70](#) Towed Howitzer using the three cartridge system the 155 mm Smoke DM 105 can reach the following ranges:

Charge 2 - range 3,900 to 5,900 m

Charge 3 - range 4,800 to 7,500 m

Charge 4 - range 6,200 to 9,500 m

Charge 5 - range 8,500 to 12,500 m

Charge 6 - range 11,200 to 16,800 m

Charge 7 - range 14,200 to 20,900 m

Charge 8 - range 17,000 to 24,700 m.

When fired from the 155 mm [FH-70](#) Towed Howitzer the 155 mm Smoke DM 105 has a maximum muzzle velocity of 827 m/s.

It is anticipated that future 155 mm propellant charge systems will involve Modular Charge Systems (MCS). [The German Army has already adopted the Rheinmetall DeTec Modular Propelling Charge System \(MPCS\) DM 72, as have Norway. and Malaysia.](#) The United Kingdom has adopted the South African [SOMCHEM M90](#) Bi-Modular Charge System.

Specifications

Weights:

projectile (nominal) - 43.1 kg

filling - 8 kg, 4 HC smoke units

ejection charge - 15 g black powder

Lengths:

projectile, fuzed - 875 mm

without lifting plug, max - 778.5 mm

Operating temperature range: -32 to +52°C

Authorised fuzes

MT L92A2, DM 153

Equivalent projectiles

GERMANY

Manufacturer

Buck Werke GmbH & Co

Type: 155 mm Smoke DM 105

Description: Standard specifications

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Smoke DM 105A1

Description: Standard specifications

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Smoke P5

Description: Similar to 155 mm Smoke DM 105. Can be configured to produce coloured smoke (green, red, yellow, violet or black)

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155 mm Smoke DM 105 (right) with 155 mm Smoke BE ERFB on left for comparison

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SMALL ARMS

Date Posted: 10 December 1999

Jane's Ammunition Handbook 1999-2000

4.73 x 33 mm

Synonyms:

4.73 mm DE Caseless

Armament

Heckler and Koch G11 rifle.

Development

Development of this cartridge was carried out by Dynamit Nobel and Heckler and Koch from about 1970 onwards, specifically for the G11 rifle. Original versions used nitrocellulose propellant, but this gave rise to cook-off problems because of the absence of a brass case to shield the heat from the chamber walls. The propellant was then changed to a new High Temperature Propellant (HiTP), based on a denatured hexogen explosive compound. The new propellant raised the cook-off temperature by 100°C, rendering the weapon immune to cook-off problems in normal use. Development of the G11 has ceased and ammunition is no longer in production. The cartridge is maintained herein only for technical reference purposes.

Description

The conventional bullet is set into a block of propellant and held rigidly. The block is square in section and longer than the bullet, but the overall length is about half that of an equivalent conventionally cased cartridge. The primer is a small pellet of initiating mixture loaded into a cavity in the base of the propellant block. Ahead of the primer is a small booster charge of initiatory explosive. This, when ignited by the cap, blows the bullet out of the block and seats it in the rifling before ignition of the

propellant takes place. Whilst this seating movement is taking place the block of propellant is shattered and ignited. The object in seating the bullet, by means of this booster charge, is to ensure that the bullet is firmly lodged in the rifling before the propellant explosion takes place, so avoiding any leak of gas around an unseated bullet. It also ensures that the chamber pressure and gas volume are constant from round to round.

The bullet is streamlined, of conventional form and consists of a lead core, steel jacket and gilding metal envelope. It shows no fragmentation on impact and will pierce 6 mm of mild steel plate at 300 m range and a standard steel helmet at 600 m range.

Specifications

Round length: 32.8 mm

Round weight (nominal): 5.2 g

Round section: 7.9 mm²

Bullet diameter: 4.73 mm

Bullet weight: 3.2 g

Muzzle velocity: 930 m/s

Muzzle energy: 1,380 J

GERMANY

Manufacturer

Dynamit Nobel

Type: Ball: FMJ; 3.2 g; MV 930 m/s

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4.73 mm DE11 Caseless

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MORTARS - 107 mm MORTARS, [GREECE](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

107 mm HE/ICM bomb GR M20

Armament

US pattern M2 and [M30](#) 107 mm (4.2 in) rifled mortars.

Development

By PYRKAL, to improve the performance of 4.2 in mortars in Greek service.

Description

This is to the same general shape as the standard HE bomb for the 107 mm mortar (see USA entry) and uses the same obturation system. It differs in being a cargo bomb, carrying 20 M20G prefragmented dual-purpose submunitions inside the body. The submunitions have a shaped charge for light armour defeat and fragmentation for antipersonnel effects. Each 39 mm diameter submunition carries 30 g of Composition A5. These are arranged around a central rod which terminates in a plate above the obturation assembly. An expelling charge below the fuze forces down this rod, so shearing off the end of the bomb and then ejects the submunitions. Centrifugal force arms the individual fuzes in the submunitions and disperses them radially from the bomb's trajectory. Delay parachutes slow the descent and stabilise the submunitions so that they fall into the target area. Dispersion radius is approximately 70 to 140 m. On striking an armoured vehicle the shaped charge, within each submunition, will penetrate at least 60 mm of armour; as an anti-personnel munition they will each produce a minimum of 200 fragments with a lethal radius of 15 m against standing troops.

Specifications

Length, fuze: 670 mm

Weight, fuze: 13 kg

Type of payload: 20 submunitions

Fuze: MTSQ M577A1 or equivalent

Max range: 5,500 m

Dispersion radius: 70-140 m around mean point of impact.

Lethality area: 7,000 m²

Manufacturer

PYRKAL: Greek Powder & Cartridge Company.

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107 mm HE/ICM bomb GR [M20](#)

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MORTARS - 81 mm MORTARS, [GREECE](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M374A2

Armament

M1, [M29](#), [M29A1](#) and [TDA](#) mortars.

Development

By PYRKAL, based upon the US pattern.

Description

The steel body is fitted with a plastic obturating ring below the bourrelet. It is threaded at the nose for the fuze and has a threaded spigot at the rear to which the alloy tailboom and fin unit is screwed. The tailboom contains an M285 ignition cartridge, located just below the body and beneath the gas escape holes in the boom. A percussion primer M71A2 is fitted at the end of the tailboom. When struck by the firing pin this ignites the ignition cartridge, the flames from which pass through the gas holes and ignite the secondaries. There are nine secondary increments provided, in elongated fabric bags attached by means of two 'increment holders' around the lower body and fins. There are two operational charges: Charge A uses one secondary increment; Charge B uses nine secondary increments.

Specifications

Length, fuzed: 529 mm

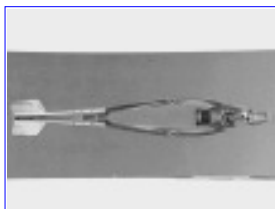
Weight, fuzed: 4.24 kg

Weight and type of payload: 945 g Comp B
Number of charges: P + 2
Fuze: impact SQ or delay M524A6
Min range: 403 m (primer and ignition cartridge only)
Max range: 4,500 m, Charge B
Muzzle velocity: 64 m/s, P only; 261 m/s, Charge B

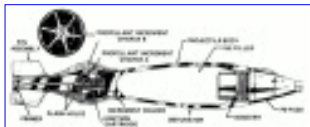
Manufacturer

PYRKAL: Greek Powder & Cartridge Company.

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81 mm HE bomb [M374A2](#)



[M374 A 2 HE bomb](#)
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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

Alenia Difesa 76 mm Flash Non-Frag (FNF-OM)

Armament

Otobreda 76/62 MMI; Otobreda 76/62 Compact; Otobreda 76/62 Super Rapid; Otobreda 76/62 Above Deck; 76 mm self-propelled AMRAD OTOMATIC air defence tank.

Development

The 76 mm Flash Non-Frag (or Non-Fragmentation) FNF-OM rounds were developed by the Otobreda Division of Alenia Difesa (formerly OTO Melara) for training use when fired against target drones, towed drogues or other training targets. They can also be utilised for functional firing tests of fuzes.

There are three types of 76 mm FNF-OM round. The FNF-MOM corresponds to the MOM round and can accept the FB 371 fuze. The FNF-OM-1 can accept all fuzes valid for the HE-OM-1 and HE-PFOM-1 while the FNF-OM-2 can accept all fuzes valid for the HE-OM-2 and PFOM-2.

All 76 mm FNF-OM rounds are mechanically interchangeable with all other types of 76/62 ammunition.

Description

Each 76 mm FNF-OM is a fixed round with the projectile rigidly secured to the brass cartridge case by a crimping ring which engages in a groove on the wide copper/gilding metal drive band. The boat-tailed projectile body is a monobloc assembly made from a special high-quality steel.

Each 76 mm FNF-OM projectile is filled with an inert compound and contains a flash charge weighing 94 g, consisting of a mixture of a flash composition and black powder, to provide a flash and sound indication when the fuze functions.

The brass cartridge case (72 per cent copper, 28 per cent zinc) has a base-mounted P85 percussion primer and is filled with 2.3 kg of [M6](#) + 2 single-base multiperforated (19-hole) propellant. A mixture of wax and

titanium in a fabric liner is glued inside the cartridge case to act as an anti-wear additive. The primer is normally protected by a clip which is removed before loading.

Specifications

Model	FNF-MOM	FNF-OM-1	FNF-OM-2
Weights			
complete round	12.25 kg	12.2 kg	12.325 kg
projectile with fuze	6.35 kg	6.3 kg	6.425 kg
filling	94 g	94 g	94 g
fuze	860 g	930 g	940 g
propellant	2.3 kg	2.3 kg	2.3 kg
cartridge case	3.4 kg	3.4 kg	3.4 kg
Lengths			
complete round	907.5 mm	907.5 mm	908.5 mm
projectile, total	355 mm	355 mm	356 mm
projectile without fuze	260 mm	260 mm	260 mm
cartridge case	635.5 mm	635.5 mm	635.5 mm

Authorised fuzes

Prox FB 371, TB 76, VTPA FB 76, UA 3005/05, UA 3018, AEG MAZ, MK 404 IR, Fuchs M8953A1
PD OP 76 Mod 1, M557, L85, M9030

Equivalent rounds

GREECE

Manufacturer

PYRKAL: Greek Powder & Cartridge Company

Type: NON-FRAG FLASH

Description: Standard specifications but fitted with TR 54/63 percussion primer. TP and TP-T also produced

ITALY

Manufacturer

[Simmel Difesa SpA](#)

Type: FNF

Description: Complete round weight given as 12.5 kg and propellant weight 2.45 kg. Otherwise standard specifications

SOUTH AFRICA

Manufacturer

Denel (Pty) Ltd ([NASCHEM](#))

Type: AA Flash

Description: Nominal weight of complete plugged round is 12 kg and length 815 mm; projectile 5.35 kg and 260 mm. Muzzle velocity 925 to 935 m/s and range 16,000 m.

Other rounds produced in [South Africa](#) are Practice, Ramming (inert handling round) and Reference (for muzzle velocity testing)

SPAIN

Manufacturer

EXPAL SA

Type: VT-NF

Description: Filled with inert material plus smoke canister together weighing 500 g. E (TP), containing 500 g of inert material only, also produced

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Cross-section of a 76 mm FNF MOM projectile

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [GREECE](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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MORTARS - 82 mm MORTARS, [HUNGARY](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm dual-purpose mortar bomb

Armament

Developed for use with the 82 mm 2B9M automatic mortar (licence-produced in [Hungary](#)) in both the direct and indirect fire modes, this bomb can also be fired from conventional 82 mm mortars.

Development

History not known, presumably by Hungarian ordnance department

Description

This dual-purpose bomb contains a copper lined two-part shaped charge, capable of penetrating 100 mm of armour. As the bomb detonates the cast-steel body breaks up to create anti-personnel fragments.

Using a basic primary cartridge this bomb is fired from the 2B9M mortar, using a fixed 4D2 propellant charge weighing 75 g around the tail assembly. When fired from conventional mortars up to three ballistite propellant discs can be located around the tail. In both cases the maximum range is 4,300 m.

Specifications

Length: 330 mm

Weight: 3.1 ±0.2 kg

Muzzle velocity: 2B9M, 270 m/s; conventional mortar, 210 m/s

Max range: 4,300 m

Armour penetration: 100 mm

Manufacturer

Mechanikai Művek.

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Cross-sectioned example of 82 mm dual-purpose mortar bomb

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [HUNGARY](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses RAFS code

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

8 × 56R mm Hungarian Mannlicher

Synonyms:

8 × 56R; 8 mm M1931; 8 mm Hungarian [M31](#); 8 mm Solothurn

Armament

Hungarian M35M bolt-action rifles; Solothurn MG 30 S (S 2-200) machine gun; possibly some Maxim machine guns.

Development

This was developed in Austria in the late 1920s for the Solothurn machine gun and was subsequently adopted by [Hungary](#) as a replacement for the 8 × 50R Mannlicher rifle and machine gun cartridge. Although the [7.92 mm Mauser](#) round was adopted during 1939-45, and the 7.62 × 39 mm [M43](#) subsequently became the service round, some stocks of 8 mm weapons remained in reserve. They were subsequently disposed of and have occasionally turned up in dissident hands in Africa.

Description

Rimmed, bottlenecked, Berdan primed, brass case. The bullet is streamlined, with a lead core in a steel jacket.

Specifications

Hungarian Ball [M31](#)

Round length: 76.71 mm

Case length: 56.13 mm

Rim diameter: 13.97 mm

Bullet diameter: 8.33 mm

Bullet weight: 13.48 g

Muzzle velocity: 730 m/s

Muzzle energy: 3,590 J

[HUNGARY](#)

Manufacturer

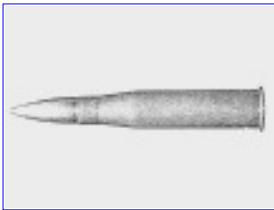
State arsenals

Type: Ball [M31](#): FMJ, SL; 13.48 g; MV 730 m/s

Tracer [M31](#): FMJ; lead core; rear tracer, red trace; 11.47 g; MV 730 m/s

AP [M31](#): FMJ; steel core; 12.31 g; MV 750 m/s

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8 × 56R mm Hungarian Mannlicher

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

0.380 British

Synonyms:

0.38/200; 9.6 × 31R

Armament

British service Webley Mk IV and Enfield revolvers; Indian Ordnance Factories revolvers; suitably chambered revolvers of other makes (most revolvers chambered for the 0.38 Smith & Wesson Long or 0.38 Long Colt will fire this round).

Development

Introduced in 1930 when the British Army adopted 0.38 as its standard revolver calibre in place of 0.455. A 12.96 g lead round-nosed bullet was adopted, but in view of the dubious legality of expanding bullets in the eyes of The Hague Convention, it was replaced by a jacketed bullet in 1938. Although the 0.38 revolver is no longer in British service it is still widely used in various parts of the British Commonwealth as a police and second-line military revolver.

Description

A rimmed, brass, straight-taper case, Berdan primed. As noted, the early standard military bullet was a round-nosed lead type, but this was replaced by a metal-jacketed bullet with an ogival pattern; the envelope may be gilding metal or nickel with a lead or lead-antimony core.

Specifications

British Service Mk 2

Round length: 31.11 mm

Case length: 19.38 mm

Rim diameter: 11 mm

Bullet diameter: 9.09 mm

Bullet weight: 11.53 g

Muzzle velocity: 180-185 m/s

Muzzle energy: 186 J

[INDIA](#)

Manufacturer

Ammunition Factory, Khadki, Pune

Type: Ball: FMJ; 11.5 g; MV 185 m/s

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[*0.380 British*](#)

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm, HESH-T L35

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

Although originally designed by Royal Ordnance (now [BAE Systems](#), RO Defence) as an anti-armour and hard target round for 105 mm L7/M68 tank guns, the 105 mm HESH-T L35 became a general purpose round. The reason for this is the projectile's high-explosive capabilities are only marginally less effective against troops in the open or under light cover than a conventional HE round, yet it remains highly effective against hard targets.

At one time Royal Ordnance developed a 105 mm HEAT anti-armour round but it was not produced in quantity.

Description

The 105 mm L35 HESH-T round is fixed with the projectile crimped to the brass cartridge case. A copper drive band is fitted just forward of the 360° crimping ring.

The projectile is a blunt-nosed thin-walled forged steel shell filled with 5.1 kg of Composition A-3 (RDX/Wax 91/9) and a bitumen nose pad. A tracer element is fitted in a spike housing projecting from the base and burns for a minimum of 9 seconds. When the projectile strikes a target the explosive filling is spread over the target surface before the L56A1 base detonating fuze functions. The resultant

detonation creates shock waves through the target surface material which either forces metal scabs from the inner surface at high velocities or else blows a large hole through the surface. The HESH-T L35 can defeat a NATO heavy single target at all ranges.

The drawn 70:30 brass cartridge case contains a nominal 2.81 kg of NH033 single base propellant. An L1 series electrical primer with an elongated flash tube is fitted into the base. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case.

The 105 mm HESH-T L35 is fired at a muzzle velocity of 732 m/s. The maximum effective combat range is estimated to be between 1,000 and 1,500 m although the maximum possible range is 8,000 m.

The training equivalent of the 105 mm HESH-T L35 is the SH Prac L38 which may be either completely inert or else contain inert material plus a base fuze and a flash pellet for spotting purposes. The weights and dimensions of the L38 are the same as those for the HESH-T L35. Also available is the 105 mm SH Prac L56 which does not contain any flash spotting material.

Also available is the Cartridge 105 mm TK SH/P-T C72, produced by SNC TEC of Canada. This round is a ballistic match for the 105 mm HESH L35 up to 4,000 m, with a 0.3 mil dispersion horizontally and vertically. The C72 round uses a C6 pattern cartridge case containing M1 Type 1 propellant initiated by a C15A2 electrical primer. The projectile, which is 412 mm long, contains a C5 tracer and a spotting charge which, following the functioning of a base detonating fuze, produces a bright flash and dark smoke. Muzzle velocity is given as 740 m/s and round length as 936 mm.

The Cartridge 105 mm TK SH/P-T C109A1 is similar to the C72 but the warhead is completely inert.

Specifications

Weights:

complete round - 21.2 kg

projectile - 11.2 kg

explosive - 5.1 kg Comp A-3

propellant, nominal - 2.81 kg NH033

Lengths:

complete round - 939 mm

cartridge case - 617 mm

Muzzle velocity: 732 m/s

Chamber pressure: 1,676 bar

Max possible range: 8,000 m

Authorised fuzes

BD L56A1

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factories

Type: 105 mm HESH

Description: L35 origins not confirmed but this round appears to be similar. Round weight 20.725 kg and muzzle velocity 734.6 m/s. Can penetrate 120 mm of armour at 915 m. Maximum range 8,000 m

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: HESH L35A3

Description: Standard specifications

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105 mm HESH L35A3 as produced by [Pakistan](#) Ordnance Factories



105 mm SH Prac L38 with flash element



SNC Industrial Technologies Inc 105 mm TK SH-P-T C-72

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TANK AND ANTI-TANK GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 105 mm, APDS-T L52

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The 105 mm [L52](#) APDS-T was developed by Royal Ordnance (now [BAE Systems](#), RO Defence) from the earlier L28 and the L36A1, the latter of which was also produced in the USA as the M392 (see separate entry). The latest version is the L52A3 which replaced the earlier versions. It was originally developed to be the main anti-armour round for use in 105 mm L7/M68 tank guns but its operational utility has been supplemented by the introduction of APFSDS rounds. However, it remains a viable and effective round. With many existing users the type is now used mainly for training purposes.

Description

The 105 mm [L52](#) APDS-T round is fixed, with the projectile assembly rigidly fixed to the brass cartridge case. The projectile assembly consists of a subprojectile and a sabot. The subprojectile consists of a pointed tungsten alloy penetrator with a steel nose pad and a tracer element in the base. This is all mounted in a light alloy sabot which separates from the subprojectile once the projectile assembly has left the gun muzzle.

The 70:30 brass cartridge case contains a nominal 5.6 kg of loose packed NQ/M12 multiperforated propellant, although NQ/M 047 was originally used. An L1 series electrical primer with an elongated

flash tube is fitted into the base. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case.

The L52A3 is fired at a muzzle velocity of 1,426 m/s. Armour penetration has been reported as 280 mm at 1,000 m and 254 mm at 1,500 m. Accuracy has been stated as 0.3 mil vertically and horizontally.

The training round for the 105 mm APDS [L52](#) is the lower cost DS Prac L63 which can also be used as the training equivalent for the 105 mm APFSDS L64 and H6/62, out to a range of 2,000 m. The DS Prac L63 uses a steel subprojectile which matches the APDS [L52](#) ballistically out to a range of 1,100 m while extending the barrel life. Round weight of the L63 is 14.91 kg of which 3.91 kg is the projectile. The cartridge case contains 3.97 kg of NQ/M07 propellant.

Also likely to be encountered is the Canadian SNC TEC 105 mm TK TPDS/T C-74. This round weighs 16.3 kg of which 4 kg is the projectile assembly; the subprojectile weighs 2.11 kg. The propellant charge contained within the C4 cartridge case is 5.1 kg of M6/NHP. Muzzle velocity is 1,590 m/s and the sub-projectile, with a C6 tracer element, provides a ballistic match with APFSDS up to 2,500 m.

[Pakistan](#) Ordnance Factories produce a low-cost 105 mm DS/T with a subprojectile matching APFSDS up to a range of 1,600 m. The safety zone does not exceed 15,000 m.

Specifications

Weights:

complete round - 19.11 kg

projectile - 6.48 kg

propellant, nominal - 5.6 kg NQ/M12

Lengths:

complete round - 838 mm

cartridge case - 617 mm

Muzzle velocity: 1,426 m/s

Authorised fuzes

None involved

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory Khamaria, Jabalpur

Type: Cartridge 105 mm TK APDS-T

Description: Understood to be based on British L28 or perhaps [L52](#). Complete round weight 18.724 kg, projectile assembly 5.9 kg, and overall length 838.2 mm; projectile has tungsten carbide core. Muzzle velocity 1,468.5 m/s. Stated to be able to defeat 120 mm of armour set at 0 to 60° at 915 m. A 105 mm DS/T Prac is also produced.

A modified version of the projectile assembly is fitted to 100 mm APDS-T ammunition for Eastern Bloc D-10 series guns

[SOUTH AFRICA](#)

Manufacturer

Denel (Pty) Ltd ([Naschem](#))

Type: APDS-T

Description: Understood to be based on a British design with (possibly) the L28 used as the original. Round weight is 19 kg of which 4.966 kg is the projectile. Length of the complete round is 838.2 mm. Muzzle velocity is 800 m/s. Used with 105 mm GT7 gun fitted to Olifant MBTs

VERIFIED



Some of the rounds included in the RO Defence range of 105 mm tank gun ammunition, from left: APFSDS-T H6/62; Smoke BE L39; HESH L35; SH/Prac L38 and APDS [L52](#) (T J Gander)



Cross-section drawing of the IOF 105 mm APDS-T round



SNC Industrial Technologies Inc 105 mm TK TPDS-T C-74

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TANK AND ANTI-TANK GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

NORINCO 125 mm APFSDS-T ammunition

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun on [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B towed anti-tank](#) gun.

Development

125 mm APFSDS-T ammunition was developed by NORINCO as a commercial venture to equip existing 125 mm tank gun users, and to provide projectiles for use in the Chinese 125 mm tank gun, details of which have yet to be announced. The NORINCO rounds, the 125-I and 125-II, use a propellant system based on the [Russian Federation](#) and Associated States (CIS) original but the projectile assemblies are completely different, based on Western tungsten rod technology allied to an up-to-date sabot assembly. This round was first shown during 1993.

Attempts to produce a close copy of the 125-I round have been made in [Pakistan](#). According to reports these attempts led to technical difficulties regarding the tungsten alloy used for the NORINCO penetrator, resulting in rounds breaking up while still in the barrel after firing. A change to the same tungsten alloy already used by Alsons to manufacture and machine 105 mm APFSDS-T L64 penetrators was considered for 125 mm manufacture but the problem has been reported as rectified.

The Indian Ordnance Factory Board has developed an almost identical 120 mm APFSDS-T round to that produced by [China](#) and [Pakistan](#). This round was probably inspired by examination of rounds

captured from [Pakistan](#) during one of their clashes and is known as the T-2A. It has been in service with the Indian Army since 1997.

Description

NORINCO 125 mm APFSDS-T rounds are separate loading munitions. They are loaded into the breech surrounded, behind the sabot assembly, by an integral combustible propellant charge in a combustible case and followed by a semi-combustible propellant case.

On both the 125-I and 125-II, a light alloy sabot assembly consists of a three-segment sabot and the monobloc tungsten alloy penetrator rod forming the projectile. The penetrator rod and the sabot are interfaced by a series of mating buttresses and the sabot is encircled by a plastic slipping obturator ring. The 125-I penetrator rod has a diameter of 28 mm, is 554 mm long (length-to-diameter ratio approximately 19.8:1) and weighs 4.03 kg. The penetrator rod has a light alloy windshield over the nose and a light alloy six-finned fin assembly at the rear. It is assumed that the fin assembly contains a tracer element. The 125-II projectile assembly weighs 7.44 kg, with the penetrator rod being 26 mm in diameter.

The two-component propellant system is carried over from the design of the RFAS 125 mm APFSDS-T. Both components are encased in what is described as a flammable nitrocellulose paper tube impregnated with TNT which is totally consumed on firing. A steel stub case, weighing 3.4 kg and containing the electrical primer, remains to be ejected after firing. The case is 140 mm long and has a flange diameter of 171.9 mm.

Muzzle velocity of the 125-I is 1,730 m/s. Armour penetration against vertical armour at 2,000 m is 460 mm and direct fire range is more than 2,100 m. It has been stated that the projectile can penetrate 220 mm of homogeneous armour set at an angle of 61.5° at a range of 2,000 m, with 'good after effects'. At a range of 1,000 m dispersion is of the order of 300 × 300 mm.

Muzzle velocity for the 125-II is 1,740 m/s. Armour penetration at 2,000 m is 600 mm.

Specifications

Weights:

projectile with propellant charge - 23 kg

projectile with sabot, 125-I - 7.37 kg

projectile with sabot, 125-II - 7.44 kg

projectile, 125-I - 4.03 kg

stub case - 3.4 kg

Lengths:

projectile with propellant charge - 672 mm

basic propellant assembly - 407 mm

projectile - 554 mm

Diameter of projectile:

125-I - 28 mm

125-II - 26 mm

Muzzle velocity:

125-I - 1,730 m/s

125-II - 1,740 m/s

Operational temperature: -40 to +50°C

Authorised fuzes

None involved

Equivalent rounds

INDIA

Manufacturer

Indian Ordnance Factory Board

Type: 125 mm APFSDS-T T-2A

Description: Virtually identical to NORINCO original. See under Development.

PAKISTAN

Manufacturer

Machinecrafts (Private) Limited, Lahore

Type: 125 mm APFSDS

Description: Production believed to be limited to the manufacture and assembly of the 125-I APFSDS assembly only, rather than the complete round. See also under Development.

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Projectile assembly for NORINCO 125 mm 125-I APFSDS-T round (T J Gander)



*The 125 mm APFSDS round (T J Gander)
(2001)*

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Shell 105 mm FD Marker L37A1/A2 and L38A1/A2 (fuzed)

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#).

Development

Originally developed for the 105 mm L13A1 ordnance used on the [Vickers Defence Systems](#) FV433 Abbot self-propelled gun, the L37A1/A2 and L38A1/A2 Marker projectile series is now used with the [RO Defence 105 mm](#) L118 Light Gun as the Abbot has been withdrawn from service by the British Army.

The only difference between the 105 mm Marker L37A1/A2 and L38A1/A2 is that the L37 projectiles emit red smoke and the L38 projectiles emit orange smoke.

The main producers of this round are RO Defence, Ammunition Division.

In July 1995, the Spanish Army ordered 56 L118 Light Guns from Royal Ordnance (now [BAE Systems](#), RO Defence). Ammunition for these guns is loaded, assembled and packed in Spain by EXPAL SA and SANTA BARBARA.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are of the [M119A1](#)

standard with a L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

Intended for use as target markers, these 105 mm Marker projectiles are identical apart from their fillings. They are also matched ballistically to the 105 mm L31 HE projectiles.

The shell has a steel body with a single driving band. The fuze cavity in the nose leads into a cavity with a distance-piece at its forward end. The distance-piece has a paper tube liner containing the RDX/WX8 exploder and two paper discs. Behind the distance-piece and separated from it by a millboard washer is the main filling, separated from the baseplate by more millboard discs. There are two steel baseplates, of different diameters and with external screw threads, separated by a copper disc.

The main filling is in two parts. The forward (main) part consists of 1.19 kg of a PETN/wax dye smoke composition in the form of prepressed pellets. These are located forward of the driving band. The lower part consists of a 269.3 g pellet of wax/dye smoke composition.

On the 105 mm Marker L37A1 and L38A1 the threads on the inner and outer baseplates lack a coating of a rubber sealing compound which is applied to the same threads on the L37A2 and L38A2.

On the 105 mm Marker L37A1 and L37A2 the front (main) filling is Composition PN 740 which produces red smoke. On the L38A1 and L38A2 the front (main) filling is Composition PN 641 M or PN 867 producing orange smoke. In both cases the explosive element is PETN.

The Charge system is assembled in brass cartridge cases, Normal (L35A1/A2) with five increments and Super (L36A2/A3), a unitary charge. Ignition is by an electric primer ([L10A1](#)) fitted in the cartridge base. Range performance is as follows:

- Charge 1 (L35A1/A2) - 2,500 to 5,700 m
- Charge 2 (L35A1/A2) - 2,700 to 7,200 m
- Charge 3 (L35A1/A2) - 5,900 to 9,500 m
- Charge 4 (L35A1/A2) - 7,900 to 12,200 m
- Charge 5 (L35A1/A2) - 15,300 m
- Super Charge (L36A2/A3) - 17,200 m.

Minimum ranges with Charge 1 and 2 require [L1A1](#) spoiler rings to be fitted to the nose of the shell.

Also available is the Cartridge 105 mm FD Training L45A1. See separate entry for details.

Specifications

Weights:

with L32 fuze - 16.113 kg

with L27 VT fuze - 16.056 kg

filling - 1.46 kg

Max range: 17,200 m

Authorised fuzes

L32 and L106 PD and Graze or L27 VT. When the L27 fuze is used the exploder and paper discs must be removed

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory
Dehu Road, Pune

Type: Shell 105 mm IFG BE Smoke Marker

Description: Fitted with MT No 213 fuze. Contains four smoke canisters. Available for blue, orange and red smoke. Maximum range given as 11,000 m

Manufacturer

Indian Ordnance Factory, Khamaria
Jabalpur

Type: Shell 105 mm IFG BE Smoke Marker

Description: Fitted with MT No 213 Mk 5 fuze. Contains four smoke canisters. Available for blue, orange and red smoke. Maximum range given as 11,000 m

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Shell 105 mm FD Marker L37A1/A2 and L38A1/A2, fuzed

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Shell 105 mm FD Illuminating L43A2 (fuzed)

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#).

Development

The 105 mm L43A2 Illuminating shell is of Swedish design and manufacture and corresponds approximately to the Bofors AB (originally FFV Ordnance) 105 mm Illuminating Projectile LUMA Mk 2 (see separate entry for details). It was originally procured for the 105 mm L13A1 ordnance used on the [Vickers Defence Systems](#) FV433 Abbot Self-propelled Gun, although the Illuminating L43A2 is now used with the [RO Defence 105 mm](#) L118 Light Gun as the Abbot has been withdrawn from service with the British Army.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are of the [M119A1](#) standard with an L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

The 105 mm L43A2 Illuminating is a comparatively thin-walled base ejection shell fitted with a single drive band. The base of the body is closed by a baseplate held in position with three shear pins. The outer face of the baseplate is recessed to provide an unbalanced condition, preventing damage to the

parachute after ejection.

The interior contains the ejection (black powder G4) and ignition charges, the flare canister and its parachute, the latter housed in a metal-sided tube in two halves. At the time selected, the fuze functions to ignite the ejection charge which in turn ignites the ignition charge. The ejection charge builds up pressure which forces down on the flare canister and tube halves. The three shear pins then break to allow the baseplate, flare parachute and canister to eject, with the baseplate moving to one side due to its unbalanced state. As this is happening the ignition charge ignites the flare composition which is magnesium and sodium nitrate bonded by a resin. The ignition charge used with the L43A2 incorporates a 1.7 second delay, which the earlier L43A1 was lacking.

The usual operating height is 400 m, depending on the cloudbase, and the flare will burn for up to 40 seconds to produce a brilliancy of 900,000 to 1 Mcd (1 Lx). Rate of descent is less than 10 m/s.

The Charge system is assembled in brass cartridge cases, Normal (L35A1/A2) having five increments and Super (L36A2/A3), a unitary charge. Ignition is by an electric primer ([L10A1](#)) fitted in the cartridge base. Also available is the Cartridge 105 mm FD Training L45A1. See separate entry for details.

Specifications

Weights:

nominal - 15.502 kg

contents - 1.8 kg

Length, fuze: 496 mm

Flare composition: magnesium/sodium nitrate

Burning time: up to 40 s

Brilliance: 900,000 cd-1 Mcd

Authorised fuzes

MT L81 or user-selected fuze. The fuze must have a metric thread form and is not compatible with any MIL-STD-333A fuze hole

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory
Dehu Road, Pune

Type: Shell 105 mm LFG Illuminating

Description: Max range given as 11,000 m. Fuze fitted is MT 213 Mk 5 (M-2). Projectile weight is 16 kg. Duration of burning of flare assembly is 25 seconds

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Shell 105 mm FD Illuminating L43A2, fuze

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Shell 105 mm FD Smoke BE L45A2 (fuzed)

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#); Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

Development

Originally developed for the 105 mm L13A1 ordnance used on the [Vickers Defence Systems](#) FV433 Abbot Self-propelled Gun, the 105 mm L45A2 BE Smoke projectile is now used by the British Army with the [RO Defence 105 mm](#) L118 Light Gun as the Abbot has been withdrawn from service by the British Army. However, numbers of Value Engineered Abbots remain in service in [India](#) (68), and ammunition similar to the L45 BE Smoke has been produced in that country for them and for the locally produced Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

The first smoke projectiles used with the 105 mm Abbot and Light Gun were the L36A1 and L36A2; these are now obsolete. The 105 mm L45A1 BE Smoke may still be encountered and is basically the same projectile as the L45A2.

The main producers of this round are RO Defence, Ammunition Division.

In July 1995, the Spanish Army ordered 56 L118 Light Guns from Royal Ordnance (now [BAE Systems](#), RO Defence). Ammunition for these guns is loaded, assembled and packed in Spain by EXPAL SA and SANTA BARBARA.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have

been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are of the [M119A1](#) standard with an L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

The 105 mm L45A2 BE Smoke is ballistically matched to the 105 mm L31 series of HE projectiles and has an identical external profile. The internal diameter of the 105 mm L45A2 BE Smoke is enlarged at the rear of the body to avert compression from the single copper driving band acting on the smoke container. Internally, the forward end of the shell is formed with a fuze cavity connected to a flash channel where the burster charge (28.35 g of gunpowder G12) is located.

Inside the shell are three smoke canisters retained in position by a steel baseplate and a PVC locking ring which is screwed home against the baseplate. Washers are used as adjustable packing between the baseplate and the rear smoke canister. Each canister is filled with approximately 848 g of Composition SR 252, which acts as an igniter, and PN 800 smoke agent.

In use the fuze functions at the selected time and the resultant flash ignites the burster charge. The burster charge sets up a pressure behind a baffle plate which then allows a small flash to pass down a perforated central channel to ignite all three smoke canisters. The pressure from the baffle plate also forces the PVC ring securing the baseplate to break the baseplate and canisters to be ejected, usually at an altitude over the target area of 200 m. The smoke canisters form a dense cloud of smoke for approximately 60 seconds. The smoke build-up is slower than White Phosphorus (WP) but the smoke cloud follows ground contours more closely and is more persistent.

The Charge system is assembled in brass cartridge cases, Normal (L35A1/A2) having five increments and Super (L36A2/A3), a unitary charge. Ignition is by an electric primer ([L10A1](#)) fitted in the cartridge base. Range performance is as follows:

- Charge 1 (L35A1/A2) - 2,500 to 5,700 m
- Charge 2 (L35A1/A2) - 2,700 to 7,200 m
- Charge 3 (L35A1/A2) - 5,900 to 9,500 m
- Charge 4 (L35A1/A2) - 7,900 to 12,200 m
- Charge 5 (L35A1/A2) - 15,300 m
- Super Charge (L36A2/A3) - 17,200 m.

Minimum ranges with Charge 1 and 2 require [L1A1](#) spoiler rings to be fitted to the nose of the shell.

Also available is the Cartridge 105 mm FD Training L45A1. See separate entry for details.

Specifications

Weight: nominal, 15.929 kg

Length, fuze: 548 mm

Filling: 3 × 849 g canisters containing SR 252/PN 800800

Max range: 17,200 m

Authorised fuzes

MT PD L34 or MT L92

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory
Dehu Road, Pune

Type: Shell 105 mm IFG BE Smoke

Description: Fitted with MT No 213 fuze. Contains four smoke canisters. Maximum range given as 11,000 m

Manufacturer

Indian Ordnance Factory, Khamaria
Jabalpur

Type: Shell 105 mm IFG BE Smoke

Description: Weight given as 16.9 kg with projectile length 465 mm

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Shell 105 mm FD Smoke BE L45A2, fuzed

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Shell 105 mm FD High-Explosive Squash Head (HESH) L42A3

Armament

FV433 Abbot; Indian Ordnance Factories [105 mm Light Field Gun](#).

Development

The 105 mm L43 series HESH was originally developed for the FV433 Abbot 105 mm self-propelled gun which has been withdrawn from service with the British Army. However, a number of Value Engineered Abbots (68) was supplied to [India](#) where ammunition similar to the L43 series HESH is still produced.

The 105 mm L43A3 HESH is not used with the [RO Defence 105 mm](#) L118 Light Gun and is no longer in production in the UK. A 105 mm HESH round is produced for the Indian [105 mm Light Field Gun](#) and FV433 Abbots in service with the army of the Indian Republic.

The 105 mm L43A1 and L43A2 HESH are obsolete.

The main producers of this round were Royal Ordnance (now [BAE Systems](#), RO Defence), Ammunition Division.

Description

The body of the 105 mm L43A3 HESH has very thin walls and a short rounded ogive, which provides

the projectile with a squat appearance that cannot be confused with the L31 HE series and other similar projectiles. The shell nose is closed by an aluminium alloy plug and there is a single driving band pressed into a ribbed groove machined into the end of the body. The rear of the body is internally screw threaded to accommodate an anodised aluminium alloy fuze subassembly which comprises the shell base, into which is fitted the L58A1 base percussion fuze. Four cavities in the base each accommodate an [L9A1](#) tracer together with its retaining plug; the tracers are ignited by the propelling charge. The base is strengthened by an aluminium plate screwed into the outside of it.

The ogive of the shell is filled with inert bitumen (composition RD 1061), separated from the main filling of 2.098 kg of RDX/WX8 and sealed at the rear by a waxed felt disc.

On impact the nose of the 105 mm L43A3 HESH projectile collapses so that the filling is spread as a 'plaster' across the target. Once the spreading action is complete, the base fuze detonates to transfer the detonation wave directly onto and through the target armour.

The maximum charge used with this projectile is Charge 4½. This is formed by removing the Charge 3 increment from the Full Charge 5.

The 105 mm Shell, Practice Squash Head (Prac SH) L41A1 is filled with 2.626 kg of an inert high-explosive substitute inside the body of the obsolete L41A1 service shell. The Shell, Practice Squash Head (Prac SH) L41A2 uses the shell body of the L41A2 (obsolete) or L41A3 service shell. These training projectiles have no base fuze but retain the four tracers. Neither of these training rounds remain in production in the UK.

Specifications

Weights:

shell, nominal - 10.546 kg

filling - 2.098 kg

Type of filling: RDX/WX8

Authorised fuzes

L58A1 base percussion

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory Khamaria
Jabalpur

Type: 105 mm IFG HESH

Description: Used with [105 mm Light Field Gun](#) and FV433 Abbot. Complete round weighs 17.69 kg with projectile weighing 11 kg. Filled with 2.128 kg of RDX/Wax 88:12. Muzzle velocity 693 m/s. Fitted with L29A3 base fuze and Tracer [No 30](#) in tail extension spike

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Shell 105 mm FD High-Explosive Squash Head (HESH) L42 with cross-sectioned example on the right (T J Gander)

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Terry J Gander

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Shell 105 mm FD HE L31A1, L31A2, L31A3, Fuzed

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#); Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

Development

Originally developed for the 105 mm L13A1 ordnance used on the [Vickers Defence Systems](#) FV433 Abbot self-propelled gun, the 105 mm L31 HE projectile series is now more widely used with the Royal Ordnance (now [BAE Systems](#), RO Defence) 105 mm L118 Light Gun as the Abbot has been withdrawn from service by the British Army. However, numbers of Value Engineered Abbots remain in service in [India](#) (68), and ammunition similar to the 105 mm L31 HE series has been produced in that country for them and for the locally produced Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

The main producers of this round are RO Defence, Ammunition Division.

In July 1995, the Spanish Army ordered 56 L118 Light Guns from Royal Ordnance (now [BAE Systems](#), RO Defence). Ammunition for these guns is loaded, assembled and packed in Spain by EXPAL and SANTA BARBARA.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are of the [M119A1](#)

standard with an L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

The 105 mm L31 HE shell is made from forged or cold-extruded high-tensile steel, formed into a streamlined and relatively thin-walled projectile to produce optimum fragmentation and blast effects. The resultant lethal area is stated to be about 25 per cent greater than that for the American 105 mm HE M1 equivalent, with higher consistency in range and accuracy.

A single copper driving band is fitted to the lower body. The baseplate is secured by either an overlapping spot weld or seam weld.

The 105 mm L31A1 HE main filling is 2.431 kg of RDX/TNT 60/40 Type A together with a filling of RDX/TNT 55/45 Type B. Nominal weight fuzed is 16.103 kg.

The L31A2 main filling is 2.3123 kg of creamed TNT. Nominal weight fuzed is 15.984 kg.

The L31A3 main filling is 2.392 kg of RDX/TNT 60/40 Type A topped with RDX/TNT or TNT. Nominal weight fuzed is 16.089 kg. The interior wall of the L31A3 shell cavity is bituminous coated while the walls of the L31A1 and L31A2 are copal varnished.

All three variants use a canned exploder containing approximately 142 g of RDX/WX8.

A groundburst detonation of a 105 mm L31 series HE projectile will result in a lethal area covering 588 m².

The Charge system is assembled in brass cartridge cases, Normal (L35A1/A2) having five increments and Super (L36A2/A3), a unitary charge. Ignition is by an electric primer ([L10A1](#)) fitted in the cartridge base. Range performance is as follows:

- Charge 1 (L35A1/A2) - 2,500 to 5,700 m
- Charge 2 (L35A1/A2) - 2,700 to 7,200 m
- Charge 3 (L35A1/A2) - 5,900 to 9,500 m
- Charge 4 (L35A1/A2) - 7,900 to 12,200 m
- Charge 5 (L35A1/A2) - 15,300 m
- Super Charge (L36A2/A3) - 17,200 m.

Minimum ranges with Charge 1 and 2 require [L1A1](#) spoiler rings to be fitted to the shell.

Also available is the Cartridge 105 mm FD Training L45A1 (see separate entry for details).

The inert drill round used to represent the 105 mm L31 HE series is the Drill Shell, 105 mm, Field, HE, [L1A1](#). It has a drill nose fuze (Drill Nose Fuze Percussion DA and Graze L83A1) representing an L32 service fuze, and a drill exploder. The filling is an inert high-explosive substitute.

Also available for training purposes is the RO 38-05A1 105 mm practice flash ammunition - (see separate entry for details).

Specifications

Weights: (all nominal)

L31A1 - 16.103 kg

L31A2 - 15.984 kg

L31A3 - 16.089 kg

Filling:

L31A1 - 2.431 kg RDX/TNT 60/40

L31A2 - 2.3123 kg TNT

L31A3 - 2.392 kg RDX/TNT 60/40 or 55/45

Length overall, fuzed: 550 mm

Max range: 17,200 m

Authorised fuzes

The L31A1 and L31A2 can use the PD Graze Delay L32, L85A2 and L112, the MT PD L33 and the VT L27

The L31A3 can use the PD Graze Delay L32, L85A1, L85A2, L112 and M557, the MT PD L33 and the VT L27

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factory, Khamaria
Jabalpur

Type: 105 mm QF - HE

Description: Fitted with PD Fuze 117 Mk 20. Weight of projectile is 16.4 kg and explosive charge given as 2.38 kg

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Shell 105 mm FD HE L31A1, L31A2, L31A3, Fuzed

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MORTARS - 120 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Indian Ordnance Factories organisation to provide a suitable illuminating bomb for Indian Army use.

Description

This illuminating bomb outwardly resembles the 120 mm HE mortar bomb (see previous entry), but the body carries a flare and parachute unit. A mechanical time fuze, which appears to be based on the British No 199, is mounted in the nose. When this fuze functions, ideally at an optimum height of 700 m, the flare and parachute are ejected to create a light output sufficient to illuminate a ground area over 1,200 m in diameter.

The propelling charge consists of a primary cartridge in the tail unit, plus seven secondaries in horseshoe containers clipped around the tailboom.

Specifications

Weight: 13.2 kg

Type of filling: flare and parachute assembly

Number of charges: P + 7

Muzzle velocity: Charge 0, 118 m/s; Charge 7, 331 m/s

Max range: 6,700 m
Light duration: >45 s

Manufacturer

Indian Ordnance Factory.

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MORTARS - 120 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Indian Ordnance Factory Board, based on [TDA M44](#) pattern.

Description

A forged steel bomb of conventional shape, with light-alloy tailboom and fins. The nose is threaded for the fuze and a light exploder container is pressed into the filling. A primary cartridge fits into the tailboom and seven secondary increments fit around it in horseshoe containers.

Specifications

Length, fuze: 680 mm

Weight, fuze: 13.03 kg

Weight and type of payload: 2.45 kg TNT

Number of charges: P + 7

Fuze: impact SQ and delay, DA4 or [V19P](#)

Min range: 500 m

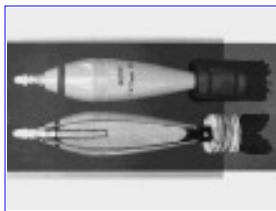
Max range: 6,650 m

Muzzle velocity: 118-331 m/s
Chamber pressure: 803.18 bar

Manufacturer

Indian Ordnance Factory Board.

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120 mm Indian HE bomb

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MORTARS - 81 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb

Armament

Indian [81 mm Mortar E1](#); US [M242](#), UK [L16](#) and similar mortars.

Development

By Indian Ordnance Factories, based upon UK originals.

Description

This bomb uses the same body, tail unit, fuze and propelling charge system as the HE bomb, but is loaded with Plasticised White Phosphorus (PWP). The nose carries an adaptor which has a short burster tube carrying an explosive burster charge. This, when detonated by the fuze, breaks open the bomb and disperses the PWP filling.

Specifications

Length, fuzed: 470 mm

Weight, fuzed: 4.2 kg

Weight and type of payload: 500 g PWP

Number of charges: P + 8

Fuze: impact SQ

Max range: 4,975 m

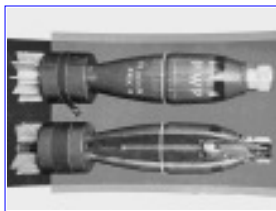
Muzzle velocity: 295 m/s

Duration of smoke: 20 s

Manufacturer

Indian Ordnance Factory Board.

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Indian 81 mm smoke bomb

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MORTARS - 81 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb

Description

This is generally to the same design as the British L36 bomb, a streamlined cast-iron bomb with obturating ring and alloy tail unit. A primary cartridge is fitted into the tailboom and up to eight secondary increments can be clipped around the boom in front of the fins.

Specifications

Length, fuzed: 470 mm

Weight, fuzed: 4.2 kg

Weight and type of payload: 705 g TNT

Number of charges: P + 8

Fuze: impact SQ

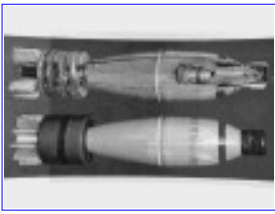
Max range: 4,975 m

Muzzle velocity: 295 m/s

Manufacturer

Indian Ordnance Factory Board.

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Indian 81 mm HE bomb

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MORTARS - 52 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

2 in smoke bomb Mk 2

Armament

2 in infantry mortars of British pattern.

Development

Based upon the British 'bomb, Smoke, ML 2 in Mortar'.

Description

Of similar shape to the HE bomb, the body is a thin steel tube, the head end of which is closed by a brazed-on cap and the rear end by a perforated alloy plug to which the six-fin steel tail unit is screwed. The perforations are covered internally by a waterproof membrane. The body is filled with hexachloroethane/zinc smoke composition. At the rear end of the filling is an ignition pellet and a delay composition. On firing, the flash from the propelling cartridge passes through the perforations in the rear body cap and ignites the delay composition. After a short delay the ignition pellet is fired and this, in turn, ignites the HCE smoke composition during the final stage of the bomb's flight. Smoke emission commences and after the bomb strikes the ground continues, via the holes in the rear body cap, for about 2 minutes.

Specifications

Weight: 907 g

Max range: 450 m

Duration of smoke emission: >120 s

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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2 in smoke bomb Mk 2

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MORTARS - 52 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

2 in illuminating bomb

Armament

2 in infantry mortars of the British pattern.

Development

By the Indian Ordnance Factory Board, based on earlier British designs.

Description

The bomb consists of a tubular thin steel body and is similar in shape to the HE bomb described above. Functioning is conventional via time delay fuze for parachute flare ejection at the optimum height of 183 m.

Specifications

Weight: 483 g

Maximum range: 153 m

Optimum burst height: 183 m

Duration of illumination: 30-35 s

Illuminating power: 2×10^2 cd

Colour/markings: white/black

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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MORTARS - 52 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

2 in HE bomb Mk 1

Armament

2 in infantry mortars of British pattern.

Development

Based upon the original British `bomb, HE, ML 2 in Mortar Mk 1', this was manufactured in [India](#) for the British Army before Independence. The mortar and its ammunition were retained and are still in use by the Indian Army.

Description

The bomb consists of a drawn steel body, to which a welded steel six-fin tail unit is attached by screwing to a spigot on the body. The walls are parallel and the nose screwed to accept a percussion fuze based on the British Fuze No 161. The bomb is filled TNT. The propelling charge consists of a primary cartridge inserted into the centre of the tail unit; no secondary charges are used and ranging is controlled solely by the elevation of the mortar barrel.

Specifications

Weight: 1 kg

Muzzle velocity: 84 m/s

Max range: 489 m

Max pressure: 11 Mpa

Lethal zone: 7.5 m

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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2 in HE bomb Mk 1

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MORTARS - 51 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm illumination bomb

Armament

UK Pattern 51 mm mortar

Development

By Indian Ordnance Factory Board, indigenous design.

Description

The illumination bomb is of conventional design with a tubular steel body, closed at the nose by a hemispherical steel cap and at the tail by a light-alloy fin unit. There is no conventional explosive fuze. Upon firing, a delay is ignited which after a short time ignites the ejecting charge, thereby blowing off the nose cap and ejecting the flare and parachute assembly. The delay is timed to eject the flare at maximum ordinate of the projectile's trajectory.

Specifications

Weight: approx 900 g

Duration of illumination: approx 39 s

Illumination area: approx 400 m

Colour/markings: light grey/black/red band

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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MORTARS - 51 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm smoke bomb

Armament

UK pattern 51 mm mortar.

Development

By Indian Ordnance Factory Board, based upon British Bomb, Smoke, 2 in Mortar Mk II.

Description

The bomb consists of a tubular steel body, closed at the head by a steel cap, and a light-alloy tail unit attached to the rear end. The body is filled with a hexachloroethane/zinc smoke mixture; in the centre rear is a filling of priming mixture and a central filling of ignition composition. The tailcone is perforated with two holes. The tail unit carries the usual central propelling cartridge; no secondary charges are used.

On firing, the flash from the propelling cartridge passes through the holes in the tailcone and fires the ignition composition. This, in turn, fires the priming mixture which takes a small time to burn through, thus allowing the bomb to pass its vertex before the ignition of the smoke mixture. The smoke then escapes through the holes in the tailcone as the bomb falls to the ground and after it has landed.

Specifications

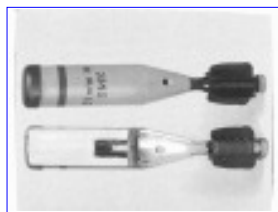
Weight: 935 g

Duration of smoke emission: >120 s
Max range: 850 m
Colour/markings: light olive/red band

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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51 mm smoke bomb

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MORTARS - 51 mm MORTARS, [INDIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm HE bomb HE-1A

Armament

UK pattern 51 mm mortar.

Development

By Indian Ordnance Factory Board, based upon the British [L1A1](#) bomb.

Description

This bomb is similar to the British original, with a tapering body containing a notched wire fragmentation coil and an explosive filling. The nose ends in an adaptor which accepts the fuze. The tail unit differs by having a short tailboom between the body and the eight fins. The propulsion system also differs by using a primary cartridge in the tail tube and a single secondary charge in a horseshoe-type container, which clips around the tail tube above the fins.

Specifications

Length, fuzed: 269 mm

Weight, fuzed: 950 g

Weight and type of payload: RDX/Wax

Number of charges: 2

Fuze: impact SQ No 152

Min range: 200 m

Max range: 850 m

Muzzle velocity: 107 m/s

Colour/markings: yellow/black tail boom/red band

Manufacturer

Indian Ordnance Factory Board,
10A Auckland Road, Calcutta.

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Indian 51 mm HE bomb

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [INDIA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge 105 mm FD Super L36A2/A3

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#); Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

Development

Originally developed for the 105 mm L13A1 ordnance used on the [Vickers Defence Systems](#) FV433 Abbot self-propelled gun, the L36A2/A3 Super cartridge is now used with the [RO Defence 105 mm](#) L118 Light Gun. Numbers of Value Engineered Abbots remain in service in [India](#) (68) and cartridges similar to the L36A2/A3 have been produced under licence in that country for them and for the locally produced Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

The main producers of this cartridge are RO Defence, Ammunition Division.

In July 1995, the Spanish Army ordered 56 L118 Light Guns from Royal Ordnance (now [BAE Systems](#), RO Defence). Ammunition for these guns is loaded, assembled and packed in Spain by EXPAL SA and SANTA BARBARA.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are of the [M119A1](#) standard with an L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

The 105 mm L36A2/A3 Super cartridge uses the same drawn brass cartridge case as the Normal L35A1/A2 and Training L45A5 cases, and the same [L10A1](#) electric primer in the base. With the L36A2/A3 there are no increments, the unitary propelling charge being contained inside a mid-brown cloth bag. With the L36A3 the propellant used is NQ/S 164-048 weighing approximately 2.863 kg. For the L36A2 the propellant used is N/S 164-048 weighing a nominal 3.349 kg. In both cases the stick-type propellant is bundled together for assembly inside the cloth bag before insertion inside the case. A sheet of lead foil is used as a decoppering agent. The case is closed by a moulded plastic sleeve.

Using the L36A2/A3 Super cartridge an L31 series HE shell can be fired to a maximum range of 17,200 m.

It is intended that this cartridge will be employed with the RO Defence Shell 105 mm, Field, Extended Range HE, X/RO 03E1 (see separate entry in this section).

Specifications

Weights:

complete case, L37A2 - 6.653 kg

complete case, L37A3 - 6.171 kg

propellant, L37A2 - 3.349 kg

propellant, L37A3 - 2.863 kg

Length, overall: 419 mm

Propellant type:

L37A2 - N/S 164-048

L37A3 - NQ/S 164-048

Case length: 326.5 mm

Diameter at flange: 127.51 mm

Diameter at mouth: 109.98 mm

Authorised fuzes

None involved

Equivalent rounds

[INDIA](#)

Manufacturer

Indian Ordnance Factories

Type: Cartridge, Super Charge, 105 mm IFG

Description: Standard specifications

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Cartridge 105 mm FD Super L36A2/A3

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm FD Normal L35A1/A2

Armament

[RO Defence 105 mm](#) L118 Light Gun; FV433 Abbot; RDM 105 mm [M101/37](#); Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

Development

Originally developed to contain all propelling charges used for all projectiles fired from the 105 mm L13A1 barrels on the [Vickers Defence Systems](#) FV433 Abbot self-propelled gun, the L35A1/A2 cartridge is now mainly used with the [RO Defence 105 mm](#) L118 Light Gun. Numbers of Value Engineered Abbots remain in service in [India](#) (68), and cartridges similar to the L35A1/A2 have been produced in that country for them and the locally produced Indian Ordnance Factories [105 mm Light Field Gun](#) and 105 mm Field Gun.

The main producers of this cartridge are RO Defence, Ammunition Division.

In July 1995, the Spanish Army ordered 56 L118 Light Guns from Royal Ordnance (now [BAE Systems](#), RO Defence). Ammunition for these guns is loaded, assembled and packed in Spain by EXPAL SA and SANTA BARBARA.

[RO Defence 105 mm](#) Light Guns are in service in at least 18 countries. Well over 1,000 units have been produced.

It should be noted that the 105 mm Light Guns deployed by the US Army are [M119A1](#) standard, with an L119 ordnance firing ammunition of the 105 mm HE M1 family.

Description

All natures of cartridge used with the 105 mm L13 and L118 guns employ the same case which is made of drawn brass. The base is fitted with an [L10A1](#) electric primer. For transport and safety the base is normally kept covered by an L2A1 cartridge clip.

There are four of the five propellant increments contained within the cartridge case. The fifth is held inside a moulded polystyrene (L35A1) or fibre (L35A2) cap with an interrupted right-hand thread to allow the holder to be screwed into the case using four indentations around the rim of the case mouth. If Charge 5 is not used the charge holder is replaced by a moulded polystyrene lid.

The increments are as follows:

No 1 467.77 g of propellant N 017 in a signal red cloth bag

No 2 141.75 g of propellant N 107 in an undyed (natural) cloth bag

No 3 283.5 g of propellant N 107 in a light blue cloth bag

No 4 602.43 g of propellant N/S 123 plus a decoppering sheet of lead foil in a light orange cloth bag

No 5 907.184 g of propellant N/S 164-048 plus a decoppering sheet of lead foil contained in a green bag held in a moulded holder screwed into the mouth of the cartridge case.

Charge 1 consists of Increment No 1. Charge 2 uses Increments Nos 1 and 2, and so on up to Charge 5 which includes all the increments combined. It is possible to create a Charge 4½ by combining Charges 1, 2, 4 and 5; this charge was used as a field expedient with British Army HESH projectiles.

The Charge range performance is as follows:

Charge 1 - 2,500 to 5,700 m

Charge 2 - 2,700 to 7,200 m

Charge 3 - 5,900 to 9,500 m

Charge 4 - 7,900 to 12,200 m

Charge 4½ - 8,700 to 13,600 m

Charge 5 - 15,300 m.

Specifications

Weights:

case complete, nominal - 5.693 kg

propellant charge, nominal - 2.392 kg

Length, overall: 520.8 mm

Propellant type: see text

Case length: 326.5 mm

Diameter at flange: 127.51 mm

Diameter at mouth: 109.98 mm

Authorised fuzes

None involved

Equivalent rounds

[INDIA](#)

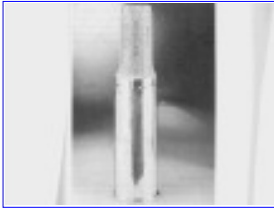
Manufacturer

Indian Ordnance Factories

Type: Cartridge 105 mm IFG

Description: Standard specifications. Charges held in cambric bags

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Cartridge, 105 mm FD Normal L35A1/A2

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MORTARS - 81 mm MORTARS, [INDONESIA](#)

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb GMO-8 PE A1

Armament

All 81 mm mortars.

Development

By P T Pindad, based upon the Soltam M64 design.

Description

A streamlined forged steel bomb, with a plastic obturating ring behind the bourrelet. The nose is threaded for a fuze and the rear formed into a threaded spigot to accept the alloy tailboom and fin unit. A primary cartridge fits into the end of the tailboom and up to eight horseshoe secondary increments can be clipped around the tailboom above the fins.

Specifications

Length, fuzed: 490 mm

Weight, fuzed: 4.6 kg

Type of payload: 740 g TNT

Number of charges: P + 8

Fuze: M-111 B1 PD

Min range: 100 m

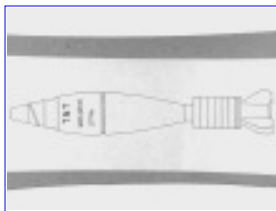
Max range: 6,500 m

Muzzle velocity: 67-353 m/s

Manufacturer

P T Pindad.

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81 mm HE bomb GMO-8 PE A1

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MORTARS - 60 mm MORTARS, [INDONESIA](#)

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb GMO-6 PE A2

Armament

Any 60 mm mortar.

Development

Designed by Tampella, produced under licence by P T Pindad.

Description

This bomb has a forged steel body of modern streamlined shape and is fitted with an obturating ring in a groove around the bourrelet. A light-alloy tail unit has canted fins to give roll stabilisation. The propelling system consists of a primary cartridge in the tail tube and up to six secondaries clipped around the boom in horseshoe containers.

Specifications

Length, fuzed: 351 mm

Weight, fuzed: 1.86 kg

Type of payload: 330 g TNT

Number of charges: P + 6

Fuze: M111B1 or DM 111A2 impact SQ

Min range: 200 m

Max range: 4,000 m

Muzzle velocities: 89-258 m/s

Manufacturer

P T Pindad.

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60 mm HE bomb [GMO-6 PE A2](#)

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MORTARS - 60 mm MORTARS, [INDONESIA](#)

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb GMO-6 PE A1

Armament

60 mm Commando and other short mortars.

Development

By Tampella, licensed to PT Pindad.

Description

This is a streamlined, modern pattern, forged steel bomb. It has four gas check rings around the bourrelet and a light-alloy tail unit screwed into the rear end. The four fins are slightly canted off the bomb axis, so as to induce a degree of roll stabilisation into the bomb's flight, which probably improves the accuracy and consistency. The propellant charge consists of a shotgun type primary cartridge inserted into the tail tube and a single secondary charge in a horseshoe container which clips around the tail tube ahead of the fins.

Specifications

Length, fuzed: 300 mm

Weight, fuzed: 1.62 kg

Type of payload: 200 g TNT

Number of charges: 1

Fuze: M111B1 or DM 111A2 impact SQ

Min range: 50 m

Max range: 800 m

Muzzle velocities: 57 m/s, P only; 95 m/s, P + 1

Fuze: M-111 B1 PD

Manufacturer

P T Pindad.

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60 mm HE bomb [GMO-6](#) PE A1

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ARTILLERY ROCKETS

Date Posted: 12 July 2001

Jane's Ammunition Handbook 2001-2002

FZ LAU-97 70 mm rockets

Armament

70 mm 40-tube LAU-97 MRS; [NDL-40](#) 70 mm 20-tube MRS ([Indonesia](#)).

Development

The 70 mm LAU-97 MRS was developed during the late 1970s and early 1980s by the Belgian Forges de Zeebrugge SA (FZ). They produced a 40-tube light artillery rocket launch system designed to utilise the FZ-68 70 mm rocket motor and an associated series of warheads. The FZ-68 was developed with the objective of smoke reduction at launch, reduced corrosion effects, improved accuracy and a higher launch velocity, all compared to existing 70 mm aircraft rockets. The resultant 70 mm FZ LAU-97 rockets can be launched from helicopters as well as the ground launchers. The LAU-97 launcher can utilise rockets with MK 40 and other similar rocket motors but with a resultant reduction in range.

In 1985, Industri Pesawat Terbang Nusantara [Indonesia](#) (IPTN), took out a licence to produce 70 mm FZ LAU-97 rockets and went on to develop its own 20-tube MRS, the [NDL-40](#). The scheduled complete development and certification phase for the [NDL-40](#) was late 1994; the present status of this programme is now uncertain.

The 70 mm FZ LAU-97 rockets are used as the subcalibre rocket component of the Royal Ordnance Reduced Range Practice Rocket ([RRPR](#)) system for the 227 mm [MLRS](#) (qv). Three ballistically matched warheads are involved for this role: indicating pyrotechnic with a strong signal in the visible and infra-red spectrums; HE (TNT) with an impact fuze; and completely inert.

Description

The 70 mm fin-stabilised FZ LAU-97 rockets utilise the FZ-68 rocket motor which uses 3 kg of solid double-base propellant, extruded in a single grain with a revised geometry compared to other similar motors. The motor is intended to burn at a 'dual' rate which, combined with the multispiral grooved single exhaust nozzle and rearwards-folding fin assembly, considerably reduces the exhaust signature at launch and produces a burnout velocity of 715 m/s after a burn time of 2.3 seconds. The complete motor weighs 5.7 kg and is 1.03 m long.

The maximum range is 8,000 m which is reduced to 7,500 m if MK 40 rocket motors are involved. Time of flight to the maximum range is 45 seconds. The circular area of probability is 170 m.

The FZ-68 rocket motor can be fitted with one of up to nine interchangeable warheads. These warheads can also be used with other types of 70 mm rocket.

FZ-71 FRAG-HE This warhead, weighing 4.3 kg, may be considered as the standard for the series. On impact, its steel casing shatters into more than 8,000 effective fragments which are scattered over a lethal radius of 21 m. The nose-mounted impact fuze will function at a minimum impact angle of 5°.

FZ-49 AP Up to 400 mm of armour can be penetrated by the shaped charge of this warhead while at the same time some 1,200 anti-personnel fragments are produced. Weight is 3 kg.

FZ-58 HEAP This warhead is intended for use against any target which requires a degree of penetration before detonating and has a penetrating and anti-ricochet plug in the nose. A base fuze is fitted. Weight is 4.52 kg.

FZ-63 Incendiary Intended for producing screening smoke, as an incendiary or for target marking, this nose-fuzed warhead contains White Phosphorus (WP). Weight is 4.15 kg.

FZ-85 PFHE This nose-fuzed warhead has a prefragmented warhead casing intended for the attack of light armour or soft-skinned vehicles. Over 3,000 fragments are produced. Weight is 4.3 kg.

FZ-86 Smoke Produces thick screening smoke which is generated for more than 4.5 minutes after ejection during flight. Weight is 4.3 kg and length is 730 mm.

FZ-100 Cargo Contains nine dual-purpose bomblets, each filled with 110 g of compressed hexogen and weighing 480 g. The shaped charge can penetrate 105 mm of armour plate and scatter anti-personnel fragments over a radius of 10.5 m. The impact-fuzed bomblets are ejected from the warhead after a delay-adjustable time fuze in the nose functions when the rocket is over a target area. This warhead weighs 6.7 kg and is 730 mm long.

M257 Illuminating This warhead contains a flare assembly which is ejected from the warhead in flight and descends on a small parachute, providing 1 million cd for 120 seconds. Weight is 4.9 kg.

FZ-32 Practice Produces a smoke cloud which lasts for 10 to 15 seconds after impact. Weight is 2.9 kg.

Some references also mention Flechette and Chaff warheads but no information regarding these is available.

Specifications

Calibre: 70 mm

Weights:

rocket motor - 5.7 kg

warhead, FZ-71 - 4.3 kg
propellant - 3 kg
Length, rocket motor: 1.03 m
Max range: 8,000 m
Burnout velocity: 715 m/s
Initial velocity: 55 m/s
Motor burn time: 2.3 s

Authorised fuzes

See text

Equivalent rockets

INDONESIA

Manufacturer

Industri Pesawat Terbang Nusantara [Indonesia \(IPTN\)](#)

Type: FZ-68 rocket motor and FZ-71 FRAG-HE warhead

Description: Licence production since 1985 - current status uncertain, see text.

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Loading an FZ LAU-97 70 mm rocket into an Indonesian [NDL-40](#) 20-tube MRS

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MORTARS - 120 mm MORTARS, INTERNATIONAL

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm Precision-Guided Mortar Munition (PGMM)

Development

In 1975, Diehl was awarded a contract by the former West German Ministry of Defence, to perform a feasibility study into a terminally guided mortar projectile. Bodensee Werk Geratetechnik, AEG and Eltro were also involved in the project. The projectile which resulted from this study was the Diehl Bussard (Buzzard).

The objective of the study was to combine the advantages of traditional gun-launched projectiles with those of guided missiles. This would mean the resulting munition could be used from existing ordnance; has a high first-round hit probability, even against moving targets; and would permit engaging armoured targets in the top attack mode. Successful firings of the first development models took place in 1983 with, at one point, three out of three direct hits being attained.

By the mid-1980s, the Bussard project had been suspended for funding reasons, only to be revived when the US Army issued a requirement for a 120 mm Precision Guided Mortar Munition (PGMM) for deployment with the [M120/121](#) 120 mm Battalion Mortar System (qv). Lockheed Martin joined with Diehl for the selection contest. In October 1994, they were awarded a Phase I critical components demonstration contract to continue development, along with another team formed by [British Aerospace](#), Alliant Techsystems and Rockwell, which proposed an enlarged Merlin 81 mm terminally guided mortar projectile allied with a Hellfire missile warhead. Two other contestants, Saab Missiles and Hercules, were eliminated from the PGMM contest at that stage.

In June 1995, it was announced that the Lockheed Martin/Diehl PGMM submission had been selected as the sole entrant for Phase II of the PGMM programme. A US\$10.8 million advanced technology

demonstration contract was awarded by the US Army Armament Research, Development and Engineering Center (ARDEC) to permit Lockheed Martin/Diehl to manufacture seven prototype rounds, later increased to 10, for live test firing to be held at Yuma Proving Ground, Arizona, from late 1997 onwards. A prototype PGMM round was fired from the Meldorf Proving Grounds in Germany during November 1995 and reached a range of more than 6,500 m.

The PGMM can be fired from all existing 120 mm ground-mounted or self-propelled mortars, including the Lockheed Martin 120 mm lightweight composite mortar. No attachments, assembly before use or sustainer propellant sections are required.

Description

The 120 mm PGMM is based on the Diehl Bussard but considerably revised to meet the PGMM requirements. It is a passive, gliding, intelligent 120 mm mortar munition with a maximum range of 15,000 m.

The nose of the projectile contains the seeker section, comprising a low-cost cooled mid-wave infra-red sensor, the associated processor, and gyro units. A mid-body section contains thermal batteries, power conditioning and four switch-blade wings. This section is followed by the warhead, comprising a tandem shaped charge, the fuze and the safe and arm unit. The tandem shaped charge is taken from the German Panzerfaust 3 anti-armour weapon series (produced by Dynamit Nobel) and enables the PGMM to be deployed against targets such as bunkers as well as armoured targets.

The tail section contains the control activation system, the four control fins and the fin deployment mechanism. The propulsion system, including the igniter, is at the rear (base) of the projectile body.

The PGMM can be operated in two modes. One is the Man-in-the-Loop mode where the projectile is guided by a laser designator operated by a forward observer; the projectile uses its imaging infra-red seeker to detect and track the designated target. For the Fire-and-Forget mode the PGMM operates autonomously, using the same imaging infra-red sensor as before but in conjunction with a target image processor. In this mode the projectile can detect and acquire both moving and stationary targets emitting infra-red radiation.

Before deploying the PGMM and following a call for a fire mission, the usual ballistic calculations are made at a fire direction centre and fire orders are given to a 120 mm mortar team. The PGMM is then loaded and fired in the normal manner. The onboard thermal batteries are activated by the launch acceleration and begin to power the system electronics. Immediately after launch the tail fins deploy to provide aerodynamic stability.

After the apogee of the trajectory the wings deploy and the projectile commences a relatively straight line target acquisition glide trajectory toward the target area. For a laser-guided mission the seeker searches for a designated target. If laser radiation is detected the autopilot assumes a Man-in-the-Loop operation and begins homing on the signal, following the laser signal to the target. During an autonomous fire mission the infra-red scene is evaluated for potential targets and the PGMM then homes onto the highest ranked infra-red signature. The seeker can search a 500×500 m footprint although this could be upgraded to $1,000 \times 1,000$ m.

In both modes, close to the end of the homing phase and as the target resolution improves, a target aimpoint is computed before the hit.

Specifications

Calibre: 120 mm

Length: 965 mm

Weight: 17.2 kg

Range: max, 15,000 m; min, 500 m

Storage life: 10 years

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MORTARS - 120 mm MORTARS, [IRAN](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket assisted HE bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Defence Industrial Organisation to provide an extended range HE bomb. History unknown.

Description

The bomb consists of a steel body, internal solid-fuel rocket motor and HE filling. The body is streamlined with a tail boom holding the initiating charge and nine horseshoe-shaped propellant increments. There are six evenly spaced gas check rings just behind the ogive. Once the bomb is fired and en route to its target, the rocket motor initiates during the final few seconds of the flight, adding approximately 4 km range over conventional bombs. When the motor fires, the tail boom separates from the body.

Specifications

Length, fuze: 740 mm

Weight, fuze: 16 kg

Payload: Composition B (RDX/TNT)

Fuze: impact, AZ111

Max range: 10.5 km

Muzzle velocity: 266 m/s

Status: In production; available.

Manufacturer

Defence Industrial Organisation, Ammunition Group.

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MORTARS - 120 mm MORTARS, [IRAN](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke WP bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Defence Industrial Organisation, development history unknown.

Description

The 120 mm white phosphorus smoke bomb is essentially similar in design to the 120 mm HE bomb described above except for payload and fuze.

Specifications

Length, fuzed: 585 mm

Weight, fuzed: 12.9 kg

Type of payload: 2.2 kg, white phosphorus

Number of charges: P + 9

Fuze: impact and super-quick AZ111A2

Max range: 6,100 m

Muzzle velocity: 301 m/s

Colour/markings: light green/red

Status: In production; available.

Manufacturer

Defence Industrial Organisation, Ammunition Group.

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*120 mm smoke WP bomb
(2000)*

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MORTARS - 81 mm MORTARS, [IRAN](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb M301A2

Armament

All medium pressure 81 mm mortars.

Development

Development history unknown. Probably copied from US designs by Defence Industries Organisation, [Iran](#).

Description

A conventional cylindrical bodied illuminating bomb of steel, consisting of the body, a mechanical time fuze and a tapered rear portion containing the parachute with a screwed on tail boom assembly with 12 stabilising fins. There is a single propelling increment attached to the tail boom. The bomb appears virtually identical to the US [M301](#) series illuminating bombs. The bomb also has what appears to be a direct copy of the US M84A1 time fuze.

Specifications

Length, fuzed: 571 mm

Weight, fuzed: 4.5 kg

Payload weight: 580 g

Fuze: Mechanical time, M84A1

Illuminating intensity/time: 500,000 cd/60 s

Rate of descent: 5-6 m/s
Muzzle velocity: 192 m/s
Max range: 2,150 m

Manufacturer

Defence Industries Organisation, Ammunition Group.

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MORTARS - 81 mm MORTARS, [IRAN](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke WP bomb

Armament

All 81 mm medium pressure mortars.

Development

Development history unknown; by Defence Industries Organisation, Ammunition Group.

Description

A symmetrical streamlined bomb of modern design, similar to the HE bomb described elsewhere. The body is of steel with four gas check rings, a tail boom assembly and eight stabilising fins. There are seven propelling increments surrounding the tail boom in addition to the internal initiating charge.

Specifications

Length, fuzed: 380 mm

Weight, fuzed: 4.05 kg

Weight and type of payload: 450 g, white phosphorus

Number of charges: P + 7

Muzzle velocity: 270 m/s

Max range: 4,700 m

Colour/markings: light green/red

Manufacturer

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FIELD ARTILLERY

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Projectile, 155 mm: Illumination, M118 Series

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The 155 mm Illumination M118 series can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The 155 mm Illumination M118 series can also be fired from the self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon

HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The M118 series of 155 mm illuminating projectiles were developed for battlefield illumination during the Second World War, originally for use with the towed 155 mm Howitzer M1. Although still in service and production, they have been largely superseded by later illuminating projectiles such as the 155 mm Illumination M485A1 and M485A2 (see following entry) in both ballistic and illumination terms. The 155 mm Illumination M118A2 series is now the only version likely to be used by the US armed forces.

The German Army equivalents to the 155 mm Illumination M118 series are the DM 16A1 and the DM 26.

The Bofors 155 mm JUSTUS illuminating projectile was based on the design of the 155 mm Illumination M118; the 155 mm JUSTUS is no longer in production.

Description

The most commonly encountered member of the 155 mm Illumination M118 series is the 155 mm Illumination M118A2. This is a separate loading illuminating munition with a hollow steel shell, a relatively blunt ogive and straight sides. A steel base plug is held secured to the shell body by shear and twist pins and a gilding metal drive band encircles the projectile close to the base. A threaded lifting plug is screwed into the fuze well in the nose cavity during storage, transport and handling.

The hollow shell interior contains an expulsion (ejection) charge, a canister assembly and a parachute assembly. In operation a nose-mounted MTSQ M501 series fuze functions (ideally at a height above ground of around 640 m), igniting the 53.5 g expulsion charge, contained in a tube running from the fuze, to a perforated baffle plate positioned on top of the canister assembly. The charge creates internal pressure which enables the canister assembly to rupture the shear and twist pins in the base and drive off the base plug. The canister assembly is then ejected from the base. The expulsion charge also ignites the 1.95 kg of illuminating compound inside the canister via a small 'first-fire' charge. At the same time a centre wire, essentially part of the parachute suspension system, passes through a hole in the centre of the canister to a release sleeve soldered on to the wire. The burning illuminant melts the solder so that the release sleeve functions, releases the wire and enables the parachute to deploy and suspend the flare body to burn for approximately 60 seconds with an intensity approaching 1 Mcd.

The 155 mm Illumination M118 projectiles are fired using M3A1/M4A2 bagged charges and [M119/M119A1](#) unitary charges only. The [M203](#) charge is not used.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is

533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required) and the base igniter contains black powder.

The Propelling Charge M4 is a white bag charge differing from the [M4A1](#) as it consists of a base charge and two increments only for firing as Charges 5 to 7. The M2 flash reducer pad is used with this charge.

The M3 and M4 series of charges are fired using the MK2A4 or [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn onto the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

When firing the 155 mm Illumination M118 series from the 155 mm M126/M126A1 Cannon used on the [M109](#) self-propelled howitzer the following ballistic data is produced:

Charge 1 (M3 green bag) - MV 200 m/s - range 2,600 m
Charge 2 (M3 green bag) - MV 228 m/s - range 3,600 m
Charge 3 (M3 green bag) - MV 259 m/s - range 4,700 m
Charge 4 (M3 green bag) - MV 298 m/s - range 6,100 m
Charge 5 (M3 green bag) - MV 355 m/s - range 7,800 m
Charge 3 ([M4A1](#) white bag) - MV 270 m/s - range 5,100 m
Charge 4 ([M4A1](#) white bag) - MV 309 m/s - range 6,500 m
Charge 5 ([M4A1](#) white bag) - MV 360 m/s - range 8,000 m
Charge 6 ([M4A1](#) white bag) - MV 443 m/s - range 9,700 m
Charge 7 ([M4A1](#) white bag) - MV 536 m/s - range 11,600 m.

When firing the 155 mm Illumination M118 series from the 155 mm M199 Cannon used on the [M198](#) towed howitzer the following ballistic data is produced:

Charge 2 ([M3A1](#) green bag) - MV 239.8 m/s - range 5,000 m
Charge 3 ([M3A1](#) green bag) - MV 280.8 m/s - range 6,500 m
Charge 4 ([M3A1](#) green bag) - MV 322.9 m/s - range 8,300 m
Charge 5 ([M3A1](#) green bag) - MV 380.1 m/s - range 9,800 m
Charge 3 (M4A2 white bag) - MV 296.5 m/s - range 7,200 m
Charge 4 (M4A2 white bag) - MV 340.9 m/s - range 8,900 m
Charge 5 (M4A2 white bag) - MV 398 m/s - range 10,300 m
Charge 6 (M4A2 white bag) - MV 482 m/s - range 12,400 m
Charge 7 (M4A2 white bag) - MV 574.3 m/s - range 14,800 m
Charge 8 ([M119/M119A1](#)) - 684.3 m/s - range 18,100 m.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are currently in the process of adopting similar modular charge systems.

Specifications

Weights:

fuzed - 46.75 kg

unfuzed - 46.27 kg

illuminating filler - 1.95 kg

expulsion charge - 53.5 g

Lengths:

with lifting plug - 594.36 mm

with fuze - 615.7 mm

Flare burning time: up to 60 s

Operating temperature range: -32 to +52°C

Authorised fuzes

MTSQ M501 series

Equivalent projectiles

[IRAN](#)

Manufacturer

Defence Industries Organisation, Ammunition Group

Type: 155 mm Illuminating

Description: Believed to be based on M118 series. Weight 42 kg with maximum range 15,000 m

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Illuminating IM160A2

Description: Similar to 155 mm Illumination M118A2. Flare unit (weight 2.15 kg) burns for approximately 70 seconds producing 1.2 Mcd. Projectile weight 46.25 kg

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: 155 mm Illumination M118A2

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 155 mm Illumination M118A2

Description: Standard US specifications. No longer in production but available on request

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

RO Defence 120 mm tank gun ammunition

Armament

120 mm L11 tank gun; 120 mm L30A1 (CHARM) tank gun.

Development

British 120 mm tank guns are rifled as opposed to the smoothbores of the Rheinmetall DeTec and similar 120 mm tank guns. The first service version of the current 120 mm guns was the L11. The L11 was fitted to the [Chieftain](#) series and [Challenger 1](#) MBTs (the earlier Conqueror used an entirely different gun and ammunition family) and was developed to the L11A5 stage. Development work was also carried out on a series of next-generation 'Modern Technology' tank guns, which resulted in the 120 mm L30A1 (CHARM - CHallenger ARMament) gun fitted to the [Challenger 2 MBT](#) and, at one time, destined to be retrofitted to the [Challenger 1](#).

The L30A1 gun can continue to fire the existing range of Royal Ordnance (now [BAE Systems](#), RO Defence) 120 mm ammunition (apart from the APDS L15) and new high-performance APFSDS projectiles. However, the L30 gun uses a new propellant charge system, the L14, to fire APFSDS. The L14 propellant system, which is based on rigid Combustible Case Charges (CCC), was modified to allow it to be used operationally with L11 guns during Operation Granby/Desert Storm. The code word for this project was Jericho.

Description

All [RO Defence 120 mm](#) tank gun ammunition is manually separate loaded, although the bundled stick

propellant charges may be loaded in either calico bags or as rigid thin-walled CCC; at one time bagged charges were used for all types of projectile. All charges are ignited electrically via vent tubes fed from a vent tube loader. The vent tubes may be the L3 for the L11 gun or L4 for the L30 gun.

The main types of projectile involved are as follows:

APFSDS L23 This is the main projectile used for the attack of armour and involves a monobloc tungsten nickel copper long rod penetrator carried in a light alloy sabot. The penetrator rod uses six aluminium fins. The projectile assembly is fired using an L8 CCC containing 6.65 kg of AX/S64-20 triple-base propellant in stick form. It can also be fired using a modified L14 CCC. Muzzle velocity is 1,534 m/s and the maximum effective range is given as 3,500 m.

APFSDS L26 Originally the XL26E1, this projectile is intended for use in the 55 calibre L30 gun currently used on the [Challenger 2 MBT](#) and, at one time, intended to be retrofitted to the [Challenger 1](#). The original CHARM 1 system version of this projectile used a Depleted Uranium (DU) penetrator rod. For the L30 gun the L26 is fired using the L14A1 or L14A2 CCC which contains RDX-based propellant in stick form. This projectile can also be fired from L11 guns using the L8 or L12 charges. The total weight of this projectile is 8.5 kg and it is 525 mm long overall.

APFSDS L27 This is known as the CHARM 3 APFSDS, with a greater Depleted Uranium (DU) penetrator length-to-diameter ratio than earlier models and is thus 'significantly more effective'. Integration development of the CHARM 3 round began during the early 1990s but was delayed from 1997 onwards by a lack of ranges suitable for firing trials within the UK. Even so the APFSDS L27A1 became available for service with British Army [Challenger 2 MBT](#) regiments during 1999, ahead of the planned schedule. The L27A1 is fired using the [L16A1](#) CCC.

A competition to provide a CHARM 3 Training Round (C3TR) for the L27 was won by RO Defence at the end of 1999. The 120 mm C3TR consists of a charge and a sabot projectile assembly and, following development, is manufactured at Birtley and Glascoed.

APFSDS L28 This is basically a L27A1 round with the DU penetrator replaced by a tungsten-nickel-iron component manufactured by RO Speciality Metals. The propellant charge remains the [L16A1](#) CCC filled with FX insensitive propellant. The APFSDS L28 was developed specifically for [Challenger 2](#) L30A1 tank guns but could be fired from the earlier [Challenger 1](#) L11 gun following fire-control system modifications and alterations to the ammunition stowage to accommodate the increased round length compared to that of the L23 round. The L28 is not yet in production.

APDS L15 The APDS round was the original anti-armour element of the 120 mm L11 series tank gun ammunition family. While it has been largely replaced as the primary anti-armour round by APFSDS rounds the APDS L15 remains a potent armour-piercing munition with a high hit probability at combat ranges; it has been estimated that the APDS L15 can penetrate 355 mm of armour at 1,000 m. The subprojectile is stated to be capable of penetrating the armour of most current MBTs at battle ranges. The APDS L15 uses a dense tungsten alloy penetrator subprojectile carried in a light alloy sabot. The projectile assembly is fired using the L4 CCC which contains 8.4 kg of NQ/S53-12 propellant. Muzzle velocity is 1,370 m/s.

120 mm APDS L15 is not fired from the L30 gun.

DS/T Prac L20A1 This is a relatively low-cost training projectile with the subprojectile penetrator made from steel with a light alloy nose. The DS/T Prac L20A1 subprojectile matches the trajectory of the APDS L15 out to 1,100 m, after which it requires a much smaller safety trace than the operational L15 subprojectile (the L20A1 also extends barrel life). The L20A1 can also be used as a training equivalent to the APFSDS L23 out to a range of 2,000 m. The DS/T Prac L20A1 is fired using the L5 CCC which contains 5.16 kg of NQ/S27-09 propellant. Muzzle velocity is 1,451 m/s.

British Army consumption of the DS/T L20A1 was forecast to run at about 60,000 units per year until 1998.

HESH L31 The HESH L31 is employed as a general purpose round with a good anti-armour performance as it is capable of defeating a NATO heavy single target at all ranges up to a maximum of 8,500 m; it can also be used in the indirect fire role. The projectile consists of a thin-walled projectile with a rounded ogive filled with 4.2 kg of RDX/Wax explosive detonated by a base percussion fuze. As with other projectiles of its nature, when the HESH L31 projectile strikes a target the thin walls collapse to allow the explosive to be spread over the surface of the target before the base fuze functions. The resultant detonation creates shock waves which force off a large high-velocity scab of material from the inner surface of the target armour. The latter capability makes the HESH L31 projectile effective against fortifications and structures as well as armoured targets. The HESH L31 is fired using the L3 bag charge containing 3.04 kg of NQ/S27-09 triple-base propellant. Muzzle velocity is 670 m/s.

SH/Prac L32A6 This training projectile is used to simulate the operational HESH L31 which it matches ballistically. The SH/Prac L32A6 is available in a completely inert form, filled with an inert HE substitute (a composition of calcium sulphate and castor oil), or an inert HE substitute plus a live fuze and a flash pellet for spotting purposes. Four small tracers are housed in the projectile base. As with the HESH L31, the SH/Prac L32A6 is fired using the L3 bag charge containing 3.04 kg of NQ/S27-09 propellant. Muzzle velocity is 670 m/s.

British Army consumption of the SH/Prac L32A6 was forecast to run at about 20,000 units per year until 1998.

WP Smoke L34 In visual appearance and ballistic performance, the WP Smoke L34 matches the HESH L31. It is a bursting type of smoke projectile with which an internal burster charge is used to break open the projectile's steel walls to release the White Phosphorus (WP) contents weighing 4.2 kg. The WP then rapidly creates a visually opaque smoke screen which lasts for at least 30 seconds, depending on the ambient weather conditions. The WP Smoke L34 is fired using the L3 bag charge containing 3.04 kg of NQ/S27-09 propellant. Muzzle velocity is 670 m/s. If required, the SH/Prac L32 can be used as a training projectile for the WP Smoke L34.

A Canister projectile was developed for use with the L11 gun but it was not placed in production. It was fired using the L3 bag charge and discharged pellets lethal against unprotected personnel up to a range of 200 m from the gun muzzle.

Drill ammunition, consisting of inert projectiles and charges, is available.

Specifications

Type	APFSDS	APDS	HESH
Designation	L23	L15	L31
Weights:			
Projectile	8 kg	10.36 kg	17.1 kg
Propellant	6.65 kg	8.4 kg	3.04 kg
Projectile length	512 mm		511 mm
Type of propellant	AX/S64-20	NQ/S53-12	NQ/S27-09
Muzzle velocity	1,534 m/s	1,370 m/s	670 m/s
Type	WP Smoke	DS/T Prac	SH/Prac

Designation	L34	L20	L32
Weights:			
Projectile	17.3 kg	5.8 kg	17.1 kg
Propellant	3.04 kg	5.16 kg	3.04 kg
Projectile length	511 mm	300 mm	508 mm
Type of propellant	NQ/S27-09	NQ/S27-09	NQ/S27-09
Muzzle velocity	670 m/s	1,451 m/s	670 m/s

Authorised fuzes

APFSDS and APDS - none involved
HESH and WP Smoke - BD, type not specified

Equivalent rounds

IRAN

Manufacturer

Defence Industries Organisation, Ammunition Division

Type: 120 mm HESH

Description: Understood to be based on HESH L31 but projectile weight given as 16.65 kg containing 3.55 kg of an unspecified explosive. Propellant weight is 2.73 kg and muzzle velocity 670 m/s. Maximum range is 2,530 m. Base fuze given as BZ 120

UPDATED



RO Defence 120 mm tank gun projectiles, from left: APFSDS-T L23A1; DS/T Prac L20A1; HESH L31A7; SH/Prac L32 and WP Smoke L32 (T J Gander)



RO Defence 120 mm APFSDS-T L26 CHARM 1 projectile



Model of 120 mm APFSDS-T CHARM 3 projectile



Cross-section drawing of projectile assembly for 120 mm APFSDS-T L23 produced by RO Defence (2000)



*Cross-section drawing of Smoke WP L23 projectile produced by RO Defence
(2000)*

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Terry J Gander

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MORTARS - 120 mm MORTARS, [IRAN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Defence Industrial Organisation, development history unknown.

Description

The 120 mm illuminating bomb is essentially similar to the WP smoke and HE bombs described above, excepting payload and fuze.

Specifications

Length, fuzed: 595 mm

Weight, fuzed: 12.1 kg

Weight/type of payload: 940 gr/illuminating composition

Number of charges: P + 5

Fuze: time, M84A1E1

Burn time: 65 s

Rate of descent: 5-6 m/s

Illuminating intensity: 700,000 cd

Max range: 5,200 m

Muzzle velocity: 274 m/s

Colour/markings: white/black

Status: In production; available.

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*120 mm illuminating bomb
(2000)*

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FUZES - IMPACT FUZES, [IRAN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

DM111

Armament

51 to 160 mm smoothbore mortar bombs.

Development

By Iranian ordnance to meet Iranian Army requirements.

Description

This is a close copy of the original Junghans DM111 produced for the German military. Detailed information on its functioning may be found under the DM111A4 entry, which is similar. In addition to mortar bombs, the Iranian military also uses this as a rocket fuze.

Specifications

Type: Impact, delay or super-quick

Weight: 201 g

Thread: 1.5 × 12UNF

Length:

overall - 87 mm

visible - 61 mm

Diameter: 49 mm

Optional delay: 0.06 s

Manufacturer

Iranian Armaments factories.

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*DM111 impact fuze
(1998)*

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MORTARS - 120 mm MORTARS, [IRAN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

Development history is not known, but there are some points of similarity between this bomb and some Israeli designs, suggesting that these may have been a source of inspiration.

Description

The bomb uses a symmetrical steel body, with five gas check rings irregularly spaced around the waist. The nose is threaded for a percussion fuze, and the body ends in a screwed spigot to which a steel tail unit is attached. The propelling charge consists of the usual primary cartridge inserted into the tail tube and an undetermined number of secondary charges arranged around the tailboom. Smoke and illuminating bombs of similar ballistic performance are also manufactured.

Specifications

Length, fuzed: 585 mm

Weight: 12.97 kg in flight

Weight and type of payload: 2.5 kg RDX/TNT

Fuze: percussion AZ111A1

Max range: 6,000 m

Max muzzle velocity: 301 m/s

Status: In production; available.

Manufacturer

Defence Industries Organisation.

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120 mm HE bomb, [Iran](#)

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MORTARS - 81 mm MORTARS, [IRAN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb

Armament

All 81 mm medium-pressure mortars.

Development

Development history is not known, but similarities between this and some Israeli designs suggest the source of inspiration.

Description

A symmetrical streamlined bomb of modern type, with a noticeably wide diameter tail tube and eight fins. The body is of steel, with four gas check rings at the waist. A primary cartridge is inserted into the rear of the tail tube and six secondary charges fit around the tube in front of the fins.

Specifications

Length, fuze: 370 mm

Weight: 4.05 kg in flight

Weight and nature of payload: 550 g RDX/TNT

Number of charges: P + 6

Fuze: Percussion AZ111A2-MP5

Max range: 5,000 m

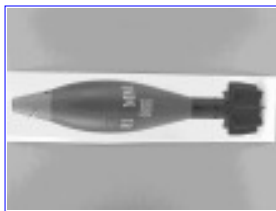
Max muzzle velocity: 270 m/s

Colour/markings: Olive drab/yellow

Manufacturer

Defence Industries Organisation.

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81 mm HE bomb, [Iran](#)

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MORTARS - 60 mm MORTARS, [IRAN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb

Armament

All 60 mm mortars.

Development

Development history not known but the appearance suggests that the design is based on the obsolete US [M49](#) bomb.

Description

A symmetrically streamlined bomb of steel, with a welded steel eight-fin tail unit screwed to the rear end. The nose is threaded to accept a fuze and there are four gas check grooves around the waist. A primary cartridge fits into the end of the tail tube, and up to four incremental charges can be clipped into the fins.

Specifications

Length, fuzed: 245 mm

Weight: 1.34 kg in flight

Weight and type of payload: 250 g RDX/TNT

Number of charges: P + 4

Fuze: Percussion, AZ111A2, M525 or equivalent

Max range: 1,700 m

Max muzzle velocity: 158 m/s

Manufacturer

Defence Industries Organisation.

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60 mm HE bomb, [Iran](#)

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ARTILLERY ROCKETS

Date Posted: 12 July 2001

Jane's Ammunition Handbook 2001-2002

AVIBRAS ASTROS II rockets

Armament

AVIBRAS [ASTROS II](#) MRS.

Development

Brazil's first AVIBRAS [ASTROS II](#) MRS were produced during 1983, together with its associated armoured truck-mounted fire-control centres and other support vehicles. Despite being produced in significant numbers for export to [Iraq](#), [Qatar](#) and [Saudi Arabia](#) (an estimated 60 launchers), as well as for the Brazilian Army (six launchers and three reload vehicles), relatively few details have been published regarding the [ASTROS II](#) (Artillery SaTuration ROcket System) rockets themselves, so known details of all four types are included in this one section. There are four [ASTROS II](#) rocket calibres, 127, 180 and two 300 mm, all fired from the same launcher vehicle but with suitably configured launch module arrangements.

A coastal defence version of the AVIBRAS [ASTROS II](#) MRS has been proposed, with two batteries having been ordered by the Brazilian Army.

Unconfirmed reports have indicated that production of the [ASTROS II](#) SS-60 rocket (see below in this entry) has been undertaken at the Al-Kharj military complex in [Saudi Arabia](#), but no firm details are available. [Saudi Arabia](#) is understood to have about 60 [ASTROS II](#) MRS launchers. Other known [ASTROS II](#) purchasers are [Iraq](#) and [Libya](#).

Description

All four [ASTROS II](#) rockets are understood to have extruded double-base propellant rocket motors.

The smallest of the [ASTROS II](#) rockets is the 127 mm SS-30 fired from a 32-tube launcher. Each wraparound folding fin-stabilised rocket is 3.9 m long and weighs 68 kg. Maximum range is 30,000 m and minimum 9,000 m. A high-explosive warhead is fitted.

The 180 mm SS-40 is fired from 16-tube launchers. Stabilised in flight by four wraparound tailfins, the SS-40 is 4.2 m long and weighs 152 kg. Maximum range is 35,000 m and minimum 15,000 m. Although a high-explosive warhead can be fitted to the SS-40, the normal warhead contains 20 dual-purpose bomblets. Each anti-personnel/anti-armour bomblet is 390 mm high and 130 mm in diameter, with a ribbon streamer to stabilise the bomblet during the descent phase and also arm the mechanical impact fuze.

The third of the [ASTROS II](#) rockets is the 300 mm SS-60 launched from four-tube launchers. The wraparound folding tailfin stabilisation method as used with the smaller [ASTROS II](#) rockets is retained, with the overall length being 5.6 m. Weight of the SS-60 is 595 kg, 212 kg of which is the cluster warhead containing 65 of the same dual-purpose bomblets used with the SS-40. Maximum range is 60,000 m and minimum 20,000 m.

In 1995 the 300 mm SS-80 was announced. Outwardly resembling the SS-60 and having the same weight, the SS-80 has a maximum range of 90,000 m and a minimum range of 22,000 m, implying that the SS-80 has a totally different rocket motor to the earlier model. Rocket weight is 595 kg. No details have yet been released regarding the SS-80 warhead although it is assumed that is the same as that for the SS-60.

In 1991, three extra types of warhead content were introduced for the 180 mm SS-40 and 300 mm SS-60. One is an HEI filled with White Phosphorus (WP). The second is a minescattering warhead containing either anti-personnel mines with an effective radius of 30 m, anti-matériel mines able to penetrate 100 mm of armour on contact or up to 20 mm of mild steel at distances of more than 100 m, or anti-armour mines capable of penetrating more than 120 mm of armour plate. The third type of warhead contains various types of delayed action fuzed TNT filled airfield denial munitions capable of penetrating concrete.

AVIBRAS was at one time developing the SS-300, with a reported range of 300,000 m and a warhead weighing 1,000 kg. Preliminary engine tests were carried out but all development was later suspended.

Specifications

Model	SS-30	SS-40	SS-60	SS-80
Calibre	127 mm	180 mm	300 mm	300 mm
Weight	68 kg	152 kg	595 kg	595 kg
Length	3.9 m	4.2 m	5.6 m	5.6 m
Max range	30,000 m	35,000 m	60,000 m	90,000 m
Min range	9,000 m	15,000 m	20,000 m	22,000 m

Authorised fuzes

No information available

Equivalent rockets

[IRAQ](#)

Manufacturer

State factories

Type: 127 mm Sajeel 30, 180 mm Sajeel 40, 300 mm Sajeel 60

Description: Equivalent to [ASTROS II](#) SS-30, SS-40 and SS-60 respectively. Probably no longer in production

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AVIBRAS [ASTROS II](#) artillery rockets, from front: SS-30; SS-40; SS-60

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MORTARS - 160 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M18 160 mm smoke bombs

Armament

160 mm Soltam and Tampella mortars.

Development

By Soltam for mortars in Israeli service.

Description

These bombs use the same body, tail unit and propelling charge as the M4 HE bomb (qv) but differ in their internal arrangements. The nose of the bomb is closed by an adaptor which supports a central exploder tube and receives the fuze. Around the exploder the body cavity is filled with either White Phosphorus (WP) or titanium tetrachloride (FM) composition. In addition to its screening smoke role, the WP bomb is also useful as a night ranging round.

Specifications

Weight, fuzed: 40 kg

Type of payload: WP or FM smoke composition

Number of charges: P + 9

Fuze: impact, SQ and delay

Min range: 600 m

Max range: 9,600 m

Manufacturer

Soltam Ltd.

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MORTARS - 160 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M4 160 mm HE bomb

Armament

160 mm Soltam and Tampella mortars.

Development

By Soltam for mortars in Israeli service.

Description

A forged steel streamlined bomb with light-alloy tail unit. The secondary charges, formed as split rings in fabric covers fitting around the tailboom, are of a smaller diameter than the bomb so there is no danger of them touching a hot barrel. There is no danger of a cook-off even with barrel temperatures as high as 650°C.

Specifications

Weight, fuzed: 40 kg

Weight and type of payload: 5 kg TNT

Number of charges: P + 14

Fuze: impact, SQ and delay

Min range: 600 m

Max range: 9,600 m

Manufacturer

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M57 120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Soltam.

Description

A forged steel body of modern streamlined pattern with a plastic obturating ring behind the bourrelet. An extruded aluminium tail unit is screwed into the bomb body. The propelling system consists of a primary cartridge in the tail and seven secondary increments in cloth rayon bags around the tailboom.

Specifications

Length, fuzed: 664 mm

Weight, fuzed: 13.2 kg

Weight and type of payload: 2.25 kg TNT

Number of charges: P + 10

Fuze: impact, SQ and delay or [M787](#) proximity

Min range: 200 m

Max range: 7,200 m

Muzzle velocity: 102-320 m/s

Manufacturer

Soltam Ltd.

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120 mm Soltam HE bomb [M57](#)

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M110 120 mm extended range smoke bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Soltam.

Description

This has the same external shape as the HE M100 bomb, the only difference being in the internal filling. A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body is filled with White Phosphorus (WP), which is liberated when the burster charge explodes and breaks open the bomb body. The WP then inflames spontaneously on contact with the air, creating a dense smoke cloud with incendiary effects.

Specifications

Length, fuze: 787 mm

Weight, fuze: 14.85 kg

Weight and type of payload: 2.3 kg WP

Fuze: impact SQ and delay M111 or [M787](#) proximity

Min range: 400 m

Max range: 10,000 m (can be adjusted according to client's mortar model)

Manufacturer

Soltam Ltd.

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M100 120 mm extended range HE bomb

Armament

Any 120 mm smoothbore mortar.

Development

By Soltam Systems.

Description

An advanced configuration bomb with streamlined body and excellent ballistic performance. The body is made of forged steel with a plastic obturating ring behind the bourrelet. The propelling system consists of a primary cartridge in the tail and secondary increments around the tailboom.

Specifications

Length, fuze: 787 mm

Weight, fuze: 14.85 kg

Weight and type of payload: 2.5 kg TNT

Fuze: impact SQ and delay M111 or [M787](#) proximity

Min range: 400 m

Max range: 10,000 m (can be adjusted according to client's mortar model)

Manufacturer

Soltam Ltd.

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120 mm Soltam extended range HE bomb M100

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M98 120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Soltam to meet a US Army requirement; it was type classified by the US Army in 1991 (as M745) and used by Israeli and other forces.

Description

A streamlined bomb with forged steel body and alloy tail unit. The propelling charge system consists of a primary cartridge and four equal sized secondary increments.

Specifications

Length, fuzed: 703 mm

Weight, fuzed: 13.6 kg

Weight and type of payload: 3 kg Comp B

Number of charges: P + 4

Fuze: impact, SQ and delay; or proximity

Min range: 200 m

Max range: 7,200 m

Muzzle velocity: 102-318 m/s

Manufacturer

Soltam Ltd.

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M68 120 mm smoke bomb

Armament

All 120 mm smoothbore mortars.

Development

By Soltam Systems.

Description

This bomb is to the same external shape as the HE [M57](#) bomb described previously, the only difference being in the internal filling.

A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body is filled with White Phosphorus (WP), which is liberated when the burster explodes and breaks the bomb body. The WP will inflame spontaneously on contact with the air, creating a dense white smoke with incendiary effects.

Specifications

Length, fuze: 664 mm

Weight, fuze: 13.2 kg

Weight and type of payload: 2.03 kg WP

Number of charges: P + 10

Fuze: impact, SQ and delay
Min range: 200 m
Max range: 7,200 m
Muzzle velocity: 102-320 m/s

Manufacturer

Soltam Ltd.

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120 mm Soltam HE and smoke [M57](#) bombs

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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M42 120 mm practice bomb

Armament

All 120 mm smoothbore mortars.

Development

By Soltam, from Tampella original for Israeli service.

Description

This uses the same body, tail unit and propelling charge system as the HE [M48](#) bomb but differs internally. The body is almost entirely filled with inert ballast, leaving only sufficient space for a small spotting charge. This is exploded on impact and provides sufficient smoke to permit observation and correction of fire.

Specifications

Length, fuzed: 581 mm

Weight, fuzed: 12.6 kg

Weight and type of payload: 2.1 kg ballast, plus 200 g spotting charge

Number of charges: P + 8

Fuze: impact SQ

Min range: 200 m

Max range: 6,250 m

Muzzle velocity: 115-310 m/s

Manufacturer

Soltam Ltd.

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120 mm Soltam HE bomb [M48](#)

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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M84 120 mm smoke bomb

Armament

All 120 mm smoothbore mortars.

Development

By Soltam, from Tampella original for Israeli service.

Description

This uses the same body, tail unit and propelling charges as the HE bomb [M48](#), but differs internally by having a central explosive burster surrounded by smoke composition. There are three types of smoke filling available: White Phosphorus (WP); Plasticised White Phosphorus (PWP) and titanium tetrachloride (FM).

Specifications

Length, fuze: 580 mm

Weight, fuze: 12.6 kg

Weight and type of payload: 2.3 kg WP, PWP or FM

Number of charges: P + 8

Fuze: impact SQ

Min range: 200 m

Max range: 6,250 m

Muzzle velocity: 115-310 m/s

Chamber pressure: 882.62 bar

Manufacturer

Soltam Ltd.

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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120 mm HE bomb M48

Armament

All 120 mm smoothbore mortars.

Development

By Soltam, based on a Tampella original for Israeli service.

Description

The [M48](#) is a conventional streamlined bomb with a steel body and alloy tail unit. There are four widely spaced gas check rings cut around the waist of the bomb. The propelling charge consists of a primary cartridge in the tail and five secondary increments in cloth split rings that fit around the tailboom. The secondaries form a base charge, which is always present, and four additional charges.

Specifications

Length, fuze: 581 mm

Weight, fuze: 12.6 kg

Weight and type of payload: 2.3 kg TNT

Number of charges: P + base + 4

Fuze: impact, SQ and delay; or proximity [M787](#)

Min range: 400 m

Max range: 6,500 m

Muzzle velocity: 115-310 m/s
Chamber pressure: 882.62 bar

Manufacturer

Soltam Ltd.

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M101 81 mm practice bomb

Armament

Soltam and other 81 mm mortars.

Development

By Soltam for its own mortars and general use.

Description

This bomb uses the same body, tail unit and propelling charge system as the standard HE bomb but is filled with a small smoke charge to mark the point of impact. The remainder of the bomb is filled with inert material.

Specifications

Weight, fuzed: 3.9 kg

Weight and type of payload: 100 g smoke material; inert filler

Number of charges: P + 6

Fuze: impact SQ

Min range: 150 m

Max range: 5,000 m

Muzzle velocity: 66-285 m/s

Manufacturer

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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M94 81 mm smoke bombs

Armament

Soltam and other 81 mm mortars.

Development

By Soltam for its own mortars and general use.

Description

These bombs use the same body, tail unit and propelling charges as the Standard HE bomb but are filled with either White Phosphorus (WP), Plasticised White Phosphorus (PWP) or titanium tetrachloride (FM) as required.

Specifications

Weight, fuzed: 3.9 kg

Weight and type of payload: 540 g WP, PWP or FM

Number of charges: P + 7

Fuze: impact SQ

Min range: 150 m

Max range: 5,000 m

Muzzle velocity: 66-285 m/s

Manufacturer

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M65 81 mm long-range smoke bomb

Armament

All 81 mm smoothbore mortars.

Development

By Soltam to provide a long-range smoke bomb matching the existing long-range HE bomb.

Description

A more modern and slender design than the standard smoke bomb. This uses a plastic obturating ring behind the bourrelet and has an extruded aluminium tailboom around which eight secondary increments can be clipped. A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body is filled with White Phosphorus (WP) which is liberated when the burster explodes and breaks the bomb body. The WP then inflames spontaneously on contact with the air, creating a dense white smoke cloud with incendiary effects.

Specifications

Weight, fuzed: 4.6 kg

Weight and type of payload: 690 g WP

Number of charges: P + 8

Fuze: impact SQ and delay DM 111

Min range : 200 m

Max range: 6,500 m

Muzzle velocity: 70-350 m/s

Manufacturer

Soltam Ltd.

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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M61 81 mm long-range HE bomb

Armament

Soltam and other 81 mm mortars.

Development

By Soltam for its own mortars and general use.

Description

A more modern and slender design than the standard HE bomb, this uses a plastic obturating ring behind the bourrelet and has an alloy tailboom and fins. A primary cartridge fits into the tailboom and seven secondary increments can be clipped around the boom.

Specifications

Weight, fuzed: 4.6 kg

Weight and type of payload: 740 g TNT

Number of charges: P + 8

Fuze: impact SQ and delay DM 111

Min range: 200 m

Max range: 6,500 m

Muzzle velocity: 70-350 m/s

Manufacturer

Soltam Ltd.

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81 mm Soltam long-range HE bomb

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

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M91 81 mm standard HE bomb

Armament

All 81 mm mortars.

Development

By Soltam, for its range of mortars and for general use.

Description

A symmetrical streamlined bomb, with four gas check grooves at the bourrelet and an alloy tailboom and fins screwed to the rear end. A primary cartridge fits into the tail tube and six secondary increments can be fitted around the tailboom.

Specifications

Weight, fuzed: 3.9 kg

Weight and type of payload: 540 g TNT

Number of charges: P + 7

Fuze: impact SQ and delay DM 111

Min range: 150 m

Max range: 5,000 m

Muzzle velocity: 66-285 m/s

Manufacturer

Soltam Ltd.

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81 mm Soltam standard HE bomb

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MORTARS - 60 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb M61

Armament

Any 60 mm smoothbore mortar.

Development

By Soltam [Israel](#).

Description

This bomb has a symmetrical streamlined body of forged steel, with four gas check grooves around the bourrelet. The tail unit and propellant system are as for the HE Bomb M61 described previously, the difference being internal. A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body is filled with White Phosphorus (WP) which is liberated when the burster explodes and breaks the bomb body. The WP inflames spontaneously on contact with the air, creating a dense white smoke with incendiary effects.

Specifications

Length, fuzed: 300 mm

Weight, fuzed: 1.61 kg

Weight and type of payload: 160 g WP

Number of charges: P + 4

Fuze: Impact and SQ M111

Min range: 100 m

Max range: 2,550 m (can be adjusted by the manufacturer to suit particular models of mortar)

Muzzle velocity: 66-199 m/s

Manufacturer

Soltam Ltd.

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MORTARS - 60 mm MORTARS, [ISRAEL](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M38A1

Armament

Specifically for the 60 mm Soltam mortars used by the [Israel](#) Defence Force but suitable for all modern 60 mm mortars.

Development

By Soltam Systems.

Description

A forged steel bomb of modern pattern with an obturating groove and plastic ring in the waist. An extruded aluminium tail unit is screwed into the bomb body and has six canted fins, giving some roll stabilisation to the bomb's flight. The propellant system consists of a primary cartridge inserted into the tail tube and six secondaries in cloth bags wrapped around the tailboom ahead of the fins.

Specifications

Length, fuze: 351 mm

Weight, fuze: 1.9 kg

Weight and type of payload: 330 g TNT

Number of charges: P + 6

Fuze: M111 impact SQ or [M787](#) proximity

Min range: 200 m

Max range: 4,000 m

Muzzle velocities: 70-350 m/s

Manufacturer

Soltam Ltd.

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60 mm HE bomb M38

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MORTARS - 60 mm MORTARS, [ISRAEL](#)

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M61

Armament

Any 60 mm smoothbore mortar.

Development

By Soltam [Israel](#).

Description

This bomb has a symmetrical streamlined body of forged steel with four gas check grooves around the bourrelet. An extruded aluminium tail unit is screwed into the bomb body and has six canted fins, giving some roll stabilisation to the bomb's flight. The propellant system consists of a primary cartridge inserted into the tail tube and four secondaries in cloth bags wrapped around the tailboom ahead of the fins.

Specifications

Length, fuze: 300 mm

Weight, fuze: 1.61 kg

Weight and type of payload: 200 g TNT

Number of charges: P + 4

Fuze: Impact and SQ M111

Min range: 100 m

Max range: 2,550 m (can be adjusted by the manufacturer to suit particular models of mortar)

Muzzle velocity: 66-199 m/s

Manufacturer

Soltam Ltd.

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60 mm Soltam HE bomb M61 compared to M38

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MORTARS - 60 mm MORTARS, [ISRAEL](#)

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb M50A1

Armament

Israeli 60 mm mortars and others.

Development

By Soltam Systems.

Description

This uses the same body, tail unit and propellant system as the HE Bomb M38 described previously but differs internally. A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body, around this tube, is filled with either White Phosphorus (WP), Plasticised White Phosphorus (PWP) or titanium tetrachloride (FM) which is liberated when the burster explodes and breaks open the bomb. WP and PWP will inflame spontaneously, FM will combine with the water vapour in the air and either will thus produce smoke.

Specifications

Length, fuze: 351 mm

Weight, fuze: 1.84 kg

Weight and type of payload: 210 g WP

Number of charges: P + 6

Fuze: M111 impact SQ

Max range: 4,000 m

Manufacturer

Soltam Systems.

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FUZES - PROXIMITY FUZES, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M787 Alpha

Armament

60 to 160 mm HE and bursting smoke bombs.

Development

By Reshef to meet Israeli Defence Forces requirements.

Description

A proximity/point detonating fuze, selectable between the two functions and with impact back-up in case of proximity failure. The normal proximity configuration is for the optimum burst height (factory-set at 2.4 m), but the fuze can be specially configured for near surface burst (0.5 m) or for jungle canopy penetration functioning if required. Arming is two-fold, requiring acceleration and a build-up of airspeed through the turbogenerator which provides electrical power.

The fuze is supplied as standard with the 1.5 in NATO thread; it can, however, be supplied in 2 in 12 tpi UNS 1B, 1.4 in 10 tpi, 1.41 in 14 tpi or 35.7 × 200 metric threads if required. These variants have the appropriate intrusion for standard HE bombs in those thread sizes.

Specifications

Type: proximity/point detonating

Weight: 275 g

Thread: 1.5 in 12 tpi UNF-1A (but see text)

Length overall: 92 mm

Intrusion: 27.5 mm

Diameter: 49.2 mm

Arming requirement: 400 g for 1 ms; min airspeed of 30 m/s

Arming distance: 200 m

Manufacturer

Reshef Technologies.

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Reshef Alpha proximity fuze

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FUZES - TIME FUZES, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M760 Lambda

Armament

60 to 160 mm smoke, illuminating and cargo bombs.

Development

By Reshef for mortars in Israeli service and general use.

Description

An electronic time and percussion fuze, electrical power being supplied by a turbo-alternator driven by a wind vane impeller. The nose of the fuze carries three setting rings; at the centre of the nose is a vent which admits air to the impeller, concealed by the nose. This air exhausts from vents between the cap and the body of the fuze. The body contains the turbo-alternator and electronic circuits, together with inertia-operated safety devices. These include a missequencing detector, which locks the fuze in a safe condition should airspeed cause the generator to function before setback has taken place. The electric detonator is short-circuited until arming is complete. Should the fuze be set to a time longer than the time of flight, or fired at zero setting, then an electromechanical percussion element will function on impact.

Specifications

Type: electronic time and percussion

Weight: 275 g

Thread: 1.5 in 12 tpi UNF

Length overall: 97 mm

Intrusion: 27.5 mm

Diameter: 47 mm

Operating time: 3-99.8 s in 0.1 s steps

Arming requirement: 400 g for 1 ms, min; airspeed of 30 m/s, min

Arming distance: 100 m

Manufacturer

Reshef Technologies.

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[M760](#) *Lambda electronic time fuze*

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FUZES - PROXIMITY FUZES, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M25 proximity fuze

The M25 is an electronic proximity fuze, giving a nominal 5 m height of burst and an impact back-up element should the proximity function fail. It is adaptable to 81, 120 and 160 mm smoothbore mortars of all types. A safety indication window and a safety and arming unit combined with an air-driven power source provide a complete safety system and there is a minimum 60 m arming delay after firing.

Specifications

Compatibility: all 81, 120 and 160 mm smoothbore mortars

Bore safety: setback integrator

Power source: ram air turbine alternator

Min arming requirements: 2 s flight time; V_0 80 m/s; setback 500 g; setback duration 1 ms

Length overall: 155.5 mm

Intrusion: 60 mm

Thread size: [M57](#) × 2.5 (Version A); or 2 in 12 tpi UNS (Version B)

Weight: 500 g

Manufacturer

KM Fuze Engineering Ltd.

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KM Fuze Engineering M25 mortar proximity fuze

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FUZES - IMPACT FUZES, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M797

Armament

All types of HE and WP smoke bombs of 81 to 160 mm calibre and modern ballistically improved 60 mm HE and WP bombs.

Development

By Reshef Technologies to produce a modern, light, fuze with two independent arming systems to meet NATO and US safety requirements.

Description

The [M797](#) utilises the same power supply and S&A units already used in the [M787](#) proximity and [M760](#) electronic time fuzes described elsewhere. Power is provided by an air turbine alternator and a selector on the side of the fuze allows setting in the PD or Delay modes.

Arming is done by two arming mechanisms, monitored by a mis-sequencing mechanism. On firing there must be a setback force of at least 400 g, for a duration of not less than 1 ms. There must also be air flow through the fuze corresponding to a velocity of at least 30 m/s. Should the `air flow' condition precede the `setback' condition, the fuze will not arm and will self-lock in a safe condition.

The [M797](#) meets MIL-STD-331B, -333A and -1316D and STANAG 4187. It is fully interchangeable with the DM 111A2/3/4, M525, M734, M935, [V19P](#) and, with the use of an adaptor, M567 and M526.

Specifications

Type: electronic point detonating with optional delay

Weight: 275 g

Thread: UNF-1A 1.5 in × 12 tpi; or UNS-1A 2 in × 12 tpi; or 35.7 Pas200; or as required

Length overall: 95.1 mm

Intrusion: 28.4 mm

Diameter: 49 mm

Optional delay: 50 ms

Arming distance: >70 m

Manufacturer

Reshef Technologies.

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Reshef electronic PD fuze [M797](#)



Reshef fuze [M797](#): phantom drawing

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb M3

Armament

All 120 mm smoothbore mortars.

Development

By [Israel Military Industries \(IMI\)](#) as an improvement upon the M2.

Description

This generally resembles the M2, but has had some detail improvement in the internal arrangements and the flare unit is more powerful. The propelling charge system has been altered to a nine-charge system, to give greater flexibility.

Specifications

Length, fuzed: 580 mm

Weight, fuzed: 12 kg

Type of payload: parachute and flare

Number of charges: P + 9

Fuze: mechanical time

Min range: 1,100 m

Max range: 6,100 m

Muzzle velocity: 330 m/s

Illumination intensity: min 1,250,000 cd

Burning time: min 45 s
Rate of descent: 5-6 m/s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bombs M1, M2

Armament

All Tampella, [TDA](#) or similar 120 mm smoothbore mortars.

Development

By [Israel Military Industries \(IMI\)](#).

Description

A streamlined steel bomb body with steel tailboom and alloy fins; it has five gas check grooves around the waist arranged as three and two. A primary cartridge fits into the tailboom and six secondary increments, in cloth-covered split rings, fit around the tailboom in front of the fins. These provide Charges 2, 4, 6, 8 and 9, which are the only charges used with the bomb.

The bomb is assembled in two parts, the body and the tailcone and tailboom assembly, both being joined by shearable pins. The nose is threaded for a time fuze. In the body is the flare canister and behind it, the parachute. Attached to a central spigot in the flare canister is a short steel rocket motor. When the time fuze magazine explodes it provides sufficient internal gas pressure to cause the shear pins to break and allow the body section to be blown free. At the same time the rocket motor is ignited and as soon as the body section has cleared this rocket pulls the flare canister away from the tail section. Once it is clear, a small braking parachute is deployed, slowing the flare canister (which by now has begun to burn) and allowing the tail section to fly past. As it does so, the main parachute is pulled clear

of the tail section and deploys, allowing the burning flare to float to the ground.

The M1 and M2 bombs are similar except in the filling of the flare canister, giving the M2 a greater intensity but shorter burning time.

Specifications

Length, fuze: 580 mm

Weight, fuze: 12.6 kg

Type of payload: parachute and flare

Number of charges: 6

Fuze: MTSQ

Min range: 1,200 m

Max range: 6,100 m

Muzzle velocity: 330 m/s

Illumination intensity: 700,000 cd, M1; 1.1 Mcd, M2

Burning time: 57 s, M1; 54 s, M2

Manufacturer

[Israel Military Industries \(IMI\)](#).

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120 mm illuminating bomb M2

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm M971/1 (CL 3144) ICM bomb

Armament

All 120 mm smoothbore mortars.

Development

By [Israel Military Industries \(IMI\)](#) to provide an ICM bomb for the [Israel](#) Defence Force and for export. While under development, the [M971/1](#) was designated the CL 3144.

Description

The [120 mm M971/1 ICM](#) mortar bomb carries 24 dual-purpose (anti-personnel/anti-armour) 42 mm diameter Bantam bomblets, to be scattered over a target area following an airburst. The Bantam bomblets are carried inside the [M971/1](#) body in six layers of four bomblets.

The [M971/1](#) is handled and loaded in the same way as conventional 120 mm mortar bombs. The six-increment propellant system is adjusted as required and the nose-mounted [DM 93](#) (or similar) mechanical time fuze preset to ensure an airburst over the target area. Once the bomb has left the mortar muzzle, jack-knife tailfins deploy to provide aerodynamic stability.

When the fuze functions in flight it ignites an expulsion charge to pressurise the bomb ogive and eject the bomblet payload. The 24 bomblets are scattered to fall to the ground forming an approximate × pattern over a 100 to 110 m radius, covering an area of about 4,800 m². A salvo of [M971/1](#) bombs over a target will ensure good target area coverage.

As each Bantam bomblet impacts with the target area its RDX shaped charge detonates to provide a penetration of more than 105 mm of armour. The bomblet body also breaks up into more than 1,200 lethal fragments. Each 42 mm Bantam bomblet weighs 296 g, of which approximately 44 g is the RDX shaped charge; each bomblet is 55.65 mm long. Should a Bantam bomblet not detonate on impact there is an integral pyrotechnic self-destruction mechanism initiated as the fuze is armed during its descent from the [M971/1](#) body.

Specifications

Length: fuzed, 823 mm; unfuzed, 763 mm

Weight: 14.5 kg

Fin diameter: 270 mm

Type of filling: 24 Bantam dual-purpose bomblets

Muzzle velocity: 315 m/s from K6A1 mortar

Min range: 300 m

Max range: ca 5,750 m from K6A1 mortar

Dispersion radius: 100-100 m

Number of fragments: total per bomb, ca 29,000

Manufacturer

[Israel Military Industries](#) ([IMI](#)).

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Cross-sectioned drawing of [IMI](#) 120 mm CL 3144 ICM mortar bomb

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MORTARS - 120 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket-assisted HE bomb

Armament

Tampella, [TDA](#) and other 120 mm smoothbore mortars.

Development

By [Israel Military Industries \(IMI\)](#) to improve performance of current [Israel](#) Defence Force mortars.

Description

A steel bomb of conventional shape, but with the rear taper considerably thicker than normal and with the tailfins close to the body. The central cartridge container extends behind the fins and the nine split-ring secondary increments are fitted around it. This cartridge container also forms the rocket efflux, the motor extending upwards into the base of the bomb.

Precise details have not been divulged, but it seems probable that the end of the cartridge container carries the primary cartridge and the bomb is drop loaded and fired in the usual manner. A delay mechanism will ignite the rocket motor on the upward leg of the trajectory, moving the vertex out and thus increasing the range.

Specifications

Length, fuzed: 744 mm

Weight, fuzed: 16.7 kg

Weight and type of payload: 2.15 kg Comp B

Number of charges: P + 9

Fuze: impact SQ

Max range: 10,500 m

Muzzle velocity: 280 m/s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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MORTARS - 82 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm smoke bomb

Armament

All 82 mm smoothbore mortars.

Development

By Soltam, to provide ammunition for use in 82 mm mortars.

Description

This bomb uses the same body, tail unit and propelling charge as the standard HE bomb described previously, but is filled with White Phosphorus (WP). A short burster tube fits into the head of the bomb and carries a burster charge. The cavity of the bomb body is filled with WP which is liberated when the burster charge explodes and breaks open the bomb. The WP then ignites spontaneously on contact with the air, producing a dense white smoke cloud with incendiary effects.

Specifications

Weight, fuzed: 3.9 kg

Weight and type of payload: 540 g WP

Number of charges: P + 6

Fuze: impact SQ and delay M111

Min range: 150 m

Max range with Soviet mortar: 3,600 m

Max range with Soltam mortar: 4,900 m

Muzzle velocity: 66-285 m/s

Manufacturer

Soltam Ltd.

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MORTARS - 82 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm standard HE bomb

Armament

All 82 mm smoothbore mortars.

Development

By Soltam, to provide ammunition for use in 82 mm mortars.

Description

A symmetrical streamlined bomb, with four gas check grooves at the bourrelet and an alloy tailboom and fins screwed to the rear end. A primary cartridge fits into the tail tube and six secondary increments can be fitted around the tailboom.

Specifications

Weight, fuzed: 3.9 kg

Weight and type of payload: 540 g TNT

Number of charges: P + 6

Fuze: impact SQ and delay M111

Min range: 150 m

Max range with Soviet mortar: 3,600 m

Max range with Soltam mortar: 4,900 m

Muzzle velocity: 66-285 m/s

Manufacturer

Soltam Ltd.

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MORTARS - 81 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb M2A1

Armament

For 81 mm medium-pressure ([M29](#)) or high-pressure (M242/L16) mortars: but see text.

Development

By [Israel Military Industries](#) ([IMI](#)).

Description

This bomb consists of a cast-steel rear portion, tapering to a screwed spigot to which the alloy tail unit is attached. A light tubular steel parallel-sided body section is attached to the rear section by shear pins. An adaptor is screwed into the front of the tubular section; this is threaded to receive a time fuze. There are four gas check grooves formed in the body, just above the joint with the rear section.

Internally, the rear section is occupied by two parachutes, a main parachute and a small braking parachute. Above this, in the tubular section of the body is the flare canister. Above this, within the adaptor space, is a small propulsive charge.

At the set time, the fuze ignites the propulsive charge, this shears the connecting pins between the two parts of the body and accelerates the front portion away from the rear. This allows the braking parachute to be deployed, pulling the ignited flare from the forward section of the shell, which now falls away. The braking action of this parachute also allows the tail unit to pass by, so that the main parachute is withdrawn from the rear section and is deployed. The flare and parachute then descend.

There are two propellant options available; both use a primary cartridge and four horseshoe-shaped increments, but for medium-pressure mortars such as the [M29](#) the charge weight is 132 g. For high-pressure mortars such as the [L16](#) the charge weight is 147.5 g, giving an increased maximum range.

Specifications

Length, fuze: 566 mm

Weight, fuze: 3.9 kg

Weight and type of payload: 720 g parachute and flare

Number of charges: P + 4

Fuze: time

Min range: 400 m

Max range: 4,000 m medium pressure; 4,500 m high pressure

Illuminating power: 700,000 cd

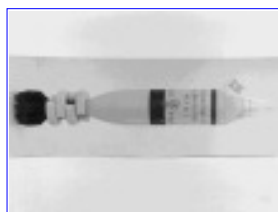
Duration of illumination: 55 s

Rate of descent: 5 m/s

Manufacturer

[Israel Military Industries](#) ([IMI](#)).

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81 mm illuminating bomb [M2A1](#)



Internal arrangements of [M2A1](#) illuminating bomb

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MORTARS - 60 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm long-range illuminating bomb

Armament

Israeli Soltam 60 mm mortars and others.

Development

By [Israel Military Industries \(IMI\)](#).

Description

This bomb uses a forged steel tubular body and an alloy tail unit which screws on to the rear of the tubular section. Internally there is a flare and parachute assembly, the flare is in the head of the tube and the parachute behind.

Operation of the bomb is initiated by a time fuze which ignites a small burster charge. This separates the two parts of the bomb by shearing the connecting pins, ignites the illuminant and lights a small rocket motor. This motor gives a forward thrust to the illuminant assembly, ejecting it from the nose of the bomb and causing the small drag parachute to deploy. The drag parachute slows down the illuminant assembly, allowing the empty bomb body to pass it in flight. It then extracts the main parachute from its container, which is still attached to the bomb body by a line. The main parachute then deploys, to lower the illuminant to the ground. The drag parachute has by now been burned by the illuminant and the bomb body, trailing the empty main parachute bag, has continued on its own trajectory and cannot interfere with the descending illuminant unit.

Specifications

Length, fuze: 432 mm

Weight, fuze: 1.44 kg

Weight and type of payload: parachute and flare

Number of charges: P+2

Fuze: time

Max range: 2,270 m

Illuminating power: 500,000 cd

Duration of light: 38 s

Rate of descent: 4 m/s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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[IMI](#) 60 mm long-range illuminating bomb

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MORTARS - 52 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

52 mm illuminating bomb, Type 2

Armament

Israeli 52 mm Soltam mortars; ex-British 2 in mortars.

Development

By [Israel Military Industries \(IMI\)](#) based upon the British 2 in mortar bomb.

Description

This is the same as the Type 1 bomb, described previously, but has a more powerful propelling cartridge, giving a slightly greater operating range when fired at the standard 45° elevation.

Specifications

Length: 268 mm

Weight: 830 g

Weight and type of payload: parachute and flare

Number of charges: 1

Fuze: none

Operating range: 400 m

Muzzle velocity: 90 m/s

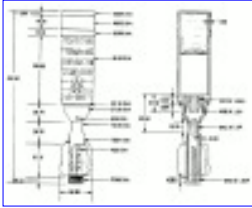
Illuminating power: 100,000 cd

Delay time: 8 s
Burst height: 100 m
Burning time: 30 s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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*52 mm illuminating bomb, Type 2
(1998)*

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MORTARS - 52 mm MORTARS, [ISRAEL](#)

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52 mm illuminating bomb, Type 1

Armament

Israeli 52 mm Soltam mortars; ex-British 2 in mortars.

Development

By [Israel Military Industries \(IMI\)](#) based upon the British 2 in mortar bomb.

Description

The body of the bomb resembles others in this family, a steel tube with a cast fin assembly and a simple flat nose cover. The interior carries a flare canister attached to a parachute. A pyrotechnic delay runs from the cartridge container to the interior of the bomb, where it ignites a small expelling charge. This charge lights the flare composition and then blows the complete unit through the nose of the bomb, after which the parachute deploys and the flare descends.

Specifications

Length: 260 mm

Weight: 800 g

Weight and type of payload: parachute and flare

Number of charges: 1

Fuze: none

Operating range: 350 m

Muzzle velocity: 78 m/s

Illuminating power: 100,000 cd

Delay time: 6 s

Burst height: 100 m

Burning time: 30 s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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MORTARS - 52 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

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52 mm smoke bomb MK1/2

Armament

Israeli 52 mm Soltam mortars; ex-British 2 in mortars.

Development

By [Israel Military Industries \(IMI\)](#) based upon the British 2 in mortar bomb.

Description

The body of this bomb is a steel tube, closed at the head by a cap and at the tail by a diecast plug with four emission holes and a central screwed hole, into which the diecast tail unit is screwed. The body is filled with hexachloroethane smoke composition. A delay unit passes from the cartridge container in the tail to a priming charge inside the bomb body. After firing, the delay burns through and ignites the priming charge, which in turn lights the smoke composition. The smoke is emitted through the four holes in the base plug.

Specifications

Length: 235 mm

Weight: 910 g

Weight and type of payload: 540 g HC smoke composition

Number of charges: 1

Fuze: none

Max range: 400 m
Muzzle velocity: 78 m/s
Delay time: 7.5 s
Emission time: 100 s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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MORTARS - 52 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

52 mm HE/fragmentation bomb

Armament

Israeli 52 mm Soltam mortars; ex-British 2 in mortars.

Development

By [Israel Military Industries \(IMI\)](#) based upon the British 2 in mortar bomb.

Description

This generally resembles the HE bomb described previously but differs in having a serrated, spirally wound steel coil, lining the interior of the body in order to increase fragmentation.

Specifications

Length, fuzed: 242.5 mm

Weight, fuzed: 1.02 kg

Weight and type of payload: 105 g TNT

Number of charges: 1

Fuze: impact PD No 161

Max range: 480 m

Muzzle velocity: 78 m/s

Manufacturer

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MORTARS - 52 mm MORTARS, [ISRAEL](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

52 mm HE bomb MK 2/1

Armament

Israeli 52 mm Soltam mortars; ex-British 2 in mortars.

Development

Developed by [Israel Military Industries \(IMI\)](#) based upon the British 2 in mortar bomb.

Description

The bomb body is a pressed steel tube into which a diecast four-fin tail unit is screwed. An adaptor is fitted into the nose, into which the fuze is screwed. The propellant charge is a single cartridge fitted into the tail tube and retained by a screwed plug, with a central hole for the mortar's firing pin.

Specifications

Length, fuze: 243 mm

Weight, fuze: 1.02 kg

Weight and type of payload: 130 g TNT

Number of charges: 1

Fuze: impact SQ No 161

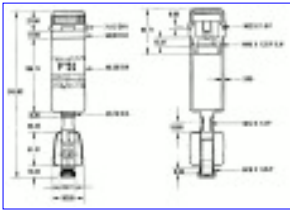
Max range: 480 m

Muzzle velocity: 78 m/s

Manufacturer

[Israel Military Industries \(IMI\)](#).

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*52 mm HE bomb
(1998)*

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [ISRAEL](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Tracer	red bullet tip
AP	black bullet tip
AP-I	blue tip over black ring
AP-I-T	blue tip over black ring over red ring

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.50 Action Express

Synonyms:

0.50 AE

Armament

[Desert Eagle](#) semi-automatic pistol; LAR [Grizzly](#) Mk V semi-automatic pistol.

Development

Developed by Evan Wildey of Action Arms and put into production by TAAS - [Israel](#) Industries in 1991 (now [Israel Military Industries](#) (IMI)) under its 'Samson' commercial brand name. The intention was to provide a pistol with a large calibre cartridge, designed to produce a stopping power previously unavailable.

Description

A rimless, straight case, Boxer primed, carrying a jacketed hollow point bullet. It originated as a round for silhouette shooting with single-shot weapons, but since the heavy [Desert Eagle](#) automatic pistol was adapted and has proved successful, other manufacturers are now beginning to chamber heavy pistols in this calibre. This round may have attractions for the military.

Specifications:

Round length: 40.5 mm
Case length: 32.64 mm
Rim diameter: 13.06 mm
Bullet diameter: 12.7 mm
Bullet weight: 19.44 g
Muzzle velocity: 420 m/s
Muzzle energy: 1,715 J

[ISRAEL](#)

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: JHP; 19.44 g; MV 420 m/s

Ball: JSP; 19.44 g; MV 420 m/s

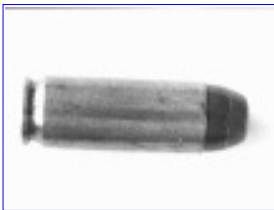
UNITED STATES OF AMERICA

Manufacturer

CCI-Speer

Type: Ball: JHP; 19.5 g; MV 420 m/s

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0.50 Action Express

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.41 Action Express

Synonyms:

0.41AE; 10.4 mm AE

Armament

Suitably chambered automatic pistols, namely SIG, Beretta, Sphinx and so on.

Development

This was developed by Evan Whildin of Action Arms in 1986, as a method of upgrading 9 mm automatic pistols with the minimum amount of rebuilding. It was initially produced for the Action Arms AT-88 pistol, an upgraded copy of the CZ-75 semi-automatic pistol. A significant feature is that the dimensions of the base and extraction rim are identical to the 9 × 19 mm Parabellum cartridge, so the dimensions of the weapon's breech face remain unchanged. All that is required is to change the weapon's barrel and magazine, replace the recoil springs and recalibrate the sights. The first commercial production of this cartridge was undertaken by [Israel Military Industries \(IMI\)](#).

Description

The case is a rebated rimless pattern in which the extraction rim is smaller than the head of the case; in effect, a 9 mm case with the body expanded to suit the 0.41 bullet. The larger bullet and charge produce a significant increase in energy. A number of loads have been developed, but the only one suitable for

military purposes uses a 13 g full metal jacketed bullet.

Specifications

Round length: 29.25 mm
Case length: 22 mm
Rim diameter: 9.96 mm
Bullet diameter: 10.41 mm
Bullet weight: 13 g
Muzzle velocity: 310 m/s
Muzzle energy: 625 J

ISRAEL

Manufacturer

[Israel Military Industries \(IMI\)](#)

Type: Ball: FMJ; 13 g; MV 310 m/s; Eo 625 J
Ball: JHP; 11 g; MV 387 m/s; Eo 823 J

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: FMJ; 13 g; MV 290 m/s

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer
Type: Ball: JHP; 11.7 g; MV 305 m/s
Ball: FMJ; 11.7 g; MV 305 m/s

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0.41 Action Express



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ARTILLERY ROCKETS

Date Posted: 10 December 1999

Jane's Ammunition Handbook 1999-2000

240 mm FRAG-HE F-961

Armament

BM-24-12 MRS; 240 mm artillery rocket system.

Development

The Soviet 240 mm rocket system dates from the early 1950s. It has for some years been regarded generally as obsolete, although numbers may remain in reserve with a few of the former Warsaw Pact armed forces and some nations in the Middle East. In 1967, sufficient numbers of BM-24-12 truck-mounted tubular frame launchers were captured by the [Israel](#) Defence Force for the type to be taken into the Israeli armoury. For a time, direct copies of the 240 mm FRAG-HE rockets were manufactured by [Israel Military Industries \(IMI\)](#) and were even offered for possible export sales as the 240 mm Artillery Rocket System. The 240 mm Artillery Rocket System has been withdrawn from front-line Israeli service but may be retained in reserve.

Description

Only one type of 240 mm artillery rocket, the FRAG-HE F-961, is likely to be encountered although chemical and smoke rockets were reported at one time.

The 240 mm FRAG-HE F-961 is a spin-stabilised rocket resembling an elongated conventional artillery projectile. The streamlined ogive has a threaded fuze well for a nose-mounted PD V-24 fuze, although the Israeli equivalent is provided with a NATO-standard PD M577 with an optional 0.05 second delay mode. The latter fuze is not armed until it is at least 200 m from the launch point. Proximity fuzes were offered as an option on Israeli produced 240 mm rockets.

The warhead is a machined steel forging threaded onto the rocket motor. On the 240 mm FRAG-HE the explosive filling is 27.15 kg of TNT; on the Israeli equivalent it is 18.3 kg of TNT. In both cases detonation of the explosive fractures the steel warhead casing into approximately 12,000 fragments, creating an effective lethal area for each rocket warhead of approximately 12,000 m².

The rocket motor casing is machined from heat-treated high-tensile alloy steel. Threaded into the base is a steel nozzle block into which 16 nozzles canted at an angle of 10° to impart stabilising spin are machined; the external diameter of each nozzle is 29.97 mm. The spin rate at launch is 14 rps, raising to 180 rps at burnout.

The double-base rocket propellant is formed in seven tubular blocks, each hollow along the centre, providing a thrust of 4,000 kg and a burn time of 1.2 seconds. The propellant is ignited, via a base-mounted electrical initiator, by black powder in a bag under the forward bulkhead and above the propellant blocks. Propellant weight in the Israeli version is 24 kg. A base grid prevents the propellant blocks from shifting towards the nozzles.

The maximum range of the 240 mm FRAG-HE F-961 and its Israeli equivalent is approximately 10,700 m. At that range probable error ranges are of the order of 95 m in range and 40 m in azimuth. At 10,000 m a salvo of 12 rockets can cover an area of 125,000 m².

Specifications

Israeli model

Calibre: max 240.54 mm

Weights:

complete, at launch - 110.5 kg

complete, at burnout - 85.8 kg

warhead - 48.3 kg

explosive - 18.3 kg TNT

propellant - 24 kg

Length, with fuze: 1.29 m

Max range: approx 10,700 m

Velocity:

at launch - 40 m/s

at burnout - 400 m/s

at impact, max range - 270 m/s

Total impulse: 4,800 kg/s

Thrust: 4,000 kg

Motor burn time: 1.2 s

Flight time to max range: 51.5 s

Authorised fuzes

PD V-24; PD M577

Equivalent rockets

[ISRAEL](#)

Manufacturer: [Israel Military Industries \(IMI\)](#)

Type: 240 mm FRAG-HE

Description: See text.

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240 mm FRAG-HE rocket as produced by [Israel Military Industries \(IMI\)](#). The RFAS 240 mm FRAG-HE F-961 is virtually identical

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

Ammunition for US 3 in/50-calibre naval guns

Armament

3 in/50 dual-purpose naval gun mountings.

Development

The 3 in/50 medium calibre dual-purpose gun has been in US Navy service for many years, although it has now been largely superseded by more modern equipments. However, 3 in/50 naval guns continue to be used by many navies and in some countries, such as Denmark and Norway, are deployed as coastal defence weapons. Mountings vary widely but most are dual-purpose single-gun mountings with possible rates of fire up to 50 rds/min, typical being the Mk 34 mounting used by the Spanish Navy.

Many different types and marks of 3 in/50 ammunition have been introduced over the years and some natures, such as APC and Illuminating, have largely been withdrawn. Only those most likely to be encountered are mentioned here.

Description

The 3 in/50 rounds are fixed with the thin-walled forged steel projectiles securely crimped into brass Mk 7 cartridge cases by a single cannelure just behind a wide pressed copper drive band. Various types of projectile case will be encountered, including ductile and high-fragmentation steel, but most have nose fuzes, either proximity or point-detonating. Projectile fillings also vary but as a general rule Composition A-3 (RDX/Wax 91/9), Composition B and similar explosives have taken the place of the earlier TNT.

Projectile types include Mks 25 (Illuminating - no longer used), 27, 29, 31 and 33. Variations between the various marks include the type of steel involved, the shape of the cavity, screw threads and lengths.

The brass Mk 7 rimmed cartridge case (the Mk 9 is an alternative) has a distinctive neck just behind the junction with the projectile. The most common propellant charge is 1.859 kg of [M6](#) flashless propellant although other types of single-base multiperforated grain powders will be encountered. The propellant charge is held against the cartridge base and the Mk 41 percussion or Mk 42 electrical primer tube by a wad fronted by a combustible distance-piece which contains lead foil.

Muzzle velocity for most rounds is of the order of 823 m/s. Maximum range against surface targets is 12,930 m and 8,950 m against air targets.

Although there are many marks and sub-marks of each type, 3 in/50 ammunition was divided by the US Navy into the following categories - not all remain operational and other navies apply their own designations and/or categories:

AA

Anti-Aircraft rounds with solid-based and mechanical time fuzes.

HC

High Capacity, intended for use against surface targets and fitted with PD fuzes such as the M557. Originally filled with 336 g of TNT (typical), more recently produced projectiles now contain 577 g of Composition A-3.

HE-MT

A mechanical time fuzed round which was intended to completely replace the AA.

HE-IR

Fuzed with an infra-red proximity fuze. Not procured in quantity.

HE-IR/PD

Fuzed with an infra-red proximity fuze with an additional impact feature. Not procured in quantity.

HE-PD

Originally intended to replace the HC rounds, this round has a point-detonating fuze for use against surface targets.

VT

Intended for use against air targets this round has a radio proximity fuze.

BLP

Inert training projectile with dummy fuze.

BLT

Inert training projectile with tracer and dummy fuze.

Specifications

Weights:

complete round - 11.35 kg

projectile - 5.91 kg

explosive - (HC) 577 g Comp A-3

propellant - 1.859 kg [M6](#)

Lengths:

complete round - (fuzed) 883 mm

projectile - 330 mm

Muzzle velocity: 823 m/s

Max range: (surface targets) 12,930 m

Operating temperature limits: -40 to +51°C

Storage temperature limits: -62 to +71°C

Authorised fuzes

See text

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 3 in L/50 HE, FNF, Prac (BL)

Description: Standard specifications. HE loaded with Composition A-3 and could be fitted with a Proximity fuze. FNF is Flash No Fragmentation

NORWAY

Manufacturer

[Nammo](#) Raufoss A/S

Type: 76 mm ASP [M78](#)

Description: See following entry

SPAIN

Manufacturer

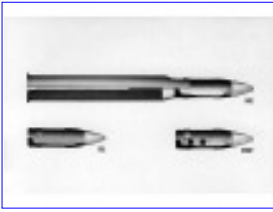
EXPAL

Type: HE-VT, NF-VT, HC, BLP, BLT

Description: Standard specifications as text but propellant is GSB112 flashless (equivalent to [M6](#)).

Muzzle velocity given as 823 m/s. HE-VT filled with Hexotonal

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Types of 3 in/50-calibre ammunition manufactured by [Simmel Difesa SpA](#)

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NAVAL AND COASTAL DEFENCE GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

5 in/54 naval gun ammunition

Armament

5 in/54 calibre Mk 18 naval gun in Mk 42 mountings; 5 in/54 calibre Mk 19 naval gun in Mk 45 mountings; 5 in/Mk 45 Ultra-Lightweight naval gun; Otobreda 127/54; 127/54 OTO Compact gun mount (Compatto); Otobreda 127/54LW Alleggerito.

Development

All 5 in/54 calibre naval guns use a different family of ammunition from the earlier 5 in/38 calibre guns but the numerous types and subvariants remain as varied as before.

The first 5 in/54 calibre gun was the Mk 16, used on the Mk 39 mounting. This combination was developed during the last years of the Second World War but it was not a success, compared to the development of the Mk 18 gun on the various Mk 42 mountings. In 1971, these were followed by the Mk 19 gun on the Mk 45 series of mountings for the US Navy, now in widespread service (the US Navy has over 150 currently in service) and still the basis of further development. Mk 45 guns are in service with Australia, [Greece](#), New Zealand, [Thailand](#) and [Turkey](#), as well as with the US Navy.

Metal parts for 5 in/54 calibre projectiles are manufactured at the Scranton Army Ammunition Plant operated by Chamberlain Manufacturing.

The 5 in/Mk 45 Ultra-Lightweight naval gun was the subject of a May 1994 licence agreement between Royal Ordnance, UK (now [BAE Systems](#), RO Defence) and Lockheed Martin, USA. The agreement, which involves manufacturing the system on a 50:50 basis, is with a view to RO Defence being the naval gun system prime contractor for the UK, French and Italian tripartite Common Next

Generation Frigate (CNGF) programme (now cancelled). An adjunct to this agreement was that RO Defence and Alenia Difesa Divisione Otobreda of Italy are jointly engaged in developing a 5 in/127 mm ERHE round with a planned maximum range of 30,000 m. Available details of this round are provided below in this entry.

A US Navy programme involves modifications to the Mk 45 mountings to provide for, among other objectives, a capability to produce a range increase of approximately 50 per cent for ballistic projectiles. In mid-1997, Lockheed Martin delivered a modified Mk 45 gun proof-of-concept firing assembly to the US Naval Surface Weapons Center in Virginia. This has a 62 calibre Mk 45 Mod 4 barrel and housing and a strengthened breech to accommodate the increase in muzzle energy from the current 10 MJ to about 18 MJ. By 1999, two full prototypes were to be delivered, with an introduction into service on DDG-51 destroyers during the year 2000. Between 18 and 28 mountings will initially be involved, with the longer term possibility of retrofitting about 150 existing guns still in service with the US and other navies.

Further range increases for ship-to-shore bombardment will be obtained by the introduction of rocket assistance or gliding projectiles. The latter will provide Naval Surface Fire Support (NSFS) capable of attacking targets within 63 n miles (116 km) of a ship. As a first step rocket-assisted projectiles are being developed to extend ranges past the existing maximums. Another objective is to develop an Extended Range Guided Munition (ERGM) which will involve the use of Global Positioning System (GPS) and inertial navigation guidance trajectory control over 140 km plus ranges. In-service date could be as early as FY01. Maximum unit cost for production ERGMs is required to be no more than US\$20,000 or lower. A GPS receiver suitable for use in a rocket-assisted 5 in (127 mm) projectile has been produced by the Interstate Electronics Corporation (IEC) of Anaheim, California.

As an indication of what the ERGM could involve, Raytheon TI Systems, Inc, (formerly Texas Instruments) in association with the US Naval Surface Warfare Center, Dahlgren Division, is developing the EX 171 ERGM carrying 72 EX-1 submunitions (adapted from the US Army's XM80) each with a XM234 self-destruct fuze. The EX 171 is 1.55 m long and weighs 50 kg. Guidance involving GPS, locking onto four or more GPS satellites and with a back-up inertial navigation system (INS), is effected using canard fins while a rocket-assist motor burns for 15 seconds; this motor has been relocated from the tail to a position closer towards the nose. The submunition payload is ejected 250 to 400 m above a target area. Accuracy is claimed to be a 20 m CEP. Operational testing at sea was scheduled for FY01 although during testing some difficulties were encountered due to the high firing energies generated when firing the ERGM from the L/62 barrel mounted on the United Defense Mark 45 Mod 4 mounting. The energy level produced when firing the ERGM is of the order of 18 MJ compared to the 9.6 MJ produced firing conventional projectiles. This has resulted in the programme being extended to FY04, although the US Navy hopes that it will be completed by the year 2003.

A 155 mm version of the ERGM has been proposed for US Army deployment. Much of the guidance, navigation, control and payload technology involved in the 127 mm ERGM is shared with the 155 mm XM982 (which see).

The US Navy is interested in developing a 155 mm naval gun to arm future generations of warships. This will provide ammunition commonality with land artillery systems and allow the Navy to make use of advanced and long range smart munitions formerly developed for land use.

Description

As with the earlier 5 in (127 mm) 38 calibre rounds, 5 in/54 calibre ammunition is semi-fixed. Compared with the earlier 5 in/38 calibre ammunition the rounds are longer with a more modern design, making the provision for deep intrusion fuzes. The forged steel projectiles are also longer and have a more streamlined outline, especially with the ogive, together with a distinct boat tail and flat base. The

single wide copper drive band is retained.

As with the 38 calibre ammunition, most of the projectiles are similar in weight (between 31 and 31.75 kg) and outward appearance, but all use a common charge system contained in a straight-sided 72:28 brass cartridge case which is 834.5 mm long. The usual operational charge is Full Charge (STD) but a Reduced Charge (RCHG) is also provided. All the case types mentioned below are basically similar and use loose-filled single-base multiperforated (seven-hole) diphenylamine powder propellants with an SPDF-type stabiliser and anti-flash additive, all held in place by a wad surmounted by a distance-piece. A case plug closes off the mouth of the case until just before loading. Primers are electrical. The types of cartridge case and their fillings (weights are nominal) are shown in the following text.

Full Charge (STD) - Case Mark number 6 containing 8.4 kg of SPDN-BF or SPDF-BF propellant; Primer Mark number 13

Full Charge (STD) - Case Mark numbers 7 and 9 containing 8.4 kg of SPDN-BF or SPDF-BF propellant; Primer Mark number 45

Full Charge (STD) - Case Mark number 9 containing 8.4 kg of Universal propellant; Primer Mark number 45

Reduced Charge (RCHG) - Case Mark number 9 containing 2.85 kg of SPDF-BF propellant; Primer Mark number 153.

As a range table guide, the muzzle velocity for Full Charge when firing a nominal 31.8 kg projectile is 808 m/s. Maximum range against surface targets when fired from a Mk 19 gun in a Mk 45 mounting is 23,600 m, while for air defence the maximum ceiling is 15,000 m. The Reduced Charge produces a muzzle velocity of 457.2 m/s with the same weight of projectile.

The types of 5 in 54 calibre projectile are as follows:

5 in/54 Calibre Projectile, Common

Although intended for use primarily against naval or other surface targets this projectile can be used as an anti-aircraft projectile; it approximates to the APC-T land equivalent. There is only one type, the Mk 42. It uses a forged steel body with an armour-piercing tip hooded behind a light-alloy streamlined ballistic cap. The centre of the penetrator body contains a 970 g Explosive D (ammonium picrate) burster charge. The base of the projectile has a base plug into which is threaded a base-detonating fuze which is intended to function only after the projectile has penetrated the target armour. To provide an impact marker for spotting purposes the hollow interior of the ballistic cap contains a marker dye container. Available dye colours are orange, red, blue and green.

This projectile is normally fired using the Full Charge only. The nominal muzzle velocity is then 808 m/s. Projectile weight is 31.8 kg and length 665 mm.

5 in/54 High Explosive Projectiles

There are numerous variants of the basic 5 in/54 calibre high-explosive projectile, which are essentially the same, yet, vary according to the size and presence or absence of a cavity in the base for a base fuze or the type of steel (fragmentation or non-fragmentation) used for the body. All body types have the same basic outline, are 660.4 mm long and have a nominal weight of 31.8 kg. These projectiles may use either Full or Reduced Charges. As a general guide, base detonating projectiles are filled with Explosive D (ammonium picrate) while point detonating projectiles use Composition A-3 (RDX/Wax 91/9).

A new high-fragmentation HE projectile is a component of the Mk 45 Gun System Modification Program.

5 in/54 Anti-Aircraft/Controlled Variable Time - AAC

This uses a mechanical time fuze fitted to the nose (normally protected before loading by a domed cover), along with an auxiliary detonating fuze located in a cavity behind the nose fuze and a base detonating fuze. The AAC body types likely to be encountered are the Mk 41 and 61, both of which contain 3.45 kg of Explosive D (ammonium picrate).

5 in/54 HE

Also referred to as HC, this is essentially the same as the AAC but uses a point-detonating fuze in place of the mechanical time nose fuze. The body types involved are the Mk 41 and 61, both containing 3.54 kg of Composition A-3 (RDX/Wax 91/9).

5 in/54 High Explosive/Point Detonating HE-PD

This is basically similar to the HE but lacks the base-detonating fuze. Where appropriate the base fuze cavity is closed by a threaded plug. The body types involved are the Mk 41, 55, 61 and 64, all containing 3.54 kg of Composition A-3 (RDX/Wax 91/9).

5 in/54 High Explosive/Variable Time HE-VT

This projectile uses a radio proximity fuze which may or may not have a self-destruct element. With this projectile the base fuze cavity is plugged. Body types likely to be encountered are the Mk 41 and Mk 64, both containing 3.54 kg of Composition A-3 (RDX/Wax 91/9).

5 in/54 High Explosive/Controlled Variable Time HE-CVT

This is fitted with a radio proximity fuze only (an infra-red proximity fuze was used at one time but was withdrawn) with fuze control effected through the use of a built-in mechanical timer. The body types likely to be used are the Mk 55, Mk 64 or Mk 65 high fragmentation, all with solid bases. All contain 3.54 kg of Composition A-3 (RDX/Wax 91/9). The French [TDA](#) 127 MM proximity fuze is one optional fuze for this projectile.

A rocket-assisted HE projectile was developed for the 5 in/54, with a maximum range of 29,170 m at an angle of barrel elevation of 60°. It was not issued for service.

127 mm/5 in/54 ERHE

This round is currently at the technology demonstrator stage to illustrate that a 30,000 m range can be achieved in support of the gun options being considered for the Common Next Generation Frigate (CNGF). Royal Ordnance and Alenia Difesa Divisione Otobreda are jointly engaged in the programme.

The round is semi-fixed and of similar dimensions to the Mk 64 body and Mk 9 case combination from the 5 in/54 family to ensure compatibility with existing ammunition handling systems. The required range increase is provided by a 9.5 kg triple-base propellant charge to increase muzzle velocity to 910 m/s, and a Base Bleed (BB) unit. The projectile contains a nominal 3.5 kg of Composition A-3 (similar to that of the Mk 64) and has a forged steel body with improved fragmentation performance.

Other available details are that the projectile weighs 28.6 kg, of which 2.12 kg is the fuze. Projectile length is 663 mm.

5 in MK 172, HE-ICM

The US Navy Conventional Ammunition Program Office has completed qualification of a 5 in HE-ICM projectile for land attack and anti-submarine warfare. The projectile is based around the MK 172 projectile body capable of carrying a variety of payloads, including HE, Smoke, decoys and others, but for the HE-ICM role it carries 49 dual-purpose (fragments and shaped charge) MK 2 submunitions arranged in seven layers. The MK 2 submunition differs from the US Army's [M80](#) in having the usual Comp A5 explosive charge replaced by PBXW-11/PBXN-5 insensitive explosives. As part of a future update programme the submunition M223 fuze will be replaced by the M234 with a self-destruct element.

The expulsion charge is WC294 Ball Powder propellant. For the HE-ICM fuze, the existing MK 419 Multi-Function Fuze (MFF) has been modified by replacing the usual PBXN-5 booster with a transfer tube that ignites the expulsion charge. The modified fuze is known as the MK 429 MFF although it will be employed in the electronic time mode only.

The base 5 in MK 172 HE-ICM has a baseline range of 13 nm, although it is planned to increase this to 21 nm once the EX 174 propelling charge has been qualified for the 5 in, 62 Caliber, MK 45 MOD 4 gun.

Provisional approval for production for the baseline projectile body without fuze was given in March 1998. Limited production has commenced.

5 in/54 Calibre Projectile, Illuminating

This is a conventional illuminating round. There is only one body type, the Mk 48-1, carrying the Mk 11 illuminating load which weighs 7.39 kg and produces 600,000 candlepower for 50 seconds. When the nose-mounted Mk 342-1 mechanical time fuze functions, the illuminating load is ejected from the projectile base by a 77.8 g black powder charge located behind the nose-mounted mechanical time fuze. The illuminating load (which uses 1.355 kg of powdered magnesium mixed with an oxidiser) then descends suspended from a 940 mm parachute.

The projectile weighs 30.93 kg and is 662.4 mm long. Full or Reduced Charges can be used.

5 in/54 Calibre Projectile, Chaff

Chaff projectiles are used as a basic Electronic CounterMeasure (ECM) by filling a volume of air with a large number of small metallised glass fibre needles, these produce a large radar cross-section to confuse enemy radars or missiles. The projectile uses a Type B (S-band), Type C (X-band) or Mk 22 Mod 0 (S-band) chaff load in a body interior optimised in volume to accommodate chaff payloads, it also uses a mechanical time fuze. Payloads are ejected through the projectile base by a small ejection charge located behind the nose-mounted fuze.

A typical 5 in/54 Chaff projectile weighs 31.4 kg and is 662 mm long. Maximum range using the Full Charge is 21,860 m. Full or Reduced Charges can be used. This projectile is no longer in the US Navy inventory.

5 in/54 White Phosphorus (Smoke)/Point Detonating WPW/PDF

This projectile uses an unusual smoke production system, in that a Mk 14 canister containing White Phosphorus (WP), is ejected from the base of the carrier projectile once the nose-mounted Mk 89 point-detonating (over land) or Mk 90 mechanical time (over sea) fuze has functioned. The canister, which is 384.3 mm long, is ejected by the internal pressures created by a 56.7 g expulsion charge

located beneath the nose fuze cavity. The same charge also initiates a delay element in the top of the canister. After the delay is complete the delay element detonates a burster tube running through the centre of the canister and breaks the canister open to disperse the white phosphorus. This then creates a grey/white screening smoke cloud which, in still air conditions, persists for up to 7 minutes and is approximately 45 m in diameter. The WP with this projectile is coated with synthetic rubber to improve its shelf life - the coated product is called TWP (plastized White Phosphorus).

The projectile weighs 31.75 kg and is 661.9 mm long. Full or Reduced Charges can be used.

As a general guide a complete 5 in/54 calibre round weighs 47.9 kg.

5 in/54 Practice projectiles with inert fillings and dummy fuzes have also been produced along with completely inert handling training and 'ramming' rounds. 5 in/54 TP rounds include the Target Practice (PUFF)/Mechanical Time (TP/PUFF) and the Target Practice, Non-fragmenting/Variable Time (VT/NONFRAG).

Specifications

Type	Common	HE	Illum	Smoke
Weight	31.8 kg	31.8 kg	30.93 kg	31.75 kg
Filling	970 g	3.54 kg	7.39 kg	WP
Length	665 mm	660.4 mm	662.4 mm	661.9 mm

Authorised fuzes

Several types - see text

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HE, ILL, FNF, BL

Description: FNF is Flash No Frag for training and spotting while BL is Practice. Charges and various types of fuze, including Proximity, also available. Weight of all projectiles given as 32 kg and propellant charge weight 7 kg

SPAIN

Manufacturer

DEFEX SA

Type: HE-VT, HE-MT, E (Prac)

Description: Standard US specifications

Manufacturer

EXPAL SA

Type: HE-VT, HE-MT, VT-NF, E (Prac)

Description: Standard US specifications

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi tactical 12 gauge slugs

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi to provide long-range slugs for military and law enforcement purposes.

Description

Fiocchi slug ammunition is intended for use in situations where targets must be engaged at longer ranges than would be possible with shot shells or in situations where enhanced target penetration is required. Fiocchi slugs feature an integral plastic base wad that is fixed to the slug and stabilises the slug all the way to targets at ranges of 100 m and beyond, depending upon the type of gun used. The hollow point round is designed for optimal stopping power, while the trophy slug is intended for barrier penetration.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Hollow point slug, 36.0 g; Trophy slug, 28 g
Muzzle velocity: Hollow point slug, 449 m/s; Trophy slug, 475 m/s
Muzzle energy: Hollow point slug, 3,639 J; Trophy slug, 3,204 J
Max range: 100 + m
Max effective range: 75-100 m, depending upon gun

ITALY

Manufacturer

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi tactical 12 gauge shotgun shells

Synonym:

none

Armament

Suitably Chambered 12 gauge shotguns.

Development

By Fiocchi for military and law enforcement use.

Description

Fiocchi manufactures three standard tactical shotgun rounds, two buckshot and one Nr. 7½ shot shells. The buckshot shells are in 00 buck and Nr. 4 buck, respectively. Each plastic bodied shell is roll crimped with a transparent closure disc for instant visual identification as to shell type. The 00 buck round contains nine 8.3 mm lead pellets, the Nr. 4 buck shell contains 27 6.1 mm lead pellets, while the Nr 7½ shot shell contains approximately 390 2.4 mm lead pellets.

Fiocchi also manufactures buckshot rounds with copper plated lead shot to provide tighter shot patterns, better shot penetration and reduced shot deformation. These shells have clear plastic casings to allow visible identification and are star crimped rather than roll crimped. Shot weights and velocities are essentially identical to those shells with unplated pellets, although the effective range of the plated pellets will be slightly increased.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 00 buck, 33.4 g; Nr. 4 buck, 36.8 g; 7½ shot, 31.7 g

Muzzle velocity: 00 buck, 406 m/s; Nr. 4 buck, 389 m/s; Nr. 7½ shot, 384 m/s

Muzzle energy: N/A

Max range: Approx 75 m

Max effective range: Approx 25 m

ITALY

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi plastic pellet 12 gauge less than lethal shotshell

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi for military and law enforcement use in riot control and peacekeeping operations.

Description

The Fiocchi plastic pellet round is intended to provide less than lethal options for military and law enforcement in non-compliant or confrontational situations at close ranges from 2.5 to 5 m. Because the plastic pellets are irregularly shaped and lightweight, they rapidly lose velocity and penetration capability. The pellets are coloured yellow and the roll crimped plastic shell has a transparent closure disc for instant visual identification of shell type.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: 7 g
Muzzle velocity: 339 m/s (269 m/s at 2.5 m)
Muzzle energy: 1.01 J (0.65 J at 2.5 m)
Max range: Approx 10 m
Max effective range: 5 m

ITALY

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi low-recoil 12 gauge training round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi for training and familiarisation purposes.

Description

The low-recoil training load is intended for training personnel in the use of the shotgun for military and law enforcement purposes. Because the recoil of full power shotgun shells is sometimes daunting to inexperienced personnel, Fiocchi has developed training ammunition with significantly reduced recoil. Two types of training ammunition are available. One round is filled with Nr. 7½ shot and the other with Nr. 8 shot. Fiocchi training ammunition is plastic cased, colour-coded blue and star crimped.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 24.6 g, both types

Muzzle velocity: 365 m/s, both types

Muzzle energy: N/A

Max range: Approx 100 m

Max effective range: Approx 25 m

ITALY

Manufacturer

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi 12 gauge tactical entry breaching load

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi to provide a door and lock breaching round for military and law enforcement special operations teams.

Description

The Fiocchi tactical entry breaching round is intended for use in special operations dynamic entries, such as where doors and locks must quickly and effectively be breached to allow the entry team quick access to the area under assault. The projectile is constructed of a composite of powdered metal and epoxy that eliminates ricochet. The round may be used for destruction of door locks and hinges, padlocks and chains, or as an explosive ordnance disposal disrupter round. Because of the nature of the round, the muzzle of the gun must not be in contact with the surface of the target, although a standoff device is not necessary.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)
Rim diameter: 22 mm
Projectile weight: 30 g
Muzzle velocity: 400 m/s (374 m/s at 10 m)
Muzzle energy: 2,399 J (2,109 J at 10 m)
Max range: N/A
Max effective range: N/A

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi 12 gauge tactical armour piercing load

Synonyms:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi to provide an armour piercing round for military and law enforcement uses.

Description

The Fiocchi armour-piercing round gives the military or law enforcement user the ability to shoot through light armoured targets and body armour. The plastic sabot contains a two-part projectile consisting of a 7.62 mm subcalibre hardened steel penetrator surrounded by a lead band or 'hammer.' The plastic sabot prevents damage to the shotgun barrel and encases the penetrator en route to the target. Upon impact, the plastic sabot peels away, releasing the penetrator. The lead 'hammer' slides forward through inertia and enhances the effect of the steel penetrator.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 24 g
Muzzle velocity: 451 m/s
Muzzle energy: 2433 J
Max range: 100+ m
Max effective range: 50-100 m, depending upon gun

ITALY

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi 12 gauge rubber buckshot

Synonyms:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi for use in crowd control at distances of greater than 15 m.

Description

The Fiocchi rubber buckshot round contains 15 Nr. 00 buckshot pellets of 0.33 mm diameter. These pellets are light weight and lose velocity at a greater rate than standard lead pellets. At ranges closer than 15 m, these rubber buckshot rounds may cause serious injury. The rounds are plastic, roll crimped with a clear plastic closure disc for positive visual identification.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 0.57 g, each pellet; 9.0 g total

Muzzle velocity: 158 m/s (179 m/s @ 10 m; 149 m/s @ 20 m)

Muzzle energy: 17 J (8.9 J @ 10 m; 7.8 J @ 20 m)

Max range: Approx 50 m

Max effective range: Approx 25 m

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Fiocchi 12 gauge rubber baton/slug

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Fiocchi for use in crowd control at distances of 15 to 40 m.

Description

The Fiocchi rubber baton round is intended for use in crowd control situations at ranges up to 40 m. At ranges closer than 15 m, the baton may cause serious injury. Like most other Fiocchi tactical shotgun shells, the rubber baton round is loaded in a plastic roll crimped case with a clear plastic closure disc for positive visual identification.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 4.5 g

Muzzle velocity: 183 m/s (180 m/s @ 10 m)

Muzzle energy: 120 J (77.2 J @ 10 m)

Max range: Approx 100 m

Max effective range: Approx 40 m

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FUZES - IMPACT FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

PDB335

Armament

60, 81 and 120 mm mortar bombs for smoothbore mortars.

Development

By Borletti for Italian Army mortars.

Description

The PDB335 is an impact super-quick design, similar to the FB332. It has a central striker that protrudes from the nose but is protected by a plastic cap. The striker is held out of alignment by a mechanical escapement, released by setback forces. The fuze body is aluminium.

Specifications

Type: impact

Weight: 204.3 g

Length:

overall - 91 mm

visible - 67 mm

Diameter: 46 mm

Manufacturer

FB Borletti.

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FUZES - PROXIMITY FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FB 391

Armament

60, 81 and 120 mm HE mortar bombs.

Development

By Fuchs Electronics, [South Africa](#), licensed to Borletti to meet requirements of Italian forces.

Description

This is a selectable proximity/point detonating fuze, with impact back-up in the event of proximity failure. A radio fuze, it functions on the reflected signal mixing with the transmitted signal to provide a low Doppler frequency. The particular signal processing technique used ensures proximity function with sharper altitude discrimination than that obtained with an unmodulated carrier. Burst height is typically 3 m, almost independent of soil reflectivity, approach angles and terminal velocities. Arming requires setback and air flow through the turbogenerator and the electric detonator is short-circuited and out of line before firing.

Two models exist; the FB 391A has the 1.5 in 12 tpi UNF thread and standard intrusion; the FB 391B has the French 35.7 × 200 metric thread and appropriate intrusion to be interchangeable with the [V19P](#) fuze.

Specifications

Type: proximity/point detonating

Weight: 180 g

Thread: 1.5 in 12 tpi UNF-1A (but see text)

Length overall: 100 mm

Intrusion: 25.5 mm

Diameter: 49 mm

Arming requirement: 700 g; min airspeed 50 m/s

Arming distance: 3 s flight

Manufacturer

F B Borletti.

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[Borletti FB 391](#) proximity fuze

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FUZES - TIME FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FB 338

Armament

81 and 120 mm carrier bombs.

Development

By Borletti for mortars in Italian service and for general use.

Description

A mechanical time fuze with spring-driven timing mechanism. Safety is ensured by a pull-wire which locks the timing mechanism until withdrawn before loading and by a sliding relay carrying the detonator which is out of line until the fuze has armed in flight.

Specifications

Type: mechanical time

Weight: 140 g

Operating time: 2-50 s

Length:

overall - 175 mm

exposed - 138 mm

Max diameter: 70 mm

Manufacturer

F B Borletti.

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FB 338 mechanical time fuze

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FUZES - IMPACT FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FB 267A

Armament

81 and 120 mm HE bombs in smoothbore mortars.

Development

By Borletti for Italian service mortars.

Description

An impact fuze with optional delay, with direct and graze action. A rotor carries the detonator and delay system and is locked by a pull wire before loading. A firing pin in the nose performs the SQ impact function and an internal inertia firing pin provides graze action.

Specifications

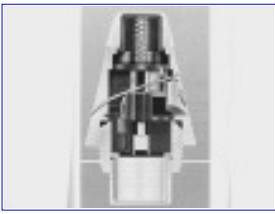
Type: impact, SQ and graze, optional delay

Optional delay: 0.07 s

Manufacturer

F B Borletti.

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Borletti FB 267A DA and graze fuze

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FUZES - IMPACT FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FB 332

Armament

60, 81 and 120 mm HE bombs in smoothbore mortars.

Development

By Borletti for Italian Army mortars.

Description

An impact super-quick fuze of relatively simple design. It has a central firing pin in the nose which is aligned with a detonator and firing train but mechanically locked securely away from the detonator. The lock is removed by a mechanical escapement, released by acceleration and propelled by a spring, after the bomb has left the mortar.

Manufacturer

F B Borletti.

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[Borletti FB 332](#) impact fuze

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FUZES - IMPACT FUZES, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FB 282

Armament

81 and 120 mm smoothbore mortar bombs.

Development

By Borletti for mortars in Italian service.

Description

The FB 282 fuze is a dual-purpose super-quick or delay type, designed for use with 81 or 120 mm mortars. The fuze uses a direct action striker for super-quick functioning and a graze pellet and pyrotechnic element for delay functioning, which is designed to operate to very low-impact angles.

Safety is in accordance with MIL-STD-1316 and there is a pull wire for safety in handling, shipment and parachuting. The fuze has an external Safe and Armed indicator.

The fuze has a plastic nose cap, removable to increase the PD sensitivity for operations on snow or soft surfaces.

Specifications

Type: impact, SQ and delay

Thread: 1.5 × 12 tpi UNF

Optional delay: 0.07 s

Manufacturer

F B Borletti.

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Borletti FB 282 impact, SQ and delay fuze

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm flash, sound and smoke bomb S14B

Armament

All 120 mm smoothbore mortars.

Development

By [Simmel Difesa](#) to provide a training bomb, allowing the point of impact to be observed from distances up to 3 km away.

Description

This is a conventional bomb using a steel body and extruded 12-fin steel tail unit. Most of the body space is filled with inert material, but a central tube carries 300 g of Flash, Sound and Smoke (FSS) mixture, a black-powder based composition. An impact fuze fits in the nose. On impact, the fuze ignites the FSS composition and the resulting explosion can be seen and heard for considerable distances. The bomb is broken up, but the design has been optimised to keep the danger radius to the minimum.

The propelling charge is the same as the WP smoke bomb S11B, described previously and the ballistic performance, weights and dimensions are all exactly as for the S11B.

Manufacturer

[Simmel Difesa](#) SpA.

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb S11B

Armament

All 120 mm smoothbore mortars.

Development:

By [Simmel Difesa](#) for Italian and other Brandt-pattern 120 mm mortars.

Description

This is a conventional White Phosphorus (WP) smoke bomb. It has a steel body filled with WP and is closed at the forward end by an adaptor, which incorporates a thin steel tube on the axis of the bomb. This tube is filled with a charge of Composition B and the adaptor is threaded to accept a percussion fuze.

The tail end of the body is recessed and threaded to accept the extruded steel tail unit which comprises a perforated tail tube and 12 fins. The propelling charge consists of a primary cartridge, inserted into the tail tube and four secondary charges fitted around the tail tube in horseshoe containers.

The bomb is drop-fired in the usual way. On impact with the target area, the filling of Composition B is detonated, providing sufficient force to break open the shell and distribute the WP around the point of impact. The WP then ignites spontaneously giving a smoke cloud and incendiary effect.

Specifications

Length, fuzed: 663 mm

Weight: 13 kg in flight (nominal)

Weight and type of payload: 2.7 kg WP

Number of charges: P + 4

Fuze: impact, DM 111 or equivalent

Max range: 4,690 m

Max muzzle velocity: 248 m/s

Ballistic performance:

Charge	Muzzle Velocity	Range
1	154 m/s	2,155 m
2	187 m/s	3,018 m
3	218 m/s	3,865 m
4	248 m/s	4,690 m

Manufacturer

[Simmel Difesa](#) SpA.

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm submunition TP bomb S15B

Armament

All 120 mm smoothbore mortars.

Development

By [Simmel Difesa](#) as a training round to simulate the submunition bomb S12B.

Description

This bomb is exactly the same as the S12B bomb described previously, except that the submunitions contain smoke composition. The method of functioning is identical, but when the submunition bomblets land on the ground no explosions take place and a smoke cloud is emitted. The weight, dimensions and ballistic performance are exactly as the S12B.

Manufacturer

[Simmel Difesa](#) SpA.

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm submunition bomb S12B

Armament

All 120 mm smoothbore mortars.

Development

By [Simmel Difesa](#), for Italian and other [TDA](#) pattern 120 mm mortars.

Description

The body is of steel and in two parts; the forward section has its nose threaded to accept a time fuze, while the rear section has the tail end recessed and threaded to accept the tailboom. The two sections push-fit together and are secured by a number of shear pins. Beneath the fuze there is an expelling charge and a pusher plate and in the forward part of the body are 12 submunitions. Beneath the submunitions is a steel plate which rests upon the inner lip of the rear body section.

The tail unit is extruded from steel and has a tailboom and 12 fins. The primary cartridge fits into the tailboom and the four secondary charges fit around the tailboom, ahead of the fins, in horseshoe containers.

The bomb is drop loaded and fired in the usual way. When the time fuze functions, it ignites the expelling charge and the subsequent explosion presses down on the pusher plate. The force is transmitted to the steel plate below the submunitions, this pushes on the rear section, shears the securing pins and throws the rear section and tail unit clear. A distributing charge in the bomb then fires, ejecting the submunitions and dispersing them around the trajectory. The bombs then fall to the ground and are

fuzed to burst on impact. Each bomb contains a shaped charge of Composition A5 weighing 25 g. The bomb is designed to burst at a height of 400 m above the ground, in order to obtain a dispersal pattern which ensures overlap between the individual bomblets.

Specifications

Length, fuzed: 663 mm

Weight: 13 kg in flight

Number of charges: P + 4

Fuze: MTSQ, [DM 93](#) or equivalent

Max range to 400 m airburst: 4,230 m

Max muzzle velocity: 248 m/s

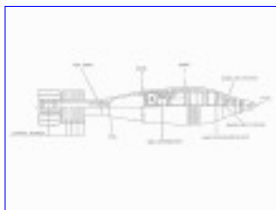
Ballistic performance:

Charge	Muzzle Velocity	Airburst range	Elevation
1	154 m/s	1,590 m	942 mils
2	187 m/s	2,480 m	888 mils
3	218 m/s	3,350 m	888 mils
4	248 m/s	4,230 m	800 mils

Manufacturer

[Simmel Difesa](#) SpA.

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120 mm Simmel submunition bomb S12B

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb

Armament

All 120 mm smoothbore mortars.

Development

By SNIA-BPD for Tampella mortars in Italian service and for general use.

Description

This uses the same body, tail and propulsion system as the HC smoke bomb described previously. The body contains a single flare canister and a parachute. The two supports, beneath the flare canister, rest on the lip of the tailcone and relieve the parachute of any crushing during the functioning of the ejection system. As with the smoke shell, the time fuze fires an expelling charge which ignites the flare composition and forces the canister down. This, via the supports, presses on the tailcone, shears the pins and throws the tail clear, allowing the parachute to deploy and pull the canister from the body.

Specifications

Length, fuzed: 575 mm

Weight, fuzed: 12.6 kg

Type of payload: parachute and flare

Number of charges: P + 7

Fuze: time

Max range: 6,500 m

Manufacturer

SNIA-BPD Defence.

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb HC

Armament

All 120 mm smoothbore mortars.

Development

By SNIA-BPD for Tampella mortars in Italian service and general use.

Description

This resembles the HE and smoke bombs and uses the same tail unit and propulsion system. However, the body is divided about 120 mm from the junction with the tail tube, a tailcone is press fitted into the body and secured by four shear pins. A lip on the cone supports two smoke canisters which occupy the remainder of the body. Above the canisters is a black powder expelling charge held in a nose adaptor, into which a time fuze is screwed.

Upon the functioning of the time fuze the expelling charge is exploded. The flash ignites the two smoke canisters and the gas pressure forces the canisters against the lip on the tailcone, so shearing the pins and causing the tailcone and tail unit to fall away. The pressure then ejects the burning smoke canisters, these fall to the ground and emit smoke.

Specifications

Length, fuzed: 575 mm

Weight, fuzed: 12.6 kg

Type of payload: 2 canisters filled HC smoke composition

Number of charges: P + 7

Fuze: time

Max range: 6,500 m

Manufacturer

SNIA-BPD Defence.

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb WP

Armament

All 120 mm smoothbore mortars.

Development

By SNIA-BPD for Tampella mortars in Italian service and general use.

Description

This uses the same body, tail unit and propulsion system as the HE bomb described previously. The nose is closed by a heavy adaptor which carries a burster tube, extending almost the full length of the body cavity. A percussion fuze fits into the adaptor and the cavity space around the exploder is filled with White Phosphorus (WP) smoke composition.

Specifications

Length, fuzed: 572 mm

Weight, fuzed: 12.6 kg

Type of payload: WP

Number of charges: P + 7

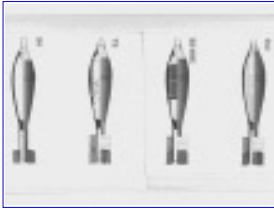
Fuze: impact SQ

Max range: 6,500 m

Manufacturer

SNIA-BPD Defence.

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SNIA-BPD 120 mm family of bombs

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MORTARS - 120 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By SNIA-BPD for Tampella mortars in Italian service and general use.

Description

A conventional streamlined bomb with four gas check rings around the waist and an alloy tail unit and fins. A primary cartridge fits into the tailboom and four secondary increments in horseshoe containers fit above the fins. The nose is closed by an adaptor forming an exploder container and the fuze screws into the adaptor.

Specifications

Length, fuzed: 572 mm

Weight, fuzed: 12.6 kg

Type of payload: TNT

Number of charges: P + 7

Fuze: impact SQ

Max range: 6,500 m

Manufacturer

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm flash, sound and smoke bomb S9A1

Armament

81 mm [TDA](#) and other medium-pressure mortars.

Development

By [Simmel Difesa](#) to provide a training bomb capable of indicating fall of shot at long ranges.

Description

The bomb consists of an aluminium alloy body, the nose of which is threaded to accept a percussion fuze and an extruded aluminium tail unit which is screwed into the end of the body. The bomb body is almost entirely filled with inert material; a central burster tube carries a charge of flash and sound mixture (black powder based). A primary cartridge is fitted into the tail tube and six secondary charges fit around the tail tube in horseshoe containers.

The bomb is fired in the normal way; on impact with the ground the fuze ignites the flash and sound composition, this produces a strong signature capable of being seen over 1,000 m from the point of burst.

Specifications

Length, fuzed: 570 mm

Weight: 4.2 kg in flight

Weight and nature of payload: 200 g flash/sound/smoke mixture

Number of charges: P + 6

Fuze: Percussion, DM 111 or equivalent

Max range: 5,150 m

Max muzzle velocity: 294 m/s

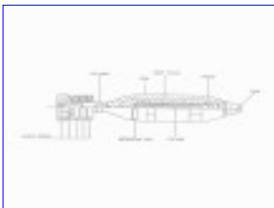
Ballistic performance:

Charge	Muzzle velocity	Airburst range	Elevation
1	120 m/s	1,300 m	800 mils
2	170 m/s	2,330 m	800 mils
3	221 m/s	3,400 m	871 mils
4	245 m/s	4,000 m	817 mils
5	276 m/s	4,700 m	764 mils
6	294 m/s	5,150 m	764 mils

Manufacturer

[Simmel Difesa](#) SpA.

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81 mm Simmel flash, sound and smoke bomb S9A1

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb S3A3

Armament

81 mm [TDA](#) and similar medium-pressure mortars.

Development

By [Simmel Difesa](#) for Italian Army mortars and for export.

Description

This is similar to the base ejection HC smoke bomb S5A1 described previously, differing only in its payload. This consists of a folded parachute and an illuminating flare container carried below the pusher plate in the forebody. The flare container, mouth upwards, is immediately below the pusher plate. The folded parachute is surrounded by two curved metal supports. These serve to transmit pressure from the flare container to the steel plate in the bottom of the forebody. When the time fuze functions, it fires the expelling charge, and the explosion pressure pushes on the flare container and, via the two metal supports and the bottom disc, against the tailcone of the body. This shears the attachment pins and the tailcone and fin unit are thrown clear. The flame from the expelling charge ignites the illuminating composition inside the flare container and the pressure pushes the container, parachute and supports out of the bomb body. The supports fall away, the parachute deploys and the flare is lowered to the ground, delivering area illumination during its fall.

Specifications

Length, fuzed: 570 mm

Weight: 4.2 kg in flight

Weight and type of payload: Illuminating flare and parachute; 800 g of illuminating composition

Number of charges: P + 6

Fuze: MTSQ [DM 93](#) or equivalent

Illuminating power: 1.2×10^6 cd

Duration of fall: >30 s

Optimum deployment height: 400 m

Max range: 4,850 m

Max muzzle velocity: 294 m/s

Ballistic performance: identical to the smoke bomb S5A1 previously

Manufacturer

[Simmel Difesa](#) SpA.

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81 mm Simmel illuminating bomb S3A3

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HC smoke bomb S5A1

Armament

81 mm [TDA](#) and similar medium-pressure mortars.

Development

By [Simmel Difesa](#) for Italian Army mortars and for export.

Description

This bomb is similar to the WP smoke bomb S2A1 in appearance, but differs in the filling and in being fitted with a time fuze. Beneath the time fuze is a black powder expelling charge and a pusher plate, followed by two steel smoke canisters. These rest on a steel plate which is supported by the edge of the body tailcone, fastened to the body by shear pins. The smoke canisters have a central perforated tube and are filled with hexachloroethane/zinc (HC) smoke composition.

The bomb is drop-fired in the usual manner, the time fuze having been set to an appropriate time to produce an airburst at 400 m height at the desired range. When the fuze functions, it fires the expelling charge. The explosion pressure acts on the pusher plate, which then pushes on the smoke canisters and lower steel disc, so placing pressure on the tailcone which shears the securing pins. The tailcone and tailfin unit are thrown clear. While this is taking place, the flame from the expelling charge passes through a central hole in the pusher plate and down the central tubes of the smoke canisters, igniting a priming cloth. Thus the canisters have been ignited by the time they are ejected from the body by the

action of the pusher plate. They then fall to the ground, roughly following the trajectory of the bomb, by which time the priming cloth has ignited the smoke composition. Smoke is emitted for a minimum of 40 seconds.

Specifications

Length, fuzed: 570 mm

Weight: 4.2 kg in flight

Weight and type of payload: 1.5 kg HC smoke mixture

Number of charges: P + 6

Fuze: MTSQ [DM 93](#) or equivalent

Max range: 4,850 m

Max muzzle velocity: 294 m/s

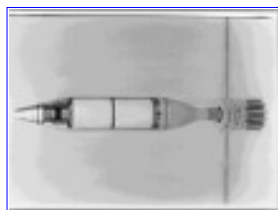
Ballistic performance:

Charge	Muzzle velocity	Airburst range	Elevation
1	120 m/s	850 m	1,031
2	170 m/s	2,000 m	853
3	221 m/s	3,180 m	800
4	245 m/s	3,750 m	800
5	276 m/s	4,425 m	800
6	294 m/s	4,850 m	764

Manufacturer

[Simmel Difesa](#) SpA.

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81 mm Simmel smoke bomb S5A1

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm WP smoke bomb S2A1

Armament

81 mm Brandt and other medium-pressure mortars.

Development

By [Simmel Difesa](#) for Italian Army mortars and for export.

Description

The bomb body is of thin steel and comprises the ogive and parallel-walled portion of the bomb. Behind this is the body tailcone, a push-fit into the main body and secured there by pins. Attached to the end of the tailcone is the tail unit, an alloy extrusion with a perforated tail tube and 12 fins. A primary cartridge fits into the tail tube and up to six secondary charges fit around the tube in horseshoe containers.

The bomb forebody is filled with White Phosphorus (WP) and has a central burster tube filled with 100 g of Composition B. The bomb is drop-fired in the usual manner. On impact with the target the percussion fuze detonates the Composition B, this bursts open the bomb and distributes the WP. This ignites spontaneously on contact with the air, producing dense white smoke and having a degree of incendiary effect.

Specifications

Length, fuzed: 570 mm

Weight: 4.2 kg in flight

Number of charges: P + 6

Fuze: Percussion, DM 111 or equivalent

Max range: 5,150 m

Max muzzle velocity: 294 m/s

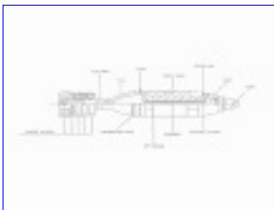
Ballistic performance:

Charge	Muzzle velocity	Airburst range	Elevation
1	120 m/s	1,300 m	800 mils
2	170 m/s	2,330 m	800 mils
3	221 m/s	3,400 m	871 mils
4	245 m/s	4,000 m	817 mils
5	276 m/s	4,700 m	764 mils
6	294 m/s	5,150 m	764 mils

Manufacturer

[Simmel Difesa](#) SpA.

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81 mm Simmel smoke bomb S2A1

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm submunition bomb S6A2

Armament

81 mm [TDA](#) and other medium-pressure mortars.

Development

By [Simmel Difesa](#) for use in Italian Army mortars and for export.

Description

The S6A2 is a parallel-walled bomb with an aluminium alloy body in two parts. The ogive and straight section form the principal unit and carry the time fuze, expelling charge, pusher plate and nine submunitions. The rear section is the tailcone of the body and is a push-fit into the forward section which is retained by shear pins. An extruded alloy tail unit screws into the end of the body. A primary cartridge fits into the tailboom and six secondary charges fit around the boom, ahead of the fins, in horseshoe containers.

The bomb is drop-fired in the usual way, the time fuze being set to produce a burst 400 m above the ground at the desired range. When the fuze functions, it ignites the expelling charge; this presses on the pusher plate and the payload and, shearing the retaining pins, throws off the body tailcone and tail assembly. An explosive ejector then ejects the submunitions and disperses them around the trajectory so as to fall roughly in an ellipse of overlapping lethal zones about 50 × 20 m.

Each submunition weighs 140 g, is 34 mm in diameter and 77 mm long and contains a 25 g

Composition A5 shaped charge capable of penetrating 60 mm of armour. In addition there is a 5 m lethal area of fragmentation around the point of impact.

Specifications

Length, fuze: 570 mm

Weight: 4.2 kg in flight

Number of charges: P + 6

Fuze: MTSQ [DM 93](#) or equivalent

Max range: 4,850 m

Max muzzle velocity: 294 m/s

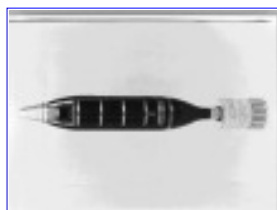
Ballistic performance:

Charge	Muzzle velocity	Airburst range	Elevation
1	120 m/s	850 m	1,031 mils
2	170 m/s	2,000 m	853 mils
3	221 m/s	3,180 m	800 mils
4	245 m/s	3,750 m	800 mils
5	276 m/s	4,425 m	800 mils
6	294 m/s	4,850 m	764 mils

Manufacturer

[Simmel Difesa](#) SpA.

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81 mm Simmel submunition bomb S6A2

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm submunition TP bomb S8A1

Armament

81 mm [TDA](#) and other medium-pressure mortars.

Development

By [Simmel Difesa](#) for use as a training round to simulate the effect of the submunition bomb S6A2.

Description

This bomb is the same as the submunition bomb S6A2 described previously, except that the submunitions are filled with a smoke-producing compound to indicate their point of impact on the ground. The weights, dimensions and ballistic performance are identical in all respects to the service bomb.

Manufacturer

[Simmel Difesa](#) SpA.

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MORTARS - 81 mm MORTARS, ITALY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm submunition bomb RS6A2

Armament

For [L16](#), [M252](#) and similar high-pressure 81 mm mortars.

Development

By Simmel for use in the Breda and other appropriate mortars.

Description

The RS6A2 is a long bomb with an alloy body in two parts. The forward section is threaded for a time fuze, has an expelling charge and pusher plate beneath the fuze and the interior holds nine submunition bomblets. The rear section is a push-fit into the front and is retained by a number of shear pins. A tailboom and six fins are extruded from aluminium and attached to the end of the rear body section. The propelling charge consists of a primary cartridge inserted into the tailboom and six secondary charges fitted around the boom in horseshoe containers.

After firing, the time fuze functions at the selected time to give a burst 350 m above the ground at the required range. The fuze ignites the expelling charge which, by pressure on the pusher plate and through the payload, shears the retaining pins and throws the rear body and tail unit clear. The submunitions are then expelled from the body and dispersed around the trajectory; the height of burst is selected so as to give the optimum ground pattern in which the lethal areas of the bomblets overlap. The bomblets contain a charge of 25 g Composition A5 and are impact fuzed.

Specifications

Length, fuzed: 650 mm

Weight: 4.5 kg in flight

Number of charges: P + 6

Fuze: MTSQ [DM 93](#) or equivalent

Max range to 350 m burst: 4,727 m

Max muzzle velocity: 274 m/s

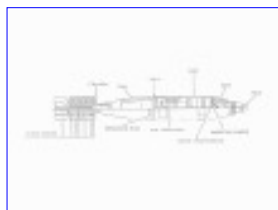
Ballistic performance:

Charge	Muzzle velocity	Airburst range	Elevation
1	122 m/s	744 m	800 mils
2	166 m/s	1,750 m	888 mils
3	194 m/s	2,650 m	863 mils
4	210 m/s	3,272 m	800 mils
5	243 m/s	3,969 m	800 mils
6	274 m/s	4,727 m	800 mils

Manufacturer

[Simmel Difesa](#) SpA.

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Construction of the 81 mm submunition bomb RS6A2

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IDENTIFICATION OF SMALL ARMS AMMUNITION, ITALY

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.455 Webley Mark VI

Synonyms:

0.455 Revolver Mark VI

Armament

Suitably chambered revolvers.

Development

This is the last of a series of British Army 0.455 cartridges originating in 1891. The principal differences in the various Marks related to the bullets, which began as an ogival lead, progressed through a flat-tip lead, three 'Manstopper' flat-nosed types and finally settled on a full jacketed bullet in 1939. It remained in UK service until 1946 but has been produced commercially because numerous revolver makers besides Webley have produced suitable weapons.

Description

A rimmed, straight, brass or nickel case, Boxer or Berdan primed, with an ogival FMJ bullet.

Specifications

Round length: 31.45 mm

Case length: 19.05 mm

Rim diameter: 13.5 mm
Bullet diameter: 11.55 mm
Bullet weight: 17.17 g
Muzzle velocity: 198 m/s
Muzzle energy: 337 J

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: Lead, ogival; 17 g; MV 260 m/s

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0.455 Webley Mark V

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.44 Smith & Wesson Russian

Synonyms:

0.44 Russian; 0.44 Short; DWM 242; GR960

Armament

Suitably chambered revolvers.

Development

Developed in 1871, in order to improve the accuracy of the Smith & Wesson 0.44 revolver, for the Russian government. It became renowned for its accuracy and power and was placed on the commercial market in 1878. Although technically obsolete, the 0.44 S&W Russian may be safely fired in any revolver chambered either for 0.44 Special or 0.44 Magnum. Due to its light recoil, it is well suited as a practice load for either of the more powerful calibres. The cartridge has recently achieved popularity in North America for use in cowboy action-shooting competitions.

Description

A rimmed, brass, straight case, Berdan or Boxer primed, and sometimes with a bullet-stop cannellure in the case. The bullet is usually flat-tipped or round-nosed lead, but FMJ, spherical ball and birdshot have been used in the past.

Specifications

Round length: 36.3 mm
Case length: 24.6 mm
Rim diameter: 13.05 mm
Bullet diameter: 10.9 mm
Bullet weight: 15.94 g
Muzzle velocity: 214 m/s
Muzzle energy: 365 J

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: Lead, RN; 16 g; MV 240 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition Company

Type: Ball: Lead, FP; 13.6 g; MV 213 m/s

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0.44 S&W Russian

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

8 mm Lebel Revolver

Synonyms:

8 × 27R; 8 mm French Revolver; 8 mm Réglementaire Francaise

Armament

8 mm French service revolver Modele 1892.

Development

This cartridge was introduced with the Mle 1892 service revolver. The calibre was chosen so that barrels could be made on 8 mm rifle barrel machinery. It remained in service until the early 1950s and was widely used by police forces. The revolver was also used in French colonies and doubtless many remain in various parts of the world. No government manufacture of ammunition takes place but commercial production continues.

Description

The rimmed case has a fairly distinct taper and a slight shoulder or bottleneck. The standard service bullet was a jacketed flat-nosed type, doubtless chosen in order to improve the otherwise marginal stopping power.

Specifications

Round length: 36.7 mm
Case length: 27.3 mm
Rim diameter: 10.16 mm
Bullet diameter: 8.25 mm
Bullet weight: 7.75 g
Muzzle velocity: 265 m/s
Muzzle energy: 272 J

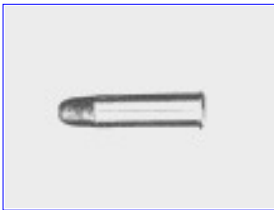
ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: 7.2 g; MV 250 m/s

UPDATED



8 mm French Revolver

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.63 × 25 mm

Synonyms:

7.63 mm Mauser pistol; 0.30 Mauser; 7.62 × 25 mm; 7.62 Tokarev

Armament

Mauser c/96 pistol and variants; Spanish and Chinese copies of the Mauser c/96; early Bergmann, Steyr-Solothurn and Neuhausen sub-machine guns. Also Soviet, Chinese and other weapons chambered for the 7.62 mm Tokarev cartridge, which is virtually identical in almost every detail and is generally usable in any pistol or submachine gun chambered in either calibre.

Development

The 7.63 mm Mauser pistol cartridge was developed by the Mauser company in about 1896, and is virtually identical to the earlier Borchardt cartridge. The dimensions are very similar but the Mauser loading is more powerful. Although the Mauser pistol ceased manufacture in the early 1930s, there are several weapons still in existence which chamber this round and it is still commercially manufactured. The 7.62 × 25 mm Tokarev cartridge is essentially identical to the 7.63 × 25 mm; the existence and continued production of pistols and sub-machine guns in 7.62 × 25 mm are the primary reasons for the continued production of this cartridge. Weapons chambered for this cartridge have recently regained a degree of popularity in some East European special operations and law enforcement organisations because of the bullet's ability to penetrate most body armour, increasingly being worn by criminals. The cartridge is also regaining some popularity in the USA because of a recent influx of thousands of

surplus VZ-52 pistols from the Czech republic.

Description

The case is rimless, bottlenecked and Berdan or Boxer primed. Manufacture took place in many countries in the past and steel-, brass-, or nickel-plated brass cases can be found. Many different types of bullet have been used in this weapon, but the military standard has always been a full metal jacketed type of 5.57 g weight. The high velocity and flat trajectory of this round, coupled with its FMJ bullet make it an excellent performer against body armour and light metal barriers.

Specifications

Round length: 34.55 mm

Case length: 25.14 mm

Rim diameter: 9.91 mm

Bullet diameter: 7.82 mm

Bullet weight: 5.57 g

Muzzle velocity: 455 m/s

Muzzle energy: 576 J

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 5.6 g; MV 440 m/s

PORTUGAL

Manufacturer

INDEP

Type: Ball: FMJ; 5.4 g; MV 425 m/s

UPDATED



7.63 mm Mauser Pistol

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 38R Nagant Revolver

Synonyms:

7.62 mm Soviet revolver; 7.62 mm Nagant gas seal

Armament

Russian/Soviet Nagant Model 1895 revolver.

Development

This cartridge was developed by Leon Nagant, a Belgian gunsmith, in the early 1890s to suit a gas seal revolver he had designed. The gas seal element involved moving the cylinder forward, so that the chamber about to be fired enclosed the rear of the revolver barrel and the mouth of the cartridge actually entered the barrel. On firing, the case mouth opened out to form the gas seal. This, in theory, obviated the usual leak of gas at the cylinder/barrel faces and improved velocity. The actual gain is small and scarcely warrants the mechanical complication of the design. Nevertheless, the Russian Army adopted the design in 1895 and the weapon was manufactured until 1945. Large numbers still exist in reserve stocks and paramilitary hands, and in addition there is a number of target revolvers of gas seal pattern still manufactured in [Russia](#) and the [Czech Republic](#).

Description

The case is rimmed and very slightly necked. The bullet is enclosed inside the case. The necking merely

serves to retain the bullet and also acts as a lead-in for the cartridge, as it is forced forward to enter the rear end of the revolver barrel. The case may be of brass or steel. The actual shape of the necking or taper at the front of the case appears to depend very much upon the ideas of the individual makers; some have a straight taper, others may be found with a slight shoulder. The standard service bullet is lead cored and nickel jacketed, with a flat tip. The bullet may be additionally retained in place by punching into the case in two opposed places.

Specifications

Russian Ball Type R

Round length: 38.86 mm

Case length: 38.86 mm

Rim diameter: 9.85 mm

Bullet diameter: 7.49 mm

Bullet weight: 7 g

Muzzle velocity: 285 m/s

Muzzle energy: 284 J

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: Jacketed, cylindro-conoidal; 6.3 g; MV 300 m/s

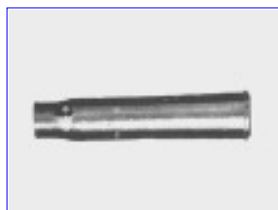
[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Government arsenals

Type: Ball Type R: see above

VERIFIED



7.62 × 38R Nagant Revolver

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.5 × 22.5 Rmm

Synonyms:

7.5 mm Swiss revolver

Armament

Swiss service revolvers.

Development

Introduced in 1882 for use with a Nagant revolver adopted by the Swiss Army. A similar cartridge, which is interchangeable, was adopted in [Sweden](#) and Norway in 1887 when they also placed a Nagant revolver in service. Although officially superseded as a first-line weapon in 1901, the Swiss revolver remained in second-line and reserve service for many years and is still widely used as a target pistol. Limited supplies of ammunition are occasionally still produced in Swiss arsenals.

Description

The case is rimmed, straight taper, brass and Berdan primed. The standard military loading was a 7.12 g jacketed round-nose bullet, whilst a 6.95 g lead bullet was provided for police and other official use and is still the preferred bullet for target shooting. The cartridge identical in dimensions and is fully interchangeable with 7.5mm Swedish and Norwegian revolver rounds.

Specifications

Round length: 34.3 mm
Case length: 23.11 mm
Rim diameter: 10.41 mm
Bullet diameter: 8.07 mm
Bullet weight: 7.12 g
Muzzle velocity: 210 m/s
Muzzle energy: 157 J

ITALY

Manufacturer

Fiocchi Munizioni SpA
Type: Ball: FMJ; 6.95 g; MV 320 m/s

SWITZERLAND

Manufacturer

State arsenals

Type: Ball: FMJ; 7.12 g; MV 210 m/s

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7.5 mm Swiss Revolver

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Rheinmetall DM 642 155 mm cargo shell

Armament

This projectile can be fired from the following 155 mm self-propelled howitzers: TAMSE VCA 155; PzH 2000; Rheinmetall [M109A3G](#) and [M44T](#); Soltam Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); [AS90](#) and [Braveheart](#); M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS.

This projectile can be fired from the following towed 155 mm howitzers: [FH-70](#) and [FH-70 R](#); GH [N-45](#); CITEFA CALA 30/2; Patria Vammas 155 GH 52 Howitzer; Soltam M-46; Otobreda 155 mm 155/39 TM; RDM [155 mm M139](#) and [M114/39](#); SANTA BARBARA 155 mm SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114/39](#); Bofors [FH-77B](#); M199 Cannon for [M198](#) Towed Howitzer; XM777 Lightweight Towed Howitzer.

Development

The DM 642 (RB 63) 155 mm cargo shell was originally a Rheinmetall development, with some funding from the German Ministry of Defence, to produce a cargo projectile with a longer range than the 155 mm DPICM M483A1. The first test rounds were fired during 1983. The 155 mm DM 642 became a joint development with [Simmel Difesa](#) SpA (formerly BPD Difesa e Spazio) of Italy, which also marketed the DM 642. 155 mm RB 63 projectiles produced by Simmel have been known as the 155 mm IM 303 BCR, or simply BCR (Bomblets Cargo Round).

Earlier versions of the DM 642 varied by having several forms of expulsion units or bomblets without

a self-destruct capability. The first type was the DM 602, followed by the essentially similar DM 612 and then the DM 632 which introduced DM 1383 self-destruct bomblets.

An essentially similar enhanced range projectile, the Rheinmetall 155 mm Rh 49, was developed in tandem with the RB 63 (DM 642) and involves a low-drag body combined with a Base Bleed (BB) unit ballistically matched to the US 155 mm DPICM M864 producing a maximum range of around 30,000 m; the number of DM 1383 bomblets carried is reduced to 49. Weight, unfuzed, is 46.13 kg; maximum range is 28,500 m. This extended range version is known as the DM 652.

In June 1996, it was announced that [Israel Military Industries](#) Limited ([IMI](#)) and Rheinmetall Industrie AG (now Rheinmetall DeTec) of Ratingen, Germany, had entered into agreement concerning future co-operation in the field of artillery bomblet ammunition, including the [IMI M85](#) dual-purpose bomblet which has a self-destruct mechanism. Both companies will combine their expertise in the development of future bomblet artillery projectiles in 155 mm calibre. Rheinmetall will also procure 155 mm projectile payloads from [IMI](#) and integrate them into its own artillery projectiles.

One result of the latter agreement was the late 1996 award to Rheinmetall Industrie GmbH (now Rheinmetall DeTec) of a contract from Norway to supply an unspecified number of Base Bleed (BB) cargo rounds carrying [IMI M85](#) dual-purpose bomblets with self-destruct mechanisms. The projectile involved is the DM 662, a development of the DM 652 configured to accommodate 49 [IMI M85](#) bomblets.

Description

The 155 mm DM 642 is a separate loading base ejection carrier projectile, using a high-grade steel carrier shell (known as the DM 1396) with the cavity filled by a total of 63 DM 1383 (RH II) dual-purpose (anti-personnel/anti-armour) bomblets. An expulsion charge is located under the nose fuze well and within the streamlined ogive, while the recessed aluminium base is secured in position by shear pins. A wide copper drive band encircles the body close to the boat tailed base section. The projectile is supplied with a lifting plug.

After firing the nose-mounted MTSQ DM 163 or M577 fuze will function at the selected time, ideally about 300 to 500 m above the target area. The fuze functioning ignites, via a small booster charge, the expulsion charge which creates an expansion of gases within the ogive. This pressure is transmitted downwards to the aluminium baseplate until the shear pins rupture and the baseplate falls away. The contents of the bomblet are then expelled through the base and scattered over the target area by centrifugal forces created by the spin of the carrier shell.

The 155 mm DM 642 carries 63 DM 1383 bomblets arranged in a central stack of nine bomblets surrounded by a further six nine-bomblet stacks. Each DM 1383 bomblet has a steel body containing a small shaped charge and a sensitive impact fuze. The bomblets are intended to detonate on impact but if for any reason this fails to happen a self-destruct fuze will function after about 15 seconds. If both fuzes fail the bomblet fuze has a back-up safety.

As they detonate, the DM 1383 bomblets create an optimum number of anti-personnel fragments and an anti-armour effect. To improve the effectiveness of the shaped charge jet the bomblets are provided with an aerodynamic brake which greatly reduces spin before impact. A nylon ribbon attached to the arming screw on the fuze is used to arm the fuze after expulsion from the projectile and also stabilises the bomblet during flight. The DM 1383 bomblet is heavier and larger than the M42/M46 bomblet used with the 155 mm DPICM M483A1 and distributes a greater number of effective fragments with increased energy. The DM 1383 bomblet weighs 290 g and has a diameter of 42 mm; length is 95 mm.

The charge system used with the tripartite family of 155 mm ammunition and the RB 63 (DM 642) is known colloquially as the 'three cartridge' system. As its name implies the system is made up of three cartridges, the first two with a base charge and a number of increments. Cartridge 3 (Charge 8) is a unitary charge. (UK designations are provided here.)

Cartridge 1, the Charge Propelling, 155 mm, Howitzer, Charge 2, L2A1 consists of the Charge 1 and Charge Propellant Increment 2 combined to form Charge 2. The two weigh 1.21 kg and use SC/202 propellant. They are stitched together and should not be separated.

Charge 1 [L1A1](#) consists of a salmon pink cloth bag, containing 783 g of propellant SC/Z008 with an Igniter L19A1 containing 67 g of NC/200 and 18 g of G20 gunpowder stitched to its base. The forward part of the bag is recessed to contain the Charge Propellant Increment 2, a white cloth bag containing 311 g of propellant SC/Z008.

Cartridge 2, the Charge Propelling, 155 mm, Howitzer Charge 7, L8A1 is made up from Charge 3 L4A1 and Charge Propellant Increments 4 to 7. Total weight is 7.55 kg.

The Charge Propelling 155 mm, Howitzer, Charge 3, L4A1 consists of a smoke grey cloth bag containing 1.39 kg of NO25 propellant divided into two equal bundles. The charge bag is stitched into a combustible sleeve which in turn is secured in a smoke grey main charge bag. The sleeve and main charge bag are large enough to receive the propellant increments 4 to 7 which, when assembled with Charge 3, form the Charge 7 L8A1. On the base of the main charge bag is fitted the Igniter L20A1 containing 80 g of propellant NC/200 and 18 g of G20 gunpowder. The mouth of the main charge bag is fitted with a Velcro loop and hook.

The Charge Propellant Increment 4 consists of an orange cloth bag containing 529 g of NO25 propellant.

The Charge Propellant Increment 5 consists of a grass green cloth bag containing 1.56 kg of N/S 134-040 propellant together with a flash inhibitor pack. This pack contains 125 g of potassium sulphate powder and is positioned in the centre of the propellant. Wrapped and secured around the front end of the propellant is 17 g of lead foil.

The Charge Propellant Increment 6 consists of a dark violet cloth bag containing 2.42 kg of N/S 134-040 propellant divided into two equal bundles, each of which has lead foil strip wrapped and secured around its front end.

The Charge Propellant Increment 7 consists of a beige cloth bag containing 1.49 kg of N/S 134-040 propellant divided into three equal bundles, each of which has lead foil wrapped and secured around its front end.

Cartridge 3 is the Charge, Propelling, 155 mm, Howitzer, Charge 8, [L10A1](#). This consists of a brown combustible main case and a pink combustible end cap. The end cap contains an Igniter, Propelling, Charge L23A1 mounted on a perforated disc. The propellant charge bundle consists of 12.48 kg of NS 54.14 propellant sticks tied in five places using polyester/cotton thread and incorporating lead foil positioned under the top layer of sticks.

All charges are ignited by the Primer Percussion DM 191A1 which contains a primary charge of 1.25 g of nitrocellulose S536.

Using Charge 8 the muzzle velocity of the 155 mm DM 642 is 802 m/s and maximum range 22,400 m. The maximum range of the extended range 155 mm DM 652 is 28,500 m.

It is anticipated that future 155 mm propellant charge systems will involve Modular Charge Systems (MCS). [The German Army has already adopted the Rheinmetall DeTec Modular Propelling Charge System \(MPCS\) DM 72, as have Norway and \[Malaysia\]\(#\).](#)

For training purposes Rheinmetall DeTec have proposed a 155 mm Bomblet Practice Round based on the DM 1396 carrier shell for the 155 mm DM 642 DPICM but containing 24 practice bomblets which produce only smoke, flash and noise on impact, destroying the practice bomblets in the process; non-functioning practice bomblets are identifiable and can be picked up safely. The Bomblet Practice Round has the same ballistic performance as the DM 642 with a maximum range of 22,400 m when using the [L10A1](#) or [M203](#) propelling charge.

Specifications

DM 642

Weights:

projectile - 47 kg

contents - 20.79 kg

bomblet, each - 290 g

Length: 899 mm

Contents: 63 DM 1383 bomblets

Bomblet diameter: 42 mm

Bomblet height: 95 mm

Muzzle velocity (Charge 8): 802 m/s

Max range: 22,400 m

Operating temperature: -46 to +63°C

Authorised fuzes

MTSQ M577 or DM 163

Equivalent projectiles

ITALY

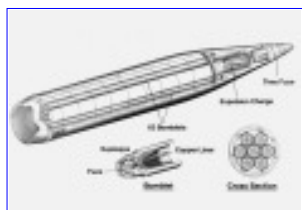
Manufacturer

[Simmel Difesa](#) SpA

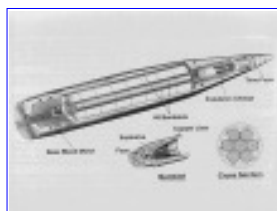
Type: 155 mm BCR

Description: Contains 63 dual-purpose bomblets with self-destruct devices. Projectile weight with lifting plug is 49 kg

UPDATED



Rheinmetall DM 642 155 mm Cargo Shell



Rheinmetall RB 49 155 mm Cargo Shell



Cutaway examples of Rheinmetall 155 mm DM 642 cargo projectile (left) with DM 652 Base Bleed (BB) cargo projectile on right

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Shell, 155 mm, Illuminating DM 106

Armament

This projectile can be fired from the following self-propelled 155 mm howitzers: TAMSE VCA 155; PzH 2000; Rheinmetall [M109A3G](#) and [M44T](#); Soltam Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); [AS90](#) and [Braveheart](#); M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS.

This projectile can be fired from the following towed 155 mm howitzers: [FH-70](#) and [FH-70 R](#); GH [N-45](#); CITEFA CALA 30/2; Patria Vammas 155 GH 52 Howitzer; Soltam M-46; Otobreda 155 mm 155/39 TM; RDM [155 mm M139](#) and [M114/39](#); SANTA BARBARA 155 mm SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114/39](#); Bofors [FH-77B](#); M199 Cannon for [M198](#) Towed Howitzer; XM777 Lightweight Towed Howitzer.

Development

The 155 mm Illuminating DM 106 projectile is one of the three 155 mm projectiles developed as a result of the tripartite agreement entered into by Germany, Italy and the UK, to develop the 155 mm [FH-70](#) Towed Howitzer and its associated ammunition. The 155 mm Illuminating DM 106 projectile is a Rheinmetall W & M GmbH (now Rheinmetall DeTec) development while the illuminating body was developed by the Italian Simmel SpA, now [Simmel Difesa](#) SpA.

Description

The 155 mm Illuminating DM 106 is a separate loading, base ejection carrier shell with a high-grade forged steel body. Normally fitted with a nose-mounted mechanical time fuze, the 155 mm Illuminating DM 106 uses the same carrier shell and booster as the 155 mm Smoke DM 105 (see separate entry). The interior, however, is occupied by a steel case containing an illuminating unit, the main parachute and a secondary spin retarder, all maintained in position by a base cover secured by six shear pins; the base cover also contains a drag parachute. A primary spin retarder is fitted to the dome-shaped top of the steel case along with an ignition chain unit.

In operation, the nose-mounted time fuze functions, ideally at a height of approximately 600 m above ground level, and lights the booster which, in turn, lights the ignition chain unit. The ignition chain consists of a 90 g primary charge of black powder plus a 16 g secondary black powder charge. The 90 g primary charge creates an internal pressure which causes the six slotted pins in the recessed base to shear, allowing the shell's contents to eject. The drag parachute immediately deploys along with the four fins of the primary spin retarder which flip out under centrifugal forces. This reduces the spin rate of the steel case containing the illuminating body and main parachute.

The second stage of deployment then commences approximately 3.5 seconds later when a delay composition ignites the 16 g secondary black powder charge. The pressure forces off the base cover once the six shear pins rupture and the main parachute is then free to deploy, along with the secondary spin retarder. Both combine to stabilise the illuminating body which is ignited by flash from the secondary charge. The illuminating body descends at a rate of less than 5 m/s and provides a non-flickering light intensity of not less than 1.8 Mcd over a diameter of 800 m. Minimum illuminant burn time is 60 seconds.

The charge system used with the tripartite family of 155 mm ammunition is known colloquially as the 'three cartridge' system. As its name implies the system is made up of three cartridges, the first two with a base charge and a number of increments. Cartridge 3 (Charge 8) is a unitary charge.

Cartridge 1, the Charge Propelling, 155 mm, Howitzer, Charge 2, L2A1 consists of the Charge 1 and Charge Propellant Increment 2 combined to form Charge 2. The two weigh 1.21 kg and use SC/202 propellant. They are stitched together and should not be separated.

Charge 1 [L1A1](#) consists of a salmon pink cloth bag, containing 783 g of propellant SC/Z008 with an Igniter L19A1 containing 67 g of NC/200 and 18 g of G20 gunpowder stitched to its base. The forward part of the bag is recessed to contain the Charge Propellant Increment 2, a white cloth bag containing 311 g of propellant SC/Z008.

Cartridge 2, the Charge Propelling, 155 mm, Howitzer Charge 7, L8A1 is made up from Charge 3 L4A1 and Charge Propellant Increments 4 to 7. Total weight is 7.55 kg.

The Charge Propelling 155 mm, Howitzer, Charge 3, L4A1 consists of a smoke grey cloth bag containing 1.39 kg of NO25 propellant divided into two equal bundles. The charge bag is stitched into a combustible sleeve which in turn is secured in a smoke grey main charge bag. The sleeve and main charge bag are large enough to receive the propellant increments 4 to 7 which, when assembled with Charge 3, form the Charge 7 L8A1. Fitted on the base of the main charge bag is the Igniter L20A1, containing 80 g of propellant NC/200 and 18 g of G20 gunpowder. The mouth of the main charge bag is fitted with a Velcro loop and hook.

The Charge Propellant Increment 4 consists of an orange cloth bag containing 529 g of NO25 propellant.

The Charge Propellant Increment 5 consists of a grass green cloth bag containing 1.56 kg of N/S 134-040 propellant together with a flash inhibitor pack. This pack contains 125 g of potassium sulphate powder and is positioned in the centre of the propellant. Wrapped and secured around the front end of the propellant is 17 g of lead foil.

The Charge Propellant Increment 6 consists of a dark violet cloth bag containing 2.42 kg of N/S 134-040 propellant divided into two equal bundles, each of which has lead foil strip wrapped and

secured around its front end.

The Charge Propellant Increment 7 consists of a beige cloth bag containing 1.49 kg of N/S 134-040 propellant divided into three equal bundles, each of which has lead foil wrapped and secured around its front end.

Cartridge 3 is the Charge, Propelling, 155 mm, Howitzer, Charge 8, [L10A1](#). This consists of a brown combustible main case and a pink combustible end cap. The end cap contains an Igniter, Propelling, Charge L23A1 mounted on a perforated disc. The propellant charge bundle consists of 12.48 kg of NS 54.14 propellant sticks tied in five places using polyester/cotton thread and incorporating lead foil positioned under the top layer of sticks.

All charges are ignited by the Primer Percussion DM 191A1 which contains a primary charge of 1.25 g of nitrocellulose S536.

When fired from the 155 mm [FH-70](#) Towed Howitzer using the three cartridge system the 155 mm Illuminating DM 106 can reach the following ranges:

Charge 2 - range 3,900 to 5,900 m

Charge 3 - range 4,800 to 7,500 m

Charge 4 - range 6,200 to 9,500 m

Charge 5 - range 8,500 to 12,500 m

Charge 6 - range 11,200 to 16,800 m

Charge 7 - range 14,200 to 20,900 m

Charge 8 - range 17,000 to 24,700 m.

When fired from the 155 mm [FH-70](#) Towed Howitzer the 155 mm Illuminating DM 106 has a maximum muzzle velocity of 827 m/s.

It is anticipated that future 155 mm propellant charge systems will involve Modular Charge Systems (MCS). Germany has already adopted the Rheinmetall DeTec Modular Propelling Charge System (MPCS) DM 72, as have Norway and [Malaysia](#). The United Kingdom has adopted the South African [SOMCHEM M90](#) Bi-Modular Charge System.

Specifications

Weights:

projectile, nominal - 43.3 kg

primary ejection charge - 90 g black powder

Length of projectile, fuze: 875 mm

Rate of descent: <5 m/s

Illumination: 1.8 Mcd

Operating temperature range: -32 to +52°C

Authorised fuzes

MT L92A2

Equivalent projectiles

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Illuminating DM 106A1

Description: Standard specifications

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm Illuminating P4

Description: Similar to 155 mm Illuminating DM 106

UPDATED



Cutaway example of 155 mm Illuminating DM 106

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Terry J Gander

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Shell, 155 mm, HE L15A1, L15A2 and L15A3

Armament

These projectiles can be fired from the following 155 mm self-propelled howitzers: TAMSE VCA 155; [PzH 2000](#); Rheinmetall [M109A3G](#) and [M44T](#); Soltam Slammer; Otobreda Palmaria and [M109L](#); K9 Thunder ([South Korea](#)); VSEL [AS90](#) and [Braveheart](#); M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS.

These projectiles can be fired from the following towed 155 mm howitzers: [FH-70](#) and [FH-70 R](#); GH [N-45](#); CITEFA CALA 30/2; Patria Vammas 155 GH 52 Howitzer; Soltam M-46; Otobreda 155 mm 155/39 TM; RDM [155 mm M139](#) and [M114/39](#); SANTA BARBARA 155 mm SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114/39](#); Bofors [FH-77B](#); M199 Cannon for [M198](#) Towed Howitzer; XM777 Lightweight Towed Howitzer.

Development

The 155 mm L15 HE projectile is one of the three projectiles developed as a result of the tripartite agreement entered into by Germany, Italy and the UK, to develop the 155 mm [FH-70](#) Howitzer and its associated ammunition. The 155 mm HE L15 is mainly a Royal Ordnance (now [BAE Systems](#), RO Defence) development as is the 'three cartridge' charge system. The main difference between the 155 mm HE L15A1 and L15A2, is that the L15A2 has an obturator band behind the drive band, enhancing performance in worn barrels. **The L15A3 has a revised drive band and obturator arrangement.** There is also a L15A4 which has two nylon obturator bands to provide extra in-bore stability when fired from

52-calibre barrels.

It has been proposed that as the explosive fillings of L15 series projectiles pass their safe life date, the explosive could be removed and replaced by a mixture of epoxy resin and slate dust with the same specific gravity as the original explosive. Once the fuze has been replaced by a suitable inert unit this would allow the projectiles to be fired as relatively cost-effective direct fire anti-armour munitions.

Description

The 155 mm HE L15A1/L15A2 is a separate loading projectile with a thin-walled, low-drag, high-fragmentation steel body. The projectile is streamlined, has a recessed base and a length-to-diameter ratio of 5.5:1. A carbon steel disc is secured at the bottom of the recessed base, while a single welded drive band is pressed into a pre-prepared groove encircling the body close to the base. The internal walls of the shell are painted with lead free primer to which a solution of TNT in xylene is added, providing the adhesive surface for the main filling. The filling is approximately 11.3 kg of RDX/TNT Type G. A circular paper tube-lined cavity is formed below the nose to receive an exploder and is normally sealed during storage by an inert composition. The exploder fits into the tube-lined cavity and consists of a sealed aluminium container filled with 150 g of pressed RDX/WX8 93/7 pellets. A lifting band around the exploder container enables it to be removed when necessary.

The weight of a filled projectile can vary between 41.75 and 43.35 kg so the shell weights are differentiated into three zones which are marked on the shell body by painted squares.

The main difference between the 155 mm HE L15A1 and L15A2, is that the L15A2 has an obturator band behind the drive band to enhance performance in worn barrels.

The charge system used with the tripartite family of 155 mm ammunition is known colloquially as the 'three cartridge' system. As its name implies the system is made up of three cartridges, the first two with a base charge and a number of increments. Cartridge 3 (Charge 8) is a unitary charge. (British designations are used here.) Cartridge 1, the Charge Propelling, 155 mm, Howitzer, Charge 2, L2A1 consists of the Charge 1 and Charge Propellant Increment 2 combined to form Charge 2. The two weigh 1.21 kg and use SC/202 propellant. They are stitched together and should not be separated.

Charge 1 [L1A1](#) consists of a salmon pink cloth bag, containing 783 g of propellant SC/Z008 with an Igniter L19A1 containing 67 g of NC/200 and 18 g of G20 gunpowder stitched to its base. The forward part of the bag is recessed to contain the Charge Propellant Increment 2, a white cloth bag containing 311 g of propellant SC/Z008.

Cartridge 2, the Charge Propelling, 155 mm, Howitzer Charge 7, L8A1 is made up from Charge 3 L4A1 and Charge Propellant Increments 4 to 7. Total weight is 7.55 kg.

The Charge Propelling 155 mm, Howitzer, Charge 3, L4A1 consists of a smoke grey cloth bag containing 1.39 kg of NO25 propellant divided into two equal bundles. The charge bag is stitched into a combustible sleeve which in turn is secured in a smoke grey main charge bag. The sleeve and main charge bag are large enough to receive the propellant increments 4 to 7 which, when assembled with Charge 3, form the Charge 7 L8A1. On the base of the main charge bag is fitted the Igniter L20A1, containing 80 g of propellant NC/200 and 18 g of G20 gunpowder. The mouth of the main charge bag is fitted with a Velcro loop and hook.

The Charge Propellant Increment 4 consists of an orange cloth bag containing 529 g of NO25 propellant.

The Charge Propellant Increment 5 consists of a grass green cloth bag containing 1.56 kg of N/S 134-040 propellant together with a flash inhibitor pack. This pack contains 125 g of potassium sulphate powder and is positioned in the centre of the propellant. Wrapped and secured around the front end of the propellant is 17 g of lead foil.

The Charge Propellant Increment 6 consists of a dark violet cloth bag containing 2.42 kg of N/S 134-040 propellant divided into two equal bundles, each of which has a lead foil strip wrapped and

secured around its front end.

The Charge Propellant Increment 7 consists of a beige cloth bag containing 1.49 kg of N/S 134-040 propellant divided into three equal bundles, each of which has lead foil wrapped and secured around its front end.

Cartridge 3 is the Charge, Propelling, 155 mm, Howitzer, Charge 8, [L10A1](#). This consists of a brown combustible main case and a pink combustible end cap. The end cap contains an Igniter, Propelling, Charge L23A1 mounted on a perforated disc. The propellant charge bundle consists of 12.48 kg of N/S 54.14 propellant sticks, tied in five places using polyester/cotton thread and incorporating lead foil positioned under the top layer of sticks.

All charges are ignited by the Primer Percussion DM191A1 which contains a primary charge of 1.25 g of nitrocellulose S536.

The Rheinmetall 155 mm [FH-70](#) R has a 46 calibre barrel with an enlarged chamber which allows it to accommodate a larger Charge 9. When fired using this charge the 155 mm HE L15A1/L15A2 has a muzzle velocity of over 910 m/s and can reach a range of 30,000 m.

When fired from the 155 mm [FH-70](#) Towed Howitzer using the three cartridge system the 155 mm HE L15A1/L15A2 can attain the following range performances:

Charge 2 - range 3,900 to 5,900 m

Charge 3 - range 4,800 to 7,500 m

Charge 4 - range 6,200 to 9,500 m

Charge 5 - range 8,500 to 12,500 m

Charge 6 - range 11,200 to 16,800 m

Charge 7 - range 14,200 to 20,900 m

Charge 8 - range 17,000 to 24,700 m.

When fired from the 155 mm [FH-70](#) Towed Howitzer the 155 mm L15A1/L15A2 has a maximum muzzle velocity of 827 m/s.

It is anticipated that future 155 mm propellant charge systems will involve Modular Charge Systems (MCS). [The German Army has already adopted the Rheinmetall DeTec Modular Propelling Charge System \(MPCS\) DM 72, as have Norway and \[Malaysia\]\(#\).](#) The United Kingdom has adopted the South African [SOMCHEM M90](#) Bi-Modular Charge System.

The matching training projectile for the 155 mm HE L15A1/L15A2 is the Shell, 155 mm, Howitzer, Inert, L17A2, although the NATO 155 mm HE [M107](#) is often used for (relatively) low-cost firing training. The L17A1 uses an inert high-explosive substitute filling and the nose fuze well is closed by a Plug Representing Fuze (PRF) type L32. Weight is a nominal 43.55 kg. In mid-1997 the British Army had a requirement for 5,000 of these projectiles for delivery by February 1998.

The Rheinmetall 155 mm DM 108 is an inert Drill projectile.

Royal Ordnance, Ammunition Division, (now [BAE Systems](#), RO Defence) developed the 155 mm RO 24-03A1 (equivalent to the L17A2) and RO 24-05A1 training projectiles as the ballistic equivalents of the 155 mm HE L15A1/L15A2. In UK service the RO 24-05A1 is known as the L19. For details see separate entry for the 155 mm RO 24-05A1.

Specifications

Weights:

projectile - 41.75-43.35 kg

projectile, nominal - 42.55 kg

explosive - L15A1, 11.3 kg RDX/TNT; L15A2, 11.5 kg Comp B

exploder - 150 g RDX/WX8

Lengths:

projectile, unfuzed - 858 mm

projectile, fuzed - 873.5 mm

Operating temperature range: -32 to +52°C

Authorised fuzes

PD L106A2, L85A2, L112A1

MT L92A2

Equivalent projectiles

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm HE L15A2B1

Description: Standard specifications as text with explosive filling given as Compound B. The main change from the L15A2 is a revised drive band profile which permits firing from worn barrels. 155 mm TP L15A2B1 also produced with explosive filling replaced by an inert mixture surrounding 2 kg of black powder to provide flash, sound and smoke on impact. 155 mm TP L17A2B1, containing inert filling only, also produced

Manufacturer

[Simmel Difesa](#) SpA

Type: 155 mm HE P3

Description: Similar to 155 mm HE L15A2 but constructed in two pieces, the shell body and the base/tail unit, which are connected by six pins

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: 155 mm HOW HE RO24

Description: Essentially similar to L15 projectiles but optimised for ordnance meeting the NATO Joint Ballistics Memorandum of Understanding. The high tensile steel walls are thinner than those of the L15 series and contain 11.7 kg of RDX/TNT. Total weight is 43.4 kg. The Shell 155 mm HOW Inert RO24-03 is a training version.

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Shell, 155 mm, HE L15A1 (left), with inert drill example (right)



155 mm Drill DM 108 projectiles (T J Gander)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 105 mm: HERA, M548

Armament

M101/M101A1, [M102](#) (towed) and [M108](#) (self-propelled) howitzers; Giat Industries [LG1](#) Mk II Light Gun; Otobreda 105/14 Pack Howitzer (L5); [105 mm KH178](#) ([South Korea](#)).

Description

Development of the Cartridge 105 mm, HERA, [M548](#) was initiated during the 1960s in an attempt to increase the overall range and lethality of the existing 105 mm HE M1 round. Type classification was completed in 1971. The [M548](#) can attain a range of 15,100 m and the on-target effects are enhanced, although the introduction of the rocket motor means that accuracy at longer ranges is reduced. Production in the US has ceased as the [M548](#) is scheduled to be supplemented and then replaced by the Cartridge, 105 mm HERA, M913 (which see).

Description

The 105 mm Cartridge HERA, [M548](#) is a semi-fixed round with the projectile being a free fit in the cartridge case to allow free access to the propellant increments inside the case. The projectile is a hollow steel forging with a rocket motor assembly attached to the base. The body is filled with approximately 2.36 kg of Composition B, deep drilled beneath the fuze well to accommodate a 136 g supplementary charge of TNT pressed into an aluminium sleeve.

The rocket motor assembly consists of a body with a conventional boat-tailed outline with a central extension (spike) protruding from the base. The rocket motor body has a sintered iron driving band

around its upper part next to the junction where it joins the shell body, and the motor itself contains 454 g of rocket grain propellant. The base extension houses an ignition delay assembly loaded with a pyrotechnic mixture and fitted with a rocket selector cap.

The 105 mm Cartridge HERA, [M548](#) has an intermediate and an extended range capability. For intermediate ranges the [M548](#) is fired using Charges 3 to 7 with the rocket selector cap in place. For extended ranges the projectile is fired using Charge 7 only and with the rocket selector cap removed. On firing, the propellant gases ignite the pyrotechnic delay mixture. After a fixed delay of 16 seconds the mixture ignites the rocket motor which cuts in for two seconds at a critical instant during the projectile's trajectory, using its thrust to augment the projectile velocity and thus extending the range. On impact the [M548](#) functions in the same manner as the 105 mm HE M1, but is claimed to be significantly more effective than the older projectile.

The cartridge case may be either the [M14](#), M14B1 or M14B4 type fitted with an [M108](#) percussion primer. The propelling charge is the M176 using five increments (Charges 3 up to 7) of M30A1 propellant which, when combined, weigh a nominal 1.247 kg.

The 105 mm Cartridge HERA, [M548](#) has a maximum muzzle velocity of 549 m/s and maximum range is 15,100 m; this is reduced to 15,000 m when fired from the [M102](#) howitzer.

Specifications

Weights:

complete round with fuze - 16.78 kg

propellant - nominal 1.247 kg

rocket motor propellant - 454 g

Lengths:

complete round - 830.6 mm

cartridge case - 371.9 mm

Max muzzle velocity

M101/M101A2 - 549 m/s

[M102](#), [M108](#) - 494 m/s

Max range: 15,100 m

Authorised fuzes

PD M557 and M739. Prox [M728](#) (requires removal of supplementary charge)

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: 105 mm HE-RAP

Description: Standard US specifications

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Mauser 27 mm ammunition

Armament

Mauser BK 27 × 145 mm Gun System (BK 27); Mauser MLG 27 naval gun; Mauser Drakon CIWS; Mauser UGP 27 universal gun pod.

Development

The Mauser BK 27 × 145 mm gun system (BK 27) was developed primarily for the MultiRole Combat Aircraft (MRCA) which later became the Tornado. Development of the gun was completed in 1976, and the Mauser BK 27 is now the integral gun armament of Tornado strike aircraft in service with Germany, Italy, [Saudi Arabia](#) and the UK. The Mauser BK 27 is also used on the Alpha Jet and is the gun armament of the Swedish JAS 39A Gripen (in service with [Sweden](#) and ordered by [South Africa](#)) and the European Eurofighter (EF 2000) developed by Germany, Italy, Spain and the UK. In April 2000, Eurofighter orders stood at Germany 180, Italy 121, Spain 87 and the UK 232. Eurofighters destined for the RAF will not carry the BK 27 cannon. Over 3,100 BK 27 guns have been produced.

The BK 27 has been selected as the weapon for the future US Joint Strike Fighter (JSF). Two separate JSF designs are under development by Boeing and Lockheed-Martin. For this application the BK 27 has been modified by a team comprising Mauser, Boeing, General Dynamics Ordnance and Tactical Systems and Western Design. The latter is responsible for the linkless, case recovery ammunition handling system. Boeing acquired a licence to manufacture the BK 27 during 1998.

The Mauser Drakon CIWS is a naval gun system mounting four BK 27 pattern cannon producing a combined cyclic rate of fire of 7,200 rds/min. It has yet to be adopted by any navy.

The Mauser MN 27/30 GS naval gun mounting, originally intended to accommodate either the Mauser BK 27 or a MK 30 cannon, has been superseded by the MLG 27 light naval gun system. Carrying a single BK 27 cannon, it is on order to replace all existing 20 and 40 mm air defence guns and mountings operated by the German Navy.

Mauser have developed the UGP 27 universal gun pod together with Aerotek of [South Africa](#). The UGP 27 contains a single BK 27 cannon and may be used with a wide range of trainer, ground attack and fighter aircraft.

All types of full calibre 27 × 145 mm ammunition used with the BK 27 and its derivatives have matching ballistics and the same overall weights and dimensions according to STANAG 3820.

Mauser-Werke Oberndorf GmbH (now part of Rheinmetall DeTec) is the developer for this ammunition and remains the main contractor for the Tornado programme. Also involved with the production of the 27 × 145 mm ammunition family are [BAE Systems](#), RO Defence, BPD Difesa e Spazio (now [Simmel Difesa](#) SpA) of Italy, and Diehl Stiftung of Germany.

The UK Ministry of Defence awarded [Nammo](#) Raufoss AS of Norway a contract to develop a MultiPurpose (MP) 27 mm round for the Royal Air Force's Tornado squadrons. The result, the [M90](#), has qualified for service.

Description

The types of full calibre 27 × 145 mm ammunition fired from the Mauser 27 mm BK revolver aircraft cannon can be put into three main categories: air-to-air combat; air-to-ground combat; and training ammunition. *To these can be added the [Nammo](#) Raufoss MP rounds, the APFSDS anti-missile round developed for the Drakon CIWS, the FAPDS for the MGL 27, and the proposed US JSF cannon.*

The cartridge case used with all rounds is of lacquered steel. It has an electrical current dependent primer in the base and contains approximately 85 g of triple base multiperforated propellant.

Rounds are delivered to the revolving feed magazine on the gun in belts connected by DM 80 steel cartridge belt links. On the EF 2000 rounds are delivered to the feed mechanism linklessly.

Full calibre ammunition There are three types of Mauser 27 mm full calibre HE ammunition: HE DM 21; HE [DM 31](#); and the self-destruct HE-SD [DM 11](#). They are all designed for operations against aircraft in air-to-air combat. All have an electro-magnetic nose fuze which functions even at extremely flat impact angles. A delayed action in the fuze ensures good fragmentation after the projectile has entered the target.

There are five types of AP cartridge: APHE DM 13; APHE-SD DM 23; SAPHE DM 53; and SAPHE-SD DM 43. The AP DM 43 uses a tungsten carbide penetrator to produce the armour penetration effects while zirconium in the penetrator nose and around the base provides an additional incendiary effect. The APHE DM 13 and APHE-SD DM 23 both have a mechanical delayed action base fuze, with or without a Self-Destruct (SD) element. An incendiary composition is pressed into the projectile nose to create an additional incendiary effect. Aluminium powder is added to the explosive charge which, in conjunction with the detonation cloud and atmospheric oxygen, creates additional flaming and increases the blast effect. The SAPHE DM 43 and SAPHE-SD DM 53 both have a mechanical delayed action base fuze while the projectile tip carries an incendiary charge and a zirconium sponge pellet. These SAPHE rounds are intended for use against armoured and unarmoured targets.

A MultiPurpose (MP) projectile will function against a 2 mm dural plate at impact angles between 0 and 87° NATO at normal combat ranges but will not function against a 0.5 mm dural plate placed directly in front of the gun muzzle. No fuze is involved as the MP projectile relies on a drop safe pyrotechnic ignition train. When impacting against aircraft type targets the projectile will detonate approximately 300 mm inside the aircraft. Fragments are distributed in a cone with an opening angle of

approximately $\pm 20^\circ$ against the line of fire.

Training ammunition There are four 27 mm training cartridges: TP DM 28; TP-T DM 58; TP-FRAN DM 38; and the inert DM 10 drill round.

The TP-FRAN projectile body consists of an aluminium alloy body with shear lines and is filled with iron powder pellets. On impact at angles between 0 and 80° NATO no effective fragments will ricochet from the target, be it water, sand, wood, concrete or steel. This substantially reduces the ricochet risk against aircraft during practice firings.

A non-ricochet TPFP-T round, developed in conjunction with Schweizerische Unternehmung für Waffensystem, is used by German Luftwaffe at the Tornado training unit based at Holloman Air Force Base, New [Mexico](#).

Recocking cartridge The DM 72 is a recocking cartridge for the BK 27 gun system, intended to recock the gun in the event of a misfire.

Sub-calibre ammunition An APFSDS round has been released for service with the Mauser Drakon CIWS. It consists of a long-rod tungsten alloy penetrator with high strength mechanical properties. The fin-stabilised penetrator is accelerated by a three-segment aluminium sabot instead of a slipping drive band. It has a muzzle velocity of 1,100 m/s and can destroy a sea-skimming missile with a single hit. This round may also be used with the MGL 27 light naval gun system.

MGL 27 ammunition In theory, the MGL 27 light naval gun system can utilise any 27×145 mm round, including the APFSDS-T, but the main operational nature is expected to be a specially-developed FAPDS. It consists of a brittle tungsten alloy penetrator, ejection moulded in a plastic sabot with an integral plastic band. The penetrator is spin stabilised and released in front of the muzzle. Disintegration of the penetrator into a large number of fragments occurs even at low impact angles against thin plates and materials such as fibre-reinforced plastics, together with blast and incendiary effects. A muzzle velocity of over 1,100 m/s coupled with a low drag coefficient results in a short time of flight and increased hit probabilities. TP rounds are produced for training purposes, along with a projected TP-FP.

JSF ammunition Four natures of 27×145 mm ammunition have been proposed for the Advanced 27 mm aircraft cannon selected for the future JSF. The cannon will have a linkless feed from left or right, and will have a case recovery capability. A range capability of 4,000 m has been specified. One of the two main operational rounds will be a HEDP developed by General Dynamics Ordnance and Tactical Systems with a 'smart' dual-function fuze. An API will utilise a state of the art tungsten penetrator. Two training rounds will be available, a TP and a frangible TP-F. As with other 27×145 mm ammunition, all rounds will be ballistically matched.

Specifications

Weights:

complete round - 516 g

projectile - 260 g

Length: 243 mm

Length of cartridge case: 145 mm

Max base diameter: 34.5 mm

Muzzle velocity: 1,025 m/s

Authorised fuzes

See text (where applicable)

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: APHE, TP

Description: Standard specifications

NORWAY

Manufacturer

[Nammo](#) Raufoss AS

Type: MP [M90](#)

Description: See text

UNITED KINGDOM

Manufacturer

[BAE Systems](#), RO Defence

Type: HE, API, TP

Description: Standard specifications

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The three main types of Mauser 27 × 145 mm ammunition, from top: air-to-air combat; air-to-ground combat; and (bottom) training



Mauser 27 mm (1d)



[Nammo](#) Raufoss A/S 27 × 145 mm NM90 MP round for 27 mm Mauser BK cannon

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: Blank M394

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm Blank M394 is mainly used to produce battlefield sound effects for training purposes. It may also be used for saluting purposes. Many countries employ locally produced 90 mm blank charges or utilise refilled spent cases for the same purpose.

Description

The 90 mm Blank M394 consists of a shortened cartridge case known as the M27 (brass) or M27B1 (aluminium). The case is filled with a mixture of black powder and potassium nitrate weighing 794 g which, when ignited by a base-mounted [M1A2](#) percussion primer, produces a loud report, smoke and flash. The charge is sealed inside the case by a polystyrene closing cup.

Specifications

Weights:

round - 3.73 kg

explosive - 794 g

Length: 184.6 mm

Authorised fuzes

None involved

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: M394 Blank

Description: Standard US specifications

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: Smoke, WP, M313 and M313C

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm Smoke, WP, M313 and M313C are used for target marking and to create screening smoke. They also have a limited incendiary effect. The main difference between the two rounds is that the M313C uses a different propellant load which reduces muzzle velocity and barrel wear.

Description

The 90 mm Smoke M313/M313C is a fixed round with the projectile crimped into the brass cartridge case. A single gilding metal drive band encircles the projectile just forward of the case/projectile junction.

The 90 mm Smoke M313/M313C projectile consists of a hollow steel forging with a boat tailed base and a streamlined ogive. A PD or MTSQ fuze is fitted to the nose above an internal burster casing. This is a thin-walled steel tube containing an [M24](#) burster 66 g of tetrytol and an M2 burster initiator. The burster tube extends from the fuze adaptor to the rear of the projectile cavity, forming a seal for the White Phosphorus (WP) filling which weighs 894 g.

As the fuze functions the burster charge is initiated via the M2 burster initiator. The projectile casing ruptures to spread the WP contents. On contact with the air these begin to burn, creating dense white screening smoke plus flaming particles.

The cartridge case used is the brass [M19](#) or M19B1. Press fitted into the base is an M28A2, M28B2 or [M49](#) percussion primer although the DM 141 may also be encountered. The M313 contains 3.316 kg of [M6](#) or [M15](#) propellant. The M313C contains 2.418 kg of M1 propellant.

Specifications

Model	M313	M313C
Weights:		
complete round	19.28 kg	18.38 kg
filling	894 g WP	894 g WP
burster	66 g tetrytol	66 g tetrytol
propellant	3.316 kg	2.418 kg
Type of propellant	M6 or M15	M1
Lengths:		
complete round	950.9 mm	951.5 mm
cartridge case	614 mm	614 mm
Muzzle velocity	821 m/s	731 m/s
Max range	17,720 m	15,362 m

Authorised fuzes

PD 48A3. MTSQ M501 series

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: M313 Smoke

Description: Standard US specifications

SPAIN

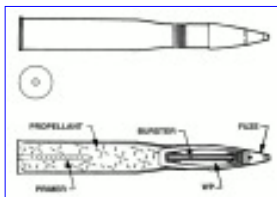
Manufacturer

Barreiros Hermanos Internacional SA

Type: M313 Smoke

Description: Standard US specifications

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Outline and cross-section drawings of Cartridge, 90 mm: Smoke, WP, M313C (2000)

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: APC-T M82

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm APC-T [M82](#) replaced the earlier 90 mm AP [M77](#). It was one of the rounds developed during the Second World War for the 90 mm anti-aircraft gun M1, the 90 mm T13 anti-tank gun series and the 90 mm T7/M3 series of guns used in [M26](#) Pershing MBTs. When the [M26](#) MBTs were phased out of service in favour of the [M47](#) and [M48](#) MBTs, the 90 mm APC-T [M82](#) remained in service. It is, however, no longer deployed by the US armed forces as gun-armed M47/M48 MBTs have been removed from US service. Stocks of the 90 mm APC-T [M82](#) are retained by other 90 mm gun M47/M48 user nations, although they are now relegated to training purposes.

Description

The 90 mm APC-T [M82](#) is a fixed round with the projectile crimped into the brass cartridge case. A single gilding metal drive band encircles the projectile just forward of the case/projectile junction.

The 90 mm APC-T [M82](#) projectile is manufactured from hardened steel and has a short curved ogive. An armour-piercing cap is located over the ogive and a thin steel streamlined windshield acts as a cover for both the cap and the projectile. A small cavity inside the projectile contains an Explosive D charge weighing 140 g. The base of the cavity is enclosed by a threaded assembly consisting of a BD [M68](#) or M68A1 fuze with a delay function and an integral red tracer which burns for a minimum of 3 seconds

after firing.

On impact with a target the steel windshield crumples allowing the armour-piercing cap to penetrate the target armour by kinetic energy, protecting the hardened tip of the main projectile in the process. The projectile can then enter the target interior before the high-explosive charge detonates inside.

The 70:30 brass cartridge case is of the [M19](#) type with an M28A1 or [M49](#) percussion primer press fitted into the base. The propelling charge can vary between 3.316 and 3.656 kg of [M6](#) propellant, depending on the required muzzle velocity. An igniter pad may be located beneath the projectile to ensure uniform ignition, although this is not always fitted.

The muzzle velocity of the 90 mm APC-T [M82](#) may vary between 790 and 851 m/s. Maximum range is 19,570 m. The 90 mm APC-T [M82](#) can penetrate 130 mm of face-hardened armour at 450 m.

Specifications

Weights:

complete round - 19.39 or 19.9 kg

explosive charge - 140 g Explosive D

propellant - 3.316-3.656 kg [M6](#)

Lengths:

complete round - 971.3 mm

cartridge case - 615 mm

Muzzle velocity: 790-851 m/s

Authorised fuzes

BD [M68](#) or M68A1 (integral)

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: APC-T [M82](#)

Description: Standard US specifications

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: HEAT-T M431, M431A1 and M431A2

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm HEAT-T M431 series was developed during the late 1960s and replaced the earlier M348 series, although stocks of the latter may still exist. Although no longer in service with the US armed forces, the 90 mm HEAT-T M431 series is still used by many other armed forces and remains in production with some nations (see below).

Description

The 90 mm HEAT-T M431 series are all fixed rounds with the projectiles crimped into their brass cartridge cases. A plastic obturator band (normally protected by a grommet until loading) encircles the projectile just forward of the case/projectile junction.

The projectile consists of a steel body, a threaded standoff spike assembly, an aluminium chamber and a fin and boom assembly. The aluminium chamber adapts the fin and boom assembly to the body and contains the base detonating fuze. The projectile nose cap contains a piezoelectric element. An [M13](#) tracer is threaded into the base of the boom assembly.

As the round is fired the propellant gases propel the fin-stabilised projectile from the body and ignite

the tracer to burn for at least the first 2,280 m of the trajectory. On impact the piezoelectric fuze functions to ignite the shaped charge formed from 544 g of Composition B under a funnel-shaped liner. The resultant high-temperature metal particle jet can penetrate approximately 190 mm of steel up to an effective range of 1,000 m.

The rimmed cartridge case used for the M431 series is the [M114A1](#) (M114E1) which uses an M79 percussion primer press fitted into the base. The case filling is 3.74 kg of [M30](#) propellant.

The main differences between the M431 series rounds involve the cartridge case wear-reducing liners. The M431 does not have a cartridge liner. The M431A1 has a wax impregnated titanium dioxide liner intended to reduce barrel wear. The M431A2 also contains a titanium dioxide liner with a high melting temperature wax and a mylar barrier.

The 90 mm HEAT-T M431 projectiles have a muzzle velocity of 1,204 m/s and while the maximum range is 8,138 m the maximum effective range is limited to 1,000 m.

Specifications

Weights:

complete round - 14.97 kg

explosive - 544 g Comp B

propellant - 3.74 kg [M30](#)

Lengths:

complete round - 914.7 mm

cartridge case - 615 mm

Muzzle velocity: 1,204 m/s

Max range: 8,138 m

Max effective range: 1,000 m

Authorised fuzes

BD M509A1

Equivalent rounds

ITALY

Manufacturer

[Simmel Difesa](#) SpA

Type: HEAT-T M431

Description: Standard US specifications

KOREA, SOUTH

Manufacturer

Korea Explosives Company Ltd

Type: HEAT-T M431A2

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: HEAT-T M431A2

Description: Standard US specifications but uses brass KM197 cartridge case

SPAIN

Manufacturer

Barreiros Hermanos Internacional SA

Type: HEAT-T M431

Description: Standard US specifications

Manufacturer

SANTA BARBARA SA

Type: HEAT-T ME-431

Description: Understood to be standard US specifications

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: HEAT-T M431

Description: Standard US specifications. Production as required

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*Cross-section drawing of 90 mm HEAT-T M431A2
(1999)*



*Outline drawing of 90 mm HEAT-T M431
(2000)*

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SMALL ARMS

Date Posted: 10 December 1999

Jane's Ammunition Handbook 1999-2000

8 mm Roth-Steyr

Synonyms:

8 x 18 mm; 8 mm Roth M'07

Armament

Roth-Steyr M1907 pistol.

Development

Introduced into the Austro-Hungarian Army in 1907 together with the Roth-Steyr automatic pistol. Although officially superseded in 1912, it remained in service with the Austrian, Hungarian and Italian armies after 1918 and was used during the Second World War. After 1945 the pistols appear to have been disposed of to [Yugoslavia](#) and numbers still exist. Ammunition has not been produced in government arsenals since the 1930s, but commercial manufacture continues.

Description

The case is rimless, straight taper, brass and Berdan primed. The standard bullet was a 7.25 g ogival jacketed type.

Specifications

Round length: 28.75 mm

Case length: 18.65 mm

Rim diameter: 8.92 mm

Bullet diameter: 8.12 mm

Bullet weight: 7.25 g

Muzzle velocity: 320 m/s

Muzzle energy: 371 J

ITALY

Manufacturer

Fiocchi Munizioni SpA

Type: Ball: FMJ; 7.3 g; MV 315 m/s

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8 mm Roth-Steyr

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [JAPAN](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

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Uses NATO standard code

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IDENTIFICATION OF SMALL ARMS AMMUNITION, KOREA, NORTH

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FIELD ARTILLERY

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

Projectile, 155 mm: HE, RA, M549 and M549A1

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The Projectile, 155 mm: HE, RA, M549 and M549A1 can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The Projectile, 155 mm: HE, RA, M549 and M549A1 can also be fired from the self-propelled

artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The 155 mm HERA M549 (High-Explosive Rocket-Assisted, otherwise known as a Rocket-Assisted Projectile, or RAP) was developed to provide existing and developmental 155 mm artillery pieces with enhanced range and on-target effectiveness, although accuracy is degraded at the longer ranges. The main difference between the 155 mm HERA M549 and M549A1 (now the standard US Army version) is that the M549 shell body is filled with Composition B while the M549A1 is filled with TNT. The conversion to TNT was made to ensure safety compliance with weapon systems utilising the [M203](#) or M203A1 charge; type classification of the 155 mm HERA M549A1 was completed in September 1977. **This projectile is no longer in production for the USA but is offered for export by General Dynamics OTS and continues to be manufactured in [South Korea](#).**

The configuration of the 155 mm HERA M549/549A1 was used as the basis for the Projectile, Nuclear, 155 mm: XM785, and the ballistics of the two projectiles are `similar'.

Description

The 155 mm HERA M549/M549A1 is a separate loading munition with a two-piece, high-fragmentation, forged alloy HF 1 steel body. The shell body uses a low-drag aerodynamic profile and fitted to the base is a rocket motor body. The 4340 steel motor body weighs 13.5 kg (approximately 3.175 kg of which is propellant), is 266.7 mm long and is encircled by a welded overlay copper driving band and obturator band, both protected during storage and transit by a polycarbonate composition grommet. At the front of the projectile the fuze cavity is protected during transport by an energy absorbing lifting plug, this protected the fuze area from damage during storage, transit and handling. Before loading, the lifting plug is replaced by a fuze and the protector cap over the rocket motor nozzle is removed; the 155 mm HERA M549/M549A1 is not intended to be fired in the `rocket off' mode. On-target effects are enhanced by the shell's high-fragmentation steel body.

The 155 mm HERA M549 is filled with a nominal 7.26 kg of Composition B. The HERA M549A1 filler is 6.8 kg of cast TNT.

At the instant of firing the propellant gases ignite a pyrotechnic delay train in the rocket motor. The delay burns for approximately 7 seconds, by which time the end of the delay train will have reached the rocket's primary igniter to subsequently light the motor's two propellant grains via an igniter pellet. The rocket motor then burns to deliver thrust for approximately 3 seconds to increase the projectile's velocity and range. The recessed rocket motor nozzle has a graphite insert.

The 155 mm HERA M549/M549A1 can be fired using the Full Charge 7 M4A2 charge or the [M119A1](#) or M119A2 Charge 7/8 (the [M119](#) cannot be used). The TNT-filled M549A1 can be fired using the [M203](#) Charge 8S but the 155 mm HERA M549 should not be used in conjunction with this charge.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section, and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M119](#) cannot be used with either the 155 mm HERA M509 or M509A1.

The Propelling Charge [M119A1](#) is a single increment centrally ignited white rayon bag charge, containing approximately 9.525 kg of cool-burning [M6](#) propellant. The central igniter consists of a moulded nitrocellulose tube containing benite strands. The forward end contains lead foil as a decoppering agent and a ring-shaped flash reducer enabling the charge to ignite the rocket motor on the 155 mm HERA M549/M549A1 projectiles. The [M119A1](#) charge is 660 mm long.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 736.6 mm long. The M119A2 is produced by Eurometaal NV as the No 13.

The Propelling Charges [M203](#) and M203A1 (Charge 8S) were developed primarily for use in the 155 mm M199 Cannon used with the [M198](#) Towed Howitzer and the 155 mm M284 cannon used with the M109A5 and [M109A6](#) Paladin self-propelled howitzers. However, the [M203](#) or M203A1 charges cannot be used to fire the 155 mm HERA M509. The M203/M203A1 and 155 mm HERA M509A1 combination can, however, be used with other similar long-barrelled pieces, such as the CN79 Cannon used on the South Korean [155 mm KH179](#) Towed Howitzer.

The M203/M203A1 is a single red bag charge encased in a tight fitting lacing jacket for strength. The bag has an igniter sewn to the base, a central core igniter extending through the centre of the charge and a flash reducer in front of the charge. The M203A1 differs from the [M203](#) by producing cooler burning to increase barrel life, together with a reduction in blast and muzzle flash.

When firing the 155 mm HERA M549A1 from the 155 mm M109A5 and [M109A6](#) Paladin self-propelled howitzers and the [M198](#) towed howitzer, a version of the Charge, Propelling, 155 mm: M203A1 with a rigid combustible case may be used. This version of the M203A1 weighs 14.06 kg, is 768 mm long overall and contains 12.7 kg of cool-burning M31A1E1 stick propellant. The combustible case and end cap contains a talc wear-reducing additive while the contents include a further wear-reducing additive and 156 g of lead foil to act as a decoppering agent. The use of this charge results in reduced flash and muzzle blast.

When fired from the 155 mm [M1A2](#) Cannon used on the [M114A2](#) Towed Howitzer and the 155 mm M126/M126A1 Cannon used on the [M109](#) self-propelled howitzer (both using M4A2 white bag Charge 7), the 155 mm HERA M549/M549A1 has a muzzle velocity of 560.8 m/s and a maximum range of 19,300 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers (using M4A2 white bag Charge 7), the 155 mm HERA M549/M549A1 has a muzzle velocity of 567.5 m/s and a maximum range of 19,500 m. When using the M119A1/M119A2 charge the muzzle velocity is 678.2 m/s and the maximum range 23,500 m.

When fired from the 155 mm M199 Cannon used on the [M198](#) towed howitzer (using M4A2 white bag Charge 7), the muzzle velocity is 567.5 m/s and the maximum range 19,500 m. Using the M119A1/M119A2 charge the muzzle velocity is 678.2 m/s and maximum range 23,500 m. Using the [M203](#) Charge 8 (M549A1 only) the muzzle velocity is 826 m/s and maximum range 30,100 m.

When fired from the 155 mm M284 Cannon used on M109A5 and [M109A6](#) Paladin self-propelled howitzers ([M203](#) Charge 8), the 155 mm HERA M549A1 has a maximum range of 30,100 m.

Giat Industries of France produce a combustible case intended for use with all NATO standard 155 mm weapons. The case consists of a skirt, a base and a cover containing Charges 6 to 9; lower charges are formed using bagged charges. Use of this case system produces a barrel life at maximum charge of 3000 EFC.

The muzzle velocities produced using this combustible case system are as follows:

Charge 6 - 586 m/s
Charge 7 - 705 m/s
Charge 8 - 810 m/s
Charge 9 - 830 m/s.

Chartered Ammunition Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter and weighs 10 kg.

It is anticipated that future US 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are in the process of adopting similar modular charge systems.

Specifications

Weights:

complete round, M549 - 43.545 kg
complete round, M549A1 - 43.6 kg
complete round, motor consumed - 40.61 kg
explosive, M549, nominal - 7.26 kg Comp B
explosive, M549A1, nominal - 6.8 kg cast TNT
rocket motor - 13.5 kg
rocket propellant - approx 3.175 kg

Lengths:

fuzed - 873.5 mm
unfuzed - 858 mm
rocket body - 266.7 mm

Operating temperature limits: -46 to +63°C

Storage temperature limits: -54 to +71°C

Authorised fuzes

PD M557, M739
MTSQ M582, M564

Equivalent projectiles

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: 155 mm HERA M549

Description: Standard US specifications. Used with [155 mm KH179](#) Towed Howitzer

Manufacturer

Korea Explosives Company

Type: 155 mm HERA M549

Description: Standard US specifications

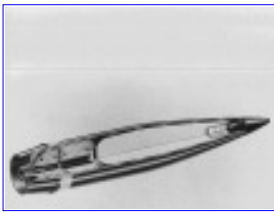
Manufacturer

Poongsan Corporation

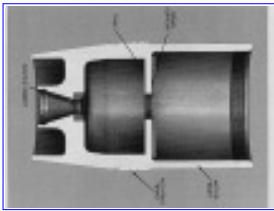
Type: 155 mm HERA M549A1

Description: Standard US specifications. Used with [155 mm KH179](#) Towed Howitzer

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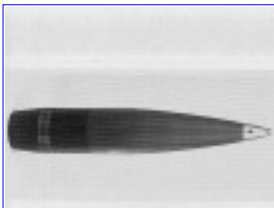
Projectile, 155 mm: HE, RA, M549A1



Cross-section of rocket motor body for Projectile, 155 mm: HE, RA, M549A1



Rocket motor body for Projectile, 155 mm: HE, RA, M549A1



Projectile, 155 mm: HE, RA, M549A1



*Cross-sectioned Projectile, 155 mm: HE, RA, M549A1 (T J Gander)
(1998)*

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MORTARS - 81 mm MORTARS, KOREA, SOUTH

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb M301A3

Armament

US M1, [M29](#) and [M29A1](#) mortars and similar.

Development

By Korea Explosives, based upon US original pattern.

Description

A cylindrical bomb with time fuze in the nose and a tailcone, tailboom and fins. The tailboom carries a percussion primer and an ignition cartridge, eight secondary increments in tubular fabric bags are attached alongside the tailboom by means of retaining clips.

The interior of the bomb contains the flare canister and parachute. Upon functioning of the time fuze, the flare is ignited and the tailcone is blown off, so that the canister and parachute are ejected.

Specifications

Length, fuzed: 628 mm

Weight, fuzed: 4.58 kg

Type of payload: parachute and flare

Number of charges: P + 8

Fuze: time

Max range: 3,150 m

Height of burst: 600 m

Illumination intensity: 500,000 cd

Burning time: min 60 s

Restrictions: To be fired only with Charge 3 and above.

Manufacturer

Korea Explosives Company.

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MORTARS - 81 mm MORTARS, KOREA, SOUTH

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M374

Armament

US M1, [M29](#) or [M29A1](#) mortars, or similar.

Development

By Korea Explosives, based on original US design.

Description

This is a streamlined bomb with a plastic obturating ring behind the bourrelet, an alloy tailboom and fins and a nose adaptor threaded for the fuze. The tailboom carries a percussion primer at its end and an ignition cartridge close behind the bomb body and under the gas holes. The secondary increments are in tubular fabric bags laid alongside the tailboom and secured by spring retainer clips. There are nine increments.

Specifications

Length, fuzed: 529 mm

Weight, fuzed: 4.35 kg

Weight and type of payload: 952 g Comp B

Number of charges: P + 9

Fuze: impact SQ or proximity

Ballistic performance:

Charge	Muzzle velocity	Max range
P	64 m/s	403 m
1	104 m/s	1,000 m
2	132 m/s	1,529 m
3	154 m/s	1,988 m
4	176 m/s	2,475 m
5	200 m/s	2,955 m
6	216 m/s	3,416 m
7	233 m/s	3,831 m
8	248 m/s	4,197 m
9	261 m/s	4,500 m

Restrictions: Charge 5 is the maximum permitted to be fired in M1 mortars.

Manufacturer

Korea Explosives Company.

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81 mm HE bomb [M374](#)

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MORTARS - 60 mm MORTARS, KOREA, SOUTH

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb M83A3

Armament

Any 60 mm mortar.

Development

US Army design manufactured under licence.

Description

This bomb uses a tubular body with an alloy tailcone and fin unit secured to the body by shear pins. After about 15 seconds of flight, a fixed-time fuze ignites an expelling charge which ignites the illuminating flare and blows off the bomb tail, ejecting the flare and its parachute.

Specifications

Length, fuzed: 363 mm

Weight, fuzed: 1.88 kg

Type of payload: parachute and flare

Number of charges: P + 4

Fuze: fixed time

Max range: 1,006 m

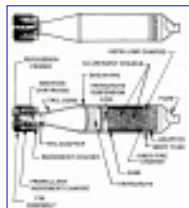
Illuminating power: 320,000 cd

Duration of light: 32 s

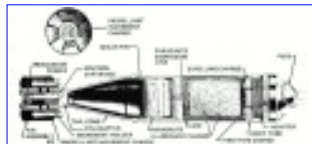
Manufacturer

Korea Explosives Company.

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*60 mm illuminating bomb [M83A3](#)
(1998)*



*60 mm illuminating bomb [M83A3](#)
(2000)*

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MORTARS - 60 mm MORTARS, KOREA, SOUTH

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE Bomb M49A4

Armament

All 60 mm mortars.

Development

US Army design with improved tail unit.

Description

A conventional pearlitic, cast-iron, teardrop-shaped bomb, with four gas check grooves around the bourrelet and a welded steel eight-fin tail unit screwed to the body. The propellant system consists of a primary cartridge inserted into the tail tube and up to four secondary charges that are in plastic capsules and clip between the pairs of fins.

Specifications

Length, fuzed: 295 mm

Weight, fuzed: 1.47 kg

Type of payload: Comp B

Number of charges: P + 4

Fuze: M525 impact SQ

Max range: 1,795 m

Manufacturer

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IDENTIFICATION OF SMALL ARMS AMMUNITION, KOREA, SOUTH

Date Posted: 16 July 2001

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All types:

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.45 Long Colt

Synonyms:

0.45 Colt

Armament

Suitably chambered revolvers.

Development

Introduced by Colt together with the M1873 Single Action or 'Frontier' revolver, this became a US Army official round in 1875 until it was replaced by a 0.38 round in 1892. It attained enormous popularity and fame in western USA, and most revolver makers have produced suitable weapons at various times. It has undergone a rebirth of popularity in recent years, partly due to its terminal ballistics which in the context of modern firearms approach those of the 0.44 Magnum.

Description

A rimmed, straight, brass case, Boxer primed. Usually with a flat-nosed lead bullet, though JHP bullets are also produced, as are shot loadings.

Specifications

Round length: 40.65 mm

Case length: 32.76 mm
Rim diameter: 13 mm
Bullet diameter: 11.53 mm
Bullet weight: 16.52 g
Muzzle velocity: 262 m/s
Muzzle energy: 567 J

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball: Lead, HP; 14.6 g; MV 275 m/s

UNITED STATES OF AMERICA

Manufacturer

3-D
Type: Ball: Lead, RN; 16.52 g; MV 244 m/s

Manufacturer

Black Hills Ammunition Company
Type: Ball: Lead, FP; 15 g; MV 221 m/s
Ball: FMJ, RN; 16.2 g; MV 260 m/s

Manufacturer

CCI-Speer
Type: Ball: JHP; 13 g; MV 305 m/s
Ball: Lead, RN; 14.6 g; MV 262 m/s

Manufacturer

Cor-Bon Ammunition
Ball: JHP; 13g; MV 335 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammunition)
Type: Ball: Lead, FP; 16.2 g; MV 243 m/s

Manufacturer

Federal Cartridge Company
Type: Ball: Lead, SWC; 14.6 g; MV 274 m/s

Manufacturer

Glaser Safety Slug Inc
Type: Ball: Glaser Blue; 9.4 g; MV 412 m/s
Ball: Glaser Silver; 9.4 g; MV 412 m/s

Manufacturer

Remington Arms Company Inc

Type: Ball: Lead, RN; 16.2 g; MV 262 m/s

Ball: Lead, SWC; 14.6 g; MV 293 m/s

Manufacturer

Winchester-Olin

Type: Ball: Lead, RN; 16.52 g; MV 262 m/s

Ball: JHP; 14.6 g; MV 280 m/s

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0.45 Colt

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Charles Q Cutshaw

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.44 Smith & Wesson Special

Synonyms:

0.44 Special; GR 964

Armament

Suitably chambered revolvers.

Development

This appeared in the early 1900s and is more or less the smokeless version of the 0.44 Smith & Wesson Russian. The Russian case did not have sufficient volume for the smokeless powders of the day. Suitable revolvers were then made by other companies, and the 0.44 Special has remained popular ever since. In recent years it has been overshadowed by the 0.44 Magnum, but it has managed to retain its place due to its effectiveness as a defence round while having less recoil and muzzle blast than the Magnum.

Description

A rimmed, straight, brass or nickel-plated case, often with a bullet-stop cannelure, Berdan or Boxer primed. The bullet can be a round-nosed lead, flat-nosed lead, or JHP type, though spherical ball and semi-wadcutter can also be found.

Specifications

Round length: 39.65 mm
Case length: 29 mm
Rim diameter: 13 mm
Bullet diameter: 10.75 mm
Bullet weight: 15.88 g
Muzzle velocity: 235 m/s
Muzzle energy: 438 J

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball: Lead, HP; 11.7 g; MV 299 m/s
Ball: Lead, HP; 7.1 g; MV 366 m/s
Ball: Lead, SWC; 15.6 g; MV 233 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition Company
Type: Ball: Lead, SWC; 15.6 g; MV 229 m/s

Manufacturer

CCI-Speer
Type: Ball: JHP; 13 g; MV 267 m/s

Manufacturer

Cor-Bon Ammunition
Type: Ball: JHP; 10.7 g; MV 343 m/s

Manufacturer

Glaser Safety Slug Inc
Type: Ball: Glaser Blue; 8.75 g; MV 412 m/s
Ball: Glaser Silver; 8.75 g; MV 412 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)
Type: Ball: SWC; 15.5 g; MV 232 m/s
Ball: JHP; 11.6 g; MV 298 m/s

Manufacturer

Hornady Manufacturing Corporation
Type: Ball: Lead, HP; 11.7 g; MV 305 m/s

Manufacturer

Remington Arms Company Inc
Type: Ball: Lead, RN; 16 g; MV 230 m/s

Ball: Lead, SWC; 13 g; MV 274 m/s

Manufacturer

Winchester-Olin

Type: Ball: Lead, RN; 16 g; MV 230 m/s

Ball: Lead, RN; 15 g; MV 274 m/s

Ball: JSP; 13.6 g; MV 274 m/s

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0.44 S&W Special

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.41 Magnum

Synonyms:

0.41 Remington Magnum

Armament

Smith & Wesson, Ruger, Astra and other suitably chambered revolvers.

Development

The 0.41 Magnum was a joint development between Remington and Smith & Wesson in the early 1960s, to provide a police cartridge with greater terminal ballistics than the [0.357 Magnum](#). It was a fairly popular police cartridge in the USA for a number of years, but has largely been replaced by 9 × 19 mm Parabellum and 0.40 S&W pistols. It remains in service with a few agencies.

Description

A rimmed, straight-taper brass case, Boxer primed. Bullets are almost all of the JHP type, although solid lead bullets may be encountered.

Specifications

Round length: 40.4 mm

Case length: 32.76 mm

Rim diameter: 12.5 mm
Bullet diameter: 10.41 mm
Bullet weight: 13.6 g
Muzzle velocity: 457 m/s
Muzzle energy: 1,420 J

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation
Type: Ball: Lead, SWC; 13.6 g; MV 366 m/s
Ball: JHP; 13.6 g; MV 393 m/s

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer
Type: Ball: SWC; 13 g; MV 396 m/s

Manufacturer

Cor-Bon Ammunition
Type: Ball: FMJ; 17.8 g; MV 396 m/s

Manufacturer

Eldorado Cartridge Corp (PMC Ammunition)
Type: Ball: JSP; 13.6 g; MV 393 m/s

Manufacturer

Federal Cartridge Company
Type: Ball: JHP; 13.6 g; MV 397 m/s

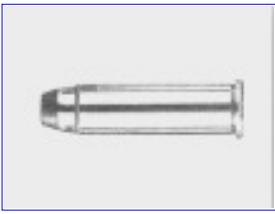
Manufacturer

Remington Arms Company Inc
Type: Ball: Lead, conoidal; 13.61 g; MV 320 m/s
Ball: FMJ; 13.61 g; MV 457 m/s
Ball: JHP; 11.05 g; MV 433 m/s

Manufacturer

Winchester-Olin
Type: Ball: JHP; 11.4 g; MV 381 m/s
Ball: Lead, conoidal; 13.6 g; MV 294 m/s
Ball: FMJ; 13.6 g; MV 396 m/s
Ball: Lead, RN; 13.6 g; MV 304 m/s

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0.41 Magnum

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.32 Harrington & Richardson Magnum

Synonyms:

none

Armament

Suitably chambered Harrington & Richardson and other 0.32 revolvers.

Development

Developed by Harrington & Richardson, in co-operation with the Federal Cartridge Company, in 1983 and based upon a lengthened 0.32 Smith & Wesson Long case. As it is more heavily loaded than the normal 0.32 cartridge, it was only for use in revolvers designed for it and of adequate strength. It gave a useful increase over the normal 0.32 revolver and was principally intended for police forces committed to this calibre and for use in concealed weapons. It appears to have been adopted in small quantities and at least two manufacturers make the ammunition, even though Harrington & Richardson have gone out of business.

Description

The case is rimmed, straight taper, brass and Boxer primed. The original bullet was a semi-wadcutter, but both jacketed hollow point (JHP) and solid lead bullets have since been produced.

Specifications

SWC bullet

Round length: 34.29 mm

Case length: 27.3 mm

Rim diameter: 9.54 mm

Bullet diameter: 8 mm

Bullet weight: 6.16 g

Muzzle velocity: 314 m/s

Muzzle energy: 303 J

KOREA, SOUTH

Manufacturer

Poongsan Metal Corporation

Type: Ball: Lead, SWC; 6 g; MV 311 m/s

Ball: Lead, HP; 5.5 g; MV 319 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition

Type: Ball: JHP, 5.5 g; MV 335 m/s

Manufacturer

Federal Cartridge Company

Type: Ball: Lead, SWC; 6.1 g; MV 314 m/s

Ball: JSP; 5.5 g; MV 335 m/s

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0.32 Harrington & Richardson Magnum

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Rheinmetall 30 mm FAPDS and FMPDS

Armament

GAU-8/A Avenger gun system; [30 mm Bushmaster II](#); Goalkeeper CIWS; Mauser MK 30; SAMOS CIWS.

Development

The 30 mm Frangible Missile-Piercing Discarding Sabot (FMPDS) was developed as an additional round in the GAU-8/A range for use with the multibarrel Goalkeeper Close-In Weapon System (CIWS) in the anti-ship missile role. The intention is that the tungsten alloy subprojectile of the FMPDS will penetrate the forebody of an attacking anti-ship missile and destroy the explosive warhead; the brittle tungsten alloy subprojectile is designed to destructively fragment once it has penetrated the thin metal plates encountered in air defence scenarios. The 30 mm Frangible Armour-Piercing Discarding Sabot (FAPDS) is essentially similar but has a revised solid core subprojectile and is intended for use with all Mauser MK 30 (Mauser Model F) family cannon.

The 30 mm FMPDS was developed by NWM De Kruihoorn of the Netherlands, now sublimated into Rheinmetall DeTec, for the Goalkeeper CIWS in service with the Royal Navy, the Royal Netherlands and [United Arab Emirates](#) navies. Rate of fire of the seven-barrel Goalkeeper CIWS is 4,200 rds/min. Three land-based versions of the Goalkeeper CIWS have been proposed: static; semi-mobile (containerised); and mobile (truck-mounted).

Description

The 30 × 173 mm FMPDS and FAPDS are both fixed rounds, featuring a high-density tungsten alloy penetrator subprojectile threaded into a light sabot assembly which falls away once the projectile assembly has left the gun muzzle. The projectile assembly is crimped into the aluminium cartridge case by a single 360° crimping ring.

The aluminium cartridge case is necked and contains 156 g of PMC 9230 T high-energy propellant, loose packed in granular form. A percussion primer is utilised.

The 30 mm FMPDS has a muzzle velocity of 1,150 m/s. This, combined with the flat trajectory, high density and low drag, provides the FMPDS subprojectile with good accuracy and the kinetic energy to pierce and destroy oncoming anti-ship missile warheads; the FMPDS projectile is also intended for use against both aircraft and naval targets. The time of flight to 1,000 m is approximately 0.94 second and about 2.07 seconds to 2,000 m.

The 30 mm FAPDS has a muzzle velocity of 1,300 m/s; penetrator assembly weight is 202 g. The time of flight to 1,000 m is approximately 0.81 second and about 1.73 seconds to 2,000 m.

A TP round is in production to simulate both the FMPDS and FAPDS. This has an inert full calibre steel projectile with an aluminium ballistic cap. The reduced performance TP round weighs 665 g of which 368 g is the projectile. Propellant weight is 148 g, resulting in a muzzle velocity of 1,021 m/s and a time of flight to 1,000 m of 1.1 seconds.

Specifications

Weights:

complete round - FMPDS, 620 g; FAPDS, 772 g

penetrator assembly - FMPDS, 234 g; FAPDS, 202 g

propellant - 156 g

Lengths:

complete round - 290 mm

cartridge case - 173 mm

Muzzle velocity: FMPDS, 1,150 m/s; FAPDS, 1,300 m/s

Time of flight to 1,000 m: FMPDS, approx 0.94 s; FAPDS, approx 0.81 s

Time of flight to 2,000 m: FMPDS, approx 2.07 s; FAPDS, approx 1.73 s

Operational temperature range: -10 to +45°C

Authorised fuzes

None involved

Equivalent rounds

KOREA, SOUTH

Manufacturer

Poongsan Corporation

Type: [MPDS K164](#), FMPDS K165

Description: These two rounds are basically similar. Having a muzzle velocity of 1,150 m/s. Weight of cartridge is given as 610 g and projectile weight 310 g. The percussion primer is the K602. Otherwise standard specifications

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Rheinmetall 30 mm FMPDS ammunition



Cross-section of Rheinmetall 30 mm FMPDS round

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: HEAT, M371A1

Armament

M67 rifle.

Development

The [90 mm M67](#) recoilless rifle was designed from the outset to be a shoulder-fired, direct fire anti-armour weapon with the accent on simplicity and lightness. It was developed during the 1950s and originally intended to use only one operational round, the 90 mm HEAT M371, later developed to the M371A1 stage. The [90 mm M67](#) rifle has now passed from US service, although some may still be held in reserve, but the weapon and its ammunition continue to find favour with nations such as [South Korea](#) where it is retained in service and full-scale production (along with the 90 mm HEAT M371A1).

Description

The 90 mm HEAT M371A1 is a fixed round with the carbon steel and aluminium projectile rigidly secured to the aluminium cartridge case. The projectile holds a 780 g shaped charge of Composition B contained in a copper cone. In front of this is a standoff spike threaded onto the body containing a piezoelectric element and a paper insulating cup. Threaded onto the base is an aluminium adaptor which also has a PIBD M530 or M530A1 fuze. The adaptor is threaded to a hollow perforated boom assembly with six T-shaped tailfins.

The M112 aluminium cartridge case contains the [M82](#) propelling charge, formed by 594 g of

granulated [M5](#) double-base multiperforated propellant in a silk bag located around the boom and fin assembly behind the projectile body. The base of the cartridge case holds a rupture disc held in place by the M92A1 percussion primer (the original M371 used a [M78](#) primer), which is connected to a black powder ignition cartridge located between the fins of the fin assembly.

On firing, the burning propellant gases force the projectile along the barrel and off the rupture disc from the base of the cartridge case, so that recoil can be minimised by the controlled pressure relief of the gases through apertures in the breech block. Once in flight the projectile is stabilised by the fin assembly until it impacts with a target. The piezoelectric element then functions to trigger the PIBD fuze while the standoff spike provides the optimum distance for the shaped charge to operate. When used against personnel targets the round is directed into the ground to produce a graze effect, the fuze being initiated on impact by a stab primer instead of the piezoelectric element.

Maximum range of the 90 mm HEAT M371A1 is 400 m and muzzle velocity is 213 m/s.

The training round used to simulate the firing of the 90 mm HEAT M371A1 is the Cartridge, 90 mm: Practice, M371. This is similar to the operational HEAT round except that the explosive filling is replaced by an equivalent weight of an inert material. A Mox 2B smoke pellet is ignited by the PIBD M530 fuze on impact providing a puff of smoke for marking purposes.

A Cartridge, 90 mm: Canister, Anti-personnel, M590 was type classified for firing from the [90 mm M67](#) Rifle but appears to have been little used. Intended for anti-personnel use it was filled with 2,400 flechettes weighing a total of 1.13 kg (each flechette weighed about 0.5 g). Maximum effective range was 200 m. Total weight was 3.08 kg and length 485.6 mm. Muzzle velocity was 366 m/s.

Specifications

Weights:

complete round - 4.196 kg

explosive - 780 g Comp B

propellant - 594 g [M5](#)

Length: 705.6 mm

Muzzle velocity: 213 m/s

Max range: 400 m

Authorised fuzes

PIBD M509 or M509A1

Equivalent rounds

KOREA, SOUTH

Manufacturer

[Daewoo Corporation](#)

Type: HEAT M371A1

Description: Standard US specifications

Manufacturer

Korea Explosives Company Ltd

Type: HEAT M371A1

Description: Standard US specifications

Manufacturer

Poongsan Corporation

Type: HEAT M371A1

Description: Standard US specifications.

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*Cross-section drawing of Cartridge, 90 mm: HEAT M371A1
(1999)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Aguila 12 gauge Minishell slug round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Industrias Technos to provide tactical shotshells that provide increased magazine capacity in slide-action shotguns and for a new specialised family of shotguns.

Description

The Minishell slug is essentially the same as the buckshot shell described in an earlier entry, except that it is loaded with a 25 g slug rather than buckshot.

Specifications

Calibre: 12 gauge

Round length: 44.45 mm (1.75 in)

Rim diameter: 22 mm

Projectile weight: 25 g

Muzzle velocity: 381 m/s
Muzzle energy: 567 J
Max range: Approx 200 m
Max effective range: 50 m

[MEXICO](#)

Manufacturer

Industrias Technos, s.a. de c.v.
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UNITED STATES OF AMERICA

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*Aguila 12 gauge 35 mm Minishell slug (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Aguila 12 gauge Minishell Nr 1 buckshot round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Industrias Technos to provide tactical shotshells that provide increased magazine capacity in slide-action shotguns and for a new specialised family of shotguns.

Description

Aguila Number 1 (7.62 mm) buckshot Minishells are approximately 33 per cent shorter than standard 70 mm shotgun shells, allowing up to twice the number of Minishells to be loaded in a conventional tubular shotgun magazine. Although Minishells provide increased magazine capacity, most shotguns require modification in order for the Minishells to reliably feed. The modification is to the shell elevator and once accomplished, does not prevent the use of conventional shotgun shells. While Minishells can be used in modified shotguns, their main purpose is for use in the Poseidon series of compact 12 gauge shotguns specifically designed for Minishells. Although Minishells provide increased magazine capacity, it should be noted that their shot capacity and terminal ballistics are concomitantly reduced. The capacity of the Nr. 1 buckshot shell case, for example, is reduced to six pellets, compared to approximately 10 pellets in a standard 70mm shotshell. Minishells will not cycle semi-automatic

shotguns.

Specifications

Calibre: 12 gauge

Rim diameter: 22 mm

Projectile Length: 44.45 mm (1.75 in)

Projectile weight: 2.5 g each, 15 g total

Muzzle energy: n/a

Muzzle velocity: 366 m/s

Max range: Approx 50 m

Max effective range: 25 m

MEXICO

Manufacturer

Industrias Technos, SA de cv
km 6 Carretera Cuernavaca a Tepoztlan
Cuernavaca, Morelos, 62000 [Mexico](#)

UNITED STATES OF AMERICA

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.22 Sniper Subsonic

Synonyms:

0.22 SSS

Armament

Any rifle or pistol chambered in 0.22 LR.

Development

The 0.22 Sniper Subsonic cartridge (0.22SSS) has been developed by Industrias Technos of [Mexico](#), primarily for use in suppressed firearms. The 0.22 SSS 3.89 g bullet is the heaviest 0.22 rimfire bullet in the world and, while overall cartridge length is essentially identical to that of the 0.22LR cartridge, the case length approximates that of a 0.22 Short cartridge. Despite this, the 0.22 SSS cartridge will reliably operate any semi-automatic rifle or pistol chambered in 0.22LR. The 0.22 SSS cartridge achieves very high levels of accuracy within its effective ranges when fired from an appropriate rifle or pistol. The trajectory of the 0.22 SSS 3.89 g bullet exhibits greater drop over range than a 2.5 g 0.22 LR bullet, but the 0.22 SSS has higher residual velocity and energy due to its greater mass. In fact, energy of the 0.22 SSS at 50 m is greater than the muzzle energy of a standard velocity 0.22 LR bullet.

Description

The cartridge case is brass, rimmed and straight walled, with a solid lead round-nose bullet.

Specifications

Round length: 24.5 mm

Case length: 11 mm

Rim diameter: 6.9 mm

Bullet diameter: 5.6 mm

Bullet weight: 3.89 g

Muzzle velocity: 289 m/s

Muzzle energy: 162 J

MEXICO

Manufacturer

Industrias Technos, S A (Aquila)

UNITED STATES OF AMERICA

Distribution: [Centurion](#) Ordnance

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*0.22 Sniper Subsonic
(1999)*

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Rheinmetall DeTec 120 mm APFSDS-T-TP (LKL) DM 38

Armament

Rheinmetall 120 mm Smoothbore Guns used on the [Leopard 2](#) and Leopard L1A1A1 (prototype); Japanese Type 90; South Korean [K1A1](#).

[M256](#) Cannon used on [M1A1](#) and [M1A2](#) Abrams MBTs.

This round can also be fired from the Otobreda 120 mm Smoothbore Gun, the Swiss 120 mm Compact Gun, the Giat Industries 120 mm Smoothbore Guns G1 and F1, and the [Israel Military Industries \(IMI\)](#) MG251 120 mm Smoothbore Gun.

Development

The 120 mm APFSDS-T-TP (LKL) DM 38 is one of two Rheinmetall DeTec training rounds produced at Ratingen. It uses a similar aerodynamic principle (the other being the 105 mm equivalent - see separate entry) permitting realistic firing training on ranges with relatively short safety traces. The principles involved in the short-range factor were already developed when they came to be applied to the Rheinmetall DeTec 120 mm tank gun ammunition family. The latest form of this round is the DM 48 which is understood to differ from the DM 38 only in production details.

This round is used as the training munition for the Rheinmetall DeTec 120 mm APFSDS-T DM 33. It is also produced in the USA by Alliant Techsystems (ATK) for the US Army as the 120 mm M865 TPCSDS-T - see following entry.

Description

The 120 mm APFSDS-TP-T (LKL) DM 38 round is fixed, with the projectile assembly secured to the Combustible Cartridge Case (CCC) by a case adaptor ring. The CCC has a steel cartridge case base with a silicone rubber sealing ring around the top. A DM 72A2 electrical primer is secured to the cartridge case base and extends some two-thirds of the way up the centre of the CCC. The DM 38 is handled, loaded and fired in exactly the same manner as a conventional round.

The projectile assembly consists of a steel rod with a pierced tailcone used for in-flight stabilisation. The tailcone also acts as the range reduction component, depending on an established aerodynamic principle referred to as the Lochkegelleitwerk (pierced tailcone), or LKL. The tailcone also houses an extremely bright tracer.

For the LKL principle to operate, the nine holes in the tailcone are accurately machined to a size where, at high velocities, they are aerodynamically open and air can pass through without significant hindrance. As the projectile velocity reduces with range the holes aerodynamically close at a certain velocity. This leads to an increase in drag and the projectile becomes unstable to the point where it will tumble and fall to the ground at a maximum range of about 7,500 m. This aerodynamic change takes place after the projectile has travelled about 2,000 m. Up to that point the LKL projectile follows the same ballistic trajectory and is as accurate as a normal operational projectile. The result is that range safety traces can be reduced to as little as 8,000 m in place of the 30,000 m plus required for firing ranges where operational APFSDS rounds are fired.

The steel LKL projectile is carried in a discarding sabot assembly secured in a normal CCC. The CCC contains approximately 8.2 kg (± 0.3 kg) of granular nitrocellulose, multiperforated (19-hole) propellant in a containment bag which prevents spillage in the event of a rupture of the combustible case walls. Although described as combustible, case ignition does leave the steel base stub intact for ejection from the gun after firing.

Muzzle velocity is 1,700 m/s.

Specifications

Weights:

complete round - 18.4 kg

projectile assembly - 5.9 kg

long rod with tailcone - 3.2 kg

propellant - approx 8.2 kg

stub base - 2.985 kg

Length, complete round: 881 mm

Diameter:

long rod - 38 mm

tailcone - 85 mm

Muzzle velocity: 1,700 m/s

Chamber pressure: 4,800 bar

Authorised fuzes

None involved

Equivalent rounds

NETHERLANDS

Manufacturer

Eurometaal NV

Type: KE-Practice

Description: Licence production of Rheinmetall LKL round. Specifications as text

VERIFIED



120 mm APFSDS-T-TP (LKL) DM 38



120 mm APFSDS-T-TP (LKL) DM 38 rounds



Penetrator assembly for Rheinmetall DeTec 120 mm APFSDS-T-TP (LKL) DM 38

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NETHERLANDS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

175 mm Projectile, HE, M437A1/M437A2

Armament

175 mm [M113](#) or [M113A1](#) Gun mounted on [M107 175 mm Self-propelled](#) Gun.

Development

The 175 mm HE M437A1/M437A2 projectiles were virtually the only in-service projectiles used by the US armed forces, with their 175 mm [M113](#) long-range gun mounted on the [M107](#) Self-propelled Gun, ever since it entered service with the US Army in early 1963. The [M107](#) Self-propelled Gun is no longer in service with the US Army and its ammunition is not produced in the USA. However, it remains in service with several other nations throughout the world and the 175 mm HE M437A1 and/or M437A2 projectiles remain available for production in several countries.

Known users of the 175 mm [M107](#) Self-propelled Gun include the following: [Greece](#) (12); [Iran](#) (30, some destroyed); [Israel](#) (140); [South Korea](#) (no definite information regarding numbers available but may be about 100); and [Turkey](#) (36). Many of these guns are being, at best, placed in reserve as they are replaced by [MLRS](#) rocket systems.

Description

The 175 mm HE M437A1 and M437A2 are classified as separate loading ammunition. The only difference between the 175 mm HE M437A1 and M437A2 is that the M437A1 is filled with 13.608 kg of TNT, while the M437A2 is filled with 14.1 kg of Composition B plus a supplementary pressed TNT

charge in an aluminium container; the supplementary charge, which weighs approximately 136 g, is removed when a long intrusion proximity fuze is fitted.

The projectile body is forged steel with a streamlined ogive, a distinct 'waist' profile noticeable just behind the bourrelet, and an 8° boat tail. The baseplate is welded into position. A 625 mm wide gilding metal drive band encircles the projectile and a nylon obturator band, 145 mm wide, is located behind the rotating band. The obturator band, which seals propellant gases behind the projectile, is discarded after the projectile leaves the gun muzzle.

The 175 mm HE M437A1 and M437A2 are fired using the M86A1 propelling charge assembly. This is made up of three increments of bagged [M6](#) multiperforated propellant weighing a nominal 24.95 kg. The propellant is contained in sealed white acrylic-viscose rayon cartridge cloth bags, with the three increment bags taped together. When the weapon is fired the [M82](#) percussion primer ignites the base pad of the single-base propelling charge which, in turn, ignites black powder charges in the core assembly. This produces sparks and flames which flash through perforations in the igniter core tubes to uniformly ignite the propellant increments. When the round is fired at the full Charge 3, an M1 additive jacket is added to Increment No 3 to reduce bore wear.

The M86A1 charge is 1,257 mm long. Increments No 1 and 2 have a diameter of 203 mm; the diameter of Increment No 3 is 190.5 mm. Total weight of the charge assembly is approximately 26.3 kg. It is fired using an [M82](#) percussion primer.

The Charge system operates as follows:

Charge 1 - MV 510.5 m/s - range 15,100 m

Charge 2 - MV 704.1 m/s - range 22,100 m

Charge 3 - MV 914.4 m/s - range 32,700 m.

The Charge, Propelling, 175 mm: M86A2 differs from the M86A1 in detail only, for example the provision of a central tube of a more robust nature and the M1 additive jacket permanently fitted to Increment No 3.

The Charge, Propelling, 175 mm: M124 is a single-increment green bag charge used to overcome ballistic discrepancies which may occur when firing Charge 1 only. The M124 charge is the equivalent of Charge 1 only and uses a different size of propellant grain. It weighs 7.94 kg, is 406 mm long and is used in conjunction with a cruciform polyurethane spacer approximately 838 mm long which prevents the projectile falling back onto the charge at high angles of barrel elevation. The green bag M124 cannot be used in conjunction with any white bag charges. It is fired using an [M82](#) percussion primer.

The inert training round equivalent to the 175 mm HE M437A1 and M437A2 is the M458. This round is identical to the service rounds but has no fuze and is filled with an inert explosive substitute. Weight of the 175 mm M458 is 67.45 kg.

Specifications

Weights:

complete round, nominal - 66.8 kg

explosive, M437A1 - 14.1 kg Comp B

explosive, M437A2 - 13.608 kg TNT

propelling charge, nominal - 25.4 kg

propelling charge assembly - approx 26.3 kg

supplementary charge, M437A2 - approx 136 g

Lengths:

projectile, fuzed - 962 mm

with lifting plug - 945.6 mm

Max body diameter: 174.94 mm

Diameter over driving band: 183.74 mm

Max muzzle velocity: 914.4 m/s

Max range: 32,700 m

Authorised fuzes

PD M572

MTSQ M582

Prox M514 and [M728](#)

Equivalent projectiles

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 175 mm HE, described as equivalent to M437

Description: Standard US specifications. [M86](#) and M124 charges also manufactured.

PORTUGAL

Manufacturer

Explosivos Da Trafaria SA.

Type: 175 mm Projectile, HE, M437A1

Description: Available together with propellant charges, MTSQ M577 fuze and primer

SPAIN

Manufacturer

FOREX SA

Type: 175 mm Projectile, HE, M437

Description: Standard US specifications - exact model not specified. No longer in production

TURKEY

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 175 mm MKE-MOD 111

Description: Understood to be equivalent to 175 mm HE M437A2. No longer in production but considerable stocks held. Charges also available.

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175 mm Projectile, HE, M437A2

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM777 Lightweight Towed Howitzer.

The Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1 can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1 can also be fired from the self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

Design studies for a Dual-Purpose Improved Conventional Munition (DPICM - often referred to as a 'Cargo' round), to expand the range of munitions available for the US Army's 155 mm artillery systems began in the late 1960s. The first type classified result, the 155 mm DPICM M483, was soon replaced by the 155 mm DPICM M483A1 which differs only in detail. The 155 mm DPICM M483A1 contains 88 submunition dual-purpose grenades and the nature of this payload means that the projectile contents cannot withstand the high g forces produced by the large [M203](#) propellant charges. This, combined with increased projectile weight, means that potential range is reduced compared to most other 155 mm projectiles.

The 155 mm DPICM M483A1 was used operationally during the 1990-91 Gulf War, where its on-target effects resulted in the bestowal of the name 'Steel Rain' by the Iraqi recipients. However, it was noticeable that many grenades failed to detonate on impact, leaving them as potentially lethal battlefield hazards once fighting had ceased. One reference mentions the distribution of 32 million grenades from all artillery systems (including [MLRS](#)) during Operation Desert Storm. This has since led to training and other operational limitations being imposed on this projectile.

The 155 mm DPICM M483A1 has been used as the base projectile for a number of other 155 mm carrier/cargo rounds including the M692/M731 ADAM, the M718/741 RAAM, the XM867 AD/EXJAM, and the Projectile 155 mm, Smoke, WP, M825. See separate entries for details of these projectiles.

The Projectile, Leaflet, 155 mm: M951 is based on 155 mm DPICM M483A1 metal parts but has special internal hardware to protect the leaflets during projectile launch and during base ejection. These projectiles appear to have been produced in small numbers only and are loaded in side-loading pallets to allow leaflet loading without breaking down a pallet. It weighs 46.95 kg. The M951 is no longer in production and was not manufactured on any great scale.

The successor to the 155 mm DPICM M483A1 is the extended-range 155 mm DPICM M864, featuring a base bleed (base burn) assembly. See separate entry for details.

In October 1980, a Memorandum of Understanding was signed between the USA and the Netherlands. It was agreed to produce the 155 mm DPICM M483A1 in Europe, with Eurometaal NV the licensee for production for the NATO countries. First production deliveries to the Royal Netherlands Army were made in 1989.

In early 1994, it was announced that Eurometaal and [MKEK](#) of [Turkey](#) were to co-produce the M483A1 DPICM for the Turkish Army. Production is shared between Eurometaal's Zaandam facility and the [MKEK](#) facility at Kirikale, some components being manufactured at Zaandam with other components and final assembly taking place in Kirikale. Production of the M483A1 is also carried out by [Pakistan](#) Ordnance Factories (POF) at Wah Cantt. This production probably involves the assembly of some parts delivered from the USA.

The 155 mm DPICM M483A1 is no longer in production in the USA although manufacturing facilities remain available at several locations.

Description

The 155 mm DPICM M483A1 projectile is a separate loading munition consisting of a 1340 or 4190 forged steel alloy body assembly lined internally with glass fibre, an expulsion charge assembly, a pusher plate, 88 individual submunitions (the grenades) and an aluminium ogive, a short hollow boat tailed aluminium base plug. A MTSQ M577 or ET M742 fuze is threaded into the nose fuze well although projectiles are stored, transported and handled using an energy absorbing threaded lifting plug screwed into the fuze well. A metal drive band and plastic obturating band are located close to the base of the projectile; both are protected by a plastic grommet which is removed before loading.

In operation, the fuze functions at the selected time during the projectile's trajectory and initiates a 58 g expulsion charge of [M10](#) propellant located at the base of the fuze well. The resultant increase in internal pressure against the pressure plate and the contents forces the base plug to shear and the shell contents are ejected. Centrifugal forces disperse the entire grenade load radially from the projectile line of flight.

The grenades are of two types, the [M42](#) and [M46](#). The 155 mm DPICM M483A1 carries 88 of them, 64 [M42](#) grenades arranged in the eight layers closest to the projectile nose, and 24 [M46](#) grenades in the three layers closest to the base. Both grenades are basically identical, although the wall of the [M46](#) is heavier and thicker to carry the setback loads imposed on the bottom layers when fired. Serrations are embossed into the inner wall of the [M42](#) grenades to enhance fragmentation; [M46](#) grenades are not embossed. The grenades are unarmed while inside the projectile and are armed mechanically by spin after ejection. While in flight they are stabilised and orientated for impact by the deployment of a nylon ribbon streamer which also creates spin to arm the grenade.

The grenades detonate on impact under the control of an integral M223 or M337A1 graze fuze mechanically initiating an [M55](#) detonator. Each grenade contains 30.5 g of Composition A5 formed into a shaped charge with a 60° cone angle which is directed downwards to produce an anti-armour jet capable of penetrating approximately 70 mm of homogeneous armour plate. Fragmentation of the grenade body produces anti-personnel effects, as well providing a fixed standoff distance of 19 mm. Both grenades are 82.55 mm long. The [M42](#) weighs 208 g and the [M46](#) 213 g.

The lethality ratio of the 155 mm DPICM M483A1 compared to the 155 mm HE [M107](#) projectile (filled with Composition B) is stated to be as high as 6.54:1.

The 155 mm DPICM M483A1 can also be fired in a fire registration mode. In this mode the expulsion charge is replaced by a spotting charge. When the fuze functions the spotting charge causes all 88 grenades to detonate, causing the projectile to fragment in the same manner as a conventional HE shell and provide an airburst marker for fire registration.

The 155 mm DPICM M483A1 can be fired using the M3A1/M4A2 bagged charge system, normally from Charge 3 upwards, or the [M119](#) series of unitary bagged charges. The [M203](#) Charge 8S cannot be utilised with the 155 mm DPICM M483A1.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#), but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base

section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required) and the base igniter contains black powder.

The M3 and M4 series of charges used with the 155 mm DPICM M483A1 are fired using the [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn on to the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The M119A2 is produced by Eurometaal NV as the No 13.

Ballistic performance achieved when firing the 155 mm DPICM M483A1 from the 155 mm M126 Cannon used on the [M109](#) Self-propelled Howitzer is as follows:

Charge 3 ([M3A1](#) green bag) - MV 253.9 m/s - range 5,590 m

Charge 4 ([M3A1](#) green bag) - MV 293.5 m/s - range 7,080 m

Charge 5 ([M3A1](#) green bag) - MV 349.5 m/s - range 9,050 m

Charge 3 (M4A2 white bag) - MV 334.2 m/s - range 6,490 m

Charge 4 (M4A2 white bag) - MV 310.1 m/s - range 7,720 m

Charge 5 (M4A2 white bag) - MV 363.5 m/s - range 9,420 m

Charge 6 (M4A2 white bag) - MV 445 m/s - range 11,730 m

Charge 7 (M4A2 white bag) - MV 535.2 m/s - range 14,320 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers, the 155 mm DPICM M483A1 provides the following results:

Charge 3 ([M3A1](#) green bag) - MV 263 m/s - range 5,940 m

Charge 4 ([M3A1](#) green bag) - MV 304.1 m/s - range 7,500 m

Charge 5 ([M3A1](#) green bag) - MV 358.3 m/s - range 9,300 m

Charge 3 (M4A2 white bag) - MV 297.5 m/s - range 7,230 m

Charge 4 (M4A2 white bag) - MV 337 m/s - range 8,630 m

Charge 5 (M4A2 white bag) - MV 386 m/s - range 10,080 m

Charge 6 (M4A2 white bag) - MV 460 m/s - range 12,150 m

Charge 7 (M4A2 white bag) - MV 546.5 m/s - range 14,650 m

Charge 8 ([M119/M119A1](#)) - MV 650 m/s - range 17,740 m.

When fired from the 155 mm M199 Cannon used on the [M198](#) Towed Howitzer, the 155 mm DPICM M483A1 provides the following results:

Charge 3 ([M3A1](#) green bag) - MV 261.9 m/s - range 5,852 m

Charge 4 ([M3A1](#) green bag) - MV 303.6 m/s - range 7,450 m

Charge 5 ([M3A1](#) green bag) - MV 358.1 m/s - range 9,167 m

Charge 3 (M4A2 white bag) - MV 285.2 m/s - range 7,230 m

Charge 4 (M4A2 white bag) - MV 326.5 m/s - range 8,630 m
Charge 5 (M4A2 white bag) - MV 381.3 m/s - range 10,080 m
Charge 6 (M4A2 white bag) - MV 460.7 m/s - range 12,150 m
Charge 7 (M4A2 white bag) - MV 546.2 m/s - range 14,650 m
Charge 8 ([M119/M119A1](#)) - MV 655.8 m/s - range 17,740 m
Charge 8 (M119A2) - MV 660 m/s - range 17,740 m.

It is anticipated that future US 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are adopting similar modular charge systems.

Specifications

Weights:

complete round - 46.54 kg
total explosive filling - 2.84 kg Comp A5
individual grenade filling - 30.5 g Comp A5
expulsion charge - 51 g [M10](#) propellant

Lengths:

fuzed - 937 mm
unfuzed, with lifting plug - 899 mm

Payload: 88 grenades; 64 [M42](#); 24 [M46](#)

Operating temperature limits: -40 to +52°C

Storage temperature limits: -65 to +73.9°C

Authorised fuzes

MTSQ M577; ET M742

Equivalent projectiles

NETHERLANDS

Manufacturer

Eurometaal NV

Type: 155 mm M483A1 Cargo

Description: Standard US specifications

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 155 mm M483A1 ICM

Description: Standard US specifications

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 155 mm M483A1 Cargo

Description: Standard US specifications. See under Development

UNITED STATES OF AMERICA

Manufacturer

Lockheed Martin Milan Army Ammunition Plant

Type: 155 mm DPICM M483A1

Description: Standard specifications. Available as required

Manufacturer

Morton Thiokol Inc

Type: 155 mm DPICM M483A1

Description: Standard specifications

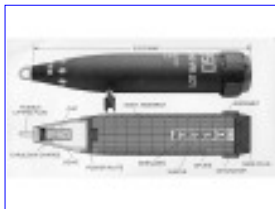
Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: 155 mm DPICM M483A1

Description: Standard specifications. Available as required

UPDATED



General arrangement of Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1



Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1 fitted with Electronic Time (ET) fuze and with one [M46](#) grenade in foreground for size comparison (T J Gander)



South Korean produced example of Projectile, 155 mm: HE, DP, Improved Conventional Munition, M483A1

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: AP-T M318 and M318A1

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm AP-T M318 series replaced the earlier 90 mm AP-T [M77](#) round, that could trace its origins back to the Second World War. It was developed for use with the 90 mm anti-aircraft gun M1, the 90 mm T13 anti-tank gun and the 90 mm Cannon M3 used on [M26](#) Pershing MBTs. Remaining stocks of these early rounds were still being used, for training purposes, during the late 1970s and early 1980s.

There are differences between the 90 mm AP-T M318 and the later M318A1 and both have different ballistic performances.

Although the 90 mm AP-T M318 series is no longer widely used it is apparently still available for production, on request, from Makina ve Kimya Endüstrisi Kurumu ([MKEK](#)) of [Turkey](#).

Description

The 90 mm AP-T M318 and M318A1 (formerly the M318/T33E7) are both fixed rounds with the projectiles crimped into the cartridge cases. A single gilding metal or copper drive band encircles the projectile just forward of the case/projectile junction. In both cases the projectile body is a solid hardened steel slug with a flat base and a relatively short ogive. A lightweight aluminium windshield is secured over the ogive of the projectile slug. The projectile base is threaded to accept a tracer, for the

M318 the M5A2 or M5A2B1. The same types of tracer may be fitted to the M318A1 along with the [M13](#). In all cases the red tracer burns for the first 3 seconds of the projectile trajectory.

The 90 mm AP-T M318 and M318A1 use different cartridge cases and propellant loads.

The M318 uses a 70:30 brass rimmed [M19](#) or M19B1 case with an [M49](#) percussion primer press fitted to the base. The case is loosely filled with 3.9 kg of [M6](#) propellant.

The M318A1 uses an [M108](#) or M108B1 case with an [M58](#) percussion primer press fitted to the base. The rimmed case is loosely filled with 3.9 kg of M7 or [M30](#) propellant.

In both instances uniform propellant ignition is assisted by an igniter located below the cartridge closure disc.

The 90 mm AP-T M318 has a muzzle velocity of 851 m/s and a maximum range of 19,570 m. The 90 mm AP-T M318A1 has a muzzle velocity of 912 m/s and a maximum range of 21,030 m.

The Cartridge, 90 mm: TP-T M353, M353A1 and M353A2 are low-cost training rounds ballistically matched to the 90 mm AP-T M318A1. They all use a steel projectile body and the only difference between the three models is the type of cartridge case lining used to reduce barrel wear.

Specifications

Model	M318	M318A1
Weights:		
complete round	19.95 kg	19.92 kg
propellant	3.9 kg	3.9 kg
Type of propellant	M6	M7 or M30
Lengths:		
complete round	950.7 mm	942.6 mm
cartridge case	615 mm	615 mm
Muzzle velocity:	851 m/s	912 m/s
Max range:	19,570 m	21,030 m

Authorised fuzes

None involved

Equivalent rounds

NETHERLANDS

Manufacturer

Eurometaal NV

Type: TP-T

Description: Standard US specifications as for 90 mm TP-T M353A1. **No longer in production.**
Eurometaal NV is now part of Rheinmetall DeTec.

TURKEY

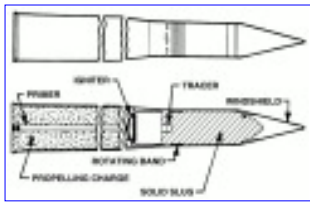
Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: AP-T M318 series

Description: Standard US specifications. Production as required

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Outline and cross-section drawings of Cartridge, 90 mm: AP-T M318 (2000)

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NEW ZEALAND

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NORTH ATLANTIC TREATY ORGANISATION

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

HE	yellow body
HE-I	yellow body, red lettering
HE-I-T	yellow body, red lettering, red ring
AP-I	black body, red lettering
AP-I-T	black body, red lettering, red ring
APDS	black body, white lettering
APDS-T	black body, red lettering
TP	blue body
TP-T	blue body, red ring

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NORTH ATLANTIC TREATY ORGANISATION

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Tracer	red bullet tip
Tracer (Dark ignition)	orange bullet tip
AP	black bullet tip
AP-I	silver or white bullet tip
AP-I-T	red tip over white or silver ring
Incendiary	blue bullet tip
Observation	yellow bullet tip
Observation-T	yellow tip over red ring

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NORTH ATLANTIC TREATY ORGANISATION

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

The NATO standard code was based upon a modification of the contemporary US system. It is used not only by the armies of NATO countries, but also by several other countries who purchase or make NATO standard types of small arms ammunition. Ammunition standardised within NATO is headstamped by a cross-in-circle symbol; unfortunately this symbol has come to be applied somewhat indiscriminately and can be found on rounds which, though NATO standard calibres, are not to NATO specification; on rounds which are to NATO standard; and on ammunition which has never even seen a NATO country. The symbol should be treated with some reserve unless it is on ammunition made by a NATO member.

Colour Coding of Small Arms Ammunition

Type	Characteristics
Ball	none
Frangible ball	green and white ring
Heavy ball (5.56 SS109 ; 7.62 duplex)	green
Armour piercing	black
Grenade	rose crimp (red in 5.56)
Tracer	orange (new) Red (old)
High pressure test	plain bullet silver cartridge case
Dummy	plain fluted or hole in cartridge case
Blank	no bullet
Inert	all black

Incendiary	blue or dark blue/light blue
Armour piercing incendiary (API)	silver
Armour piercing incendiary tracer (API-T)	red/silver
Observation	yellow
Observation tracer	yellow/red

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FUZES - PROXIMITY FUZES, NORWAY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

PPD 324

Armament

120 mm fin- or spin-stabilised mortar bombs.

Development

By NFV to NATO requirements.

Description

This is the same fuze as the [PPD 323](#) described previously but optimised for use with 120 mm mortar bombs. There are differences in the circuitry, a different burst height and small changes in the explosive train, all demanded by the change of projectile, but the operation remains the same.

Specifications

Type: proximity/point detonating

Weight: 210 g

Thread: 1.5 in 12 tpi UNF-1A

Length overall: 91 mm

Intrusion: 27.2 mm

Diameter: 49.2 mm

Arming requirement: 700 g arm, 400 g non-arm

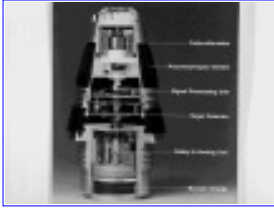
Arming distance: min 100 m; max 250 m

Height of burst: 5 m

Manufacturer

[Kongsberg Gruppen AS.](#)

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NFV multipurpose fuze [PPD 324](#)

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FUZES - PROXIMITY FUZES, NORWAY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

PPD 323

Armament

All 60 to 81 mm mortars.

Development

By NFV to NATO requirements.

Description

This is an electronic proximity fuze with an optional, selectable, impact mode. Power for the proximity function is provided by a turbo-alternator driven by air as the fuze moves along the trajectory. The fuze is delivered set for proximity mode and is prepared by simply removing the plastic cap before loading. By turning the plastic cap to the 'Impact' mark before loading, the proximity mode is inhibited and the fuze functions on impact. Should the proximity circuit fail, then the impact mode will function when the bomb strikes the ground. The impact mode actually gives a slight delay, approximately 20 ms, for better effect against covered targets. The fuze is very well protected against ECM by an apex sensor, the antenna diagram, broadband frequency modulation, a spread in frequency and a blocking channel.

Specifications

Type: proximity/point detonating

Weight: 210 g

Thread: 1.5 in 12 tpi UNF-1A

Length overall: 91 mm

Intrusion: 27.2 mm

Diameter: 49.2 mm

Arming requirement: 700 g arm, 400 g non-arm

Arming distance: min 100 m; max 250 m

Height of burst: 3 m

Manufacturer

[Kongsberg Gruppen AS.](#)

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NFV multipurpose fuze [PPD 323](#)

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MORTARS - 81 mm MORTARS, NORWAY

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb NM 123A1

Armament

All medium- and high-pressure 81 mm mortars.

Development

By Raufoss in co-operation with the Norwegian Army Materiel Command.

Description

The bomb is made from ductile cast iron with an extruded aluminium alloy tail unit. It has a plastic obturating ring which reduces the spread in muzzle velocity. It can be used with any type of mortar bomb fuze at the option of the user; normally the bomb is fitted with 1.5 in (38 mm) threads, but may if desired, be produced with 2 in (51 mm) threads, or 2 in threads with an adaptor for 1.5 in threads.

There is a primary cartridge in the tailboom and six ballistite secondary charges of equal weight. Identical increments allow simple and safer handling during night operations. The bomb has low loading densities and excellent ballistic performances. Probable error at maximum range is 4 m in azimuth and 22 m in range.

Specifications

Length, fuzed: 522 mm

Weight, fuzed: 4.34 kg

Weight and type of payload: 800 g RDX/TNT 60/40

Number of charges: P + 6

Fuze: optional; see text

Min range: 183 m

Max range: 5,863 m

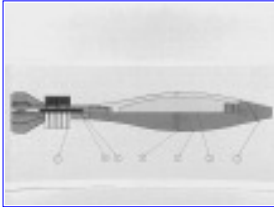
Muzzle velocity: 297 m/s (Charge 6)

Chamber pressure: 745.32 bar

Manufacturer

Raufoss Technology A/S.

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81 mm HE bomb NM 123: (1) fuze; (2) HE filling; (3) body; (4) obturating ring; (5) primary cartridge; (6) tail unit; (7) secondary increments

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IDENTIFICATION OF SMALL ARMS AMMUNITION, NORWAY

Date Posted: 16 July 2001

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All types:

Uses NATO standard codes

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MORTARS - 120 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm HE bomb M44A2

Armament

[AM-50](#) 120 mm mortar (Brandt) and any 120 mm smoothbore mortar with 1.75 m barrel.

Development

By [Pakistan](#) Ordnance Factories for [TDA](#) mortars in [Pakistan](#) service and for general use.

Description

This conventional streamlined bomb is similar to the [TDA](#) Mle44/66. The bomb body is of forged steel with a main charge and seven horseshoe shaped supplemental increments arranged around the tail boom. There are 12 tail fins. The main charge consists of 73 g of CL3 Ballistite. Each increment contains 75 g of Ballistite GB Pa.

Specifications

Weight, fuzed: 13 kg

Length, fuzed: 676 mm

Weight and type of payload: 2.6 kg TNT

Number of charges: P + 7

Fuze: impact SQ and delay [V19P](#)

Max range: 6,745 m

Chamber pressure: 804.17 bar

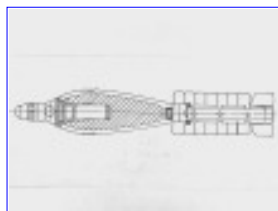
Ballistic performance:

Charge	Muzzle velocity
0	119 m/s
1	153 m/s
2	185 m/s
3	217 m/s
4	248 m/s
5	277 m/s
6	305 m/s
7	331 m/s

Manufacturer

[Pakistan Ordnance Factories.](#)

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120 mm HE bomb

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MORTARS - 81 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm WP smoke bomb

Armament

All 81 mm mortars.

Development

By [Pakistan](#) Ordnance Factories, based on [TDA M57](#) series.

Description

This is similar to the HE bomb (qv), but filled with White Phosphorous (WP). The nose is closed by an adaptor containing a burster tube and charge. The rest of the cavity is filled with WP. The same propellant system is used.

Specifications

Weight, fuzed: 3.2 kg

Length fuzed: 382 mm

Type of payload: WP

Number of charges: P + 7

Fuze: impact SQ and delay [V19PA](#) -A2

Pressure: 100-510 kg/cm², short barrel; 100-570 kg/cm², long barrel.

Max range: 4,140 m short barrel, 4,550 m long barrel

Muzzle velocity: 291 m/s

Manufacturer

[Pakistan](#) Ordnance Factories.

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81 mm WP smoke bomb

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MORTARS - 81 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M57-D Mk 1

Armament

All 81 mm mortars. Specifically for the [TDA](#) MO-81-61 O Short Barrel and MO-81-61-L Long Barrel mortars in service with the [Pakistan](#) Army.

Development

By [Pakistan](#) Ordnance Factories, based upon the Thomson Brandt Model 57D.

Description

This is a teardrop-shaped bomb with four gas check grooves around the bourrelet, a very short tailboom and a welded fin unit. The bomb body is of forged steel. It is a close copy of the [TDA](#) Model 57D bomb. A primary cartridge is inserted in the tailboom. There are seven supplementary charges fitted around the tail boom in horseshoe shaped increments. The fuze is the V19PA-A2.

Specifications

Weight, fuzed: 3.2 kg

Length, fuzed: 382 mm

Weight and type of payload: 681 g TNT or Comp B

Number of charges: P + 7

Fuze: impact SQ and delay [V19PA](#) -A2

Max range: 4,140 m short barrel, 4,550 m long barrel

Pressure: short barrel, 100-510 kg/cm²; long barrel, 100-570 kg/cm²

Muzzle velocity: 291 m/s (Charge 7)

Manufacturer

[Pakistan](#) Ordnance Factories.

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[POF 81 mm](#) HE bomb M57-D Mk 1

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MORTARS - 60 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb

Armament

All 60 mm mortars.

Development

By [Pakistan](#) Ordnance Factories.

Description

A conventional bomb of teardrop shape, with four gas check grooves around the bourrelet. The bomb body may be either forged steel or graphite cast iron. The tail unit is of steel, with welded fins and carries the usual shotgun type primary cartridge inside the tail tube with five secondary cartridges, in horseshoe form, clipped around the tail tube above the fins.

Specifications

Weight, fuzed: 1.33 kg

Length, fuzed: 233-243 mm

Weight and type of payload: 113 g TNT/DNN 42/58

Number of charges: P + 5

Fuze: PAI-1A or PAI-7 PDSQ

Max range: 2,075 m

Chamber pressure: 360 kg/cm²

Ballistic performance:

Charge	Muzzle velocity
0	65 m/s
1	93 m/s
2	115 m/s
3	134 m/s
4	152 m/s
5	170 m/s

Manufacturer

[Pakistan](#) Ordnance Factories.

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60 mm HE bomb

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MORTARS - 60 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm illuminating and signal bombs (red & green)

Armament

All 60 mm mortars.

Development

By [Pakistan](#) Ordnance Factories.

Description

This is a cylindrical bomb which comes in three variants: a parachute illuminating bomb, a red signal bomb and a green signal bomb. The basic bomb is a canister attached to a tail unit which carries the primary cartridge. At the base of the bomb is a chamber containing a fixed time delay unit which is ignited by the propellant flash. After burning through, the delay ignites an expelling charge in the base of the body; this ignites the pyrotechnic payload and then ejects it, blowing off the front cap of the body to permit exit. In the case of the illuminating bomb, the parachute deploys and lowers the flare unit to the ground. In the case of the signal bombs, the smoke unit is thrown clear and falls free, the duration of its fall being sufficient for signalling purposes.

Specifications

Length, fuzed: 246 mm

Weight, fuzed: 1 kg

Type of payload: illuminating composition SR562 and parachute; green flare composition SR429AM; red flare composition SR406

Delay time: 4 ± 1 s

Duration: illumination 35-45 s; signal 8-12 s

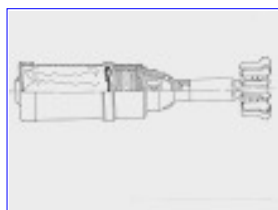
Ejection height: 183 m

Illuminating power: 125,000-150,000 cd

Manufacturer

[Pakistan](#) Ordnance Factories.

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60 mm illuminating bomb

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MORTARS - 60 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb WP

Armament

All 60 mm mortars.

Development

By [Pakistan](#) Ordnance Factories

Description

This bomb uses the same body and tail unit as the 60 mm HE Bomb (qv) but it is filled with White Phosphorus (WP) and there are only three supplemental charges. Fuzing may be either PAI-1A or PAI-7 point detonating fuzes.

Specifications

Weight, fuzed: 1.6 kg

Length, fuzed: 280 mm

Type of payload: 400 g WP

Number of charges: P + 3

Fuze: PAI-1A or PAI-7 impact SQ

Max range: 1,320 m, Charge 3

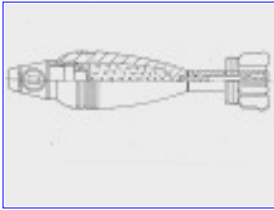
Ballistic performance:

Charge	Muzzle Velocity
0	65 m/s
1	93 m/s
2	115 m/s
3	134 m/s

Manufacturer

[Pakistan](#) Ordnance Factories.

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60 mm smoke bomb

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MORTARS - 120 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

120 mm WP smoke bomb M44A1

Armament

[AM-50](#) (Brandt) mortars in [Pakistan](#) service and any 120 mm mortar with a 1.75 m barrel

Development

By [Pakistan](#) Ordnance Factories based on a [TDA](#) design.

Description

This bomb is generally similar to the 120 mm HE bomb previously described except that it is filled with White Phosphorus (WP).

Specifications

Type: smoke, WP

Length, fuze: 676 mm

Weight, fuze: 13 kg

Type of Payload: 2.6 kg WP

Type of Charges: P + 7

Fuze: [V19P](#) SQ and delay

Max range: 6,745 m

Ballistics:

Charge	Muzzle Velocity
0	119 m/s
1	153 m/s
2	185 m/s
3	217 m/s
4	248 m/s
5	277 m/s
6	305 m/s
7	331 m/s

Colour/Markings: sea green/yellow

Status: In production

Manufacturer

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MORTARS - 81 mm MORTARS, [PAKISTAN](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

81 mm illuminating and signal bombs (red and green)

Armament

All smoothbore 81 mm mortars.

Development

By [Pakistan](#) Ordnance Factories.

Description

This is a cylindrical bomb that is manufactured in three variants: a parachute illuminating bomb, a red signal bomb and a green signal bomb. The basic design is a seamless tubular canister attached to a tail unit with 10 fins that carries the primary cartridge. At the bomb's base is a chamber containing a fixed time delay unit that is ignited by the propellant flash. There are three horseshoe shaped supplemental incremental charges arranged around the tail boom. After the delay unit burns through, it ignites an expelling charge in the base of the body, which in turn ignites the pyrotechnic payload and ejects it, blowing off the body's front cap to permit exit. The illuminating bomb contains a flare with a 1 m nylon parachute linked to the flare by a zinc/cadmium/chromium plated steel wire, which retards the flare's descent. The smoke unit of the signal bombs is thrown clear of the bomb and falls free with the duration of fall being sufficient for signaling purposes.

Specifications

Type: illuminating and signal

Length: 318 mm

Weight: 2.5 kg

Type of Payload: illuminating, Composition RDP 590; signal red, Composition SR 406; signal green, Composition SR 429 AM

Fuze: n/a

Number of charges: P + 3

Delay time: illuminating, 15 s, burn time 50 s; signal, 6 s, burn time 10 s

Colour/Markings: white/black. Illuminating, 6 mm red nose band; green signal, 12 mm green nose band; red signal, 12 mm red nose band.

Status: In production

Manufacturer

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

RO Defence 105 mm APFSDS-T L64A4

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The Royal Ordnance (now [BAE Systems](#), RO Defence) 105 mm L64A4 may be regarded as a first-generation APFSDS-T round which, when introduced into British Army service, replaced the earlier APDS rounds fired by 105 mm L7 tank guns. L7 guns are no longer used by the British Army but the L64 series is used widely by many armed forces using L7 or [M68](#) guns. The L64A4 is licence produced by the [Pakistan](#) Ordnance Factories at Wah Cantt.

Description

The 105 mm L64A4 APFSDS-T is a fixed round with the projectile assembly crimped onto a standard 105 mm cartridge case. The projectile assembly consists of a subprojectile and a sabot.

The L64A4 subprojectile consists of a monobloc standard tungsten alloy core acting as the penetrator rod, the front part of which has an aluminium windshield. A six-finned extruded aluminium fin assembly is fitted to the rear of the penetrator rod and contains an L14A1 tracer. The penetrator rod diameter is 28 mm.

The sabot is aluminium and consists of three 120° segments assembled around the subprojectile, interfaced with the penetrator body by a series of mating buttress grooves. The sabot is held in place by

a plastic band at the forward end and a slipping plastic obturating band toward the sabot base. The base of the sabot is sealed by a foam rubber collar.

The 70:30 brass cartridge case contains a nominal 5.62 kg of a triple-based granular seven-hole multitubular propellant known as WNC LM1900. An L20A1 electrical primer is fitted to the base; it includes a flash tube extending almost to the tail of the projectile assembly. Before loading, the primer is normally protected by a metal clip over the base of the cartridge case. A barrel wear reducing titanium dioxide liner is secured to the interior wall of the cartridge case.

The L64A4 projectile assembly has a muzzle velocity between 1,480 and 1,490 m/s, and can defeat a NATO triple heavy target or a NATO single heavy target, both at 4,000 m. Dispersion is better than 0.3 mil horizontally and vertically, out to 3,000 m.

The training round for the 105 mm APFSDS L64 is the lower cost DS Prac L63 which can also be used as the ballistic equivalent for the 105 mm APFSDS-T H6/62 out to a range of 2,000 m. Round weight of the L63 is 14.91 kg of which 3.91 kg is the projectile. The cartridge case contains 3.97 kg of NQ/M07 propellant.

Specifications

Weights:

complete round - 18.91 kg

projectile assembly - 6.12 kg

subprojectile - 3.59 kg

propellant, nominal - 5.62 kg (± 0.007 kg)

Lengths:

complete round, max - 948 mm

cartridge case - 617 mm

Subprojectile diameter: 28 mm

Muzzle velocity: 1,480-1,490 m/s

Max chamber pressure: 5,110 bar

Authorised fuzes

None involved

Equivalent rounds

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: L64A4 APFSDS-T

Description: Propellant charge is 5.9 kg of NQ/M.046. Otherwise standard specifications

Manufacturer

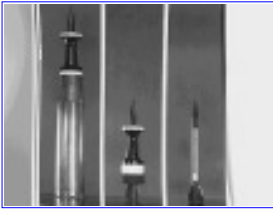
Machinecrafts (Private) Limited

Lahore

Type: 105 mm APFSDS

Description: Production believed to be limited to the manufacture and assembly of the L64A4 APFSDS-T assembly only

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From left, complete round, projectile assembly and penetrator for the 105 mm APFSDS-T L64A4



105 mm APFSDS-T L64A4 as produced by the [Pakistan](#) Ordnance Factories

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TANK AND ANTI-TANK GUNS

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

NORINCO 100 mm APFSDS-T Type 73

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#) and 69); 100 mm field gun BS-3; 100 mm [KS-19](#) anti-aircraft gun; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; 100 mm towed [anti-tank gun M1977](#) ([Romania](#)).

Development

The NORINCO 100 mm APFSDS-T Type 73 was developed for use with the Type 69 version of the 100 mm D-10 series tank gun fitted to the Chinese Type 69 tank. At least two versions of this round have been developed, one of which is manufactured in [Pakistan](#) by the [Pakistan](#) Ordnance Factories at Wah Cantt. It is claimed that this round is capable of defeating the armour of a [T-72](#) tank.

Description

The NORINCO 100 mm APFSDS-T Type 73 is a fixed round with the projectile assembly crimped onto a brass cartridge case. The projectile assembly consists of a subprojectile and a sabot. The subprojectile consists of a monobloc dense tungsten alloy penetrator rod with a diameter of 40 mm, the front part of which has an aluminium windshield. An aluminium fin assembly with eight fins is fitted to the rear of the penetrator rod and contains a tracer element. The sabot is aluminium and consists of three 120° segments assembled around the subprojectile and interfaced with the penetrator body by a series of mating buttress grooves. The sabot is held in place by a plastic ring at the forward end and a plastic

obturating band toward the sabot base. Rotating rate at the muzzle is 6,000 to 8,000 rpm.

The brass cartridge case contains loose, cool-burning, multiperforated, double-base propellant. A percussion primer is fitted to the base.

The projectile assembly has a muzzle velocity of 1,505 m/s. It can penetrate 150 mm of homogeneous armour plate set at an angle of 65° at a range of 2,400 m. Dispersion at 1,000 m is less than 300 × 300 mm. The direct firing range against a 2 m high target is 1,730 m.

Specifications

Weights:

complete round - 19 kg

projectile assembly - 5.56 kg

Lengths:

complete round - 945 mm

cartridge case - 695 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 1,505 m/s

Operating temperature range: -40 to +50°C

Authorised fuzes

None involved

Equivalent rounds

PAKISTAN

Manufacturer

[Pakistan](#) Ordnance Factories

Type: 100 mm APFSDS

Description: Complete round length given as 1.021 m and weight 20.17 kg; projectile assembly weight is approximately 5 kg. The 70:30 drawn brass cartridge case contains a nominal 6.01 kg of double-base multitubular NQ/M 046 propellant. The percussion primer is a Type P5A2. Muzzle velocity is 1,452 m/s. Effective range given as 2,500 m

Manufacturer

Directorate General Munitions Production, Defence Production Division

Type: 100 mm Practice DS/T

Description: Intended to ballistically match the POF 100 mm APFSDS up to 1,600 m for relatively low cost firing training. Maximum safety zone range is 15,000 m. No further information available.

Manufacturer

Machinecrafts (Private) Limited

Lahore

Type: 100 mm APFSDS

Description: Production believed to be limited to the manufacture and assembly of the APFSDS assembly only

UPDATED



100 mm APFSDS produced under licence from NORINCO by the [Pakistan Ordnance Factories](#)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, QF, 25-pounder, Blank

Armament

25-pounder field guns.

Development

Developed for saluting purposes and battle noise simulation, this Blank cartridge may be encountered in factory produced and locally loaded forms. Many Blank cartridges used for saluting purposes are prepared at unit level and their cartridge cases are recycled.

Description

This cartridge consists of the same drawn 70:30 brass cartridge case used for other rounds but fitted with a No 1 primer in the base. The Blank charge consists of 454 g of gunpowder G.12, contained in a silk cloth or cream serge bag and held in position at the bottom of the case by a leatherboard cup. Paper packaging is sometimes used in place of the cloth bag.

Specifications

Weights:

complete round - 3.5 kg

charge - 454 g gunpowder G.12

Length, cartridge case: 293 mm

Authorised fuzes

None involved

Equivalent rounds

[PAKISTAN](#)

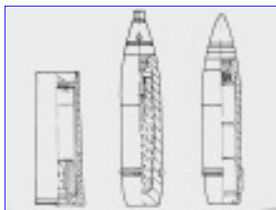
Manufacturer

[Pakistan](#) Ordnance Factories

Type: Cartridge, QF, 25-pounder, Blank

Description: Standard specifications

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The range of 25-pounder projectile produced by the [Pakistan](#) Ordnance Factories, from left: Blank; HE; and Smoke

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, QF, 25-pounder, Smoke

Armament

25-pounder field guns.

Development

Intended to provide screening smoke, this base ejection projectile was developed alongside the HE projectile during the late 1930s. The standard projectile was the Mk IID although other marks and variants, up to Mk VIIB, were produced. As far as can be determined this round is now produced only by the [Pakistan](#) Ordnance Factories.

The US Cartridge, 105 mm: HC, [M84](#) was developed using the 25-pounder Smoke projectile as a basis.

Description

This steel base ejection shell (actual calibre 87.6 mm) has a streamlined outline, a flat base with only a slight taper and a copper driving band. The front of the shell body is threaded to accept a steel adaptor into which a No 221 time fuze is threaded. Below the fuze is a 42.5 g black powder charge contained in a bag located just above a steel baffle plate. The main interior of the shell has parallel walls and contains three cylindrical smoke containers separated from each other by millboard washers. Each container is filled with a smoke-producing composition which is ignited after the time fuze functions. As the fuze functions it creates internal pressure against the baffle plate to force off the steel baseplate and eject the smoke canisters. The same charge also creates flash to travel down a central channel to ignite the contents of the smoke canisters which then produce dense clouds of grey/white smoke.

The cartridge case is drawn 70:30 brass and fitted with a No 11 percussion primer in the base. The normal cartridge carries three charges sewn into linen or cambric bags, with the charges being removed by hand to suit the particular requirement. Charge 1, the 'core' charge, is coloured red, Charge 2 is white and Charge 3 is blue. The charges are retained in place by a fibre cup. The propellant involved is cordite-based, the usual propellants are triple-base flashless NQ 018 and NQ 050 weighing 857 g. The Super Charge was not normally used with the Smoke projectile.

Ballistic data for the charge system is as follows:

- Charge 1 - MV 198 m/s - max range 3,566 m
- Charge 2 - MV 297 m/s - max range 7,132 m
- Charge 3 - MV 442 m/s - max range 10,790 m.

Specifications

Weights:

- projectile** - 9.89 kg
- filling** - 2.27 kg smoke canisters (3)
- propellant, normal** - 857 g NQ 018 or NQ 050

Lengths:

- projectile** - 330.9 mm
- cartridge case** - 293 mm
- Max muzzle velocity:** 442 m/s
- Max range:** 10,790 m

Authorised fuzes

Time No 221

Equivalent rounds

[PAKISTAN](#)

Manufacturer

[Pakistan](#) Ordnance Factories

Type: Cartridge, QF, 25-pounder, Smoke

Description: Standard specifications. In production and offered for export sales

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, QF, 25-pounder, HE

Armament

25-pounder field guns.

Development

The first 25-pounder field gun-howitzer was the Mk 1, an updated 18-pounder field gun from the Great War period with an 87.6 mm loose barrel sleeve inserted into the jacket of the older barrel. This was the 18/25-pounder, dating from 1938, most of which were lost in France in 1940. The next model was the Mk 2, dating from 1940 onwards, which remains the standard version (there were several other service versions, such as the self-propelled Sexton which is no longer in service anywhere), although most have now either been withdrawn from front-line use with many armed forces or relegated to training, gate guardian and saluting duties.

Ammunition production facilities now survive only in [Pakistan](#), from where exports are understood to have been delivered to [Myanmar](#). The Indian Ordnance Factories no longer produce 25-pounder ammunition, although manufacturing facilities no doubt still exist. [South Africa](#) (where the 25-pounder is known as the G1) no longer retains a manufacturing capability as the stockpile of remaining rounds is understood to be around 300,000 and the G1 is held only as a reserve weapon. However, some 25-pounder barrels may be used as subcalibre training inserts for [155 mm G5](#) and G6 howitzers to economically utilise the remaining stockpiles.

A radio proximity fuze, the M85C88, was developed in [South Africa](#) by Fuchs Electronics

specifically for 25-pounder/G1 ammunition. The M85C88 can replace the usual PD fuze directly and operates at a factory set reference height between 6 and 8 m. The fuze circuits employ frequency-agility techniques. Should the fuze fail there is an impact detonating back-up.

The only types of 25-pounder ammunition still likely to be encountered are HE, Smoke and Blank. Over the years the numbers and variations of 25-pounder ammunition have been legion and included AP-T, Illuminating, Chemical, Leaflet, paper-filled for functional testing, and so on. A 1944 service manual lists no fewer than four marks of cartridge case, 15 types of cordite-based propellant and 24 types of projectile. As a result the descriptions provided here for HE, Smoke and Blank can only be taken as typical.

Description

All 25-pounder rounds (actual calibre 87.6 mm) are classed as separate loading ammunition as the projectile is loaded separately from the cartridge case.

The 25-pounder HE projectile is forged steel and normally filled with (typically) 825 g of TNT, although other fillings have been used, including cold pressed 60:40 Amatol, with or without a topping of TNT. The projectile is streamlined and there is a slight boat tail taper to the rear of the projectile; the flat steel base is screwed into a recess formed in the base. A copper drive band is used. The nose-mounted fuze is the DA and Percussion No 119B Mk 18 although the No 117/117C and No 222 have been used.

The cartridge case is drawn 70:30 brass and is fitted with a No 11 percussion primer in the base. The normal cartridge carries three charges sewn into linen or cambric bags, with the charges being removed by hand to suit the particular requirement. Charge 1, the 'core' charge, is coloured red, Charge 2 is white and Charge 3 is blue. The charges are retained in place by a fibre cup. The propellant involved is triple-based and flashless, the usual propellants being NQ 018 and NQ 050 weighing 857 g. There was also a unitary Super Charge, originally developed for an AP-T projectile which is no longer in service, using triple-base, flashless NQ/S 134-040 weighing 1.253 kg.

Ballistic data for the charge system is as follows:

Charge 1 - MV 198 m/s - max range 3,566 m

Charge 2 - MV 297 m/s - max range 7,132 m

Charge 3 - MV 442 m/s - max range 10,790 m

Super Charge - MV 518 m/s - max range 12,253 m.

Inert drill projectiles and drill cartridge cases complete with inert propelling charges have been produced.

Specifications

Weights:

projectile - 11.34 kg

explosive - approx 825 g TNT

propellant, normal - 857 g NQ 018 or NQ 050

propellant, Super Charge - 1.253 kg NQ/S 134-040

Lengths:

projectile - 351.5 mm

cartridge case - 293 mm

Max muzzle velocity: 518 m/s

Max range: 12,253 m

Authorised fuzes

PD and Percussion No 119B Mk 18
Prox Fuchs M85C88

Equivalent rounds

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: Cartridge, QF, 25-pounder, HE

Description: Standard specifications. In production and offered for export sales

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25-pounder ammunition produced by the Pakistan Ordnance Factories, from left: HE projectile; cutaway cartridge case; Smoke projectile (T J Gander) (1998)

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

100 mm HVAPDS-T UBM-6

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)); 100 mm field gun BS-3; NORINCO 100 mm field gun and 100 mm anti-tank gun Type 73; [100 mm Field Gun M53](#); 100 mm towed [anti-tank gun M1977 \(Romania\)](#).

Development

The 100 mm HVAPDS-T UBM-6 was the main anti-armour round used by D-10 series guns from about 1968 onwards. It fired the main anti-armour projectile for the D-10 gun series until the belated introduction of the 100 mm APFSDS 3BM-2 projectile and its equivalents.

The Chinese Type 59 tank with its locally produced 100 mm main gun does not include an equivalent of this round in its normal ammunition inventory, although some form of APDS is offered by NORINCO as part of an enhanced performance 100 mm gun package. However, the [Pakistan](#) Ordnance Factories do produce a 100 mm APDS.

Description

The 100 mm HVAPDS-T BM-8 is the projectile component of a fixed round with the projectile assembly securely fixed to the brass cartridge case. The case mouth periphery is pressed around the narrow steel drive bands, five in number, which encircle the rear of the projectile assembly.

The BM-8 projectile assembly consists of a light-alloy sabot and projectile. The penetrator has a

diameter of 49.5 mm and a length of 120.14 mm. The streamlined nose of the projectile carries a pyrotechnic-filled tip to provide a flash indication of the impact point on a target. Behind this is a light-alloy cap covering the relatively blunt nose of the tungsten carbide penetrator. A thin-walled metal liner surrounds the penetrator and a tracer element is carried inside a housing protruding from the penetrator base. The penetrator subprojectile without the sabot weighs 2.9 kg.

The brass or lacquered steel cartridge case contains 6.66 kg of stick and granular propellant, plus flash reducing and wear additives located in a ring close to the top of the cartridge case. There is a KW-13 or KW-13U percussion primer threaded into the base. Brass cases are made of MK-75 brass and weigh 8.5 kg. The flange diameter is 147.5 mm.

The 100 mm HVAPDS-T BM-8 has a muzzle velocity of 1,400 to 1,415 m/s and is claimed to be able to penetrate 300 mm of vertical armour at the maximum effective direct fire range of 1,680 m.

Specifications

Weights:

complete round - 21.2 kg

projectile assembly - 5.7 kg

penetrator - 2.9 kg

discarded elements of projectile assembly - 1.8 kg

propellant - 6.66 kg

Lengths:

complete round - 920 mm

projectile assembly - 243.08 mm

subprojectile - 120.14 mm

cartridge case - 695 mm

Diameter of penetrator: 49.5 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 1,400-1,415 m/s

Authorised fuzes

None involved

Equivalent rounds

PAKISTAN

Manufacturer

Pakistan Ordnance Factories

Type: 100 mm APDS

Description: Muzzle velocity is 1,424 m/s and maximum effective range 1,500 m. Complete round weight is approximately 20 kg and projectile weight, including a tungsten alloy penetrator core, is 4.9 kg. The brass cartridge case contains a nominal 6.803 kg of NQ/M 054 double-base, multiperforated propellant

ROMANIA

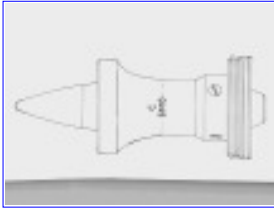
Manufacturer

SN ROMARM SA

Type: 100 mm APDS

Description: No longer in series production but may be held in reserve stocks. Standard specifications

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Projectile assembly for 100 mm HVAPDS-T 3BM8

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

ZPS 125 mm APFSDS-T

Armament

2A45 and [2A45M](#) tank guns fitted to [T-64](#) and early [T-72](#) MBTs; 2A46 (D-81) and 2A46M (D-81M) tank guns fitted to [T-64A](#) and [T-72](#) MBTs; 2A46M1 tank gun fitted to [T-80](#) and [T-90E](#) MBTs; 2A75 gun fitted to [2S25 self-propelled anti-tank](#) gun; [2A45M Sprut-B towed anti-tank](#) gun.

Development

This 125 mm APFSDS-T round was developed by Zaklady Tworzyw Sztucznych `Pronit' SA (now Zaklady Produkcji Specjalnej SO zoo (ZPS)) at its plant at Pionki in [Poland](#). The round uses the original D-81 gun series two-part propellant system but the projectile assembly is entirely different and based on Western-type APFSDS technology.

Description

The ZPS 125 mm APFSDS-T is a separate loading munition. It is loaded into the breech surrounded, behind the sabot assembly, by an integral combustible propellant charge in a combustible case and followed by the main 4Zh63 semi-combustible propellant charge.

The light alloy sabot assembly consists of a three-segment sabot, with a high-strength tungsten alloy penetrator rod forming the projectile. The penetrator rod has a diameter of 28 mm and a length-to-diameter ratio of 19.3:1. The rod has an aluminium six-finned fin assembly at the rear containing a tracer element.

The two-component propellant system is based on the design of the [Russian Federation](#) and Associated States (CIS) 125 mm APFSDS and can be auto-loaded using the loading system of the [T-72](#) tank. Both components are encased in a combustible tube which is totally consumed on firing. The rear charge continues to be the standard 4Zh63. A steel stub case, weighing 3.4 kg and containing the GUV-7 electrical primer, remains to be ejected after firing. The case, made of BW 11 steel, is 140 mm long and has a flange diameter of 171.9 mm.

Muzzle velocity is a nominal 1,650 m/s with velocity drop at 1,000 m less than 100 m/s. The projectile can penetrate a minimum of 460 mm of RHA at 2,000 m. Accuracy at 1,000 m is 0.3×0.3 m and 0.6×0.6 m at 2,000 m.

ZPS has also produced a sound- and flash-producing 125 mm round known as ISA, using a plastic projectile filled with either water or an anti-freeze mixture. It permits firing in confined maintenance areas or over short ranges. When fired, the plastic projectile immediately breaks up to release its fluid contents and fragments within a maximum range of 100 m, while the recoil forces generated allow gun recoil mechanisms to operate for test or other purposes. The ISA projectile is 670 mm long and weighs from 5.5 to 6.5 kg.

Specifications

Weights:

projectile with secondary charge, packed - 11.5 kg

projectile with sabot - 7.15 kg

projectile in flight - 4.25 kg

base charge propellant mass - 5.855 kg

secondary propellant charge - 3 kg

stub case - 3.4 kg

Lengths:

projectile - 542 mm

propelling charge - 408 mm

Diameter of projectile: 28 mm

Diameter of combustible case: 158.5 mm

Diameter of stub case: 160.76 mm

Muzzle velocity: (nominal) 1,650 m/s (± 5 m/s)

Chamber pressure: (nominal) 570 MPa

Operational temperature limits: -35 to +52°C

Authorised fuzes

None involved

Equivalent rounds

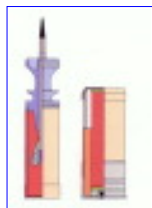
POLAND

Manufacturer

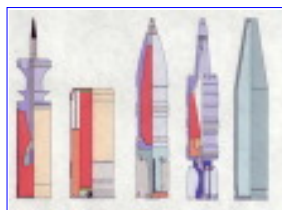
Presta

Type: 125 mm APFSDS-T

Description: Similar to ZVS round but projectile weight given as 7.1 kg and propellant weight as 9.56 kg. Projectile length is 550 mm. Muzzle velocity is 1,670 ms. Maximum effective range given as 2,500 m.



Cross-sectioned drawing of ZVS 125 mm APFSDS-T



125 mm D-81 tank gun series ammunition produced by ZVS, from left: APFSDS-T; main propellant charge (4Zh63); FRAG-HE(FS); HEAT-FS; ISA training projectile

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [POLAND](#)

Date Posted: 16 July 2001

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All types:

Uses RAFS code

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MORTARS - 120 mm MORTARS, PORTUGAL

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Explosivos da Trafaria for Tampella mortars in Portuguese service and for general use.

Description

This is the standard pattern Tampella 120 mm bomb, streamlined with four gas check grooves, an alloy tailboom and fins. It has the usual arrangement of a primary cartridge in the tail and secondaries in split rings around the tailboom.

Specifications

Length, fuzed: 575 mm

Weight, fuzed: 12.6 kg

Type of payload: TNT

Number of charges: P + 7

Fuze: impact SQ

Max range: 6,500 m

Manufacturer

Explosivos da Trafaria SA.

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MORTARS - 81 mm MORTARS, PORTUGAL

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M43A1

Armament

All 81 mm mortars.

Development

By INDEP, based upon the US M43A1B1 original pattern.

Description

This is the standard US bomb, a teardrop-shaped forged steel bomb with four gas check grooves at the bourrelet and a welded tail unit. A shotgun type primary cartridge fits in the rear of the tail unit and up to eight secondary incremental charges fit between the fins, secured by spring clips. The secondaries are simply leaves of smokeless powder stitched together and enclosed in transparent plastic envelopes.

Specifications

Length, fuze: 338 mm

Weight, fuze: 3.25 kg

Weight and type of payload: 560 g TNT

Number of charges: P + 8

Fuze: impact SQ DM 111A2

Min range: 75 m

Max range: 4,200 m

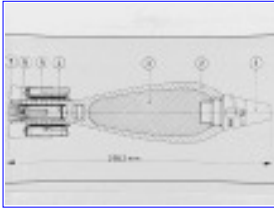
Muzzle velocity: 268 m/s, Charge 8

Restrictions: When firing Portuguese FBP LP and US M1 mortars, Charges 7 and 8 must not be used.

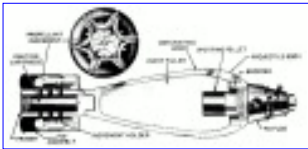
Manufacturer

INDEP.

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81 mm HE bomb M43A1: (1) fuze; (2) shell body (forged steel); (3) bursting charge (cast TNT); (4) ignition cartridge, [M8](#); (5) propellant increment charge, [M1A1](#); (6) percussion primer, [M34](#); (7) fin assembly, M3



M43A1 TP bomb
(1998)

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MORTARS - 60 mm MORTARS, PORTUGAL

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb NR431A1

Armament

60 mm mortars of all types.

Development

Developed by PRB of Belgium in the early 1970s and one of the first mortar bombs to use controlled fragmentation. Now made under licence in Portugal.

Description

This bomb uses a light cast-steel body shell into which a patented fragmentation sleeve is inserted before filling with high explosive. An eight-fin cast alloy tail unit screws to the rear of the body. A primary cartridge is inserted into the tailboom, and up to four secondary increments can be placed between the fins and retained there by spring clips.

Specifications

Length, fuze: 255 mm

Weight: 1.36 kg as loaded

Weight and type of payload: 150 g TNT

Number of charges: P + 4

Fuze: AZ111A2 or equivalent

Max range: 2,100 m

Max muzzle velocity: 177 m/s

Lethal radius: >13.5 m

Restriction: For Commando type mortars Charges 3 and 4 cannot be used.

Manufacturer

INDEP.

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60 mm HE bomb NR431A1

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MORTARS - 60 mm MORTARS, PORTUGAL

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb M49A2

Armament

60 mm mortars of all types.

Development

Developed by INDEP and based upon the US M49A2 round.

Description

The M49A2 bomb uses a cast-steel body of teardrop shape, with four gas check grooves at the bourrelet and a screwed-in steel tail unit. The nose is threaded for an M525 or similar impact fuze. The primary cartridge is a shotgun type inserted into the centre of the tail unit and four secondary charges, in plastic containers, clip in between the fins.

Specifications

Length, fuzed: 243.5 mm

Weight: 1.34 kg as loaded

Weight and type of payload: 155 g TNT

Number of charges: P + 4

Fuze: M525 or equivalent

Max range: 1,820 m

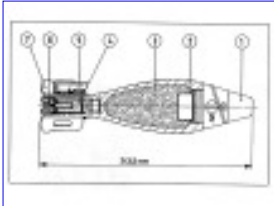
Max muzzle velocity: 158 m/s

Restriction: For Commando type mortars Charges 3 and 4 cannot be used.

Manufacturer

INDEP.

VERIFIED



INDEP 60 mm HE bomb M49A2. (1) fuze; (2) shell body (forged steel); (3) bursting charge (cast TNT); (4) ignition cartridge, M5A1; (5) propellant increment charge, [M3A1](#); (6) percussion primer, M32; (7) fin assembly, M2

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IDENTIFICATION OF SMALL ARMS AMMUNITION, PORTUGAL

Date Posted: 16 July 2001

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All types:

Uses NATO standard code

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[1 Image](#)

SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.92 × 24.5 mm subcalibre

Synonyms:

7.92 mm M388; 7.92 mm Portuguese Regaña

Armament

Subcalibre insert barrel for the Portuguese service 84 mm anti-tank rocket launcher (the US [3.5 in M20](#)).

Development

Developed by the Portuguese Army technical staff in 1973, based upon the 7.62 mm Spanish Regaña cartridge (described previously). It differs from the Spanish round as it is smaller and uses a unique cartridge case, which may have been developed from tooling used for the [7.65 mm Parabellum](#) cartridge.

Description

This round uses a short-necked, rimless cartridge case, specially developed for the design and not cut down from any existing case. It carries a rifle-type tracer bullet with a very long, tapering ogive. The exposed portion of the bullet is only slightly shorter than the cartridge case. The bullet is designed to reproduce the trajectory of the rocket fired from the parent weapon, delivering a trace to the target for initial training purposes.

Specifications

Round length: 48.4 mm

Case length: 24.7 mm

Rim diameter: 9.8 mm

Bullet diameter: 7.95 mm

Bullet weight: 12.8 g

Muzzle velocity: ca 275 m/s

Muzzle energy: 378 J

PORTUGAL

Manufacturer

INDEP

Type: Tracer: As above

VERIFIED



7.92 × 24.5 mm subcalibre

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 24 mm subcalibre

Synonyms:

none

Armament

Subcalibre insert barrel for the Portuguese service 84 mm anti-tank rocket launcher (the US [3.5 in M20](#)).

Development

Developed by the Portuguese Army technical staff as an improvement on the 7.92 mm subcalibre round described elsewhere. With the adoption of 7.62 mm as the standard small arms calibre, subcalibre barrels in this size were also adopted, although the 7.92 mm versions are still in use. This version uses the same cartridge case but with a standard production bullet rather than a specially made one. It is notable that this round gives better accuracy and range than the 7.92 mm subcalibre round.

Description

This round uses a short-necked, rimless cartridge case derived from the 7.63 × 25 mm cartridge. It carries a standard 7.62 mm rifle bullet which reproduces the trajectory of the rocket fired from the parent weapon.

Specifications

Round length: 42.4 mm
Case length: 24.7 mm
Rim diameter: 9.8 mm
Bullet diameter: 7.83 mm
Bullet weight: 9.45 g
Muzzle velocity: 260 m/s
Muzzle energy: 319 J

PORTUGAL

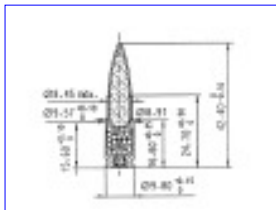
Manufacturer

INDEP

Type: Ball M387: FMJ; lead core; 9.45 g; MV 260 m/s

Tracer M358: FMJ; lead core; red trace to 300 m; 8.95 g; MV 260 m/s

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*7.62 × 24.5 Subcalibre
(1996)*

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MORTARS - 82 mm MORTARS, [ROMANIA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

82 mm steel body HE bomb

Armament

82 mm RFAS and similar mortars

Development

By Romtehnica to provide a mortar round of increased effectiveness

Description

The Romtehnica 82 mm steel body bomb is a streamlined mortar bomb using thin-wall steel for the body rather than traditional cast iron, to allow increased payload with concomitant increase in bursting radius. The bomb has an alloy tailboom screwed into the body. There are 10 tail fins attached to the tailboom. Romtehnica also manufactures cast iron bombs, which are apparently derived from the RFAS [O-832](#) series (which see). The 82 mm steel bomb is a design unique to [Romania](#). It should be noted that Romanian colour coding of the HE bombs is grey, rather than the usual OD green.

Specifications

Length, fuze: 487 mm

Weight, fuze: 4.45 kg

Fuze: M-6R PD (impact)

Muzzle velocity: 305 m/s

Min range: 100 m

Max range: 4,500 m

Manufacturer

Romtehnica
Bucharest, [Romania](#).

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MORTARS - 82 mm MORTARS, [ROMANIA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

82 mm illuminating bomb

Armanent

Romanian and other 82 mm mortars.

Development

By Romtehnica to provide ammunition for indigenous and other 82 mm mortars.

Description

The Romtehnica 82 mm illuminating bomb is a conventional design of unknown derivation. The TI time fuze has a secondary impact function. The bomb is streamlined rather than the tubular shape generally associated with illuminating and other cargo-carrying mortar bombs.

Specifications

Weight: 3.62 kg

Length: 363 mm

Fuze: TI, time and impact

Min range: 220 m

Max range: 2,670 m

Illuminating time: >30 s

Illuminating intensity: 150,000 cd

Illuminating radius: 200 m

Colour/markings: grey, white band/black

Marketed by

Romtehnica
Bucharest, [Romania](#).

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MORTARS - 82 mm MORTARS, [ROMANIA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

82 mm HE bomb

Armament

Romanian and other 82 mm mortars.

Development

By Romtehnica, to provide ammunition for indigenous and other 82 mm mortars.

Description

There are two versions of the Romtehnica HE 82 mm mortar bomb, one with a cast-iron body and the other with a steel body. The cast-iron bomb is clearly based on the Soviet O-832-series mortar bombs, while the steel bomb is derived from an unknown Western 81 mm design. Fuzing is identical for both bombs.

Specifications

Weight, steel/cast iron: 4.45/3.25 kg

Length, steel/cast iron: 487/380 mm

Fuze: M-6R (SH82), impact

Min range: 100 m

Max range, steel/cast iron: 4,500/4,600 m

Muzzle velocity, steel/cast iron: 305/295 m/s

Colour/markings: grey/black

Marketed by

Romtehnica
Bucharest, [Romania](#).

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Ratmil 12 gauge rubber buckshot round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Ratmil to provide a less than lethal 12 gauge shotgun shell for military and law enforcement use.

Description

The Ratmil less than lethal buckshot round is a conventional 12 gauge round loaded with 15 hard rubber pellets. It is intended for crowd control, peacekeeping operations and similar situations where lethal force is not called for. According to manufacturer's information, all 15 pellets will fall within a 20 m circle at 25 m range. The Ratmil less than lethal round can cause severe injury if fired at individuals at ranges closer than 5 m.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: N/A

Muzzle velocity: Approx 150 m/s

Muzzle energy: N/A

Max range: Approx 75 m

Max effective range: 30 m

[ROMANIA](#)

Manufacturer

RATMIL

Calera Victoriei (Pasajul Victoriei)

Nr. 48 - 50, Sector 1

Cod R-70102

Bucharest

[Romania](#)

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, AG 40

Armament

Low-velocity grenade launcher of the M79 and [M203](#) types.

Development

By ROMARM for domestic and export sales.

Description

This is a conventional fixed grenade. The projectile body contains a pre-fragmented steel sleeve and an impact fuze. The fuze is covered by the lightweight steel ogive.

Specifications

Type: HE

Round length: 108 mm

Round weight: 275 g

Muzzle velocity: 76 m/s

Max range: 400 m

Colour/markings: unpainted steel/black

Status: Available for export.

Manufacturer

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, AGA-40

Armament

High-velocity grenade launchers.

Development

By ROMTEHNICA for domestic use and export sales.

Description

The [AGA-40](#) is a conventional 40 × 53 mm cartridge intended for use in automatic grenade launchers. The projectile body contains a pre-fragmented steel sleeve and impact fuze.

Specifications

Type: HE

Round length: 144 mm

Round weight: 490 g

Payload: unspecified high explosive

Muzzle velocity: 223 m/s

Lethal radius: 10 m

Max range: 1,400 m

Status: In production and available.

Manufacturer

ROMTEHNICA.

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HE, PG-4M

Armament

Low-velocity grenade launchers of M79 and [M203](#) types.

Development

By ROMARM for domestic use and export sales.

Description

The [PG4M](#) is a conventional 40 × 46 mm projected grenade with an impact fuze pre-fragmented sleeve which breaks into 220 fragments of equal size. The grenade is equipped with an impact fuze and FRAM-1M self-destruct device. The grenade will detonate either on impact or approximately 18 seconds after launch.

Specifications

Type: HE

Round length: 108 mm

Round weight: 210 g

Payload: TNT, 30 g

Muzzle velocity: 78 m/s

Arming distance: 12-30 m

Max range: 400 m

Colour/markings: unpainted steel/black

Status: In production and available.

Manufacturer

SN ROMARM SA.

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FUZES - IMPACT FUZES, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

SH82

Armament

82 mm mortars.

Development

The SH82 is a development of the Soviet/RFAS [M-6](#), being similar in both form and function.

Description

A detailed description of the functioning of this fuze may be found under the [M-6](#) entry. The SH82 is manufactured with an aluminium body and differs only in the details from the original.

Specifications

Type: impact

Weight: 166 g

Length:

overall - 80 mm

visible - 40 mm

Diameter: 40 mm

Manufacturer



*SH82 impact fuze
(1998)*

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MORTARS - 120 mm MORTARS, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb

Armament

Indigenous and other smoothbore 120 mm mortars.

Development

By Romtehnica to provide ammunition for indigenous and other 120 mm mortars.

Description

The Romtehnica 120 mm illuminating bomb is a conventional streamline design which uses a TI time fuze with a secondary impact function. There is a generally similar leaflet (propaganda) round which differs only slightly from the illuminating round as noted in the specifications.

Specifications

(figures in parenthesis refer to the leaflet round)

Weight: 16.28 kg (16.78 kg)

Length: 786 mm (728.5 mm)

Min range: 1,060 m

Max range: 6,600 m (5,900 m)

Muzzle velocity: 274 m/s

Illuminating time: >30 s

Illuminating radius: 600 m

Illuminating power: 500,000 cd

Colour/markings: grey, white band/black (grey, red band/black)

Marketed by

Romtehnica, Bucharest, [Romania](#).

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MORTARS - 120 mm MORTARS, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb

Armament

Indigenous and other 120 mm smoothbore mortars.

Development

By Romtehnica to provide ammunition for indigenous and other 120 mm mortars.

Description

As with their 82 mm mortar bombs, Romtehnica manufactures their 120 mm HE bombs in both cast-iron and steel versions. The 120 mm cast-iron HE mortar bomb is apparently derived from the RFAS [OF-843](#) series of bombs, to which it bears great similarity. The origin of the steel version is unknown at the time of writing. The steel version achieves greater range and probably has a greater explosive fill weight, as the steel body is inherently lighter than cast-iron. Both bombs use a Romanian version of the RFAS M6R fuze

Specifications

Weight, cast iron/steel: 15.62/16.77 kg

Length, cast iron/steel: 623/702 mm

Min range, cast iron/steel: 560 / 660 m

Max range, cast iron/steel: 6,450 / 7,000 m

Muzzle velocity, cast iron/steel: 300/315 m/s

Fuze: M6R impact and delay

Colour/markings: grey/black

Marketed by

Romtehnica, Bucharest, [Romania](#).

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MORTARS - 60 mm MORTARS, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb

Armament

Romanian 60 mm Standard and Commando mortars.

Development

By ROMARM, Bucharest, [Romania](#).

Description

The Romanian 60 mm mortars are indigenous designs which incorporate features from several Western designs. The 60 mm HE Bomb, however, appears to be based on the US [M49A4](#). The bomb is entirely conventional in design and appearance with four gas check grooves around the bourrelet. The fuze functions on both delay and impact.

Specifications

Weight: 1.54 kg

Length: 296 mm

Min range: 100 m

Max range: 3,000 m

Fuze: impact and delay

Muzzle velocity: 210 m/s

Colour/markings: grey/OD band around bourrelet

Manufacturer

SN ROMARM SA.

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MORTARS - 60 mm MORTARS, [ROMANIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illumination bomb

Armament

Romanian 60 mm Standard and Commando mortars.

Development

By ROMARM, Bucharest, [Romania](#).

Description

Other than colour coding, this illumination bomb is identical in appearance to the 60 mm HE Bomb described in the previous entry. Function is apparently similar to that of other conventional illuminating bombs.

Specifications

Weight: 1.54 kg

Length: 296 mm

Min range: 100 m

Max range: 3,000 m

Muzzle velocity: 210 m/s

Colour/markings: grey/OD band at bourrelet/white band

Manufacturer

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [ROMANIA](#)

Date Posted: 16 July 2001

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All types:

Uses RAFS code

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

IMI 152 mm DP-ICM M351 (CL 3162)

IMI 152 mm ER DP-ICM M350 (CL 3150)

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer; 152 mm Howitzer [M1943](#) (D-1); [NORINCO 152 mm Gun-Howitzer Type 66](#); [NORINCO 152 mm Gun-Howitzer](#) Type 37; 152 mm Model 1981 Gun-Howitzer ([Romania](#)); 152 mm Model 85 Gun-Howitzer ([Romania](#)); 152 mm Howitzer [M84](#) series (Federal Republic of [Yugoslavia](#)).

Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer; [NORINCO Type 83](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer DANA and ONDAVA.

Development

Although the 152 mm DP-ICM M350 (design designation CL 3150) and 152 mm ER DP-ICM M351 (CL 3162) are featured on [Israel Military Industries \(IMI\)](#) (formerly TAAS - [Israel](#) Industries before the reassumption of the original name) sales literature as Israeli developments, they also appear on Romanian marketing material as purely Romanian developments. It has emerged that these projectiles are a joint development and marketing venture, carried out in conjunction with equivalent 155 mm

developments, the [IMI](#) DP-ICM M395 and ER DP-ICM M396 (see separate entry for details). All these models are part of the [IMI](#) range of artillery projectiles carrying [IMI M85](#) dual-purpose grenades.

The Romanian ROMARM equivalents to the Israeli projectiles are the CG-540 (M351) and CG-540 ER (M350). They carry bomblets that appear to be identical to the Israeli [M85](#) but are known as the GAA-001. The manufacturer of the bomblets is Aeroteh SA.

Description

As with other 152 mm rounds the [IMI](#) 152 mm DP-ICM M351 (also known as the CL 3162) and 152 mm ER DP-ICM M350 (CL 3150) are separate loading munitions.

The projectile steel bodies have relatively thin walls and a single wide copper drive band. The contents of the M351 projectile are 56 [M85](#) dual-purpose bomblets arranged in eight layers, with seven bomblets in each layer. On the 152 mm ER DP-ICM M350 the number of bomblets is reduced to 49 due to the inclusion of a Base Bleed (BB) unit; the projectile weight is also reduced from 44.6 kg to 42.9 kg. The bomblets are scattered over a target area via the projectile base under the control of a nose-mounted ZETA [M138](#) electronic time fuze which initiates an expulsion charge. When the fuze is not fitted it is replaced by a lifting plug for transport and storage.

Each prefragmented [M85](#) dual-purpose bomblet (CL 3022-S2-SD, based on the [IMI](#) Bantam bomblet series) weighs 290 g and contains a 44 g RDX shaped charge. Bomblet stabilisation and rotation during their descent phase is controlled by winglets while the projectile spin is used to arm the sensitive impact fuzes. The bomblet either detonates on impact or after a 15 seconds delay introduced by a pyrotechnic back-up self-destruct mechanism. On detonation, each bomblet can penetrate 105 mm of Rolled Homogeneous Armour (RHA) and scatter anti-personnel fragments over a 9 m lethal radius. Bomblets from a single projectile of either type will fall within a circle having a diameter of 110 m.

The 152 mm DP-ICM M351 and ER DP-ICM M350 use the standard two-part variable charge system contained in brass or lacquered steel cartridge cases 547.5 mm long. The two parts are the Reduced Charge and the Full Charge, each in its own cartridge case.

The Reduced Charge uses 9/7, 4/1 and 8/1 Tr nitrocellulose powder in a series of 12 bags. Charge 6, the lowest, comprises the base bag charge only, to which a series of equal size bags are added creating higher charges. One charge bag is added to the base charge bag to comprise Charge 5, two are added for Charge 4, three for Charge 3 and five for Charge 2. These are all held in place by a fibre cup. The total weight of the Reduced Charge propellant is 4.2 kg.

The Full Charge uses, NDT-3 16/1 or NGH powder in bags, together with 150 g of 8/1 UG flash reducing agent plus S-1 decoppering agent. Charge 1 has two base bag charges, one located above the other. To create the Full Charge, two further equal size bag charges are added; as mentioned previously, a fibre cup holds the charge bags in place. The total weight of the Full Charge propellant is 8.8 kg.

With this charge system the 152 mm DP-ICM M351 has a maximum muzzle velocity of 648 m/s and a maximum range of 17,300 m. The 152 mm ER DP-ICM M350 figures are 670 m/s and 20,300 m respectively.

Specifications

Weights, less fuze:

projectile, fuzed, DP-ICM M351 - 44.6 kg

projectile, fuzed, ER DP-ICM M350 - 42.9 kg

Filling:

DP-ICM M351 - 56 [M85](#) bomblets

ER DP-ICM M350 - 49 [M85](#) bomblets

Lengths, projectile, less fuze:

DP-ICM M351 - 761.5 mm

ER DP-ICM M350 - 748 mm

cartridge case - 547.5 mm

Muzzle velocity at +15°C:

DP-ICM M351 - 648 m/s

ER DP-ICM M350 - 670 m/s

Max range:

DP-ICM M351 - 17,300 m

ER DP-ICM M350 - 20,300 m

Chamber pressure at +15°C:

DP-ICM M351 - 2,650 bar

ER DP-ICM M350 - 2,800 bar

Authorised fuzes

ET ZETA [M138](#)

Equivalent rounds

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HEAT CG-540 and CG-540 ER

Description: Standard specifications - see text for details of GAA-001 bomblet carried

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The Romanian ROMARM 152 mm HEAT CG-540 (projectile on left) and CG-540 ER compared to a 152 mm FRAG-HE OF540 (1999)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

122 mm FRAG-HE OF-471N

Armament

122 mm Corps Gun M1931/37 (A-19); 122 mm BS-3 Field Gun; 122 mm [KS-19](#) anti-aircraft gun; 122 mm Field Gun 390/1 and 390/2 (Spain); 122 mm [M77](#) anti-tank gun ([Romania](#)).

Development

As its designation implies, the 122 mm Corps Gun M1931/37 (A-19) dates back to 1931, the year it entered service with the Soviet armed forces; the ordnance was placed on a different carriage in 1937 to convert it to the M1931/37. This heavy weapon has now passed from service with nearly all the former Warsaw Pact nations (other than [Romania](#)) but it remains in service with other nations throughout the world. 122 mm self-propelled equipments carrying variants of the A-19 gun (such as the SU-122) are no longer in service anywhere.

The 122 mm Field Gun 390/1 and 390/2 were originally Soviet weapons captured by the Germans during the Second World War. Numbers were passed to Spain for political purposes before 1945 and they remain in service with their carriages and ammunition updated. (The designations refer to the original German identification numbers; 12.2 cm Kanone 390/1(r) in the case of the M1931 and 12.2 cm Kanone 390/2(r) for the M1931/37). Ammunition for these guns continues to be produced in Spain, with a new long-range projectile, the 122 mm HE [M86](#) with a Base Bleed (BB) unit, developed as late as 1986.

The OF-471N is the latest of a line of 122 mm FRAG-HE projectiles used with the A-19 gun and is

now virtually the only round used with this gun (although the Yugoslavs have developed a HESH-T - see separate entry). It was possible to fire the 122 mm FRAG-HE OF-462 from the A-19 gun but this capability was apparently only rarely used. Other rounds used by the 122 mm A-19 have included the 122 mm AP-T BR-471 and BR-471B, Smoke and Illuminating, but these are now rarely encountered, other than in old stockpiles.

Description

The 122 mm FRAG-HE OF-471N is a separate loading munition, with the projectile loaded before the cartridge case so that the bagged charge system can be varied to suit any particular fire mission.

The projectile is forged steel, with a bourrelet and a band located just before the copper drive band. There is a distinct boat tail. The explosive filling is 3.36 kg of TNT but a thin-walled version with the same designation uses 4.48 kg of TNT/Amatol. Ignition of the explosive is via a point detonating fuze of the RGM-2, RGM-6 or V-429 type; it is also possible to employ the D-1 mechanical time fuze.

The cartridge case used with the OF-471N is extruded 70:30 brass. The case is 785 mm long and weighs 8.45 kg. The original propellant system employed four bag charges but this was later revised to a seven-charge system (six bag charges plus a tube-shaped increment) involving DG 3 17/1 or NDT 3 17/1 charges. The seven-charge system produces muzzle velocities from 570 to 800 m/s, with the maximum range being 20,200 m.

Specifications

Weights:

complete round - 41 kg

projectile - 25 kg

explosive - 3.36 kg TNT or 4.48 kg TNT/Amatol

propellant - 6.2 kg NC

cartridge case - 8.45 kg

Lengths:

complete round - 1.325 m

projectile fuze - 611 mm

cartridge case - 785 mm

Max muzzle velocity: 800 m/s

Chamber pressure: 2,700 bar

Authorised fuzes

PD RGM-2, RGM-6, V-429

MTSQ D-1

Equivalent rounds

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HE OF-471N

Description: Standard specifications. Maximum range given as 20,000 m

SPAIN

Manufacturer

EXPAL SA

Type: 122 mm × 46 HE

Description: Contains either 3.5 kg of TNT or 3.7 kg of Composition B, together with a TNT or Composition B supplementary charge in an aluminium container which can be removed from the fuze cavity when deep intrusion fuzes are used. Weight is 33.4 kg. Muzzle velocity is 830 m/s and maximum range 19,900 m

Manufacturer

EXPAL SA

Type: 122 mm HE [M86](#)

Description: This is a streamlined projectile fitted with a base bleed unit providing a maximum range of 25,000 m. The projectile is 660 mm long and weighs 23.5 kg. This projectile may be fired from other 122 mm pieces having a muzzle velocity of approximately 800 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: HE [M59](#)

Description: Standard specifications. May no longer be in production

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Projectile for 122 mm HE [M86](#) produced by EXPAL



Cross-sectioned 122 mm FRAG-HE OF-471N as produced in [Romania](#) by ROMARM (1999)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

76 mm AP-T BR-350B

Armament

76 mm Divisional Field Gun M1942 (ZIS-3); [76 mm Mountain Gun GP \(M1966\)](#); D-56T tank gun; NORINCO 76 mm Field Gun Type 54.

Development

The first AP-T for the ZIS-3 field gun family was the BR-350; the BR-350B was an enhanced performance version with an improved propellant providing a higher muzzle velocity for the projectile. Neither type is now likely to be encountered operationally, although the BR-350B is still in production in [Romania](#) and offered for export sales by ROMARM.

Description

The 76 mm (actual calibre 76.2 mm) AP-T BR-350B are fixed rounds with the projectile rigidly fixed to the cartridge case by a 360° crimping band, located in a cannellure close to the single copper drive band which is 13.72 mm wide.

The projectile is solid hardened steel with a thin metal windshield providing a streamlined ballistic outline for the blunt nose of the armour-piercing projectile. The base of the projectile has a machined cavity to accommodate a small (65 g) two-part A-IX-2 bursting charge ignited by an MD-8 base detonating fuze threaded into the base. The rear of the fuze has a protruding assembly housing a tracer element.

The straight-sided cartridge case is extruded brass (lacquered steel has been used) and contains approximately 1.08 kg of loose-filled 9/7 nitrocellulose powder plus S-1 decoppering agent, distance

piece and obturator to fill the gap between the propellant and the projectile base. A 25 mm brass percussion primer housing is threaded into the base.

The muzzle velocity is of the order of 680 m/s (BR-350, 662 m/s), producing a direct fire range of approximately 780 m, although the maximum range is 4,000 m. The projectile can penetrate 60 mm of vertical armour at 1,000 m.

Specifications

Weights:

complete round - 9.33 kg

projectile - 6.505 kg

explosive - 65 g A-IX-2

propellant - 1.08 kg 9/7 NC

cartridge case - 1.55 kg

Lengths:

complete round - 617-620 mm

projectile - approx 274 mm

cartridge case - 385 mm

Max diameter over cartridge case rim: 90 mm

Muzzle velocity: 680 m/s

Authorised fuzes

BD MD-8

Equivalent rounds

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: AP-T BR-350B

Description: For D-56T tank guns. Offered for export sales

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

76 mm HEAT-FS-T BK-354M

Armament

76 mm Divisional Field Gun M1942 (ZIS-3); [76 mm Mountain Gun GP \(M1966\)](#); D-56T tank gun; NORINCO 76 mm Field Gun Type 54; 76.2 mm Romanian Mountain Guns Models 48B1A5 and 82; Romanian Mountain Howitzer Model 84.

Development

The 76 mm HEAT-FS-T BK-354 was originally developed to provide the ZIS-3 field gun with an improved anti-armour capability. Small modifications produced the BK-354M. Although this round is now rarely used with the ZIS-3 it is still a potential round for the [76 mm Mountain Gun GP \(M1966\)](#).

The 76 mm HEAT-FS-T BK-354 projectile is employed with the Romanian Mountain Guns Models 48B1A5 and 82 and the Mountain Howitzer Model 84 (see separate entry for details).

Description

The BK-354M may be loaded as a fixed or separate loading munition as the projectile is only a loose fit in the cartridge case.

The steel projectile has relatively thin walls and a short curved ogive, at the top of which is an impact sensor threaded into the fuze cavity. The interior contains 750 g of A-IX-1 (RDX 95 per cent, Wax 5 per cent) contained behind a conical copper liner to form a shaped charge. The nose impact sensor is internally connected to a GPV-2 base detonating fuze so that impact on a target will ignite the explosive

filling and create a high-temperature jet to penetrate the target armour.

The base of the projectile carries a tubular boom carrying four forward-folding fins. As the projectile leaves the muzzle the fins snap forward to provide a fin span of 275.7 mm for flight stabilisation. The tailboom also contains a No 6 tracer element.

The extruded brass cartridge case contains 860 g of 9/7 propellant to provide a muzzle velocity of 325 m/s. A 25 mm brass percussion primer housing is threaded into the base.

At any range the BK-354M warhead can penetrate 300 mm set at an angle of incidence of 0°, but the maximum practical range is of the order of 700 to 800 m. This is reduced to 475 m when fired from the Romanian mountain guns although the muzzle velocity is then 410 m/s. **When fired from the Romanian Arsenalul Mountain Howitzer Model 84 at a maximum muzzle velocity of 398 m/s, the maximum firing range is given as 1,000 m.**

Specifications

Weights:

complete round - 9.7 kg

projectile - 6.87 kg

explosive - 750 g RDX/Wax

cartridge case - 1.55 kg

propellant - 860 g

Lengths:

projectile, unfuzed - 510.8 mm

projectile fuzed - 566.7 mm

cartridge case - 385 mm

Max diameter over cartridge case rim: 90 mm

Fin span, opened: 275.7 mm

Muzzle velocity: 325 m/s

Authorised fuzes

PIBD GPV-2

Equivalent rounds

[ROMANIA](#)

Marketed by

SN ROMARM SA

Type: HEAT-T BK-354M

Description: Produced primarily for the Model 48B1A5 and 82 mountain guns and Mountain Howitzer Model 84, this one-piece munition differs in appearance by having a flat-fronted projectile with a standoff spike. Complete round length is 725 mm. The fold-out finned projectile weighs 6.065 kg and is approximately 495 mm long, containing 300 g of A-IX-1 explosive. It can penetrate up to 60 mm of armour. Muzzle velocity is 410 m/s and operational range 475 m.

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Projectile for 76 mm HEAT-FS-T BK-354M with tailfins extended

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

RFAS (CIS) 30 mm ammunition for aircraft cannon

Armament

GSh-30, GSh-30K, GSh-6-30 and GSh-301 aircraft gun mountings.

Development

The ammunition in the 30 mm aircraft gun category is used with various gun mountings on MiG-27, MiG-29, Su-25, Su-27 strike fighter aircraft and the Mi-24P helicopter. These mountings involve various types of cannon, only one of which can be positively identified, the 30 mm 9A621 six-barrelled rotary cannon used on the GSh-6-30 mounting. The latter resembles a Gatling type gun but is gas operated (starting the gun cycle involves compressed air), with a rate of fire from 4,600 to 5,100 rds/min.

Description

[Russian Federation](#) and Associated States (CIS) 30 mm aircraft cannon ammunition is fixed and appears to have close affinities to the ammunition used for the 30 mm AO-18 rotary gun used on naval AK-630 CIWS (qv). However, the projectiles used with the aircraft guns differ in several respects. The projectiles utilise a single wide copper drive band and are securely fixed to the coated light steel cartridge cases by two rows of spaced crimps engaging in cannelures on the projectile. The rimless cartridge cases contain 6/7 FIAV pyroxyline powder propellant initiated by an electrical primer.

All these 30 mm rounds were designed to operate over a temperature range of -60 to +80°C. All rounds in the family are stated to be capable of withstanding a fall from a height between 5 and 10 m onto a hard surface.

There are six main types of round in the 30 mm aircraft cannon ammunition range: AP-T, APE, HEFI,

HEFI-T, HE-I and a special type of fragmentation round, the CC. The latter is worthy of further study as it is of an unusual nature.

The CC (Cargo Carrying) projectile has been described in promotional text as a 30 mm 'multi-element projectile'. Its projectile consists of a thin-walled container body with 28 bullet-shaped fragments spaced around a central explosive payload weighing 117 g. The forward end of the projectile sidewall is crimped over a light metal windshield, providing a streamlined ballistic outline for the projectile. When the central explosive payload detonates, apparently under the control of an internal delay train and at a range of 800 to 1,300 m from the gun muzzle (1.1 to 1.5 seconds after firing), the walls break open and the windshield is blown off. This enables the ejected 28 dense metal fragments, each weighing 3.5 g, to travel forward forming an initial 8° cone and leaving the projectile debris behind to fall to the ground. The subprojectiles are claimed to be highly effective against personnel in the open and lightly armoured material, such as parked aircraft.

The HEFI round has a more conventional function and appearance. It has a nose-fuzed (PD AG-30 or AG-30D) streamlined steel-walled projectile and contains 116.5 g of explosive payload. The HEFI-T round has the same weight (832 g) but contains a tracer element. The HE-I weighs 830 g and contains a self-destruct element operating 12 to 20 seconds after leaving the gun muzzle. The AP-T round weighs 844 g and can penetrate 20 mm of armour set at 60° at a range of 1,300 m. The tracer element burns for 2 seconds. The APE projectile contains 146 g of explosive and the equivalent armour penetration is reduced to 15 mm.

Production now appears to be concentrated on the HEFI, AP-T and CC rounds.

Inert TP, and TP-T rounds are assumed to exist, along with inert training and drill rounds.

Types	HEFI	HEFI-T	APE	AP-T	HE-I	CC
Weights						
cartridge	832 g	832 g	829 g	844 g	830 g	837 g
projectile	390 g	387 g	390 g	403 g	388 g	395 g
Length of cartridge	284 mm	284 mm	284 mm	284 mm	284 mm	284 mm
Muzzle velocity	890 m/s	890 m/s	890 m/s	880 m/s	890 m/s	885-890 m/s

Authorised fuzes

HEFI and HEFI-T, PD AG-30 or AG-30D

Equivalent rounds

ROMANIA

Manufacturer: SN ROMARM SA

Type: HE OF-84, AP-T

Description: For GSh-30 L guns. HE OF-84 standard specifications. The AP-T appears to be a local development capable of penetrating 20 mm of armour at 500 m. Complete AP-T round weight is 850 g and projectile 448 g. Tracer element burns for a minimum of 5 seconds

RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer: Federal State Unitary Enterprise 'Zavod Imeni Sergo'

Type: HEFI, AP-T, CC

Description: Standard specifications

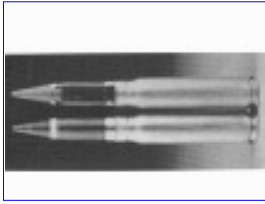
RUSSIAN FEDERATION AND ASSOCIATED STATES (CIS)

Manufacturer: SSIE `PRIBOR'

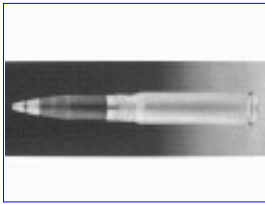
Type: HEFI, AP-T

Description: Standard specifications

UPDATED



CC `Multiple element projectile' round for 30 mm aircraft cannon showing (on right) cutaway of projectile to reveal some of the 28 dense metal fragments carried



HE-I round for 30 mm aircraft cannon

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

30 × 165 mm ammunition for AK-630

Armament

30 mm AO-18 gun on AK-630 Kashtan CIWS; AO-18L gun on AK-306 mounting; ZKBR `KORTIK'.

Development

The naval 30 mm AK-630 Kashtan Close-In Weapon System (CIWS), was developed during the late 1960s and entered service in 1969. It is an electrically driven Gatling-type revolving barrel weapon controlled by a ship's central fire-control system. The AK-630 reportedly has a rate of fire between 4,000 and 5,000 rds/min. The 30 mm AK-630 is known to be in service with [India](#), [Cuba](#) and former Warsaw Pact nations, including [Poland](#), [Romania](#) and the [Russian Federation](#) and Associated States (CIS).

There is also a 30 mm AO-18L rotary gun with a rate of fire reduced by 750 rds/min to 1,000 rds/min. This version is used on the AK-306 naval mounting.

Description

The 30 mm rounds fired from the AO-18 gun are fixed and fired at a nominal muzzle velocity of 900 m/s. A single wide copper drive band is used with the projectiles crimped into the rimless steel cartridge cases by two rows of spaced crimpings engaging in cannelures on the projectile. Each case has a special tropic-proofed protective coating. The 6/7 FL pyroxyline powder propelling charge weighs 117 to 118 g and is initiated by an electrical primer.

There are two types of this 30 mm ammunition known to be in existence, HE-I and HE-T. Both were designed to operate over a temperature range of -40 to +50°C.

HE-I For this round the projectile is known as the UOF-84 (or VOF-84) and weighs 390 g - the round itself is also referred to in some instances as HEFI. The streamlined projectile has a nose-mounted MG-32 all-weather point detonating fuze with a self-destruct element functioning approximately 16 seconds after firing. It contains 48.5 g of explosive.

HE-T Described as a high explosive fragmentation shell (FT or FRAG-T), the projectile for this round is the UOR-84M (or VOF-84M), weighing 386 g. The filling is 115 g of A-IX-2G, The MG-32 point detonating fuze is retained and the primer is the EKV-30M. The projectile has a distinct waist just forward of the drive band. The tracer element burns for at least 10 seconds. Self-destruct time is approximately 16 seconds.

Inert practice and drill rounds are known to exist.

Specifications

Type	HE-I	HE-T
Designation	UOF 84	UOR 84
Weights		
Round	832 g	828 g
Projectile	390 g	386 g
Propellant	117 g	118 g
Explosive	48.5 g	117 g
Lengths		
Round	291 mm	290 mm
Projectile	149.5 mm	149.5 mm
Case	165 mm	165 mm
Muzzle velocity	900 m/s	900 m/s

Authorised fuzes

HE-I and HE-T - PD MG-32

Equivalent rounds

[ROMANIA](#)

Manufacturer

SN ROMARM SA

Type: HE-T OF-84, HE OR-84

Description: Muzzle velocities given as 890 m/s and round weights as 833 g (HE-T) and 837 g (HE). Otherwise standard specifications

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

POZIS

Type: HE-I, HE-T

Description: Standard specifications

Manufacturer

PRIBOR

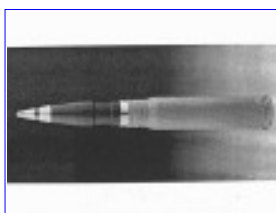
Type: HE-I, HE-T

Description: Standard specifications

VERIFIED



30 mm HE-I UOF 84 round for AK-630 CIWS



30 mm HE-T UOR 84 round for AK-630 CIWS

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

100 mm APFSDS-T M309

Armament

100 mm D-10 series tank guns (including [NORINCO Type 59](#)).

Development

When it was first shown publicly this round was understood to be a purely Romanian development but it has transpired that it is a joint Israeli-Romanian development. It is produced by [Israel Military Industries \(IMI\)](#) and marketed as the 100 mm APFSDS-T M309. The same round is also marketed by the Romanian company ROMARM specifically for D-10 series tank guns. **It is actually manufactured by AEROTEH SA of Bucharest who have applied the confusing designation of BM-412 Sg, a designation normally applied to an AP-T rounds (see separate entry).**

At one time ROMARM marketed a 100 mm APFSDS round with a muzzle velocity of 1,315 m/s and a direct fire range of 2,000 m. Round weight was 18.91 kg and the length 913 mm. This round is no longer marketed.

Description

The 100 mm APFSDS-T M309 is a fixed round with the projectile assembly crimped onto a brass cartridge case. The projectile assembly consists of a subprojectile and a sabot. The subprojectile consists of a monobloc high-strength tungsten alloy penetrator rod, with an aluminium fin assembly containing a tracer element fitted to the rear of the penetrator rod. Length to diameter ratio of the penetrator is over

20:1. The three segment sabot is aluminium alloy, held in place by a plastic ring at the forward end and a plastic obturating band toward the sabot base.

The brass (MK-75) cartridge case contains 6 kg of [M30](#) propellant: a percussion primer is fitted to the base.

The projectile assembly has a muzzle velocity of 1,400 m/s. The penetrator is stated to be able to penetrate 445 mm of armour at 1,000 m. Maximum effective range is given as 5,000 m.

Specifications

Weights:

complete round - 21.3 kg

projectile assembly - 5.8 kg

propellant - 6 kg [M30](#)

cartridge case - 8.5 kg

Lengths:

complete round - 1.06 m

projectile assembly - 584 mm

cartridge case - 695 mm

Diameter of cartridge case over rim: 147.5 mm

Muzzle velocity: 1,400 m/s

Chamber pressure: (nominal) 3,300 bar

Operating temperature range: (firing) -35 to +52°C

Authorised fuzes

None involved

Equivalent rounds

[ROMANIA](#)

Manufacturer

AEROTEH SA

Type: 100 mm APFSDS-T BM-412 Sg

Description: As M309 specifications.

UPDATED



A display of ROMARM 100 mm tank gun rounds with 100 mm APFSDS-T in centre (1999)



Cross-section illustration of [Israel Military Industries \(IMI\)](#) 100 mm APFSDS-T M309

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

85 mm HVAP-T BR-365P and BR-365PK

Armament

[85 mm Divisional Gun D-44](#); 85 mm Auxiliary-propelled Field Gun [SD-44](#); 85 mm [M1944](#) ZIS-S-53 tank gun; 85 mm [Anti-aircraft Gun M1939](#) and [M1944](#); [85 mm Field Gun Type 56](#); [85 mm Field Gun M52](#) and [M52/55](#).

Development

The 85 mm HVAP-T BR-365P and BR-365PK, were the most powerful of the kinetic energy armour-piercing rounds fired by 85 mm ordnance. They became more favoured operationally than the 85 mm AP-T BR-365 and BR-365K rounds, due mainly to their superior armour penetration capabilities (although some reports mention a lack of HVAP-T accuracy at longer ranges). The 85 mm HVAP-T BR-365P and BR-365PK have been referred to as 'arrowhead' rounds due to the distinctive shape of the projectile assemblies.

Description

The 85 mm HVAP-T BR-365P and BR-365PK are fixed rounds. The projectiles are rigidly fixed to the cartridge case by two 360° crimping rings, engaging in two cannelures located under the twin copper drive bands.

The 85 mm BR-365P and BR-365PK projectiles are basically identical with a three-part construction. A light metal conical cover forms the nose and is threaded into the main carrier body. The carrier body is steel and has a distinctive waist which accentuates the 'arrowhead' appearance of the nose portion. The carrier body contains the pointed tungsten penetrator core, on the BR-365P this weighs 640 g, is 89.5 mm long and 27.5 mm in diameter. The tungsten core on the BR-365PK weighs 650 g, is 90.55 mm in length and has a diameter of 27.95 mm. The base of the steel carrier portion is widened out from the waist section to carry the two drive

bands and the base area itself is recessed. A tracer element housing is threaded into the base.

The brass cartridge case (lacquered steel has been used) has a percussion primer threaded into the base and contains sufficient propellant to provide a muzzle velocity of approximately 1,030 m/s. This is enough to penetrate 130 mm of armour plate set at an angle of 0° at 1,000 m.

Specifications

Model	BR-365P	BR-365PK
Weights:		
projectile	4.96 kg	5.07 kg
tungsten core	640 g	650 g
Length, projectile	256.5 mm	259 mm
Diameter over cartridge case rim	112 mm	112 mm
Muzzle velocity	approx 1,030 m/s	approx 1,030 m/s

Authorised fuzes

None involved

Equivalent rounds

ROMANIA

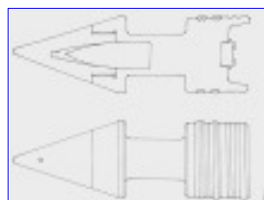
Manufacturer

SN ROMARM SA

Type: HVAP-T BR-365K

Description: No longer in series production. Standard specifications

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Projectile for 85 mm HVAP-T BR-365PK (left) with cross-section (right)



A selection of 85 mm rounds, from left: HEAT-FS BK-367; HVAP-T BR-365PK; HEAT-FS BK-2 (1999)

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FUZES - IMPACT FUZES, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M-6

Armament

82 mm mortar bombs generally.

Development

Development history is not known but this fuze was a Soviet development, adopted by Warsaw Pact countries and slightly modified to suit their own needs. It has been widely copied and produced by former Warsaw Pact countries, including [Bulgaria](#) and [Romania](#).

Description

The [M-6](#) fuze is manufactured with a Bakelite, plastic or aluminium alloy body. Safety is ensured by a safety pin, withdrawn before firing, which locks the striker in the safe condition. A steel ball prevents arming of the fuze until setback occurs on firing. When the fuze arms, the striker is lifted out of a pocket in the bore-safe shutter, allowing a spring to move the shutter so that a detonator and relay charge are positioned beneath the striker. On impact, the striker is driven into the detonator and the relay charge and fuze magazine initiate the filling of the bomb.

Specifications

Type: impact, SQ

Weight: 127 g, plastic body; 148 g, aluminium body

Length:

overall - 83 mm, plastic body; 83.4 mm aluminium body

exposed - 52 mm

Diameter: 39 mm, plastic body; 40 mm aluminium body

Arming distance: 5-50 m

Manufacturer: Soviet and Russian arsenals.

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Fuze, percussion, [M-6](#) for 82 mm mortar bombs

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FUZES - MORTAR FUZES, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

OFZ-2M

Armament

107, 120 and 160 mm mortars of Soviet/RFAS origin or others with 1.4 in 10 tpi fuze well.

Development

Development history not known, but it is believed that this design originated in the 1930s and has been subsequently improved from time to time. Also produced in [Bulgaria](#).

Description

The OFZ-2M is an impact and graze percussion fuze with an optional delay which can be set by means of a turnscrew. Arming is by inertia and setback forces.

Specifications

Type: impact, SQ and graze, with optional delay

Weight: 483 g

Thread: 1.4 × 10 tpi

Length overall: 100.5 mm

Diameter: 40 mm

Optional delay: 0.006-0.051 s

Arming distance: 2-5 m

Manufacturers

State factories.
Kintex.

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Impact fuze OFZ-2M

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MORTARS - 240 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

240 mm HE bomb F-864

Armament

240 mm mortar M-240.

Development

By Soviet ordnance authorities.

Description

A conventional steel bomb with a noticeable parallel-sided centre section and nine undercut gas check grooves below it. A steel tail unit screws into the base of the body and has ten fins. The nose is closed by an adaptor which forms an exploder container and receives the fuze. A primary cartridge is screwed into the base of the tail tube and the secondary increments, in cloth bags, are tied around the tube above the fins.

Specifications

Length, fuzed: 1.565 m

Weight, fuzed: 130.84 kg

Weight and type of payload: 31.93 kg TNT

Number of charges: P + 8

Fuze: impact, SQ, GVMZ-7 or M-16

Min range: 800 m

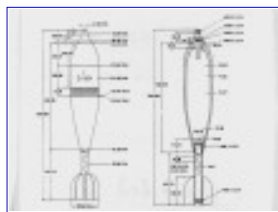
Max range: 9,700 m

Colour/markings: grey/black

Manufacturer

State arsenals.

VERIFIED



240 mm HE bomb F-864

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MORTARS - 160 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

160 mm HE bomb F-852

Armament

160 mm mortar [M160](#).

Development

By Soviet ordnance authorities.

Description

A rather more streamlined bomb than the [F-853A](#) with a steel, rather than cast-iron body and showing a reduction in weight. A new tail unit, with exceptionally large fins, screws into the end of the body. There are seven gas check grooves around the bourrelet. A primary cartridge fits into the tail and the secondary increments, in cloth bags, are tied around the boom above the fins.

Specifications

Length, fuze: 1.194 m

Weight, fuze: 39.95 kg

Weight and type of payload: 7.39 kg TNT

Number of charges: P + 6

Fuze: impact SQ, GVMZ-7

Min range: 800 m

Max range: 8,500 m

Muzzle velocity: 345 m/s

Colour/markings: grey/black

Manufacturer

State arsenals.

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MORTARS - 160 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

160 mm HE bomb F-853A

Armament

160 mm mortar [M160](#).

Development

By Soviet ordnance authorities.

Description

This generally resembles the [F-853U](#) bomb but has a rather more rounded nose and a longer parallel-sided section in the body. A total of nine undercut gas check grooves is cut around the bourrelet and a steel tail unit is screwed into the end of the body. The propelling charge system is the same as that for the [F-853U](#).

Specifications

Length, fuze: 1.119 m

Weight, fuze: 41.18 kg

Weight and type of payload: 7.732 kg Amatol

Number of charges: P + 6

Fuze: impact, SQ GVMZ-7

Min range: 750 m

Max range: 8,050 m

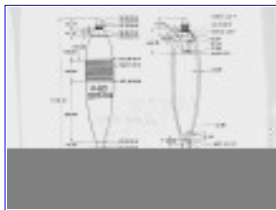
Muzzle velocity: 343 m/s

Colour/markings: grey/black

Manufacturer

State arsenals.

VERIFIED



160 mm HE bomb [F-853A](#)

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MORTARS - 160 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

160 mm HE bomb F-853U

Armament

160 mm mortar [M160](#).

Development

By Soviet ordnance authorities for the 160 mm mortar.

Description

A steel bomb of teardrop shape, with six gas check rings at the bourrelet. The nose is closed by an adaptor which forms an exploder container and receives the fuze. A steel tail unit screws into the end of the bomb body. The propelling charge consists of a primary cartridge in the tailboom and the secondary increments, in cloth bags, are tied around the boom.

Specifications

Length, fuzed: 1.12 m

Weight, fuzed: 41.18 kg

Weight and type of payload: 8.99 kg TNT

Number of charges: P + 6

Fuze: impact, SQ GVMZ

Min range: 750 m

Max range: 8,040 m

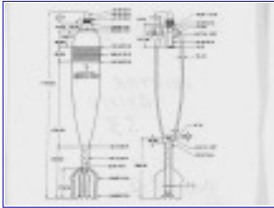
Muzzle velocity: 343 m/s

Colour/markings: grey/black

Manufacturer

State arsenals.

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160 mm HE bomb [F-853U](#)

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MORTARS - 120 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm Gran laser-guided mortar projectile

Description

The 120 mm Gran (Facet) laser-guided mortar projectile was developed by the KBP at Tula. It is intended for the indirect engagement of spot targets such as structures or lightly armoured vehicles by 120 mm mortars when conventional artillery assets are not available. The Gran is apparently usually carried by self-propelled 120 mm mortar vehicles such as the [2S9](#) Nona-S or [2S23](#) Nona-SVK, but could also be fired from conventional ground-mounted 120 mm mortars. Maximum range is 7,500 m.

The Gran projectile is 1.225 m long and weighs 25 kg. It resembles an elongated artillery projectile; there are no tailfins. A laser sensor is located in the nose.

For a Gran fire mission, a forward observer locates a suitable target and relays target data to a fire-control position. At that position a microcomputer is used to produce fire data, while at the fire position the fire data is passed to a hand-held microcomputer for further specialised computation relating to preparation of the Gran laser seeker electronics. Once the projectile has been launched and has passed its trajectory apogee, the target is illuminated by a laser target designator for the descending Gran projectile to sense and home onto. As far as can be determined, trajectory corrections are effected using small thruster rockets close to the projectile's centre of gravity.

On target the 11 kg warhead, of which 5.1 kg is explosive, is of the High-Explosive Fragmentation (HEF) type. It is capable of destroying structures such as bunkers.

Specifications

Calibre: 120 mm

Length: 1.225 m

Weight: total, 25 kg: warhead, 11 kg

Filling: 5.1 kg HE

Range: 7,500 m

Status: Development complete. Offered for export sales.

Development agency: KBP Instrument Design Bureau, Tula.

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MORTARS - 120 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb F-843

Armament

All 120 mm smoothbore mortars.

Development

By Soviet authorities to obtain greater terminal effect.

Description

This is a much more streamlined bomb than its predecessors, made of high-grade steel, giving high capacity but reduced fragmentation. The body is actually in two parts screwed together at the waist, the tail ends in a screwed spigot, around which the tailboom and fin units are screwed. There are five undercut and one semi-circular gas check rings at the bourrelet. The propelling charge system consists of a primary cartridge and six secondary increments in cloth bags which are tied around the tailboom.

Specifications

Length, fuzed: 750 mm

Weight, fuzed: 16.45 kg

Weight and type of payload: 3.9 kg TNT

Number of charges: P + 6

Fuze: impact SQ GVMZ or M-1

Min range: 400 m

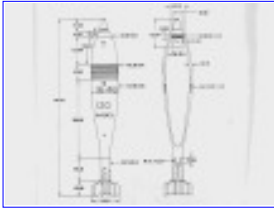
Max range: 5,000 m

Muzzle velocity: 265 m/s

Manufacturer

State arsenals.

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120 mm HE bomb F-843

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MORTARS - 120 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE/fragmentation bomb OF-843

Armament

All 120 mm smoothbore mortars.

Development

By Soviet ordnance authorities.

Description

A cast-iron bomb of teardrop shape, with a complex combination of five narrow and one broad gas check rings at the bourrelet. The tail unit is of drawn and welded steel, screwed into the base of the bomb. A primary cartridge fits into the tail and six secondary increments in cloth bags are tied around the tailboom.

Specifications

Length, fuze: 656 mm

Weight, fuze: 16.02 kg

Weight and type of payload: 2.68 kg TNT

Number of charges: P + 6

Fuze: impact, GVMZ, GVMZ-7, M-12

Min range: 460 m

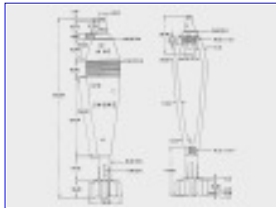
Max range: 5,000 m

Muzzle velocity: 272 m/s

Manufacturer

State arsenals.

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120 mm HE bomb [OF-843](#)

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MORTARS - 120 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE/fragmentation bomb OF-843A

Armament

All 120 mm smoothbore mortars.

Development

By Soviet ordnance authorities to obtain greater range from existing mortars.

Description

This is similar to the [OF-843](#) bomb described previously but is shorter and lighter. There are five undercut gas check rings round the bourrelet. The steel tail unit and propelling charge system are similar to those used with the earlier bomb.

Specifications

Length, unfuzed: 625 mm

Weight, fuzed: 15.98 kg

Weight and type of payload: 1.58 kg Amatol 80/20

Number of charges: P + 6

Fuze: impact, GVMZ-7 or M-12

Min range: 460 m

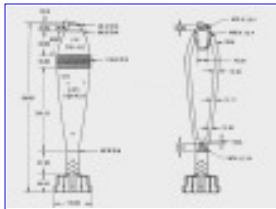
Max range: 5,700 m

Muzzle velocity: 285 m/s

Manufacturer

State arsenals.

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120 mm HE bomb [OF-843A](#)

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MORTARS - 107 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

107 mm HE/fragmentation bomb OF-841A

Armament

All 107 mm smoothbore mortars.

Development

An elderly design, developed under the Soviet regime for use with the 107 mm mountain mortar M38.

Description

A conventional cast-iron bomb, with multiple gas-check grooves around the bourrelet and with a steel tail unit screwed to the body. A primary cartridge is inserted into the tail unit, and an unknown number of secondary cartridges fit around the tailboom in cloth bags.

Specifications

Length, fuzed: 560 mm

Weight, fuzed: 9.1 kg

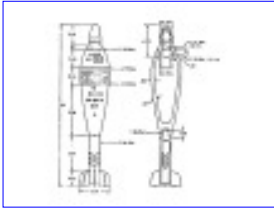
Filling: 1 kg TNT or Amatol

Fuze: GVMZ-1 or -7 impact SQ

Manufacturer

State arsenals.

VERIFIED



107 mm Model OF-841A HE/fragmentation bomb

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MORTARS - 82 mm MORTARS, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm HE/fragmentation bomb O-832 Series

Armament

All RFAS and other 82 mm mortars.

Development

Originally developed ca 1935 and apparently based upon the contemporary Brandt designs. Detail improvements made thereafter.

Description

A cast-iron, teardrop-shaped bomb with four gas check grooves around the bourrelet and a welded steel tailfin assembly. A primary cartridge fits into the tailboom and four secondary increments in cloth-covered split rings fit around the boom. The nose is threaded for the fuze, no adaptor being used. There are three versions of the [O-832](#) series, the basic [O-832](#), the O-832D and [O-832DU](#). Differences between variants are minor, with different fuzing, fin shape and projectile fill chief among them.

Specifications

[O-832DU](#)

Length, fuzed: 329 mm

Weight, fuzed: 3.23 kg

Weight and type of payload: 436 g TNT/
Dinitronaphthalene

Number of charges: P + 4

Fuze: impact SQ

Min range: 100 m

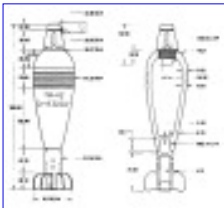
Max range: 3,040 m

Muzzle velocity: 211 m/s

Manufacturer

State arsenals.

VERIFIED



82 mm HE Bomb [O-832 DU](#)

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 64 mm

Synonym:

9.3 × 64 mm

Development

Complete development history of this cartridge is unknown. It was probably originally developed by Barnaul as a hunting cartridge for large game in the Russian Central Asian republics where long distance shots at relatively large game are the norm, requiring a cartridge that fires a bullet with high sectional density for range and heavy weight for terminal effects. These characteristics make for an excellent long range sniper cartridge that bridges the gap between 7.62 × 54Rmm used in the SVD and V-98 rifles and the 12.7 × 108 mm cartridge used in the V-94 and V-96 anti-matérial rifles. Russian sales literature is now promoting this round for sniper use. As such the 9 × 64 mm falls only slightly below the [0.338 Lapua Magnum](#) in terms of overall ballistics. Although listed as a 9 mm in the latest Russian military sales literature, the cartridge has been available as a hunting round for some years with the designation 9.3 × 64 mm. As the cartridge's bullet diameter is 9.28 mm, this is actually a technically correct designation.

Description

The 9 × 64 mm is a rimless, Berdan primed cartridge with a tapered bottlenecked case. Both steel and brass cases have been shown in Russian literature and both full metal jacket and soft point bullets have appeared. The 9 mm bullet is a streamlined, boat tail design with a crimping cannelure. The FMJ steel cored military bullet is claimed to be capable of penetrating 10 mm or hardened steel at 200 m. This

bullet has a cupro-nickel jacket with lead and steel core components. The forward core element is a pointed hardened steel penetrator, backed by a lead filler. There is a small air gap in the bullet's nose ahead of the steel penetrator. Accuracy is claimed to be within 10 cm at 200 m and within 12 cm at 300 to 500 m when fired from a 'Tiger Carbine'.

Abbreviated ballistics table, 9 × 64 mm

Range	Velocity	Energy
0 m	770 m/s	5146 J
100 m	705 m/s	4314 J
200 m	643 m/s	3599 J
300 m	586 m/s	2988 J
400 m	533 m/s	2467 J
500 m	484 m/s	2035 J

Specifications

Round length: 88.8 mm

Case length: 64.0 mm

Head diameter: 12.6 mm

Bullet diameter: 9.28 mm

Bullet weight: 17 g

Muzzle velocity: 755 - 770 m/s

Muzzle energy: 4567 J

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Barnaul Machine Tool Plant, JSC

Type: Ball: JSP; 17.4 g; MV 740 m/s

Ball: FMJ (steel core); 16.7 g; 775 - 770 m/s

Ball: FMJ; 17.4 g; V₂₅ 710 m/s

Ball: JSP; 17.4 g; V₂₅ 710 m/s

Manufacturer

Low Voltage Equipment Works (LVE), JSC

Type: Ball: FMJ; 17 g; V₂₅ 755 - 770 m/s

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

AP-I-T	black projectile with yellow tip
HE-I-T	black projectile with magenta tip

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [RUSSIAN FEDERATION AND ASSOCIATED STATES \(CIS\)](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition: 5.45 mm - 14.5 mm

5.45 × 39 mm cartridges

Ball, steel core	none
Tracer	green tip
Ball, reduced velocity	black tip, green band

7.62 × 25 mm cartridges

Ball, lead core, Type P	none
Ball steel core, Type PST	none
Tracer	green tip
API	black tip, red band

7.62 × 39 mm cartridges

Ball, steel core	none
Tracer, M1945	green tip
API, Type BZ	black tip, red band
Incendiary-tracer (I-T)	red tip
Ball, reduced velocity	black tip, green band

7.62 × 54R mm

Heavy ball, M1930	yellow tip
Light ball, M1908	none
Tracer, M1946	green tip
API, M1932	black tip, red band
API, M1940	red bullet, black tip, black cartridge base
Light Ball, steel core	silver tip
API-T	violet tip, red band

Incendiary-tracer (I-T)	red tip
-------------------------	---------

9 × 18 mm

Ball, lead core, Type P	none
Ball, steel core, Type PST	none
Ball, high velocity, Type PM	none, conical ogive

12.7 × 108 mm

AP, M1930, Type B-30	black tip
API, M1932, Type B-32	black tip, red band
API, M1941, Type BS-41	red bullet, black tip, black primer
API-T, Type BZT	violet tip, red band
API-T, M1944 , Type BZT-44	violet tip, red band
HEI, Type MDZ	red bullet

14.5 × 114 mm

API, M1932, Type B-32	black tip, red band
API, M1941, Type B-41	red bullet, black tip, black primer
API-T, Type BST	red bullet, violet tip
API-T, Type BZT	violet tip, red ring
Incendiary-tracer (I-T), Type ZP	red tip
HEI, Type MDZ	red bullet

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 42 mm SP-4

Synonyms:

7.62 × 42 mm; 7.62 mm silent cartridge

Armament

TsNIITOCHMash PSS semi-automatic pistol; NRS-2 Special Scout Knife

Development

The 7 × 42 mm [SP-4](#) cartridge was developed for use in the PSS, a small semi-automatic silent pistol. Little is known of the development history of the [SP-4](#), other than the fact that it was developed in conjunction with the PSS pistol to provide a compact silent firearm that did not require a bulky external suppressor.

Description

The [SP-4](#) case is of drawn steel, copper washed, of conventional rimless design, with a slight taper and small bottleneck except that the case walls are very thick to retain the propellant gases and provide obturation of the internal piston. No manufacturer's headstamp has ever been encountered with this cartridge, so the manufacturer is unknown. The [SP-4](#) is Berdan primed. The bullet is a low alloy steel cylinder with a reduced diameter at the front which is splined and has a brass rotating or driving band swaged over it. The rear of the bullet has a central conical recess, which mates with the top of the

driving piston and centralises the bullet in the case and in the pistol bore as it is fired. The projectile is lubricated with a dry molybdenum sulphide coating. The bullet body diameter is 7.59 mm; rotating/driving band diameter is 7.8 mm and overall projectile length is 28.4 mm. On firing, the primer ignites the propelling charge which drives the piston forward, pushing the bullet into the bore of the pistol and engaging the rotating/driving band with the rifling. The piston stops against the internal case shoulder and deforms slightly, thereby sealing the gases inside the case.

Specifications

Round length: 41.9 mm

Round weight: 23.2 g

Case length: 41.5 mm

Bullet diameter: 7.82 mm

Bullet weight: 9.97 g

Muzzle velocity: Approx 300 m/s

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

State Arsenals

Type: Ball: Steel; 9.97 g; V_o 300 - 310 m/s

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7.62 mm [SP-4](#) sectional view showing fired and unfired condition (1998)

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 39 mm SP-5 and SP-6

Synonyms:

9 × 38 mm

Armament

[A-91](#) and MA miniature assault rifles; AS silent assault rifle; VSS silent sniper rifle (BSK silent sniper system); [OTs-14](#) assault rifle.

Development

The 9 × 39 mm cartridge was derived from the 7.62 × 39 mm cartridge by expanding the case mouth to accept the large 9 mm bullet. The cartridge was developed for use in assault rifles and in silenced weapons that must fire subsonic bullets in order to fully take advantage of the suppressor's characteristics. The 9 × 39 mm achieves this by firing a relatively heavy 16.2 g bullet at approximately 290 m/s. There were two versions of the cartridge developed, the SP-5 Ball and the SP-6 armour-piercing variant.

Description

Aside from the size of the bullet, the 9 × 39 mm cartridge is a conventional tapered, bottlenecked rimless design, Berdan primed. The case is of lacquered steel. The SP-5 Ball bullet is a boat tail bullet with a two-part lead and steel core, similar to that of late production 7.62 × 39 mm cartridges. The lead

core extends from the base of the bullet about halfway up its length, where a steel penetrator forms the rest of the core. The steel core has a flat tip, leaving a small airspace in the nose of the bullet, which aids in terminal ballistics against personnel targets. The SP-6 armour-piercing bullet incorporates a steel penetrator which extends the entire length of the bullet and protrudes from the tip of the gilding metal jacket. The SP-6 can further be identified by its black tip. The steel penetrator is surrounded by a lead sleeve for about two-thirds of its length inside the bullet jacket. This may serve to reduce bore erosion by providing a degree of jacket compression as the bullet is fired and engages with the rifling in the weapon's barrel.

Specifications

Round length: 55.5 mm

Case length: 38.5 mm

Bullet diameter: 9.2 mm

Bullet length: 35.7 mm

Bullet weight: 16.2 g

Muzzle velocity: 290 m/s

Muzzle energy: 681 J

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Tula Ammunition Factory

Type: Subsonic Ball: FMJ; 16.2 g; MV 290 m/s

Type: Subsonic AP: Composite; 16.2 g; MV 290 m/s

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*SP-6 9 × 39 mm armour-piercing cartridge
(1997)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 21 mm Russian

Synonyms:

9 × 21 Gurza

Armament

TsniiTochmash Gurza semi-automatic pistol; Baxsan prototype machine pistol.

Development

The 9 × 21 mm Russian cartridge, officially designated RG-052 and RG-054, and its associated Gurza pistol were developed because of limitations inherent in the 9 × 18 mm Makarov round, even in its updated form. The 9 × 21 mm Russian cartridge is specifically designed to defeat soft body armour, vehicle bodies and heavy barriers. It is intended for military and police use. The new round was derived from the older 9 × 18 mm cartridge in much the same way that the 9 × 21 mm was based on the 9 × 19 mm round.

Description

The copper-washed, straight taper, steel case is a lengthened version of the 9 × 18 mm cartridge; case dimensions are virtually identical, save for length. The bullet is armour-piercing, with a steel penetrator protruding from the gilding metal jacket. The jacket is internally lined with Teflon or plastic surrounding the steel penetrator and remaining with the jacket when it peels away from the steel

penetrator upon impact with the target. There are two versions of the cartridge, the original RG-052 and the improved penetration RG-054, although both remain in service. The two can be differentiated by the armour-piercing tip, which protrudes farther from the bullet jacket on the RG-054. The RG-054 bullet was originally claimed to penetrate 30 layers of Kevlar and two 1.4 mm titanium plates at 100 m, but these performance claims have subsequently been amended to the more realistic defeat of two 1.2 mm titanium plates and 30 layers of Kevlar at 50 m.

Specifications

Round length: 32.5 mm (RG-052); 32.8 mm (RG-054)

Round weight: 11 g

Case length: 20.8 mm

Bullet diameter: 9 mm

Bullet weight: 6.7 g

Muzzle velocity: 415 m/s

Muzzle energy: 608 J

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Tula Ammunition factory

Type: Armour-piercing, RG-052: AP; 6.71 g; MV 415 m/s (est)

Armour piercing, RG-054: AP; 6.69 g; MV 415 m/s

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*9 × 21 mm Russian
(1997)*

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SMALL ARMS

Date Posted: 16 July 2001

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7.62 × 62.8 mm

Synonyms

PZAM

Armament

[S4M](#) Pistol.

Development

This cartridge is apparently a development similar in concept to the 7.62 × 35 mm SP-3, which was used in the MSP Pistol. The exact relationship between the two cartridges and the weapons that chamber them is unclear, but both were developed in the 1970s for Soviet special operations forces, when an absolutely silent firearm was required. The SP-3 was used in the MSP pistol and the 7.62 × 62.8 mm in the [S4M](#) pistol. Both the MSP and [S4M](#) pistols are small, easily concealed, two-barrelled derringer-type pistols used operationally in [Afghanistan](#) and Central America, respectively. The design of the cartridge precludes its use in a semi-automatic pistol, as the piston which protrudes after firing prevents extraction and ejection through a conventional port. The subsequent 7.62 × 42 mm [SP-4](#) silent cartridge resolved this problem and it is presumed that it may have replaced both this and the SP-3 in Russian service. However, either cartridge may still be encountered in areas where Soviet/Russian forces were present or in areas of the world Soviet/Russian clandestine services operate because unlike the semiautomatic PSS pistol that fires the [SP-4](#) cartridge, the MSP and [S4M](#) are completely silent.

Description

The cartridge case is a straight taper rimless design, highly unusual in that it contains the firing pin and primer in its base. A version of this cartridge with a slight bottleneck has also been reported. The case walls are very thick to contain the powder gases which remain inside after the cartridge is fired. Upon firing, a piston propels the conventional bullet and remains extended. The piston obturates inside the case and seals it gastight so that the cartridge is absolutely silent upon firing, save for the snap of the firing pin. The bullet is seated very deeply in the case and protrudes only slightly from the case mouth prior to firing. It is identical in appearance to the [M1943](#) 7.62 × 39 mm ball bullet. This cartridge and its associated pistol have been referred to as the 'PZAM', but this acronym has not been confirmed, nor has the cartridge's official Russian designation been made public.

Specifications

Round length: 77 mm

Case length: 62.8 mm

Case base diameter: 12.7 mm

Bullet diameter: 7.8 mm

Bullet weight: 8 g

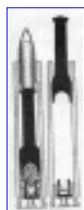
[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Tula Ammunition Factory

Type: **Ball:** FMJ; 8 g; MV 835 m/s

UPDATED



*Russian 7.62 × 62.8 mm cartridge, unfired/fired
(1997)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

7.62 × 40 mm SP-3

Synonyms:

none

Armament

TsNIITochMash MSP pistol.

Development

The SP-3 cartridge was developed in the 1960s along with the 7.62 × 62.8 mm for use by Soviet special operations forces in situations where absolute silence was required. It was introduced into service in 1972, along with the associated MSP silent two-barrelled derringer-type pistol. The relationship between the two cartridges and the similar pistols associated with them is unclear, although it is presumed that the SP-3 preceded the 7.62 × 62.8 mm, which was used in the [S4M](#) pistol. The MSP pistol, chambered for the SP-3, was used in [Afghanistan](#) by Soviet special operations forces, and the [S4M](#) has been used in Central America. The cartridge retains the propellant gases after it has been fired, but like the 7.62 × 62.8, the protruding piston prevents the use of the SP-3 in a conventional semi-automatic pistol.

Description

The SP-3 is a rimless, tapered bottleneck design, virtually identical in external appearance and

dimensions to the standard Soviet [M1943](#) 7.62 × 39 mm cartridge. It has been designated 7.62 × 40 mm to differentiate it from the standard 7.62 × 39 mm. The SP-3, however, is quite different in design in that it has thickened case walls to retain the pressure of the powder gases upon firing and has a complex pair of pistons, one surrounding the other, which obturate against the case wall when the cartridge is fired, sealing in the powder gases. The pistons remain outside the cartridge after firing. The SP-3 bullet is identical in external appearance to that of the [M1943](#), except that the SP-3 bullet has no cannelure.

Specifications

Round length: 51.8 mm

Case length: 39.6 mm

Case head diameter: 10.4 mm

Rim diameter: 10.5 mm

Bullet diameter: 7.85 mm

Bullet weight: 7.99 g

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Tula Ammunition Factory

Type; Ball: FMJ; 8 g; MV ? m/s

VERIFIED



*SP-3 silent cartridge
(1997)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

5.66 × 39 mm Russian Underwater

Synonyms:

5.66 mm Underwater; 5.66 mm MPS

Armament

TsniiTochMash ([Russia](#)) APS underwater assault rifle.

Development

The 5.66 mm MPS cartridge was developed along with the associated APS underwater assault rifle and the SPP-1 underwater pistol in the late 1960s, to a Soviet military requirement for weapons to be used against underwater swimmers. The assault rifle and ammunition became operational in 1971, but remained unknown in the West until recent years when they became available for sale to western military forces.

Description

Rimless, bottlenecked case of lacquered steel, sealed for waterproofing at case mouth and primer annulus. The steel bullet is a simple shaft, tapered to a point at the front and is extremely long (ratio approximately 25:1) in relation to calibre for underwater stability. A tracer round, designated MPST, is also produced. The MPS bullet does not stabilise in air.

Specifications

Round length: 150 mm
Round weight: 26 g
Bullet diameter: 5.66 mm
Bullet length: 120 mm
Bullet weight: approx 2 g

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

State arsenals

Type: Ball: Steel; 2 g; MV (air) 365 m/s

Tracer: Data unknown

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

5.45 × 18 mm

Synonyms:

5.45 mm soviet pistol; 5.45 mm 7N7

Armament

PSM pistol; *Drel* pistol; [OTs-23](#) *Drotik* pistol

Development

This cartridge was developed in 1979 by Aleksandr I Bochyn, for use in the PSM ultra-compact pistol issued to police and military security troops. It became known in the West shortly after its development, but nothing was known of its parent weapon until 1983. The *Drel* pistol in 5.45 × 18 mm was derived from the 0.22 LR Margo and introduced at a later date. The *Ots-23 Drotik* is a select fire pistol manufactured by Tula KBP.

Description

The round uses a bottlenecked rimless case, carrying an unusual FMJ bullet with a flat tip and compound core. The bullet is unusually long being 14.3 mm or 2.62 calibres; conventional pistol bullets are usually about 1.5 calibres long. The bullet has a gilding metal jacket and a core which comprises a steel front half and lead rear. This, again, is unusual in a pistol bullet but generally duplicates the construction of rifle bullets of similar calibre, such as the 5.56 × 45 mm [SS109](#) and 5.45 × 39 mm.

Stopping power is no better than the 6.35 mm Browning cartridge, but experiments in the UK have demonstrated the bullet's formidable capacity for penetrating soft body armour. The bottlenecked cartridge case is an unusual complication in a blowback weapon, but Russian sources claim that the PSM is unusually reliable.

Specifications

- Round length:** 24.9 mm
- Round weight (nominal):** 4.8 g
- Case length:** 17.8 mm
- Rim diameter:** 7.55 mm
- Head diameter:** 7.55 mm
- Bullet diameter:** 5.64 mm
- Bullet weight:** 2.4-2.6 g
- Muzzle velocity:** 315 m/s
- Muzzle energy:** 129 J

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

Barnaul Machine Tool Building Plant

Type: Ball: FMJ; 2.6 g; MV 315 m/s

Tula Cartridge Works

Type: Ball, FMJ; 2.9g; MV 320m/s

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5.45 mm Soviet Pistol

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

4.5 × 39 mm Russian

Synonyms:

4.5 × 39 mm SPS; 4.5 Underwater

Armament

TsniiTochMash (Russian) Model SPP-1 and SPP-1 M underwater pistols.

Development

This cartridge and associated SPP-1 underwater pistols were developed by Soviet military for special operations' use against underwater swimmers in the late 1960s. Little is known of the actual development of the Russian underwater firearms, other than the fact that they were developed and fielded in 1971 and remained unknown in the West until recently. The SPP-1 underwater pistol and APS underwater assault rifle continue in operational use today. Weapons and ammunition are now available for sale to western military forces.

Description

A rimmed, bottlenecked brass case, Berdan primed. The primer annulus and case mouth are sealed against entry of water. The steel bullet is extremely long (ratio 25:1) in relation to its calibre. This is in order to stabilise the bullet in water; the bullet does not stabilise in air.

Specifications

Round length: 145 mm
Round weight: 18 g
Bullet weight: 13.2 g
Bullet diameter: 4.5 mm

[RUSSIAN FEDERATION](#) AND ASSOCIATED STATES (CIS)

Manufacturer

State arsenals

Type: Ball: Steel; 13.2 g; Mv; 250 m/s

VERIFIED



*4.5 × 39 mm Russian
(1997)*

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [SAUDI ARABIA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

AP	purple bullet tip
AP-T	green bullet tip
Incendiary	orange bullet tip

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [SINGAPORE](#)

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

Cartridge, 40 mm, HV, HE, S412

Armament

High-velocity grenade launchers of the Mk19 type, CIS AGL and other approved launchers.

Development

By Chartered Ammunition Industries to a [Singapore](#) military requirement and for export.

Description

The S412 He grenade is essentially similar to the S411 and S413 series of HEDP grenades, except that it is HE only with only fragmentation effects.

Specifications

Type: 40 × 53 mm high-velocity

Length: 112 mm

Weight: 350 g

Payload: Comp A5

Arming distance: 18-40 m

Lethal radius: 5 m

Fuze: PIBD

Max range: 2,200 m

Status: In production, standard; available for export.

Manufacturer

Chartered Ammunition Industries Pte Ltd.

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HE, S405

Armament

Low-velocity grenade launchers of the M79 and [M203](#) type.

Development

By Chartered Ammunition Industries to satisfy a military requirement for an HE round and for export.

Description

The S405 is identical to the [S401B](#) except that it has only a fragmentation effect. It fully complies with MIL-C-60983.

Specifications

Type: 40 × 46 mm low-velocity

Length: 103 mm

Weight: 230 g

Muzzle velocity: 75 m/s (nominal)

Arming distance: 14-28 m

Type of payload: Comp A5

Fuze: PIBD

Max range: 400 m

Lethal radius: 5 m

Status: In production, standard with [Singapore](#) military; available for export.

Manufacturer

Chartered Ammunition Industries.

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FUZES - PROXIMITY FUZES, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

EF 792

Armament

60 to 160 mm fin-stabilised HE bombs.

Development

By Chartered Industries.

Description

A solid-state proximity fuze powered by an air turbine. Fully bore-safe, the arming sequence must be performed correctly or the fuze will fail-safe. Should the proximity circuits fail, the fuze will be detonated on impact by an electromechanical element. Alternatively, by setting a switch in the side of the fuze, the proximity circuits can be disabled and the fuze set for impact only.

Specifications

Type: proximity/point detonating

Weight: 265 g

Thread: 1.5 in 12 tpi UNF

Length overall: 107 mm

Intrusion: 28 mm

Diameter: 49.1 mm

Burst height: 2-16 m; other heights can be factory set during manufacture

Arming requirement: 380 g for 1 ms; 60 m/s airspeed for 3 s. Acceleration must precede airspeed

Manufacturer

Chartered Electronics Industries.

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Chartered Industries EF 792 proximity fuze

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MORTARS - 120 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm extended range smoke FM bomb

Armament

All 120 mm smoothbore mortars.

Development

By Chartered Ammunition Industries to provide an alternative smoke system to the WP bomb.

Description

This is the same bomb, tail unit and propelling charge as the WP bomb described previously. The difference is, it has a cavity filled with titanium tetrachloride (FM) smoke mixture. This offers a far cooler burning smoke and is indicated for use where the customary WP smoke bomb might be an unacceptable fire hazard.

Specifications

Length, fuze: 699 mm

Weight, fuze: 14.6 kg

Weight and type of payload: 1.8 kg FM

Number of charges: P + 8

Fuze: impact, SQ and delay

Min range: 600 m

Max range: 8,000 m

Muzzle velocity: 134-369 m/s

Chamber pressure: 1,250 bar

Colour/markings: pale green, yellow band/black

Manufacturer

Chartered Ammunition Industries.

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MORTARS - 120 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm extended range smoke WP bomb

Armament

All 120 mm smoothbore mortars.

Development

By Chartered Ammunition Industries to partner the HE bomb for use in [Singapore](#) service 120 mm mortars.

Description

This uses the same body, tail unit and propelling charge system as the HE bomb previously described. It differs, however, in having the nose closed by an adaptor/burster tube and the rest of the body cavity filled with White Phosphorus (WP) smoke composition.

Specifications

Length, fuzed: 699 mm

Weight, fuzed: 14.6 kg

Weight and type of payload: 1.8 kg WP

Number of charges: P + 8

Fuze: impact, SQ and delay

Min range: 600 m

Max range: 8,000 m

Muzzle velocity: 134-369 m/s

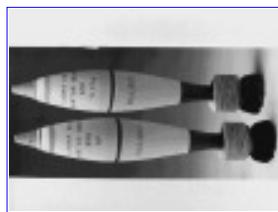
Chamber pressure: 1,250 bar

Colour/markings: pale green, yellow band/light red

Manufacturer

Chartered Ammunition Industries

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120 mm extended range smoke bombs

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MORTARS - 120 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm extended range HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By Chartered Ammunition Industries to provide ammunition for 120 mm mortars in [Singapore](#) service.

Description

The bomb is streamlined and has a single plastic obturating ring let into a groove below the bourrelet. The bomb tail flows into a light-alloy tailboom, into the end of which a primary cartridge fits. The eight incremental charges in cloth-covered split rings fit around the boom above the fins.

Specifications

Length, fuze: 699 mm

Weight, fuze: 14.6 kg

Weight and type of payload: 2.8 kg TNT

Number of charges: P + 8

Fuze: impact, SQ and delay

Min range: 600 m

Max range: 8,000 m

Muzzle velocity: 134-369 m/s
Chamber pressure: 1,250 bar
Colour/markings: OD, yellow band/yellow

Manufacturer

Chartered Ammunition Industries.

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120 mm extended range HE bomb

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MORTARS - 81 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm extended range FM smoke bomb

Armament

All medium- and high-pressure 81 mm mortars.

Development

By Chartered Ammunition Industries to provide improved ammunition for 81 mm mortars in [Singapore](#) service.

Description

This is the same as the WP smoke bomb described previously except that the filling is titanium tetrachloride (FM), indicated for use when white phosphorus presents a fire hazard.

Specifications

Length, fuzed: 483 mm

Weight, fuzed: 4.25 kg

Weight and type of payload: 700 g FM

Number of charges: P + 7

Fuze: impact SQ and delay

Min range: 200 m

Max range: 5,850 m

Muzzle velocity: 69-304 m/s

Chamber pressure: 670 bar

Manufacturer

Chartered Ammunition Industries.

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MORTARS - 81 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm extended range WP smoke bomb

Armament

All medium- and high-pressure 81 mm mortars.

Development

By Chartered Ammunition Industries to provide improved ammunition for 81 mm mortars in [Singapore](#) service.

Description

This uses the same body, tail unit and propelling charges as the HE bomb described previously, but has a central burster and a main filling of White Phosphorus (WP).

Specifications

Length, fuze: 483 mm

Weight, fuze: 4.25 kg

Weight and type of payload: 700 g WP

Number of charges: P + 7

Fuze: impact SQ and delay

Min range: 200 m

Max range: 5,850 m

Muzzle velocity: 69-304 m/s

Chamber pressure: 670 bar

Manufacturer

Chartered Ammunition Industries.

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81 mm WP and FM smoke bombs

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MORTARS - 81 mm MORTARS, [SINGAPORE](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm extended range HE bomb

Armament

All medium- and high-pressure 81 mm mortars.

Development

Developed by Chartered Ammunition Industries to provide improved ammunition for 81 mm mortars in [Singapore](#) service.

Description

A modern, streamlined bomb with a single plastic obturating ring at the bourrelet. The body tapers smoothly into the alloy tail unit, which contains a primary cartridge, and has six secondary increments in horseshoe containers clipped around the tailboom.

Specifications

Length, fuzed: 483 mm

Weight, fuzed: 4.25 kg

Weight and type of payload: 750 g TNT

Number of charges: P + 7

Fuze: impact SQ and delay

Min range: 200 m

Max range: 5,850 m

Muzzle velocity: 69-304 m/s

Chamber pressure: 670 bar

Manufacturer

Chartered Ammunition Industries.

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81 mm extended range HE bomb

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [SINGAPORE](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Ammunition for French M50 75 mm tank gun

Armament

75 mm M50 gun on [AMX-13](#) and [AMX-13 SM1](#) light tanks.

Development

At one time, during the Second World War, the 75 mm calibre was widely used by tank guns but its importance as a calibre has diminished to the point where it is now used by only one light tank. That tank is the French [AMX-13](#) of the early 1950s. 75 mm gunned AMX-13s are now mainly used for close fire support rather than the anti-armour role, leading to a gradual withdrawal of AP ammunition stocks. However, [Singapore](#) remains a dedicated user of the [AMX-13](#) and Chartered Ammunition Industries continues to market 75 mm ammunition, including a locally developed Canister round. During 1998, the [Singapore](#) Armed Forces announced that they were considering a replacement for their [AMX-13](#) light tanks.

Description

All rounds fired by the 75 mm gun used on the [AMX-13](#) light tank are fixed, with the projectiles rigidly secured to their brass cartridge cases by a 360° crimping ring just below the twin copper drive bands, on the projectile body. The ammunition was originally produced in France by Luchaire, now part of Giat Industries, but is now no longer produced in France other than to special order.

The following types have been produced:

POT-PCOT This was the original 75 mm AP round produced by Luchaire (now part of Giat Industries) using a solid armour-piercing projectile with the nose protected by a light windshield. The complete round weighs 14.1 kg with the projectile able to penetrate 170 mm of armour at an angle of 0° at 1,000 m. Muzzle

velocity is 1,000 m/s and maximum effective range is 1,000 m. This round has largely fallen from use although stocks may remain. A practice round matching the AP was also produced.

OE This is a general-purpose 75 mm HE round, now the most widely used of this family of ammunition. This round is also produced in [Singapore](#). The HE projectile (an HE-T is also produced, with the tracer visible for a distance of 150 to 3,000 m of the trajectory) uses a projectile weighing 4.6 kg and containing 600 g of TNT. A point detonating M739 nose fuze is now standard although at one time the M572 was used. The muzzle velocity is from 745 to 762 m/s and complete round weight is 12.7 kg. Dispersion at 1,000 m is 1.1 m vertically and 850 mm horizontally.

Canister Developed in [Singapore](#) by CIS, this 75 mm anti-personnel round uses a steel-based tubular projectile containing 1,200 9 mm steel spheres which are dispersed almost as soon as the four-grooved, aluminium walled projectile leaves the gun muzzle; the spheres are dispensed in a 9° cone with a maximum range of at least 200 m. The projectile weighs 6.4 kg.

TP-T Developed in [Singapore](#) by CIS, the 75 mm TP-T ballistically matches the HE and HE-T. The projectile is inert and carries a dummy nose fuze. Weight of the complete round is 12.5 kg. The French designation for this type of round was PL/PN.

Specifications

Type	HE, HE-T	Canister
Weights:		
complete round	12.7 kg	12.5 kg
projectile	4.6 kg	6.4 kg
filling	600 g TNT	1,200 steel balls
Length:		
complete round	876 mm	810 mm
Muzzle velocity	745-762 m/s	n/a

Authorised fuzes

PD M572 or M739 (on [Singapore](#) HE and HE-T)

Equivalent rounds

[SINGAPORE](#)

Manufacturer

Chartered Ammunition Industries Pte Ltd

Type: 75 mm HE, HE-T, TP-T, Canister

Description: For details see text

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75 mm tank gun ammunition produced by [Singapore](#) Technologies, from left; TP, HE-T and HE

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MORTARS - 120 mm MORTARS, [SLOVAKIA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Model OF

Armament

RFAS, Czech, Slovak and other patterns of smoothbore 120 mm mortar.

Development

This appears to be an improved version of the Czech OF-A 120 mm HE bomb; it was probably developed under Czechoslovakian Army auspices before independence.

Description

Generally similar to the Model OF-A, this bomb is of conventional form, though rather longer and more slender than the OF-A design and probably of higher grade steel. It is filled with RDX/TNT and carries a percussion fuze with optional delay. The body is of steel and a light-alloy tail unit is screwed to a spigot formed at the rear end. The propelling charge consists of a primary cartridge inserted into the tail unit and six secondary charges in cloth bags, tied around the tailboom.

Specifications

Weight: 15.975 kg in flight

Weight and type of payload: 2.66 kg RDX/TNT

Number of charges: P + 6

Fuze: Impact, optional delay, MZ-81

Max range: 8,000 m

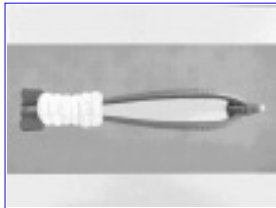
Max muzzle velocity: 352 m/s

Max pressure: 135 Mpa

Manufacturer

ZVS Dubnica.

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120 mm HE bomb OF

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm HE ER EOFd

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer; 152 mm Howitzer [M1943](#) (D-1); [NORINCO 152 mm Gun-Howitzer Type 66](#); [NORINCO 152 mm Gun-Howitzer](#) Type 37; 152 mm Model 1981 Howitzer ([Romania](#)); 152 mm Model 85 Gun-Howitzer ([Romania](#)); [152 mm Gun-Howitzer M84](#) series (Federal Republic of [Yugoslavia](#)).

Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer; [NORINCO Type 83](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer DANA and ONDAVA.

Development

The 152 mm HE ER (Extended Range) EOFd is a Czech/Slovak development, originally intended for use with the 152 mm self-propelled howitzer DANA, although it can be fired from other 152 mm towed and self-propelled howitzers. The projectile is available in two versions, one with a hollow boat-tailed base unit providing a maximum range of 20,000 m and the other with a rocket-assisted unit providing a maximum range of 32,000 m. It is extremely likely that this projectile was based on the design of a [Russian Federation](#) and Associated States (CIS) original about which little information has been forthcoming.

NORINCO has developed a special hollow base HE round for use with their towed [152 mm Gun Type 83](#) which has a 45-calibre barrel. This projectile is apparently also known as the 152 mm Type 83

and can be fired to a range of 30,370 m.

Description

As with other 152 mm rounds the HE ER EOFd is a separate loading munition.

The projectile has a more streamlined outline than the standard 152 mm FRAG-HE OF-540 projectile and is much longer at a nominal 831.31 to 837.31 mm. The high-fragmentation steel body has relatively thin walls and a single copper drive band, while the boat-tailed base has a deep recess. The filling is 8 to 8.1 kg of TNT, initiated by a nose-mounted point detonating KZ-88 or RGM-2 fuze.

The lacquered steel cartridge case contains a different variable charge propellant system from other 152 mm rounds. The system comprises a basic four-bag system in three layers to which are added a further four bags, again in three layers. The propellant involved with all the bags is NDT-3 powder and the total weight is 8.1 kg. The bags are retained in place by two covers, the upper of which uses a light grease seal. The case uses a KV-4 percussion primer threaded into the base while the bottom of the case interior is occupied by igniter rings and anti-flash additives.

The 152 mm HE ER EOFd has a muzzle velocity of 655 m/s and a maximum range of 20,000 m without rocket assistance; with rocket assistance the range is 32,000 m.

Specifications

Weights:

complete round, nominal - 58.96 kg

projectile - 43.56 kg

explosive filling - 8-8.1 kg TNT

propellant - 8.1 kg NDT-3

cartridge case, Full Charge - 15.4 kg

cartridge case, steel - 6.35 kg

Lengths:

projectile - 838 mm

cartridge case - 547.5 mm

Diameter of cartridge case rim: 170 mm

Diameter over drive band: 156 mm

Muzzle velocity: 655 m/s

Max range:

normal - 20,000 m

rocket-assisted - 32,000 m

Authorised fuzes

PD KZ-88 and RGM-2

Equivalent projectiles

SLOVAKIA

Manufacturer

ZVS Dubnica

Type: 152 mm EOFd

Description: See text

Manufacturer

VIHORLAT As Snina

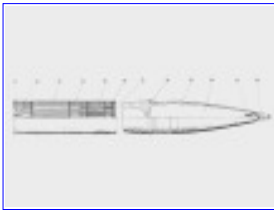
Type: 152 mm EOFd

Description: See text

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152 mm HE ER EOFd projectile and cartridge case (T J Gander)



The 152 mm HEER EOFd; (1) Priming screw; (2) Igniter with firer damper; (3) Steel cartridge case; (4) Lower bundle of powder; (5) Upper bundle of powder; (6) Lower cover; (7) Upper cover with Vaseline; (8) Copper leading ring; (9) Body of shell; (10) Explosive T/H/E; (11) Initiating charge fuze; (12) Impact fuze

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FUZES - TIME FUZES, [SOUTH AFRICA](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M9813 electronic mortar time fuze

Armament

Any mortar bomb from 60 to 160 mm.

Development

By Fuchs Electronics for use on any 60 to 160 mm fin stabilised conventional, extended-range or rocket-assisted mortar system

Description

The Fuchs Electronics [M9813](#) is hand settable with Point Detonation (PD) backup. The time function is factory set at 99.9 seconds. In the field, the time function is set by hand using three rings incorporated into the fuze nose cone. Time range is from 5 to 99.9 seconds in 0.1 second increments. If the time functions fails, the fuze has a secondary independent super-quick PD backup function. The [M9813](#) meets MIL-STD-1316D and STANAG 4187 and 4157 safety requirements. It is also fully compliant to MIL-STD-331B environmental standards.

The fuze is powered by an air driven turbine (windwheel) and is mechanically armed after a minimum distance of 60 m from the muzzle. Time and PD functions are electronically blocked for 4 seconds after launch. The time function cannot be set for less than 5 seconds.

Specifications

Type: electronic time

Weight: 0.4 kg

Arming Distance: 60 m

Muzzle velocity: 70-470 m/s

Status

Design qualification phase.

Manufacturer

Fuchs Electronics.

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FUZES - PROXIMITY FUZES, [SOUTH AFRICA](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M9502

Armament

All 60 to 160 mm fin-stabilised mortar cargo bombs.

Development

By Fuchs Electronics to replace mortar time fuzes.

Description

This is a highly reliable altimetric fuze powered by an air turbine, with altimeter function supported by super-quick point detonating clean-up function. The fuze is designed to deploy the contents of cargo bombs at the optimum height above ground for their particular cargo type. A 17 m burst height is available for 120 mm anti-armour bombs; a 50 m burst height for smoke and red phosphorus is available; and a 600 m burst height for illumination is currently under development.

The fuze is interchangeable with any existing mortar time fuze.

Specifications

Type: high-bursting proximity

Weight: 390 g nominal

Min muzzle velocity: 65 m/s

Max muzzle velocity: 480 m/s

Electronic dead time: 4 s

Muzzle safety: 60 m

Operational temperatures: -46 to +63°C

Manufacturer

Fuchs Electronics.

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M9502 high-burst proximity fuze

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FUZES - PROXIMITY FUZES, [SOUTH AFRICA](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

M9327/M9815

Armament

All 60 to 160 mm fin-stabilised bombs.

Development

By Fuchs Electronics, to replace M8516, M8517 and M8959 mortar proximity fuzes.

Description

A highly reliable proximity fuze powered by air turbine, with selectable proximity (3 m burst height), supported by super-quick point detonating clean-up function or super-quick point detonating function only. Selection is done by turning a mode selector ring (integral to the fuze) to the required position.

Specialised circuitry gives the fuze virtual immunity to countermeasures. The fuze is supplied with a rubber boot providing water and dustproofing. It must be removed before firing. The fuze is qualified to NATO STANAG specifications.

By using adaptor rings this fuze can be fitted to any existing mortar bomb, though in special cases a change to the fuze intrusion may be necessary.

The M9815 fuze is an extended range version of the M9327.

Specifications

Type: proximity/point detonating

Weight: 390 g nominal

Min muzzle velocity: 65 m/s

Max muzzle velocity: 480 m/s

Electronic dead time: 4 s

Muzzle safety: 60 m

Operational temperatures: -46 to +63°C

Manufacturer

Fuchs Electronics.

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M9327 mortar proximity fuze

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FUZES - PROXIMITY FUZES, [SOUTH AFRICA](#)

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

MO120

Armament

For Chinese Type 55 and similar 120 mm mortars.

Development

By Fuchs Electronics to suit the dynamics of the Chinese Type 55 and similar 120 mm mortars.

Description

The MO120 fuze is a radio Doppler proximity fuze which is factory-set to give a burst 3 to 4 m above the ground, the optimum height for maximum fragment spread from a 120 mm bomb. There is also an impact element that can be selected instead of the proximity action and which also acts as a clean-up feature should the proximity circuits fail.

The fuze operates in the UHF range of frequencies and innovative circuit design has been employed to give it frequency agility, providing effective immunity against countermeasures.

Specifications

Type: radio proximity/point detonating

Arming distance (mechanical): 60 m

Arming time (electronic): 6.5 s

Manufacturer



MO120 mortar proximity fuze with adaptor rings

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [SOUTH AFRICA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HEDP, M9219

Armament

High-velocity grenade launchers.

Development

By Swartklip to South African defence requirement.

Description

The M9219 is similar in design to the US M430. It provides penetration of approximately 50 mm of armour plate plus anti-personnel effects within a 5 m radius. The rounds are packaged in 20-round linked belts in a hermetically sealed plastic container.

Specifications

Type: HEDP

Round length: 112 mm

Round weight: 340 g

Payload: 26 g, RDX

Muzzle velocity: 242 m/s

Arming distance: 14-61 m

Max range: 2,200 m

Colour/markings: olive drab/yellow, gold ogive

Status: Standard with South African military.

Manufacturer

[Swartklip Products](#), a Division of Denel (Pty) Ltd.

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, [SOUTH AFRICA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HEDP M9115

Armament

Low-velocity grenade launchers of the M79 and [M203](#) types.

Development

By Swartklip to meet South African defence requirement.

Description

The M9115 is a low-velocity HEDP grenade designed to penetrate light armour and, at the same time, inflict personnel casualties by fragmentation effects. Fragments are produced by a pre-fragmented steel sleeve, which breaks into 425 fragments with a uniform weight of 120 mg each.

Specifications

Type: HEDP

Round length: 103 mm

Round weight: 227 g

Payload: RDX

Muzzle velocity: 76 m/s

Arming distance: 9-28 m

Lethal radius: 5 m

Effective range: 28-400 m

Colour/markings: olive drab/yellow, yellow band, gold ogive

Manufacturer

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FUZES - TIME FUZES, [SOUTH AFRICA](#)

Date Posted: 05 November 2001

Jane's Ammunition Handbook 2001-2002

M9148

Armament

All types of mortar bombs.

Development

By Fuchs Electronics to provide a time fuze with universal application.

Description

The M9148 is a universal programmable time fuze functioning in any type of mortar bomb; adaptor rings will enable it to be fitted to various thread diameters and intrusions.

The fuze does not use a battery or generator, so there is no source of energy within the fuze during storage or transport. Power is provided during programming, using a hand-held programmer, at the same time as the operating time is being set. The fuze is thus immune to any form of electronic countermeasure. It has a shelf-life in excess of 10 years. The electronic module is hermetically sealed inside the fuze and an option permits infra-red communication with the programmer if desired.

The operating time is programmable up to 80 seconds in 1 ms steps and the timing is accurate to 3 ms in a 50 seconds time of flight.

Specifications

Type: programmable electronic time

Weight: 222 g
Length overall: 87.3 mm
Diameter: 49 mm
Arming time: 2 s

Manufacturer

[NASCHEM](#) (Division of Denel (Pty) Ltd).

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Fuze M9148 with programmer

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Swartklip 12 gauge double baton rubber ball round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Swartklip for peacekeeping operations, riots and crowd control.

Description

The Swartklip double baton ball round is similar to the single baton ball round described previous, save for the fact that it contains two, rather than a single rubber ball.

Specifications

Caliber: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Approximately 3 g each, total 6 g

Muzzle velocity: Approximately 150 m/s

Muzzle energy: 67 J

Maximum range: Approximately 100 m

Maximum effective range: 50 -70 m

SOUTH AFRICA

Manufacturer:

Swartklip Division

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Swartklip 12 gauge single baton rubber ball round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Swartklip for peacekeeping operations, riots and crowd control.

Description

The single baton rubber ball round is intended for use to disable individuals in mobs or in situations where lethal force is not appropriate. The round, while less lethal than conventional shotgun shells, can cause serious injury or death at close ranges.

Specifications

Caliber: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: Approx 4 g

Muzzle velocity: Approx 150 m/s

Muzzle energy: Approx 44 J

Max range: 100 m

Max effective range: 50-70 m

[SOUTH AFRICA](#)

Manufacturer

Swartklip Division

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Swartklip 12 gauge Thundershot distraction round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Swartklip for peacekeeping operations, riots and crowd control.

Description

The Swartklip Thundershot fires a projectile into the air or on the ground in the vicinity of rioters to produce a distraction or disorientation effect. It produces a loud 90 dB report without fragments. Although it does not produce fragments, the Thundershot should not be fired directly at personnel.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: N/A

Muzzle velocity: N/A

Muzzle energy: N/A

Max range: 50-75 m

Max effective range: 50-75m

[SOUTH AFRICA](#)

Manufacturer

Swartklip Division

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm long-range mortar bomb M8917

Armament

Most 60 mm mortars

Development

By Denel of [South Africa](#) to provide long-range ammunition of increased effectiveness for most 60 mm mortars.

Description

The M8917 is a streamlined bomb of modern design with a thin-wall steel body for increased cargo capacity. It offers improved obturation over earlier designs. Three types of ballistically matched rounds are available, M8917A1 HE, M8917A2 smoke and M8917A3 practice.

Specifications

Length, fuze: 420 mm

Weight, fuze: 2.24 kg

Type of payload: M8917A1, RDX/TNT; M8917A2 titanium tetrachloride (FM); M8917A3, inert

Number of charges: primary cartridge plus 9 increments

Fuze: PD (impact) or proximity

Min range: 350 m

Max range: 6,100 m ([M6](#) mortar)

Muzzle safety distance: 40 m

Manufacturer

Denel (Pty) Ltd.

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FUZES - IMPACT FUZES, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M8810A2

Armament

81 and 120 mm HE, smoke and practice bombs.

Development

By Denel for South African Defence Force mortars and for export.

Description

This fuze has a steel rear body and aluminium nose. It is fitted with a safety pin that must be removed before firing. It can be manually set to give an optional delay. Arming is by setback on firing.

Specifications

Type: percussion, direct action, with optional delay

Weight: 300 g

Length overall: 81 mm

Diameter: 48 mm

Optional delay: 50 ms

Arming distance: 40 m

Manufacturer



Fuze M8810A2, left; Fuze M8807A2, right

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FUZES - IMPACT FUZES, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M8807A2

Armament

60 mm HE, smoke and practice bombs.

Development

By Denel for South African Defence Force mortars and for export.

Description

This is an aluminium fuze having a safety wire which must be removed before firing. It is armed by setback on firing.

Specifications

Type: percussion, direct action

Weight: 180 g

Length overall: 81 mm

Diameter: 39 mm

Arming distance: 40 m

Manufacturer

Denel (Pty) Ltd.

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MORTARS - 81 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm practice bomb

Armament

Medium- and high-pressure 81 mm mortars.

Development

By [NASCHEM](#) to accompany the HE and smoke bombs.

Description

This is ballistically matched to the M61 HE bomb and is filled with an inert substance. There is a small indicating charge of TNT/aluminium, detonated on impact by the [V19P](#) fuze to give indication of fall of shot. It can be used at any charge up to Charge 8.

Specifications

Weight, fuzed: 4.43 kg

Type of payload: inert, with spotter charge

Number of charges: P + 7

Fuze: impact SQ and delay [V19P](#)

Min range: 75 m

Max range: 4,856 m

Muzzle velocity: 75-279 m/s

Manufacturer

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MORTARS - 81 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm bursting smoke bomb M61

Armament

Medium- and high-pressure mortars.

Development

By [NASCHEM](#) to partner the M61 HE bomb.

Description

This is ballistically matched to the M61 HE bomb and is filled with titanium tetrachloride (FM). On impact a small burster charge of explosive ruptures the steel body and distributes the FM, which generates smoke by reaction with the water vapour in the air. It produces a dense smoke for screening or signalling purposes.

Specifications

Weight, fuzed: 4.43 kg

Type of payload: FM

Number of charges: P + 7

Fuze: impact SQ and delay [V19P](#)

Min range: 75 m

Max range: 4,856 m

Muzzle velocity: 75-279 m/s

Manufacturer

[NASCHEM.](#)

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MORTARS - 81 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M61

Armament

Medium- and high-pressure 81 mm mortars.

Development

By [NASCHEM](#), a modernised version of a design originally licensed from Hotchkiss-Brandt (now [TDA](#)) many years ago.

Description

This uses a forged steel body with a Rilsan obturating ring and a light-alloy tail tube and fin assembly. It is filled RDX/TNT 40/60 and fuzed with the direct action [V19P](#) fuze which has provision for instantaneous or delay action, selectable before firing. A primary cartridge fits into the tail tube and secondaries can be clipped around the tube; there are eight charges.

Specifications

Weight, fuzed: 4.43 kg

Type of payload: RDX/TNT

Number of charges: P + 7

Fuze: impact SQ and delay [V19P](#)

Min range: 75 m

Max range: 4,856 m

Muzzle velocity: 75-279 m/s

Manufacturer

[NASCHEM.](#)

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm red phosphorus bomb M1A1

Armament

All 60 mm mortars.

Development

By Denel.

Description

This bomb is fitted with a point detonating fuze which causes the bomb, on impact, to eject a canister containing Red Phosphorus (RP) composition 2 to 6 m into the air. At that height a burster charge ignites the pre-pelleted RP granules and distributes them over the immediate area up to 20 m from the point of burst. The RP composition is formulated to cause a high-temperature conflagration of the granules for about 30 seconds.

The bomb is used to provide screening smoke as well as serve as a powerful incendiary device. Deployed in advance of forward troops it can be used as a defensive or offensive munition, or as a means of indicating targets to forward air support.

Specifications

Length, fuzed: 377 mm

Weight, fuzed: 1.79 kg

Weight and type of payload: 320 g RP in 2,800 granules

Max range: 2,100 m

Min burning time: 5 s

Burning temperature: 800°C

Min distribution: 700 m²

Colour/markings: grey/red

Manufacturer

Denel (Pty) Ltd.

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60 mm red phosphorus bomb [MIAI](#)

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb M802A2

Armament

All 60 mm mortars.

Development

By Denel.

Description

This is of the conventional pattern using a parachute-suspended star unit to provide illumination. A time fuze is fitted and set before firing. At the end of the set time the fuze ignites an expelling charge which blows off the tail unit and ejects the star and parachute.

Specifications

Length, fuzed: 377 mm

Weight, fuzed: 1.6 kg

Type of payload: parachute and flare

Fuze: time

Max range: 2,000 m

Illuminating power: min 180,000 cd

Min burning time: 30 s

Rate of descent: approx 4.5 m/s

Colour/markings: grey/black

Manufacturer

Denel (Pty) Ltd.

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60 mm illuminating bomb [M802A2](#)

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm practice bomb M61

Armament

All 60 mm mortars.

Development

By Denel.

Description

This is ballistically matched to the 60 mm HE Bomb M61 so that it may be used for practice when non-explosive bombs are necessary. The bomb is filled with an inert substance, but carries a small marker charge of TNT/aluminium which detonates on impact to give an indication of the fall of shot. The direct action impact fuze V9 is fitted as standard. Colour coding is deep saxe blue.

Manufacturer

Denel (Pty) Ltd.

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb M61

Armament

All 60 mm mortars.

Development

By Denel, based on earlier [TDA](#) designs.

Description

This is ballistically matched to the 60 mm HE Bomb M61. It is charged with titanium tetrachloride (FM) which is preferred to White Phosphorus (WP) because of its lower fire risk in bush country. The FM is distributed by a small explosive burster and generates dense white smoke by reaction with water vapour in the air. The direct action impact fuze V9 is fitted as standard. Colour coding is Nile blue.

Manufacturer

Denel (Pty) Ltd.

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MORTARS - 60 mm MORTARS, [SOUTH AFRICA](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb M61

Armament

[TDA](#) pattern 60 mm mortars and gun-mortars.

Development

By Denel.

Description

This can be used in either the standard infantry drop-fired mortars or in the 60 mm gun-mortar used with armoured vehicles. It uses a forged steel body and is filled with RDX/TNT 40:60. A primary cartridge fits into the tail tube and four secondaries fit in between the fins while a fifth can be clipped around the tail tube ahead of the fins. It can be supplied fuzed with the V9 direct action impact fuze or the SC12B direct action and graze impact fuze. The former is based on the [TDA](#) V9 design but has been somewhat modified in the light of combat experience. The latter incorporates long- or short arming times that can be selected by the user and is of French design.

Specifications

Weight, fuzed: 1.8 kg

Type of payload: RDX/TNT

Number of charges: P + 5

Fuze: SC12B DA and graze or V9 impact SQ

Max range: 2,100 m

Muzzle velocity: 62-171 m/s

Colour/markings: deep bronze green

Manufacturer

Denel (Pty) Ltd.

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [SOUTH AFRICA](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm MAT-120 submunition bomb

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

A further stage in the development of the Espin projectile. It is in production by Instalaza SA and in service with the Spanish armed forces.

Description

The [MAT-120](#) cargo mortar round is fired from 120 mm smoothbore mortars and carries 21 submunitions, each of 37 mm diameter, up to a range of 5,500 m.

The [MAT-120](#) incorporates an electronic safety and arming system. When stored, the round does not contain any electrical energy. The main fuze generates all necessary power after firing, once the round is in flight.

Each submunition has its own electronic super-quick impact fuze. The fuze controls submunition fuze activation after submunition scattering, initiation of the submunition warhead on impact, self-destruction after 20 seconds, or self-neutralisation after a few minutes. The submunitions are dual-purpose, being anti-armour (up to 150 mm RHA penetration) and anti-personnel (about 650 fragments with an 18 m effective radius).

The [MAT-120](#) round is fired in the same way as any other conventional mortar round and does not

require any specific training. After firing and once the preset time fuze has functioned, the round spreads the submunitions to fall freely in a near-vertical trajectory and reach the target in a random pattern covering a circle some 50 to 60 m in diameter. The hit probability on a target with the dimensions of an MBT within the target area is close to 20 per cent. The effective area of each submunition overlaps the others, covering a circular area between 2,500 and 3,000 m² without significant gaps.

Specifications

Calibre: 120 mm

Number of submunitions: 21

Total number of fragments produced: ca 13,600

Max range: 5,500 m

Area covered: 2,200 m²

Submunition Diameter: 37 mm

Weight: total, 275 g; filling, 50 g

Penetration: steel, 150 mm

Number of fragments: ca 650

Lethal area radius: 6 m

Action radius: 18 m

Manufacturer

Instalaza SA.

UPDATED



Instalaza [MAT-120](#) submunition bomb

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FUZES - IMPACT FUZES, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Model 53

Armament

All calibres of smoothbore mortars.

Development

By Ecia for its own range of mortar bombs.

Description

A mechanical nose fuze providing super-quick action. Safety is ensured by a rotor which is locked in the rest position by a setback sleeve. On firing, this sleeve moves down and locks, leaving the rotor free. Because of its asymmetrical shape, as long as the bomb is under acceleration, the rotor will remain in the safe position. As soon as acceleration ceases, a spring causes it to revolve to the armed position where it is locked in place with a detonator under the firing pin. On impact, the firing pin is driven into the detonator which then fires the fuze magazine.

Specifications

Type: impact, SQ

Optional delay: none

Arming distance: 40 m

Manufacturer



Ecia Model 53 impact fuze

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm submunition bomb 'Espin'

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

Developed by Ecia in 1986 to provide an anti-armour capability for 120 mm mortars.

Description

This bomb has a cylindrical body, curved ogive with time fuze, tailcone and a light-alloy tailboom and fins. The usual type of primary cartridge fits into the tailboom and the secondary charges fit around the boom ahead of the fins.

The payload consists of 21 submunitions, each containing a shaped charge and an impact fuze in a steel casing which provides anti-personnel fragments; a stabilising tape is attached to each submunition. They are packed around a central tube, above an expelling charge. When the time fuze functions, the expelling charge is fired, blows off the ogive from the bomb and then ejects the submunitions. The stabilising tapes ensure that they fall vertically. On impact they can penetrate 150 mm of steel and generate about 650 fragments. Each submunition has a lethal radius of 8 m; the area covered by the 21 submunitions varies according to the height at which deployment takes place and can be as much as 4,000 m².

Specifications

Length, unfuzed: 796 mm

Weight, fuzed: 18.7 kg

Type of payload: 21 submunitions each of 285 g

Number of charges: P + 7

Fuze: time or proximity

Max range: 6,500 m

Manufacturer

Esperanza y Cia.

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120 mm submunition bomb 'Espin'

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb Model AE

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to provide an illuminating bomb compatible with the AE series bombs.

Description

This is a streamlined bomb, outwardly similar to the other members of the AE family. Internally it carries the usual parachute and flare assembly. A time fuze ignites an expelling charge which blows off the forward section of the body and allows the contents to be ejected.

Specifications

Weight, unfuzed: 14 kg

Type of payload: parachute and flare

Fuze: mechanical time

Max range: 7,500 m

Illumination intensity: 1 Mcd or 1.5 Mcd as requested

Burning time: 60 s

Rate of descent: 4 m/s

Manufacturer

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb Model N

Armament

EXPAL and other 120 mm mortars.

Development

By Ecia for 120 mm smoothbore mortars.

Description

This bomb has a cylindrical body with an ogival head held in place by shear pins. A tailcone is attached to the rear of the body and to this is attached a light-alloy tailboom and fins. A primary cartridge fits into the end of the tailboom and the secondary charges fit around the boom. A time fuze fits into the ogive. Beneath this, in the cylindrical section, is a flare canister and a folded parachute.

At the set time, the fuze ignites an expelling charge. This ignites the flare composition and blows off the ogive. A spring in the tailcone then ejects the flare canister and parachute.

Specifications

Length, fuze: 735 mm

Weight, fuze: 14.087 kg

Type of payload: parachute and flare

Number of charges: P + 4

Fuze: time

Max range: 5,450 m

Chamber pressure: 809.1 bar

Illumination intensity: 1 Mcd

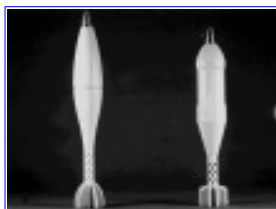
Duration of illumination: 60 s

Rate of descent: 4 m/s

Manufacturer

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120 mm illuminating bombs Models AE and N

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm practice bomb Model AE

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to supplement the AE range of bombs.

Description

This uses the same body and tail assembly as the smoke bomb but has the body largely filled with inert ballast and a small spotting charge.

Specifications

Length, fuzed: 817 mm

Weight, fuzed: 14.75 kg

Type of payload: inert ballast and spotting charge

Number of charges: P + 7

Fuze: impact SQ

Max range: 8,000 m, 1.6 m barrel; 8,250 m, 1.8 m barrel

Muzzle velocity: 345 m/s, 1.6 m barrel; 357 m/s, 1.8 m barrel

Manufacturer

Esperanza y Cia.

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb Model AE

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to accompany the HE bomb Model AE.

Description

This uses the same body and tail components as the HE bomb and has the same propulsive system. The nose is closed by an adaptor which carries a long central burster tube; the remainder of the body cavity is loaded with White Phosphorus (WP) smoke composition.

Specifications

Length, fuze: 817 mm

Weight, fuze: 14.75 kg

Type of payload: WP

Number of charges: P + 7

Fuze: impact SQ

Max range: 8,000 m, 1.6 m barrel; 8,250 m, 1.8 m barrel

Muzzle velocity: 345 m/s, 1.6 m barrel; 357 m/s, 1.8 m barrel

Manufacturer

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Model AE

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

Introduced in 1984 by Ecia to improve the performance of existing mortars and to accompany the [M84](#) mortar.

Description

The Model AE (for Aerodynamic) bomb is streamlined, with a good weight-to-calibre ratio. It uses a plastic obturating ring set in a groove at the bourrelet to achieve good gas sealing and ballistic regularity. The tail tube and fin assembly is of forged aluminium; a primary cartridge fits into the tail tube and the secondary incremental charges, in horseshoe containers, fit around the tube in front of the fins.

Specifications

Length, fuzed: 817 mm

Weight, fuzed: 14.75 kg

Weight and type of payload: 3.148 kg TNT

Number of charges: P + 7

Fuze: impact SQ

Max range: 8,000 m, 1.6 m barrel; 8,250 m, 1.8 m barrel

Muzzle velocity: 345 m/s, 1.6 m barrel; 357 m/s, 1.8 m barrel

Manufacturer

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120 mm Model AE series bombs

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm practice bomb L

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to match the L series service bombs.

Description

This is the same modification to the Model L smoke bomb used on the Model N; filling of the body with inert ballast and the inclusion of a small blowing charge to give indication of the point of impact.

Specifications

Length, fuzed: 604 mm

Weight, fuzed: 13.195 kg

Weight and type of payload: inert ballast and 335 g spotting charge

Fuze: impact SQ

Min range: 600 m

Max range: 6,260 m

Manufacturer

Esperanza y Cia.

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb Model L

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to improve range and velocity of existing mortars.

Description

As with the HE bomb, this is a shorter and lighter version of the Model N smoke bomb, using the same tail unit and propulsion system. Although the bomb weighs 3.5 kg less, most of this saving is in steel and the payload is only reduced by 700 g

Specifications

Length, fuze: 604 mm

Weight, fuze: 13.195 kg

Weight and type of payload: 2.267 kg WP

Fuze: impact SQ

Min range: 600 m

Max range: 6,260 m

Manufacturer

Esperanza y Cia.

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Model L

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia to improve its range of existing 120 mm mortar ammunition.

Description

The `L' series of bombs are generally similar to the `N' series, but shorter and lighter improving the velocity and range. They are of the same streamlined shape and forged steel construction, with four gas check grooves and, they use the same tail unit and propulsion system as the Model N series.

Specifications

Length, fuzed: 604 mm

Weight, fuzed: 13.195 kg

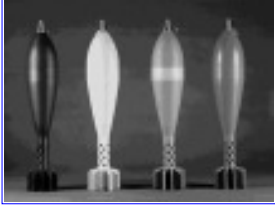
Weight and type of payload: 2.34 kg TNT

Fuze: impact SQ

Min range: 600 m

Max range: 6,260 m

Manufacturer



120 mm Model L series bombs

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm practice bomb Model N

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia for general use.

Description

This practice bomb is generally the same as the smoke bomb Model N but most of the body is filled with inert ballast. At the bottom end of the burster tube there is a small blowing charge which, when initiated by the fuze and burster charge, will blow off the head of the bomb and give a cloud of smoke for spotting purposes.

Specifications

Length, fuzed: 668 mm

Weight, fuzed: 16.745 kg

Weight and type of payload: ballast and 335 g spotting charge

Fuze: impact SQ

Max range: 4,940 m, Mortar Model SL; 5,700 m, Mortar Model L

Manufacturer

Esperanza y Cia.

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb Model N

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia for general use.

Description

This uses the same bomb body, tail unit and propulsion system as the HE bomb Model L (which see). In this bomb the nose adaptor is extended to form a burster container and the remainder of the body cavity is filled with White Phosphorus (WP).

Specifications

Length, fuzed: 668 mm

Weight, fuzed: 16.745 kg

Weight and type of payload: 2.975 kg WP

Fuze: impact SQ

Max range: 4,940 m, Mortar Model SL; 5,700 m, Mortar Model L

Manufacturer

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MORTARS - 120 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb Model N

Armament

EXPAL and other 120 mm smoothbore mortars.

Development

By Ecia for general use.

Description

A conventional streamlined forged steel bomb with alloy tailboom and fins. There are four gas check rings formed around the bourrelet. The nose is closed by an adaptor which acts as an exploder container and is threaded for the fuze. A primary cartridge fits into the rear of the tailboom and the secondary increments, in split-ring form, fit around the boom in front of the fins.

Specifications

Length, fuzed: 668 mm

Weight, fuzed: 16.745 kg

Weight and type of payload: 3.11 kg TNT

Fuze: impact SQ

Max range: 4,940 m, Mortar Model SL; 5,700 m, Mortar Model L

Manufacturer

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb Model AE

Armament

Medium- and high-pressure mortars.

Development

Introduced in 1984 to provide a modern HE bomb for 81 mm mortars.

Description

This is a modern, streamlined bomb, with a plastic obturating ring below the bourrelet and a light-alloy tailboom and fins. The body is forged from ferritic and pearlitic steel. A primary cartridge is inserted into the tail tube and six secondary increments are in horseshoe containers which fit around the tailboom ahead of the fins.

Specifications

Length, fuze: 539 mm

Weight, fuze: 4.5 kg

Weight and type of payload: 1.009 kg TNT

Number of charges: P + 6

Fuze: impact SQ

Max range: 6,200 m, 1.15 m barrel; 6,900 m, 1.45 m

barrel

Muzzle velocity: 78-330 m/s

Chamber pressure: 833.59 bar

Manufacturer

Esperanza y Cia.

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Esperanza 81 mm AE series bombs

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb Model AE

Armament

Medium- and high-pressure mortars.

Development

Introduced in 1984 to provide a modern bomb for 81 mm mortars.

Description

As an illuminating bomb this is unusual as it has a streamlined body, which is exactly the same as the HE bomb AE, with the same alloy tail unit and propulsion system. The interior contains the usual parachute and flare assembly which is ejected by the action of a time fuze.

Specifications

Weight, fuzed: 4.25 kg

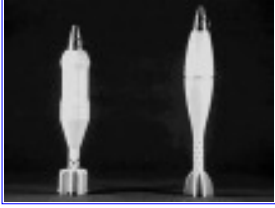
Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time

Max range: 5,800 m, 1.15 m barrel; 6,500 m, 1.45 m barrel

Manufacturer



Esperanza Models N and AE illuminating bombs

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb Model N

Armament

All 81 mm mortars.

Development

By Ecia.

Description

A tubular bomb body with pronounced bourrelets at the front and rear ends. The rear end has a tailcone attached, to which the tailboom and fins are screwed. The nose has a curved ogive into which the fuze is screwed. Inside are the usual parachute and flare canister. An ejection charge, initiated by the time fuze, blows off the tailcone and ejects the parachute and flare at the selected time. The propulsion system is that used with the NA bomb

Specifications

Length, fuzed: 474 mm

Weight, fuzed: 3.93 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time

Max range: 3,350 m, 1.15 m barrel; 4,000 m, 1.45 m

Illumination intensity: 550,000 cd

Burning time: 30 s
Rate of descent: 4 m/s

Manufacturer

Esperanza y Cia.

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb NA

Armament

All 81 mm mortars.

Development

By Ecia.

Description

This uses the same bomb body as the HE bomb Model NA but with a long burster container and the remainder of the body cavity filled with White Phosphorus (WP). The propulsion system is the same as that used with the HE bomb Model NA.

Specifications

Length, fuze: 343 mm

Weight, fuze: 3.2 kg

Weight and type of payload: 456 g WP

Number of charges: P + 6

Fuze: impact SQ

Max range: 4,125 m, 1.15 m barrel; 4,600 m, 1.45 m barrel

Manufacturer

Esperanza y Cia.

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb Model N

Armament

EXPAL and other 81 mm mortars.

Development

By Ecia for its own and other mortars.

Description

This is similar in appearance to the Model NA bomb but is longer and heavier, giving it a greater lethal area. It uses the same propellant system but with a heavier loading in the secondaries.

Specifications

Length, fuzed: 381 mm

Weight, fuzed: 4.13 kg

Weight and type of payload: 675 g TNT

Number of charges: P + 6

Fuze: impact SQ

Max range: 4,270 m, 1.15 m barrel; 5,200 m, 1.45 m barrel

Manufacturer



Esperanza 81 mm NA series bombs

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MORTARS - 81 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb Model NA

Armament

All 81 mm mortars.

Development

By Ecia.

Description

A teardrop-shaped bomb in forged steel, with four gas seal grooves around the bourrelet and a welded steel tailboom and fins. A primary cartridge fits into the tailboom and up to six secondary increments in cloth split rings fit around the tailboom in front of the fins.

Specifications

Length, fuzed: 343 mm

Weight, fuzed: 3.2 kg

Weight and type of payload: 496 g TNT

Number of charges: P + 6

Fuze: impact SQ

Max range: 4,125 m, 1.15 m barrel; 4,680 m, 1.45 m barrel

Manufacturer

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb Model AE

Armament

EXPAL and other 60 mm mortars.

Development

By Esperanza y Cia and introduced in 1984.

Description

This bomb is generally similar in form to the 60 mm HE and Smoke Bombs Model AE, but has the nose cut short so as to leave a wide enough cavity to allow expulsion of the illuminating flare and parachute. A time fuze is fitted which blows off the nose and ejects the flare assembly at the set time.

Specifications

Weight, unfuzed: 1.55 kg

Type of payload: parachute and flare

Number of charges: P + 5

Fuze: time

Max range: 4,200 m

Illumination intensity: 250,000 cd

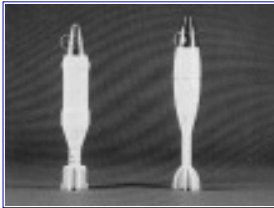
Burning time: 25 s

Rate of descent: 4 m/s

Manufacturer

Esperanza y Cia.

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60 mm Models N and AE illuminating bombs

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb Model N

Armament

EXPAL and other 60 mm mortars.

Development

By Esperanza y Cia.

Description

The Model N bomb is of forged steel, teardrop-shaped with a light-alloy tail unit and six fins. The propellant system consists of a primary cartridge inserted in the tail tube and horseshoe secondaries that fit around the tube above the fins.

Specifications

Length, fuzed: 263 mm

Weight, fuzed: 1.43 kg

Weight and type of payload: 232 g TNT

Number of charges: P + 5

Fuze: impact SQ

Max range: 1,975 m

Manufacturer

Esperanza y Cia.

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb Model N

Armament

EXPAL and other 60 mm mortars.

Development

By Esperanza y Cia.

Description

The Smoke Bomb Model N is identical to the 60 mm HE Bomb Model N described previously except for the filling. There is a short burster in the head of the bomb and the cavity is filled either with White Phosphorus (WP) or hexachloroethane (HC) composition. An impact fuze detonates the burster which breaks open the bomb and distributes the smoke composition.

Specifications

Length, fuzed: 263 mm

Weight, fuzed: 1.43 kg

Type of payload: WP or HC smoke composition

Number of charges: P + 5

Fuze: impact SQ

Max range: 1,975 m

Manufacturer

Esperanza y Cia.

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60 mm Model N series bombs

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb Model AE

Armament

EXPAL and other 60 mm mortars.

Development

Developed by Esperanza and introduced in 1984.

Description

This bomb uses the same body as the 60 mm HE Bomb Model AE described previously, but has a forward burster and is filled with either White Phosphorus (WP) or hexachloroethane (HC) smoke mixtures.

Specifications

Length, fuze: 396 mm

Weight, fuze: 2.05 kg

Type of payload: WP or HC smoke composition

Number of charges: P + 6

Fuze: impact SQ

Max range: 4,600 m

Manufacturer

Esperanza y Cia.

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb Model AE

Armament

EXPAL and other 60 mm mortars.

Development

Designed by Esperanza and introduced in 1984 to improve the performance of 60 mm mortars.

Description

The bomb is of forged steel and uses a highly streamlined body of good aerodynamic shape to obtain an excellent weight-to-calibre ratio. It carries a plastic obturating ring to obtain good gas sealing and ballistic regularity. The tail unit is of forged aluminium and is attached to the body by a screwed section. The primary cartridge is inserted into the tail tube and the secondary charges are in horseshoe containers which clip round the tail tube above the fins.

Specifications

Length, fuzed: 396 mm

Weight, fuzed: 2.05 kg

Weight and type of payload: 355 g TNT

Number of charges: P + 6

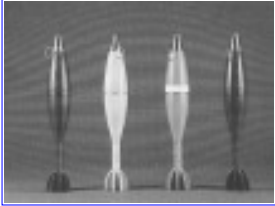
Fuze: impact SQ

Max range: 4,600 m

Manufacturer

Esperanza y Cia.

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60 mm Model AE series bombs

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MORTARS - 60 mm MORTARS, SPAIN

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb Model N

Armament

EXPAL and other 60 mm mortars.

Development

By Esperanza y Cia.

Description

This is a cylindrical bomb with distinct bourrelets at each end of the cylindrical portion. A six-fin tail unit is fitted to the conical rear section of the body. The interior carries the usual parachute and flare canister which is ejected by the action of a time fuze.

Specifications

Length, fuzed: 368 mm

Weight, fuzed: 1.97 kg

Type of payload: parachute and flare

Number of charges: P + 3

Fuze: time

Max range: 1,575 m

Illumination intensity: 250,000 cd

Burning time: 23 s

Rate of descent: 4 m/s

Manufacturer

Esperanza y Cia.

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IDENTIFICATION OF SMALL ARMS AMMUNITION, SPAIN

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 mm Browning Long

Synonyms:

9 × 20SR; 9 mm Swedish m/07

Armament

Browning M1903 pistol; Astra, Le Francais, Star, Webley pistols chambered for this calibre; Bergmann [M28](#) and Suomi M1937 sub-machine guns.

Development

Developed by Fabrique National for the Browning M1903 automatic pistol. This cartridge was intended to be as powerful as possible, consistent with operating in a weapon with unlocked breech. Although quite widely adopted in the 1920s for both military and police tasks, it was supplanted by the 9 mm Parabellum, since the Browning Long was an unconvincing combat round. It fell into obsolescence but was revived by the Swedish armed forces in the late 1980s when, due to problems with the 9 mm Lahti pistols, the Browning M1903 was reinstated as the service pistol.

Description

A semi-rimmed straight taper case, brass, Berdan primed. The standard military bullet is lead-cored, steel-jacketed and with an ogival head shape, weighing 7.25 g.

Specifications

Round length: 27.94 mm
Case length: 20.3 mm
Rim diameter: 10.16 mm
Bullet diameter: 9.06 mm
Bullet weight: 7.25 g
Muzzle velocity: 335 m/s
Muzzle energy: 407 J

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 7.25 g; MV 400 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

Type: Ball: FMJ; 7 g; MV 349 m/s

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9 mm Browning Long

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 mm Largo

Synonyms:

9 × 23 mm; 9 mm Bergmann-Bayard; 9 mm Astra

Armament

Bergmann-Bayard and Astra pistols in Spanish and Danish service; Bergmann [M28](#) and [M34](#) sub-machine guns; Star sub-machine guns.

Development

Designed by Theodor Bergmann and Hugo Schmeisser for Bergmann's 1903 pistol, which was subsequently adopted by the Spanish and Danish armies. Although the pistols are long obsolete in both forces, the cartridge was retained in Spanish service and many subsequent military and police weapons used it until replaced by the 9 mm Parabellum in the 1980s. Many Spanish police and security forces still use weapons chambered for this round.

Description

A rimless, straight-taper brass case, Berdan primed. The bullet is ogival, lead-cored with steel jacket and gilding metal envelope, and weighs 8.75 g. It should be noted that the obsolete 9 mm Steyr cartridge is of almost identical dimensions and can only be distinguished by the bullet, which has a steel jacket and is somewhat more pointed, and of course, by the Austrian headstamp.

Specifications

Spanish service

Round length: 33.5 mm

Case length: 23.11 mm

Rim diameter: 9.95 mm

Bullet diameter: 9.02 mm

Bullet weight: 8.2 g

Muzzle velocity: 400 m/s

Muzzle energy: 656 J

SPAIN

Manufacturer

SANTA BARBARA SA

Type: Ball: FMJ; 8.2 g; MV 400 m/s

UNITED STATES OF AMERICA

Manufacturer

CCI-Speer

Type: Ball: JHP; 8 g; MV 363 m/s

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9 mm Largo

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SMALL ARMS

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

6.5 × 52 mm

Synonyms:

6.5 mm Mannlicher Carcano; 6.5 mm Carcano; 6.5 × 52 mm Italian

Armament

Italian service Mannlicher-Carcano rifles and carbines, Revelli, SIA, Fiat and Breda machine guns.

Development

Dating from 1891 this cartridge is characteristic of several closely related Mannlicher designs. The Mannlicher-Carcano rifles and carbines and various machine guns chambered for this cartridge were standard equipment of the Italian Army from the 1890s to the 1940s, and after their obsolescence in Italy were distributed far and wide, particularly in the Horn of Africa. As with all 'pure' Mannlicher designs the cartridges are clip loaded, the clip forming an integral part of the feed system.

Description

A slender, rimless, bottlenecked case, brass with Berdan or Boxer priming. A bullet unique to this cartridge was the 'Frangible Loading' which was designed to break up into several anti-personnel fragments after striking any hard surface. The standard ball round has a round-nosed bullet, while armour-piercing bullets have a pointed ogive.

Specifications

Italian service pointed ball

Round length: 76.2 mm

Case length: 52.32 mm

Rim diameter: 11.43 mm

Bullet diameter: 6.75 mm

Bullet weight: 7.97 g

Muzzle velocity: 740 m/s

Muzzle energy: 2,182 J

Abridged ballistic table: 6.5 × 52 mm, 10.1 g ball

Range	Velocity	Energy
0 m	740 m/s	2,767 J
100 m	653 m/s	2,160 J
200 m	573 m/s	1,662 J
300 m	500 m/s	1,264 J

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball: FMJ; 9 g; MV 785 m/s

[YUGOSLAVIA](#), FEDERAL REPUBLIC

Manufacturer

Yugoimport SDPR

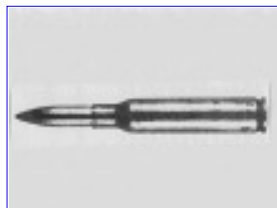
Type: Ball: FMJ; 9 g; MV 770 m/s

Ball: PSP; 8 g; MV 828 m/s

Ball: PSP; 9 g; MV 775 m/s

Ball: PSP; 10.1 g; MV 719 m/s

UPDATED



6.5 × 52 mm

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FUZES - TIME FUZES, [SWEDEN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

FFV 839

Armament

81 and 120 mm smoke bombs.

Development

By FFV (now Bofors AB) for mortar bombs in Swedish service and general use.

Description

A mechanical time fuze using a clockwork timing mechanism. It has duplicated safety devices for transport, handling, bore and mask safety. It can be set by hand in any direction of rotation. Versions are available embodying differences in the explosive train, to suit different types of bomb exploder systems.

Specifications

Type: mechanical time

Thread: 1.5 × 12 tpi UNF-1A

Diameter: 49 mm

Operating time: 5-55 s stepless

Arming requirement: 800 g

Manufacturer

Bofors AB.

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FFV 839 mechanical time fuze

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MORTARS - 120 mm MORTARS, [SWEDEN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm anti-armour guided bomb Strix

Armament

Any 120 mm smoothbore mortar.

Development

Developed jointly from 1984 to 1990 by Bofors AB and Saab Missiles, to provide a top-attack anti-tank weapon for infantry.

Description

Strix is a 120 mm mortar projectile, terminally guided by an infra-red target seeker. It is completely autonomous in operation, requiring no other information than that normally provided by a Forward Observation Officer.

The Strix projectile is handled exactly like any other mortar round, except that it is fitted with a special tail unit which separates from the bomb after approximately 20 m of flight. The bomb follows a normal ballistic trajectory, sustained if required by a rocket motor, increasing range and reducing the effect of wind. Only in the last stages of flight does the infra-red target seeker and guidance system come into operation to direct the bomb onto the upper surfaces of its target, for it is these surfaces that are generally the least protected.

The Strix projectile consists of a hollow charge warhead, a guidance system, an electronic unit, the infra-red sensor, the afterbody with the fins and an optional rocket motor. Terminal guidance is performed by side-thruster units in the afterbody.

The high descent angle implicit in the use of a mortar projectile enables the Strix projectile to overcome several attack problems. For example, it is possible to attack the lighter top armour of armoured fighting vehicles rather than attempting to defeat the front and side armour. The near-vertical final trajectory also allows the IR seeker to overcome concealment methods such as camouflage and smoke screening.

Specifications

Length, fuzed: 840 mm

Weight, fuzed: 18.2 kg

Type of payload: shaped charge

Fuze: PIBD

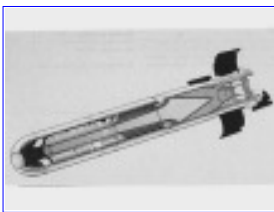
Min range: 1,000 m

Max range: 7,500 m

Manufacturer

Bofors AB.

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120 mm anti-armour bomb Strix



Loading the Strix terminally guided bomb

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MORTARS - 120 mm MORTARS, [SWEDEN](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb 266

Armament

All 120 mm smoothbore mortars.

Development

By FFV (now Bofors AB) to meet a demand from the Swedish Army for a smoke bomb, that would not bury in soft ground nor shatter against rocks on impact.

Description

The appearance of this bomb is quite conventional. It has a streamlined steel body with three gas check rings at the bourrelet and either a steel or an alloy tailboom and fins. A primary cartridge fits into the tailboom and the secondary increments fit around the boom.

The operation of the bomb is unique. A time fuze is fitted, when this functions, it first fires a small rocket motor which exhausts through a port in the side of the bomb just below the fuze. This causes the bomb to yaw sideways across its trajectory, and as it does so an expelling charge blows off the ogive of the bomb. This releases a small drag parachute which fills and pulls out a larger parachute. During this action the bomb is yawing more across its trajectory. Under the pull of the large braking parachute, which is firmly attached to the bomb afterbody, the bomb rapidly turns upside down. It has now lost all its flight momentum and is suspended beneath the braking parachute. The expelling charge that initiated all this action also lit a delay which now lights the smoke composition. The bomb afterbody now drops to the ground, emitting smoke as it does so, under the control of the braking parachute. It therefore lands

relatively gently so that it will not be shattered or buried.

The descent of the smoke container takes place at the same speed irrespective of range, so that the smoke screening ability remains the same throughout the whole firing range of the mortar. The smoke bomb is a close ballistic match for the standard Tampella pattern 120 mm HE mortar bomb.

An infra-red screening smoke composition has been developed and can be loaded into the smoke container at customers' request.

Specifications

Weight, fuzed: 13.3 kg, steel tail; 12.6 kg, alloy tail

Weight and type of payload: 3 kg HC/ZnO/CaSi mixture

Number of charges: 10

Fuze: mechanical time

Max range: 6,000 m

Chamber pressure: 1,000 bar, Charge 10

Restrictions: Bombs with alloy tail units may only be fired at Charge 8 and below.

Manufacturer

Bofors AB.

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120 mm smoke bomb 266, showing method of operation

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [SWEDEN](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Under 20 mm are identified by a coloured bullet tip or body.

Functional type	body colour	tip colour
Ball	unpainted	unpainted
Tracer	unpainted	white (15mm)
AP	unpainted	black (5-8mm)
AP (Tungsten core)	unpainted	black (15mm)
Incendiary	unpainted	orange
HE	yellow body and tip	--
HE-T	yellow body	white

Ammunition in calibres over 20 mm can be identified by a combination of projectile body colours and colour bands. Basic projectile body colours are:

Projectile type	projectile body colour
AP, APHE	black
SAP	red
HE	yellow (below 60 mm)

Canister, HE, smoke, incendiary and illuminating projectiles as well as hand grenades may be painted grey, may be unpainted, or have a special surface treatment. Colour bands around the centre of the projectile indicate functional type. Significance of these bands is as follows:

Colour band	Projectile type	Notes
Yellow	HE	Not used when base colour is yellow
Orange	Incendiary	-
Light grey	Smoke	-
Black	AP	Secondary capability

Colour bands are approximately one-tenth projectile diameter, but not less than 1 cm wide. When two or more rings are present, they are spaced approximately one ring's width apart.

Tracer ammunition is indicated by a model year designation or a colour band as follows:

When the tracer and projectile have different model year designations, the last two digits of the tracer model year are stencilled on the projectile ogive in the colour of the tracer. Height of figures is approximately one-fifth projectile calibre, but not over 0.5 cm.

Alternatively, when tracer and projectile are of the same model year, a colour band in the tracer colour may be stencilled on the projectile ogive. This ring will be approximately one-tenth projectile caliber, but no larger than 0.5 cm.

When all of the following conditions are met, no tracer marking is required (this provision applies to many HE-T projectiles in the 20-57 mm range):

- when the basic projectile colour is yellow
- when tracer and projectile model year is the same
- when the projectile model is manufactured only as a tracer
- when the tracer colour is normal for the projectile mode.

Practice ammunition that has an HE or incendiary filler will have either a blue ring of at least 1 cm diameter or a blue painted projectile. Inert loaded projectiles will have a brown ring three times the width of any other colour rings or a brown painted projectile.

Letter codes indicating projectile filler are placed next to the corresponding colour band. These codes are the same colour as the band. If there is no colour band, code letters are either black or white. Letter height is one-fifth projectile caliber and at least 1 cm in height when on the projectile body. When placed on the colour band, letters are at least 2 cm in height. Swedish letter codes are as follows:

A	TNT/ammonium nitrate mix
E	RDX/TNT (Hexotol)
F	white phosphorus
H	RDX (Hexogen)
K	black powder
N	trinitroanisol (Nitrolit)
R	smoke acid
T	TNT
Z	RDX/TNT/aluminum mix (hexotonal)
GRKT	shrapnel
LYS	illuminating
RSV	HEAT (Shaped charge)
ST	steel balls

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

6.5-284 Norma

Synonyms:

None

Armament

Suitably chambered rifles.

Development

The 6.5-284 Norma was developed as a joint venture between the Swedish firm Norma Precision AB and Black Hills Ammunition of the United States at the behest of the US military, which was seeking a cartridge with a trajectory approximating that of the [0.300 Winchester Magnum](#). The primary design goals were to reduce the recoil, noise signature and bore erosion associated with the [0.300 Winchester Magnum](#) without significantly reducing overall ballistic performance. The 6.5-284 was derived from the 0.284 Winchester sporting cartridge, which was selected in part because it provides a large capacity in a relatively short cartridge case. Except for energy, the ballistics of the 6.5-284 approach those of the [0.300 Winchester Magnum](#). The 6.5-284 is intended for match shooting and sniper use to a range of 1,000 m and beyond, and is presently undergoing evaluation by US military for both match and sniper use. The 9.2 g (142 gr) Sierra hollow point boat tail bullet remains supersonic to a range of 1,500 m. The 6.5-284 is manufactured for Norma in the United States by Black Hills Ammunition.

Description

The 6.5-284 Norma is a tapered bottleneck cartridge with brass case and rebated rim. The standard 7.7 g and 9.2 g bullets are coated with molybdenum disulphide to reduce friction and increase accuracy.

Specifications

Round length: 74.9 mm

Case length: 54.9 mm

Case head diameter: 11.96 mm

Bullet diameter: 6.7 mm

Bullet weight: 7.7 g; 9.2 g

Muzzle velocity: 7.7 g, 990 m/s; 9.2 g, 944 m/s

Muzzle energy: 7.7 g, 2,075 J; 9.2 g, 2,203 J

Abridged ballistic table: 6.5-284 Norma, 9.6 g bullet

Range	Velocity	Energy
0 m	944 m/s	2,203 J
100 m	897 m/s	1,989 J
200 m	851 m/s	1,791 J
300 m	807 m/s	1,609 J
400 m	764 m/s	1,442 J
500 m	723 m/s	1,290 J

SWEDEN

Manufacturer

Norma Precision AB

Type: Ball: HPBT, 7.7 g; MV 990 m/s

Ball: HPBT; 9.2 g; MV 944 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition

Type: Ball: HPBT, 7.7 g; MV 990 m/s

Ball: HPBT; 9.2 g; MV 944 m/s

Ball: HPBT; 9.0 g; MV 899 m/s

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*6.5-284 Norma
(1999)*

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Date Posted: 16 July 2001

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6 mm Norma BR

Synonyms:

None

Armament

Suitably chambered rifles.

Development

The 6 mm Norma BR cartridge was developed by the Swedish firm Norma Precision AB specifically to provide match shooters and snipers with a cartridge featuring light recoil, low noise signature and extreme accuracy. The cartridge fires a 6.9 g (107 gr) Sierra bullet which is coated with molybdenum disulphide to reduce bore friction and increase accuracy. The bullet remains supersonic to a range of 1,100 m and is highly resistant to crosswinds, due to its high ballistic coefficient and sectional density. The cartridge is also manufactured in the United States by Black Hills Ammunition.

Description

The case is rimless, bottlenecked and of brass. The only loading at the time of writing is a 6.9 g Sierra match hollow point boat tail bullet. The bullet is coated with molybdenum disulphide.

Specifications

Round length: 60 mm
Case length: 39.3 mm
Case head diameter: 11.8 mm
Bullet diameter: 6.4 mm
Bullet weight: 6.9 g
Muzzle velocity: 853 m/s
Muzzle energy: 1373 J

Abridged ballistic table: 6 mm Norma BR, 6.9 g bullet

Range	Velocity	Energy
0 m	853 m/s	1373 J
100 m	800 m/s	1208 J
200 m	749 m/s	1059 J
300 m	701 m/s	927 J
400 m	654 m/s	788 J
500 m	610 m/s	703 J

[SWEDEN](#)

Manufacturer

Norma Precision AB
Type: Ball: 6.9 g; MV853 m/s

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition
Type: Ball: HPBT, 6.9 g; MV 853 m/s

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*6 mm Norma BR
(1999)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.308 Norma Magnum

Synonyms:

none

Armament

Suitably chambered sporting and sniping rifles.

Development

This round was developed by Norma AB of [Sweden](#) in the late 1950s and introduced in 1960 simply as a primed case for hand loaders. In 1962 Norma initiated production of loaded cartridges. Since then, a number of manufacturers have produced rifles in this calibre. There has also been some interest in this round for sniping purposes because of its accuracy and terminal ballistics.

Description

A belted, brass, tapered, bottlenecked case. The standard bullet is a plastic-tipped patent Norma 'Dual-Core' expanding hunting bullet, but there is a variety of jacketed soft point 0.308 bullets available from various makers.

Specifications

Round length: 83.82 mm

Case length: 65 mm
Rim diameter: 13.43 mm
Bullet diameter: 7.82 mm
Bullet weight: 11.66 g
Muzzle velocity: 920 m/s
Muzzle energy: 4,924 J

Abridged ballistic table: 0.308 Norma Magnum, 11.66 g ball

Range	Velocity	Energy
0 m	920 m/s	4,924 J
100 m	846 m/s	4,164 J
200 m	776 m/s	3,503 J
300 m	709 m/s	2,924 J

[SWEDEN](#)

Manufacturer

Norma AB

Type: Ball `dual core': FMJ; 11.7 g; MV 920 m/s

Ball: JSP; 11.7 g; MV 920 m/s

Ball: JHP; 13 g; MV 885 m/s

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0.308 Norma Magnum

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SMALL ARMS

Date Posted: 16 July 2001

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7.7 × 58 mm Arisaka

Synonyms:

7 mm Japanese rimless; 7.7 mm Type 99

Armament

Japanese Type 99 rifle, Type 1, 97 and 99 machine guns.

Development

This cartridge was developed during the 1930s to provide a rimless cartridge for infantry use after concerns regarding feeding the rimmed .303 British (7.7 Arisaka) in machine guns and automatic rifles. The 7.7 × 58 mm has similar ballistics to both the .303 British and Type 92 semi-rimmed rounds but is better suited to feeding from rifle and light machine gun magazines. Its use appears to have been largely confined to Manchuria and mainland [China](#), and it was not common in the Pacific theatres of war. After 1945 manufacture continued under Chinese control for several years, and it can be expected to appear in the Far East for some years to come.

Description

A brass or lacquered steel, rimless, bottlenecked round of conventional pattern, Berdan primed. The usual tracer, AP, incendiary, explosive, blank and dummy variations were manufactured and there was a light ball round with an 11.7 g bullet, generally used in rifles, as well as the same 13 g Ball of the Type

92 round, for use in machine guns. As with the Type 92, the explosive bullet must be treated with caution.

Specifications

Round length: 79.75 mm

Case length: 57.75 mm

Rim diameter: 12.15 mm

Bullet diameter: 7.9 mm

Bullet weight: 11.6 g

Muzzle velocity: 760 m/s

Muzzle energy: 3,343 J

Abridged ballistic table: 7.7 × 58 mm, 11.6 g ball

Range	Velocity	Energy
0 m	760 m/s	3,343 J
100 m	693 m/s	2,780 J
200 m	630 m/s	2,297 J
300 m	571 m/s	1,887 J

SWEDEN

Manufacturer

Norma AB

Type: Ball; JSP; 8.4 g; MV 900 m/s

Ball: JSP; 11.6 g; MV 760 m/s

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7.7 × 58 mm Arisaka

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SMALL ARMS

Date Posted: 16 July 2001

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7.65 × 53 mm

Synonyms:

7.65 mm Mauser ; 7.65 mm Argentine Mauser; 7.65 mm Belgian Mauser; 7.65 mm Turkish Mauser.

Armament

Mauser rifles; Colt, Maxim, Browning and other machine guns.

Development

This cartridge, designed in 1889, was adopted by Belgium, resulting in construction of a new ammunition manufacturing facility that eventually became Fabrique Nationale d'armes de Guerre, Herstal. The cartridge was widely adopted in South America, notably by the Argentine, Bolivian, Colombian, Ecuadorian, Paraguayan and Peruvian armies, as well as being used in [Turkey](#) and elsewhere. As a result, this cartridge and rifles chambered for it can be found all over South America and may well still be in reserve stocks. Sporting rifles in this chambering were once popular and sporting ammunition is still made.

Description

A rimless, bottlenecked, brass case, Berdan primed. The standard ball bullet was originally FMJ with a round nose, but this was later changed to an ogival shape with both streamlined and flat-based types being used.

Specifications

Round length: 74.9 mm

Case length: 53.1 mm

Rim diameter: 11.9 mm

Bullet diameter: 7.9 mm

Bullet weight: 11.3 g

Muzzle velocity: 806 m/s

Muzzle energy: 3,670 J

Abridged ballistic table: 7.65 × 53 mm, 11.3 g ball

Range	Velocity	Energy
0 m	806 m/s	3,670 J
100 m	731 m/s	3,019 J
200 m	661 m/s	2,469 J
300 m	596 m/s	2,007 J

SWEDEN

Manufacturer

Norma AB

Type: Ball: PSP; 9.7 g; MV 811 m/s

Ball: JHP; 11.7 g; MV 790 m/s

YUGOSLAVIA, FEDERAL REPUBLIC

Manufacturer

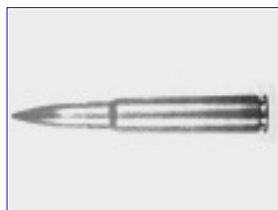
Yugoimport SDPR

Type: Ball: FMJ; 11.3 g; MV 806 m/s

Ball: FMJ; 12.4 g; MV 762 m/s

Ball: PSP; 11.7 g; MV 774 m/s

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7.65 mm Argentine Mauser

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

6.5 × 50SRmm

Synonyms:

6.5 mm Japanese; 6.5mm Arisaka

Armament

Japanese Arisaka rifles and carbines, Japanese machine guns pre-1945.

Development

First issued in 1897 this remained the standard Japanese rifle and machine gun round until after 1945. After the war many thousands of Japanese rifles and machine guns were taken by the Chinese, and ammunition was made in [China](#) until the 1950s. Many were also brought back to the USA as war souvenirs by returning servicemen and some are still in use in North America. Many more weapons were distributed around Asia and this cartridge will doubtless be encountered for some time to come.

Description

Unlike other 6.5 mm cartridges of similar vintage, the Arisaka used a semi-rimmed, bottlenecked brass case and it is the shortest of the class. The original bullet was a jacketed round-nose pattern, subsequently replaced by a non-streamlined pointed type. Japanese cartridges bore no headstamp; Chinese ammunition has the usual Chinese Communist pattern headstamp, whilst commercially made ammunition carries the usual commercial types of marking.

Specifications

Japanese service cartridge

Round length: 75.7 mm

Case length: 50.8 mm

Rim diameter: 12.14 mm

Bullet diameter: 6.65 mm

Bullet weight: 9 g

Muzzle velocity: 720 m/s

Muzzle energy: 2,333 J

Abridged ballistic table: 6.5 × 50SR, 9 g ball

Range	Velocity	Energy
0 m	720 m/s	2,333 J
100 m	652 m/s	1,917 J
200 m	589 m/s	1,561 J
300 m	529 m/s	1,261 J

SWEDEN

Manufacturer

Norma AB

Type: Ball: FMJ; 9 g; MV 785 m/s

Ball: PSP; 10.1 g; MV 740 m/s

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6.5x50SRmm

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SMALL ARMS

Date Posted: 10 April 2002

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0.300 Whisper

Synonyms:

none

Armament

Selected compact assault rifles. Most rifles chambered for this cartridge are adopted from [AR-15](#) or M-16 rifles.

Development

The 0.300 Whisper was designed by J D Jones of SSK Industries for firing extremely heavy, accurate, ballistically efficient bullets at subsonic velocities. The cartridge was subsequently adopted for use in suppressed weapons by a number of US special operations organisations and is in use by special operations units worldwide. Although expressly designed for use with suppressed weapons, use of the 0.300 Whisper is spreading to non-suppressed firearms, as it generates no sonic 'boom' upon leaving the muzzle in its subsonic loadings and in this version, the bullet delivers more energy on target at 200 m than any western subsonic round, save for other 'Whisper' cartridges. Unsuppressed, the subsonic version has less noise at the muzzle than a standard 9 × 19 mm ball round.

Description

The cartridge is derived from the 0.221 Remington and is necked up to accept a 0.308 (7.62 mm) bullet.

The case is rimless, bottlenecked, Boxer primed and loaded with relatively heavy bullets which range in weight from 8.1 g to 15.5 g in standard loadings.

Specifications

Round length: 56.8 mm

Case length: 35.5 mm

Head diameter: 9.6 mm

Bullet diameter: 7.62 mm

SWITZERLAND

Manufacturer

RUAG Munition (formerly SM Swiss Ammunition Enterprise Corp)

Type: SWISS P Subsonic: HPBT; 14.3 g; MV 320 m/s

SWISS P Armour Piercing: FMJHC; 12.7 g; MV 855 m/s; penetration 500 m: body armour class 4++

SWISS P [Styx](#) Action: HPBT; 12.85 g; MV 880 m/s

Note: SWISS P cartridges are Ballistically matched to a range of 450 m.

UNITED STATES OF AMERICA

Manufacturer

Cor-Bon

Type: Ball: JHP; 8.1 g; MV 640 m/s

Ball: JHP; 9.7 g; MV 610 m/s

Subsonic Ball: JHP; 14.3 g; MV 305 m/s

Manufacturer

SSK Industries

Type: Ball: JHP; 8.1 g; MV 696 m/s

Ball: FMJ; 8.1 g; MV 696 m/s

Ball: FMJ; 10.7 g; MV 309 m/s

Ball: JHP; 10.7 g; MV 319 m/s

Ball: FMJ; 14.3 g; MV 309 m/s

Ball: FMJ; 15.5 g; MV 317 m/s

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*0.300 Whisper Cartridge
(1998)*

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, SWITZERLAND

Date Posted: 10 April 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 40 mm, LV Frag Gren 97 RUAG

Armament

Low-velocity grenade launchers of the M79 and [M203](#) types.

Development

By RUAG Munition to a Swiss Military requirement.

Description

The model 97 is a conventional 40 × 46 mm projected grenade. It is designed to be effective up to 150 m in built-up areas. It uses a special propellant and plastic rotating band to enhance accuracy and reduce bore wear in the grenade launcher. The projectile body is pre-fragmented to enhance effectiveness within the lethal radius. The model 97 is equipped with an impact fuze and AZ-Z DM411 A1 self-destruct device which functions approximately 9 seconds after launch.

Specifications

Type: HE

Round length: 117 mm

Round weight: 285 g

Projectile weight: 220 g

Payload: 40 g, Comp B

Muzzle velocity: 78 m/s

Max range: 400 m

Colour/markings: unpainted metal/black, yellow ogive

Status: In Swiss military service, available.

Manufacturer

Swiss Munitions Enterprise.

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MORTARS - 120 mm MORTARS, SWITZERLAND

Date Posted: 10 April 2002

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120 mm Mortar Cargo Round

Armament

All 120 mm smoothbore mortars

Development

By RUAG Munitions

Description

The 120 mm Mortar Cargo Round contains 32 dual-purpose HEAT grenades which have impact fuzes with two independent safety mechanisms. An extra self-destruction device leaves virtually no armed duds. Once the round is over the target area, the pre-set time fuze ignites the expulsion charge. The payload ejects from the round body and the gas generator disperses the 32 grenades to cover a wide controlled area on the ground. As soon as the grenade hit the ground or target, the grenade fuze will activate the warhead. If for any reason the impact does not cause an explosion, a pyrotechnic delay back up mechanism will activate the armed grenades. Unarmed grenades will be neutralised by the self-delay mechanics.

A lethal pattern that is charge and range independent is provided by the round's unique dispersion system. Each grenade explodes into approximately 900 lethal fragments. The average fragment effectiveness for each grenade is 80 J at a distance of 5 m from the detonating point. The minimum average penetration into RHA steel (MIL-A 12560 or equivalent) at built-in standoff is 70 mm, enough to defeat any APC, SPH and many MBT's.

Specifications

Type: electrical or mechanical time

Length:

fuzed - 827 mm with DM-93 fuze

unfuzed - 763 mm

Weight, fuzed: 14.4 kg

Type of Payload: 32 DPICM grenades, 42 mm dia, 33 g RDX

Fuze: mechanical time; grenades, impact with self destruct

Max range: 7,200 m, depending on charge and mortar

Status: In production, available

Manufacturer

RUAG Munition

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CANNON

Date Posted: 10 April 2002

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25 × 184 mm

Synonyms:

[25 mm Oerlikon KBB](#)

Armament

Oerlikon KBB cannon.

Development

This was developed by Oerlikon in the early 1980s, in order to produce a 25 mm cannon with more power than the KBA for air defence or vehicle armament roles. It is used in the four-barrel 'Seaguard' naval Close-In Weapon System (CIWS).

Description

The case is rimless, bottlenecked, lacquered steel and has a screw-in percussion primer. The projectile is secured to the case by an eight-point crimp. Projectiles are described below. Ammunition is currently manufactured only by Oerlikon Contraves Pyrotec AG.

Specifications

Round length: 288 mm

Case length: 184 mm

Rim diameter: 38.6 mm
Bourellet diameter: 24.9 mm
Projectile weight: 230 g
Muzzle velocity: 1,160 m/s
Muzzle energy: 154.7 kJ

Equivalent rounds

SWITZERLAND

Manufacturer

Oerlikon Contraves Pyrotec AG

Type: HE-I: Hardened steel shell with ballistic cap, filled 20 g Hexal P15 combined with an incendiary composition; base fuze providing self-destruction after about 9 seconds flight; 230 g; MV 1,160 m/s

APDS-T: A 156 g heavy metal penetrator core with light alloy ballistic cap, in a plastic/alloy sabot with base tracer; 190 g; MV 1,285 m/s. Penetration 34 mm at 60° at 1,000 m

AMDS: This is virtually the same as the APDS-T projectile but does not contain a tracer. It is intended for the attack of sea-skimming anti-ship missiles. 190 g; MV 1,270 m/s. This projectile fulfils all the conditions necessary to destroy a missile warhead at ranges exceeding 1,000 m, with the missile closing at speeds from M0.9 to M3.0

FAPDS: This resembles the APDS in form but uses a frangible subprojectile which, after penetrating the target, disintegrates into fragments to cause widespread internal damage. 190 g; MV 1,285 m/s

TP: Steel shell, filled inert; dummy fuze. 230 g; MV 1,160 m/s

TP-T: Steel shell, filled inert with red tracer; dummy fuze; 230 g; MV 1,160 m/s

TPDS-T: Steel subprojectile in alloy/plastic sabot, with tracer; 190 g; MV 1,285 m/s

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Oerlikon-Contraves Pyrotec 20 × 184mm AG ammunition for the KBB gun: (left to right) TP; TP-T; TPDS-T; HE-I; FAPDS; AMDS; APDS-T



25 × 184 mm Oerlikon

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MORTARS - 120 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm smoke bomb

Armament

All 120 mm smoothbore mortars.

Development

By SM Swiss Munition Enterprise for Swiss 120 mm mortars Mw 64, Mw 74 and Fest Mw 59. **It is no longer in production.**

Description

This uses the same body, tailboom and propelling charges as the HE bomb described previously. It differs only in its internal arrangements, having the usual central burster and the rest of the body cavity filled with White Phosphorus (WP).

Specifications

Weight, fuzed: 14.33 kg

Type of payload: WP

Number of charges: P + 8

Fuze: impact, SQ and delay

Max range: 7,500 m

Muzzle velocity: 128-420 m/s

Manufacturer

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MORTARS - 120 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm illuminating bomb M74

Armament

All 120 mm smoothbore mortars.

Development

By SM Swiss Munition Enterprise for Swiss 120 mm mortars Mw 64, Mw 74 and Fest Mw 59. **It is no longer in production.**

Description

This is a conventional parachute-and-flare type of illuminating bomb. The body and payload are manufactured in [Sweden](#), but the tailboom and fins, propelling charge and the mechanical time fuze are all of Swiss manufacture and the bomb is assembled in Switzerland.

Specifications

Weight, fuzed: 15 kg

Type of payload: parachute and flare

Number of charges: P + 8

Fuze: mechanical time

Max range: 7,000 m

Illumination area: 1,000 m diameter

Rate of descent: 5 m/s

Ejection height: 500 m

Manufacturer

SM Swiss Munition Enterprise (now RUAG Munition).

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MORTARS - 120 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

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120 mm HE bomb

Armament

All 120 mm smoothbore mortars.

Development

By RUAG Munition for use in Swiss 120 mm mortars Mw 64, Mw 74 and Fest Mw 59.

Description

The bomb is a streamlined model, with five gas check grooves around the bourrelet and a long afterbody taper leading into an alloy tailboom and fins. A primary cartridge fits into the tailboom and the propellant charges, in horseshoe containers, fit around the boom.

Specifications

Weight, fuzed: 14.33 kg

Type of payload: TNT

Number of charges: P + 8

Fuze: impact, SQ and delay

Max range: 7,500 m

Muzzle velocity: 128-420 m/s

Manufacturer

RUAG Munition (formerly SM Swiss Munition Enterprise).

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MORTARS - 81 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm illuminating bomb M73

Armament

Swiss Models 1933 and 1972 mortars.

Development

A Swedish design manufactured by Swiss Munitions Enterprise (now RUAG Munition). It is no longer in production.

Description

A conventional tubular bomb with time fuze. It carries a parachute and flare unit, which is ejected some 300 m above the target area, and illuminates an area about 650 m in diameter.

Specifications

Weight, fuzed: 3.5 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time

Min range: 500 m

Max range: 3,250 m

Duration of illumination: 30 s

Rate of descent: 4 m/s

Manufacturer

SM Swiss Munitions Enterprise (now RUAG Munition).

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MORTARS - 81 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

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81 mm high-capacity HE/fragmentation bomb

Armament

Swiss Models 1933 and 1972 mortars.

Development

By Swiss Munitions Enterprise. *It is no longer in production.*

Description

This is a large, heavy bomb intended to have the greatest possible destructive effect within the limitations of the calibre.

Specifications

Weight, fuzed: 6.89 kg

Type of payload: TNT

Number of charges: P + 4

Fuze: impact SQ

Max range: 1,070 m

Muzzle velocity: 64-110 m/s

Manufacturer

SM Swiss Munitions Enterprise (now RUAG Munition).

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MORTARS - 81 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

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81 mm HE bomb

Armament

Swiss Models 1933 and 1972 mortars.

Development

By Swiss Munitions Enterprise. **It is no longer in production.**

Description

A teardrop-shaped bomb of conventional pattern with four gas check grooves around the bourrelet. The tail unit carries a primary cartridge and six secondary charges.

Specifications

Weight, fuzed: 3.17 kg

Type of payload: TNT

Number of charges: P + 6

Fuze: impact SQ or delay

Max range: 4,100 m

Muzzle velocity: 70-260 m/s

Manufacturer

SM Swiss Munitions Enterprise (now RUAG Munition).

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MORTARS - 60 mm MORTARS, SWITZERLAND

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm MAPAM

Armament

Swiss 60 mm Commando Mortar Weapon System 87 and US [M224](#) 60 mm mortar. The round can be adapted to custom mortars.

Development

By RUAG Munition.

Description

The prefragmented steel ball and epoxy matrix design of the fragmentation body, as well as the insert of the explosive body, form the main structural elements of the efficient modular design. More than 2,500 ball bearing fragments of identical mass and energy are held within the thin shell body. It is said to provide highly effective action against light skinned enemy vehicles, parked aircraft and troops in the open. The Extruded/Impregnated (E/I) propellant system consists of an ignition charge and four horseshoe-shaped charge increments. This system enables RUAG to fulfil various customer specifications.

Specifications

Weight, fuzed: 1.800 kg

Type of payload: Composition B or PBXN-110

Number of charges: P + 4

Fuze: impact SQ

Max range: 3,500 m

Muzzle velocity: 240 m/s

Manufacturer

RUAG Munition (formerly SM Swiss Ammunition Enterprise).

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FUZES - IMPACT FUZES, SWITZERLAND

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

F967

Armament

60, 81 and 120 mm smoothbore mortar bombs.

Development

The F967 fuze was developed by Miltec SA to a Swedish Army requirement, with which it has been in service since 1987.

Description

The F967 is a mechanical super-quick impact mortar fuze which incorporates the latest fuze technology while meeting all national and NATO safety requirements. The F967 meets STANAG 3525 (MIL-STD-1316), MIL-STD-331 and MIL-STD-105. It is designed to be simple, reliable and economical. The fuze is ignited mechanically upon impact. Setting the fuze between 'arm' and 'safe' is accomplished by simply turning the nose cap. The status of the fuze can be checked either visibly via a sight glass or by touch. There is no stored energy before firing, the fuze is rain safe and can be dropped when in the armed position without danger of functioning. There are no pull wires and final arming is by setback upon firing. The F967 can be fitted with an impact rod to produce an above ground detonation. The F967 is adaptable to any mortar bomb from 60 to 120 mm. The F967 will function at angles of 50 to 90° from horizontal.

Specifications

Type: impact, SQ

Optional delay: none

Arming requirement: >500 g

Arming distance: 100 m

Manufacturer

Miltec, SA.

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(1998)*

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FUZES - IMPACT FUZES, SWITZERLAND

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

F930

Armament

60, 81 and 120 mm smoothbore mortar bombs.

Development

The F930 fuze was developed by Miltec SA as a private venture.

Description

The F930 is a mechanical super-quick impact mortar fuze of modular design, making it easily adaptable to any mortar bomb between 60 and 120 mm calibre. The fuze mechanism can be adapted to virtually any round, due to the modular design feature. The F930 meets STANAG 3525 (MIL-STD-1316), MIL-STD-331 and MIL-STD-105. The fuze is ignited mechanically upon impact. Setting the fuze between 'arm' and 'safe' is accomplished by simply turning the nose cap. The status of the fuze can be checked either visibly via a sight glass or by touch. A timing mechanism returns the fuze to the 'safe' position if it is not fired within a set time limit. There is no stored energy in the F930 before firing, the fuze is rain safe and can be dropped when in the armed position without danger of functioning. There are no pull wires and final arming is by setback and time upon firing. The F930 can optionally be provided with a delay setting in addition to super-quick. The F930 will function at angles of 50 to 90° from horizontal.

Specifications

Type: impact, SQ or optional delay

Arming requirement: >500 g

Arming distance: 50 m

Manufacturer

Miltec, SA.

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FUZES - IMPACT FUZES, SWITZERLAND

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

F975

Armament

81 and 120 mm smoothbore mortar bombs.

Development

The F975 fuze was developed by Miltec SA to a Swiss Army requirement.

Description

The F975 is an electronically ignited super-quick or delay impact mortar fuze which is adaptable to any mortar bomb between 81 and 120 mm calibre. The F975 meets STANAG 3525 (MIL-STD-1316), MIL-STD-331 and MIL-STD-105. The fuze is ignited electrically upon impact. If the F975 does not function for some reason, it automatically renders itself inert 60 minutes after impact, making it safe to handle. Setting the fuze between 'arm' and 'safe' is accomplished by simply turning the nose cap. The status of the fuze can be checked either visibly via a sight glass or by touch. A timing mechanism returns the fuze to the 'safe' position if it is not fired within a set time limit. There is no stored energy in the F975 before firing, the fuze is rain safe and can be dropped when in the armed position without danger of functioning. There are no pull wires and final arming is by setback and time upon firing. The F975 can be set to a 15-30 ms delay as an alternative to super-quick. The F975 fuze will function at any angle of attack.

Specifications

Type: impact, SQ or optional delay

Arming requirement: >500 g

Arming distance: 150 m

Manufacturer

Miltec, SA.

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FUZES - IMPACT FUZES, SWITZERLAND

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

K85M

Armament

60, 81 and 120 mm smoothbore mortar bombs.

Development

By Degen to meet a Swiss Army requirement; qualified by the Federal Ammunition Factory in 1991 for use by the Swiss Army.

Description

This is a mechanical nose fuze providing super-quick action. In the rest position the firing train is interrupted by an out-of-line detonator, held safe by two safety devices, a pull-out safety wire and a setback pin. The wire is removed before loading; on firing, the setback pin pulls clear of the detonator carrier which moves into alignment under the restraint of an escapement mechanism

There are four variant models of this fuze; the K85M is threaded 1.5 in 12 tpi UNS 2A; the [K85 Special](#) is threaded M38 × 2 with a 46 mm diameter body, for use in 82 mm bombs; the [K85 \(V19P\)](#) is threaded 35.8 × 2 mm with a 47.55 mm diameter body to suit French and other bombs threaded to the Hotchkiss Brandt fuze well gauge; and the [K85 Modified](#) can be threaded to suit customer requirements.

Specifications

Type: impact, SQ

Thread: 1.5 in × 12 tpi UNS 2A (but see text)

Length overall: 78.7 mm

Intrusion: 28.5 mm

Diameter: 49 mm

Optional delay: none

Arming requirement: >500 g

Arming distance: to customer requirement

Manufacturer

Degen & Company AG.

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Degen K85M impact fuze

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IDENTIFICATION OF SMALL ARMS AMMUNITION, SWITZERLAND

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

HE	yellow body
Incendiary	pink body
HE-I	half yellow, half pink body
Tracer	red body

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IDENTIFICATION OF SMALL ARMS AMMUNITION, SWITZERLAND

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

System is based upon colouring the base of the cartridge case:

Tracer	violet
AP	red

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CANNON

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

30 × 173 mm MK 30 ammunition

Armament

Mauser MK 30 cannon series; 30 mm GAU-8/A Avenger gun system; [30 mm Bushmaster II](#); Goalkeeper CIWS; SAMOS CIWS; Artemis 30 mm air defence system; [Arrow twin 30 mm](#) air defence system; Otobreda Single 30 and Twin 30 naval mountings.

Development

The 30 × 173 mm Mauser round is based on the 30 × 173 mm Oerlikon Contraves round and was adopted for the Mauser MK 30 cannon. MK 30-1 cannon are intended for naval applications, while MK 30-2 cannon are intended for land systems, such as infantry and armoured vehicle armament.

The range of General Dynamics Ordnance and Tactical Systems (formerly PRIMEX Technologies, Olin Ordnance and before then Aerojet) 30 × 173 mm air defence ammunition was developed for use with the Artemis 30 mm air defence system. For details of the ammunition for this system refer to separate entry in this section

The German [Arrow twin 30 mm](#) air defence system was developed for the Royal Thai Air Force. This 30 × 173 mm ammunition is based on the GAU-8/A family but features significant improvements and could be fired from all existing GAU-8/A compatible cannon. Well over 400,000 rounds of 30 × 173 mm ammunition have been produced by PRIMEX for various international customers utilising the Mauser cannon.

A team of Mauser and Oerlikon-Contraves Pyrotec AG are developing a 30 × 173 mm subcalibre family specifically for the Bushmaster II and Mauser MK 30 cannon. See separate entry for available details.

Description

All 30 × 173 mm MK 30 rounds are fixed, with their streamlined projectiles secured to aluminium cartridge

cases by a single cannelure and with a single wide plastic drive band encircling the projectile body just above the case/projectile joint. The necked cases are rimless and have a percussion primer in the base. Cartridge cases may be aluminium or steel: the Mauser Model MK 30-1 fires aluminium cartridge-cased ammunition while the MK 30-2 fires steel cases.

There are three ballistically matched projectiles in the family; APDS-T, HE-I/SD-T and TP-T.

The APDS-T projectile has a blunt hollow nose with a glass-filled nylon sabot body enclosing a subcalibre tungsten penetrator. The sabot falls away from the penetrator soon after the projectile leaves the muzzle. A thin light-alloy windshield then provides ballistic efficiency for the blunt-nosed subcalibre penetrator, which is claimed to be capable of defeating twice the armour thickness of the full calibre 30 mm GAU-8/A API projectile at a range of 1,500 m.

Muzzle velocity of the APDS-T projectile is 1,225 m/s and time of flight to 2,000 m is 1.87 seconds.

Compared to the APDS-T, the HE-I/SD-T projectile has a more conventional streamlined profile and high-fragmentation steel body, with a point impact fuze screwed into the nose. The nose fuze contains a self-destruct element which functions after 7.9 seconds, while the projectile base contains an extrusion housing the tracer element.

Muzzle velocity of the HE-I/SD-T projectile is 1,035 m/s and time of flight to 2,000 m is 2.96 seconds.

The TP-T is a low-cost training round ballistically matched to the HE-I/SD-T. A ballistic windshield replaces the normal nose fuze and there is provision for an optional impact flash spotting charge. The tracer element is housed in a machined cavity in the projectile base.

Mauser-produced rounds for the MK 30 and the German Arrow twin-barrelled air defence system include HE-I/SD-T, MP-T, SAPHEI-T, APDS-T, APFSDS, and TP or TP-T.

Specifications

Type	APDS-T	HE-I/SD-T	TP-T
Weights			
complete round	560 g	670 g	670 g
projectile	225 g	363 g	363 g
Lengths			
complete round	258 mm	290 mm	290 mm
cartridge case	173 mm	173 mm	173 mm
Muzzle velocity	1,225 m/s	1,035 m/s	1,035 m/s

Authorised fuzes

No information available

Equivalent rounds

SWITZERLAND

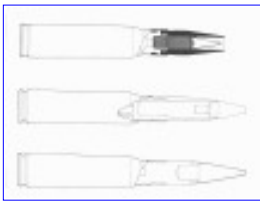
Manufacturer

Oerlikon Contraves Pyrotec AG

Type: FAPDS-T, APFSDS-T

Description: See separate entry

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30 × 173 mm air defence ammunition: from top, APDS-T; HE-I/SD-T; TP-T



30 × 173 mm Mauser Model F ammunition: from left, APDS-T; HEI/SD-T; TP-T

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [SYRIA](#)

Date Posted: 16 July 2001

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All types:

Uses RAFS code

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [TAIWAN](#)

Date Posted: 16 July 2001

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All types:

US standard system

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 76 mm: HE, M352

Armament

76 mm M32 Cannon used on [M41](#) light tanks.

Development

The 76 mm HE M353 was originally developed for the 76 mm M1 series of guns, used on the M4 Sherman tank series and the [M18](#) gun motor carriage. Later developments from 1947 onwards led to the 76 mm M32 gun for the [M41](#) Walker Bulldog light tank series, the first of which was produced during 1951.

The 76 mm [M41](#) gun and its ammunition are no longer used by the US Army but remain in service with [Brazil](#), [Chile](#), Denmark, [Dominican Republic](#), [Guatemala](#), [Somalia](#), Spain (reserve), [Taiwan](#), [Thailand](#) (store), [Tunisia](#) and [Uruguay](#). Some of these nations have updated their M41s to accept Cockerill 90 mm guns (for example [Uruguay](#)).

Description

The 76 mm HE M352 (actual calibre is 76.2 mm) is a fixed round with the projectile crimped to the brass or steel cartridge case. One unusual feature of this round, and the other rounds in the US 76 mm tank gun series, is a crimped case over the projectile's specially designed drive band which has a groove to accept the cartridge case crimp.

The 76 mm HE M352 projectile is a thin-walled steel forging with the interior filled with 662 g of

Composition B. A PD or MTSQ fuze is threaded into the fuze well in the nose.

The cartridge case may either be an [M88](#) (brass) or M88B1 (lacquered steel). The base-mounted percussion primer may be either the [M58](#) or [M68](#). A support spacer is located between the propellant and the base of the projectile. The propelling charge is 1.65 kg of [M6](#) propellant.

Muzzle velocity is 716 m/s and maximum range 14,338 m.

Specifications

Weights:

complete round - 11.58 kg

explosive - 662 g Comp B

propellant - 1.65 kg [M6](#)

Lengths:

complete round - 865.1 mm

cartridge case - 575 mm

Muzzle velocity: 716 m/s

Max range: 14,338 m

Authorised fuzes

PD M51A5, [M78](#) series M535 M557 MTSQ M520 series

Equivalent rounds

[TAIWAN](#)

Manufacturer

Hsing Hua Company Ltd

Type: 76 mm HE M352

Description: Standard US specifications

[TURKEY](#)

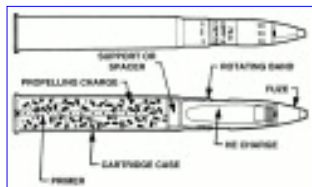
Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 76 mm HE-T M352A1

Description: Standard US specifications. Production on request

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Outline and cross-section drawings of Cartridge, 76 mm: HE, M352 (2000)

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TANK AND ANTI-TANK GUNS

Date Posted: 23 January 2002

Jane's Ammunition Handbook 2002-2003

Cartridge, 76 mm: HVAP-T, M319

Armament

M32 Cannon used on [M41](#) light tanks.

Development

The 76 mm HVAP-T M319 round was originally developed for the 76 mm M1 series of guns used on the M4 Sherman tank series and the [M18](#) gun motor carriage. Developments from 1947 onwards led to the 76 mm M32 gun for the [M41](#) Walker Bulldog light tank series, the first of which was produced during 1951. The 76 mm HVAP-T M319 is intended for use against armoured targets.

This round is no longer in the US inventory.

Description

The 76 mm HVAP-T M319 (actual calibre is 76.2 mm) is a fixed round with the projectile crimped to the brass or steel cartridge case. One unusual feature of this round, and the other rounds in the US 76 mm series, is that the case is crimped over the projectile's specially designed drive band which has a groove to accept the cartridge case crimp.

The projectile used with the 76 mm HVAP-T M319 has a core of tungsten carbide housed in an aluminium alloy body fitted with a conical aluminium windshield. An M5A1 or M5A1B1 tracer is threaded into a cavity in the base of the core. As the round is fired the tracer is ignited by the propellant gases to mark the early stages of the trajectory. On impact with a target the windshield breaks up to allow the tungsten carbide core to penetrate the target armour by kinetic energy.

The cartridge case may be either an [M88](#) (brass) or M88B1 (lacquered steel). The base-mounted

percussion primer is the [M58](#), which contains 25.9 g of black powder, or the [M62](#). The propelling charge is 2.28 kg of [M6](#) propellant.

Muzzle velocity is 1,234 m/s and maximum range 9,885 m.

Specifications

Weights:

complete round - 8.63 kg

propellant - 2.28 kg [M6](#)

Lengths:

complete round - 828 mm

cartridge case - 575 mm

Muzzle velocity: 1,234 m/s

Max range: 9,885 m

Authorised fuzes

None involved

Equivalent rounds

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 76 mm HVAP-T M319

Description: Standard US specifications. Production on request

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MORTARS - 60 mm MORTARS, [TURKEY](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE mortar bomb M49A2

Armament

60 mm Commando mortar

Development

By [MKEK](#) for use in the company's 60 mm Commando Mortar

Description

The [MKEK](#) M49A2 is for all intents and purposes identical to the US M49A2, which is obsolete in US service. It is a teardrop shaped, conventional bomb with a cast steel body and four gas check grooves. There are four propelling charges retained between the stabilising fins. The propelling charges are ignited by a shotgun-type ignition M5A1 cartridge inserted into the fin assembly. The AZDM 111A2 impact fuze appears to be a close copy of the similar Junghans DM 111A2 fuze.

Specifications

Length, overall: 242.73 mm

Weight, overall: 1.421 kg

Payload: TNT

Number of charges: 4

Fuze: AZDM 111A2

Muzzle velocity: 158 m/s

Max range: 1814 m

Manufacturer

Makina ve Kimya Endüstrisi Kurumu.

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MORTARS - 120 mm MORTARS, [TURKEY](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MKEK 120 mm mortar bombs

Description

The [MKEK](#) 120 mm mortar bombs are licence-produced [TDA](#) designs intended for the [MKEK](#) 120 mm Tosam HY 12 D1 mortar, itself a licence-produced [TDA](#) MO-120-RT rifled mortar. The Turkish rounds thus closely resemble their French equivalents and differ from them only in detail. As such they are spin-stabilised projectiles with a prerifled drive band, a plastic obturating band at the rear and an extension to carry the propellant charges protruding from the base. The extension falls to the ground once the projectile has left the mortar barrel.

The high-explosive round is the HE MKE Mod 209, filled with TNT and fitted with a locally produced M51A5 or M557 point detonating fuze. Maximum range is 8,180 m. The closest French equivalent is the [TDA](#) PR 14.

To complement the HE MKE Mod 209 for training purposes, [MKEK](#) produces the TP MKE Mod 228. This has an inert filling and a dummy fuze. Apart from the usual blue colour, it is identical to the operational HE equivalent.

The illuminating bomb is the MKE Mod 236, a close derivative of the [TDA](#) 120 mm PRECLAIR. It carries a flare and parachute assembly capable of producing 850,000 cd for 60 seconds. The fuze is the MTSQ [DM 93](#) or M501.

[MKEK](#) also produces the smoke WP MKE Mod 226. This contains White Phosphorus (WP), which is released by a burster charge to create screening smoke when the M51A5 or M557 point detonating fuze impacts on a target area.

The final member of the 120mm family is the Mod 258 cargo round which carries 16 [M85](#) submunition bomblets that are ejected over the target.

Specifications

Type	HE	Illum	smoke	TP	Bomblet
Designation	Mod 209	Mod 236	Mod 226	Mod 228	Mod 258
Length	827 mm	827 mm	827 mm	827mm	827 mm
Weight	17 kg	16 kg	17.4 kg	17 kg	23 kg
Muzzle velocity	365 m/s	365 m/s	365 m/s	365 m/s	365 m/s
Max range	8,180 m	8,132 m	8,180 m	8,132 m	8,180 m

Manufacturer

Makina ve Kimya Endüstrisi.

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[MKEK](#) 120 mm mortar bombs, from left; HE MKE Mod 209, smoke WP MKE Mod 226, TP MKE Mod 228, illuminating MKE Mod 236

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MORTARS - 107 mm MORTARS, [TURKEY](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MKEK 107 mm mortar bombs

Description

[MKEK](#) licence produces 107 mm mortar bombs for 4.2 in M2 and [M30](#) rifled mortars, in service with the Turkish armed forces. The [MKEK](#) bombs closely follow the US originals but a few local modifications have been introduced to suit local manufacturing processes and user requirements.

The high-explosive round is the M329B1, filled with TNT and fitted with a locally produced M51A5 or M557 point detonating fuze. Maximum range is 5,500 m.

To complement the HE M329B1 for training purposes, [MKEK](#) produces the TP MKE Mod 217. This has an inert filling and weighs only 9.9 kg without a dummy fuze. Apart from the usual blue colouration, it is identical to its operational equivalent.

The illuminating bomb is the M335A2, a direct copy of the US original carrying a flare and parachute assembly capable of producing 850,000 cd for 60 seconds. The fuze is the MTSQ M501.

To complete their 107 mm mortar ammunition suite, [MKEK](#) produces the smoke M328A1. This is another licence-produced US bomb containing White Phosphorus (WP) which is released by a burster charge to create screening smoke when the M51A5 or M557 point detonating fuze impacts on a target area.

Specifications

Type	HE	ill	smoke	TP
Designation	M329B1	M335A2	M328A1	Mod 217
Length	655 mm	650 mm	655 mm	655 mm
Weight	12.324 kg	12.4 kg	13.6 kg	9.9 kg*

Muzzle velocity	292 m/s	293 m/s	293 m/s	292 m/s
Max range	5,500 m	5,600 m	5,600 m	n/avail

* unfuzed

Status: In production.

Service: Turkish armed forces.

Manufacturer

Makina ve Kimya Endüstrisi.

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[MKEK 107 mm](#) mortar bombs; HE M329B1 (left) and TP MKE Mod 217



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MORTARS - 81 mm MORTARS, [TURKEY](#)

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MKEK 81 mm mortar bombs

Description

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#)) produces 81 mm mortar ammunition of varying types. One HE bomb, intended for use with locally held M1 and [M29](#) mortars, is a licence-produced US M43A1B1 fitted with an AZDM 111A2 point detonating fuze and containing a TNT explosive payload. This bomb has a maximum range of 3,017 m.

By contrast, [MKEK](#) also produce a longer range and more modern 81 mm HE mortar bomb, the MKE Mod 214, primarily for use with the [MKEK 81 mm UT1](#) and UT2 mortars. This bomb is much longer than the M43A1B1 and has a more streamlined forged steel body with a plastic obturating ring. The AZDM 111A2 fuze is retained but there is a longer tail assembly housing an MKE Mod 30 primary cartridge and up to six [M8](#) propellant increments. The MKE Mod 214 has a maximum range of 5,850 m. A practice version, the MKE Mod 238, containing an inert payload is also produced. It is ballistically matched to the MKE Mod 214.

[MKEK](#) also produces an 81 mm illuminating round, the M301A2. This is another US licence-produced bomb but it is fitted with a nose-mounted MTSQ [DM 93](#) fuze. Maximum range is approximately 2,150 m and the flare and parachute assembly can produce light for up to 60 seconds.

Specifications

HE MKE MOD 214

Length: 500.52 mm

Weight: 4.82 kg

Muzzle velocity: 331 m/s

Max range: 5,850 m

Manufacturer

Makina ve Kimya Endüstrisi.

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[MKEK](#) 81 mm mortar bombs, from left: HE M43A1B1; HE MKE Mod 214; practice equivalent of HE M43A1B1; practice MKE Mod 238; illuminating M301A2

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [TURKEY](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses NATO standard code

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 90 mm: Canister M336

Armament

M36 Cannon on [M47](#) series MBTs; [M41](#) Cannon on [M48](#) series MBTs up to (and including) [M48A3](#).

Development

The 90 mm Canister M336 anti-personnel round uses a canister projectile filled with steel pellets for anti-personnel use at short ranges. It is no longer widely used but apparently still available for production, on request, from Makina ve Kimya Endüstrisi Kurumu ([MKEK](#)) of [Turkey](#).

Description

The 90 mm Canister M336 is a fixed round with a canister projectile crimped into a brass cartridge case. A single gilding metal drive band encircles the canister base.

The canister projectile has a thin steel cylindrical body welded to a heavy cup-shaped base. The blunt-nosed body has four equally spaced axial grooves extending from the forward edge of the canister body along about half its length. The body interior is filled with 1,281 stacked steel pellets or slugs, each weighing approximately 0.5 g, held in place by a soldered closing disc.

When the gun is fired the canister body is propelled along the barrel. As it emerges from the gun muzzle, air pressure on the closing disc and the centrifugal forces acting on the body combine to cause the canister to break open along the four axial grooves. The steel pellets are then free to disperse across a conical angle of approximately 9°. The maximum effective range of the pellets is 183 m.

The 90 mm Canister M336 round uses a brass M108B1 rimmed cartridge case with an [M58](#) percussion primer press fitted to the base. The propelling charge is 3.63 kg of M2 propellant.

Specifications

Weights:

complete round - 18.87 kg

propellant - 3.63 kg M2

filling - 6.76 kg steel pellets

steel pellet, each - approx 0.5 g

Lengths:

complete round - 858.5 mm

cartridge case - 615 mm

Number of pellets: approx 1,281

Muzzle velocity: 858 m/s

Max effective range: approx 183 m

Authorised fuzes

None involved

Equivalent rounds

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: Canister M336

Description: Standard US specifications. Production as required

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 76 mm: Smoke, WP, M361 and M361A1

Armament

M32 Cannon used on [M41](#) light tanks.

Development

The 76 mm Smoke M361 was originally developed for the 76 mm M1 series of guns used on the M4 Sherman tank series and the [M18](#) gun motor carriage. Later developments from 1947 onwards led to the 76 mm M32 gun for the [M41](#) Walker Bulldog light tank series, the first of which was produced during 1951. The 76 mm Smoke M361 rounds are used to provide screening or marker smoke although they also have a secondary incendiary effect.

This round is no longer in the US inventory.

Description

The 76 mm Smoke, WP, M361 and M361A1 (actual calibre is 76.2 mm) are fixed rounds with the projectile crimped to the brass or steel cartridge case. One unusual feature of this round, and the other rounds in the US 76 mm series, is that the case is crimped over the projectile's specially designed drive band which has a groove to accept the cartridge case crimp.

On both rounds the projectile is a thin-walled forged steel casing with a point impact fuze threaded into the nose fuze cavity. Both rounds contain 626 g of White Phosphorus (WP) which, on the M361, is located around a two-piece steel casing containing an [M28](#) tetrytol burster charge weighing 34 g; the M361A1 has a one-piece aluminium burster casing. Both types of burster casing incorporate an M2 burster initiator. The M361A1 has a tracer element threaded into the projectile base.

When the nose-mounted PD fuze functions, the burster charge is detonated via the M2 burster initiator. The resultant internal pressure ruptures the body casing to expel the WP filling. On contact with the atmosphere the WP ignites to create dense white screening smoke.

The cartridge case may either be an [M88](#) (brass, used with M361) or M88B1 (lacquered steel, used with M361A1). The base-mounted percussion primer is the [M58](#), containing 25.9 g of black powder, or the [M68](#). The propelling charge is 1.65 kg of [M6](#) propellant.

Muzzle velocity is 713 m/s and maximum range 14,595 m.

Specifications

Weights:

complete round - 11.71 kg

filling - 626 g WP

propellant - 1.65 kg [M6](#)

Lengths:

complete round - 865 mm

cartridge case - 575 mm

Muzzle velocity: 713 m/s

Max range: 14,595 m

Authorised fuzes

M361 - PD [M48A3](#)

M361A1 - PD M521

Equivalent rounds

[TURKEY](#)

Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 76 mm WP M361

Description: Standard US specifications. Production on request

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TANK AND ANTI-TANK GUNS

Date Posted: 02 May 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 76 mm: AP-T, M339

Armament

M32 Cannon used on [M41](#) light tanks.

Development

The 76 mm AP-T M339 was originally developed for the 76 mm M1 series of guns used on the M4 Sherman tank series and the [M18](#) gun motor carriage. Later developments from 1947 onwards led to the 76 mm M32 gun for the [M41](#) Walker Bulldog light tank series, the first of which was produced during 1951. The 76 mm AP-T M339 is intended for use against armoured targets but is generally regarded as obsolete and is now rarely encountered.

This round is no longer in the US inventory.

Description

The 76 mm AP-T M339 (actual calibre is 76.2 mm) is a fixed round with the projectile crimped to the brass or steel cartridge case. One unusual feature of this round, and the other rounds in the US 76 mm series, is that the case is crimped over the projectile's specially designed drive band which has a groove to accept the cartridge case crimp.

The 76 mm AP-T M339 projectile is a solid tungsten carbide slug, with a relatively short ogive, covered by a lightweight windshield to provide a better ballistic shape. A red [M13](#) tracer is located in the base of the projectile for ignition by propellant gases; it burns for approximately 3 seconds. On

impact with a target the windshield crumples to allow the tungsten carbide projectile to penetrate the armour using kinetic energy alone.

The cartridge case may either be an [M88](#) (brass) or M88B1 (lacquered steel). The base-mounted percussion primer is the [M58](#) containing 25.9 g of black powder. The propelling charge is 2.54 kg of [M30](#) propellant.

Muzzle velocity is 954 m/s and maximum range 14,700 m.

The training round for the 76 mm AP-T M339 is the 76 mm TP-T M340 or M340A1. This round is virtually identical to the M339 in most respects other than the projectile body is of mild steel and therefore has only a limited armour penetration capability. The 76 mm TP-T M340 uses a brass [M88](#) cartridge case and an M5A2B1 tracer, while the M340A1 uses a lacquered steel M88B1 case and an [M13](#) tracer.

Specifications

Weights:

complete round - 12.39 kg

propellant - 2.54 kg [M30](#)

Lengths:

complete round - 835.4 mm

cartridge case - 575 mm

Muzzle velocity: 954 m/s

Max range: 14,700 m

Authorised fuzes

None involved

Equivalent rounds

[TURKEY](#)

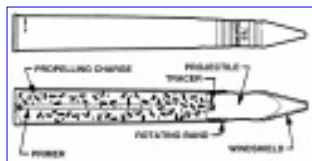
Manufacturer

Makina ve Kimya Endüstrisi Kurumu ([MKEK](#))

Type: 76 mm AP-T M339

Description: Standard US specifications. Production on request

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Outline and cross-section drawings of Cartridge, 76 mm: AP-T, M339 (2000)

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FIELD ARTILLERY

Date Posted: 08 June 2001

Jane's Ammunition Handbook 2001-2002

152 mm FRAG-HE 3OF25

Armament

[152 mm Gun-Howitzer D-20](#); 152 mm Gun-Howitzer [2A65](#) ([M1987](#) or MSTA-B); [152 mm 2A61](#) Howitzer; 152 mm Howitzer [M1943](#) (D-1); [NORINCO 152 mm Gun-Howitzer Type 66](#); [NORINCO 152 mm Gun-Howitzer](#) Type 37; 152 mm Model 1981 Howitzer ([Romania](#)); 152 mm Model 85 Gun-Howitzer ([Romania](#)); [152 mm Gun-Howitzer M84](#) series (Federal Republic of [Yugoslavia](#)).

Self-propelled equipments include: 152 mm Self-propelled Howitzer M-1973 ([2S3](#)); 152 mm [2S19](#) Self-propelled Gun-Howitzer; [NORINCO Type 83](#) Self-propelled Gun-Howitzer; 152 mm Self-propelled Howitzer DANA and ONDAVA.

Development

The 152 mm FRAG-HE 3OF25 is the successor to the FRAG-HE OF-540 (see previous entry) and is intended to be fired from the earlier generation of 152 mm towed and self-propelled howitzers, although it can also be fired from the latest long-barrel ordnance as well. It differs from the earlier OF-540 by introducing a new grade of high-fragmentation steel and the explosive filling is changed to 6.8 kg of A-IX-2 (RDX 72 per cent, Aluminium 23 per cent, Wax 4 per cent), making the projectile 1.5 to 2 times more effective in on-target effect than the earlier projectile.

The 152 mm FRAG-HE 3OF 25 projectile is involved with two rounds, the 3VOF32 with Full Charge and the 3VOF33 with Reduced Charge. The propellant charge system is identical to that used with the OF-540 and the ballistic performance remains the same.

Description

The 152 mm FRAG-HE 3OF25 projectile forms part of a separate loading item of ammunition consisting of the projectile and a variable charge system contained in a brass or lacquered steel cartridge case.

The projectile is forged high-fragmentation steel with a long streamlined ogive, a boat tail and a shallow bourrelet. A single copper drive band is just over 24 mm wide. The contents are a nominal 6.8 kg of A-IX-2 explosive.

The 152 mm ammunition uses a two-part variable charge system contained in brass or lacquered steel cartridge cases 547.5 mm long. The two parts are the Reduced Charge and the Full Charge, each in its own cartridge case.

The Reduced Charge uses 9/7, 4/1 and 8/1 Trinitrocellulose powder in a series of 12 bags. Charge 6, the lowest, comprises the base bag charge only, to which a series of equal size bags are added creating higher charges. One charge bag is added to the base charge bag to comprise Charge 5, two are added for Charge 4, three for Charge 3 and five for Charge 2. These are all held in place by a fibre cup. The total weight of the Reduced Charge propellant is 4.2 kg. Maximum muzzle velocity produced by the Reduced Charge is 511 m/s.

The Full Charge uses, NDT-3 16/1 or NGH powder in bags together with 150 g of 8/1 UG flash reducing agent plus S-1 decoppering agent. Charge 1 has two base bag charges, one located above the other. To create the Full Charge two further equal size bag charges are added; as mentioned previously a fibre cup holds the charge bags in place. The total weight of the Full Charge propellant is 8.8 kg. Maximum muzzle velocity produced by the Reduced Charge is 655 m/s.

Both charges are initiated by a KV-4 percussion primer in the base of the cartridge case.

With the Full Charge the maximum muzzle velocity is 655 m/s providing a maximum range of 17,400 m. With the reduced charge the muzzle velocity is circa 511 m/s and maximum range is 13,400 m.

Specifications

Weights:

complete round, nominal - 59.5 kg

projectile, fuzed - 43.56 kg

explosive filling - 6.8 kg A-IX-2

propellant - Full 8.8 kg NGH or NDT-3; Reduced 4.2 kg NC

cartridge case - 7.5 kg

Lengths:

projectile, fuzed - 710 mm

cartridge case - 547.5 mm

Diameter of cartridge case rim: 170 mm

Diameter over drive band: 156 mm

Muzzle velocity, Full Charge: 655 m/s

Max range, Full Charge: 17,400 m

Max chamber pressure: 2,350 bar

Operational temperature range: -40 to +40° C

Authorised fuzes

PD RGM-2, RGM-2M

MTSQ D-1U

Prox V-90, AR-5

Equivalent projectiles

[UKRAINE](#)

Manufacturer

MINMASHPROM

Type: 152 mm FRAG-HE 3OF25

Description: Standard specifications

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*Cross-sectioned 152 mm FRAG-HE 3OF25 projectile (right) with Reduced Charge (left) and Full Charge (centre)
(1998)*

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MORTARS - 81 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm practice bomb L27A1

Armament

UK [L16](#), US [M242](#) mortars and similar high-pressure types.

Development

By RARDE as the standard projectile for the [L16](#) mortar.

Description

This resembles the HE and smoke bombs but is completely inert except for the primary cartridge. It has a replaceable plastic obturating ring and after firing can be recovered, fitted with a new ring and primary cartridge and reused several times.

Specifications

Length, fuzed: 474 mm

Weight, fuzed: 4.2 kg

Type of payload: inert

Number of charges: P

Fuze: dummy

Max range: 80 m

Manufacturer

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MORTARS - 81 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb L40A1

Armament

UK [L16](#), US [M242](#) mortars and similar high-pressure types.

Development

By RARDE as the standard projectile for the [L16](#) mortar.

Description

This is similar to and ballistically matched to the HE L36 bomb. The sole difference lies in the filling, which is white phosphorus, using a central burster under the fuze to break open the bomb.

Specifications

Length, fuzed: 472 mm

Weight, fuzed: 4.2 kg

Type of payload: WP

Number of charges: P + 4 or P + 6

Fuze: impact SQ L127A2 or US or NATO equivalents

Min range: 166 m

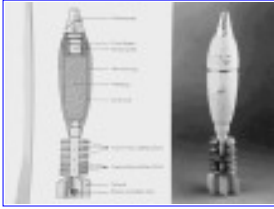
Max range: 5,650 m

Muzzle velocity: 70-297 m/s

Manufacturer

[BAE Systems](#), Royal Ordnance Division.

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81 mm smoke bomb L40A1

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MORTARS - 81 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb L36A2

Armament

UK [L16](#), US [M242](#) mortars and similar high-pressure types.

Development

By RARDE as the standard projectile for the [L16](#) mortar.

Description

The L36 bomb was the progenitor of the streamlined, plastic obturated modern bomb. It was designed to produce the maximum number of fragments of optimum size and was manufactured from spheroidal graphite cast iron. The polycarbonate sealing ring admits sufficient windage for loading but expands and seals under the gas pressure of firing. The ring also centres the bomb to reduce yaw at the muzzle.

There were two charge systems developed, Mk 4 and Mk 5. The Mk 4 system is in use with the British Army, the Mk 5 with the US Army (M821). The Mk 4 has six equal secondary charges, while the Mk 5 has four equal secondary charges. The maximum charge gives the same range with either system.

Specifications

Length, fuzed: 472 mm

Weight, fuzed: 4.2 kg

Weight and type of payload: 680 g RDX/TNT 60:40

Number of charges: P + 4 or P + 6 (see text)

Fuze: impact SQ; L127A2, US M734, US M935 and other NATO fuzes

Min range: 166 m

Ballistic performance, Mk 4 Charge System:

Charge	Muzzle velocity	Max range
P	70 m/s	497 m
1	133 m/s	1,564 m
2	175 m/s	2,500 m
3	212 m/s	3,425 m
4	243 m/s	4,200 m
5	272 m/s	4,975 m
6	297 m/s	5,650 m

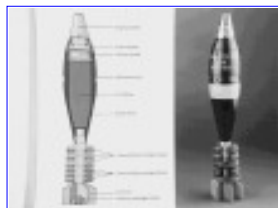
Mk 5 Charge System:

Charge	Muzzle velocity	Max range
P	70 m/s	497 m
1	154 m/s	2,060 m
2	209 m/s	3,400 m
3	257 m/s	4,620 m
4	297 m/s	5,650 m

Manufacturer

[BAE Systems](#), Royal Ordnance Division.

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81 mm HE bomb L36A2

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MORTARS - 51 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm illuminating bomb L3

Armament

UK 51 mm mortar.

Development

By RARDE to replace the 2 in mortar.

Description

This has a body of similar shape to the HE and smoke bombs, its extended flat nose has a parachute packed inside. In the body is a flare assembly which is attached to the parachute by chains. The flare assembly has a central hole, with a length of quickmatch running from a delay unit in the tail to a priming charge lying on top of the flare. The delay unit is ignited by the propelling cartridge. This ignites the match which then lights the priming charge. The explosion of the priming charge blows off the nose adaptor, allowing the parachute to deploy; at the same time the flare is ignited. The parachute draws the flare unit from the bomb body and commences its descent.

Specifications

Length, fuzed: 275 mm

Weight, fuzed: 800 g

Weight and type of payload: parachute and flare filled 215 g SR 798 illuminant

Number of charges: 1

Fuze: none

Operating range: 775 m

Muzzle velocity: 127 m/s

Height of burst: 325 m

Height at burnout: 122 m

Rate of descent: 4.6 m/s

Burning time: 44 s

Illumination intensity: 170,000 cd

Manufacturer

[BAE Systems](#)

Royal Ordnance Division.

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UK 51 mm illuminating bomb L3

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MORTARS - 51 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm smoke bomb L2

Armament

UK 51 mm Mortar.

Development

Developed by RARDE to replace the 2 in mortar.

Description

This has the same shape as the HE bomb, a straight taper to the tail, but has a flat nose and is filled with a hexachloroethane smoke composition in four increments. At the rear of the body is a drilling which passes through to the cartridge container and holds a delay element. This is ignited by the propulsion cartridge which burns through with 5 seconds delay, which then ignites a priming element that in turn lights the smoke composition. Pressure blows off the fin unit and allows the smoke to be emitted from the base of the bomb.

Specifications

Length, fuze: 273 mm

Weight, fuze: 900 g

Weight and type of payload: PN 800 smoke composition

Number of charges: 1

Fuze: none

Min range: 50 m

Max range: 800 m

Muzzle velocity: 103 m/s

Emission time: approx 2 min

Manufacturer

[BAE Systems](#),

Royal Ordnance Division.

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UK 51 mm smoke bomb L2

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MORTARS - 51 mm MORTARS, UNITED KINGDOM

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

51 mm HE bomb L1A1

Armament

UK 51 mm mortar.

Development

Developed by RARDE in the 1960s as a replacement for the 2 in mortar.

Description

A bomb of somewhat unusual shape, the body is a straight taper from nose to tail, with a six-fin tail unit screwed into the end. The body is of aluminium alloy lined with a mild steel fragmentation coil. This is notched around its internal diameter so as to produce fragments of optimum size. An adaptor ring is crimped into the head of the bomb, retaining the filling and acting as a threaded seat for the fuze. A plastic obturating ring fits into one of the crimps around the head to give gas sealing. The propelling charge consists of a single cartridge carried in the tail tube; there are no secondary charges.

Specifications

Length, fuze: 290 mm

Weight, fuze: 920 g

Weight and type of payload: 170 g RDX/TNT 60/40

Number of charges: 1

Fuze: L127 impact, SQ or delay

Min range: 50 m

Max range: 800 m

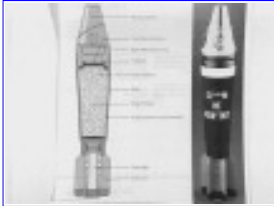
Muzzle velocity: 103 m/s

Manufacturer

[BAE Systems](#),

Royal Ordnance Division.

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UK 51 mm HE bomb [LIAI](#)

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

4.6 × 30 mm

Synonym:

none

Armament:

Heckler & Koch Personal Defence Weapon (PDW).

Development:

The 4.6 × 30 mm was developed jointly by Heckler & Koch and Royal Ordnance Radway Green for a personal defence weapon of new and innovative design. The cartridge is designed to provide a balance between terminal effects and felt recoil, optimising the former whilst minimising the latter. The cartridge and its weapon have yet to be adopted by any military service, but Heckler & Koch intend to market their PDW worldwide as a potential weapon for officers, NCOs and personnel whose duties do not require a full-power rifle.

Description:

The 4.6 × 30 mm is a tapered bottlenecked, Boxer primed, rimless cartridge with a brass case. The standard ball round consists of a copper plated solid hardened steel bullet weighing 1.6 g. At 100 m range, this bullet will penetrate 1.6 mm of titanium, 20 layers of Kevlar® and have sufficient residual energy to fully penetrate a 150 mm block of 20 per cent ordnance gelatine. Only ball ammunition is

currently available, but tracer, frangible, JHP, training (copper bullet) and blank ammunition is under development.

Specifications

Round length: 38 mm

Case length: 30 mm

Round weight: 6 g

Rim diameter: 8 mm

Bullet diameter: 4.65 mm

Bullet weight: 1.6 g

Muzzle velocity: 725 m/s

Muzzle energy: 420 j

UNITED KINGDOM

Manufacturer

Royal Ordnance Radway Green

Type: Ball: Solid steel, copper plated; 1.6 g; MV 725 m/s

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Left to right: 4.6 × 30 mm, 5.7 × 28 mm, .224 BOZ, 5.56 × 45 mm (C Cutshaw) (2000)

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IDENTIFICATION OF SMALL ARMS AMMUNITION, UNITED KINGDOM

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

Uses NATO standard code with one 30 mm Rarden addition:

AP-SE | black body with green ring

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IDENTIFICATION OF SMALL ARMS AMMUNITION, UNITED KINGDOM

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Small arms ammunition:

Uses NATO standard code

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.224 BOZ

Synonyms:

None

Armament

Suitably chambered pistols and sub-machine guns.

Development

The 0.224 BOZ was developed by Civil Defence Supply of the United Kingdom, specifically for use by police forces and military special operations units having a requirement for a pistol-class cartridge that will defeat soft body armour and light vehicle bodies. The cartridge was developed using the [10 mm Auto](#) cartridge as a basis, necking it down to 5.56 mm diameter and firing 5.56 mm bullets at higher velocities than pistol-class cartridges to achieve almost double the velocity and effective range of standard 9 × 19 mm cartridges.

Description

The 0.224 BOZ was developed by combining the cartridge case of the [10 mm Auto](#) round with 5.56 × 45 mm bullets of various types. The cartridge has a bottlenecked, brass, rimless case with various types of 5.56 × 45 mm bullets loaded.

Specifications

Round length: 32 mm

Case length: 23 mm

Case head diameter: 10.72 mm

Bullet diameter: 5.66 mm

Bullet weight: 3.5 - 3.6 g

Muzzle velocity: 640 m/s

Muzzle energy: 396 J

UNITED KINGDOM

Manufacturer

Civil Defence Supply

Type: Ball: FMJ; 3.5 g; MV 640 m/s

Tracer: FMJ; 3.6 g; MV 640 m/s

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*0.224 BOZ
(1999)*

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm WP smoke bomb, M68

Armament

[M120](#) 120 mm mortar.

Development

By Soltam as a minor modification to their WP bomb. It was type classified by the US Army to support newly-fielded 120 mm mortars, but was never actually purchased.

Description

The round consists of a fuze, three types of propellant increment, fin assembly, ignition cartridges and shell body. The shell body, made of steel, is loaded with white phosphorus (WP) filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in one brown increment, two blue increments and four white increments and is assembled around the fin assembly shaft.

Specifications

Length, fuzed: 665 mm

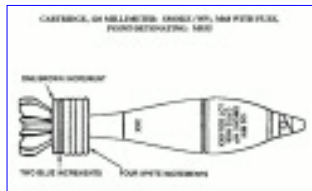
Weight, fuzed: 13 kg

Weight and type of payload: 2.03 kg/WP

Number of charges: P + 7 (1 brown, 2 blue, 4 white)

Fuze: impact M935
Colour/markings: light green/black

UPDATED



[M68](#) 120 mm WP smoke bomb
(1999)

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm HE bomb M57

Armament

[M120](#) 120 mm mortar.

Development

By Soltam. Almost identical to the Israeli [M57](#), but fitted with the US M935 PD fuze. A limited quantity were manufactured in [Israel](#) and purchased by the US to support initial 120 mm mortar fielding.

Description

The round consists of a fuze, propellant charge, fin assembly, ignition cartridge, and shell body. The shell body, made of high-fragmentation steel, is loaded with TNT filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in one brown increment, two blue increments, and four white increments assembled around the fin assembly shaft.

Specifications

Length, fuzed: 665 mm

Weight, fuzed: 13 kg

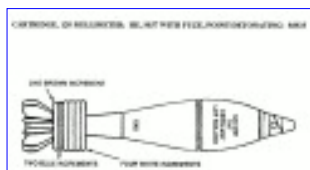
Weight/type of payload: 2.1 kg/TNT

Number of charges: P+7 (1 brown, 2 blue, 4 white)

Fuze: impact M935

Colour/markings: olive drab/white

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*[M57](#) 120 mm HE bomb
(1999)*

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm HE bomb, M934/M934A1

Armament

[M120](#) / [M121](#) 120 mm mortars.

Development

By US Army ARDEC as an incremental improvement to the [M933](#). The M934 was type classified as standard in May 1992 and the M934A1 in June 1996. The US Army had procured 244,000 M934/934A1 rounds through FY98, to which were added 50,000 in FY99 and 65,000 in each of FY00 and FY01. The FY02 budget provides US\$39.5 million for an additional 50,000 rounds. The projectile bodies are made by Chamberlain, the fuze by KDI, the propellant charge by HiTech and the load, assemble and pack operation is performed by SNC of Canada.

Description

The round consists of a fuze, propellant charge, fin assembly, ignition cartridge, and shell body. The shell body, made of wrought carbon steel, is loaded with Composition B filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in four horseshoe-shaped felt-fibre containers and assembled around the fin assembly shaft.

The M934 uses the same M981 ignition cartridge and [M230](#) propelling charge as the [M933](#). The M934A1 uses the new M1020 ignition cartridge and the M234 propelling charge. The other main difference is that the M934 uses the original M734 MOF, while the M934A1 uses the newer M734A1

MOF.

Specifications

Length, fuzed: 710.95 mm

Weight, fuzed: 14.15 kg

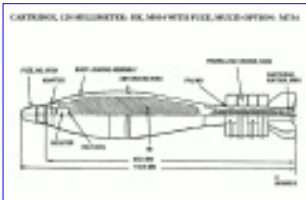
Weight/type of payload: 2.99 kg/Comp B (RDX/TNT)

Number of charges: P + 4

Fuze: multi-option M734 (impact, delay or proximity)

Colour/markings: olive drab /yellow

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*M934 120 mm HE bomb
(1999)*

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm illuminating bomb, M91

Armament

[M120](#) 120 mm mortar.

Development

By Soltam to support US fielding of their 120 mm mortar system. This was a standard Israeli illumination round but fitted with the German DM30 mechanical time fuze. A very limited quantity were manufactured in [Israel](#) and purchased by the US Army prior to development of the XM930/M983 illumination rounds.

Description

The round consists of a steel body and tail cone assembly, an illuminating candle and parachute assembly, a time fuze with a built-in expelling charge, a fin assembly, propellant charge and an ignition cartridge with percussion primer. The nose of the thin walled steel tubing body is fitted with a steel adaptor and internally threaded to accept the fin assembly, and is attached to the body tube with eight equally spaced shear pins. The illuminant assembly, consisting of a first-fire charge and an illuminant charge, is contained in an aluminium case and attached to the parachute with a glass fibre suspension line.

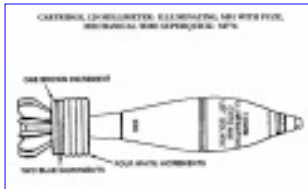
Specifications

Length, fuzed: 665 mm
Weight, fuzed: 12.3 kg
Weight/type of payload: 1.2 kg/illuminant
Number of charges: P + 7, (1 brown, 2 blue, 4 white)
Illumination intensity: 1 million cd
Intensity duration: 50 s
Fuze: MTSQ, DM30
Colour/markings: white/black

Manufacturer

US government contractors.

UPDATED



*120 mm illuminating bomb, [M91](#)
(1999)*

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 28 February 2002

Jane's Ammunition Handbook 2002-2003

120 mm HE bomb, M933

Armament

[M120](#) and [M121](#) smoothbore mortars.

Development

By US Army ARDEC as an enhanced US-manufactured version of the Israeli [M57](#).

Description

The round consists of a fuze, propellant charge, fin assembly, ignition cartridge, and shell body. The shell body, made of wrought carbon steel, is loaded with Composition B filler. The M981 ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The [M230](#) propellant charge is contained in four horseshoe-shaped felt-fibre containers assembled around the fin assembly shaft.

Specifications

Length, fuze: 710.95 mm

Weight, fuze: 14.2 kg

Weight/type of payload: 2.99 kg /Comp B (RDX/TNT)

Number of charges: P + 4

Fuze: impact M745

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M720A1

Armament

US [M224](#) 60 mm mortar.

Development

By US Army ARDEC as an improvement upon the previous [M720](#) model. The HF-1 steel shell bodies are made by Medico, the fuzes by KDI and the rounds assembled under a December 2001 contract by Day & Zimmerman at the Kansas Army Ammunition Plant. The US Army's FY02 budget includes US\$18.3 million for 40,000 rounds.

Description

The M720A1 is filled with a new melt castable explosive, PAX-21, developed jointly by ARDEC and ATK Thiokol. PAX-21 has been developed to help reduce the response of the round to unplanned stimuli. It is less shock sensitive than the Comp B explosive used in the [M720](#). This aids in the M720A1's insensitive munition performance. Weight of the explosive fill remains unchanged from the [M720](#). There are other differences between the two cartridges such as: the M720A1 uses the M734A1 fuze, the shell body is HF-1 steel and a different propulsion system employing the [M235](#) propellant charges and M702 ignition cartridge. In fact, the only common components between the [M720](#) and the M720A1 are the M27 fin and obturator.

Specifications

Length, fuzed: 377 mm
Weight, fuzed: 1.7 kg
Weight and type of payload: 360 g PAX-21
Number of charges: P + 4
Fuze: Multi-option, M734A1
Min range: 70 m
Max range: 3,490 m
Muzzle velocity: 64-247 m/s
Colour/markings: OD/yellow

Ballistic performance:

Charge	Muzzle velocity	Max range
P	64 m/s	400 m
1	126 m/s	1,340 m
2	171 m/s	2,150 m
3	207 m/s	2,890 m
4	247 m/s	3,490 m

Restrictions: Not to be fired in the [M19](#) mortar with Charges 3 or 4. Not to be fired in the hand-held mode with other than Charge 1.

Manufacturer

US government contractors.

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm training mortar bomb, M68

Armament

81 mm mortars

Development

By US Army Ordnance to satisfy military requirement for a training round.

Description

Unlike most mortar ammunition, this round is issued in separate components to facilitate replacement of worn, damaged, or expended components. The complete round consists of an inert projectile, a fin assembly and an ignition cartridge. The pear shaped body is made of cast iron and has no provision for a fuze. The base is internally threaded to accept the fin assembly. Since the projectile is inert, there is no detonation upon impact and it may be recovered and reused. This round is obsolescent in US service, although it may be encountered in other countries.

Specifications

Type: Training

Length: 281.4 mm

Weight: 4.89 kg

Type of payload: Inert

Type of charges: Ignition cartridge only

Fuze: None

Min range: NA

Max range: 284 m

Muzzle velocity: 52.7 m/s

Colour/markings: OLD: black/white; NEW: bronze

Status: Obsolescent in US services

Manufacturer

US Army contractors.

VERIFIED



*M68 training bomb, showing components
(2000)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm WP smoke bomb, M375A3

Armament

81 mm mortars of all types

Development

By US Army Ordnance to satisfy a military requirement for a white phosphorus smoke round. It is no longer in production in the US, but remains in US Army stockpiles as the standard pyrophoric round. For smoke/obscurant missions the [M819](#) RP round (qv) is used.

Description

The complete round consists of a steel projectile body, externally threaded at the base to accept the tail boom and fin assembly and internally threaded at the nose to accept the fuze, which may be either impact or proximity. The fin assembly incorporates a cartridge housing/tail boom that is surrounded by four horseshoe shaped increment charges. These each contain [M10](#) propellant. A plastic propelling charge support surrounds the increments. The burster consists of a casing that contains a small charge of RDX. The projectile body is filled with white phosphorus. The fins are canted at 5° to spin stabilise the round in flight, enhancing its accuracy. The M275A3 round cannot be fired at greater than Charge 2 in M-1 (low pressure- type) mortars.

Specifications

Type: WP smoke

Length, fuzed: 517.6 mm

Weight, fuzed: 4.12 kg

Type of payload: White phosphorous, 0.725 kg

Type of charges: Igniter cartridge and 4 increment charges, 25 g propellant each.

Fuze: Impact, M567 or M524A6

Min range: 504 m

Colour/markings: Light green/light red, yellow band

Status: In production, standard

Ballistic performance:

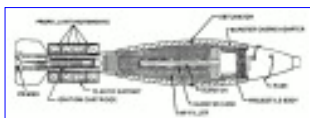
Charge	Muzzle velocity	Max range
0*	65.5 m/s	504 m
1	133.5 m/s	1,814 m
2	185.3 m/s	3,184 m
3	228.6 m/s	4,459 m
4	267.9 m/s	5,333 m

* Charge 0 is the ignition cartridge only.

Manufacturer

US Army contractors.

UPDATED



*M375A3 81 mm WP smoke bomb
(2000)*

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm training bomb, M69

Armament

Mortars of the M2 and [M19](#) type

Development

By US Army Ordnance to satisfy military requirement for a training round.

Description

Unlike other mortar ammunition, the components of this bomb are issued separately to facilitate the replacement of worn, expended or damaged parts. The round consists of an inert projectile, a fin assembly and an ignition cartridge. The projectile is pear shaped, is made of cast iron and has no provision for a fuze. It is internally threaded at the base to accept the fin assembly. The cartridge is fired using only the ignition cartridge and may be recovered for reuse, as there is no detonation upon impact. Although obsolescent in US service, this bomb may still be encountered in other countries.

Specifications

Type: Training

Length: 195.5 mm

Weight: 2.0 kg

Type of payload: NA, Inert

Type of charges: NA, Ignition cartridge only

Fuze: None

Min range: NA

Max range: 193 m

Muzzle velocity: 46.4 m/s

Colour/markings: Old, black/white or blue/white; New, bronze/white

Status: Obsolescent in US services

Manufacturer

US Army contractors.

VERIFIED



*M69
(2000)*

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm TP bomb M50 A3 (M50A2)

Armament

60 mm mortars of the M2 and [M19](#) types

Development

By US Army Ordnance to satisfy military requirement for a target practice round.

Description

The complete round consists of a projectile body, impact fuze, a fin assembly with extension boom, for increment charges and an ignition cartridge. The body is of forged steel or pearlitic malleable iron (PMI) and is threaded internally at the nose to accept the fuze and at the base to accept the extension boom. The body is loaded with an inert plaster filler to simulate the weight and ballistics characteristics of a high explosive bomb. A pellet of black powder for a spotting charge is loaded in a cavity just below the fuze booster. Excessive short rounds may occur when this round is fired at temperatures below -18°C.

Specifications

Type: TP

Length, fuzed: 294.9 mm

Weight, fuzed: 1.43 kg

Type of payload: inert, 0.13 kg; black powder, 0.25 kg

Type of charges: ignition cartridge, M5A1; 4 increment charges, M181

Fuze: impact, M525 or M935 series

Min range: 256 m (Charge 0)

Max range: 184 m (Charge 4)

Colour/markings: blue/white with brown band

Status: Obsolescent in US services

Ballistic performance:

Charge	Muzzle velocity	Max range
0	51.5 m/s	256 m
1	75.3 m/s	639 m
2	113.7 m/s	1,069 m
3	137.2 m/s	1,452 m
4	158.5 m/s	1,814 m

Manufacturer

US Army contractors.

VERIFIED



*M50A3 (M50A2E1) 60 mm TP bomb
(2000)*

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm WP smoke mortar bomb, M302

Armament

60 mm mortars of the M2 and [M19](#) types.

Development

By US Army Ordnance to satisfy military requirement for a WP smoke round.

Description

The bomb consists of a projectile with an impact fuze, a fin assembly, an ignition cartridge and four propellant increment charges. The bomb body is relatively thin walled steel with cylindrical side walls, a conical base and is filled with a charge of white phosphorus. The bomb base is internally threaded to accept the fin assembly. The nose is fitted with a steel adaptor that is threaded to accept the fuze and designed to hold the casing of the burster assembly. There are two types of burster used in this bomb. Both function identically and carry the same designation. They differ only construction of their external casing. Excessive short rounds may occur when this round is fired at temperatures below -18°C. Although obsolescent in US service, this bomb may still be encountered in other countries.

Specifications

Type: WP smoke

Length, fuzed: 281.1 mm

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb, M49A2 and M49A3 (M49A2E1)

Armament

60 mm mortars of the M2 and [M19](#) types.

Development

By US Army Ordnance to satisfy military requirement for a high explosive round. **The rounds are no longer in production in the US, but may be found in US stockpiles.**

Description

The complete round consists of a tear-drop shape projectile body and impact fuze and fin assembly. The propellant consists of an ignition cartridge and four incremental charges clipped between the fins. The projectile body is of forged steel or pearlitic malleable iron (PMI), and is threaded internally at the nose to accept the fuze and at the base to accept the fin assembly. Excessive pressure may develop when this round is fired at temperatures below 18°C at Charge 4. This round is obsolescent in US service but may be encountered worldwide.

Specifications

Type: HE

Length, fuze: 244.0 mm

Weight, fuze: 1.39 kg

Type of Payload: TNT, 0.15 kg, (M49A2); Comp B, 0.19 kg (M49A3)

Type of Charges: Ignition, M5A1 and 4 increment charges, [M3A1](#)

Fuze: Impact M525 or M717 series

Min range: 303 m

Max range: 1,809 m charge 4

Colour/markings: Olive drab/yellow

Status: Obsolescent in US service

Ballistic performance:

Charge	Muzzle velocity	Max range
0*	57.6 m/s	303 m
1	89.0 m/s	716 m
2	11.49 m/s	1,101 m
3	136.9 m/s	1,458 m
4	157.9 m/s	1,809 m
* Charge 0 is the ignition cartridge only		

Manufacturer

US Army contractors.

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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

M776

Armament

M721 60 mm Illumination bomb.

Development

By Junghans Feinwerktechnik as a general purpose mechanical time fuze for ejection-type mortar bombs.

Description

The M776 is generally similar to the Junghans [DM 93](#) mechanical time fuze described above, but with slight modifications for use in the M721 60 mm Illumination mortar bomb. The M776 can be set to function from 6 to 52 seconds in flight. For a complete description, see [DM 93](#). The most recent procurement by the US Army was for 9,038 fuzes at US\$124.06 each in September 1999, bringing procurement from Junghans since 1995 to 79,300 units.

Specifications

Weight: 223 g

Thread: 1.5-12 UNF

Length overall: 87.7 mm

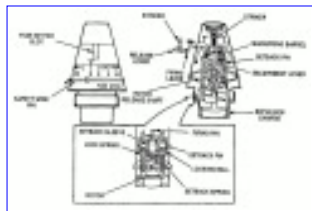
Intrusion: 27.4 mm

Diameter: 49 mm

Manufacturer

US government contractors under licence from Junghans. Recent procurements have been directly from Junghans.

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*M776
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm target practice (SR) bomb M880

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By US Army Ordnance.

Description

This short range training round consists of a practice impact fuze, hollow projectile body with vent holes, fin assembly, three plastic plugs (simulations of propellant charge increments), obturating ring and ignition cartridge with percussion primer.

Specifications

Length, fuzed: 368.3 mm

Weight, fuzed: 3.10 kg

Type of payload: None, hollow body

Number of charges: P only

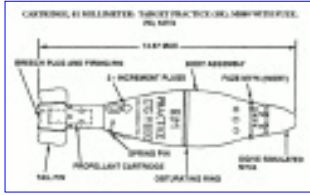
Fuze: impact M775

Max range: 490 m

Muzzle velocity: 73 m/s

Colour/markings: blue/white, brown band

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*M880
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm target practice bomb M879

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By US Army ordnance as improvement of earlier models.

Description

This round consists of an impact (practice) fuze, an inert loaded projectile body, fin assembly, four propellant increments, obturating ring and an ignition cartridge (with integral primer). The cartridge with the M751 Impact fuze (Type I) resembles the 81 mm M821 HE cartridge, and the cartridge with [M75](#) Impact Fuze (Type II) resembles the 81 mm M889 HE cartridge. These practice cartridges are ballistic matches to the HE cartridges and produce a similar signature (flash, audible sound, and smoke cloud) upon impact.

Specifications

Length, fuzed: 496.6 mm

Weight, fuzed: 0.4 kg

Weight and type of payload: 0.93, Hydrocal (inert)

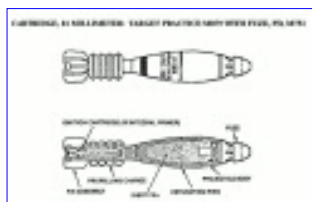
Number of charges: P + 4

Fuze: Impact M751

Max range: 5,700

Colour/markings: blue/white, brown band

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*M879
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm RP smoke bomb M819

Armament

[M252](#) 81 mm mortar and similar weapon systems.

Development

By US Army Ordnance as an improvement on previous models. It is the standard smoke/obscurant 81 mm round for the US Army. When pyrophoric effect is required the M375A3 (WP) is used.

Description

The complete round consists of an MTSQ fuze with an expulsion charge, a projectile containing red phosphorus smoke pellets, a propelling charge comprised of four horseshoe type propellant increments, a fin assembly, and an ignition cartridge with integral percussion primer.

Specifications

Length, fuzed: 648 mm

Weight, fuzed: 4.9 kg

Weight and type of payload: 1.2 kg, Red phosphorus

Number of charges: P + 4, M218

Fuze: MTSQ [M772](#)

Colour/markings: green/black, brown band

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M889A1

Armament

[81 mm M252](#) mortar and similar weapons.

Development

By US Army Ordnance as improvement of previous versions.

Description

This is the Americanised version of the M889, which consisted of changing the body from cast to forged steel and utilising standard component parts (fin, propulsion and ignition systems and packaging) to increase commonality. The complete round consists of a fuze, increment charges, fin assembly, ignition cartridge, and shell body. The shell body, made of forged steel material, is loaded with a Composition B (RDX/TNT) filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in four horseshoe felt-fibre containers and assembled around the fin assembly shaft. This round cannot be fired in Low or medium pressure mortars. It is similar to the Mecar M512 HE bomb.

Specifications

Length, fuzed: 499.6 mm

Weight, fuzed: 4.18 kg

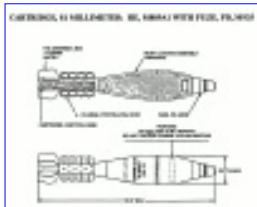
Weight and type of payload: 0.93 kg, Comp B

Number of charges: P + 4, M220

Fuze: impact, M935

Colour/markings: olive drab/yellow

UPDATED



*M889A1
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M889

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By Royal Ordnance to accompany the sale of [L16](#) mortars to the US.

Description

The complete round consists of a fuze, propellant charge, fin assembly, ignition cartridge, and shell body. The shell body, made of ductile cast iron, is loaded with an RDX/TNT filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propelling charge is contained in four horseshoe felt-fibre containers and assembled around the fin assembly shaft. This round cannot be fired in M1 or other low pressure mortars, nor above Charge 3 in [M29](#) or other medium pressure mortars.

Specifications

Length, fuze: 508 mm

Weight, fuze: 4.06 kg

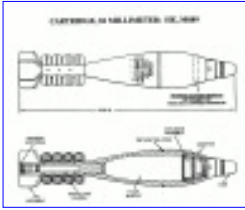
Weight and type of payload: 0.7 kg, RDX/TNT

Number of charges: P + 4

Fuze: Impact, M935

Colour/markings: olive drab/yellow

UPDATED



*M889
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M821A1

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By US Army Ordnance as improvement of earlier models.

Description

This is the Americanised version of the [M82](#), which consists of switching from a cast to a forged steel body and utilising standard American components (fin, propulsion and ignition systems and packaging) to increase commonality. The complete round consists of a fuze, four increment charges, fin assembly, ignition cartridge, and shell body. The shell body, made of forged steel material, is loaded with a Composition B (RDX/TNT) filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in four horseshoe felt-fibre containers and assembled around the fin assembly shaft.

Specifications

Length, fuzed: 496.6 mm

Weight, fuzed: 4.2 kg

Weight and type of payload: 0.9 g, Comp B

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M821

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By Royal Ordnance to accompany the sale of [L16](#) mortars to the US.

Description

The complete round consists of a fuze, propellant charge, fin assembly, ignition cartridge and shell body. The shell body, made of Ductile Cast Iron, is loaded with an RDX/TNT filler. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propelling charge is contained in four horseshoe felt-fibre containers and assembled around the fin assembly shaft.

Specifications

Length, fuzed: 510.5 mm

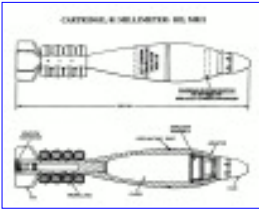
Weight, fuzed: 4.0 kg

Weight and payload: 0.73 kg, RDX/TNT

Number of charges: P + 4, MK5

Fuze: multi-option, M734

UPDATED



M821
(1999)

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm illuminating bomb M816/M853A1

Armament

[M252](#) 81 mm mortar and similar weapons.

Development

By US Army Ordnance as improvement of earlier models. The original M853 was never produced or fielded as it used the M768 pyrotechnical fuze, which was found insufficiently accurate for the illumination role. It was replaced by the [M772 MTSQ](#) fuze and the resultant round, designated [M853A1](#), was type classified as standard in December 1986. The XM816 is identical to the [M853A1](#) but carries an IR illumination module, rather than visible light. It was type classified standard limited in July 1994 and as standard in April 2001. The most recent US Army procurement came with the FY99 budget, which funded 8,000 [M816](#) rounds for US\$9.3 million.

Description

The complete round consists of a time fuze with an expulsion charge, a projectile containing an illuminant canister and parachute assembly, an M219 propelling charge comprised of four horseshoe type propellant increments, an [M29](#) fin assembly and an M752A1 ignition cartridge with integral percussion primer. The fuze initiates the candle assembly and separates the front and rear projectile segments. As the parachute deploys the candle burns for 50 to 60 seconds. The [M816](#) IR round provides 75 W/sr illumination for 60 seconds.

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm illuminating bomb M721/M767

Armament

[60 mm M224](#) mortar and similar weapons.

Development

By US Army Ordnance. The illumination canisters are made by the Crane Army Ammunition Facility and the load, assemble and pack operation is conducted at the Pine Bluff Army Ammunition Plant. The US Army's FY01 budget provided US\$10.7 million for 19,000 rounds and the FY02 budget US\$7.5 million for 12,000 rounds, in both cases being evenly split between M721s and M767s. The M767 is about US\$20 more expensive than the M721 due to the different fill.

Description

The M721 and the M767 are identical except for the illuminating composition. The cartridges are ballistically similar to the M720A1 HE round, allowing a mortar to illuminate and fire on a target without adjustments. The steel bomb is equipped with a mechanical time super-quick fuze with an expulsion charge, a parachute/candle assembly, a four increment propelling charge and an ignition cartridge. The M721 provides visible light at approximately 400,000 cd for some 40 seconds. The M767 illuminates in the IR portion of the spectrum to enhance the effectiveness of night vision devices. When the fuze functions, the expulsion charge ignites and ejects the candle assembly. A spring ejects the parachute from the tail cone, which slows the descent of the burning candle.

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb (WP), M722

Armament

[60 mm M224](#) mortar and similar weapons. It can be fired from the [M19](#) mortar at reduced charges: maximum charge 2 for training and charge 3 for combat.

Development

By US Army Ordnance. The most recent US Army procurement came in FY98 with the purchase of 9,000 rounds for US\$2.4 million.

Description

The teardrop shaped cartridge has a point-detonating fuze, a burster charge, white phosphorus (WP) filler, a thin-walled shell, fin assembly, an ignition cartridge and four M204 horseshoe-type increment charges surrounding the tail boom. The operating range is from 70 to 3,490 m.

Specifications

Length, fuzed: 376.9 mm

Weight, fuzed: 1.7 kg

Weight and type of payload: approx 340 g, white phosphorus

Number of charges: P + 4

Fuze: impact M745

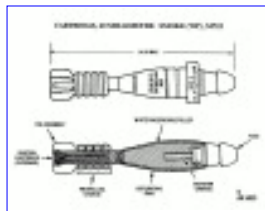
Max range: 3,490 m

Colour/markings: light green with red markings and one yellow band

Manufacturer

US government contractors.

UPDATED



*M722 60 mm WP smoke bomb
(1999)*

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb, M888

Armament

[60 mm M224](#) mortar and similar weapons.

Development

By US Army Ordnance. The load, assemble and pack operation is conducted by American Ordnance at the Milan Army Ammunition Plant using components provided by the Army. The most recent US Army procurement was funded by the FY00 budget, which provided US\$15.4 million for 231,000 rounds.

Description

The complete round consists of a teardrop shaped projectile body, a fin assembly, four increments of propellant charge, and an ignition cartridge with a percussion primer. The alloy steel projectile body is internally threaded at the nose to accept the fuze, externally threaded at the base to accept the fin assembly, and grooved to hold the Delrin obturating ring. The body is loaded with Composition B or TNT high explosive. The M888 is essentially the [M720](#), but fitted with the much less expensive M935 PD fuze.

Specifications

Length, fuzed: 373.6 mm

Weight, fuzed: 1.8 kg

Weight and type of payload: 0.36 kg, Comp B or TNT

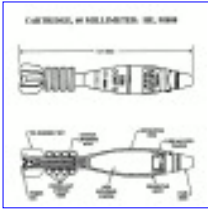
Number of charges: P + 4

Fuze: Impact, M935

Max range: Approx 3,500 m

Colour/markings: Olive drab with yellow markings

UPDATED



*M888, 60 mm HE bomb
(1999)*

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TANK AND ANTI-TANK GUNS

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

Israel Military Industries (IMI) 105 mm APAM

Armament

All 105 mm L7, Rh 105, [M68](#) and CN105F1 series tank guns and South African GT7 tank gun.

Development

The [Israel Military Industries \(IMI\)](#) 105 mm APAM is an Anti-Personnel/Anti-Matériel round (hence APAM) intended to provide tank crews with the means to neutralise infantry tank killer squads armed with anti-tank missiles and rockets. The intention is to provide tank crews with a weapon that will be effective over a general area by providing air bursts created by six submunitions ejected from the base of the projectile as it travels over an area of terrain. The tank gunner aims towards the area to be engaged and elevates the gun muzzle before firing. An electronic time fuze on the nose functions after the pre-set time to eject the submunitions to detonate in rapid sequence and cover the terrain beneath with lethal fragments and blast effects. The submunitions are effective against troops in the open or behind natural or artificial cover, including trenches and foxholes. It is also claimed that the APAM round is as effective as a HE round against various matériel targets or bunkers.

The APAM is in production and has been fielded by Israeli Army armoured units.

In July 2000 it was announced that an agreement had been reached between [Israel Military Industries \(IMI\)](#) and the then PRIMEX Technologies (now General Dynamics, Ordnance and Tactical Systems (GD-OTS)) to offer the APAM round to the US Army's Brigade Combat Team. Under the terms of the agreement [IMI](#) will transfer all of the relevant technology and production know-how to GD-OTS. Both

companies will manufacture portions of the round in their respective counties, with GD-OTS serving as the prime contractor for final systems integration and sales to the US military.

The submunitions used with APAM are also utilised by the anti-personnel warhead under development for the shoulder-launched [Shipon](#) multipurpose personal assault weapon system.

A 120 mm version of APAM is understood to be under consideration.

Description

The [Israel Military Industries \(IMI\)](#) 105 mm APAM is a fixed round with the steel projectile body rigidly crimped to the brass cartridge case by a series of crimping indentations. The steel-bodied streamlined projectile contains six submunitions, each filled with an unspecified amount of high explosive containing a high percentage of RDX. The submunitions are ejected from the projectile base under the control of an electronic time fuze threaded into a well in the projectile nose. As the projectile fuze functions it ignites a small ejection charge to create pressure against a plate which, in turn, forces the submunitions downwards until the baseplate separates from the rest of the projectile and the submunitions are ejected to air burst at what are termed specific intervals.

The 'proprietary' cylindrical submunitions are prefragmented in a controlled fashion to create a 20 m wide and 50 m long lethal area on the ground below. This pattern is long enough to cover and compensate for range measurement errors. Each fragment is designed to be capable of penetrating conventional body armour. The projectile baseplate also includes a protruding housing containing a tracer.

The drawn brass M50 pattern cartridge case contains 3.5 kg of loose packed [M6](#) propellant ignited via an M45112 electric primer. Maximum chamber pressure is 3,400 kg/cm². Muzzle velocity is 800 m/s with an average velocity drop of 70 m/s per 1,000 m. Range is given as 3,000 m.

Specifications

Weights:

complete round - 24.7 kg

projectile - 14.4 kg

propellant - 3.5 kg [M6](#)

Lengths:

complete round - 998 mm

projectile - 573 mm

cartridge case - 617 mm

Muzzle velocity: 800 m/s

Max range: 3,000 m

Operating temperature range: -40 to +52°

Storage temperature range: -40 to +63°

Authorised fuzes

ET

Equivalent Rounds

UNITED STATES OF AMERICA

Manufacturer

General Dynamics, Ordnance & Tactical Systems

Description: standard specifications



[Israel Military Industries](#) *105 mm APAM (Anti-Personnel/Anti-Matériel)*
(1998)

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm tactical CS bomb M630

Armament

US M2 and [M30](#) 107 mm mortars.

Development

By US Ordnance Department to replace earlier design.

Description

This uses a similar body assembly to the illuminating bombs described previously, but carries four canisters of CS irritant agent. The nose of the bomb is threaded for a time fuze, below which is an expelling charge of black powder. The baseplate of the body is secured by four shearing pins, and the canisters have a central hole passing through them. When the expelling charge is ignited the flash passes down this central tube and lights the contents of the canisters. The pressure of the charge pushes down on the canisters and therefore shears the baseplate pins, allowing the base to fall away and the burning canisters to be ejected.

Specifications

Length, fuze: 653 mm

Weight, fuze: 12.28 kg

Weight and type of payload: 1.81 kg CS mixture

Fuze: MT M565; MTSQ [M548](#)

Min range: 840 m

Max range: 5,650 m

Muzzle velocity: 299 m/s

Burning time of canisters: 60 s

Colour/markings: grey, red band/red

Status: *Obsolete in US service.*

Manufacturer

US government contractors.

UPDATED



*M630 107 mm tactical CS bomb
(2000)*

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm illuminating bomb M335A2

Armament

US M2 and [M30](#) 107 mm mortars.

Development

By US Ordnance Department as improvement on earlier model.

Description

This is almost identical to the M335A1 described previously, except that the flare container is somewhat larger and there are some minor constructional differences. It functions in exactly the same manner.

Specifications

Length, fuzed: 653 mm

Weight, fuzed: 11.79 kg

Type of payload: parachute and flare

Fuze: MT M565

Min range: 840 m

Max range: 5,490 m

Muzzle velocity: 305 m/s

Illumination intensity: 850,000 cd

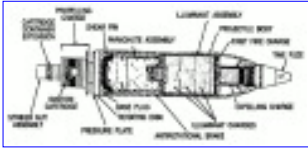
Burning time: 90 s
Colour/markings: white/black

Status: Obsolete in US service.

Manufacturer

US government contractors.

UPDATED



*M335A2 107 mm illuminating bomb
(2000)*

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm illuminating bomb M335, M335A1

Armament

US [M30](#) 107 mm mortars.

Development

By US Ordnance Department as improvement on earlier models.

Description

This is of the same general form as the HE M329A1, differing principally by having the base of the bomb as a separate component attached to the body by shear pins. The bomb is assembled with a mechanical time fuze and consists of five major components: an illuminating canister assembly, a parachute assembly, an expelling charge assembly, a parachute holder assembly and the fuze. The internal components are keyed together to prevent differential rotation in flight. The illuminating canister is fitted with anti-rotational brakes that reduce canister spin at the time of ejection and prevent the parachute lines from twisting.

When the time fuze functions, it ignites the expelling charge which explodes. The flame ignites the flare composition; the gas pressure forces the flare container away from the fuze, thus putting pressure on the baseplate and shearing the connecting pins. The plate and cartridge container fall away and the pressure forces the parachute and flare container from the bomb body. As the flare container exits, the two hinged plates are thrown outwards by springs and act as airbrakes to reduce the spin on the flare container, this ensures the composition burns evenly and progressively during its fall.

The M335 and M335A1 differ only in filler and performance is essentially identical, except as noted.

Specifications

Length, fuzed: 653 mm

Weight, fuzed: 11.8 kg

Type of payload: parachute and flare

Fuze: MT M565

Propellant: M36A1 (0.35kg)

Min range: 840 m

Max range: 4,800 m, M335; 5,490 m, M335A1

Muzzle velocity: 290 m/s, M335; 305 m/s, M335A1

Illumination intensity: 500,000 cd

Burning time: 60 s, M335; 70 s, M335A1

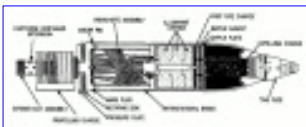
Colour/markings: white/black

Status: **Obsolete in US service.**

Manufacturer

US government contractors.

UPDATED



*M335/M335A1 107 mm illuminating bomb
(2000)*

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm smoke bomb M328, M328A1

Armament

US [M30](#) 107 mm mortars.

Development

By US Ordnance Department as an improvement upon earlier models.

Description

This cartridge is similar to the M329A1 in that it uses the propelling charge M36A1 and the design of the tail assembly. It differs internally, being filled with a centralised axial high-explosive burster assembly. The surrounding body cavity is filled with White Phosphorus (WP) smoke composition. There are four perforated vanes attached to the central burster; these act as paddles to impel the viscous WP filling to take up spin. Without these vanes the inertia of the filling, moving irregularly inside the spinning bomb body, would give rise to erratic ballistics. The M328 and M328A1 differ in the composition of their propelling charge, and the A1 model uses a higher grade steel for the body, thereby gaining space and permitting the loading of a larger amount of WP.

Specifications

Length, fuzed: 655 mm

Weight, fuzed: 13 kg

Weight and type of payload: 3.4 kg WP, M328; 3.8 kg WP, M328A1

Fuze, M328/M328A1: impact (PD) M48A3/M48A3 or M521

Min range: 840 m

Max range: 5,650 m

Muzzle velocity: 299 m/s

Colour/markings: light green, yellow band/red

Status: *Obsolete in US service.*

Manufacturer

US government contractors.

UPDATED



*M328A1 WP smoke bomb
(2000)*

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm HE bomb M329, M329A2, M329B1

Armament

US M2 and [M30](#) 107 mm mortars.

Development

By US Ordnance Department as an improvement on earlier designs.

Description

The M329A2 represents the only major design change in the history of the 107 mm mortar. This projectile is boat tailed and even more like an artillery shell than the previous models, an appearance which is enhanced by the presence of a rotating band. The complete round consists of a projectile body, the fuze and the tail assembly. The forged steel body has a pre-engraved rotating band and a neoprene rubber obturating ring near the base. The rotating disc/pressure plate system of previous rounds has been abandoned in this design. The tail assembly consists of a cartridge container and ignition cartridge, a propelling charge and a striker-nut assembly. Below the nose is a deep fuze cavity containing a TNT supplementary charge that is removed when using long proximity fuzes.

To load, the bomb is positioned so that the pre-engraved driving band engages in the rifling grooves of the mortar, and is then released to drop down the barrel. When the propelling charge fires, the gas pressure expands the neoprene obturating ring and provides the gas seal. The engagement of the driving band in the rifling generates the desired spin as the projectile moves up the barrel.

Specifications

Length, fuze: 514 mm

Weight, fuze: 9.98 kg

Weight and type of payload: 2.61 kg Comp B

Fuze: impact SQ M557 or M739; MTSQ M520 series, M564; proximity M513 series; [M728](#), M732

Min range: 840 m

Max range: 6,600 m

Muzzle velocity: 308 m/s

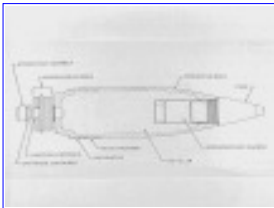
Colour/markings: OD/yellow

Status: **Obsolete in US service.**

Manufacturer

US government contractors.

UPDATED



107 mm HE bomb M329A2

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MORTARS - 107 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

107 mm HE bomb M329, M329A1, M329B1

Armament

US 107 mm Mortars M2 and [M30](#).

Development

This mortar and its associated ammunition was developed in the 1920s for the US Chemical Warfare Service production. However, it was limited and it was not until 1943 that it was approved for general service using explosive bombs. The basic bomb design has remained the same throughout the mortar's life, minor improvements being made from time to time. The 107 mm mortar and its ammunition became obsolescent in US service during the mid-1990s, being replaced by the [M120/M121](#) 120 mm mortar. The 107mm mortar is, however, widely used and may be encountered throughout the world.

Description

The bomb body is parallel-sided, with an ogival head and more generally resembles an artillery projectile than a conventional mortar bomb. A doughnut shaped cloth bag containing the first five propelling increments is never removed. The remainder of the charge consists of [M8](#) sheet propellant increments, which are removed to adjust range. The nose adaptor is threaded for the fuze, which may be impact, delay or proximity. At the rear of the bomb is the cartridge container and obturation system, which is unique to this weapon.

The 107 mm mortar is rifled, which presents the problem of how to drop load it and still engage with

the rifling when fired. At the base of the bomb is a tubular cartridge container, which has the usual type of primary cartridge inserted into it and secondary increments fitted around it. The cartridge container is screwed into the base of the bomb; around the upper end of the container is a copper 'rotating disc' which is dished so that the concave face is towards the cartridge container. This ensures the diameter of this dished plate is less than the bore of the mortar, enabling the bomb to be drop loaded in the usual way. Below this rotating disc lies a steel 'pressure plate', of the same diameter as the bomb body.

On firing, the propellant charge explodes and the gas pressure forces the pressure plate forward. This forces the dished rotating disc to flatten out so that its edges bite into the rifling of the barrel and form a gas seal. The attachment of the rotating disc to the bomb is such that any rotation of the disc, induced by the rifling, will be transmitted to the bomb. Therefore, as the gas pressure drives the bomb up the bore, the interaction of the disc in the rifling grooves develops spin in the bomb. The M329A2 has a pre-engraved rotating band which engages the rifling of the mortar bore as the bomb is dropped in the tube. There is also an obturator on the projectile base, which functions similarly to the pressure disc of the M329A1 to seal the rotating band in the mortar tube upon firing. The M329B1 has a forged body with an integral base.

Specifications

Length, fuze: 655 mm

Weight, fuze: 12.28 kg

Weight and type of payload: 3.73 kg TNT (3.21 kg main charge; 0.17 kg supplementary charge and 0.35 kg propellant)

Fuze: impact SQ M557 or M739; MTSQ M520 or M564; proximity M513 series, [M728](#), or M732

Min range: 840 m

Max range: 5,560 m

Muzzle velocity: 299 m/s

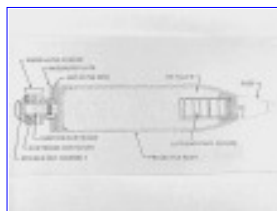
Colour/markings: OD/yellow.

Status: Obsolescent in US service.

Manufacturer

US government contractors.

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107 mm HE bomb M329A1

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm training bomb M445

Armament

US M1, [M29](#), [M29A1](#) and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, as a replacement for earlier practice bombs.

Description

Unlike other mortar rounds, the components of this round are issued separately to facilitate reuse and the replacement of damaged or worn parts. The bomb consists of a steel body threaded at the nose for a dummy fuze and at the rear to accept a tailboom and fin unit. The latter contains a propulsion cartridge inserted into the tailboom, and a smoke cartridge inside the upper part of the tailboom; there is no connection between these two items. On firing, the propulsion cartridge provides the necessary thrust; on striking the ground an inertia firing pin in the smoke cartridge fires the smoke mixture. The smoke escapes from vents in the tail tube and marks the point of impact. The bomb can then be recovered and the propulsion and smoke cartridges can be replaced, allowing the bomb to be reused.

Specifications

Length, fuzed: 527 mm

Weight, fuzed: 4.345 kg

Type of payload: steel ballast weight

Number of charges: 1

Fuze: dummy M531

Max range: 172 m

Muzzle velocity: 41.3 m/s

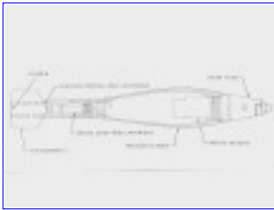
Colour/markings: old: black or blue/white; new: bronze/white

Restrictions: Not to be used with any form of secondary increment.

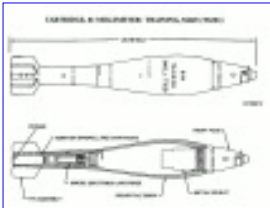
Manufacturer

US government contractors.

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81 mm training bomb M445



*M445
(1999)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke bomb M375, M375A1, M375A2

Armament

US M1, [M29](#), [M29A1](#) and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, as an advance upon earlier designs. They are no longer in production in the US. The [M375A1](#) and [M375A2](#) remain in the US Army stockpile and all three probably exist in those of other nations.

Description

This is the smoke equivalent of the HE bomb [M374A2](#), with the same canted tailfins for added stability and nine charge propelling system. The interior arrangements are similar to the M370 smoke bomb, with a central burster tube loaded with RDX and surrounded by white phosphorus smoke mixture.

The differences between the various models are minor and have no operational significance.

Specifications

Length, fuze: 529 mm

Weight, fuze: 4.23 kg

Weight and type of payload: 725 g WP

Number of charges: P + 9

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke bomb M370

Armament

US M1, [M29](#), [M29A1](#) and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, based upon British designs for the [L16](#) mortar. This round is no longer in production, having been superceded by the M816/M853A1 (qv).

Description

This is the partner to the HE bomb M362 insofar as it shares the same body without obturation ring or gas check grooves. It also uses the same tail unit, with drum tail and propulsion system. The principal difference lies in the filling of White Phosphorus (WP) and the presence of a central burster tube filled with 11 g of RDX which, when initiated by the fuze, breaks open the shell and liberates the WP smoke composition.

Specifications

Length, fuzed: 529 mm

Weight, fuzed: 4.24 kg

Weight and type of payload: 725 g WP

Number of charges: P + 8

Fuze: impact SQ M524, M526

Colour/markings: light green/yellow band, light red markings

Ballistic performance:

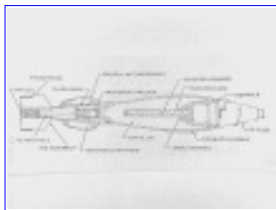
Charge	Max range
P	274 m
1	640 m
2	1,188 m
3	1,691 m
4	2,148 m
5	2,661 m
6	2,926 m
7	3,292 m
8	3,646 m

Restrictions: Charge 5 is the maximum authorised for firing from the M1 and similar low-pressure mortars.

Manufacturer

US government contractors.

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81 mm WP smoke bomb M370

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M374A3

Armament

US M1, [M29](#), [M29A1](#) and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, as an advance upon the previous model. The M374A3 is no longer in production in the US but remains in the stockpile for contingency and training use.

Description

This is generally similar to the [M374A2](#) bomb, differing principally in the propulsion system. The bomb body is of alloy steel and has a parallel-sided tailboom with canted fins. There is an ignition cartridge screwed into the tailboom which carries a percussion primer, a black powder pellet and approximately 7.5 g of propellant powder. This cartridge extends almost the full length of the tailboom. A total of four secondary increments, in cellulose acetate horseshoe containers, clip around the tailboom above the fins.

Specifications

Length, fuze: 529 mm

Weight, fuze: 4.31 kg

Weight and type of payload: 953 g Comp B

Number of charges: P + 4

Fuze: impact SQ M567, M524A6 (alternate)

Colour/markings: olive drab/yellow

Ballistic performance:

Charge*	Muzzle velocity	Max range
P	68 m/s	454 m
1	134 m/s	1,633 m
2	185 m/s	2,866 m
3	229 m/s	4,013 m
4	268 m/s	4,800 m

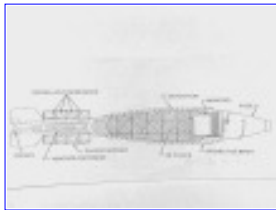
*Charge P is the ignition cartridge only: Charge 1 is the ignition cartridge and one increment charge; Charge 4 is the ignition cartridge and four increment charges.

Restrictions: Charge 2 is the maximum charge authorised for firing in M1 or other low-pressure mortars.

Manufacturer

US government contractors.

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81 mm HE bomb M374A3

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M374, M374A2

Armament

US M1, [M29](#), [M29A1](#), and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, based upon British designs for the [L16](#) mortar. These rounds are no longer in production in the US. The [M374A2](#) remains in US stockpiles for contingency and training use.

Description

This resembles the M362 bomb, but it is fitted with a plastic obturating ring in a groove behind the bourrelet and has a plain fin assembly instead of the drum tail. The [M374](#) has straight fins, while the [M374A2](#) has the fins canted 5° to induce spin stabilisation during flight and improve consistency. The [M374A2](#) also has a moisture proof ignition system, moisture resistant propelling charges and improved protective packaging. The bomb body may be of forged steel or pearlitic malleable iron (PMI). The percussion primer and ignition cartridge system in the tailboom is as the earlier bomb, but the secondary charge system differs by having nine fabric bags. The lowest (Charge 1) bag being wrapped around the tailboom outside the ignition cartridge, and the remaining eight bags assembled longitudinally alongside the boom and secured by clips, so concealing the Charge 1 bag from view.

Specifications

Length, fuzed: 529 mm

Weight, fuzed: 4.236 kg

Weight and type of payload: 953 g Comp B

Number of charges: P + 9

Fuze: impact SQ M524, M562, M567, M716; proximity M532

Ballistic performance:

Charge	Muzzle velocity	Max range
P	64 m/s	403 m
1	104 m/s	1,001 m
2	132 m/s	1,529 m
3	154 m/s	1,988 m
4	176 m/s	2,475 m
5	200 m/s	2,955 m
6	216 m/s	3,416 m
7	233 m/s	3,831 m
8	248 m/s	4,197 m
9	261 m/s	4,500 m

Restrictions: Charge 5 is the maximum authorised for firing from M1 and other low-pressure mortars. When firing Charge 9 the rate of fire must not exceed 12 rds/min. Ballistic irregularity, leading to the occasional short round, may occur when firing at Charge 3 or below.

Manufacturer

US government contractors.

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm HE bomb M362, M362A1

Armament

US M1, [M29](#), [M29A1](#), and [M252](#) 81 mm mortars and other medium- and high-pressure mortars.

Development

By US Army, based upon British designs for the [L16](#) mortar. This round is no longer in production in the US, nor is it held in US stockpiles.

Description

This is an elongated, streamlined bomb of modern type, but is unusual in that it does not employ an obturating ring nor any gas check grooves. It relies instead entirely upon accurate machining of the bourrelet to obtain the requisite windage and gas checking performance. The effect of this can be seen by comparing the ballistic performance with that of the [M374](#) design, which employs an obturating ring. The M362 bomb is of forged steel, the M362A1 of pearlitic malleable iron (PMI).

The body is threaded at the nose for a fuze and has a threaded spigot at the rear to which the fin assembly is screwed. This is of light alloy and consists of a tapering tailboom and a drum-type fin assembly, that is, six fins around the ends of which is a circular shroud. A percussion primer is fitted into the end of the tailboom and there is an ignition cartridge inside the upper end, beneath the gas escape holes. The secondary charges are attached alongside the tailboom, over the gas escape holes, and retained by spring clips. M362 is obsolescent in US service.

Specifications

Length, fuzed: 529 mm

Weight, fuzed: 4.27 kg

Weight and type of payload: 953 g Comp B

Number of charges: P + 8

Fuze: impact SQ M524, M526 or M716; proximity M517 or M532

Colour/markings: olive drab/yellow

Ballistic performance:

Charge	Muzzle velocity	Max range
P	55 m/s	297 m
1	91 m/s	777 m
2	121 m/s	1,301 m
3	146 m/s	1,791 m
4	169 m/s	2,246 m
5	189 m/s	2,657 m
6	205 m/s	3,027 m
7	220 m/s	3,327 m
8	236 m/s	3,618 m

Restrictions: Charge 5 is the maximum authorised for firing in the M1 or other low-pressure mortars.

Manufacturer

US government contractors.

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm target practice (TP) bomb M43A1

Armament

US M1, [M29](#), [M29A1](#) and other medium-pressure 81 mm mortars.

Development

By the US Ordnance Department after Brandt originals.

Description

The practice bomb is simply the body and fin assembly of the HE bomb M43A1. It is loaded with inert plaster filler and a small black powder spotting charge sufficient to allow the fall of shot to be observed and be corrected during training. The body is of forged steel, threaded at the nose to accept the fuze and at the base to accept the fin assembly. The round is propelled by an ignition cartridge and four increment charges clipped between the fins. Although obsolescent in US service, the M43A1 TP bomb may still be encountered elsewhere.

Specifications

Length, fuze: 338 mm

Weight, fuze: 3.31 kg

Weight and type of payload: 585 g inert ballast and 25 g black powder

Number of charges: P + 8

Fuze: impact SQ M52A1B1

Ballistic performance: as for the HE bomb M43A1

Colour/markings: OLD: blue or black/white; NEW: blue/white

Manufacturer

US government contractors.

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

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81 mm illuminating bomb M301A3

Armament

US M1, [M29](#), [M29A1](#) and other medium-pressure 81 mm mortars.

Development

By the US Ordnance Department as an improvement on the M301A1. The [M301A3](#) is no longer in production, but is held in US stockpiles.

Description

This is generally the same as the M301A1 described previously, except the construction is slightly different internally, producing a longer and stronger bomb. The propellant system also differs, the two in combination allowing greater range. There is a percussion primer in the end of the tailboom and an ignition cartridge located in the forward section of the boom; around this section the secondary increments are located, secured by spring clips. From three to eight increments may be attached, giving six operating charges.

Specifications

Length, fuze: 628 mm

Weight, fuze: 4.58 kg

Type of payload: parachute and flare

Number of charges: 6

Fuze: time M84A1

Illumination intensity: 500,000 cd

Burning time: 60 s

Ballistic performance:

Charge	Fuze setting	Range	Height of burst	Elevation
3	20.6	250 m	600 m	1,501.1 mils
3	19.93	250 m	600 m	1,501.1 mils
3	15.9	1,050 m	600 m	1,042.1 mils
4	19.8	1,550 m	600 m	1,004.3 mils
5	22.1	2,050 m	600 m	942.6 mils
6	26.1	2,450 m	600 m	967.4 mils
7	27.6	2,950 m	600 m	904.7 mils
8	29.8	3,150 m	600 m	883.9 mils

Manufacturer

US government contractors.

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

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81 mm illuminating bomb M301 series

Armament

US [M29](#), [M29A1](#) and other medium-pressure 81 mm mortars.

Development

By the US Ordnance Department after Brandt originals. The M301A1 and M301A2 are out of production and are no longer held in US stockpiles. However, they may still be encountered in other countries.

Description

The M301A1 and M301A2 use the same cylindrical body, tailcone and fin assembly as the [M57](#) smoke bomb described previously, but has no ogive. Instead, the end of the tubular section is closed by an adaptor into which the fuze is screwed, inside is an expelling charge. A propulsion cartridge fits into the tailboom and up to four incremental charges are attached to the tailboom ahead of the fins. Only three operating charges are used; P + 2, P + 3 and P + 4; firing with less than two or more than four increments is forbidden.

The interior of the bomb contains a parachute and flare assembly. The tailcone is attached to the tubular body by shear pins. When the fuze functions, it ignites the expelling charge and lights the flare composition. The pressure generated by the expelling charge shears the connecting pins and forces off the tailcone, allowing the parachute and flare to be ejected.

The M301A1 differs from the M301A2 in that it has gas-check bourrelet grooves and some minor differences in metal parts dimensions.

Specifications

Length, fuze: 571 mm

Weight, fuze: 4.85 kg

Type of payload: parachute and flare

Number of charges: 3 (see text)

Fuze: time [M84](#)

Illumination intensity: 500,000 cd

Burning time: 60 s

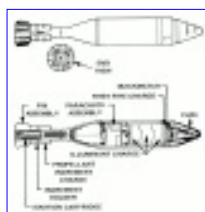
Ballistic performance:

Charge	Muzzle velocity	Max range
2	134 m/s	1,000 m
3	158 m/s	1,600 m
4	181 m/s	2,150 m

Manufacturer

US government contractors.

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*M301A1 and A2 81 mm illuminating bombs
(1998)*

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

81 mm smoke WP bomb M57, M57A1

Armament

US M1, [M29](#), [M29A1](#) and other medium-pressure 81 mm mortars.

Development

By the US Ordnance Department after Brandt originals.

Description

This bomb also dates from the introduction of the M1 mortar in 1936 and has seen little change since that time. It has a cylindrical steel body with tailcone, tailboom and fin assembly, the nose curved into an ogive into which is screwed an adaptor. This carries a central burster tube and is threaded to receive the fuze. The burster is filled with 36 g of Tetryl and the remainder of the body cavity with 1.84 kg of White Phosphorus (WP). A propulsion cartridge is fitted into the tailboom and up to four increments are attached to the tailboom in front of the fins by means of spring clips.

On impact, the fuze detonates the Tetryl burster; this breaks open the bomb and releases the WP, this inflames spontaneously on contact with the air, generating dense smoke. Although obsolescent in US service, this bomb may still be encountered in other countries.

Specifications

Length, fuzed: 582 mm

Weight, fuzed: 5.16 kg

Weight and type of payload: 1.84 kg WP

Number of charges: 4

Fuze: impact SQ M52A1 or M525

Colour/markings: Grey/yellow

Ballistic performance:

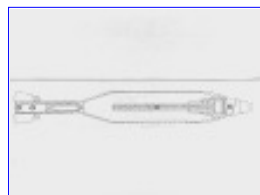
Charge	Muzzle velocity	Maximum range
1*	NA	630 m
2	NA	1,199 m
3	NA	1,646 m
4	160 m/s	2,169 m

*This round can be fired only at Charge 1 or higher. Charge 1 is the ignition cartridge and one increment charge.

Manufacturer

US government contractors.

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81 mm Smoke Bomb [M57](#): (A) primer, percussion; (B) cartridge, ignition; (C) burster; (D) fuze, PD

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MORTARS - 81 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

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81 mm HE bomb M43A1, M43A1B1

Armament

US M1, [M29](#), [M29A1](#) and other medium-pressure 81 mm mortars.

Development

By the US Ordnance Department after Brandt originals. **These rounds are out of production and no longer held in the US stockpile, but may be found elsewhere.**

Description

This the oldest mortar ammunition design in the US inventory, having been introduced (as the [M43](#)) with the M1 mortar in the late 1930s. Subsequent modifications have been relatively minor and the bomb is still essentially the original Brandt design. It is a teardrop-shaped forged steel bomb, with four gas check grooves at the bourrelet and a welded steel tail tube and fin assembly. The difference between the M43A1 and A1B1 bombs is confined to manufacturing details and has no operational significance. A propulsion cartridge is fitted in the tail tube and up to eight secondary increments fit between the tailfins and are secured by spring clips. These increments are in the form of leaves of smokeless powder contained in plastic envelopes. Although the round is obsolete in US service, it may still be encountered in other countries.

Specifications

Length, fuzed: 338 mm
Weight, fuzed: 3.24 kg
Weight and type of payload: 585 g Comp B
Number of charges: P + 8
Fuze: impact SQ M525 or M717
Min range: 69 m

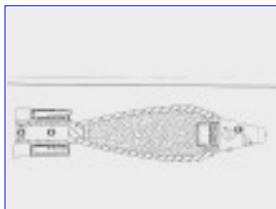
Ballistic performance:

Charge	Muzzle velocity	Max range
P	72 m/s	517 m
1	107 m/s	1,029 m
2	135 m/s	1,511 m
3	158 m/s	1,947 m
4	180 m/s	2,349 m
5	200 m/s	2,700 m
6	219 m/s	3,016 m
7	237 m/s	3,292 m
8	254 m/s	3,701 m

Manufacturer

US government contractors.

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81 mm HE bomb M43A1: (A) primer, percussion; (B) cartridge, ignition; (C) fuze, PD

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

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60 mm practice bomb M50A2

Armament

[60 mm M2](#), [M19](#) and [M224](#) mortars.

Development

By US Ordnance Department. It is no longer in production in the US, but may be found in US stockpiles.

Description

This resembles the body and tail unit of the 60 mm HE Bomb [M49A4](#), but is filled with inert ballast and a small black powder spotting charge below the fuze. On impact, the fuze ignites this charge which blows off the head of the bomb and produces a puff of smoke for spotting purposes.

Specifications

Length, fuzed: 281 mm

Weight, fuzed: 1.45 kg

Type of payload: black powder and ballast

Number of charges: P + 4

Fuze: M525 impact SQ

Min range: 45 m

Max range: 1,814 m

Colour/markings: light blue/black

Manufacturer

US government contractors.

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm illuminating bomb M83A1, M83A2 and M83A3

Armament

[60 mm M2](#), [M19](#) and [M224](#) mortars.

Development

By US Ordnance Department after an original Brandt design. They are no longer in production in the US, but may be found in US stockpiles.

Description

A cylindrical bomb with a conical section at the rear, to which the welded steel fin unit is attached. The bomb contains a parachute and flare assembly that is ejected after approximately 15 seconds of flight by the action of a fixed time fuze screwed into the nose of the bomb. An expelling charge directly below the fuze ejects the illuminant and parachute assembly. The flare assembly consists of a first-fire charge and illuminant charge and is contained in a boxboard casing that is attached to the parachute with a suspension line. Firing this bomb below Charge 2 will result in dud rounds.

Specifications

Length, fuzed: 363 mm

Weight, fuzed: 2.27 kg

Weight and type of payload: 220 g, parachute and flare

Number of charges: P + 4

Fuze: fixed time

Min range: 375 m

Max range: 1,000 m

Duration of light: 25 s

Candlepower: 250,000 cd

Area of illumination: 600 m diameter

Colour/markings: white/black

Ballistic performance:

Charge	Muzzle velocity	Horizontal range	Height of burst	Elevation
2*	95.0 m/s	434 m	155 m	68°
2	95.0 m/s	457 m	144 m	66°
2	95.0 m/s	480 m	133 m	65°
3	113.9 m/s	800 m	139 m	51°
4	132.2 m/s	1,006 m	160 m	45°

*Charge 2 is the ignition charge and 2 increment charges. Charge 4 is the ignition charge and 4 increment charges

Manufacturer

US government contractors.

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm smoke bomb M302A1 and M302A2

Armament

[60 mm M19](#), [M224](#) and other mortars.

Development

By US Ordnance Department.

Description

This is a short cylindrical bomb with welded steel fins at the end of the tapered rear section of the body. The head is closed by an adaptor carrying a burster tube which contains an [M19](#) Burster Charge. The body cavity is filled with White Phosphorus (WP) smoke mixture. The ignition cartridge is pressed into the tail boom and four increment charges are clipped between the fins. Excessive short rounds may occur when this round is fired at temperatures below 18°C.

Specifications

Length, fuze: 281 mm

Weight, fuze: 2.26 kg

Weight and type of payload: 340 g WP

Number of charges: P + 4

Fuze: M527B1 impact SQ

Min range: 213 m

Max range: 1,582 m

Colour/markings: grey/black

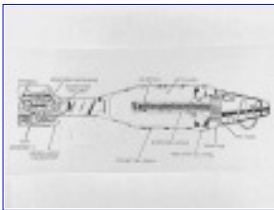
Ballistic performance:

Charge	Muzzle velocity	Max range
0	47.5 m/s	213 m
1	74.3 m/s	535 m
2	96.3 m/s	916 m
3	115.8 m/s	1,272 m
4	133.8 m/s	1,582 m

Manufacturer

US government contractors.

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60 mm smoke bomb M302

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M720

Armament

US [M224](#) 60 mm mortar.

Development

By US Ordnance Department as an improvement upon previous models and to enhance the performance of current mortars. The [M720](#) has been replaced in US procurement by the improved [M720A1](#) (qv).

Description

The [M720](#) is generally similar to the 60 mm HE Bomb [M49A5](#) described previously, but uses a more powerful propelling charge. The basic components are the [M734](#) multi-option (proximity/PD) fuze, projectile body, [M27](#) aluminium alloy fin, [M702](#) ignition cartridge, obturating ring and four equal [M203](#) propelling charges.

Specifications

Length, fuzed: 377 mm

Weight, fuzed: 1.7 kg

Weight and type of payload: 360 g Comp B

Number of charges: P + 4

Fuze: Multi-option, [M734](#)

Min range: 70 m

Max range: 3,490 m

Muzzle velocity: 64-247 m/s

Colour/markings: OD/yellow

Ballistic performance:

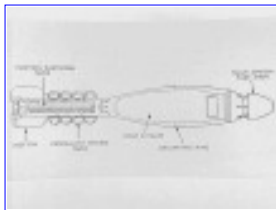
Charge	Muzzle velocity	Max range
P	64 m/s	400 m
1	126 m/s	1,340 m
2	171 m/s	2,150 m
3	207 m/s	2,890 m
4	247 m/s	3,490 m

Restrictions: Not to be fired in the [M19](#) mortar with Charges 3 or 4. Not to be fired in the hand-held mode with other than Charge 1.

Manufacturer

US government contractors.

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60 mm HE bomb [M720](#)

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M49A5

Armament

US [M19](#) 60 mm mortars.

Development

By US Ordnance Department to improve the performance of existing mortars. **The round is no longer in production in the US, but may be found in US stockpiles.**

Description

This is a streamlined bomb based upon the design of the 81 mm M362, a modern bomb with a single plastic obturating ring at the waist. The body is of alloy steel threaded at the head for a fuze and at the rear to accept the alloy tail unit. A primary cartridge fits into the tail and two secondary increments in plastic horseshoe containers fit around the boom ahead of the fins.

Specifications

Length, fuzed: 373 mm

Weight, fuzed: 1.77 kg

Weight and type of payload: 358 g Comp B

Number of charges: P + 2

Fuze: impact SQ, M935

Min range: 70 m

Max range: 2,150 m

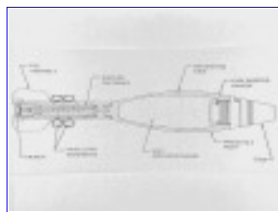
Muzzle velocity: 350 m/s

Colour/markings: OD/yellow

Manufacturer

US government contractors.

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60 mm HE bomb M49A5

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MORTARS - 60 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

60 mm HE bomb M49A4

Armament

[60 mm M19](#) and other mortars.

Development

By US Ordnance Department based on Brandt original. The round is no longer in production in the US, but may be found in US stockpiles.

Description

The bomb is of conventional cast-iron pattern, with four gas check grooves around the body and a steel tail unit screwed in. The primary cartridge is of shotgun type, inserted into the centre of the tail unit. The secondary charges are in the form of leaves of smokeless powder stitched together and are sprung into place between the tailfins as required.

Specifications

Length, fuze: 294 mm

Weight, fuze: 1.47 kg

Weight and type of payload: 190 g Comp B

Number of charges: P + 4

Fuze: M525, M525A1 or M717 impact SQ

Min range: 45 m

Max range: 1,771 m

Muzzle velocity: 158 m/s (Charge 4)

Ballistic performance:

Charge	Muzzle velocity	Max range
0	51.5 m/s	256 m
1	75.2 m/s	639 m
2	113.6 m/s	1,069 m
3	137.1 m/s	1,452 m
4	158.4 m/s	1,814 m

Restrictions: When using the M1 baseplate no more than one secondary charge may be used.

Manufacturer

US government contractors.

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US 60 mm HE bomb [M49A4](#)

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FIELD ARTILLERY

Date Posted: 07 February 2002

Jane's Ammunition Handbook 2002-2003

Projectile, 155 mm: Smoke, WP, M825A1

Armament

[M1A1](#) Cannon for M114/M114A1 Towed Howitzer; [M1A2](#) Cannon for [M114A2](#) Towed Howitzer; M199 Cannon for [M198](#) Towed Howitzer; M126/M126A1 Cannon for [M109](#) Self-propelled Howitzer; M185 Cannon for [M109A1](#) to M109A4 series of self-propelled howitzers; M284 Cannon for M109A5 and [M109A6](#) Paladin self-propelled howitzers; XM2001/XM2002 [Crusader](#) AFAS; XM777 Lightweight Towed Howitzer.

The 155 mm Smoke WP M825A1 can also be fired from the following artillery weapons:

NORICUM GH [N-45](#) Gun-Howitzer; CITEFA CALA 30/2; Patria Vammas [M-83](#) and 155 GH 52 howitzers; Giat Industries TR and 155/52 guns and M114F Howitzer; Field Howitzer [FH-70](#); Soltam Model 839P and 845P towed howitzers, [M-71 Gun-Howitzer](#), M-68 Gun-Howitzer, M-46 Field Gun, and [M114S](#) Howitzer; Hadid 155 mm Howitzer HM41 ([Iran](#)); Otobreda 155/39 TM Howitzer; [KH179](#) Howitzer ([South Korea](#)); RDM [M139](#) and M139/39 howitzers; STK [FH-88](#) and FH-2000 Gun-Howitzers; [LIW](#) G5; SITECSA 155/45 ST 012 Gun-Howitzer; SANTA BARBARA SB 155/39 and 155/52 APU SBT-1 Howitzers, [M114](#) 155/45 and [M114](#) 155/39 conversions; Bofors [FH-77B](#) Howitzer; [Bison](#) Fortress Gun (Switzerland); T65 Howitzer and Extended Range Gun ([Taiwan](#)); 155 mm/52-calibre Howitzer ([Turkey](#)); [M46/84](#) Gun and [M65](#) Howitzer (Federal Republic of [Yugoslavia](#)).

The 155 mm Smoke WP M825A1 can also be fired from the self-propelled artillery weapons:

TAMSE VCA ([Argentina](#)); PZL45 ([PRC](#)); Giat Industries [GCT](#) and CAESAR 155/52; [PzH 2000](#) (Germany); [M44T](#) (Germany); Soltam Rascal, Slammer and L33; Hadid 155 mm Self-propelled Cannon HM44 [Thunder 2](#) ([Iran](#)); Otobreda Palmaria and [M109L](#); Type 75 ([Japan](#)); K9 Thunder([South Korea](#)); ZTS [ZUZANA](#) ([Slovakia](#)); [LIW](#) G6; SFAW [M109](#) Upgrade (Switzerland); [XT-69](#) ([Taiwan](#)); [SP2000](#) ([Turkey](#)); [AS90](#) and [Braveheart](#) (UK); UD 155 mm/52-calibre International Howitzer (USA).

Development

The 155 mm Smoke WP M825A1 was developed to replace the venerable M110 family of WP/Smoke projectiles and is in production by the Thiokol Corporation (metal parts) for the US Army and Marine Corps. It is one of the projectiles developed from the 155 mm DPICM M483A1 projectile and has virtually matching ballistics, although the M825A1 can be fired using the [M203](#) propellant charges. The Smoke WP M825A1 has the advantage over other White Phosphorus (WP) filled smoke projectiles in that it does not need to be stored base down, as is usually the case with WP projectiles, as the saturated felt wedges utilised for the smoke production prohibit migration; there is therefore no centre of gravity shift within the casing.

Prior to FY98, approximately 460,000 examples of this projectile had been procured by the US armed forces. No procurement has been made since then.

Description

The 155 mm Smoke WP M825A1 is a separate loading, base ejection, smoke-producing projectile which uses a body virtually identical to the 155 mm DPICM M483A1. The projectile uses a 155 mm DPICM M483A1 aluminium ogive section and expulsion charge, a forged steel modified M483A1 body and a threaded steel ring and aluminium body base. Inside the body is a hermetically sealed canister containing 116 White Phosphorus (WP) saturated felt wedges each 190 mm thick and separated into four quadrants of 29 each. A 63.5 mm diameter burster charge containing approximately 45 g of Composition B runs the entire length of the canister's centre cavity.

In operation, the nose-mounted time fuze is set to function at a selected point during the projectile's trajectory. When the fuze functions it ignites a 51 g expulsion charge of [M10](#) propellant which creates sufficient internal pressure within the ogive to push off the body base and eject the canister. The expulsion charge also ignites a 100 ms pyrotechnic delay, enabling the canister to be fully ejected from the carrier body before the burster charge (21.2 g of Composition A5) ignites to break open the canister and release the WP-saturated felt wedges (total weight of WP in the wedges is 5.78 kg). A launch activated safe and arm module from a PD M739 fuze separates the forward end of the main burster charge from the heat sensitive pyrotechnic delay element.

In less than 45 seconds of meeting the air the separated felt wedges start to burn and produce smoke. They continue to produce a dense and uniform smoke screen between 5 to 10 minutes.

The 155 mm Smoke WP M825A1 can be fired using the M3A1/M4A2 bagged charge system, normally from Charge 3 upwards, or the [M119](#) series of unitary bagged charges. The [M203](#) (Charge 8S) can be utilised with the 155 mm Smoke WP M825A1.

The Propelling Charge [M3A1](#) is a green bag charge using 2.495 kg of M1 propellant divided into a base charge and four increments for firing as Charges 1 to 5. It has an M2 flash reducer pad (weighing 28.3 g) assembled in front of the base charge with similar pads assembled in front of increments 4 and 5. The increment bags are tied together by four cloth straps and a clean-burning igniter charge in a red cloth bag is sewn to the rear of the base charge. The complete charge is 406 mm long.

The Propelling Charge M3 is similar to the [M3A1](#) but lacks the M2 flash reducer pads and an 85 g charge of black powder is used in the igniter pad. It should be noted that Charge 1 cannot normally be used with the longer barrelled weapons.

The Propelling Charge M4A2 is a white bag charge using 5.897 kg of M1 propellant divided into a base charge and four increments for firing as Charges 3 to 7. The increments are tied together by four cloth straps. A 96.4 g clean-burning igniter charge in a red cloth bag is sewn to the rear of the base section and an M2 flash reducer pad is assembled in front of the base charge. The complete charge is 533 mm long.

The Propelling Charge [M4A1](#) is similar to the M4A2 but does not contain the M2 flash reducer pad (although this can be added if required), the base igniter contains black powder.

The M3 and M4 series of charges used with the 155 mm Smoke WP M825 are fired using the [M82](#) primer. The M2 flash reducer pad used with these charges is a 101.6 mm square red cotton cloth bag containing black powder and potassium sulphate or potassium nitrate.

The Propelling Charge [M119](#) is a single white bag charge in a laced jacket fired as Charge 8. It has an igniter bag sewn on to the base and a flash reducer pad is located on the front of the bag; the forward end also contains lead foil as a decoppering agent. The [M119](#) contains approximately 8.62 kg of cool-burning [M6](#) propellant with a central igniter consisting of a moulded nitrocellulose tube containing benite strands.

The Propelling Charge [M119A1](#) has some design improvements over the [M119](#) including a modified ring-shaped flash reducer.

The Propelling Charge M119A2 uses a red charge bag and does not have a laced jacket. It is provided with an igniter protector cap and tie strap which must be removed before firing; the circular red cloth igniter pad weighs 113 g. The M119A2 zone 7 is equivalent to the [M119/M119A1](#) zone 8 charge. There are four 113 g potassium sulphate flash reducer increments located in side pockets. The M119A2 is 660 mm long. The M119A2 charge is produced by Eurometaal NV as the No 13.

The Propelling Charges [M203](#) and M203A1 (Charge 8S) were developed primarily for use in the 155 mm M284 cannon used with the M109A5 and [M109A6](#) Paladin self-propelled howitzers. The M203/M203A1 is a single red bag charge encased in a tight fitting lacing jacket for strength. The bag has an igniter sewn to the base, a central core igniter extending through the centre of the charge and a flash reducer in front of the charge. The M203A1 differs from the [M203](#) by producing cooler burning to increase barrel life, together with a reduction in blast and muzzle flash.

The [M119](#) series and [M203](#) propellant charges should be fired using the Primer [M82](#) only.

Ballistic performance achieved when firing the 155 mm Smoke WP M825A1 from the 155 mm M126/M126A1 Cannon used on the [M109](#) self-propelled howitzer and the 155 mm [M1A2](#) Cannon used on the [M114A2](#) towed howitzer is as follows:

Charge 1 ([M3A1](#) green bag) - MV 200 m/s - range 3,640 m
Charge 2 ([M3A1](#) green bag) - MV 224.5 m/s - range 4,870 m
Charge 3 ([M3A1](#) green bag) - MV 253.9 m/s - range 5,590 m
Charge 4 ([M3A1](#) green bag) - MV 293.5 m/s - range 7,080 m
Charge 5 ([M3A1](#) green bag) - MV 349.5 m/s - range 9,050 m
Charge 3 (M4A2 white bag) - MV 334.2 m/s - range 6,490 m
Charge 4 (M4A2 white bag) - MV 310.1 m/s - range 7,720 m
Charge 5 (M4A2 white bag) - MV 363.5 m/s - range 9,420 m
Charge 6 (M4A2 white bag) - MV 445 m/s - range 11,730 m
Charge 7 (M4A2 white bag) - MV 535.2 m/s - range 14,320 m.

When fired from the 155 mm M185 Cannon used on the [M109A1](#) to M109A4 series of self-propelled howitzers, the 155 mm Smoke WP M825A1 provides the following ranges:

Charge 3 ([M3A1](#) green bag) - MV 263 m/s - range 5,400 m
Charge 4 ([M3A1](#) green bag) - MV 304.1 m/s - range 7,500 m

Charge 5 ([M3A1](#) green bag) - MV 358.3 m/s - range 9,330 m
Charge 3 (M4A2 white bag) - MV 297.5 m/s - range 7,230 m
Charge 4 (M4A2 white bag) - MV 337 m/s - range 8,630 m
Charge 5 (M4A2 white bag) - MV 386 m/s - range 10,080 m
Charge 6 (M4A2 white bag) - MV 460 m/s - range 12,150 m
Charge 7 (M4A2 white bag) - MV 546.5 m/s - range 14,650 m
Charge 8 ([M119/M119A1](#)) - MV 650 m/s - range 17,740 m
Charge 8 (M119A2) - MV 660 m/s - range 17,740 m.

When using the M203/M203A1 charges with the 155 mm M199 Cannon used on the [M198](#) Towed Howitzer, the 155 mm Smoke WP M825A1 has a muzzle velocity of 797 m/s and a maximum range of 22,600 m.

Giat Industries of France produces a combustible case intended for use with all NATO standard 155 mm weapons. The case consists of a skirt, a base and a cover containing Charges 6 to 9; lower charges are formed using bagged charges. Use of this case system produces a barrel life at maximum charge of 3000 EFC.

The muzzle velocities produced using this combustible case system are as follows:

Charge 6 - 586 m/s

Charge 7 - 705 m/s

Charge 8 - 810 m/s

Charge 9 - 830 m/s

Charge 9 can fire a standard projectile to a maximum range of 24,000 m.

Chartered Ammunition Industries of [Singapore](#) produce a unitary charge, using cloth bags, which covers Charges 6, 7, 8 and 9. Known as the C20, this charge uses [M6](#) propellant, is 610 mm long, 160 mm in diameter, and weighs 10 kg.

It is anticipated that future 155 mm propellant charge systems will involve the employment of the M231/XM232 Modular Artillery Charge System (MACS). Other nations are currently in the process of adopting similar modular charge systems.

Specifications

Weights:

complete round - 46.72 kg

total weight of WP - 5.78 kg

expulsion charge - 51 g [M10](#) propellant

burst charge - 21.2 g Comp A5

Lengths:

body - 804 mm

with fuze - 899 mm

Number of WP wedges: 116

Authorised fuzes

PD M739

MTSQ M577

ET M762

Equivalent projectiles

UNITED STATES OF AMERICA

Manufacturer

Chamberlain Manufacturing

Type: Projectile, 155 mm: Smoke, WP, M825A1

Description: Metal parts produced at Scranton Army Ammunition Plant. Standard specifications

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: Projectile, 155 mm: Smoke, WP, M825A1

Description: Standard specifications

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Projectile, 155 mm: Smoke WP M825A1

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

120 mm illumination bomb, XM930/M983

Armament

[M120](#) and [M121](#) 120 mm mortars.

Development

By US Army ARDEC as a material change to the Israeli Visible Illuminating Cartridge. The Infra-Red (IR) version (M983) was type classified as standard in June 2000. The white-light version (XM930) was type classified as limited standard in 1998, but standard classification is not expected until early 2003. Through FY99, 26,000 rounds of both types had been procured, followed by 4,000 in FY00 for US\$11.4 million, The FY02 budget funds 2,000 XM930 for US\$3.5 million and 2,000 M983 for US\$3.5 million.

Excluding non-recurring costs the unit price of the XM930 in FY02 is US\$1,888, the main components of which are US\$381 for the loading, assembly and packing at Pine Bluff Arsenal, US\$286 for the projectile metal bodies from Chamberlain, US\$276 for the visible-light canister from Crane Army Ammunition Activity, US\$140 for the M776 MTSQ fuze from Diehl and US\$58 for the parachute assembly from Paranetics Technology. The unit price of the M983 is US\$1,939, reflecting a cost of US\$316 for the IR light canister.

In September 2001, Chamberlain was awarded a contract for development of alternate materials for the projectile body. The current rounds use a two-piece body (front and rear portions) both made of AISI 1090 steel. This particular alloy is susceptible to quench cracking and problems have been encountered with cracked bodies during initial production. The goal of this effort is to qualify a replacement steel with equal or greater strength (minimum 100 KSI yield strength and 12 per cent

minimum elongation) that will significantly reduce the potential for quench cracking and improve the machinability of the material and thus reduce cost.

Description

The round consists of a fuze, propellant charge, fin assembly, ignition cartridge, body of wrought carbon steel, tail cone assembly, illuminating candle, and parachute assembly. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The propellant charge is contained in four horseshoe-shaped felt-fibre containers and assembled around the fin assembly shaft. When the fuze functions it initiates the candle assembly and separates the front and rear projectile segments. A spring located in the rear body ejects the parachute assembly.

The two rounds are identical except for the illuminant canister. The XM930 produces white light, while the M983 produces light in the IR spectrum for use with standard night-vision devices.

Specifications

Length, fuzed: 703 mm

Weight, fuzed: 14.15 kg

Weight/type of payload: 1.2 kg/illuminant

Number of charges: P + 4

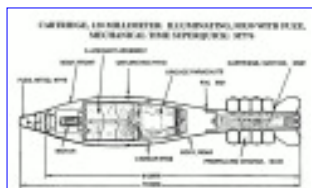
Fuze: MTSQ, M776

Illumination intensity (XM930): 1 million cd

Illumination duration: 50 s

Colour/markings: white/black

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*120 mm illuminating mortar bomb, M930
(1999)*

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 05 December 2001

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120 mm WP smoke bomb, M929/M929A1

Armament

[M120](#) and [M121](#) 120 mm mortar.

Development

The XM929 entered low-rate initial production in May 1992 and was type classified as standard (M929) in June 1996. The M929A1 is identical, but uses the XM734A1 Multi-Option Fuze (MOF). The US Army purchased 64,000 rounds in FY00 and 15,000 rounds in FY01. Overall unit cost in FY01 was US\$1,622, but if non-recurring costs (mainly related to material changes in training equipment and the ignition cartridge) are excluded, the hardware unit cost was US\$880. The main elements of the cost are the load-assemble-pack operation by Pine Bluff Arsenal (US\$226), the metal projectile bodies from Chamberlain (US\$189), the [M86](#) burster from American Ordnance (US\$25), and the M734A1 fuze from KDI (US\$225).

Description

The round consists of a fuze, propellant charge, fin assembly, ignition cartridge, and shell body. The shell body, made of wrought carbon steel, is loaded with WP filler. The filler consists of 144 felt wedges impregnated with WP, which burns immediately on contact with air. The wedges burn for approximately 2 minutes, creating a smoke that is twice as effective as the 107 mm, M328A1 round. The ignition cartridge has a percussion primer and is assembled to the end of the fin assembly. The

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TANK AND ANTI-TANK GUNS

Date Posted: 05 December 2001

Jane's Ammunition Handbook 2002-2003

120 mm M865 TPCSDS-T

Armament

Rheinmetall 120 mm Smoothbore Guns used on the [Leopard 2](#) and Leopard L1A1A1 (prototype); Japanese Type 90; South Korean [K1A1](#).

[M256](#) Cannon used on [M1A1](#) and [M1A2](#) Abrams MBTs.

This round can also be fired from the Otobreda 120 mm Smoothbore Gun, the Swiss 120 mm Compact Gun, the Giat Industries 120 mm Smoothbore Guns G1 and F1, and the [Israel Military Industries \(IMI\)](#) MG251 120 mm Smoothbore Gun.

Development

The 120 mm M865 TPCSDS-T is the US version of the Rheinmetall DeTec 120 mm APFSDS-T-TP (LKL) DM 38 - see previous entry. It differs from the German original in few respects and operates in exactly the same manner. The M865 was type classified in late 1984. It is produced by General Dynamics, Ordnance and Tactical Systems (GD-OTS) and Alliant Techsystems (ATK), with production by both intended to settle down to a 50:50 cost and quantity basis.

The 120 mm TPCSDS-T M865 is used as the training round for the 120 mm APFSDS-T M829 series, with procurement reaching 1,870,000 units by the beginning of FY98.

The US splits procurement between Alliant and GD-OTS (the former Primex) under multi-year contracts. Procurement is split 60/40 with the lower bidder getting the larger quantity. Thus, the January 2000 awards purchased 55,000 rounds at US\$468.31 from Alliant and 85,000 rounds at US\$468.03

from GD-OTS. For the February 2001 awards both firms came in with the same price of US\$472.62 and both received orders for 100,000 rounds. Both producers assemble the rounds at the government-owned Iowa Army Ammunition Plant.

Description

The 120 mm M865 TPCSDS-T round is fixed with the projectile assembly secured to the Combustible Cartridge Case (CCC) by a case adaptor ring. The CCC has a steel cartridge case base with a silicone rubber sealing ring around the top. An M125 electrical primer is secured to the cartridge case base and extends some two-thirds of the way up the centre of the CCC. The M865 is handled, loaded and fired in exactly the same manner as a conventional round.

The projectile assembly consists of a 468.5 mm steel rod with a pierced tailcone used for in-flight stabilisation. The steel tailcone also acts as the range reduction component, depending on an established aerodynamic principle referred to in Germany as the Lochkegelleitwerk (pierced tailcone), or LKL.

For the LKL principle to operate, the nine holes in the tailcone are accurately machined to a size where, at high velocities, they are aerodynamically open and air can pass through without significant hindrance. As the projectile velocity reduces with range the holes aerodynamically close at a certain velocity. This leads to an increase in drag and the projectile becomes unstable to the point where it will fall to the ground at a maximum range of approximately 7,500 m. This aerodynamic change takes place after the projectile has travelled about 2,000 m. Up to that point the M865 projectile follows the same ballistic trajectory and is as accurate as the normal M829 operational projectile. The result is that range safety traces can be reduced to as little as 8,000 m in place of the 30,000 m plus required for firing ranges where operational M829 series APFSDS-T rounds are fired.

The M865 steel projectile is carried in an aluminium three segment discarding sabot assembly secured in a normal CCC. The CCC contains approximately 7.5 kg of [M14](#) granular nitrocellulose multiperforated (19-hole) single-base propellant in a containment bag, which prevents spillage in the event of a rupture of the combustible case walls; the propellant is produced by ATK at the Radford Army Ammunition Plant in Virginia. Although described as combustible, case ignition does leave the steel base stub intact for ejection from the gun after firing. The insulated electrical primer was designed to be cool to the touch following stub case ejection.

Muzzle velocity is 1,700 m/s (± 12 m/s) and maximum effective range 2,500 m.

Specifications

Weights:

complete round - 17.2 kg

projectile assembly - 5.5 kg

long rod with tailcone - 2.4 kg

propellant - 7.5 kg [M14](#)

stub base - 2.985 kg

Lengths:

complete round - 881 mm

projectile - 469.6 mm

stub base - 79.3 mm

Diameter:

long rod - 38 mm

tailcone - 85 mm

Muzzle velocity: 1,700 m/s (± 12 m/s)

Max effective range: 2,500 m

Max range: 8,000 m

Chamber pressure: 4,600 bar

Authorised fuzes

None involved

Equivalent rounds

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems Inc (ATK)

Type: TPCSDS-T M865

Description: Standard specifications

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: TPCSDS-T M865

Description: Standard specifications

UPDATED



*Cross-section of 120 mm M865 TPCSDS-T round
(1999)*

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

120 mm APFSDS-T M829A1, M829A2 and M829E3

Armament

Rheinmetall 120 mm Smoothbore Guns used on the [Leopard 2](#) and Leopard L1A1A1 (prototype); Japanese Type 90; South Korean [K1A1](#).

[M256](#) Cannon used on [M1A1](#) and [M1A2](#) Abrams MBTs.

These rounds can also be fired from the Otobreda 120 mm Smoothbore Gun, the Swiss 120 mm Compact Gun, the Giat Industries 120 mm Smoothbore Guns G1 and F1, and the [Israel Military Industries \(IMI\)](#) MG251 120 mm Smoothbore Gun.

Development

The 120 mm M829A1 was developed as a replacement for the M829 APFSDS-T. The M829E1 and M829E2 were development models. It was used operationally during Operation Desert Storm, when it received the name 'Silver Bullet'. **The M829A1 has been out of production since the end of 1993, by which time over 177,000 had been manufactured.**

An M829A2 version, produced solely by PRIMEX Technologies (now General Dynamics, Ordnance and Tactical Systems (GD-OTS)) was type classified during 1992 and entered low-rate production during 1993. In June 1995, a firm fixed price contract was placed with GD-OTS for the manufacture of 23,278 M829A2 rounds. The order was worth US\$5.5 million. The M829A2 is the primary anti-armour 120 mm tank ammunition in service with the US Army. By the beginning of FY98 total procurement had reached 106,000 units. The total for FY98 was 20,000, followed by 3,000 in FY99. The final batch

order during FY00 was for 7,000.

An M829E3 model was introduced with the objectives of reducing sabot parasitic weight by 20 per cent and increasing muzzle velocity by 10 per cent, both compared to the M829A2. The then PRIMEX Technologies and Alliant Techsystems (ATK) competed for the contract which was awarded to ATK in August 1998. The contract was worth US\$30 million and related to the engineering and development of the M829E3. The contract, plus two subsequent production orders, could bring the total contract value to US\$127 million by the year 2004. It is intended that the M829E3 will replace all existing M829 models in service with the US armed forces.

Compared to past procurements of similar rounds, the number of M829E3 rounds is expected to be limited as it is regarded as an interim response to the arrays of reactive and other armours expected to appear in coming years. Full production, for 5,000 rounds, will commence during FY02, with 5,000 units each year from then onwards until (and including) FY05.

For the M829E3 development programme, which will lead to the eventual M829A3, ATK have teamed with Armtec Defense (combustible case), Aerojet GenCorp (DU penetrator) and American Ordnance (loading and packing). ATK's Conventional Munitions Group will carry out design and programme management from its Hopkins, Minnesota, facility. Propellant will be supplied by the Radford Army Ammunition Plant in Radford, Virginia. The Alleghany Ballistics Laboratory, Rocket Center, West Virginia, will fabricate the discarding sabot, together with Alliant's Ferrulmatic Operations in Totowa, New Jersey. The primer and tracer will be prepared at Alliant's Kilgore Operations in Toone, Tennessee. Load and pack operations will be carried out by American Ordnance at the Iowa ammunition plant.

It is understood that consideration of a M829E4 variant is in progress. This will probably have an anti-reactive armour capability.

Description

The 120 mm M829A1 APFSDS-T round is fixed with the projectile assembly secured to the Combustible Cartridge Case (CCC) by a case adaptor ring. The CCC has a steel stub cartridge case base with a silicone rubber sealing ring around the top. An M129 electrical primer is secured to the cartridge case base.

The M829A1 subcalibre Depleted Uranium (DU, also known as staballoy) finned projectile weighs 8.165 kg and is described as being redesigned compared to the projectile used with the M829. The projectile has a high length-to-diameter ratio, a steel windshield and is carried in a three-piece aluminium sabot. **The length to diameter ratio is 30.4:1 and a diameter of 22 mm.** The M829A2 projectile has a revised composite material sabot construction providing a 30 per cent reduction in parasitic weight; it is the first production design to incorporate this innovation. The M829A2 fin assembly is aluminium.

With the M829A1 the CCC contains 7.9 kg of JA-2 'solventless' granular multiperforated (19 perforations) propellant in six containment bags, these prevent spillage in the event of a rupture of the combustible case walls. With the M829A2 the CCC has granular JA-2 propellant packed around the base of the insulated M129 primer assembly but the bulk of the propellant load is JA-2 'KERFED' in stick form, total weight being 8.7 kg. On both models case ignition does leave the steel base stub intact for ejection from the gun after firing. **An M129 primer is used on both models, with the minimum firing current being 1.25 A at 24 V.**

For the M829E3, the propellant load of the round will be increased by a process known as the 'propellant pie configuration'. For this propellant slabs or discs arranged around the primer tube and penetrator and perforated to regulate the burn rate. This packing method permits a propellant density increase inside the case of about 25 per cent compared to a normal load. A propellant weight of about 11.3 kg has been forecast.

With the M829A1 the combination of projectile design and a revised propellant charge is stated to provide increased on-target kinetic energy performance, although no precise data have been provided.

The complete weight for an M829A2 projectile assembly is 9 kg and the weight of propellant is 7.9 kg. Round length is 984 mm overall. Chamber pressure is 5,600 bars.

M829A2 muzzle velocity is 1,680 m/s and 'maximum range' is over 3,000 m. No data have yet been released regarding M829A2 armour penetration performance other than that it is an improvement over that for the M829A1.

The training equivalent for these rounds is the TPCSDS-T M865 - see separate entry for details.

Specifications

M829A1

Weights:

complete round - 20.9 kg

projectile assembly - 9 kg

penetrator - 4.6 kg

propellant - 7.9 kg JA-2

stub base - 2.985 kg

Lengths:

complete round - 984 mm

projectile assembly - 780 mm

penetrator - 684 mm

stub base - 79.3 mm

Muzzle velocity: 1,575 m/s

Chamber pressure: 5,600 bar

Authorised fuzes

None involved

Equivalent rounds

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems Inc (ATK)

Type: APFSDS-T M829A1

Description: Standard specifications

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: APFSDS-T M829A2

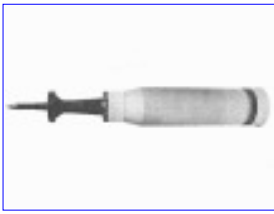
Description: Standard specifications

Alliant Techsystems Inc (ATK)

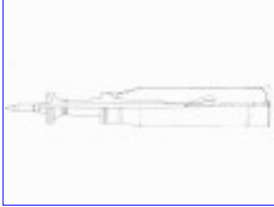
Type: APFSDS-T M829E3

Description: See text.

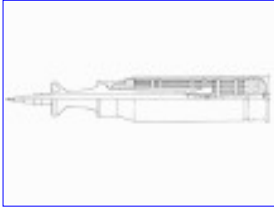
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120 mm APFSDS-T M829A1



Cutaway drawing of 120 mm APFSDS-T M829A1



Cutaway drawing of 120 mm APFSDS-T M829A2



Sectioned examples of 120 mm APFSDS-T M829A2 (right) and 120 mm APFSDS-T M829 (left) for comparison (T J Gander)



*120 mm APFSDS-T M829E3
(2001)*

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

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120 mm APFSDS-T M829

Armament

Rheinmetall 120 mm Smoothbore Guns used on the [Leopard 2](#) and Leopard L1A1A1 (prototype); Japanese Type 90; South Korean [K1A1](#).

[M256](#) Cannon used on [M1A1](#) and [M1A2](#) Abrams MBTs.

This round can also be fired from the Otobreda 120 mm Smoothbore Gun, the Swiss 120 mm Compact Gun, the Giat Industries 120 mm Smoothbore Guns G1 and F1, and the [Israel Military Industries \(IMI\)](#) MG251 120 mm Smoothbore Gun.

Development

When the US Army adopted the Rheinmetall 120 mm L/44 Smoothbore Gun as its [M256](#) Cannon for the [M1A1](#) Abrams MBT, a decision was taken to develop a Depleted Uranium (DU, also known as staballoy) penetrator to enhance the overall anti-armour performance of the penetrator. As the use of DU penetrators is not permitted in Europe for environmental and other reasons a new penetrator design was undertaken by Honeywell, now Alliant Techsystems Inc (ATK), based on the Rheinmetall original. The first result was the XM827, with a one-piece DU penetrator sheathed in a maraging steel body in place of the German two-piece tungsten design. **The XM827 was type classified in early 1983 but accepted as an interim design only, pending the development of the M829 which uses a heavier and longer penetrator, while retaining the original Rheinmetall-derived propulsion unit.** The M829 was type classified in late 1984 as a full service round which may normally only be fired in time of war.

The M829 projectile was also produced by the Chamberlain Manufacturing Corporation at its

Waterloo, Iowa, facility.

The M829 is currently out of production.

Enhanced versions, the M829A1, M829A2 and M829E3, have been produced - see following entry.

Description

The 120 mm APFSDS-T M829 round resembles the earlier XM827 but the DU penetrator is heavier and longer and has a higher length-to-diameter ratio. The round is fixed with the projectile assembly secured to the Combustible Cartridge Case (CCC) by a case adaptor ring. The CCC has a steel cartridge case base with a silicone rubber sealing ring around the top. An M215 electrical primer is secured to the cartridge case base and extends some two-thirds of the way up the centre of the CCC.

The projectile assembly consists of a subcalibre one-piece DU penetrator 615 mm long and assembled in a four-piece aluminium sabot by grooves. The sabot uses a nylon obturator and a silicone rubber seal at the rear to prevent gas leakage. The penetrator has a six-finned aluminium fin assembly at the rear which also houses a tracer element which burns for 2.5 seconds. A pointed aluminium windshield with a steel tip is fitted to the front.

The CCC contains 8.1 kg of granular JA-2 'solventless' propellant, loosely packed in a containment bag which prevents spillage in the event of a rupture of the combustible case walls. Although described as combustible, case ignition does leave the steel base stub intact for ejection from the gun after firing.

The muzzle velocity of this round is 1,670 m/s and it is understood to have an effective range of over 3,000 m. Standard armour penetration performance is 540 mm of RHA at 2,000 m.

The training equivalent for this round is the M865 TPCSDS-T - see separate entry for details.

Specifications

Weights:

complete round - 18.66 kg

projectile - 7.03 kg

propellant - 8.1 kg JA-2

stub base - 2.985 kg

Lengths:

complete round - 935 mm

projectile - 615 mm

stub base - 79.3 mm

Muzzle velocity: 1,670 m/s

Chamber pressure: 5,100 bar

Authorised fuzes

None involved

Equivalent rounds

UNITED STATES OF AMERICA

Manufacturer

Alliant Techsystems (ATK)

Type: APFSDS-T M829

Description: Standard specifications. No longer in production

Manufacturer

General Dynamics, Ordnance and Tactical Systems (GD-OTS)

Type: APFSDS-T M829

Description: Standard specifications. No longer in production

UPDATED

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TANK AND ANTI-TANK GUNS

Date Posted: 05 October 2001

Jane's Ammunition Handbook 2001-2002

Rheinmetall DeTec 120 mm APFSDS-T DM 33A1 and DM 43A1

Armament

Rheinmetall Detec 120 mm Smoothbore Guns used on the [Leopard 2](#) and Leopard L1A1A1 (prototype); Japanese Type 90; South Korean [K1A1](#).

[M256](#) Cannon used on [M1A1](#) and [M1A2](#) Abrams MBTs.

This round can also be fired from the Otobreda 120 mm Smoothbore Gun, the Swiss 120 mm Compact Gun, the Giat Industries 120 mm Smoothbore Guns G1 and F1, and the [Israel Military Industries \(IMI\)](#) MG251 120 mm Smoothbore Gun.

Development

Development of what was to become the Rheinmetall DeTec 120 mm L/44 and L/55 Smoothbore Guns began in 1964, although it was not until 1974 that the first hardware trials took place. Series production began in 1979 for the [Leopard 2 MBT](#). In 1978, the L/44 gun was adopted by the US Army as the [M256](#) Cannon for the [M1A1](#) Abrams MBT and the later [M1A2](#).

The 120 mm APFSDS-T DM 33 was developed specifically for use with the Rheinmetall Detec Smoothbore Gun and it became the standard German kinetic energy round used with the [Leopard 2](#). The DM 13 and DM 23 were earlier versions which are no longer produced. The later DM 33A1 is in service with Germany, Netherlands, Italy, [Japan](#) and Switzerland, as well as the USA where it was the

basis for the M829 APFSDS-T.

A more recent model is the Franco-German DM 43A1, the equivalent of the Giat Industries 120 OFL F1 (qv). This was type classified by the German government in January 1996. Variants of this round, modified to suit US safety certification requirements, are produced in the USA by General Dynamics, Ordnance and Tactical Systems (GD-OTS) as the KE-W(E) and KEW-A1 (see separate entry).

Development of the 'fourth-generation' 120 mm APFSDS-T DM 53 was completed by Rheinmetall DeTec and Giat Industries of France by the end of 1992 (see following entry).

Description

The 120 mm DM 33A1 APFSDS-T round is fixed with the projectile assembly secured to the Combustible Cartridge Case (CCC) by a case adaptor ring. The CCC has a steel stub cartridge case base with a silicone rubber sealing ring around the top. A DM 72 or DM 92 electrical primer is secured to the cartridge case base and extends two-thirds of the way up the centre of the CCC. The CCC was developed in collaboration with WNC Nitrochemie GmbH, a Rheinmetall DeTec company (now part of Nitrochemie AG).

The projectile assembly consists of a three-part aluminium sabot and a two-piece tungsten penetrator with a tracer element in the steel fin assembly. Sabot obturation is achieved by using a nylon band. The CCC contains 7.6 kg of granular multiperforated propellant in a containment bag which prevents spillage in the event of a rupture of the combustible case walls. Although described as combustible, case ignition does leave the steel base stub intact for ejection from the gun after firing.

The DM 43A1 differs from earlier rounds in that the round weight is 19.5 kg, 4 kg of which is the penetrator. Muzzle velocity is 1,740 m/s and chamber pressure 5,500 bar. Modifications have been introduced to the penetrator, sabot and propellant, which is seven-perforation L1/M2400. Penetration performance has been reported as 560 mm of RHA at 2,000 m.

The training equivalent for this round is the Rheinmetall DeTec APFSDS-T-TP (LKL) DM 38 or DM 48 - see separate entry for details.

Rheinmetall DeTec has also proposed that early production examples of 120 mm APFSDS-T rounds, or rounds that have exceeded their shelf life, could be converted to relatively low-cost FSDS-TP-T training rounds by substituting the tungsten penetrator with an LKL component and replacing the propellant charge after reprocessing. The tungsten penetrator rods involved could be recycled by Rheinmetall. DeTec

Specifications

DM 43A1

Weights:

complete round - 19.5 kg

projectile assembly - 7.2 kg

penetrator - 4 kg

propellant - 7.6 kg

Lengths:

complete round - 978 mm

stub base - 79.3 mm

Muzzle velocity: 1,740 m/s

Chamber pressure: 5,500 bar

Authorised fuzes

None involved

Equivalent rounds

UNITED STATES OF AMERICA

Manufacturer

General Dynamics, Ordnance and Land Systems (GD-OTS)

Type: 120 mm KE-W(E)

Description: Combustible case containing JA-2 propellant manufactured by Armtec

UPDATED



Rheinmetall DeTec 120 mm APFSDS-T rounds with DM 43A1 on left and DM 53 right (1999)



Rheinmetall DeTec 120 mm DM 33A1 APFSDS-T round (2001)

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SPIN-STABILISED GRENADES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

25 mm Objective Crew Served Weapon (OCSW)

Armament

Objective Crew Served Weapon (OCSW)

Development

By Primex Technologies to satisfy the US Military OCSW program requirements.

Description

There are three types of grenade in development for the Objective Crew Served Weapon (OCSW) System: High Explosive (HE), anti-armour and Training Practice (TP). All three rounds are ballistically matched over the entire effective range of the OCSW.

The HE round is of the fragmenting airburst type and is derived from the 20 mm Objective Individual Combat Weapon ([OICW](#)) grenade. The projectile is programmed for range and height of burst by the system fire control as it is launched. The warhead is prescored for uniformity of fragment size and weight and is filled with LX-14 high explosive. Fuzing is electronic and incorporates automatic muzzle velocity correction, along with point detonation and self-destruct capabilities.

The anti-armour round utilises a shaped charge of approximately 20 mm diameter for terminal effects and is claimed to be capable of defeating 51 mm of Rolled Homogenous Armour (RHA) in its current configuration, with 51 mm of High Hardness Armour (HHA) as a desired goal. The fuse of the anti-armour round is of the Point Initiating, Base Detonating (PIBD) type. The filler of the anti-armour

round is probably RDX.

The training practice round is inert.

The cartridge casing is aluminium and is of the belted type. It incorporates generally standard 'off the shelf' components in its construction, including standard military ball powder, standard primers and a M100 detonator.

Specifications

Type: High Explosive (HE), anti-armour, Training Practice (TP)

Round length: 120 mm

Round weight: 167 g

Projectile weight: 132 g

Projectile length: 90 mm

Payload: HE: LX-14; anti-armour: RDX, TP: none

Muzzle velocity: 1393 m/s

Effective Range: 2,000 m

Max range: 3,600 m

Colour/Markings: HE, olive drab/yellow; anti-armour, olive drab/yellow; TP, blue/black

Status:

In development.

Manufacturer

Primex Technologies

NEW ENTRY



*25 mm OCWS rounds (C Cutshaw)
(2001)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Royal Arms 12 gauge Flash-BANG rounds

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Royal Arms for use by military and law enforcement special operations units in 'dynamic entry' situations as a substitute for conventional flash-bang grenades.

Description

The Royal Arms Flash-BANG shells are specifically designed to be used in place of flash-bang grenades during dynamic entry raids. There are two types of Flash-BANG rounds. The 'soft' round delivers 180 dB level and the 'hard' produces a level of 185 dB. Both fall within accepted limits for distraction devices. The 'hard' round will shatter a window at ranges of 7 to 10 m. The blast and flash are projected directly from the shotgun's muzzle. The shooter does not receive the full effect of the shell, as hearing protection is mandatory and also for personnel within 15 m of the shooter. Neither round should be fired directly at human targets because the wads can be lethal at ranges closer than 3 m. When used outdoors, the rounds should be fired at the ground or into the air over the targets. Both will reliably cycle semi-automatic shotguns. Each round is clearly identified by colour-coded closure disc - red for the 'hard' round and white for the 'soft' round.

Specifications

Calibre: 12 gauge

Round length: 2.75 in (70 mm)

Rim diameter: 22 mm

Projectile weight: N/A

Muzzle velocity: N/A

Muzzle energy: N/A

Max range: N/A

Max effective range: N/A

UNITED STATES OF AMERICA

Manufacturer

Royal Arms

PO Box 6083

Woodland Hills, California 91365 - 6083

USA

Tel: (+1 818) 704 51 10

Fax: (+1 818) 887 20 59

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Remington Tactical 12 gauge rifled slug ammunition

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Remington for military and law enforcement use.

Description

The Remington tactical rifled slug is essentially a reduced-recoil version of the standard rifled slug sporting shotgun shell. Like the tactical buckshot round described above, this shell was developed to a military and law enforcement requirement for reduced recoil rounds to simplify training and enhance the accuracy of follow-up shots. Like the tactical buckshot, the tactical slug has approximately 40 per cent less recoil than commercial versions.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: 28 g
Muzzle velocity: 365 m/s
Muzzle energy: 1,894 J
Max range: Approx 200 m
Max effective range: Approx 100 m, depending upon gun

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company
14 Hoefler Avenue
Ilion, New York 13357-0179
USA
Tel: (+1 315) 895 34 03
Fax: (+1 315) 895 36 59
Web: <http://www.Remington.com>

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Remington 12 gauge tactical buckshot

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Remington for military and law enforcement use.

Description

The Remington tactical buckshot load is essentially a reduced-recoil load to meet complaints by military and law enforcement organisations that standard sporting ammunition was too punishing for shooting over extended periods and also that follow-up shots were made difficult by the recoil of standard shotshells. The tactical loads, therefore, have some 40 per cent less recoil than standard sporting ammunition. Remington achieves this not only by reducing the powder charge, but by reducing the number of 00 buckshot pellets in tactical loads to eight, rather than nine pellets. Tactical loads will not reliably cycle some semi-automatic shotguns.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: 3.4 g pellet, 28 g total
Muzzle velocity: 365 m/s
Muzzle energy: N/A
Max range: Approx 75 m
Max effective range: Approx 35 m

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company
14 Hoefler Avenue
Ilion, New York 13357-0179
USA
Tel: (+1 315) 895 34 03
Fax: (+1 315) 895 36 59
Web: <http://www.Remington.com>

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MK Ballistics Flexible Baton-12 12 gauge less than lethal round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By MK Ballistic Systems to provide a family of less than lethal bag-type baton rounds for use in civil disturbances, prisoner control, peacekeeping operations and similar situations.

Description

There are two types of Flexible Baton-12 rounds, standard velocity and close-range versions. Each is for use depending upon the range to the target. The plastic shell case of both rounds is transparent to give the user a visual confirmation of the type of round. The bags of each round are colour coded to indicate either green for close range, or red for standard rounds. Like similar rounds by other manufacturers, the MK Ballistics bag type rounds can be lethal under certain conditions. These rounds are especially dangerous if fired at an individual's head. According to the manufacturer, close range shells should not be fired at a human torso, but at the legs of persons at ranges closer than 3 m. Standard velocity shells

should be fired at the legs of individuals at ranges of 10 m or less. The bags are filled with fine lead shot and are identical other than colour. When used in cylinder bore shotguns, the bags can be expected to impact within a 152 mm circle at 15 m.

Specifications (close-range figures in parentheses)

- Calibre:** 12 gauge
- Round length:** 70 mm
- Rim diameter:** 22 mm
- Projectile weight:** 40 g
- Muzzle velocity:** 91 m/s (70 m/s)
- Muzzle energy:** 162 J (108 J)
- Max range:** 30 m (15.4 m)
- Max effective range:** 9-25 m (3-12 m)

UNITED STATES OF AMERICA

Manufacturer

MK Ballistic Systems
2702 Santa Ana Valley Road
Hollister, California 95023
USA
Tel: (+1 831) 636 15 04
Fax: (+1 831) 636 86 57
Web: <http://www.mkballistics.com>

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Flexible Baton-12 standard and close-range round (2000)

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Mk Ballistic Systems RB-2 12 gauge rubber baton

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

BY MK Ballistic Systems to provide a less than lethal shotgun rounds for civil disturbances, prisoner control, peacekeeping and similar operations.

Description

The RB-2 is a kinetic impact round that is loaded with two Buna-N rubber batons. The weight of each baton is approximately that of other such tactical shotgun shells that use single projectiles. The high-velocity Nr. 4700 RB-2 is intended primarily for skip-firing and long range direct fire applications, while the low-velocity Nr. 4710 RB-2LV round is intended for direct fire against individuals at close ranges.

Specifications (Low-velocity round figures in parentheses)

Calibre: 12 gauge

Round length: 70 mm
Rim diameter: 22 mm
Projectile weight: 6 g each
Muzzle velocity: 152 m/s (91.4 m/s)
Muzzle energy: 69 J (25 J)
Max range: N/A
Max effective range: 9-45 m (3-18 m)

UNITED STATES OF AMERICA

Manufacturer

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*12 gauge RB-2 rubber baton (Defence Technology)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MK Ballistic Systems RB-1FS 12 gauge rubber fin stabilised baton

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

BY MK Ballistic Systems to provide an accurate fin stabilised less than lethal round for civil disturbances, prisoner control, peacekeeping and similar operations.

Description

The RB-1 fin stabilised round is designed to be direct fired against individuals with a high degree of accuracy due to its canted fin design, which imparts spin into the projectile while in flight. The projectile has a band that both obturates and centres the projectile in the shotgun's bore to further enhance accuracy. Because of its design, the RB-1FS can be expected to achieve hits within a circle of 50 to 100 mm diameter at ranges of 20 m. At 50 m, all projectiles will fall within a 305 to 457 mm circle. The rubber projectile is rated at 75 Durometer `A' Scale. The shell case is clear to provide visual confirmation of the shell type.

Specifications

Calibre: 12 gauge

Round length: 70 mm

Rim diameter: 22 mm

Projectile weight: 6.8 g

Muzzle velocity: 137 - 152 m/s

Muzzle energy: 81 J

Max range: 100 m

Max effective range: 50 m

UNITED STATES OF AMERICA

Manufacturer

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*12 gauge rubber fin stabilised baton (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MK Ballistic Systems RB-12 12 gauge Rubber Buckshot

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By MK Ballistic Systems to provide a multiple projectile less than lethal round for civil disturbances, prisoner control, peacekeeping and similar operations.

Description

The MK Ballistic Systems RB-12 is available in both standard and low-velocity configurations, each being loaded with 12 10 mm rubber balls equivalent in diameter to 000 buckshot. Each Buna-N ball weighs 0.54 g and is rated 55 Durometer `A' Scale for hardness. The shell casings for both shells are coloured dark red. The low velocity Nr. 4810 round is marked as such in yellow, while the standard velocity Nr. 4800 round is marked in dark green. The standard velocity round is suitable for use against threats wearing heavy clothing. Either round may cause severe injuries at close ranges and can be lethal at point blank range.

Specifications (Low velocity in parentheses)

Calibre: 12 gauge

Round length: 70 mm

Rim diameter: 22 mm

Projectile weight: 0.54 g (6.4 g total)

Muzzle velocity: 274 m/s (152 m/s)

Muzzle energy: N/A

Max range: N/A

Max effective range: 4-18 m (4-9 m)

UNITED STATES OF AMERICA

Manufacturer

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*12 gauge RB-12 rubber buckshot (Defence Technology)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

MK Ballistic Systems QB-Slug 12 gauge anti-vehicular/anti-matériel round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By MK Ballistic Systems to provide a shotgun shell capable of penetrating lightly armoured vehicles and equipment.

Description

The QB-Slug is specifically designed to disable light vehicles, aircraft, boats and other matériel through the use of preformed fragmentation. The QB-Slug fires a slug containing eight hardened steel wedges similar in design to those of the QB-8 buckshot round. The wedges are carried to the target in a plastic sabot that protects the shotgun barrel and holds the wedges as a unit until the projectile penetrates the target. The QB-slug travels intact to its target, penetrates and then releases its hardened steel wedges inside. Once inside, the steel wedges cut wires and perforate or sever vital components. The spread of wedges ranges from 1,270 to 3,810 mm after penetrating the target, thus optimising the chances of

destroying vital internal components. The stacked column of steel wedges acts as a single slug as it penetrates, thus providing significant penetration prior to break-up. In testing, QB-Slug rounds have penetrated 10 mm mild steel plates at angles as acute as 45°. When used as an antipersonnel round, the QB-Slug will result in eight separate wound paths in a circular pattern centered on the point of impact. Although the QB-Slug round can be fired from smoothbore shotguns, a rifled bore shotgun is recommended for use against targets at ranges greater than 50 m. The plastic shell case is international orange in colour and marked as to type in black.

Specifications

Calibre: 12 gauge

Round length: 70 mm

Rim diameter: 22 mm

Projectile weight: 23.6 g

Muzzle velocity: 488 m/s

Muzzle energy: 2,797 J

Max range: 200 m

Max effective range: 50 m, smoothbore shotgun, 100 m, rifled bore shotgun

UNITED STATES OF AMERICA

Manufacturer

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*12 gauge QB-Slug showing slug fragments (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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MK Ballistic Systems 12 gauge Quadrangle Buckshot QB-8

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By MK Ballistic Systems to provide a shotgun round for Close Quarters Battle (CQB) applications where standard 00 buckshot is either not effective or has limited effectiveness.

Description

The QB-8 round is a direct substitute for standard 00 buckshot and is intended for applications where standard lead 00 buckshot is not effective or has limited effectiveness. The standard lead 7.65 mm buckshot pellets are replaced by hardened steel wedges with six pointed corners, seven sharp edges and five flat surfaces on each. The design of these pellets coupled with the hardness of the metal make them very effective against soft body armour and light metal armour. Whereas standard pellets use kinetic energy to punch through hard targets, the QB-8 hardened steel wedges cut their way through. The pellets are carried inside a plastic sleeve to prevent damage to shotgun barrels. The QB-8 round will

defeat automobile safety glass with sufficient energy remaining to completely pierce a 12.7 mm thick plywood sheet. The QB-8 will defeat NIJ Level IIA body armour with sufficient residual energy to penetrate over 100 mm of ballistic gelatin. Although the QB-8 performs well against hard targets at close range, the design of the wedge-shaped pellets cause the pellet pattern to spread at ranges beyond 25 m, which is the extreme effective range of this round. The shell case is international orange colour and is marked as to type in large black letters.

Specifications

Calibre: 12 gauge

Round length: 70 mm

Rim diameter: 22 mm

Muzzle velocity: 481 m/s

Projectile weight: 2.6 g each (20.8 g total)

Max effective range: 25 m

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*12 Gauge QB-8 shell with steel shot (C Cutshaw)
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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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MK Ballistic Systems Master Key 12 gauge forced entry shells

Synonym:

None

Armament

Suitably chambered 12 gauge shotguns.

Development

By MK Ballistic Systems to provide a round capable of destroying locks, door fixtures and automobile locks.

Description

The MK Nr. 4100 Master Key round is intended for forced entry situations where doors must be quickly opened without regard to damages to the locks or fixtures. The Master Key round will completely remove a standard door hinge, although metal doors may require a second shot. Automobile doors can be opened without damage to the vehicle's interior. The projectile is made up of fine metal shot and is bound in a special epoxy matrix that will not damage shotgun bores, but breaks up into fine powder on impact, thus reducing the potential for injuries on the door's opposite side. At ranges of 25 m or less, the Master Key can be used as a slug and is an excellent anti-personnel round due to its frangible

characteristics. When used in a rifled shotgun barrel, the Master Key will typically place all rounds inside a 23 mm circle at 25 m. Because it is frangible, the Master Key will not ricochet if fired against a hard surface.

Specifications

Calibre: 12 gauge
Round length: 70 mm
Rim diameter: 22 mm
Projectile weight: 30 g
Muzzle velocity: 475 m/s
Muzzle energy: 3,389 J
Max range: 100 m
Max effective range: 25 m

UNITED STATES OF AMERICA

Manufacturer

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Fax: (+1 831) 636 86 57
Web: <http://www.mkballistics.com>

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*12 gauge Master Key forced entry shell (Defence Technology)
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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Federal 12 gauge tactical slug round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Federal for military and law enforcement purposes.

Description

Federal's tactical slug load uses a proprietary 'Hydra-Shok' hollow point slug and a unique one-piece wad that, according to the manufacturer, offers enhanced accuracy, improved terminal ballistics in comparison to standard type slugs and reduced recoil. The Federal tactical slug shell case is clear plastic and clearly marked for instant visual identification.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 28.3 g
Muzzle velocity: 396 m/s
Muzzle energy: 2,228 J
Max range: 150 m
Max effective range: 50-100 m, depending upon gun

UNITED STATES OF AMERICA

Manufacturer

Federal Cartridge Company
900 Ehlen Drive
Anoka, Minnesota 55303
USA
Tel: (+1 800) 322 23 42
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Web: <http://www.federalcartridge.com>

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*Federal 12 gauge tactical slug (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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Federal 12 gauge tactical buckshot

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Federal for military and law enforcement use.

Description

Federal manufactures two tactical buckshot shells specifically designed for military and law enforcement purposes. One is conventional nine pellet 00 (8.3 mm) buckshot, while the other is Nr. 4 (6 mm) buckshot. The latter contains 27 pellets in each shell, which is actually a slightly heavier load than that of Federal's 00 tactical buckshot round. Both rounds are in essence reduced recoil loads that allow for rapid follow-up shots in dynamic tactical situations, where rapid fire is required. In addition, the reduced recoil enhances training and improves shotgun qualification scores. Federal buckshot is loaded with extra hard, copper plated lead alloy pellets that are contained in a patented shot cup that precludes pellet deformation. The pellets are configured in a patented 'spiral stack' that, according to the manufacturer, ensures that 97 per cent of the pellets will hit a human size target at 25 m with no

reduction in target penetration.

Specifications (figures for Nr. 4 buckshot in parentheses)

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 3.5 g each, 31.3 g, total (1.3 g each, 36 g, total)

Muzzle velocity: 349 m/s

Muzzle energy: N/A

Max range: 50-75 m

Max effective range: 25-30 m

UNITED STATES OF AMERICA

Manufacturer

Federal Cartridge Company

900 Ehlen Drive

Anoka, Minnesota 55303

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Tel: (+1 800) 322 23 42

Fax: (+1 612) 323 25 06

Web: <http://www.federalcartridge.com>

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*Federal tactical buckshot round (C Cutshaw)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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Defense Technology M23FS 12 gauge rubber fin stabilised round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Defense technologies to provide a less than lethal round for riot control, civil disturbances, peacekeeping and similar operations.

Description

The M23FS rubber fin stabilised round fires a single rubber projectile to a greater range than either bean bag type rounds or rubber pellets. The fin stabilised projectile also provides greater accuracy than bag or pellet type rounds and may thus be used to target specific individuals, such as riot leaders. Like other shells in the Defense Technology product line, the M23FS shell case is transparent to allow the user visual confirmation of the type of round.

Specifications

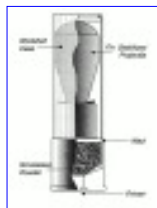
Calibre: 12 gauge
Round length: 622 mm
Rim diameter: 22 mm
Projectile weight: 5.8 g
Muzzle velocity: 152 m/s
Muzzle energy: 68 J
Max range: 76.3 m
Max effective range: 30.5 m

UNITED STATES OF AMERICA

Manufacturer

Defense Technology Corporation
13386 International Parkway
Jacksonville, Florida 32218
USA
Tel: (+1 904) 741 54 00
Fax: (+1 904) 741 54 07
Web: <http://www.armorholdings.com>

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*M23FS fin stabilised round (Defence Technology)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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Defense Technologies M23SB 12 gauge Rubber Ball Round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Defense Technologies to provide a less than lethal round for use in riot control, civil disturbances, peacekeeping and similar operations.

Description

The M23SB round fires an 18 mm round PVC rubber compound ball. It is intended for use against extremely violent individuals and may be lethal under certain circumstances, especially at close ranges. Because of its design, this round may be 'skip fired' by ricocheting the rubber ball off pavement or walls and this is the recommended mode of usage by the manufacturer. The shell case is transparent in order to allow visual verification of the type of round.

Specifications

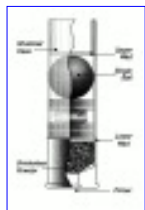
Calibre: 12 gauge
Round length: 584 mm
Rim diameter: 22 mm
Projectile weight: 3.7 g
Muzzle velocity: 274 m/s
Muzzle energy: 141 J
Max range: 30.5 m
Max effective range: 21.4 m

UNITED STATES OF AMERICA

Manufacturer

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Web: <http://www.armorholdings.com>

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*M23SB rubber ball round (Defence Technology)
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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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Defense Technologies M23RP 12 gauge rubber pellet round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Defense Technologies to provide a less than lethal round for riot control, civil disturbances, peacekeeping and similar operations.

Description

The M23RP round is a conventional plastic bodied shotgun shell filled with 18 0.8 cm diameter rubber balls of 75 Durometer Scale hardness. Each rubber ball weighs 0.3 g. The rubber pellet round is intended for use in situations where lethal force is not called for, although the pellets can cause severe injury if fired at extremely close ranges. The effectiveness of the rubber pellet round is affected by the weight of the clothing worn by the individual against whom it is fired. The round is most effective against personnel wearing light clothing. The shell body is transparent to allow visual confirmation of the contents.

Specifications

Calibre: 12 gauge

Round length: 635 mm

Rim diameter: 22 mm

Projectile weight: 0.3 g (5.4 g total)

Muzzle velocity: 152 m/s

Muzzle energy: N/A

Max range: 30.5 m

Max effective range: 15 m

UNITED STATES OF AMERICA

Manufacturer

Defense Technology Corporation

13386 International Parkway

Jacksonville, Florida 32218

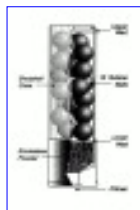
USA

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*M23RP 12 gauge rubber pellet round (Defence Technology)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

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Defense Technologies M23HV 12 gauge high-velocity rubber pellet round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Defense Technologies to provide less than lethal ammunition for riot control, civil disturbances, peacekeeping and similar operations.

Description

The M23HV rubber pellet round is similar in design to the previously described M23RP with the exception that the M23HV fires its 18 pellets at a velocity of 274 m/s so that the pellets are effective not only at a greater distance, but against personnel wearing heavy clothing. This ammunition can cause severe injury when fired against personnel at close ranges.

Specifications

Calibre: 12 gauge

Round length: 602 mm

Rim diameter: 22 mm
Projectile weight: 0.25 g (4.5 g total)
Muzzle velocity: 274 m/s
Muzzle energy: N/A
Max range: 38 m
Max effective range: 18.3 m

UNITED STATES OF AMERICA

Manufacturer

Defense Technology Corporation
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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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Defense Technologies M23BR 12 gauge bean bag round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Defense Technologies to provide a less than lethal round for riot control, civil disturbances, peacekeeping and similar operations.

Description

The Defense Technologies 23BR bean bag round is a conventional 12 gauge shotgun shell that contains a single cotton canvas bag filled with #9 shot. Weight of the payload is 40 g. The cartridge is intended for direct firing at relatively close ranges - approximately 15 m or less. The plastic shell case is transparent, allowing the user to see that the shell has a white cotton bag filler.

Specifications

Round length: 59 mm (2.3 in)

Rim diameter: 22 mm

Projectile weight: 40 g

Muzzle velocity: 91 m/s

Muzzle energy: 158 J

Max range: 46 m

Max effective range: 15 m

UNITED STATES OF AMERICA

Manufacturer

Defense Technology Corporation

13386 International Parkway

Jacksonville, Florida 32218

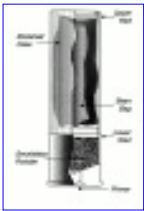
USA

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Web: <http://www.armorholdings.com>

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*Defence Technology M23BR 12 gauge bean bag round (Defence Technology)
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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Combined Tactical Systems 12 gauge Super Sock™ bean bag round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Combined Tactical Systems to provide an enhanced performance less than lethal tactical shotgun round.

Description

The new M2581 Super Sock™ less than lethal tactical shotgun round is designed with a shot filled bag of aerodynamic shape that retains velocity and accuracy at longer ranges than conventional square bags. The aerodynamic shape enables the Super Sock™ to be loaded at somewhat lower velocities as compared to conventional bag-type rounds that reduce minimum employment distances. The bag does not tumble nor spin in flight.

Specifications

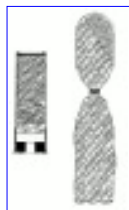
Calibre: 12 gauge
Round length: 70 mm (2.75 in)
Rim diameter: 22 mm
Projectile weight: 40 g
Muzzle velocity: 91 m/s
Muzzle energy: 167 J
Max range: Approx 50 m
Max effective range: Approx 25 m

UNITED STATES OF AMERICA

Manufacturer

Combined Tactical Systems, Inc
388 Kinsman Road
Jamestown, Pennsylvania 16134
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Fax: (+1 412) 932 21 66
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*CTS 12 GA Super Sock (CTS)
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Date Posted: 05 September 2001

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Combined Tactical Systems 12 gauge liquid barricade projectiles

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Combined Tactical Systems to provide a family of non-pyrotechnic irritant agent shells for barrier penetration.

Description

Combined tactical Systems manufactures a family of less than lethal tear agent rounds that include CN, CS, OC and inert fillers. These rounds are fin stabilised for accuracy and once they penetrate a barrier, a weakened circular section in the nose bursts open, releasing the payload into the target area. The sudden deceleration coupled with projectile spin produces a large volume of aerosol mist. Since the rounds are fired at a relatively high velocity, they should not be fired directly at personnel as they will cause serious injury or death.

Specifications

Calibre: 12 gauge
Round length: 70 mm (2.75 in)
Rim diameter: 22 mm
Projectile weight: Approx 6 g
Muzzle velocity: 305 m/s
Muzzle energy: N/A
Max range: Approx 100 m
Max effective range: 45 m

UNITED STATES OF AMERICA

Manufacturer

Combined Tactical Systems, Inc
388 Kinsman Road
Jamestown, Pennsylvania 16134
USA
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Fax: (+1 412) 932 21 66
Web: <http://www.less-lethal.com>

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Combined Tactical Systems 12 gauge kinetic energy rounds

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By Combined Tactical Systems to provide specialised kinetic energy loads for military and law enforcement special operations applications.

Description

Combined Tactical Systems manufactures a family of kinetic energy shotgun rounds for various purposes. The M2552 and M2553 Sting-Ball™ rubber pellet shells contains 18 rubber 7.62 mm balls and are intended to be 'skip fired' in situations where collateral damage and personal injuries are to be avoided. The M2552 and M2553 are low-velocity and high-velocity versions, respectively. The Model 2580 'bean bag' unfolds in flight and delivers a shock to the target by impact of a bag filled with lead shot. The Model 2570 breaching round is designed for defeating door locks and hinges. While no standoff mechanism is required, the round must be fired at 101 to 203 mm from the target to ensure

safety. Upon impact, the compressed metal slug disintegrates and imparts its energy to the target. Debris and fragments beyond the target are of low energy and the slug does not ricochet. These shells are intended to be used in cylinder bore or improved cylinder bore shotguns.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: M2552, 18 g; M2570 22 g; M2580, 40 g

Muzzle velocity: M2552, approx 121m/s; M2553, 274 m/s; M2570, 411m/s; M2580, approx 100 m/s

Muzzle energy: N/A

Max range: M2552, approx 50 m, M2553, approx 100 m; M2570, approx 50 m; M2580, approx 35 m

Max effective range: M2552, approx 10 m; M2553, approx 25 m; M2570, approx 5 m; M2580, approx 15 m

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Manufacturer

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*CTS 12 gauge breaching round (CTS)
(2000)*

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies 12 gauge Tactical Entry Safety Slug

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and special operations.

Description

The Safety Slug was designed to overcome the shortcomings of conventional shotgun shells by limiting overpenetration, while producing effective wounding effects in soft targets via its hollow point slug. Like the Aguila Minishell discussed previously, the 48 mm long Safety Slug and buckshot Tactical Entry loads below and are shorter than standard shotgun shells, but the Tactical Entry shells are of sufficient length to reliably function in most slide-action tactical shotguns. This ammunition is specifically intended for use in urban environments where lethal force is called for, but where overpenetration and collateral damage is a concern.

Specifications

Calibre: 12 gauge

Round length: 48 mm (1.9 in)

Rim diameter: 22 mm

Projectile weight: 34 g

Muzzle velocity: 335 m/s

Muzzle energy: 1,912 J

Max range: Approx 200 m

Max effective range: 50-75 m

UNITED STATES OF AMERICA

Manufacturer

ALS Technologies

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Date Posted: 05 September 2001

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ALS Technologies 12 gauge Tactical Entry buckshot round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and special operations.

Description

The ALS Technologies Tactical Entry round is a 48 mm long shotgun shell loaded with 27 Nr. 4 (6 mm) lead pellets. The round is specifically intended for use by entry teams and special operations units in urban environments where overpenetration and collateral damage are a concern.

Specifications

Calibre: 12 gauge

Round length: 48 mm (1.9 in)

Rim diameter: 22 mm

Projectile weight: 1.3 each, 35.8 total

Muzzle velocity: 335 m/s

Muzzle energy: N/A

Max range: Approx 75 m

Max effective range: Approx 30 m

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies 12 gauge rubber fin stabilised projectile

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and similar operations.

Description

The rubber fin stabilised 'rocket' is a teardrop shaped fin stabilised projectile intended to be direct fired at individuals at short to medium ranges. Because of its accuracy, the projectile can be used to disable individuals at ranges as far distant as 22 m. A higher-velocity round is available upon special order. This round will not cycle semi-automatic shotguns.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: 7.4 g
Muzzle velocity: 167 m/s
Muzzle energy: 124 J
Max range: Approx 100 m
Max effective range: 3-22 m

UNITED STATES OF AMERICA

Manufacturer

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies 12 gauge `Power Punch' ballistic bag round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and similar operations.

Description

The `Power Punch' ballistic bag is similar in design to other such `bean bag' rounds, but differs in the weight of bag and velocity. It is intended for use in situations where subjects must be subdued, but where the use of lethal force is not appropriate. There are two versions of the ALS ballistic bag available -- one fires a 40 g ballistic nylon bag and the other a 50 g. Both bags are filled with fine lead shot. Neither will cycle semi-automatic shotguns. When fired at close ranges, either bag can cause serious injury.

Specifications (high-power bag in parentheses)

Calibre: 12 gauge
Round length: 70 mm (2.75 in)
Rim diameter: 22 mm
Projectile weight: 40 g (50 g)
Muzzle velocity: Approx 150 m/s
Muzzle energy: 115 J (166 J)
Max range: Approx 75 m
Max effective range: 25 m

UNITED STATES OF AMERICA

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies 12 gauge `Bore Thunder' flash bang round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and special operations.

Description

The Bore Thunder round is intended to be used as a diversionary device that achieves disorientation via concussion and a bright, disconcerting flash. The round is designed to be aimed at the floor or ceiling at angles of 45°. The round should not be fired directly at individuals because the wads can be lethal at typical engagement ranges.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: N/A
Muzzle velocity: N/A
Muzzle energy: N/A
Max range: Approx 25 m
Max effective range: Approx 25 m

UNITED STATES OF AMERICA

Manufacturer

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies 12 gauge `bolo' round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and similar operations.

Description

The Bolo round is designed to be used to capture individuals who are fleeing or running towards unauthorised areas by entangling their legs and feet. The round consists of three 18 mm balls connected by 3.4 m of extremely tough cord that will entangle the feet and legs of individuals when fired towards them at ground level.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: N/A

Muzzle velocity: 122 m/s
Muzzle energy: N/A
Max range: Approx 50 m
Max effective range: 20-40 m

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

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ALS Technologies `Power Punch' 12 gauge tail stabilised ballistic bag

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and similar operations.

Description

The ALS tail stabilised ballistic bag fires a 40 g bag with a 152 mm cotton tail that stabilises the bag over its effective range and enhances its accuracy.

Specifications

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm

Projectile weight: 40 g

Muzzle velocity: 91 m/s
Muzzle energy: 343 J
Max range: Approx 100 m
Max effective range: Approx 35 m

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SMALL ARMS - TACTICAL AND SPECIALITY SHOTGUN AMMUNITION

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

ALS Technologies `Hornets Nest' 12 gauge rubber buckshot round

Synonym:

none

Armament

Suitably chambered 12 gauge shotguns.

Development

By ALS Technologies to provide specialised and less than lethal ammunition for peacekeeping, crowd control and similar operations.

Description

The Hornets Nest 12 gauge shotgun round consists of 21 hard rubber Nr. 1 buckshot (7.62 mm) pellets designed to inflict painful, but superficial injuries in situations where lethal force is inappropriate. The shell case is transparent plastic for instant visual identification. Both high-velocity and low-velocity versions of the Hornets Nest round are available, although neither will cycle semi-automatic shotguns.

Specifications (high velocity in parentheses)

Calibre: 12 gauge

Round length: 70 mm (2.75 in)

Rim diameter: 22 mm
Projectile weight: Approx 21 G, total
Muzzle velocity: 121 m/s (243 m/s)
Muzzle energy: N/A
Max range: Approx 75 m
Max effective range: 25-50 m

UNITED STATES OF AMERICA

Manufacturer

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HE-T, M677

Armament

40 mm high-velocity grenade launchers.

Development

By US Army Ordnance.

Description

This cartridge is a high-explosive round containing a tracer element for flight tracking purposes, designed to inflict personnel casualties in the target area from ground burst effect.

This cartridge is a fixed round of ammunition consisting of an internally embossed one-piece steel projectile body with a metal rotating band, and a cartridge case assembly containing a propelling charge and a percussion primer. An impact fuze is threaded into the front end of the projectile. The projectile cavity contains a high-explosive bursting charge and an RDX booster pellet seated below the fuze. A trace element is threaded into the opening in the centre of the projectile base. The projectile assembly is press-fitted into a cartridge case. The case is an aluminium bi-chambered cylinder with a metal closing plug crimped into the open well of the propellant chamber in the base. The propelling charge is contained in the spherical high-pressure propellant chamber. The chamber has vents in the top and is sealed in the bottom by the closing plug. The hollow chamber in the upper section of the case acts as a low-pressure chamber. A percussion primer is crimped into the centre opening in the closing plug.

Specifications

Type: HE-T

Round length: 112.1 mm

Round weight: 340.2 g

Payload: 45 g, Cyclotol 70/30

Muzzle velocity: 244 m/s

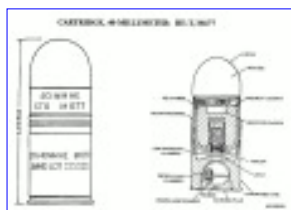
Max range: 2,200 m

Status: Standard with US forces.

Manufacturer

US government contractors.

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*Cartridge, 40 mm, HE-T, M677
(1999)*

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HE, M441

Armament

Low-velocity launchers of the M79 and [M203](#) types.

Development

By US Army Ordnance.

Description

The cartridge is a fixed round of ammunition consisting of a projectile body with a rotating band and a cartridge case assembly. A hollow aluminium ogive is fitted to the front of the projectile. An impact fuze with a booster charge is threaded into the opening of a steel ball assembly crimped into the projectile base. The ball assembly contains an HE bursting charge. The projectile assembly is press-fitted into the aluminium cartridge case. The case is a hollow bi-chambered cylinder with a metal closing plug crimped into the cartridge case. The propellant cup assembly is sealed by the closing plug in the bottom, and contains the propelling charge. A percussion primer is crimped into a centre opening in the closing plug. The propellant cup assembly acts as a high-pressure chamber; and the hollow cavity in the case surrounding the cup acts as a low-pressure chamber.

Specifications

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, multiple projectile, M576

Armament

Low-velocity grenade launchers of the M79 and [M203](#) types.

Development

US Army Ordnance.

Description

This cartridge is intended for use in counter-insurgency and conventional operations in jungle environments, particularly during periods of poor visibility where personnel targets appear at short distances without warning and are vulnerable only fleetingly.

The cartridge is a fixed round of ammunition consisting of a multiple projectile assembly and a cartridge case assembly. The projectile assembly includes a polyethylene sabot carrier with one centre cavity and several smaller cavities around the outside perimeter. A plastic pellet cup filled with 20 metal pellets is fitted into the centre cavity and is covered by a snap-on cap. The outer cavities act as air scoops. An obturator on the rear of the sabot serves as a propellant gas seal between the cartridge case and the sabot.

The projectile assembly is crimped into the cartridge case. The case is a hollow bi-chambered cylinder with a metal closing plug crimped into the open well of the propellant chamber in the cartridge base. The propellant chamber acts as a high-pressure chamber and has 10 vent holes in the top sealed by

a copper disc. The upper hollow cavity in the case serves as a low-pressure chamber. A percussion primer is crimped into a centre opening in the closing plug.

Specifications

Type: multiple projectile

Round length: 67.2 mm

Round weight: 115.1 g

Payload: 20 metal pellets, 24 g

Muzzle velocity: 26 m/s

Effective range: 30 m

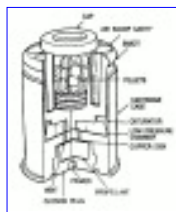
Color/markings: black/white

Status: Standard with US forces.

Manufacturer

US government contractors.

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*Cartridge, 40 mm, multiple projectile, M576
(1999)*

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SPIN-STABILISED GRENADES - 40 mm HIGH-EXPLOSIVE GRENADES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

Cartridge, 40 mm, HE, M684

Armament

High-velocity grenade launchers.

Development

By US Army Ordnance.

Description

This cartridge is a high-explosive round designed to inflict personnel casualties from air burst effect.

This cartridge is a fixed round of ammunition consisting of a one-piece internally embossed steel body with a metal rotating band and a cartridge case containing the propelling charge and percussion primer. The projectile cavity contains a Composition A5 bursting charge. An electric proximity fuze is threaded into the front opening of the projectile. The fuze assembly includes all-solid-state circuitry, liquid reserve power supply, electronic detonator, mechanical safety arming mechanism and an independent mechanical impact element. The projectile assembly is press-fitted into a cartridge case. The case is a hollow bi-chambered aluminium cylinder with an aluminium closing plug crimped into the open well of the propellant chamber in the cartridge base. The propelling charge is contained in the spherical high-pressure propellant chamber. This chamber has vent holes in the top and is sealed at the bottom by the closing plug. The hollow chamber in the upper section of the case acts as a low-pressure chamber. A percussion primer is crimped into the centre opening in the closing plug.

Specifications

Type: HE

Round length: 112.1 mm

Round weight: 335.7 g

Payload: 53 g, Comp A5

Muzzle velocity: 244 m/s

Arming distance: 18-36 m

Max range: 2,200 m

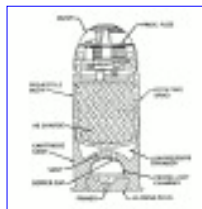
Colour/markings: olive drab/yellow, translucent ogive

Status: Standard with US forces.

Manufacturer

US government contractors.

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*Cartridge, 40 mm, HE, M684
(1999)*

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M751

Armament

81 mm M879 practice bomb.

Development

By US Army Ordnance.

Description

The fuze has an aluminium body with an M734 multi-option fuze ogive or an M935 impact fuze ogive, a pyrotechnic smoke cartridge, a striker and an arming mechanism.

Specifications

Type: impact (practice)

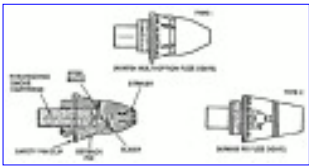
Weight: 200 g

Length: 104.1 mm

Thread size: 1.5-12 UNF

Intrusion: 40.6 mm

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M751
(1999)

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M719

Armament

60 mm mortar WP smoke bombs.

Development

By US Army Ordnance.

Description

The aluminium fuze head contains a spring-loaded striker and firing pin. A spring-loaded cylindrical slider, mounted transversely in the aluminium fuze body, contains the detonator and is equipped with an O-ring pressure seal. Inbore safety is provided by a spring-loaded bore riding pin that locks the slider. A pull wire restrains the setback pin which locks the bore riding pin. Tape and a plastic disc protect the metering orifice. The fuze base contains a tetryl booster lead charge and a small tetryl booster charge.

Specifications

Type: impact

Weight: 110 g

Length:

overall - 74.9 mm

exposed - 62.2 mm

Thread size: 1.5 in-12 NF-1

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M745

Armament

60 mm smoke bombs, M722.

Development

By US Army Ordnance.

Description

The fuze has a similar exterior configuration to the M734 multi-option fuze, a two-piece plastic/aluminium head, and an aluminium base. The head contains a turbine. The base contains a safe and arming device. The fuze functions on impact with variable point detecting action only.

Specifications

Type: impact

Weight: 230 g

Length: 66 mm

Thread size: 1.5-12 UNF-1A

Intrusion: 28.2 mm max

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(1999)

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M716

Armament

81 mm HE and WP smoke mortar bombs.

Development

By US Army Ordnance.

Description

The M716 is a super-quick delay arming impact fuze. The aluminium fuze head contains a spring-loaded striker and firing pin. A spring-loaded cylindrical slider, mounted transversely in the aluminium fuze body, contains the detonator and is equipped with an O-ring pressure seal. Inbore safety is provided by a spring-loaded bore riding pin that locks the slide. A pull wire restrains the setback pin (not shown in illustration) which locks the bore riding pin. Tape and a plastic disc protect the metering orifice. The fuze base contains a booster lead charge and a booster charge. An adaptor assembly with two tetryl booster pellets and a cup with one pellet are threaded to the base.

Specifications

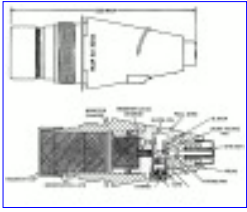
Type: impact, SQ

Weight: 570 g

Length:

overall - 150.6 mm
exposed - 94.5 mm
Thread size: 2.0 in -12UNS-1A

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M716
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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M717

Armament

60 mm HE mortar bombs.

Development

By US Army Ordnance.

Description

The M717 is a super-quick impact fuze. The aluminium fuze head contains a spring-loaded striker and firing pin. A spring-loaded cylindrical slider, mounted transversely in the aluminium fuze body, contains the detonator and is equipped with an O-ring pressure seal. Inbore safety is provided by a spring-loaded bore riding pin that locks the slider. A pull wire restrains the setback pin (not shown in illustration) which locks the bore riding pin. Tape and a plastic disc protect the metering orifice. The fuze base contains a tetryl booster lead charge. A cup containing a tetryl booster pellet is threaded to the base.

Specifications

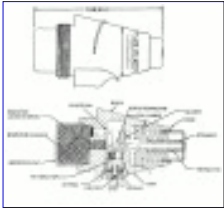
Type: impact

Weight: 110 g

Length

overall - 74.9 mm
exposed - 62.2 mm
Thread size: 1.5 in-12NF-1

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M717
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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M525/M525A1

Armament

60 and 81 mm HE and 81 mm TP or WP smoke bombs.

Development

By US Army Ordnance.

Description

The head of the fuze contains a spring-loaded striker, direct-acting firing pin, and a clockwork mechanism to delay arming for a safe distance from the muzzle of the mortar. The head is threaded into an aluminium body containing a cylindrical slider to position the detonator, and a booster lead charge. Positive safety is provided by a safety pin to be removed just before firing. Note: the M525A1 is for training purposes only.

Specifications

Type: point detonating

Weight: 199.9 g

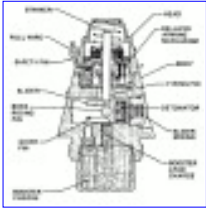
Length:

visible - 61.47 mm

overall - 89.79 mm

Thread size: 1/2-12NF

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*M525A1
(1999)*

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M527 series

Armament

60 mm mortar White Phosphorus (WP) smoke bombs.

Development

By US Army Ordnance.

Description

The M527 fuze is generally similar to the M525 and M526 series fuzes, except that it is intended for use only in WP mortar bombs. The body materials of the M527 series are also different from the others. The M527 and M527A1 have plastic bodies, while the M527B1 and the M527A1B1 have aluminium bodies. Functioning is identical to the M525 and M526 series fuzes.

The heads of these fuzes contain a spring-loaded striker, direct-acting firing pin, and a clockwork mechanism to delay arming to a safe distance from the muzzle of the mortar. The head is threaded into a body of plastic or aluminium (dependent upon model). The body contains a cylindrical slider to position the detonator, a booster lead charge, and a small tetryl booster charge carried in an intrusion within the base of the fuze. Positive safety for shipment and handling is provided by a safety wire and pull wire.

Specifications

Type: impact, super-quick

Weight: 109 g

Thread: 1.5-12NF-1

Length:

overall - 74.9 mm

visible - 67.3 mm

Arming delay: 3 s

Manufacturer

US government contractors.

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M526 and M526A1

Armament

60 mm HE, 81 mm HE and WP/Smoke ammunition with 2-12UNS-1A fuze well threads.

Development

By US Army Ordnance.

Description

The M526 and M526A1 fuzes are single-action, super-quick types with direct action firing mechanisms. Bore safety is provided by a slider-type interruptor that holds the detonator out of alignment with the firing pin and booster when in unarmed status. The slider is held in place by a bore riding pin which is, in turn, held in place by a setback pin. Upon firing, setback forces move one setback pin to the rear, releasing the bore safety pin that is forced outward by its spring. As the bomb leaves the muzzle, the pin is ejected, partially releasing the slider. Acceleration also moves the second setback pin to the rear, releasing the wheel and pallet of a spring-loaded runaway escapement disk. This disk rotates 270° in approximately 3 seconds, releasing the spring-loaded firing pin that, in turn, releases the slider, which moves into and is locked in the armed position. Upon impact, the plunger carries the firing pin to the rear, where it functions the detonator.

The M526A1 is identical to the M526, save for slight differences in the plunger and pull wire. The M525 and M526 fuzes are identical except for the thread adaptors and booster charges.

Specifications

Type: impact, super-quick

Weight: 10 g

Thread: 2-12UNS-1A

Length overall: 149.4 mm

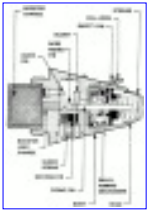
Arming delay: 2-4 s

Arming requirement: 300-350 g

Manufacturer

US government contractors.

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*M525A1 point detonating fuze
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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

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M521

Armament

107 mm (4.2 in) mortar bombs.

Development

By US Army Ordnance for use in M328 and M328A1 mortar bombs.

Description

This is a super-quick or delay impact fuze that may be set via a slotted turn screw on the fuze body. If set for SQ, on firing, centrifugal forces move a radial interrupter outward, opening a flash channel. Two radial plungers move outward, releasing the M1 delay plunger. A centrifugal latch rotates and locks detents in the outward position. On impact, the firing pin crushes the cup and fires the [M24](#) detonator, which sends burning gases down the flash tube. If the fuze is set to delay, the interrupter stops the burning gases, but the M1 plunger moves forward striking the delay firing pin, firing the M2 delay, consisting of the M54 primer, a 0.05 second delay and the M7 relay. The M521 fuze is identical to the [M48](#), except for the diameter of the rear body and the fuze threads.

Specifications

Type: impact, SQ and delay

Weight: 726 g

Thread: 2 × 12UNS

Length:

overall - 117.6 mm

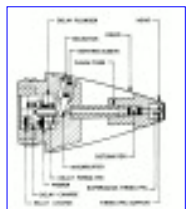
exposed - 95 mm

Optional delay: *ca* 0.05 s

Manufacturer

US government contractors.

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*M521 impact fuze
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FUZES - PROXIMITY FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M734 multi-option fuze

Armament

60 mm mortar bomb, [M224](#) and 81 mm mortar bomb, [M252](#) or any bomb with fuze cavity threads of 1.5-12-UNF-1A.

Development

By US Army Ordnance.

Description

The M734 is a multi-option fuze that may be set in any one of four options: proximity with burst height of 1 to 4 m; near surface burst with burst height of 0 to 1 m; super-quick impact and delay of 50 to 1.5 ms. The fuze is delivered in proximity mode, but settings can be changed manually by the user. The fuze is made safe by restraining the rotor with an acceleration/time sensing device and an airflow-operated detent. The fuze is set by rotating the head to the desired function. Upon firing, setback forces move a weight rearward through a zig-zag track to sense proper time and acceleration. This partially releases the rotor and frees a turbine alternator. In flight, airflow through the turbine retracts the threaded detent, completely freeing the rotor. The rotor is spring driven and, when free, moves into the 'armed' position, completing the fuze electrical circuits. The alternator also powers the fuze electronics, including a timing circuit that delays firing until 2 to 3 seconds after the rotor has fully armed. When the continuous-wave radio frequency Doppler radar signal reaches the proper value, the firing circuit functions, firing the M100 detonator. When set SQ, an electric switch closes at impact and

fires the M100 detonator. When set delay, an inertial firing pin functions a delay that initiates the M61 detonator.

Specifications

Type: proximity/impact/delay

Weight: 0.227 g

Length:

overall - 94.3 mm

exposed - 66.2 mm

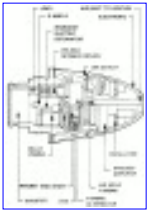
Intrusion: 28.2 mm

Thread: 1.5-12-UNF-1A

Manufacturer

US government contractors.

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*M734 multi-option fuze
(1998)*



*M734
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FUZES - PROXIMITY FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M532 proximity fuze

Armament

81 mm mortars having standard fuze cavities of 2.00-12NS-1.

Development

By US Army Ordnance.

Description

The M532 is a radio frequency-type proximity fuze for all 81 mm mortars having standard fuze wells. The proximity element functions over land or water and the fuze will function upon impact if the proximity function fails. The M532 can also be set to disable the proximity function if impact functioning is desired. This is accomplished by turning the nose cap. Once selected, the point detonation function is irreversible.

Arming is initiated by setback forces, which must actuate both an electrical and mechanical system. Airburst over the target is 3.04 to 4.5 m.

The fuze consists of a ribbed plastic nose attached to an aluminium ring, which is in turn attached through a slip joint to an aluminium base. A steel housing is screwed into the base. Radio transmitter/detector and amplifier/triggering circuits are contained within the plastic nose. A thermal reserve battery within the base supplies power to the electronic circuits. A setback-initiated arming delay clock, detonator and booster pellet are contained within the steel housing. The nose and attached ring are turned $\{1/3\}$ turn or more in the direction indicated to change the mode of operation from

proximity to impact. It cannot be reset. A shear pin prevents accidental turning during normal handling.

Specifications

Type: proximity/point detonating

Weight: 0.581 g

Thread: 2-12-UNS-1

Length:

overall - 157.2 mm

visible - 101.1 mm

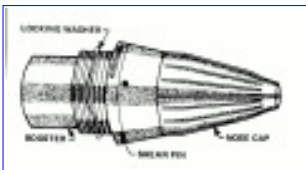
Optional delay: 7-11 s

Arming requirement: 550 g

Manufacturer

US government contractors.

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*M532 proximity fuze
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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M936 time fuze

Armament

[M802A2](#) 60 mm mortar smoke bomb.

Development

By US Army Ordnance.

Description

The M936 is an impact, super-quick (SQ) and delay fuze for use in the [M802A2](#) 60 mm mortar smoke bomb fired from M2, [M19](#) and [M224](#) mortars. Safety is via a pull pin and arming pin which lock the arming slider. The arming pin is restrained by the [M53](#) pyrotechnic delay and the pull pin. The fuze is set before firing by rotating a slotted shaft in the fuze body and removing the pull pin. Upon firing, setback forces move a plunger pin rearward against its spring, freeing a ball detent and the firing pin. The firing pin moves forward after acceleration under spring pressure and partially frees the slider. Acceleration also moves a second plunger to the rear, releasing a second ball that frees a delay arming firing pin. Acceleration moves this pin rearward, firing the [M53](#) delay. After the 2 to 6 second delay has burned, it removes the arming pin from the slider that arms the SQ or delay alignment. On impact, the fuze firing pin fires the [M98](#) SQ or [M76](#) delay detonator, which initiates the lead and booster.

Specifications

Type: impact, SQ and delay

Weight: 259 g

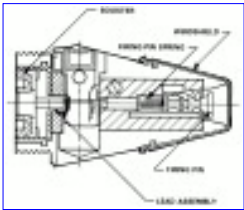
Thread: 1.5-12UNF-1A

Length overall: 75.2 mm

Manufacturer

US government contractors.

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*M936 impact fuze
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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M769 time fuze

Armament

[M83A3](#) and M721 60 mm illuminating mortar bombs.

Development

By US Army Ordnance as a replacement for the M65A1 time fuze.

Description

The M769 is identical to the M65A1E1 pyrotechnic time fuze and is functionally identical to the M768. For a description of fuze functioning, see the entry under M768. The M769 can be set from 3 to 45 seconds delay by simply rotating the nose of the fuze.

Specifications

Type: selective powder train time

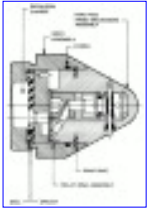
Weight: 336 g

Thread: 2-20NS-1

Length overall: 64.5 mm

Optional delay: 3-45 s

Manufacturer



*M769 time fuze
(1998)*

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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M768 time fuze

Armament

[M301A3](#) and M853 81 mm illuminating bombs and [M819](#) smoke bomb.

Development

By US Army Ordnance as a replacement for the M84A1 time fuze.

Description

The M768 is a waterproof powder train delay fuze that utilises tungsten, as a delay composition can be set for up to 62 seconds and has only one time ring.

Safety is provided by a safety pull wire and a shear pin in the firing pin, plus non-alignment of the firing train until the fuze is set. Upon firing, setback moves the firing pin to the rear severing the shear pin and firing the M39A1 primer. The primer ignites the A1A ignition powder, which ignites the tungsten delay composition in the time ring. After the set delay burns through, it ignites a boron-potassium-nitrate pellet that in turn ignites a black powder expelling charge. The M768 is identical to the M84A1E1 and similar to the M769, except that the M768 is larger.

Specifications

Type: selective powder train time

Weight: 930 g

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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M84 and M84A1 time fuzes

Armament

81 mm illuminating rounds.

Development

By US Army Ordnance.

Description

The [M84](#) and M84A1 fuzes are of the single-purpose, powder train, selective time types and are used only with 81 mm illuminating ammunition. The two fuzes are identical, save for powder train chemicals and the fact that the M84A1 has a time scale of 50 seconds with 2 second intervals, while the [M84](#) has a range of 25 seconds with 5 second intervals. The fuzes consist of a primer, powder train, timing rings and a black powder expelling charge. The fuze is armed by removing the safety wire. At this point the inertial plunger is held by two shear pins passing through the plunger guide. Setback causes the plunger to shear the pins and strike the primer at the base of the plunger guide. The primer ignites the powder train, which burns for the preset time and then ignites a black powder pellet and the expelling charge. The expelling charge ejects the parachute and illuminant assemblies through the base of the projectile.

Specifications

Type: selective time

Weight: [M84](#), 826 g; M84A1, 780 g

Thread: 2.4-18NS-1

Length:

overall - 97.8 mm

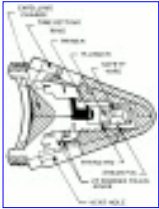
visible - 82.6 mm

Optional delay: [M84](#), 0-25 s; M84A1, 0-50 s

Manufacturer

US government contractors.

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*[M84](#) and M84A1 time fuzes
(1998)*

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FUZES - TIME FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M65 and M65A1 time fuzes

Armament

60 mm mortar illuminating rounds, M83A1, M83A2 and [M83A3](#) (M65A1 fuze).

Development

By US Army Ordnance.

Description

The [M65](#) series fuzes are powder train, fixed delay types used with 60 mm mortar illuminating ammunition. The time train is a powder type, consisting of a primer, black powder pellet, time ring charge loaded to burn for 15 seconds, body pellet and a black powder expelling charge. After the flame from the time ring charge encircles the ring, it ignites the body pellet, which in turn ignites the expelling charge. The expelling charge gases pass through apertures in the expelling charge retaining disc, ejecting the parachute and illuminating charge assemblies from the base of the bomb.

The M65A1 is similar, but has a heavier time ring train and minor construction differences. The [M65](#) is no longer in production.

Specifications

Type: time, fixed delay

Weight: 0.349 g, [M65](#); 0.336 g, M65A1

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

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M567

Armament

US 81 mm HE bombs, [M374](#) series and WP bombs, M375 series used in US 81 mm mortars, M1, [M29A1](#) and [M252](#).

Development

By US ordnance authorities for service bombs.

Description

The M567 is identical to the M935, except for the addition of a 2-12UNS to 1.5-UNF adaptor booster for use in 81 mm mortar bombs with 2 in threads. It is the addition of this booster that gives the M567 its additional length and weight in comparison to the M935. Safety is via a pull pin and arming pin that lock the arming slider. The arming pin is retained by the [M53](#) pyrotechnic delay and the pull pin. Before firing, the fuze is set by rotating a slotted shaft in the ogive and removing the pull pin. On firing, setback moves a plunger pin rearward against its spring, freeing a ball detent that releases the fuze firing pin. The firing pin is spring loaded and moves forward after acceleration, partially releasing the slider. Acceleration also moves a second plunger that releases a delay arming firing pin to the rear, functioning the [M53](#) delay. When the delay train has buried from 2 to 6 seconds, it removes the arming pin from the slider that arms the super-quick or delay alignment. On impact, the fuze firing pin fires the [M98](#) super-quick or [M76](#) delay detonator that initiates the lead and booster.

Specifications

Type: impact, SQ or delay

Weight: 590 g

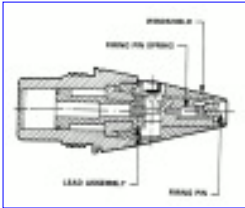
Length: 151.6 mm

Thread size: 2-12UNS-1A

Optional delay: 0.0534 s

Manufacturer: Bulova Technologies Inc.

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*M567 impact fuze
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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M935

Armament

US service 60 mm and 81 mm HE bombs.

Development

By US ordnance authorities for current service bombs.

Description

The M935 is a selectable SQ or delay fuze using two independent detonators, the [M98](#) for super-quick functioning and the [M76](#) with 50 ms delay for use against light cover. Delayed arming is provided by the [M53](#) delay unit which maintains the explosive train out of line for 3 seconds after firing. This fuze and the M567 are identical except for the booster and threads for the fuze well adaptor. For details of functioning, see description under M567 listing.

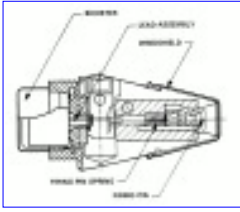
Specifications

Type: impact, SQ and delay

Weight: 259 g

Length: 90.9 mm

Manufacturer



*Bulova M935 impact fuze
(1998)*

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

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M524 Series

Armament

81 mm HE and WP smoke bombs.

Development

Originally developed by US ordnance authorities but now manufactured under licence elsewhere.

Description

The fuze has an aluminium body threaded externally to fit the round and internally to accept a tetryl booster. The fuze nose is a spring-loaded striker with a slot for selection of super-quick or delay action. Either detonating train is initiated by independent firing pins. The delay train includes a primer and M2 delay charge. Bore safety is provided by a delayed arming mechanism consisting of a spring-loaded rotor released by setback when the mortar is fired and a timing device. There are two safety pins - one for the internal plunger and the other to secure the setback arming device. Setback trips the arming mechanism release, allowing the arming rotor to turn toward the armed position. This mechanism assures that arming will occur no earlier than 1.25 seconds and no later than 2.5 seconds after the round has left the mortar tube. If delay is selected, the firing pin is not aligned with the M63 detonator and charge detonation occurs 0.05 second after the delay firing pin operates on the delay train through the M2 delay charge. Each mode operates by separate flash tubes upon the [M80](#) detonator, the booster lead charge and the booster.

Specifications

Type: point detonating, super-quick, with optional delay

Weight: 576 g

Thread: 2-12UNS-1A

Length:

overall - 152.7 mm

exposed - 96.5 mm

Intrusion: 56.2 mm

Optional delay: 0.05 s

Manufacturer

US Military contractors.

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PYRKAL impact fuze M524A6: (1) striker; (2) body; (3) SQ firing pin; (4) delay firing pin; (5) detonator M63; (6) detonator lead charge; (7) delay plunger; (8) detonator [M80](#); (9) rotor; (10) arming mechanism; (11) arming delay escapement; (12) booster

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MORTARS - 120 mm MORTARS, UNITED STATES OF AMERICA

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm Extended Range HE bomb

Armament

All smoothbore high-pressure mortars.

Development

By PRIMEX Technologies to meet a US military requirement for extended-range ammunition for the 120 mm [M120/M121](#) Battalion Mortar System.

Description

A conventional streamlined bomb of high-grade steel with a plastic obturating ring let into a groove around the waist. An adaptor is screwed into the nose, into which the fuze is screwed and a stabiliser unit consisting of a perforated tail tube with six machined alloy fins, screws on to a spigot at the rear end of the bomb body. A primary cartridge fits into the end of the tail tube and up to eight secondary charges fit around the tail tube in horseshoe form. The secondary charges use a new ball powder propellant giving low flame temperature and high velocity.

Specifications

Weight, fuzed: 14.97 kg

Length, fuzed: 870 mm

Weight and type of payload: 3.33 kg Comp B

Number of charges: P + 8

Fuze: various

Max range: 10,000 m

Max muzzle velocity: 450 m/s in 2.6 m tube

Time of flight to 10,000 m: 48.3 s

Manufacturer

PRIMEX Technologies.

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.408 Cheyenne Tactical

UNITED STATES OF AMERICA

Synonym:

0.408 CheyTac; 10 × 77 mm

Armament

Suitably chambered rifles.

Development

The 0.408 Cheyenne tactical is a developmental cartridge intended to provide a sniper or anti-matérial cartridge whose terminal ballistics approach those of the 12.7 × 99 mm (0.50 BMG), albeit at closer ranges and with less recoil than the 12.7 × 99 mm. Rifles in 0.408 Cheyenne Tactical that can be transported and fired by a single soldier are under development by several manufacturers in the United States. The round is also intended to be used in general purpose machine guns as a more effective alternative to cartridges of the 7.62 mm class.

Description

The 0.408 Cheyenne tactical is based on the 0.505 Gibbs cartridge and is essentially the 0.505 Gibbs resized to 0.40 calibre (approximately 10 mm). The cartridge has a straight tapered, rimless, bottlenecked case, is Boxer primed and fires solid bronze Very Low Drag (VLD) bullets to optimise long-range performance.

Specifications

Round length: 114.0 mm

Case length: 77.0 mm

Rim diameter: 16.0 mm

Bullet diameter: 10.0 mm

Bullet weight: 26.6 g

Muzzle velocity: 850 m/s

Muzzle energy: 9829 J

UNITED STATES OF AMERICA

Manufacturer

Dr John Taylor

Type: Ball: Solid bronze; 26.6 g; MV 850 m/s (nominal)

Ball: Solid bronze; 27.6 g; MV 850 m/s (nominal)

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

440 CorBon Magnum

Synonym:

none

Armament

Suitably chambered hand guns, including [Desert Eagle](#) and [AMT](#) Auto Mag.

Development

By CorBon to combine the ballistic coefficient of 0.44 calibre bullets with the case capacity of the 0.50 AE.

Description

The 440 CorBon Magnum is essentially a 0.50 AE case, necked down to accept 0.44 calibre bullets. It is a rimless straight taper bottlenecked case loaded with bullets of various types and weights including JHP, SP, FMJ types.

Specifications

Round length: 40.5 mm

Case Length: 32.6 mm

Rim diameter: 13.06 mm

Bullet diameter: 10.9 mm

Bullet weight: 19.7g (FMJ)

Muzzle velocity: 488 m/s

Muzzle energy: 2,351 J

UNITED STATES OF AMERICA

Manufacturer

CorBon Ammunition

Type: Ball: FMJ; 19.7 g; MV 488 m/s; 2,351 J

Ball: JSP; 17.0 g; MV 518 m/s; 2,264 J

Ball: JHP; 15.6 g; MV 548.6 m/s; 2,341 J

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.308 CorBon SuperMag

Synonym:

none

Armament

Suitably chambered rifles and carbines.

Development

The 0.308 CorBon SuperMag was developed to equal the ballistic performance of full length magnum cartridges such as the [0.300 Winchester Magnum](#), but utilising a shorter cartridge case. Magnum ballistics are achieved using modern quicker burning propellants than are used in earlier cartridges. This new design thus allows use of shorter barrels because the propellant burns completely, even in carbine length barrels.

Description

The straight tapered case is rimless and bottlenecked; it is Boxer primed with a sharp bottleneck angle.

Specifications

Round length: 71.1 mm

Case Length: 53 mm

Rim diameter: 13.8 mm

Bullet weight: 10.7 g

Muzzle velocity: 975 m/s

Muzzle energy: 5,088 J

UNITED STATES OF AMERICA

Manufacturer

CorBon Ammunition Co.

Type: Ball: JSP; 10.7 g; MV 975.4 m/s; 5,088 J

Ball: JSP; 11.7 g; MV 944.9 m/s; 5,209 J

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IDENTIFICATION OF SMALL ARMS AMMUNITION, UNITED STATES OF AMERICA

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

20-30 mm:

Prior to the adoption of the NATO standard code, the following body colour code was in use and, as with small arms calibres, may be found used by countries who were originally supplied by the USA.

Practice ball	black
AP	black with white lettering
HE (filled TNT)	white
HE (filled Pentolite)	yellow
HE-I (filled TNT)	red
HE-I (filled Pentolite)	pink
HE-T (filled TNT)	grey
HE-T (filled Pentolite)	dark blue
TP	grey
TP-T	grey with yellow ring

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IDENTIFICATION OF SMALL ARMS AMMUNITION, UNITED STATES OF AMERICA

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

Small arms ammunition:

Before the adoption of the NATO standard code in 1957 the following system, based on coloured bullet tips was in use. The system is still used by various countries which were supplied by the USA.

Tracer	red bullet tip
Tracer (Dark Ignition)	brown bullet tip
AP	black bullet tip
AP-I	silver bullet tip
AP-I-T	red bullet tip over silver ring
Incendiary	blue bullet tip
Incendiary	
(.50 Browning)	dark blue tip over light blue ring
Frangible ball	green tip over white ring
Observing-T	yellow tip over red ring
Duplex ball	green bullet tip

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 × 23 mm Winchester

Synonyms:

none

Armament

Suitably chambered pistols.

Development

The 9 × 23 Winchester cartridge was developed as a joint venture by Colt and Winchester-Olin to provide a cartridge for semi-automatic pistols that would develop terminal ballistics on a par with those of the .357 Magnum.

Description

The 9 × 23 mm Winchester is a rimless, straight taper, brass case, Boxer primed cartridge. It was derived from the 9 × 19 mm Parabellum cartridge by lengthening the case and increasing the powder load. It is very similar to the 9 mm Largo and 9 mm Steyr cartridges and can be distinguished from these by the fact that the 9 × 23 mm Winchester is loaded only with JHP or JSP, rather than FMJ bullets

Specifications

Round length: 33.5 mm

Round weight: 11 g

Case length: 23 mm

Bullet diameter: 9 mm

Bullet weight: 8 g

Muzzle velocity: 442 m/s

Muzzle energy: 432 J

UNITED STATES OF AMERICA

Manufacturer

Winchester-Olin

Type: Ball: JHP, 8 g; MV 442 m/s

Ball: JSP; 8 g; MV 442 m/s

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.500 Whisper

Synonyms:

12.7 × 57B; 0.50/0.460 Weatherby Magnum

Armament

Suitably chambered rifles.

Development

The .500 Whisper was developed by J D Jones of SSK Industries to provide a cartridge that would deliver accuracy and good terminal ballistics at, below, or above the speed of sound. It is intended for use by snipers in suppressed weapons and is ideal for that purpose, firing a bullet of high ballistic coefficient with great sectional density, usually at subsonic velocities. When used with low-drag bullets, the 0.500 Whisper cartridge is little affected by crosswinds and retains over half of its muzzle energy at ranges of up to 1 mile (1.6 km). **This cartridge reportedly is in use for long-range sniping by several European special operations organisations.**

Description

The 0.500 Whisper is derived from the 0.460 Weatherby Magnum cartridge and is simply a 0.460 Weatherby cartridge casing shortened to a length of 57 mm and necked down to accept a 0.50 calibre bullet. It is belted, with a slight taper and bottleneck. The case is brass and Boxer primed. Bullets are

streamlined and any of several varieties may be encountered, as some users custom-load to their own specifications. The most common configuration of this cartridge is with a 0.50 BMG bullet and it is for that loading with an M33 ball bullet that specifications are given.

Specifications

Round length: 129.5 mm

Case length: 57 mm

Rim diameter: 23.7 mm

Head diameter: 23.7 mm

Bullet diameter: 12.7 mm

Bullet weight: 43 g (M33 .50 BMG)

UNITED STATES OF AMERICA

Manufacturer

SSK Industries, Inc

Type: Ball: FMJ; 43 g; MV 317 m/s

UPDATED



*0.500 whisper cartridge
(1998)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.357 SIG

Synonyms:

none

Armament

Suitably chambered pistols.

Development

Developed by Sigarms, USA, in 1994 in order to produce a semi-automatic pistol cartridge with ballistics similar to the [0.357 Magnum](#). The intention is to provide users of 0.357 revolvers with similar ballistics in semi-automatic pistols. **This cartridge is gaining wide acceptance by law enforcement agencies both in North America and in Europe.**

Description

This is a [0.40 Smith & Wesson](#) cartridge case necked down to take a 0.357 revolver bullet. It is therefore a rimless brass case, bottlenecked and carrying a jacketed hollow point or FMJ bullet.

Specifications

Round length: 28.45 mm

Case length: 21.84 mm

Rim diameter: 10.64 mm
Bullet diameter: 9.07 mm
Bullet weight: 8.1 g
Muzzle velocity: 412 m/s
Muzzle energy: 686 J

Abridged ballistic table: [0.357 SIG](#), 8.1 g ball

Range	Velocity	Energy
0 m	411 m/s	683 J
25 m	386 m/s	602 J
50 m	363 m/s	533 J
75 m	344 m/s	478 J
100 m	329 m/s	438 J

UNITED STATES OF AMERICA

Manufacturer

Black Hills Ammunition
Type: Ball: JHP; 8.1g; MV 411 m/s

Manufacturer

CCI
Type: Ball: JHP; 8.0 g; MV 411 m/s

Manufacturer

Cor-Bon Ammunition
Type: Ball: JHP; 7.5 g; MV 457 m/s
Ball: JHP; 8.1 g; MV 434 m/s

Manufacturer

Eldorado Cartridge Corporation (PMC Ammunition)
Type: Ball: JHP; 8.0 g; MV 411 m/s
Ball: FMJ; 8.0 g; MV 411 m/s

Manufacturer

Federal Cartridge Company
Type: Ball: FMJ; 8.1 g; MV 411 m/s
Ball: JHP; 8.1 g; MV 411 m/s

Manufacturer

Hornady
Type: Ball XTP: JHP; 8.03 g; MV 412 m/s
Ball XTP: JHP; 9.52 g; MV 363 m/s

Manufacturer

Longbow Incorporated

Type: Frangible ball: 5.5 g; MV 472 m/s

UPDATED



[0.357 SIG](#)
(1996)

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

9 mm Winchester Magnum

Synonyms:

9 × 29 mm

Armament

Wildey automatic pistol; other suitably chambered pistols.

Development

This cartridge was developed in the USA in 1979 for the Wildey gas-operated automatic pistol, a weapon intended for long-range target shooting. Although it was designed purely as a commercial venture, the 9 mm Winchester Magnum appears to have considerable military potential as a sub-machine gun or carbine cartridge and for this reason it is included here.

Description

A rimless, straight-taper brass case, Boxer primed. The current commercial loading is a jacketed ogival 7.45 g bullet, which would be satisfactory for military purposes.

Specifications

Round length: 40 mm

Case length: 29.5 mm

Rim diameter: 10 mm
Bullet diameter: 9.03 mm
Bullet weight: 7.45 g
Muzzle velocity: 450 m/s
Muzzle energy: 754 J

UNITED STATES OF AMERICA

Manufacturer

Winchester-Olin

Type: Ball: FMJ; 7.45 g; MV 450 m/s

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9 mm Winchester Magnum

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.400 Cor-Bon

Synonyms:

none

Armament

Suitably chambered semi-automatic pistols.

Development

The 0.400 Cor-Bon was designed by Peter Pi of Cor-Bon. The intention was to provide a cartridge with better terminal ballistics than either the 0.45 ACP or [0.40 Smith & Wesson](#), thereby enhancing the performance of existing pistols using modern ammunition technology. To increase flexibility and marketing appeal, the low-pressure, high-velocity cartridge can be used in any 0.45 ACP pistol simply by changing the barrel. All other pistol components may be retained, including springs and magazines. The cartridge was introduced into the US self-defence and law enforcement market in 1997.

Description

The 0.400 Cor-Bon is essentially a 0.45 ACP case necked down to accept 0.40 calibre/10 mm bullets. It is a rimless, bottlenecked case loaded with bullets of various types and weights, including JHP, BHP and FMJ types.

Specifications

Round length: 31.1 mm
Case length: 22.8 mm
Rim diameter: 12 mm
Bullet diameter: 10.1 mm

Abridged ballistic table: 0.400 Cor-Bon, 8.7 g ball

Range	Velocity	Energy
0 m	442 m/s	854 J
25 m	402 m/s	705 J
50 m	369 m/s	594 J
75 m	343 m/s	512 J
100 m	323 m/s	455 J

UNITED STATES OF AMERICA

Manufacturer

Cor-Bon Ammunition

Type: Ball: JHP; 8.7 g; MV 442 m/s

Ball: JHP; 9.7 g; MV 441 m/s

Ball: FMJ; 10 g; MV 381 m/s

Ball: BHP; 10 g; MV 405 m/s

Ball: JHP; 10.6 g; MV 396 m/s

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*0.400 Cor-Bon
(1997)*

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.32 Colt New Police

Synonyms:

0.32 Smith & Wesson Long; 0.32-44 Target

Armament

Suitably chambered revolvers.

Development

Developed in 1896 for the Colt New Police revolvers introduced in the same year, which subsequently became the Police Positive model. The Smith & Wesson First Model 1903 chambers the same cartridge, called the 0.43 S&W Long, which is identical to the 0.32 Colt New Police except for the bullet, and most manufacturers made suitable revolvers. Like the S&W cartridge, it was long a favourite US police cartridge for detectives and plain-clothes operatives, though it seems to have been less popular in Europe and its popularity in the USA has waned with the widespread introduction of semi-automatic pistols for police work.

Description

A straight, brass or plated, rimmed cartridge, Berdan or Boxer primed and generally recognisable by the flat-tipped lead bullet. The 0.32 Smith & Wesson can be identified by its round-nosed bullet.

Specifications

Round length: 31.9 mm
Case length: 23.27 mm
Rim diameter: 9.5 mm
Bullet diameter: 7.82 mm
Bullet weight: 6.48 g
Muzzle velocity: 207 m/s
Muzzle energy: 139 J

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company Inc
Type: Ball: Lead, ogival; 6.48 g; 207 m/s

Manufacturer

Winchester-Olin
Type: Ball: Lead, ogival; 6.4 g; 207 m/s

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.32 Colt New Police

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SMALL ARMS

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

0.32-20 Winchester

Synonyms:

0.32 Winchester CF; 0.32 Marlin; 0.32 Colt Lightning; GR 943

Armament

Suitably chambered revolvers and sporting rifles.

Development

This cartridge appeared in 1882 for a 0.32 calibre Winchester lever-action rifle and was thereafter used in rifles by various makers and in revolvers made in the USA and Europe. The large cartridge case gives a useful amount of power for hand gun use, and as a rifle round it was long popular with farmers for dealing with vermin and small game.

Description

A rimmed, brass case with a slight bottleneck, Boxer or Berdan primed. A variety of bullets can be found, lead, jacketed soft point or full metal jacketed, but almost always with the nose flattened to improve terminal effects. Shot loadings have also been made in this calibre. Some loadings are 'rifle only', too heavy for use in a revolver; the specification data given below are for use in revolvers or rifles, unless otherwise indicated.

Specifications

Round length: 40.4 mm
Case length: 33.53 mm
Rim diameter: 10.28 mm
Bullet diameter: 7.92 mm
Bullet weight: 7.45 g
Muzzle velocity: 300 m/s
Muzzle energy: 335 J

Abridged ballistic table: 0.32-20 Winchester, Rifle loading, 7.45 g ball

Range	Velocity	Energy
0 m	451 m/s	756 J
100 m	372 m/s	514 J
200 m	320 m/s	380 J
300 m	287 m/s	306 J

UNITED STATES OF AMERICA

Manufacturer

Remington Arms Company Inc
Type: Ball: Lead, RN; 6.48 g; MV 314 m/s

Manufacturer

Winchester-Olin
Type: Ball: Lead, RN; 6.5 g; MV 314 m/s
Ball: JSP; 6.5 g; MV 314 m/s

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0.32-20 Winchester

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FUZES - IMPACT FUZES, UNITED STATES OF AMERICA

Date Posted: 10 December 1999

Jane's Ammunition Handbook 1999-2000

M567

Armament

HE or WP smoke 81 mm mortar bombs.

Development

By US Army Ordnance.

Description

The M567 fuze is a selective superquick or 0.05 second delay impact fuze. The front body assembly contains an arming mechanism and a firing mechanism which include two spring-loaded setback pins, a slide with inner and outer compression springs (not shown in illustration), an arming pin, and two balls which restrain the superquick firing pin and the pyrotechnic delayed arming striker sequence. The explosive train consists of a delay detonator and a superquick detonator housed 90 ° apart in the cylindrical slider, a lead assembly an auxiliary booster assembly, and a booster charge.

Specifications

Type: point detonating

Weight: 590 g

Length:

overall - 151.6 mm

exposed - 95.76 mm

Thread size: 2.00-12UNS1A

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IDENTIFICATION OF SMALL ARMS AMMUNITION, [VIETNAM](#)

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses RFAS code

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb M91

Armament

60 mm mortar [M90](#).

Development

By Krusik and Yugoimport SDPR.

Description

Conventional teardrop shaped smoke bomb with white phosphorus filler. It is similar in appearance to 60 mm [M90](#) HE and smoke bombs.

Specifications

Length, fuzed: 395 mm

Weight, fuzed: 2,100 g

Weight and type of payload: 300 g, RDX/TNT

Number of charges: P + 6

Fuze: super-quick action

Min range: 90 m

Max range: 5,200 m

Colour/markings: Light green with red markings

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE mortar bomb M91

Armament

60 mm mortar [M90](#).

Development

By Krusik and Yugoimport SDPR to provide extended range and improved terminal ballistics for 60 mm ammunition.

Description

A teardrop-shaped bomb of cast-iron construction with impact, delay or super-quick fuze.

Specifications

Length, fuzed: 395 mm

Weight, fuzed: 2,100 g

Weight and type of payload: 400 g, RDX/TNT or TNT

Number of charges: P + 6

Fuze: Impact super-quick, delay action

Max range: 5,200 m

Min range: 100 m

Colour/markings: Olive drab green / yellow

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb M91

Armament

60 mm mortar [M90](#) and similar weapons.

Development

By Krusik and Yugoimport SDPR.

Description

A conventional 60 mm illuminating bomb similar in appearance to the M67.

Specifications

Length, fuzed: 495 mm

Weight, fuzed: 2,100 g

Intensity of illumination: 400,000 cd for 30 s

Weight and type of payload: 300 g, illuminating candle

Number of charges: P + 6

Fuze: [M91](#) pyrotechnic time fuze

Max range: 4,000 m

Min range: 90 m

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FUZES - PROXIMITY FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

BU 120 M80

Armament

120 mm HE bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR to provide a multifunction fuze for mortars in Yugoslav service.

Description

This is a solid-state Proximity/Point Detonating (PPD) fuze powered by an air turbine. An electromechanical percussion unit will detonate the fuze on impact should the proximity action fail.

Specifications

Type: proximity/point detonating

Weight: 250 g

Operating time: proximity action after a min flight time of 3 s and 0.9 s after vertex

Burst height: 7.5 m (+3.5, -2.5) at 60° angle of descent

Arming requirement: min muzzle velocity of 171 m/s

Arming distance: 150 m

Manufacturer

Yugoimport SDPR.

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FUZES - TIME FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M67

Armament

81 and 82 mm illuminating bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR for mortars in Yugoslav service and general use.

Description

This is to the same basic design as the [M66](#) fuze described previously, differing only in its dimensions, weight and operating time, to suit it to use with smaller bombs. There are two versions of the M67. One version has a maximum time setting of 35 seconds; the other, maximum setting of 38 seconds.

Specifications

(35 s version)

Type: time, combustion

Weight: 573 g (263 g)

Length:

overall - 76 mm (65 mm)

exposed - 67 mm (56 mm)

Max diameter: 79 mm (58 mm)

Operating time: 38 s max setting (35 s max)

Manufacturer

Yugoimport SDPR.

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FUZES - TIME FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M66

Armament

120 mm illuminating bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR for mortars in Yugoslav service and general use.

Description

A combustion time fuze with a single time ring using a zirconium-based time composition. The time ring is ignited on firing by a setback pellet striking a detonator; this pellet is locked by a pull-wire before loading. With the time ring set at safe, the explosive train is interrupted.

Specifications

Type: time, combustion

Weight: 1.269 kg

Length:

overall - 103 mm

exposed - 76 mm

Max diameter: 104 mm

Operating time: 50 s max

Manufacturer

Yugoimport SDPR.

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Combustion time fuze [M66](#)

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FUZES - IMPACT FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

UTU M78

Armament

120 mm HE rocket-assisted bomb [M77](#).

Development

By Yugoimport SDPR to suit the specific requirements of the [M77](#) bomb.

Description

This is a super-quick and delay fuze, the delay being set if required. The fuze operates on a combination of setback and centrifugal force, the specific bomb to which it is matched having a degree of spin stabilisation though fired from a smoothbore mortar.

The fuze relies upon a Semple rotor for safety; this rotor is spring tensioned and is restrained by a centrifugal detent, locking into a hole in the rotor. In the nose of the fuze is a firing pin and primary detonator, below this is a plug which can be turned by a turnscrew on the exterior of the fuze. The plug has a hole in it which, in the SQ position, aligns with a fire channel beneath the primary detonator. Adjacent to this plug is a delay lead and a secondary detonator. The rotor, which contains a detonator and a stem of explosive, lies beneath the plug and above the fuze magazine.

At rest the rotor is locked by a detent. On firing, this withdraws, but the rotor will not move until the centrifugal detent is withdrawn under the influence of spin. Once this frees, the rotor is free to turn under spring tension, positioning the detonator under the plug. On impact, if set for SQ action, the firing

pin strikes the primary detonator and the flash passes down through the channel in the plug, firing the rotor detonator and then the magazine. If the plug is turned to the delay position the flash from the primary cannot pass through and diverts to the delay filling, burning through and firing the detonator. This in turn fires the rotor detonator through a fire channel and the magazine is fired as before.

Specifications

Type: impact, SQ with optional delay

Weight: 430.9 g

Length:

overall - 102 mm

exposed - 57 mm

Diameter: 40 mm

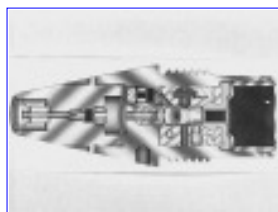
Optional delay: 0.05 s

Arming distance: min, 10 m

Manufacturer

Yugoimport SDPR.

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[UTU M78](#) impact SQ and optional delay fuze

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FUZES - IMPACT FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

UT M70P1

Armament

60, 81 and 120 mm smoke bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR for Yugoslav service.

Description

This is mechanically similar to the [UTU M67](#) fuze, relying upon a spring-loaded sliding rotor for safety. The rotor is locked safe by the firing pin when the fuze is at rest. On firing, an inertia sleeve sets back, locks and then lifts the firing pin into the armed position, freeing it from engagement in the rotor. The rotor is then free to rotate and slide sideways, bringing a detonator under the firing pin.

Specifications

Type: impact, SQ

Weight: 158.7 g

Length:

overall - 80 mm

exposed - 63 mm

Diameter: 46 mm

Optional delay: none

Arming distance: min, 8 m

Manufacturer: Yugoimport SDPR.

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[UT M70P1](#) *impact fuze*

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FUZES - IMPACT FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

M68/M68P1

Armament

60, 81 and 82 mm HE bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR for Yugoslav service.

Description

These fuzes use a mechanism very similar to the Brandt V19 series, with a spring-driven rotor carrying the detonator which is locked by the firing pin in the rest position. On firing, an inertia sleeve sets back, locks, and then moves forward under spring pressure, lifting the firing pin out of the rotor and into the armed position. This permits the rotor to turn and align the detonator. Differences are primarily in dimensions and weight.

Specifications

[\(M68P1\)](#)

Type: impact, SQ

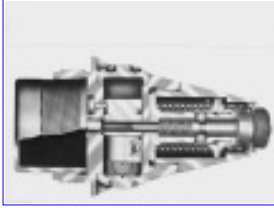
Weight: 163.2 g (173 g)

Length:

overall - 90 mm (87 mm)

exposed - 62 mm (61 mm)
Diameter: 40 mm (46 mm)
Optional delay: none
Arming distance: min, 8 m at 68-72 m/s
Manufacturer: Yugoimport SDPR.

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UT M68P1 impact fuze

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FUZES - IMPACT FUZES, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

UTU M67

Armament

81 and 82 mm HE bombs of Yugoslav manufacture.

Development

By Yugoimport SDPR for Yugoslav service mortars.

Description

This is a direct action impact fuze with selectable delay. It uses a rotor which is locked by the firing pin when at rest. On firing, an inertia sleeve sets back, locks and then lifts the firing pin out of the rotor into the armed position. The rotor can then turn and move laterally across the fuze, the distance it moves depending upon the setting of a turnscrew in the side. When set for SQ action, the rotor stops with a detonator lined up beneath the firing pin. On impact this detonator is struck and transmits its effect directly to the fuze magazine. If the turnscrew is set for delay, the rotor moves to position a second detonator under the firing pin, which has a delay unit beneath it. Thus, when struck by the firing pin there will be the usual 0.05 second delay before the effect is transmitted to the fuze magazine.

Specifications

Type: impact, SQ and delay

Weight: 285 g

Length overall: 91 mm

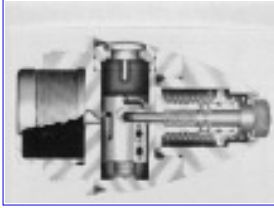
Optional delay: 0.05 s

Arming requirement: min 8 m at 68-72 m/s

Manufacturer

Yugoimport SDPR.

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[UTU M67](#) impact, SQ and delay fuze

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm practice bomb M63

Armament

All 120 mm smoothbore mortars.

Development

Developed by Yugoimport SDPR to provide a training aid for the 120 mm mortar.

Description

This is actually a subcalibre device rather than a projectile. It consists of a steel body, with fins the same size as the standard HE bomb. A central hole passes through this body from nose to tail. In the tail end is a propulsion cartridge. Inserted into the nose is a subprojectile, a small bomb with flexible fins wrapped around its tailboom, which has an impact fuze and a small spotting charge.

The complete 'bomb' is drop loaded into the mortar in the usual manner. The propulsion cartridge is exploded by the firing pin and fires the subprojectile from the central tube to a maximum range of 500 m. The gas pressure also takes effect upon the bomb body and ejects this from the muzzle at low speed, to fall some 4 to 6 m in front of the mortar. It can then be picked up, recharged with a fresh subcalibre bomb and propulsion cartridge and fired again.

Specifications

Length, complete: 508 mm

Weight, complete: 11.6 kg

Weight and type of payload: 400 g subprojectile

Number of charges: 1

Fuze: impact SQ

Max range: 500 m

Manufacturer

Yugoimport SDPR.

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120 mm practice bomb M63

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb M87

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR to improve upon the [M84](#) bomb.

Description

This is generally the same as the illuminating bomb [M84](#) described previously but has been improved by a new fuze, an improved illuminating composition and a slightly changed propelling charge. Instead of the five silk bags of the [M84](#), the [M87](#) uses six plastic horseshoe containers and has a different propellant.

Specifications

Weight, fuzed: 10.7 kg without propellant charge

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time, combustion, [M87](#)

Max range: 6,000 m

Chamber pressure: 637.45 bar

Illumination intensity: 1 Mcd

Duration of illumination: 60 s

Area of illumination: 2,100 m diameter

Rate of descent: 3 m/s

Manufacturer

Yugoimport SDPR.

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm illuminating bomb M84

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR to provide an illuminating bomb for Yugoslavian service mortars and general use.

Description

This bomb uses the same body, tail unit and propelling charge as the persistent smoke bomb [M84](#). It differs internally by containing the usual flare canister and parachute. A time fuze ignites an expelling charge; this lights the flare canister and also blows off the ogive of the bomb, allowing the canister and parachute to be ejected. The ballistic performance is the same as the [M84](#) smoke bomb.

Specifications

Weight, fuzed: 10.35 kg

Type of payload: parachute and flare

Number of charges: P + 5

Fuze: time, combustion, [M84](#)

Min range: 88 m

Max range: 5,850 m

Muzzle velocity: 137-303 m/s

Chamber pressure: 570 bar

Illumination intensity: 900,000 cd

Duration of illumination: 50 s

Illuminated area: 1,800 m diameter

Rate of descent: 3 m/s

Manufacturer

Yugoimport SDPR.

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120 mm illuminating bomb [M84](#)

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm high-smoke bomb M88

Armament

All 120 mm smoke bomb mortars.

Development

By Yugoimport SDPR for Yugoslavian mortars, in order to provide a smoke canister with a controlled descent to avoid burying or breaking on impact.

Description

This uses a similar bomb body to the persistent smoke bomb [M84](#) described previously and operates in a similar manner. The difference is that the smoke canister in this bomb is fitted with a parachute to slow the descent and ensure a relatively soft landing. The smoke mixture has been improved and the size of the canister increased so that the smoke is now emitted for between 4 and 6 minutes.

Specifications

Length, fuze: 670 mm

Weight, fuze: 11.25 kg

Weight and type of payload: 1.65 kg HC smoke mixture

Number of charges: P + 5

Fuze: time, combustion, [M84](#)

Max range: 6,000 m

Manufacturer

Yugoimport SDPR.

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm persistent smoke bomb M84

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR to provide a more persistent smoke screen.

Description

This bomb has a short, rounded ogive, a parallel-walled body section and a curving tail, with a tailboom and fin unit threaded on. The bomb is fitted with a time fuze and contains a single container charged with Hexachloroethane smoke mixture, giving a lower and longer-lasting smoke cloud than White Phosphorus (WP). The tail unit carries a primary cartridge and five secondary increments in silk bags which are tied around the tailboom.

Upon the functioning of the time fuze the expelling charge ignites the smoke canister, then blows off the ogive of the bomb, allowing the smoke canister to be ejected and fall to the ground, where it continues to emit smoke for a minimum of 3 minutes.

Specifications

Weight, fuze: 10.35 kg

Weight and type of payload: 1.2 kg HC smoke composition

Number of charges: P + 5

Fuze: time, combustion, [M84](#)

Min range: 88 m

Max range: 5,850 m

Muzzle velocity: 137-303 m/s

Chamber pressure: 570 bar (Charge 5)

Ballistic performance from 1.5 m barrel:

Charge	Muzzle velocity	Max range
P		88 m
1	137 m/s	1,260 m
2	185 m/s	2,560 m
3	229 m/s	3,850 m
4	266 m/s	4,850 m
5	303 m/s	5,850 m

Manufacturer

Yugoimport SDPR.

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120 mm persistent smoke bomb [M84](#)

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm smoke bomb M64P1

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR for Yugoslavian 120 mm mortars and general use.

Description

This is similar to the HE bomb M62P1 though slightly more rounded in the ogive. It uses the same tail unit and propelling charge system. The nose is closed by an adaptor which is formed into a burster container extending almost to the tail of the bomb. The remainder of the cavity is filled with White Phosphorus (WP) smoke mixture.

Specifications

Weight, fuzed: 12.4 kg

Weight and type of payload: 2.45 kg WP

Number of charges: P + 6

Fuze: impact SQ [UT M70P1](#)

Min range: 255 m

Max range: 6,010 m

Muzzle velocity: 123-302 m/s

Chamber pressure: 960 bar

Ballistic performance fired from Yugoslav mortar [M52](#):

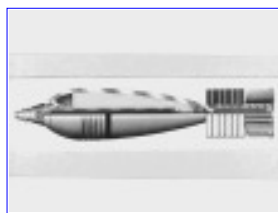
Charge	Muzzle velocity	Max range
1	123 m/s	1,410 m
2	165 m/s	2,375 m
3	204 m/s	3,400 m
4	240 m/s	4,400 m
5	271 m/s	5,250 m
6	302 m/s	6,010 m

When fired from Yugoslav mortar [M75](#), maximum range Charge 6 is 6,464 m.

Manufacturer

Yugoimport SDPR.

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120 mm smoke bomb M64P1

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm rocket-assisted HE bomb M77

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR to improve the range of existing Yugoslavian service mortars.

Description

The body of this bomb resembles that of an artillery shell, a tapering ogive leading into a parallel-sided body with no boat tail. At the end of the body a tail unit is attached, consisting of a set of fins folded up jack-knife fashion with their tips beneath the bomb base. There is also a tubular cartridge container which houses a primary cartridge and supports the six secondary increments in horseshoe containers. In addition, the cartridge container carries a delay system; and the rear one-third of the bomb body is a separate compartment, carrying a rocket motor which exhausts through a venturi in the base of the bomb. The fins are shaped and canted slightly so as to induce a degree of spin stabilisation into the flight of the bomb.

The bomb is drop fired in the usual manner; the rocket assistance is optional. As the bomb leaves the muzzle, the fins swing back and lie horizontally, extending well over the calibre and giving excellent stability to the bomb in flight. If rocket assistance is selected, a delay unit in the cartridge container causes the container to be discarded shortly after leaving the muzzle; a further delay unit ignites the rocket motor during the upward leg of the trajectory, extending the trajectory and the range.

Specifications

Weight, unfuzed: 13.42 kg

Weight and type of payload: 2.91 kg TNT

Number of charges: P + 6

Fuze: impact, SQ and delay

Min range: 300 m

Max range: 5,300 m without rocket; 9,400 m with rocket

Muzzle velocity: 133-307 m/s

Chamber pressure: 981 bar

Ballistic performance:

(R indicates rocket assistance)

Charge	Muzzle velocity	Max range
1	133 m/s	1,500 m
2	180 m/s	2,500 m
3	217 m/s	3,400 m
4	251 m/s	4,100 m
5	280 m/s	4,700 m
6	307 m/s	5,300 m
3R	217 m/s	7,900 m
4R	251 m/s	8,500 m
5R	280 m/s	8,900 m
6R	307 m/s	9,400 m

Manufacturer

Yugoimport SDPR.

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120 mm rocket-assisted HE bomb [M77](#)

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MORTARS - 120 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

120 mm HE bomb, light, M62P1

Armament

All 120 mm smoothbore mortars.

Development

By Yugoimport SDPR for Yugoslavian mortars and for general use.

Description

A conventional streamlined bomb with four gas check grooves around the bourrelet. A light-alloy tail unit screws into the base of the body, which carries a primary cartridge and six secondary increments in horseshoe containers.

Specifications

Weight, fuzed: 12.6 kg

Weight and type of payload: 2.25 kg TNT

Number of charges: P + 6

Fuze: impact SQ and delay

Min range: 400 m

Max range: 6,050 m

Chamber pressure: 1,030 bar

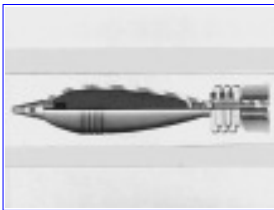
Ballistic performance:

Charge	Muzzle velocity	Max range
1	121 m/s	1,400 m
2	162 m/s	2,360 m
3	200 m/s	3,370 m
4	236 m/s	4,400 m
5	267 m/s	5,280 m
6	297 m/s	6,050 m

Manufacturer

Yugoimport SDPR.

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120 mm HE bomb, light, M62P1

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MORTARS - 82 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm illuminating bomb M67

Armament

All 82 mm mortars.

Development

By Yugoimport SDPR for Yugoslavian and other mortars.

Description

A streamlined bomb but with an elongated parallel-walled body with five gas check grooves at the bourrelet and four bore-diameter studs at the nose end to steady the bomb in the bore. The tail unit and propulsion system of the HE and smoke bombs [M74](#) is used.

The interior contains a parachute and flare assembly. A time fuze initiates an ejection system which blows off the fuze and adaptor, allowing the contents to be ejected by a spring. The parachute then deploys and lowers the burning flare to the ground.

Specifications

Weight, fuzed: 2.95 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time, combustion, M67

Min range: 300 m

Max range: 3,380 m, 1.15 m barrel; 3,645 m, 1.45 m barrel

Illumination intensity: 500,000 cd

Burning time: 40 s

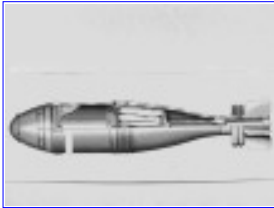
Illuminated area: 800 m diameter

Rate of descent: 2.4 m/s

Manufacturer

Yugoimport SDPR.

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82 mm illuminating bomb M67

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MORTARS - 82 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm anti-sabotage bomb `Pliska' M81

Armament

Yugoslavian M69 mortar; probably usable in other 82 mm mortars.

Development

Developed by Yugoimport SDPR for specialised defence of harbours and water areas against swimmers and submersible craft.

Description

This has been developed from the 82 mm [M74](#) HE bomb. It generally resembles that bomb but is fitted with a special SQ and delay fuze, which allows the bomb to be initiated on striking the water and then sink to between 4 and 10 m depth before detonating. The detonation produces a shock overpressure effect in the water which is lethal to swimmers inside a 15 m radius of the burst. The pressure effect will also activate mine sensors in the area. A special blast filling is used to obtain the desired effect.

In addition to the specialised underwater application, the bomb, with the fuze set to SQ action, can be used as a normal anti-personnel bomb against forces which have landed from the sea.

Specifications

Length, fuzed: 370 mm

Weight, fuzed: 3.05 kg

Weight and type of payload: 690 g KDX explosive

Number of charges: P + 5

Fuze: impact SQ and delay

Delay time: 0.14 ±0.05 s

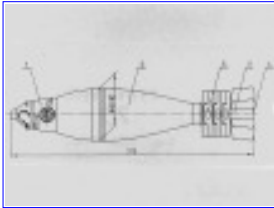
Min range: 100 m

Max range: 4,900 m

Manufacturer

Yugoimport SDPR.

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82 mm Anti-Sabotage Bomb 'Pliska' [M81](#): (1) fuze; (2) shell body; (3) tail unit; (4) ignition cartridge; (5) increment charge

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MORTARS - 82 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm smoke bomb M74

Armament

All 82 mm mortars.

Development

By Yugoimport SDPR for Yugoslavian and other mortars.

Description

This generally resembles the HE bomb [M74](#), using the same body, tail unit and propulsion system. It differs in having the nose closed by an adaptor/burster container into which the fuze is screwed. The body cavity is filled with white phosphorus smoke composition.

Specifications

Length, fuzed: 383 mm

Weight, fuzed: 3.05 g

Weight and type of payload: 600 g WP

Number of charges: P + 6

Fuze: impact SQ

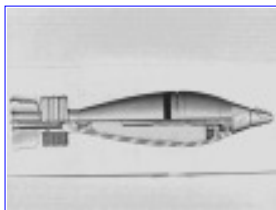
Min range: 84 m

Max range: 4,943 m

Manufacturer

Yugoimport SDPR.

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82 mm smoke bomb [M74](#)

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MORTARS - 82 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

82 mm HE bomb M74

Armament

All 82 mm mortars.

Development

By Yugoimport SDPR for their designs of mortar and for general use.

Description

This might almost be called a `transitional' pattern since the shape tends toward the older teardrop, but it has a longer and more tapered ogive and a single, deep, gas check groove which at first glance might be assumed to be for a plastic obturation system. The body is of forged steel, the tailboom and fins of light-alloy. A primary cartridge fits into the tailboom and six horseshoe secondary increments clip around the tail in front of the fins.

Specifications

Length, fuze: 375 mm

Weight, fuze: 3.05 kg

Weight and type of payload: 680 g TNT

Number of charges: P + 6

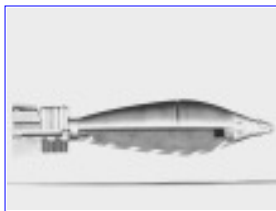
Fuze: impact SQ

Min range: 84 m
Max range: 4,943 m

Manufacturer

Yugoimport SDPR.

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82 mm HE bomb [M74](#)

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MORTARS - 81 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm illuminating bomb M67

Armament

All 81 mm mortars.

Development

By Yugoimport SDPR for Yugoslavian and other mortars.

Description

A streamlined bomb but with an elongated parallel-walled body, five gas check grooves at the bourrelet and four bore-diameter studs at the nose end to steady the bomb in the bore. The tail unit and propulsion system of the HE and smoke bombs [M74](#) are used.

The interior contains a parachute and flare assembly. A time fuze initiates an ejection system which blows off the fuze and adaptor, allowing the contents to be ejected by a spring. The parachute then deploys and lowers the burning flare to the ground.

Specifications

Weight, fuzed: 2.95 kg

Type of payload: parachute and flare

Number of charges: P + 6

Fuze: time, combustion, M67

Min range: 300 m

Max range: 3,380 m, 1.15 m barrel; 3,645 m, 1.45 m barrel

Illumination intensity: 500,000 cd

Burning time: 40 s

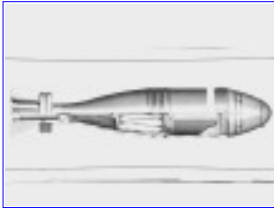
Illuminated area: 800 m diameter

Rate of descent: 2.4 m/s

Manufacturer

Yugoimport SDPR.

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81 mm illuminating bomb M67

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MORTARS - 81 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb M74

Armament

All 81 mm mortars, subject to the restriction below.

Development

By Yugoimport SDPR for Yugoslavian and other mortars.

Description

This generally resembles the HE bomb [M74](#), using the same body, tail unit and propulsion system. It differs in having the nose closed by an adaptor/burster container into which the fuze is screwed. The body cavity is filled with white phosphorus smoke composition.

Specifications

Length, fuzed: 383 mm

Weight, fuzed: 3.05 g

Weight and type of payload: 600 g WP

Number of charges: P+6

Fuze: impact SQ

Min range: 84 m

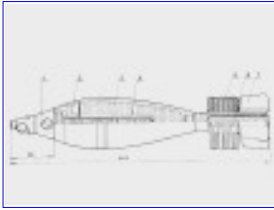
Max range: 4,943 m

Restrictions: Only to be fired with Charge 4 in low-pressure (<413.85 bar) mortars, when the maximum range will be 3,713 m.

Manufacturer

Yugoimport SDPR.

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81 mm smoke bomb [M74](#): (1) fuze; (2) body; (3) burster; (4) smoke mixture; (5) secondary increments; (6) primary cartridge; (7) tail unit

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MORTARS - 81 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm HE bomb M74

Armament

All 81 mm mortars, subject to restriction given below.

Development

By Yugoimport SDPR for their designs of mortar and for general use.

Description

This might almost be called a `transitional' pattern, since the shape tends toward the older teardrop but has a longer and more tapered ogive and a single, deep, gas check groove. This, at first glance might be assumed to be for a plastic obturation system. The body is of forged steel, the tailboom and fins are of light alloy. A primary cartridge fits into the tailboom and six horseshoe secondary increments clip around the tail in front of the fins.

Specifications

Length, fuze: 375 mm

Weight, fuze: 3.05 kg

Weight and type of payload: 680 g TNT

Number of charges: P + 6

Fuze: impact SQ

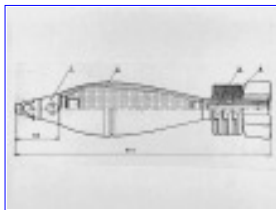
Min range: 84 m
Max range: 4,943 m

Restrictions: Only to be fired with Charge 4 in low-pressure (<413.85 bar) mortars, when the maximum range will be 3,713 m.

Manufacturer

Yugoimport SDPR.

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81 mm HE bomb [M74](#): (1) fuze; (2) body; (3) primary cartridge; (4) secondary increments

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MORTARS - 81 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

81 mm smoke bomb M89

Armament

Modern medium- and high-pressure 81 mm mortars such as the UK [L16](#), US [M29](#) and [M252](#), French [TDA](#) MO-81-61-C and -L, Yugoslav M69K and M69B-D.

Development

By Yugoimport SDPR for use in previous mortars.

Description

This is the partner to the [M86](#) HE bomb described previously, using the same body, tail assembly and propulsion system. It differs only in having a central burster charge of TNT and a main filling of White Phosphorus (WP) smoke mixture.

Specifications

Length, fuzed: 470 mm

Weight, fuzed: 4.1 kg

Weight and type of payload: 630 g WP

Number of charges: P + 6

Fuze: impact SQ UT [M86](#) or UT [M88](#)

Min range: 150 m

Max range: 6,200 m, 1.15 m barrel; 6,700 m, 1.45 m

barrel

Chamber pressure: 610 bar

Manufacturer

Yugoimport SDPR.

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MORTARS - 81 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

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81 mm HE bomb M86

Armament

Modern medium- and high-pressure 81 mm mortars such as the UK [L16](#), US [M29](#) and [M252](#), French [TDA](#) MO-81-61-C and -L, Yugoslav M69K and M69B-D.

Development

By Yugoimport SDPR for use in the above mortars.

Description

This is an elongated, streamlined bomb based on the design introduced with the UK [L16](#) mortar and fitted with a plastic obturating ring. The alloy tail unit carries a primary cartridge and six secondary increments, in horseshoe plastic containers which clip around the tailboom.

Specifications

Length, fuze: 470 mm

Weight, fuze: 4.1 kg

Weight and type of payload: 850 g TNT or RDX/TNT

Number of charges: P + 6

Fuze: impact SQ UT [M86](#) or UT [M88](#)

Min range: 150 m

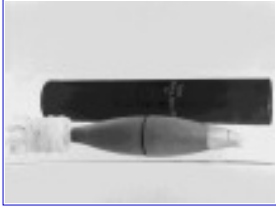
Max range: 6,200 m, 1.15 m barrel; 6,700 m, 1.45 m barrel

Chamber pressure: 610 bar

Manufacturer

Yugoimport SDPR.

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81 mm HE bomb [M86](#)

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm WP smoke bomb M90

Armament

60 mm [TDA](#) pattern long-barrelled mortars.

Development

By Federal arsenal to provide the 60 mm mortar with performance approximating that of an 81 mm weapon.

Description

This is the same bomb as the 60 mm Long-Range HE Bomb [M90](#) described previously. It differs in its payload of 270 g White Phosphorus (WP), and in having a central TNT burster beneath the fuze, so as to break open the bomb and distribute the contents. Performance, weights and dimensions are exactly the same.

Manufacturer

Yugoimport SDPR.

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm long-range HE bomb M90

Armament

60 mm [TDA](#) pattern long-barrelled mortars.

Development

By Federal arsenal to provide the 60 mm mortar with performance approximating that of an 81 mm weapon.

Description

The [M90](#) bomb is of modern symmetrical streamlined shape, with a plastic obturating ring set into a groove at the body waist. An extruded light-alloy tail unit is screwed to the rear of the body and a ballistically shaped impact fuze is fitted in the nose. A primary cartridge fits into the rear of the tail tube and up to six secondary charges may be fitted around the tube, ahead of the fins, in plastic horseshoe containers.

Specifications

Weight: 2.1 kg in flight

Length, fuze: 400 mm

Weight and type of payload: 400 g TNT

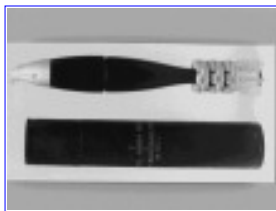
Fuze: Impact, SQ

Min range: 150 m
Max range: 5,200 m

Manufacturer

Yugoimport SDPR.

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60 mm long-range HE bomb [M90](#)

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm practice bomb M62

Armament

60 mm mortars [M57](#), [M70](#), [TDA](#) Commando and similar.

Development

No information.

Description

This is a self-contained launching unit for a subprojectile. The bomb consists of a teardrop-shaped body with the tail unit and fins formed together with the body in a single unit. A steel tube runs from the nose of the bomb down to the tail. The tail tube is hollow and a rifle blank cartridge fits into the rear end. Into the tube fits: the subprojectile, a small bomb with an impact fuze and a small powder charge and thin metal fins are coiled around the tail shaft. The bomb is dropped into the mortar and the blank cartridge cap is struck by the firing pin. The gas generated by the blank cartridge is partially vented to the interior of the mortar where it provides sufficient propulsive force to eject the bomb. At the same time, the internal pressure in the bomb ejects the subprojectile and launches it on to a ballistic trajectory, with a range of about 280 m when the mortar is at 45° elevation. The bomb body is ejected from the muzzle behind the subprojectile and falls about 4 to 6 m in front of the mortar. It can then be picked up and reloaded with a new subprojectile and blank cartridge and reused.

Specifications

Length, fuzed: 202 mm

Weight, fuzed: 1.08 kg

Type of payload: subprojectile; see text

Number of charges: 1

Manufacturer

Yugoimport SDPR.

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60 mm practice bomb [M62](#)

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm illuminating bomb M67

Armament

60 mm mortars [M57](#), [M70](#), [TDA](#) Commando and similar.

Development

No information.

Description

The body has parallel sides for some distance in front of the bourrelet and has four gas check grooves behind it. An alloy tail unit with six fins is screwed into the tail of the body. There are four studs of bourrelet diameter at the nose end of the body which act as guides to keep the bomb centralised in the mortar barrel. Internally, at the tail end, is a central spigot surrounded by a compressed spring. Above this is an alloy cup into which a parachute is folded. Above the parachute are the coiled lines and above this the flare container, mouth upwards. A time fuze is screwed into the bomb nose and retains the contents in place. When the fuze functions at the set time it ignites the flare composition and, due to the pressure evolved, blows the fuze out of the nose of the bomb. The coiled spring then ejects the flare container and parachute. The alloy cup falls away and the parachute deploys to support the burning flare.

Specifications

Weight, fuzed: 1.27 kg
Intensity of illumination: 180,000 cd
Mean height of parachute deployment: 180 m
Rate of descent: 2.5 m/s
Fuze: time, combustion, M67

Ballistic performance:

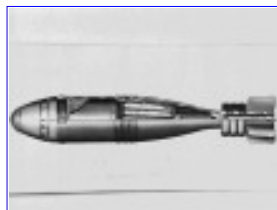
Charge	Muzzle velocity	Max range
1	117 m/s	950 m
2	154 m/s	1,600 m
3	185 m/s	2,100 m
4	210 m/s	2,450 m

Restrictions: When fired in Commando pattern mortars, restricted to Primary plus two secondaries. Not to be fired in any mortar with only the primary cartridge.

Manufacturer

Yugoimport SDPR.

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60 mm illuminating bomb M67

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm smoke bomb M73

Armament

60 mm mortars [M57](#), [M70](#), [TDA](#) Commando and similar.

Development

Based upon the [60 mm HE Bomb M73](#).

Description

The bomb body and tail unit are similar to those of the [60 mm HE Bomb M73](#). Internally the body is closed by a screwed adaptor which carries a tubular burster container reaching into the body. The White Phosphorus (WP) smoke composition is loaded into the body, around the burster container. A burster charge of pelleted TNT is loaded into the burster container. The fuze is screwed into the adaptor and retains the burster charge in place. A primary cartridge fits into the tail unit and four celluloid horseshoe secondaries fit around the tail tube above the fins.

Specifications

Length, fuzed: 286 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 190 g WP

Number of charges: P + 4

Fuze: [UT M68P1](#) impact SQ

Min range: 94 m

Ballistic performance:

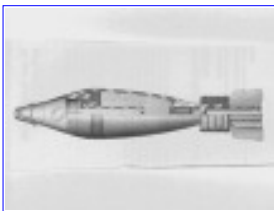
Charge	Muzzle velocity	Max range
P	74 m/s	523 m
1	111 m/s	1,072 m
2	143 m/s	1,632 m
3	170 m/s	2,136 m
4	193 m/s	2,537 m

Restrictions: When fired in Commando pattern mortars, restricted to Primary plus two secondary charges only, giving a maximum range of 1,632 m.

Manufacturer

Yugoimport SDPR.

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60 mm smoke bomb [M73](#)

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MORTARS - 60 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

60 mm HE bomb M73

Armament

60 mm mortars [M57](#), [M70](#), [TDA](#) Commando and similar.

Development

Appears to be based upon a Brandt/TDA 60 mm design.

Description

A teardrop-shaped bomb of conventional pattern, with four gas check grooves behind the bourrelet. The tail unit is an alloy cartridge container with six fins screwed into the rear of the bomb body. The primary cartridge is a shotgun type, inserted into the cartridge container and four celluloid secondaries of horseshoe pattern clip around the container ahead of the fins. Propellant is an NG Ballistite powder.

Specifications

Length, fuzed: 286 mm

Weight, fuzed: 1.35 kg

Weight and type of payload: 220 g TNT

Number of charges: P + 4

Fuze: [UT M68P1](#) impact SQ

Min range: 94 m

Ballistic performance:

Charge	Muzzle velocity	Max range
P	74 m/s	523 m
1	111 m/s	1,072 m
2	143 m/s	1,632 m
3	170 m/s	2,136 m
4	193 m/s	2,537 m

Restrictions: When fired in Commando pattern mortars, restricted to Primary plus two secondary charges only, giving a maximum range of 1,632 m.

Manufacturer

Yugoimport SDPR.

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MORTARS - 50 mm MORTARS, [YUGOSLAVIA](#), FEDERAL REPUBLIC

Date Posted: 05 September 2001

Jane's Ammunition Handbook 2001-2002

50 mm HE bomb M82

Armament

50 mm mortars of the former Soviet origin.

Development

This was developed in [Yugoslavia](#) in the early 1980s to provide a modern bomb with a better performance than the elderly designs that were all that then existed for this class of mortar.

Description

This is a modern design of streamlined shape with a gas check groove just behind the bourrelet. The tail unit is partly of steel, forming the rear, tapering section of the bomb, with an alloy cartridge container and fin unit screwed to it. The propelling charge is a shotgun-type cartridge inserted into the cartridge container; there are no secondary charges.

Specifications

Weight, fuzed: 950 g

Payload weight: 410 g TNT

Number of charges: 1

Fuze: TK-135 impact, SQ

Max range: 1,000 m

Muzzle velocity: 120 m/s

Manufacturer

Yugoimport SDPR.

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Yugoslavian 50 mm HE bomb

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**IDENTIFICATION OF SMALL ARMS AMMUNITION, [YUGOSLAVIA](#), FEDERAL
REPUBLIC**

Date Posted: 16 July 2001

Jane's Ammunition Handbook 2001-2002

All types:

Uses RFAS code

UPDATED

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