

PHILIPS

Data handbook



Electronic
components
and materials

Electron tubes

Part 6

July 1983

Geiger-Müller tubes

ELECTRON TUBES

PART 6 – JULY 1983

GEIGER-MÜLLER TUBES

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DATA HANDBOOK SYSTEM

Our Data Handbook System is a comprehensive source of information on electronic components, sub-assemblies and materials; it is made up of four series of handbooks each comprising several parts.

ELECTRON TUBES

BLUE

SEMICONDUCTORS

RED

INTEGRATED CIRCUITS

PURPLE

COMPONENTS AND MATERIALS

GREEN

The several parts contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

Where ratings or specifications differ from those published in the preceding edition they are pointed out by arrows. Where application information is given it is advisory and does not form part of the product specification.

If you need confirmation that the published data about any of our products are the latest available, please contact our representative. He is at your service and will be glad to answer your inquiries.

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ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks is comprised of the following parts:

- T1 Tubes for r.f. heating**
- T2 Transmitting tubes for communications**
- T3 Klystrons, travelling-wave tubes, microwave diodes**
- TET3 Special Quality tubes, miscellaneous devices (will not be reprinted)**
- T4 Magnetrons**
- T5 Cathode-ray tubes**
Instrument tubes, monitor and display tubes, C.R. tubes for special applications
- T6 Geiger-Müller tubes**
- T7 Gas-filled tubes**
Segment indicator tubes, indicator tubes, dry reed contact units, thyratrons, industrial rectifying tubes, ignitrons, high-voltage rectifying tubes, associated accessories
- T8 Picture tubes and components**
Colour TV picture tubes, black and white TV picture tubes, colour monitor tubes for data graphic display, monochrome monitor tubes for data graphic display, components for colour television, components for black and white television and monochrome data graphic display
- T9 Photo and electron multipliers**
Photomultiplier tubes, phototubes, single channel electron multipliers, channel electron multiplier plates
- T10 Camera tubes and accessories, image intensifiers**
- T11 Microwave semiconductors and components**

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks is comprised of the following parts:

- S1 Diodes**
Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes
- S2 Power diodes, thyristors, triacs**
Rectifier diodes, voltage regulator diodes (> 1,5 W), rectifier stacks, thyristors, triacs
- S3 Small-signal transistors**
- S4 Low-frequency power transistors and hybrid IC modules**
- S5 Field-effect transistors**
- S6 R.F. power transistors and modules**
- S7 Microminiature semiconductors for hybrid circuits**
- S8 Devices for optoelectronics**
Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices.
- S9 Taken into handbook T11 of the blue series**
- S10 Wideband transistors and wideband hybrid IC modules**

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks is comprised of the following parts:

- IC1** Bipolar ICs for radio and audio equipment
- IC2** Bipolar ICs for video equipment
- IC3** ICs for digital systems in radio, audio and video equipment
- IC4** Digital integrated circuits
CMOS HE4000B family
- IC5** Digital integrated circuits – ECL
ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs
- IC6** Professional analogue integrated circuits
- IC7** Signetics bipolar memories
- IC8** Signetics analogue circuits
- IC9** Signetics TTL logic
- IC10** Signetics Integrated Fuse Logic (IFL)
- IC11** Microprocessors, microcomputers and peripheral circuitry

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks is comprised of the following parts:

- C1 Assemblies for industrial use**
PLC modules, PC20 modules, HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices, hybrid ICs
- C2 Television tuners, video modulators, surface acoustic wave filters**
- C3 Loudspeakers**
- C4 Ferroxcube potcores, square cores and cross cores**
- C5 Ferroxcube for power, audio/video and accelerators**
- C6 Electric motors and accessories**
Permanent magnet synchronous motors, stepping motors, direct current motors
- C7 Variable capacitors**
- C8 Variable mains transformers**
- C9 Piezoelectric quartz devices**
Quartz crystal units, temperature compensated crystal oscillators, compact integrated oscillators, quartz crystal cuts for temperature measurements
- C10 Connectors**
- C11 Non-linear resistors**
Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)
- C12 Variable resistors and test switches**
- C13 Fixed resistors**
- C14 Electrolytic and solid capacitors**
- C15 Film capacitors, ceramic capacitors**
- C16 Piezoelectric ceramics, permanent magnet materials**

CONVERSION TABLES

actual type range	old type no.	old type no.	actual type no.
ZP1200	18503	18503	ZP1200
ZP1201	—	18504	ZP1400
ZP1210	18520	18505	ZP1410
ZP1220	18545	18506	ZP1431
ZP1300	18529 ¹	18507	ZP1600
ZP1301	—	18509	ZP1310
ZP1302	—	18511	ZP1610
ZP1310	18509	18515	ZP1441
ZP1313	—	18518	ZP1700
ZP1320	18550	18520	ZP1210
ZP1322	ZP1320 ¹	18526	ZP1430
ZP1330	18555	18529	ZP1300
ZP1400	18504	18536	ZP1451
ZP1401	—	18545	ZP1220
ZP1410	18505	18550	ZP1320
ZP1430	18526	18555	ZP1330
ZP1431	18506	MX123	ZP1470
ZP1441 ³	18515	MX168	ZP1481
ZP1442 ⁴	18515/01 ²	MX168/01	ZP1480
ZP1451 ³	18536		
ZP1452 ⁴	18536/01 ²		
ZP1461 ⁶	ZP1460 ⁵		
ZP1470	MX123		
ZP1480	MX168/02		
ZP1481	MX168		
ZP1600	18507		
ZP1610	18511		
ZP1700	18518		

obsolete and replacing types

obsolete	replaced by
ZP1311	ZP1313 ⁸
ZP1440 ²	ZP1441, ³ ZP1442 ⁴
ZP1450 ²	ZP1451, ³ ZP1452 ⁴
ZP1460	ZP1461 ⁶
ZP1500	—
ZP1501	—
ZP1520	—

obsolete and replacing types

obsolete	replaced by
18515/01 ²	ZP1441, ³ ZP1442 ⁴
18525	(ZP1520 ⁵)
18536/01 ²	ZP1451, ³ ZP1452 ⁴
18546/01	(ZP1460 ⁵), ZP1461 ⁶
18552	ZP1330 ⁷
ZP1080	(ZP1501 ⁵)
ZP1083	(ZP1500 ⁵)
ZP1100	ZP1311, ⁵ ZP1313 ⁸

Notes

1. different anode length
2. alpha sensitive
3. alpha sensitive, low background
4. not alpha sensitive
5. obsolete, () = not replaced
6. different plateau length, obsolescent
7. protective coating
8. improved compensating filter

SELECTION GUIDE

cylinder tubes

type number	sensitive for			counting rate at 10^{-1} mGy/h ¹ count/s	sensitive length mm	plateau threshold V	plateau length V	plateau slope %/V	dead time ² μ s	background shielded count/min	dose rate range mGy/h
	α	β	γ								
ZP1200	•			230	40	400	200	0.04	90	10	$10^{-3} - 10$
ZP1201 ³	•			210	40	400	200	0.04	110	10	$10^{-3} - 10$
ZP1210	•			1200	140	400	100	0.15	200	70	$10^{-3} - 2$
ZP1220	•			1600	240	400	100	0.15	210	90	$10^{-3} - 1$
ZP1300	•			2500 ²	8	500	100	0.30	11	1	$10^{-1} - 2 \times 10^4$
ZP1301 ³	•			3400 ²	8	500	100	0.30	13	1	$10^{-1} - 2 \times 10^4$
ZP1302 ³	•			3400 ²	8	500	100	0.30	13	(-)	$10^{-1} - 2 \times 10^4$
ZP1310	•			11000 ²	16	500	150	0.15	15	2	$4 \times 10^{-3} - 3 \times 10^3$
ZP1313 ³	•			13000 ²	16	500	150	0.15	15	2	$4 \times 10^{-3} - 3 \times 10^3$
ZP1320	○	•		230	28	500	150	0.08	45	12	$10^{-3} - 10^2$
ZP1322	○	•		230	28	500	150	0.08	45	12	$10^{-3} - 10^2$
ZP1330	○	•		1200	75	450	350	0.02	70	30	$3 \times 10^{-4} - 10$

cosmic ray guard tube

ZP1700	•			-	800	400	903	1000	70		$3 \times 10^{-4} - 3 \times 10^{-1}$
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window tubes

type number	sensitive for			counting rate at 10^{-1} mGy/h ¹ count/s	window ϕ /type mm	plateau threshold V	plateau length V	plateau slope %/V	dead time ² μ s	background shielded count/min	dose rate range mGy/h
	α	β	γ								
ZP1400	•	•		210	9 c	400	200	0.04	90	10	$10^{-3} - 10$
ZP1401	•	•	○	210	9 a	400	200	0.04	90	10	$10^{-3} - 10$
ZP1410	•	•	○	320	19.8 a	450	250	0.02	175	15	$10^{-3} - 3 \times 10$
ZP1430	•	•	○	540	27.8 a	450	250	0.04	190	25	$10^{-3} - 2 \times 10$
ZP1431	•	•	○	540	27.8 c	450	250	0.04	190	25	$10^{-3} - 2 \times 10$
ZP1441	•	•	○	200	19.8 a	500	200	0.09	65	5	$10^{-3} - 10^2$
ZP1442	•	•	○	200	19.8 c	500	200	0.09	65	8	$10^{-3} - 10^2$
ZP1451	•	•	○	400	27.8 a	500	250	0.07	60	9	$10^{-3} - 3 \times 10$
ZP1452	•	•	○	400	27.8 c	500	250	0.07	60	18	$10^{-3} - 3 \times 10$
ZP1461	•	•	○	1100	51 f	700	200	0.04	45	45	$3 \times 10^{-4} - 1$
ZP1470	•	•	○	340	24.1 b	550	150	0.15	70	25	$10^{-3} - 2 \times 10$
ZP1480	•	•	○	270	17 d	400	100	0.20	120	30	$10^{-3} - 2 \times 10$
ZP1481	•	•	○	270	17 d	400	100	0.20	120	30	$10^{-3} - 2 \times 10$

X-ray sensitive tubes

ZP1600	6 - 20 keV	660	19.8 e	1600	400	0.07	110	25	-
ZP1610	2.5 - 40 keV	-	7 x 18 b	1900	working voltage 1460 to 1850 V				-

- Notes
- 1R = 8.69 mGy
 - Counting rate at 10^2 mGy
 - With compensating filter

Window thickness mg/cm²

- | | |
|---------------|---------------|
| a: 1.5 to 2.0 | d: 2.5 to 3.0 |
| b: 1.5 to 2.5 | e: 2.5 to 3.5 |
| c: 2.0 to 3.0 | f: 3.5 to 4.0 |

RADIATION QUANTITIES AND UNITS

In previous issues of this handbook, the (exposure) dose rate has been given as röntgen/hr (R/hr), but this unit is being phased out internationally.

Absorbed dose will be used in future, expressed in the new unit gray (Gy).

Absorbed dose is a measure of energy deposition in any medium by all types of ionizing radiation and

$$1 \text{ Gy} = 1 \text{ J/kg in SI units}$$

Since an exposure of 1 R results in an energy deposition of 869×10^{-5} J/kg in air it follows that 1 R is equivalent to 869×10^{-5} Gy or 8.69 mGy.

Consequently this handbook gives data for the counting rate as a function of the absorbed dose rate in air as:

count/s and mGy/h

quantity	old unit	new unit	relationship
exposure dose	röntgen	no special unit	1 R = produces in air ions carrying a charge of: 2.58×10^{-4} C/kg
absorbed dose	rad	gray	1 rad = 10^{-2} J/kg 1 Gy = 1 J/kg = 100 rad 1 mGy = 100 mrad

GENERAL INFORMATION
GEIGER-MÜLLER TUBES

Where appropriate, the terminology used conforms to the following publications:— IEC50-531, IEC100, IEC151-25.

1. GENERAL

- 1.1 **Geiger-Müller radiation counter tubes (G.M. tubes)** are intended to detect alpha particles, beta particles, gamma or X-radiation.
 - 1.2 A G.M. tube is a gas-filled device which reacts to individual ionizing events, thus enabling them to be counted.
 - 1.3 A G.M. tube consists basically of an electrode at a positive potential (anode) surrounded by a metal cylinder at a negative potential (cathode). The cathode forms part of the envelope or is enclosed in a glass envelope. Ionizing events are initiated by quanta or particles entering the tube either through the window or through the cathode and colliding with the gas molecules.
 - 1.4 The **gas filling** consists of a mixture of one or more rare gases and a quenching agent.
 - 1.5 **Quenching** is the termination of the ionization current pulse in a G.M. tube. Effective quenching in our tubes is determined by the combination of the quenching gas properties and the value of the anode resistor.
2. The **capacitance** of a G.M. tube is that between anode and cathode, ignoring the capacitive effects of external connections.

3. OPERATING CHARACTERISTICS**3.1. Starting voltage**

This is the lowest voltage applied to a G.M. tube at which pulses of 1 V amplitude appear across the tube. See fig.1.

3.2 Plateau

This is the section of the counting rate versus voltage characteristic (with constant irradiation), over which the counting rate is substantially independent of the applied voltage. Unless otherwise stated, the plateau is measured at a counting rate of approximately 100 count/s.

3.3 Plateau threshold voltage

This is the lowest voltage applied which corresponds to the start of the plateau for the stated sensitivity of the measuring circuit. See fig.1.

3.4 Plateau length

This is the range of applied voltage over which the plateau extends. See fig.1.

3.5 Plateau slope

This is the change in counting rate over the plateau length, expressed in % per volt. See fig.1.

3.6 Recommended supply voltage

This is the supply voltage at which the G.M. tube should preferably be used. This voltage is normally chosen to be in the middle of the plateau. See fig.1.

OPERATING CHARACTERISTICS (continued)

3.7 Background

This is the counting rate in the absence of the radiation which the G.M. tube is intended to measure.

3.8 Dead time

This is the time interval, after the initiation of a discharge resulting in a normal pulse, during which the G.M. tube is insensitive to further ionizing events. See fig.4.

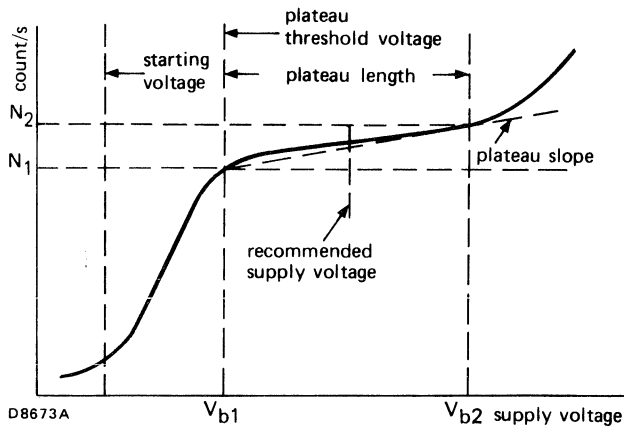


Fig.1

Plateau length: $V_{\text{plateau}} = V_{b2} - V_{b1}$ V

Plateau slope (over the plateau length):

$$\frac{N_2 - N_1}{0.5 (N_1 + N_2)} \times \frac{1}{V_{\text{plateau}}} \times 100 \quad \% / V$$

where N_1 is the counting rate at V_{b1} , and
 N_2 is the counting rate at V_{b2}

4. MEASURING CIRCUITS

4.1 The measuring equipment used to establish the G.M. tube data consists of the circuit given in the data, an emitter follower with a pulse shaper, a limiting amplifier and a scaler.

4.2 Measuring circuit A

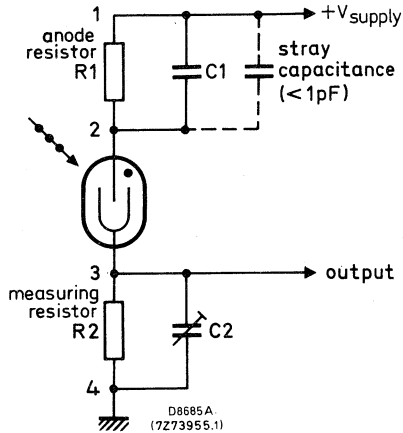


Fig.2

Notes:

1. The input resistance and capacitance of the measuring equipment are represented by R2 and C2 respectively.
2. When applying a rectangular pulse at 1 with the tube inserted but short-circuited, C2 should be adjusted to give an undistorted pulse at 3. Under these conditions $R1 \times (C1 + \text{stray capacitance}) = R2 \times C2$.

4.3 Measuring circuit B

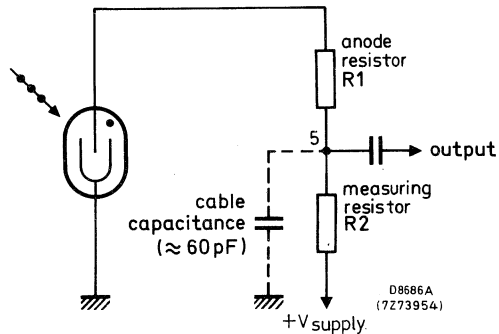


Fig.3

Tapping the load resistor at 5 in fig.3 reduces the influence of a capacitive load.

5. NOTES

5.1 Resolution (resolving) time (of a counting system or a counter).

This is the minimum time interval between two distinct ionizing events which enables both to be counted.

5.2 Recovery time

This is the minimum time interval between the initiation of a normal size pulse and the initiation of the next pulse of normal size. See fig.4.

5.3 Pulse amplitude

The pulse amplitude of a G.M. tube may be approximated by the equation:

$$P = b \times (V_{\text{supply}} - V_{\text{starting}})$$

where P = pulse amplitude

$$b = \frac{R_2}{R_1 + R_2} \quad (\text{See measuring circuits on page 3})$$

V_{supply} = anode supply voltage

V_{starting} = starting voltage

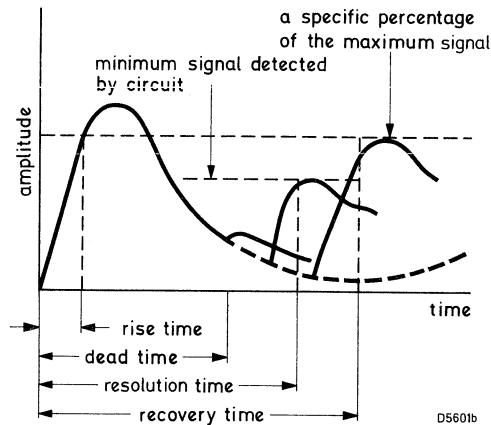


Fig.4

5.4 Anode resistor

Normally the tube should be operated with an anode resistor of the value indicated in the measuring circuit, or higher. Decreasing the value of the anode resistor not only decreases the dead time but also the plateau length. A decrease in resistance below the limiting value may affect tube life and lead to its early **destruction**.

The anode resistor should be connected direct to the anode connector of the tube to ensure that parasitic capacitances of leads will not excessively increase the capacitive load on the tube. An increase in capacitive load may increase the pulse amplitude, the pulse duration, the dead time and the plateau slope. In addition the plateau will be shortened appreciably. Shunt capacitances of more than 20 pF may **destroy** the tube.

5.5 Maximum counting rate

The maximum counting rate is approximately $1/\tau$ (τ = dead time). For continuous stable operation it is recommended that the counting rate is adjusted to a value in the linear part of the counting rate/dose rate curve. In extreme cases the time constant RC (see fig.2) may exceed the dead time of the tube. If this is so, CI may be omitted, thus reducing the RC product. However, this could cause calibration problems in series equipment production if the stray capacitances in individual instruments show wide variations.

5.6 Tube sensitivity at extremely high dose rates.

At dose rates exceeding the recommended maximum, a G.M. tube will produce the maximum number of counting pulses per second, limited by its dead time and the circuit in which it is incorporated.

However, due to the characteristics of a specific circuit, the indicated counting rate may fall appreciably, even to zero.

If dose rates exceeding 10 times the recommended maximum for window tubes, or 100 times for cylinder tubes, are likely to be encountered, it is advisable to use a circuit that continuously indicates saturation.

5.7 Dead time losses

After every pulse, the tube is temporarily insensitive during a period known as the dead time (τ). Consequently, the pulses that occur during this period are not counted. At a counting rate of N count/s the tube will be dead during $100 \times N \times \tau$ % of the time, so that approximately $100 \times N \times \tau$ % of the counts will be lost.

If, in an experiment, the inaccuracy must be $< 1\%$, N should be less than $1/100 \tau$ count/s. Example: If $\tau = 20 \mu\text{s}$, an inaccuracy of 1% is reached at a counting rate of approximately 500 count/s.

5.8 Background

See definition under 3.7. The most important sources of background are:

1. Gamma radiation from the environment and from cosmic radiation.
2. Mesons from cosmic radiation.
3. Beta particles from contamination and impurities of the materials from which the detector itself is made.
4. Spontaneous discharge or pulses in the detector and the counting circuit that do not originate from radiation.

From published experimental data the gamma contribution accounts for approximately 70% of the background and a further 25% (approximately) is due to cosmic mesons. For the majority of G.M. tube applications, the background may be reduced to an acceptable level by shielding the tube with lead or steel. Thus most of the gamma contribution is eliminated. The values given in the data in count per minute are derived from averages over a longer duration.

5.9 Counting rate/dose rate curves

These are measured with the source perpendicular to the tube axis, at the recommended supply voltage. The curves shown are typical. Deviation of up to approximately $\pm 10\%$ may occur.

5.10 Current/dose rate curves

These are measured with the source perpendicular to the tube axis. The curves shown are typical. Deviation of up to approximately $\pm 20\%$ may occur.

NOTES (continued)

5.11 **Dead time curves**

These represent the dead time (see 3.8 and fig.4) as a function of the supply voltage, measured with pulsed X-radiation in the recommended circuit, unless otherwise stated. The curves shown are typical. The maximum value is stated under OPERATING CHARACTERISTICS. Note that a higher anode resistor results in a longer dead time.

5.12 **Energy response curves**

These represent the energy sensitivity as a function of the radiation energy, measured in the recommended circuit and in the linear part of the counting rate/dose rate curve. The curves shown are typical. Deviation depends on energy and construction.

5.13 **Polar response curves**

These represent the relative sensitivity as a function of the angle of irradiation (as defined in the drawing), measured in the recommended circuit. The curves shown are typical. Deviation depends on energy and construction.

6. **LIMITING VALUES**

The limiting values of G.M. tubes are given in the Absolute Maximum Rating System in accordance with IEC Publication 134.

Absolute maximum ratings are limiting values of operating and environmental conditions, applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment control adjustment load variation, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

Note: When operated at a limiting value the tubes may not be expected to function in accordance with the published operating characteristics. Under operating conditions where limiting values coincide or are combined with extreme counting rates, the tubes may not function properly.

7. **MOUNTING**

G.M. tubes must not be clamped tightly in the vicinity of glass-metal seals. Great care must be taken in handling and fixing thin walled tubes. Mica windows are extremely fragile and must never be touched.

Low capacitance between anode and cathode is essential, i.e. the **shortest possible** connections between anode terminal and load resistor must be made.

Soldering to the anode pin or to the cathode wall may **destroy** the tube. Most types are provided with a cathode lead or strap. This lead should be used for connection to the cathode. Tubes with an anode pin are supplied with the appropriate connector (see fig.5). This must be used.

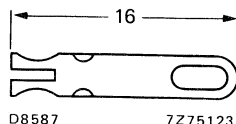


Fig.5

8. STORAGE AND HANDLING

The tube should not be stored at ambient temperatures outside the limits given under the heading LIMITING VALUES on the data sheets.

To prevent leakage between the anode and the cathode, the tube should be dry and clean. Condensation of water vapour may cause a short-circuit between anode and cathode.

9. OUTSIDE PRESSURE

In tubes provided with a mica window, the gas pressure outside the tube should neither be lower than 35 kPa (\approx 25 cm Hg) nor higher than the atmospheric pressure (unless otherwise stated) and changes in pressure should be gradual.

Care should be taken not to expose tubes with very thin envelopes to pressures substantially higher than atmospheric.

10. ENERGY DEPENDENCE

The sensitivity of G.M. tubes to gamma radiation is influenced considerably by the energy of the radiation.

At energies above about 300 to 400 keV, the action of the tube is due to emission of electrons from the cathode and the higher the atomic number of the cathode material the greater will be the electron emission. Radiation with an energy of less than 300 to 400 keV is absorbed by the gas filling, the absorption increasing as the energy decreases. This gives rise to the characteristic peak in sensitivity which occurs at about 60 keV, below which the sensitivity decreases rapidly due to cut-off by the thickness or density of the cathode wall. By using an external filter a near linear sensitivity can be obtained.

11. LIFE

11.1 Storage life

If stored in a cool dry place, free from continuous or severe vibration, there is hardly any deterioration in the tube's characteristics. A storage life of years is not unusual.

11.2 Operational life

The operational life of a G.M. tube is expressed in counts (discharges). Theoretically the quenching gas, ionized during a discharge, should be re-combined between discharges. However, minute quantities will be chemically bound, no longer taking part in the quenching process. This will lead to a gradual reduction of the plateau length, and, for a given working voltage, to an increased counting rate. This will culminate in a continuous state of discharge of the tube, rendering it useless.

Apart from the accumulated number of counts registered, the ambient temperature during operation is of prime importance to the life of the tube. At temperatures above 50 °C, changes in the gas mixture may occur, possibly reducing the total number of counts attainable. Short periods of operation (not exceeding 1 h) up to approximately 70 °C should not prove harmful, but life will progressively decrease with increasing temperature.

Thus, depending on application and circumstances, the quenching gas could be exhausted in as little as a few hours or theoretically last for many years.

For these reasons G.M. tubes cannot be guaranteed unconditionally for a specified period of time.

Exceeding the LIMITING VALUES
Soldering to the tube body or pin
Bending the anode pin
Touching the mica window

may destroy the tube

12. MAXIMUM BETA ABSORPTION (percentages)

source	max. β energy MeV	in mica window (mg/cm ²)			in metal envelope (mg/cm ²)		
		2	3	4	40	60	100
⁴² K	3.55	1	1	2	13	20	30
⁹⁰ Y + ⁹⁰ Sr	2.27	1	3	3	23	32	48
³² P	1.71	3	4	5	33	44	63
⁸⁹ Sr	1.46	3	4	5	40	51	70
²⁴ Na	1.39	3	5	6	41	53	73
¹⁰⁹ Pd	1.00	4	6	8	54	68	85
³⁶ Cl	0.71	7	10	13	72	84	95
¹³¹ I	0.61	8	11	15	77	90	97
²² Na	0.54	8	13	17	81	92	98
⁴⁶ Sc	0.36	15	22	27	94	99	100
⁶⁰ Co	0.31	20	26	34	97	100	100
⁹⁹ Tc	0.29	21	30	37	99	100	100
⁴⁵ Ca	0.25	24	33	42	100	100	100
³⁵ S	0.17	36	49	59	100	100	100
¹⁴ C	0.16	39	51	62	100	100	100
³ H	0.02	100	100	100	100	100	100
Geiger-Müller tube type numbers		ZP1401 ZP1410 ZP1430 ZP1441 ZP1451	ZP1400 ZP1431 ZP1442 ZP1452 ZP1470 ZP1480 ZP1481	ZP1461	ZP1320 ZP1322	ZP1330	ZP1300 ZP1310

GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube.

QUICK REFERENCE DATA

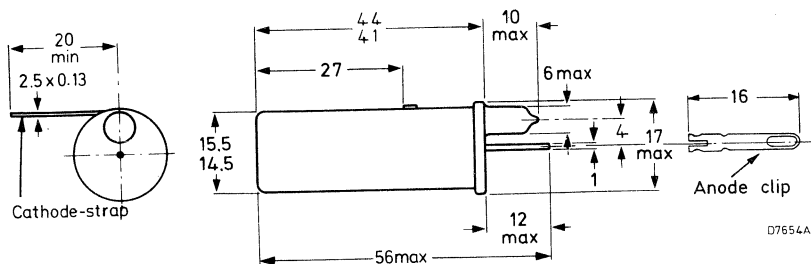
Dose rate range	10^{-3} to 10	mGy/h
Plateau threshold voltage	400	V
Plateau length	200	V
Recommended supply voltage	500	V
Chrome-iron cathode	250	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig. 1



CATHODE

Thickness	250	mg/cm ²
Sensitive length	40	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.1	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	325	V
Plateau threshold voltage	max.	400	V
Plateau length		200	V
Recommended supply voltage		500	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	10	count/min
Dead time, at recommended supply voltage	max.	90	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	600	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 10\text{ M}\Omega$

$R_2 = 220\text{ k}\Omega$

$C_1 = 1\text{ pF}$

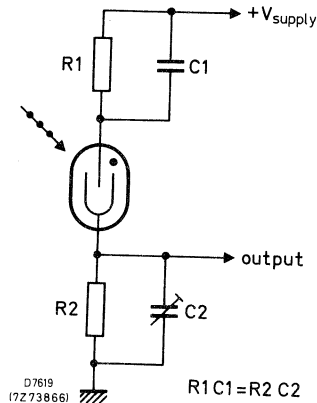
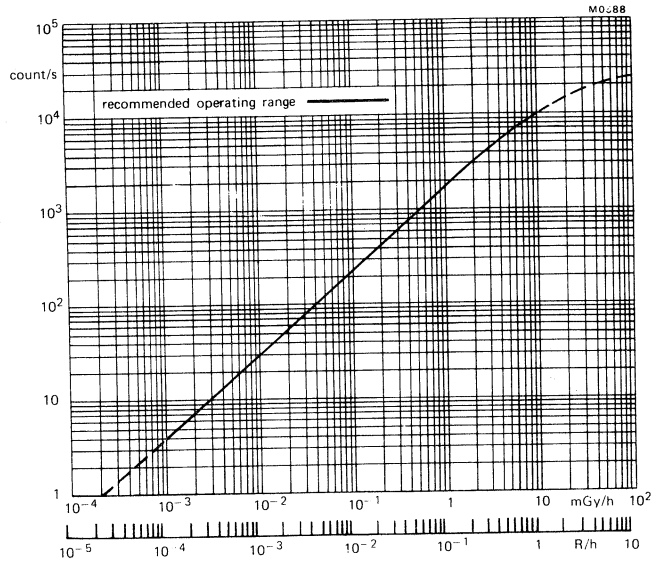
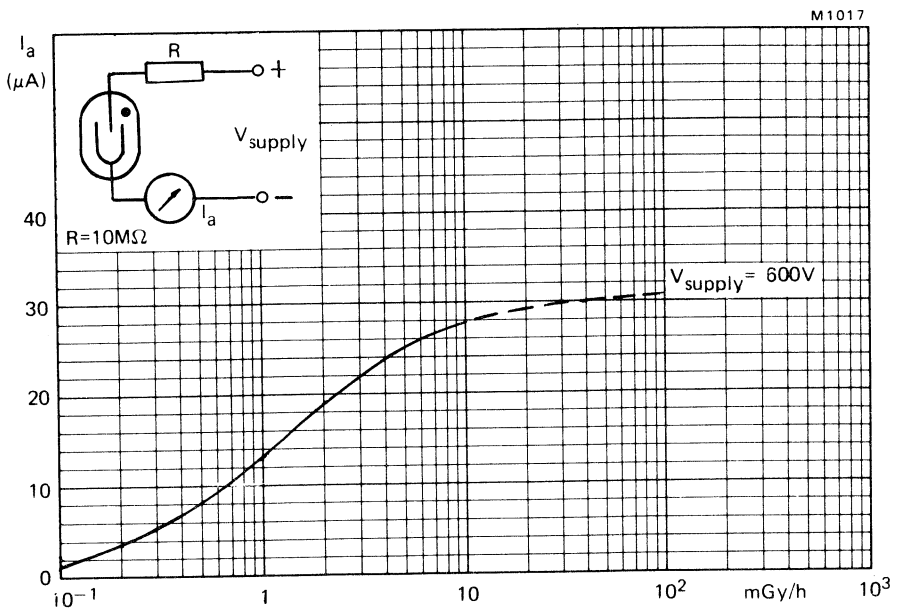


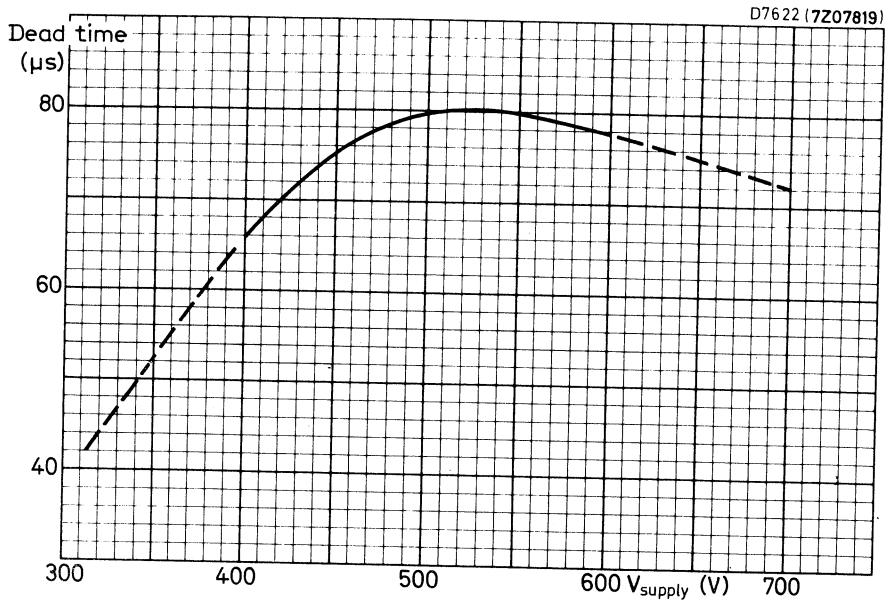
Fig.2



Typical counting rate as a function of dose rate (^{137}Cs)



Typical current as a function of dose rate (^{60}Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube fitted in a filter. The energy response is flat to within +25 % over the range 50 keV to 1.25 MeV referred to ^{137}Cs (661 keV). The ZP1201 is an energy -15 compensated version of the ZP1200.

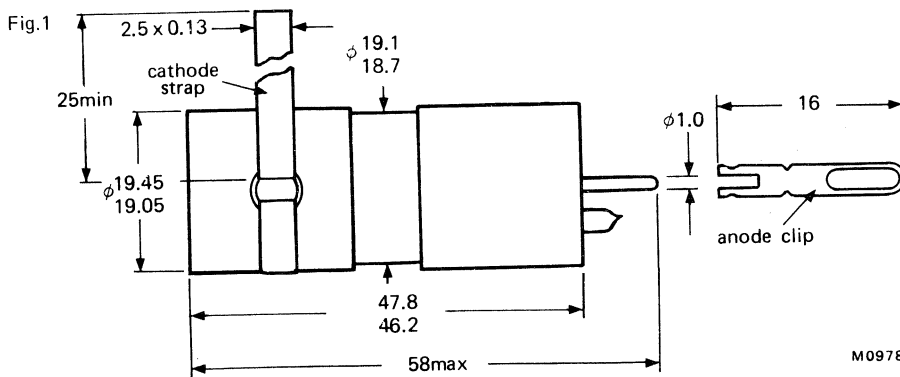
QUICK REFERENCE DATA

Dose rate range	10^{-3} to 10	mGy/h
Plateau threshold voltage	400	V
Plateau length	200	V
Recommended supply voltage	500	V
Chrome-iron cathode	250	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm



CATHODE (ZP1200)

Thickness	250	mg/cm ²
Sensitive length	40	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.2	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	325	V
Plateau threshold voltage	max.	400	V
Plateau length		200	V
Recommended supply voltage		500	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	10	count/min
Dead time, at recommended supply voltage	max.	110	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	600	V
Ambient temperature			
continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 10\text{ M}\Omega$

$R_2 = 220\text{ k}\Omega$

$C_1 = 1\text{ pF}$

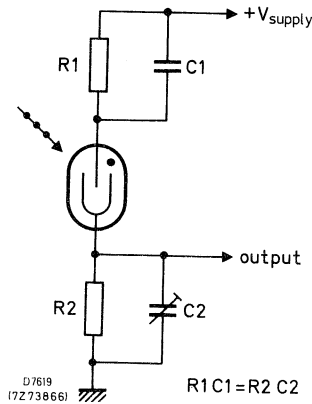
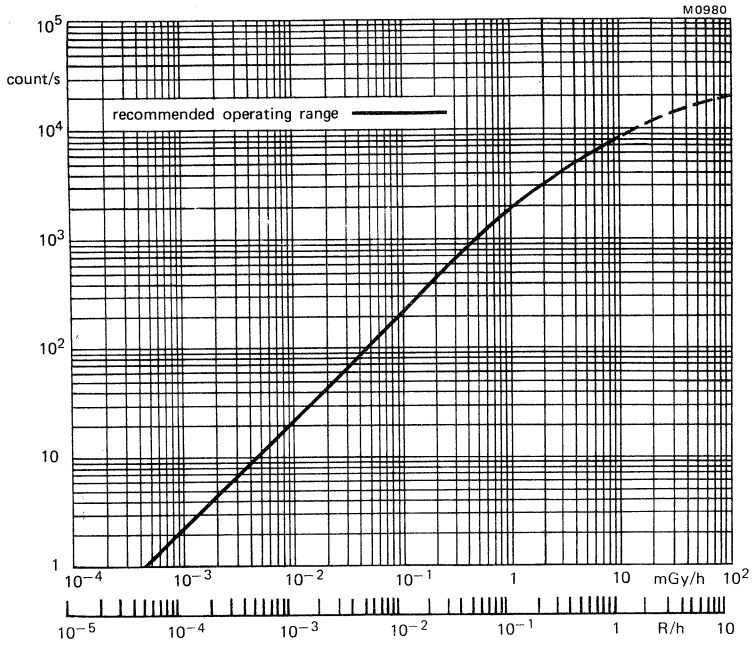
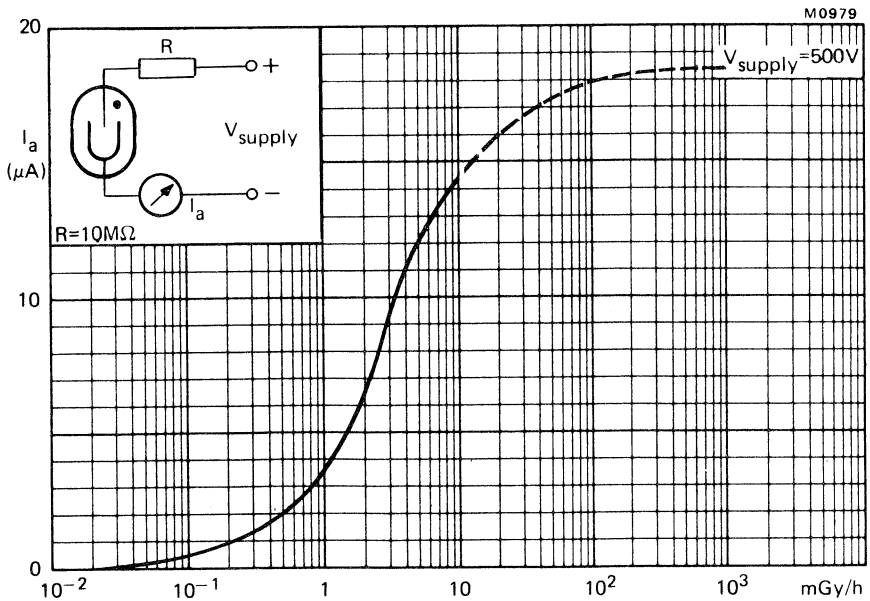


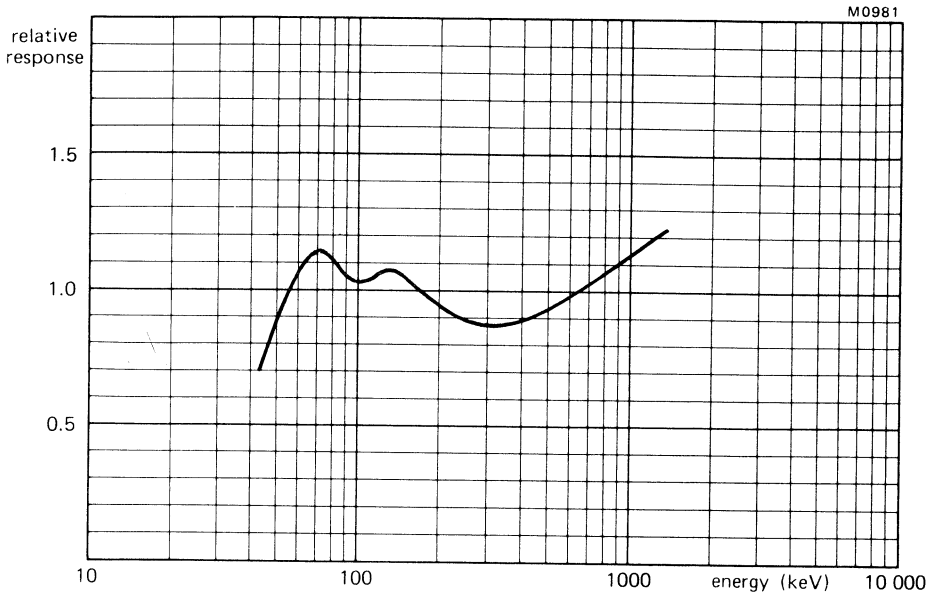
Fig.2



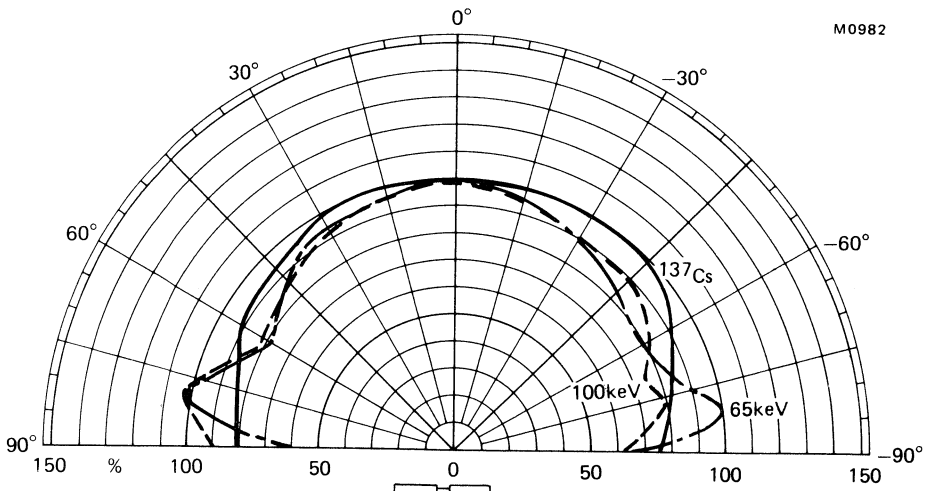
Typical counting rate as a function of dose rate (^{137}Cs)



Typical current as a function of dose rate (^{137}Cs)



Typical energy response relative to ^{137}Cs



Typical polar responses

GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube.

QUICK REFERENCE DATA

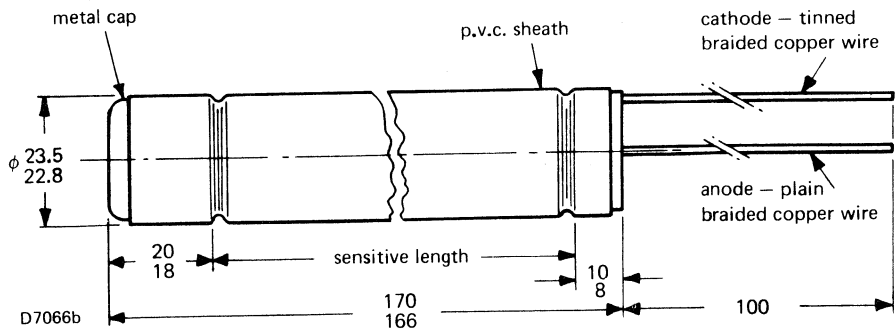
Dose rate range	10^{-3} to 2 mGy/h	←
Plateau threshold voltage	400 V	
Plateau length	100 V	
Recommended supply voltage	450 V	
Chrome-iron cathode	525 mg/cm ²	

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm ←

Fig.1



Tube must not be clamped within 30 mm of either end.

CATHODE

Thickness	525 mg/cm ²
Sensitive length	140 mm
Material	chrome-iron

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	4.5 pF
------------------	--------

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	350	V
Plateau threshold voltage	max.	400	V
Plateau length		100	V
Recommended supply voltage		450	V
Plateau slope	max.	0.15	%/V
→ Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	70	count/min.
Dead time, at recommended supply voltage	max.	200	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.7	M Ω
Anode voltage	max.	500	V
Ambient temperature			
continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$	5×10^{10}	count
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MEASURING CIRCUIT

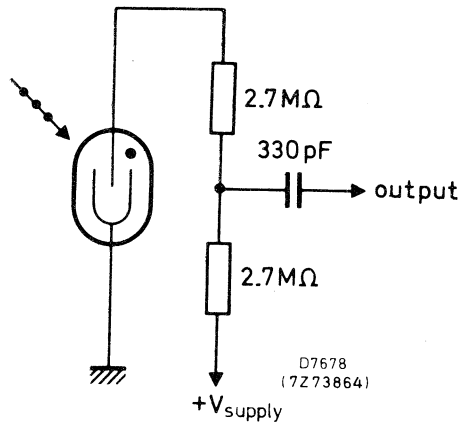
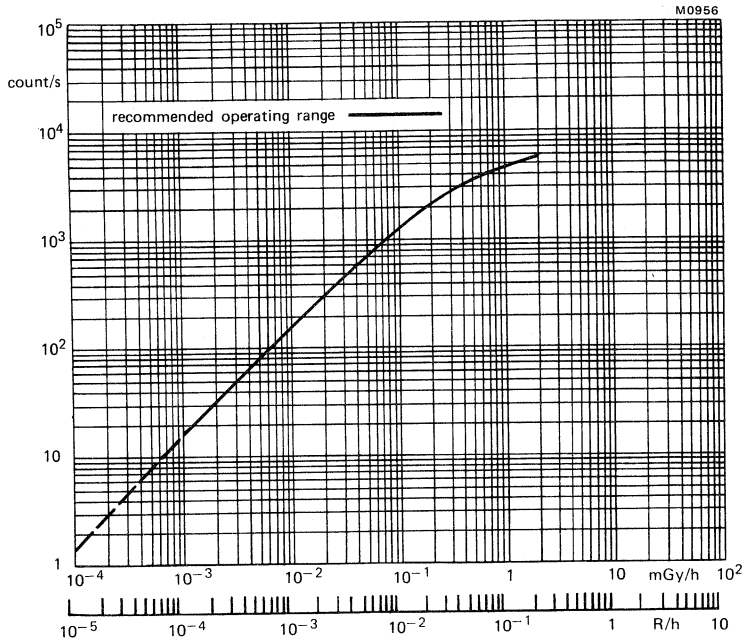
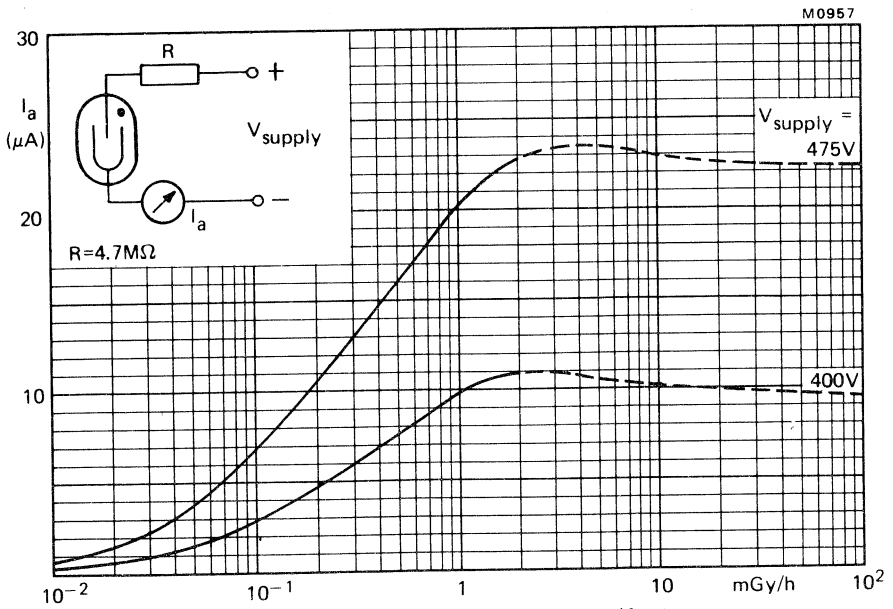


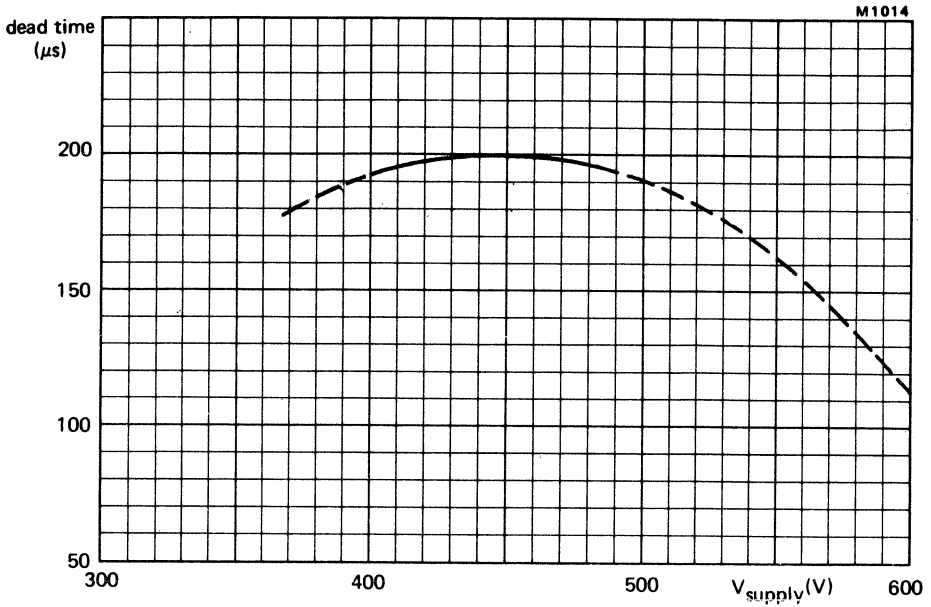
Fig.2



Typical counting rate as a function of dose rate (⁶⁰Co)



Typical current as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube.

QUICK REFERENCE DATA

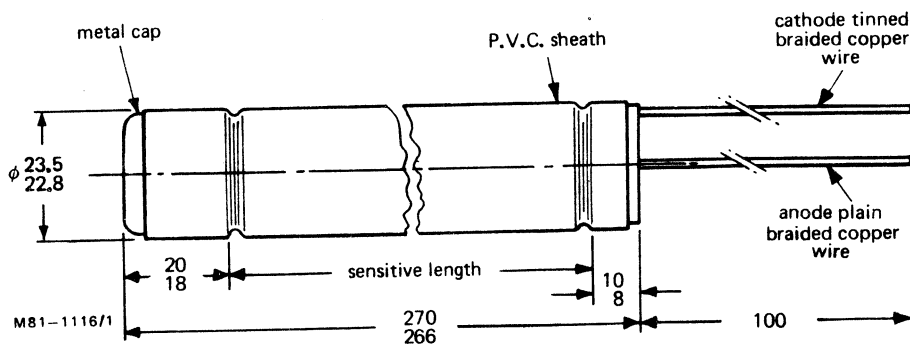
Dose rate range	10^{-3} to 1	mGy/h
Plateau threshold voltage	400	V
Plateau length	100	V
Recommended supply voltage	450	V
Chrome-iron cathode	525	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



Tube must not be clamped within 30 mm of either end.

CATHODE

Thickness	525	mg/cm ²
Sensitive length	240	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	10	pF
------------------	----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	350 V
Plateau threshold voltage	max.	400 V
Plateau length		100 V
Recommended supply voltage		450 V
Plateau slope	max.	0.15 %/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	90 count/min.
Dead time, at recommended supply voltage	max.	210 μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.7 $\text{M}\Omega$
Anode voltage	max.	500 V
Ambient temperature continuous operating	max.	+70 $^{\circ}\text{C}$
	min.	-40 $^{\circ}\text{C}$
storage	max.	+75 $^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

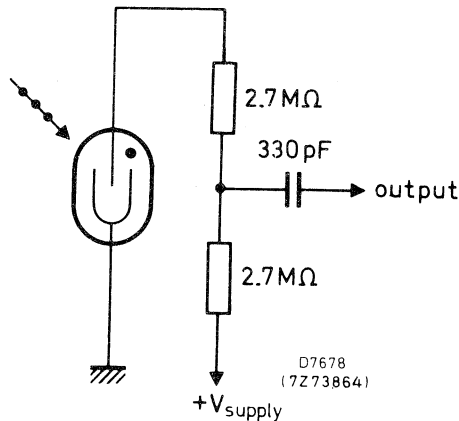
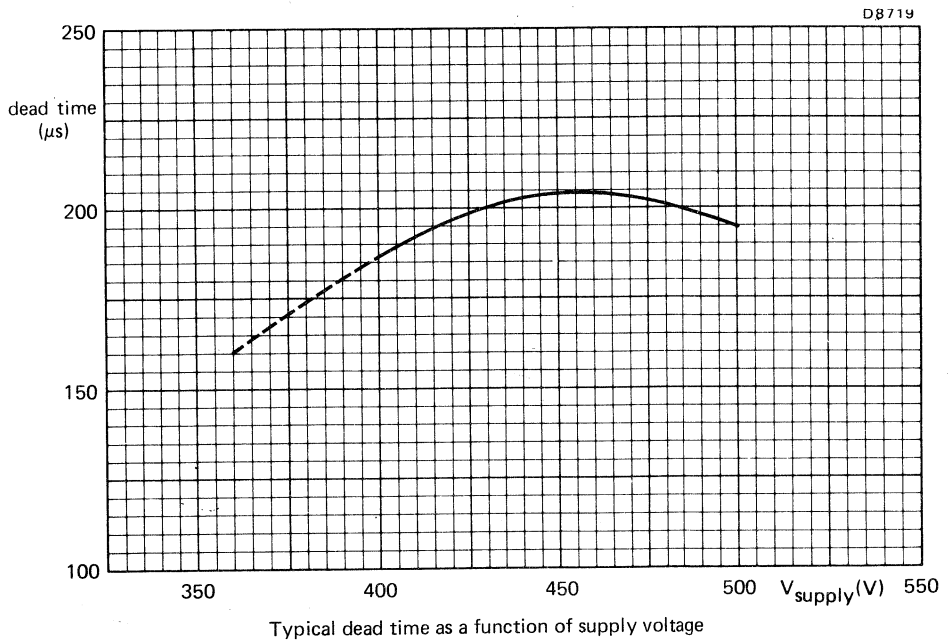
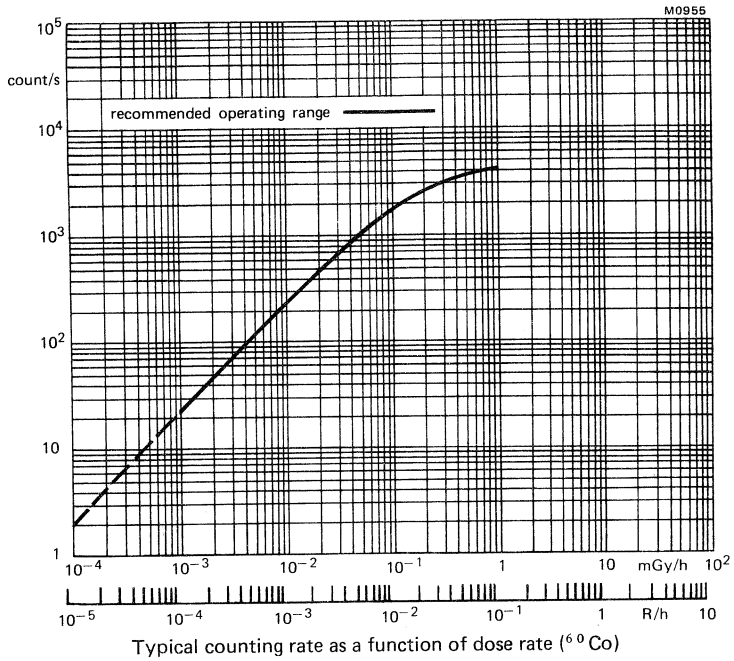


Fig.2



GEIGER-MÜLLER TUBE

Halogen quenched γ and high energy β (> 0.5 MeV) radiation counter tube.

QUICK REFERENCE DATA

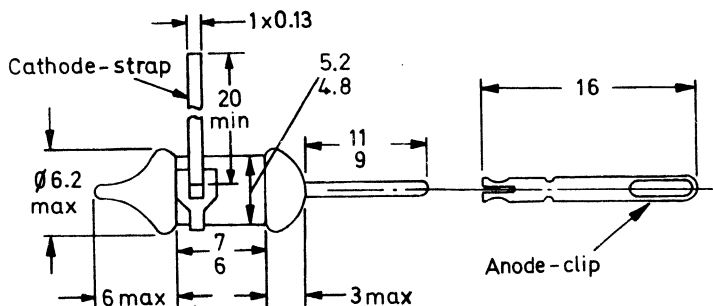
Dose rate range	10^{-1} to 2×10^4	mGy/h
Plateau threshold voltage	500	V
Plateau length	100	V
Recommended supply voltage	550	V
Chrome-iron cathode	80 to 100	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm ←

Fig.1



D7076A

CATHODE

Thickness	80 to 100	mg/cm ²
Sensitive length	8	mm
Material	chrome-iron	

FILLING

helium, neon, halogen

CAPACITANCE

Anode to cathode	0.7	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	400 V
Plateau threshold voltage	max.	500 V
Plateau length		100 V
Recommended supply voltage		550 V
Plateau slope	max.	0.3 %/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	1 count/min
Dead time, at recommended supply voltage	max.	11 μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2 $\text{M}\Omega$
Anode voltage	max.	600 V
Ambient temperature continuous operating	max.	+70 $^{\circ}\text{C}$
	min.	-40 $^{\circ}\text{C}$
storage	max.	+75 $^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 10^{10} count

MEASURING CIRCUIT

- $R_1 = 2.2\text{ M}\Omega$
- $R_2 = 47\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

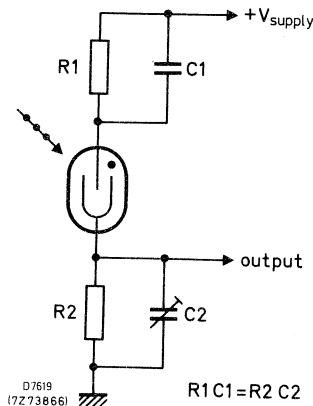
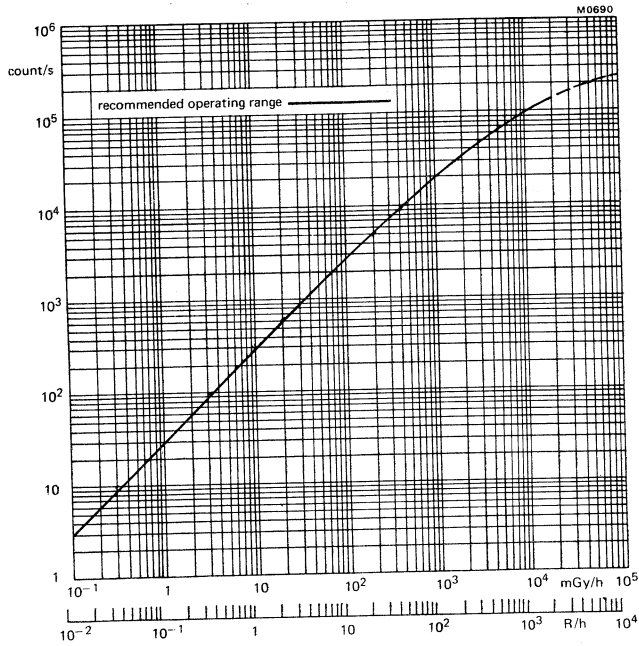
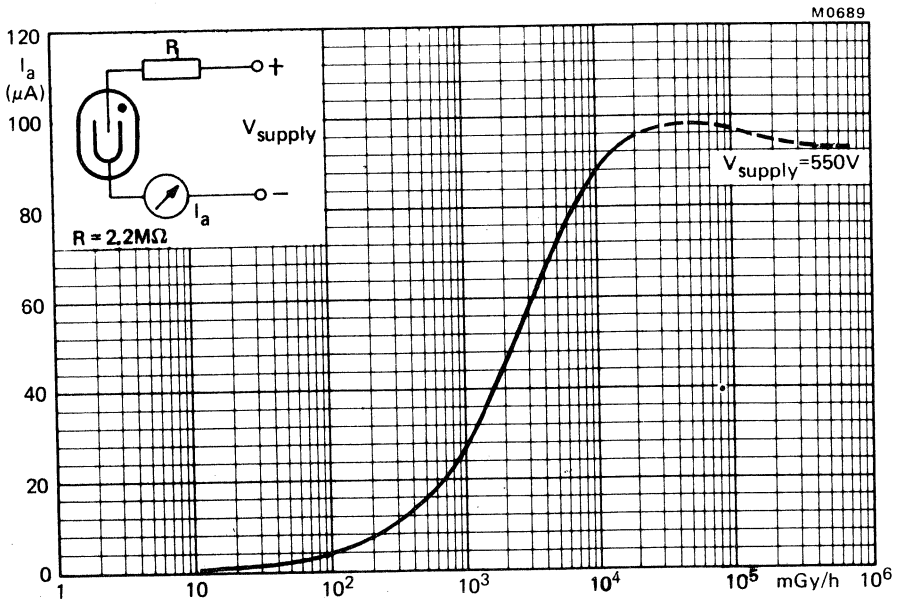


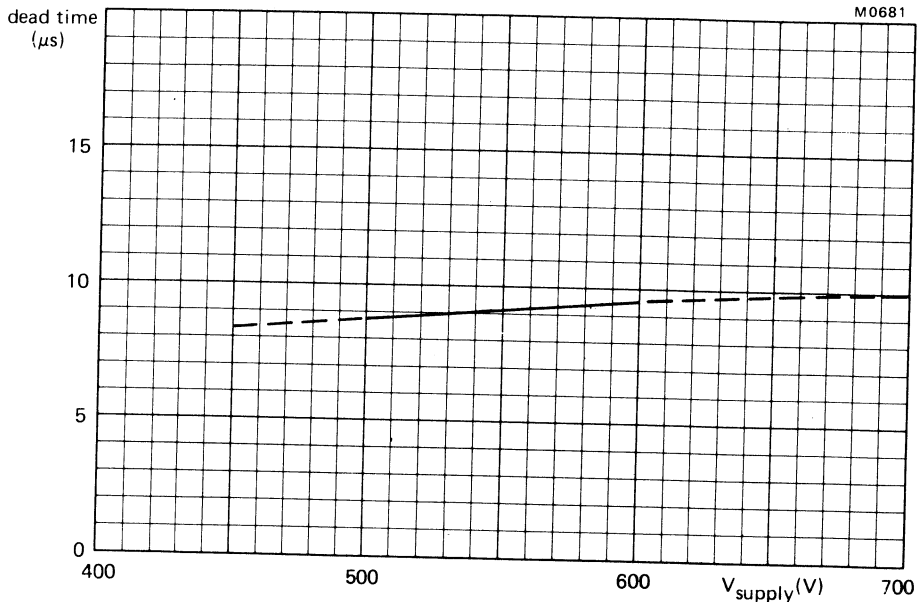
Fig.2



Typical counting rate as a function of dose rate (^{137}Cs)



Typical counting rate as a function of dose rate (^{137}Cs)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube fitted in a filter. The energy response is flat to within $\pm 15\%$ over the range 80 keV to 3.0 MeV referred to ^{137}Cs (661 keV). The ZP1301 is an energy compensated version of the ZP1300. Also available with long life artificial background as ZP1302.

QUICK REFERENCE DATA

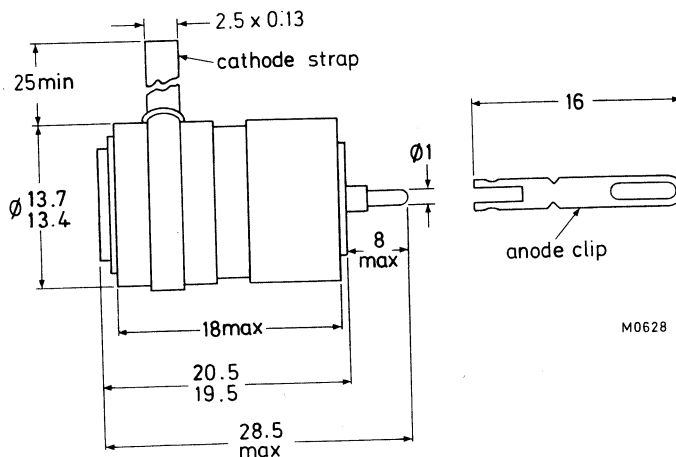
Dose rate range	10^{-1} to 2×10^4	mGy/h
Plateau threshold voltage	500	V
Plateau length	100	V
Recommended supply voltage	500	V
Chrome-iron cathode	80 to 100	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



CATHODE (ZP1300)

Thickness	80 to 100	mg/cm ²
Sensitive length	8	mm
Material	chrome iron	

FILLING

helium, neon, halogen

CAPACITANCE

Anode to cathode	1.25	pF
------------------	------	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	400	V
Plateau threshold voltage	max.	500	V
Plateau length		100	V
Recommended supply voltage		550	V
Plateau slope	max.	0.3	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al) at 550 V	max.	1	count/min
Dead time at 550 V	max.	13	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	600	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
storage	min.	-40	$^{\circ}\text{C}$
	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 10^{10} count

MEASURING CIRCUIT

$R_1 = 2.2\text{ M}\Omega$

$R_2 = 47\text{ k}\Omega$

$C_1 = 1\text{ pF}$

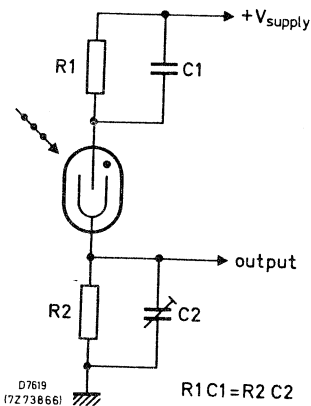
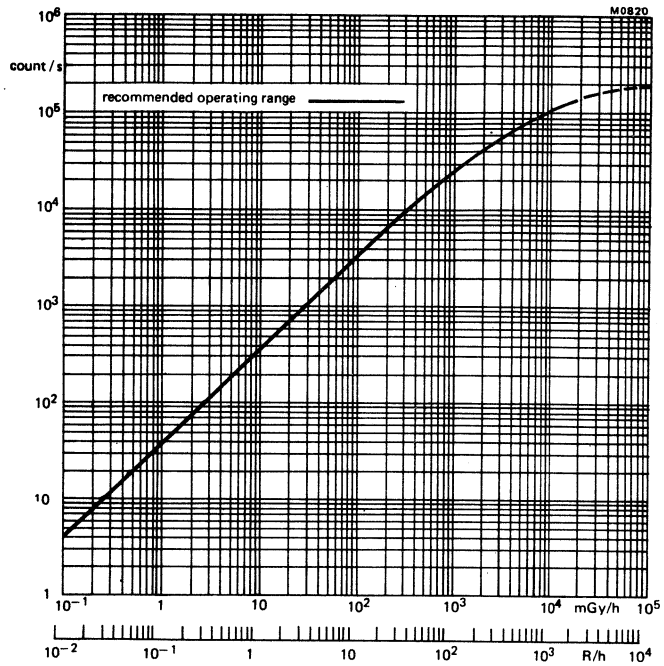
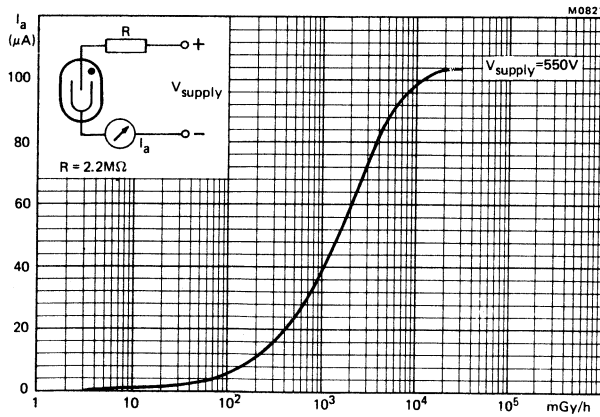


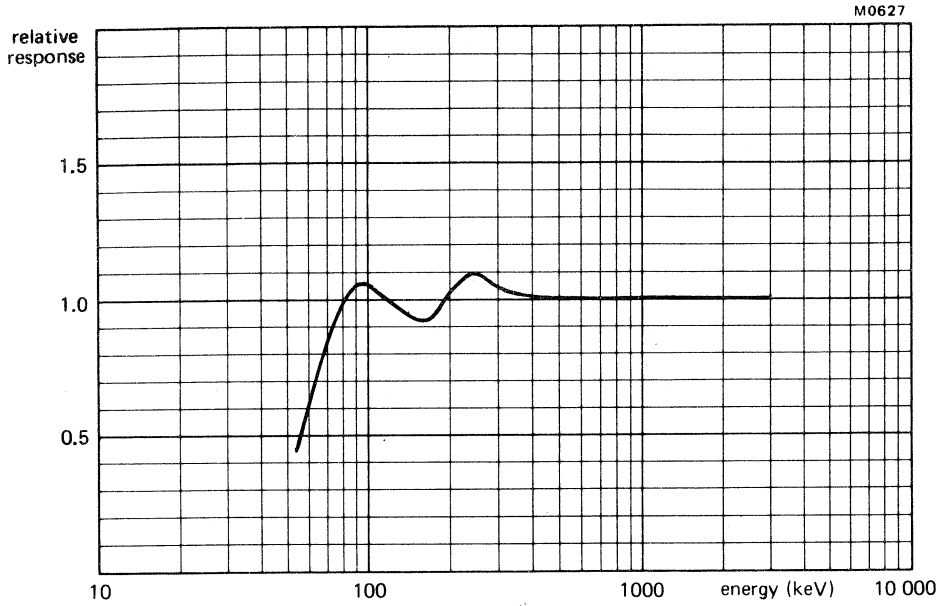
Fig.2



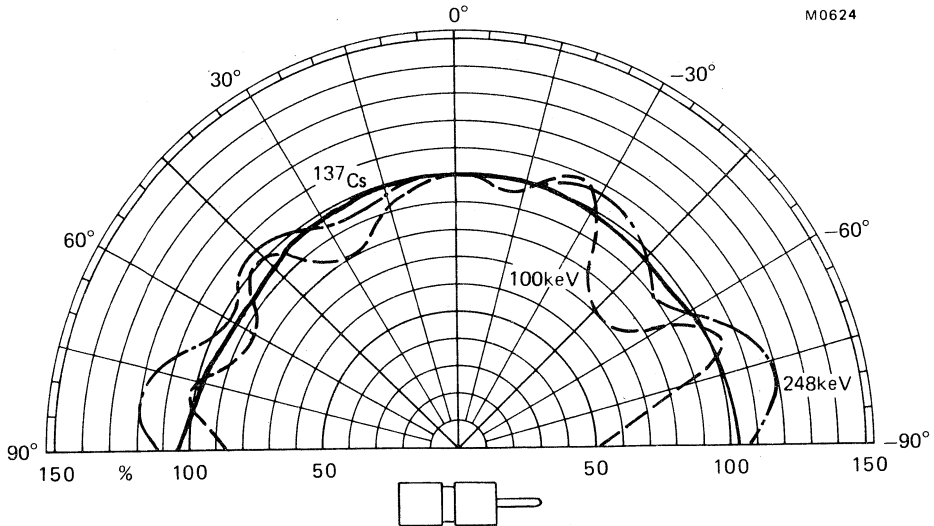
Typical counting rate as a function of dose rate (¹³⁷Cs)



Typical current as a function of dose rate (¹³⁷Cs)



Typical energy response relative to ^{137}Cs



Typical polar responses

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	380 V
Plateau threshold voltage	max.	500 V
Plateau length		150 V
Recommended supply voltage		575 V
Plateau slope	max.	0.15 %/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	2 count/min
Dead time, at recommended supply voltage	max.	15 μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2 $\text{M}\Omega$
Anode voltage	max.	650 V
Ambient temperature continuous operating	max.	+70 $^{\circ}\text{C}$
	min.	-40 $^{\circ}\text{C}$
storage	max.	+75 $^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 2.2\text{ M}\Omega$

$R_2 = 47\text{ k}\Omega$

$C_1 = 1\text{ pF}$

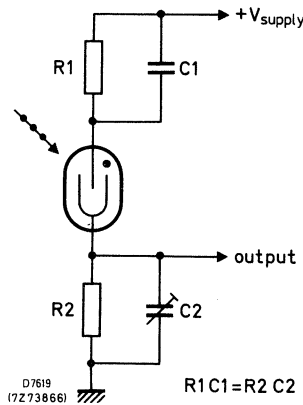
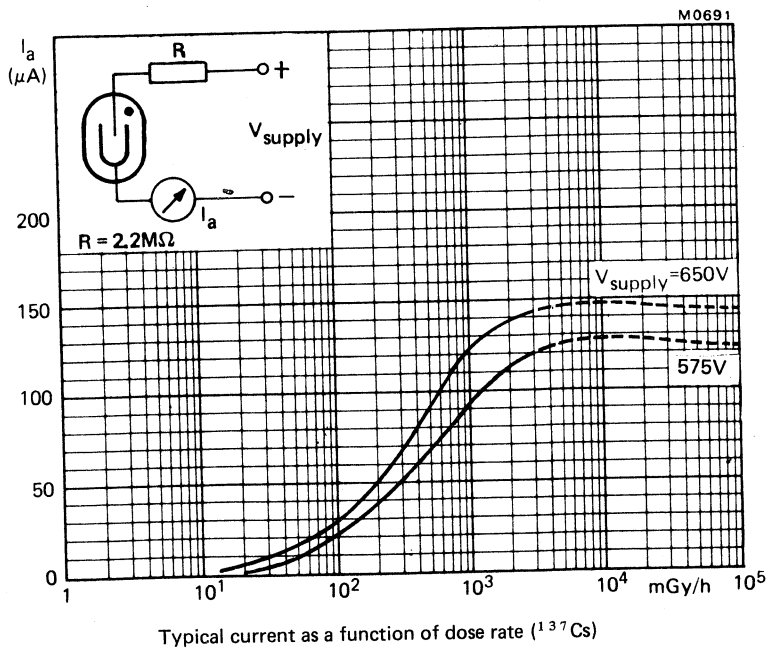
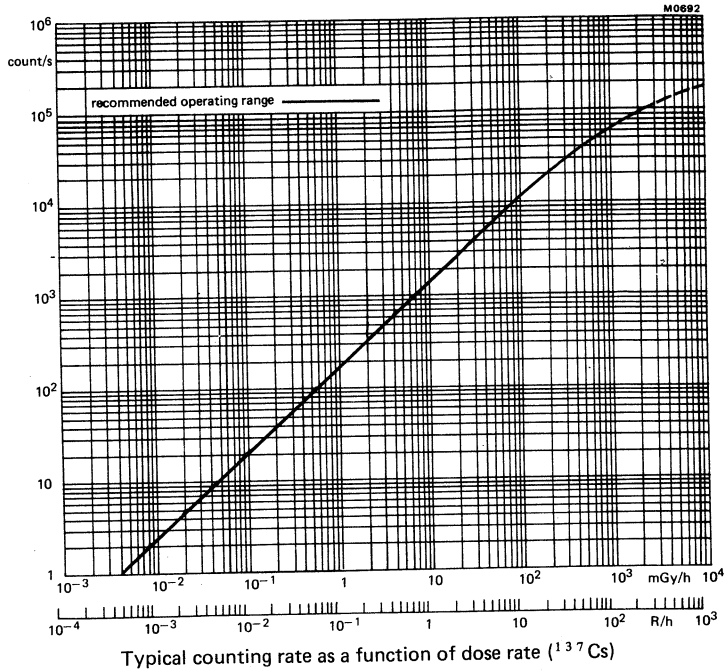
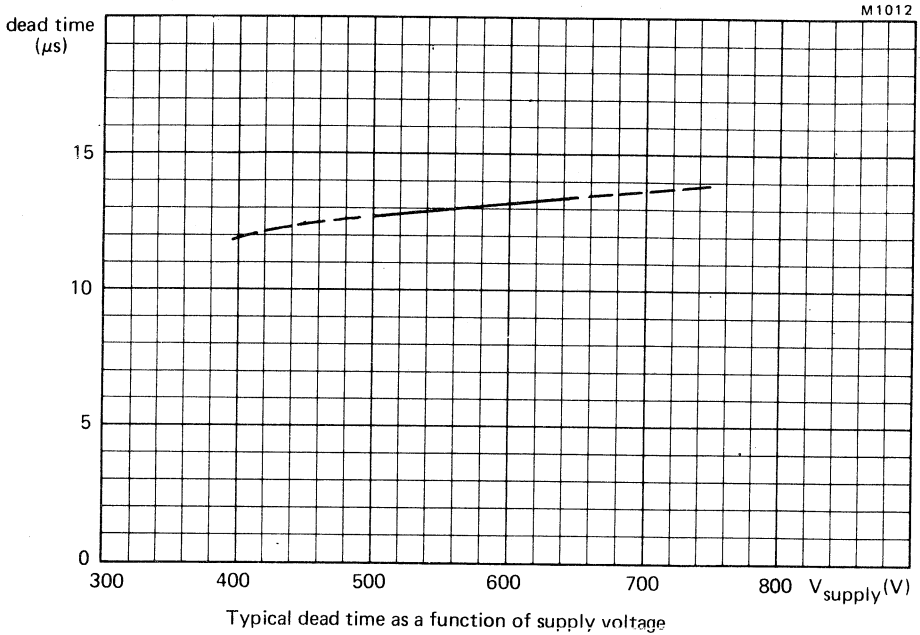


Fig.2





GEIGER-MÜLLER TUBE

Halogen quenched γ radiation counter tube fitted in a filter. The energy response is flat to within $\pm 15\%$ over the range 50 keV to 1.25 MeV referred to ^{137}Cs (661 keV). The ZP1313 is an energy compensated version of the ZP1310.

QUICK REFERENCE DATA

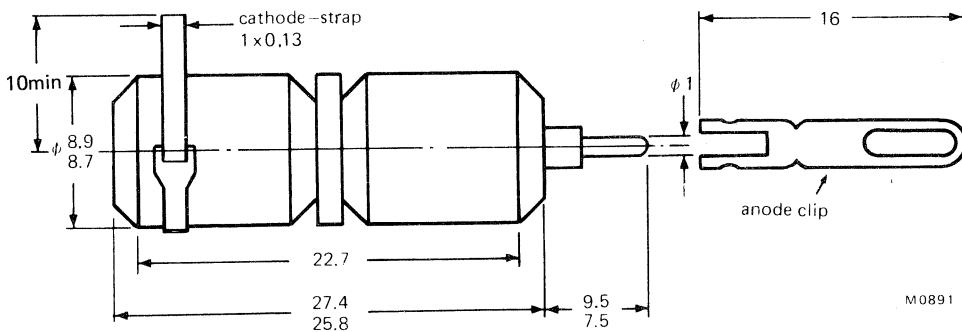
Dose rate range	4×10^{-3} to 3×10^3	mGy/h
Energy range	40 to 3000	keV
Plateau threshold voltage	500	V
Plateau length	150	V
Recommended supply voltage	575	V
Chrome-iron cathode	80 to 100	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



CATHODE (ZP1310)

Thickness	80 to 100	mg/cm ²
Sensitive length	16	mm
Material	chrome-iron	

FILLING

helium, neon, halogen

CAPACITANCE

Anode to cathode	2.0	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	380	V
Plateau threshold voltage	max.	500	V
Plateau length		150	V
Recommended supply voltage		575	V
Plateau slope	max.	0.15	%/V
Background shielded with 50 mm Pb with an inner liner of 3 mm Al, at recommended supply voltage	max.	2	count/min
Dead time, at recommended supply voltage	max.	15	μs

LIMITING VALUES (Absolute max, rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	650	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 2.2\text{ M}\Omega$

$R_2 = 47\text{ k}\Omega$

$C_1 = 1\text{ pF}$

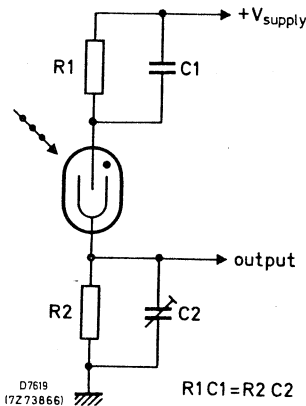
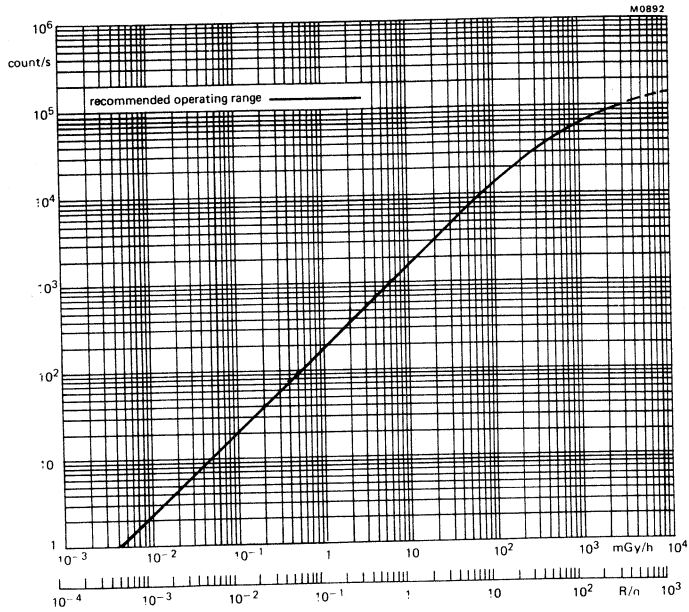
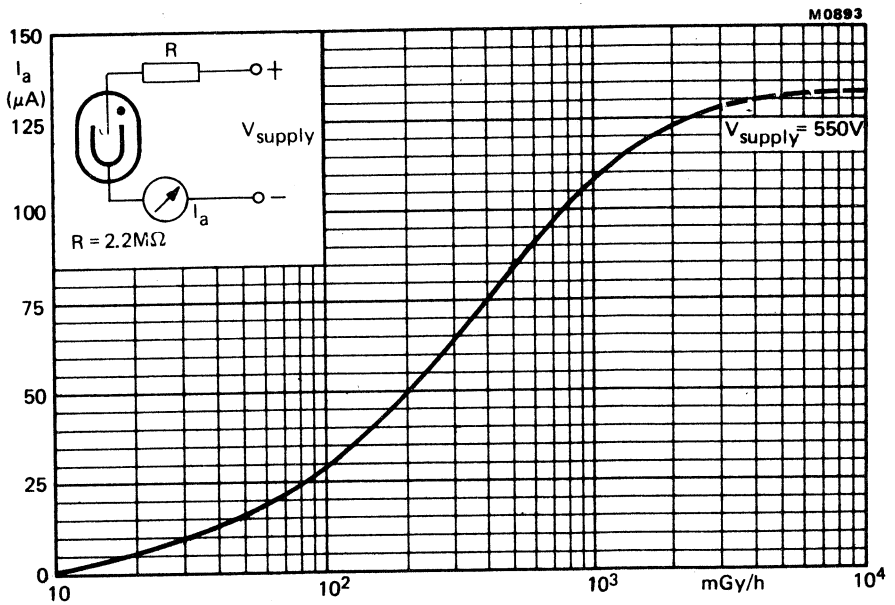


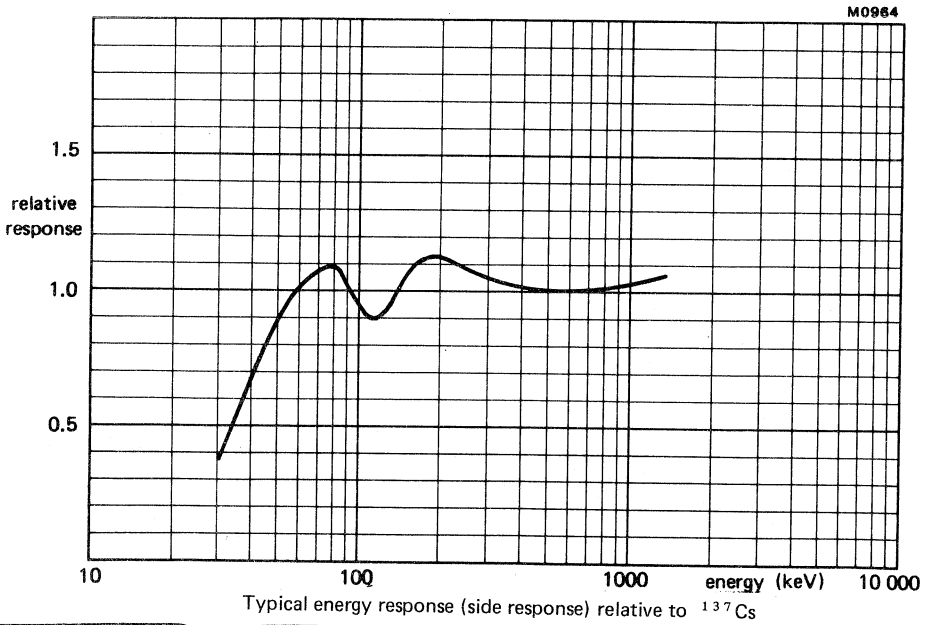
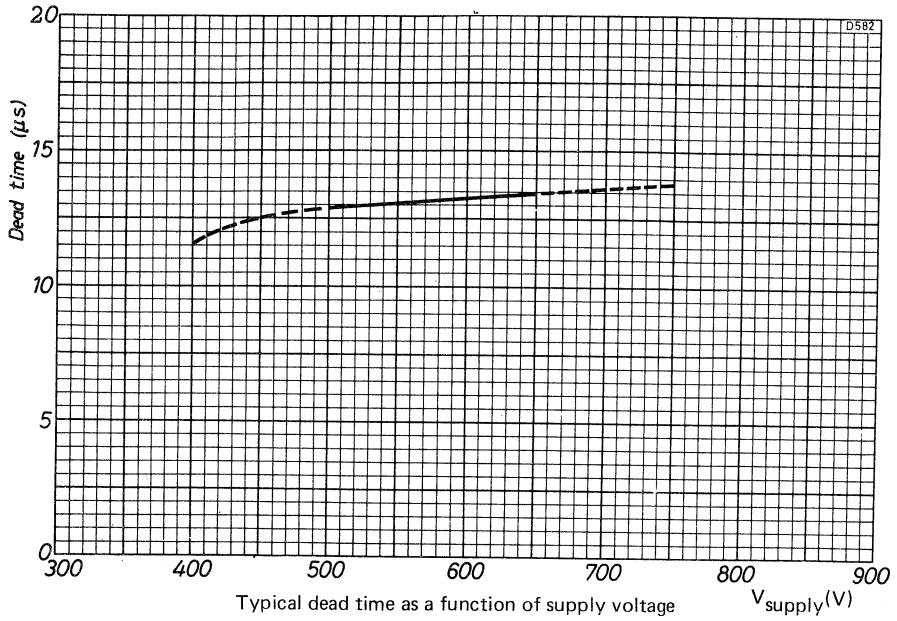
Fig.2

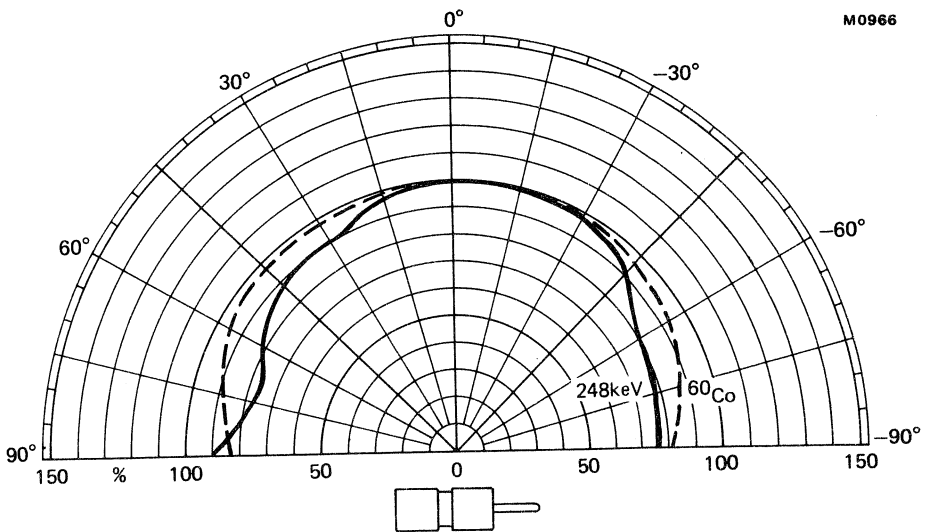
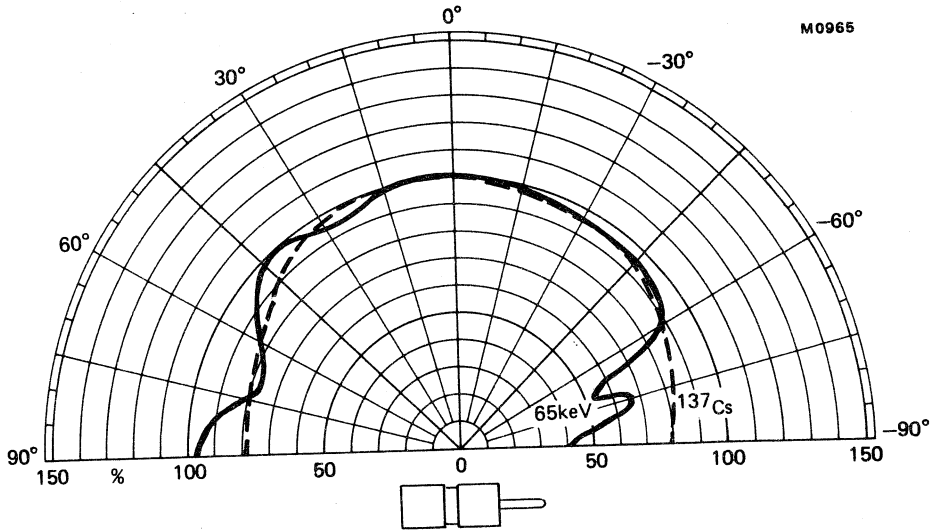


Typical counting rate as a function of dose rate (¹³⁷Cs)



Typical current as a function of dose rate (¹³⁷Cs)





Typical polar responses

GEIGER-MÜLLER TUBE

Halogen quenched γ and β (> 0.25 MeV) radiation counter tube.

QUICK REFERENCE DATA

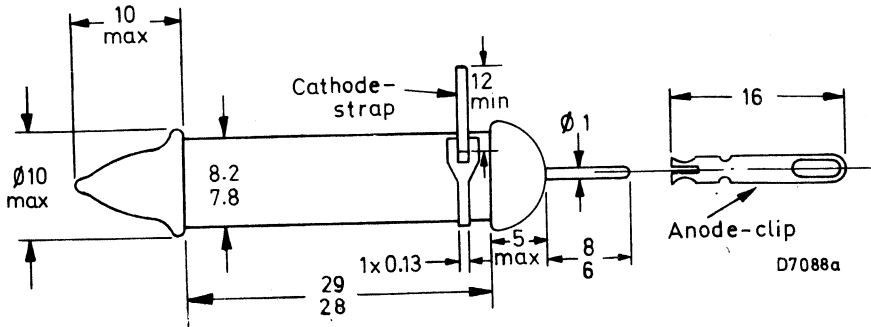
Dose rate range	10^{-3} to 10^2	mGy/h
Plateau threshold voltage	500	V
Plateau length	150	V
Recommended supply voltage	575	V
Chrome-iron cathode	32 to 40	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm ←

Fig.1



CATHODE

Thickness	32 to 40	mg/cm ²
Sensitive length	28	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.1	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	380	V
Plateau threshold voltage	max.	500	V
Plateau length		150	V
Recommended supply voltage		575	V
Plateau slope	max.	0.08	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	12	count/min
Dead time, at recommended supply voltage	max.	45	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	650	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 4.7\text{ M}\Omega$

$R_2 = 100\text{ k}\Omega$

$C_1 = 1\text{ pF}$

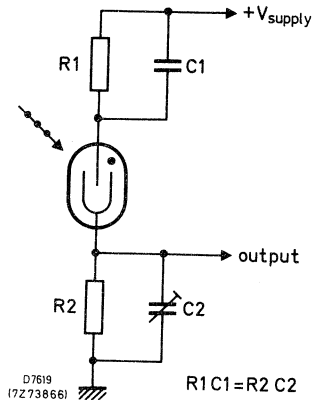
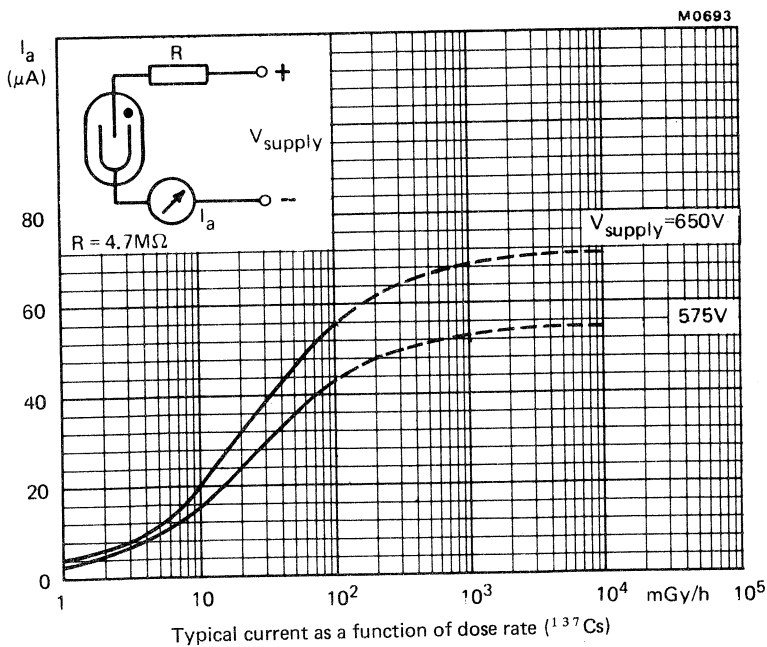
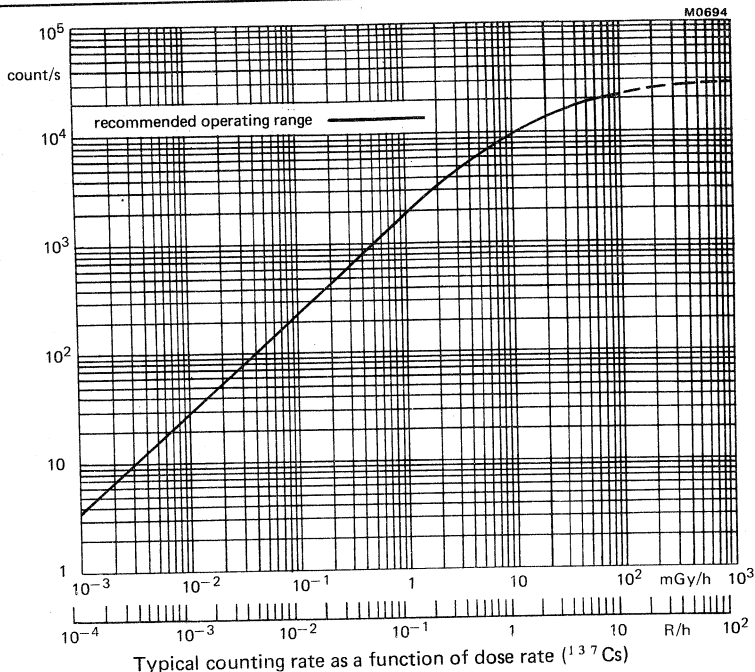
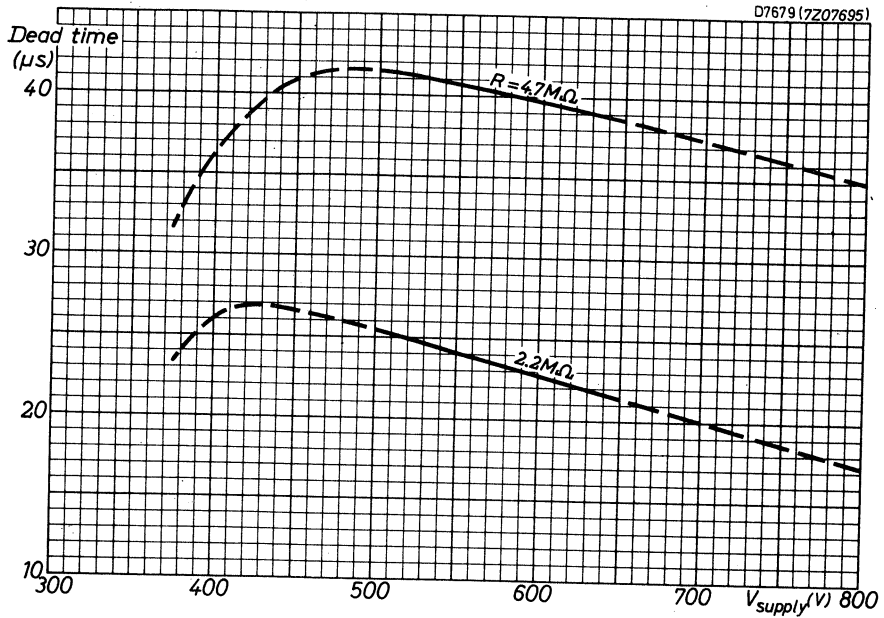


Fig.2





Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Halogen quenched γ and β (> 0.25 MeV) radiation counter tube.

QUICK REFERENCE DATA

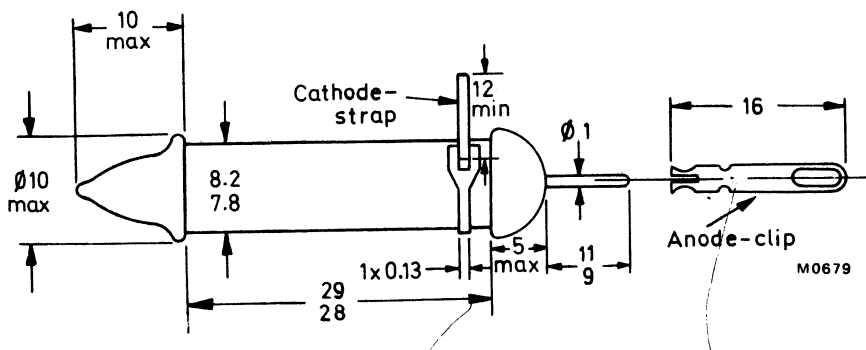
Dose rate range	10^{-3} to 10^2	mGy/h
Plateau threshold voltage	500	V
Plateau length	150	V
Recommended supply voltage	575	V
Chrome-iron cathode	32 to 40	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



CATHODE

Thickness	32 to 40	mg/cm ²
Sensitive length	28	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.1	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	380	V
Plateau threshold voltage	max.	500	V
Plateau length		150	V
Recommended supply voltage		575	V
Plateau slope	max.	0.08	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	12	count/min
Dead time, at recommended supply voltage	max.	45	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	650	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 4.7\text{ M}\Omega$

$R_2 = 100\text{ k}\Omega$

$C_1 = 1\text{ pF}$

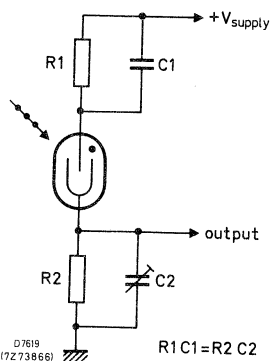
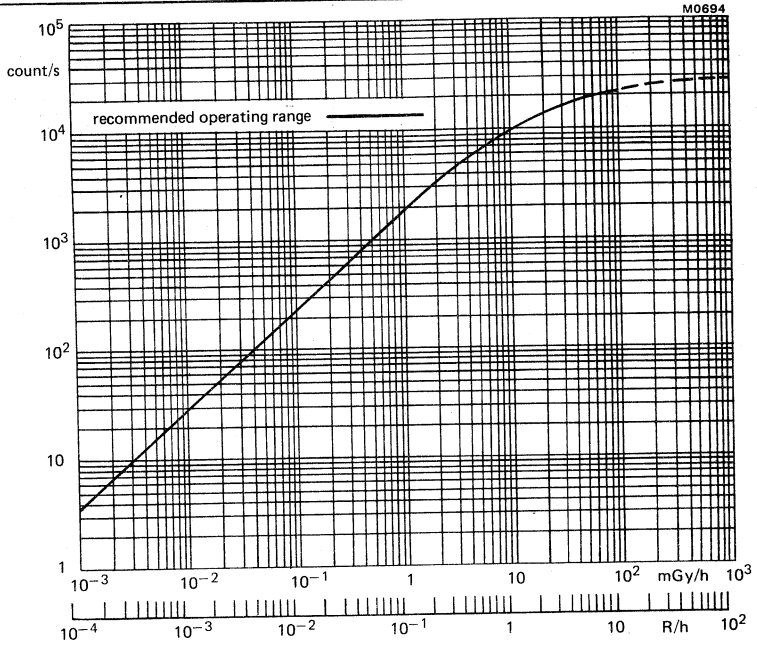
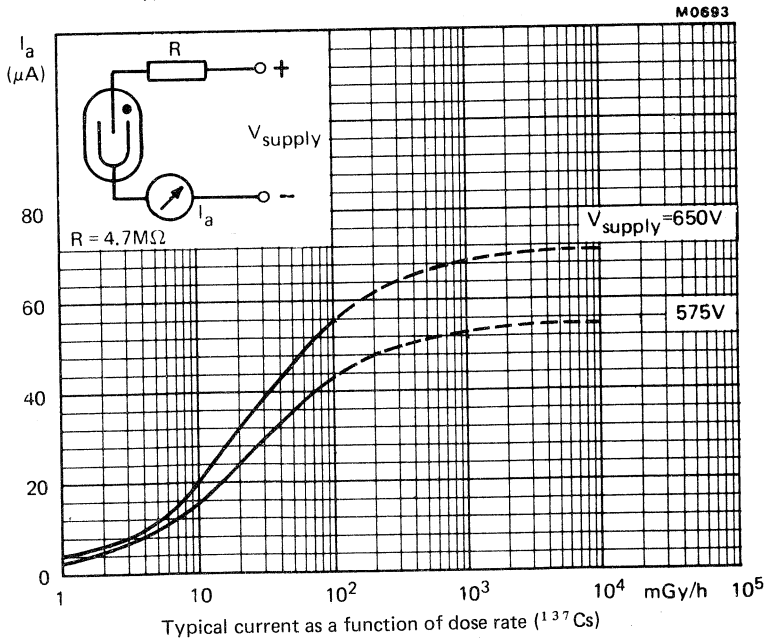
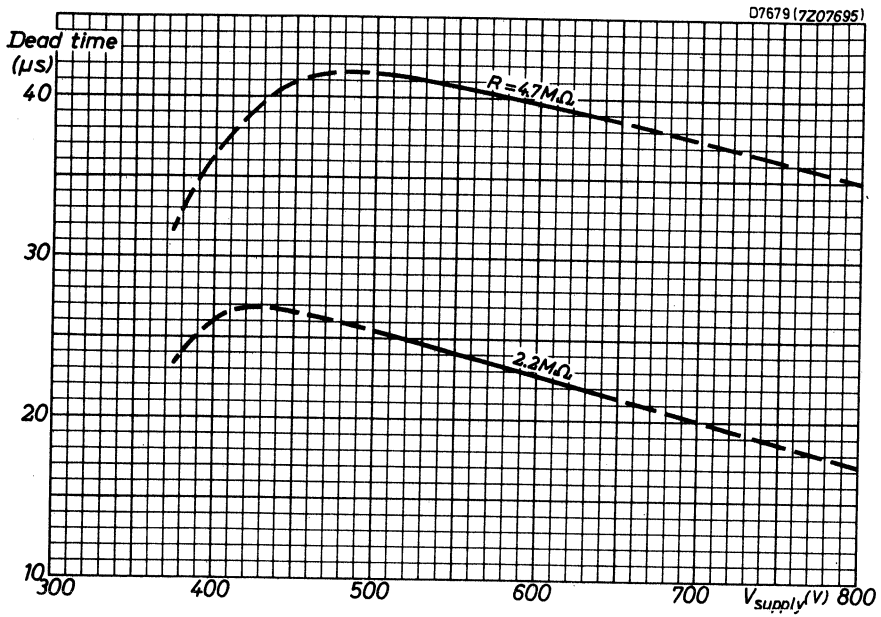


Fig.2



Typical counting rate as a function of dose rate (¹³⁷Cs)





Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Halogen quenched γ and β (>0.3 MeV) radiation counter tube for use in damp and/or saline atmosphere.

QUICK REFERENCE DATA

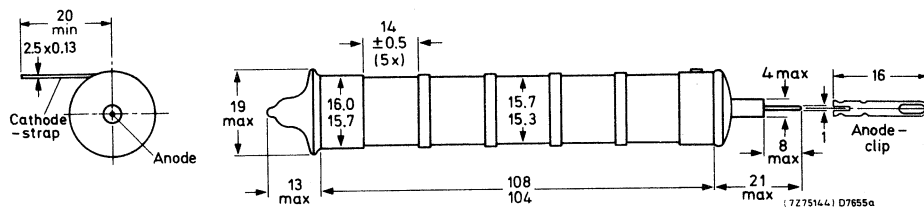
Dose rate range	3×10^{-4} to 10	mGy/h
Plateau threshold voltage	450	V
Plateau length	350	V
Recommended supply voltage	625	V
Chrome-iron cathode	40 to 60	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



The cathode is covered with a corrosion resistant coating.

CATHODE

Construction	cylindrical wall with strengthening ribs	
Thickness between strengthening ribs	40 to 60	mg/cm ²
Sensitive length	75	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	4.0	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	400	V
Plateau threshold voltage	max.	450	V
Plateau length		350	V
Recommended supply voltage		625	V
Plateau slope	max.	0.02	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	30	count/min
Dead time, at recommended supply voltage	max.	70	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	800	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R = 2.2\text{ M}\Omega$

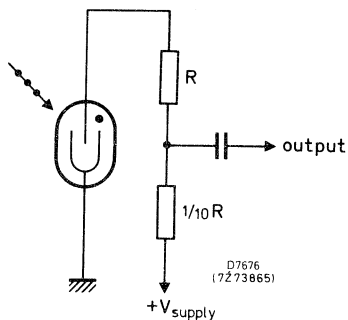
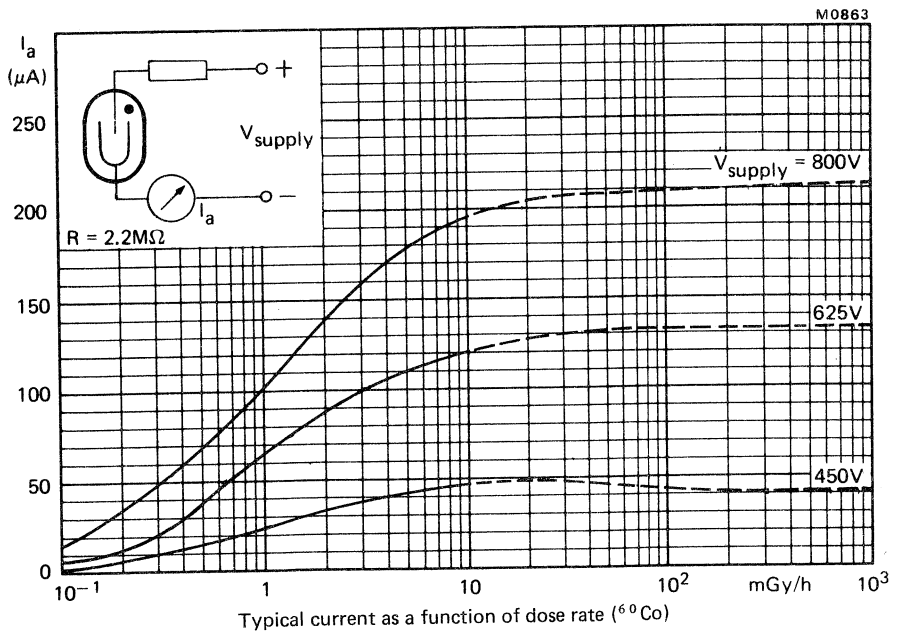
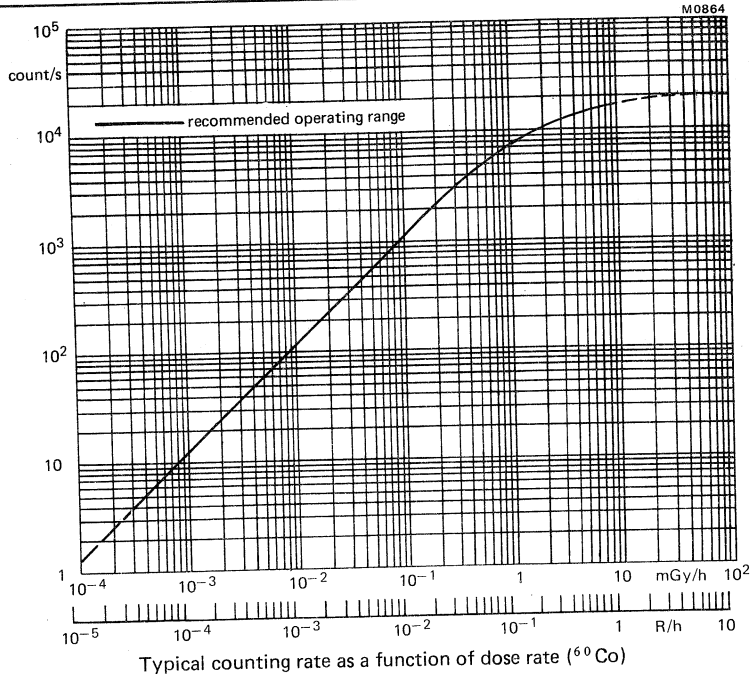
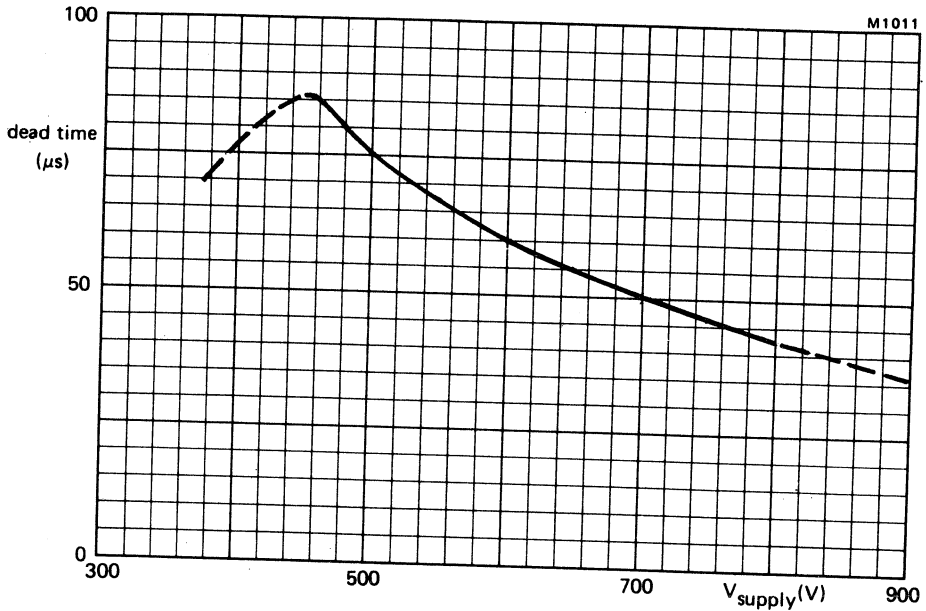


Fig.2





Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

QUICK REFERENCE DATA

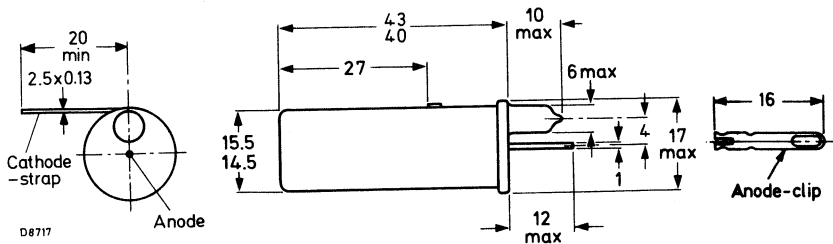
Dose rate range	10^{-3} to 10	mGy/h
Plateau threshold voltage	400	V
Plateau length	200	V
Recommended supply voltage	500	V
Chrome-iron cathode	250	mg/cm ²
Mica window (9 mm diameter)	2.0 to 3.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	2.0 to 3.0	mg/cm ²
Useful diameter	9	mm
Material	mica	

CATHODE

Thickness	250	mg/cm ²
Sensitive length	39	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode

1.1 pF ←

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	325	V
Plateau threshold voltage	max.	400	V
Plateau length		200	V
Recommended supply voltage		500	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	10	count/min.
Dead time, at recommended supply voltage	max.	90	μs

LIMITING VALUES (Absolute max. rating system).

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	600	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

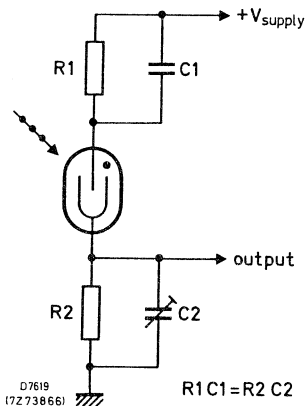
Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$	5×10^{10}	count
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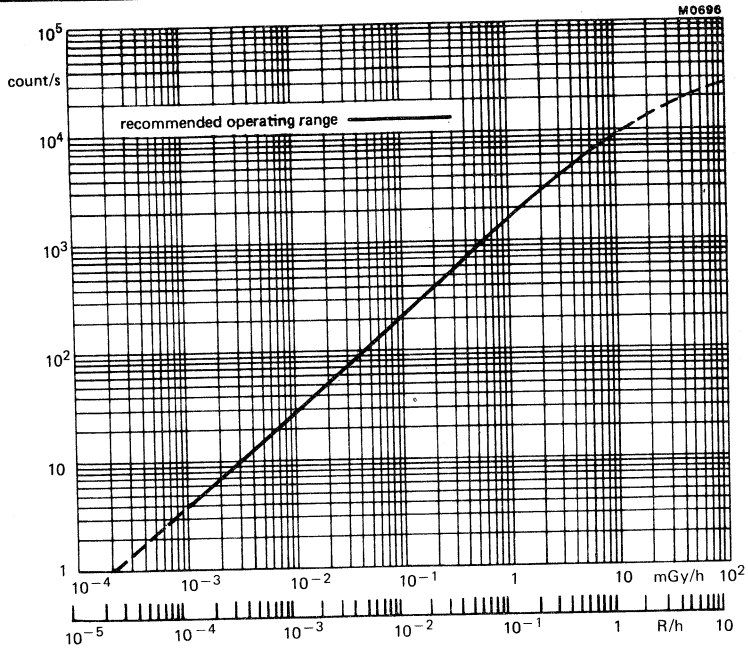
MEASURING CIRCUIT

$R_1 = 10\text{ M}\Omega$

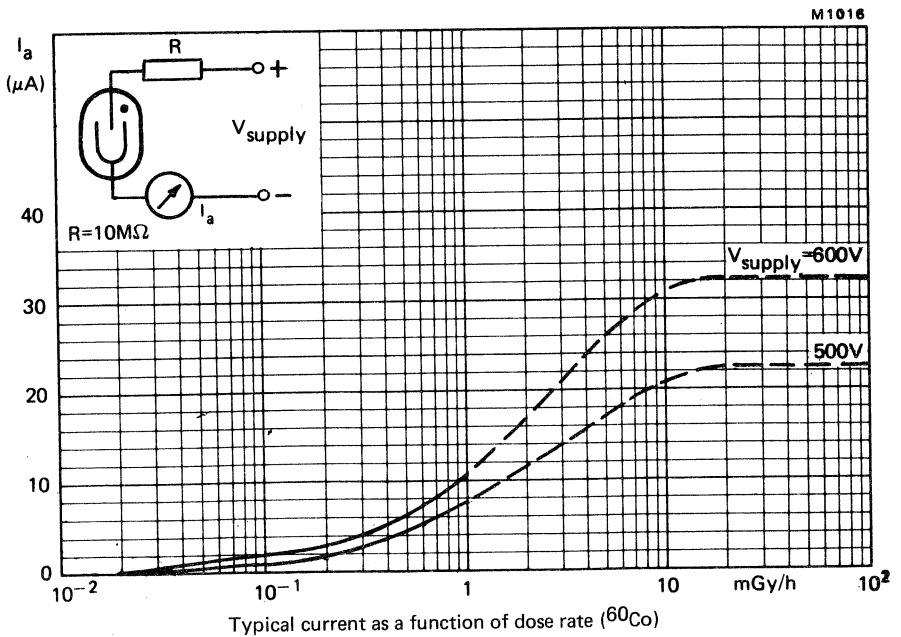
$R_2 = 220\text{ k}\Omega$

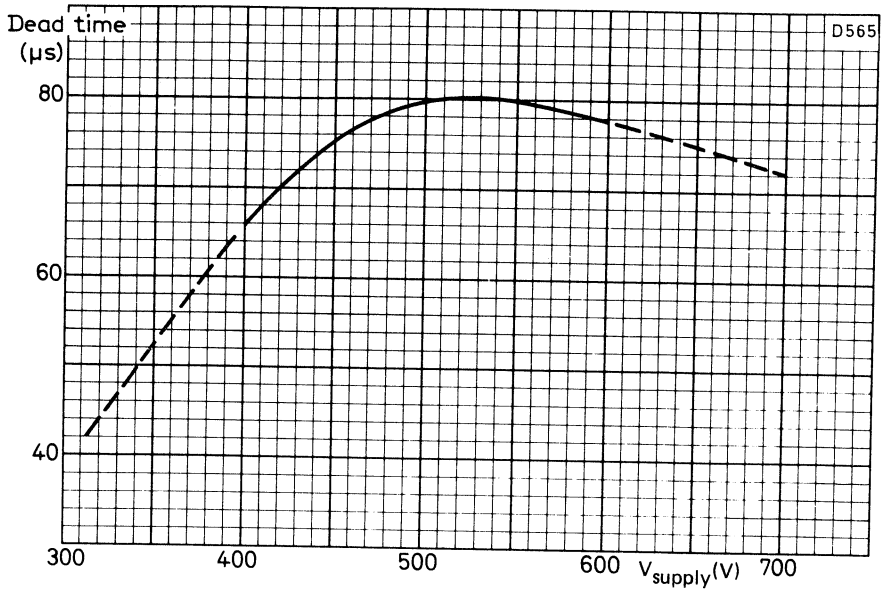
$C_1 = 1\text{ pF}$





Typical counting rate as a function of dose rate (¹³⁷Cs)





Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched α , β and γ radiation counter tube.

QUICK REFERENCE DATA

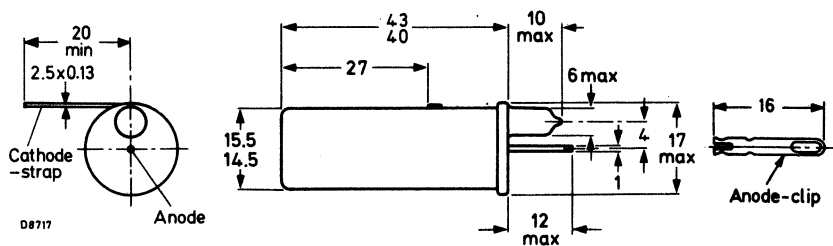
Dose rate range	10^{-3} to 10	mGy/h
Plateau threshold voltage	400	V
Plateau length	200	V
Recommended supply voltage	500	V
Chrome-iron cathode	250	mg/cm ²
Mica window (9 mm diameter)	1.5 to 2.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	1.5 to 2.0	mg/cm ²
Useful diameter	9	mm
Material	mica	

CATHODE

Thickness	250	mg/cm ²
Sensitive length	39	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.1	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	325	V
Plateau threshold voltage	max.	400	V
Plateau length		200	V
Recommended supply voltage		500	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	10	count/min
Dead time, at recommended supply voltage	max.	90	μs

LIMITING VALUES (Absolute max. rating system).

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	600	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

- $R_1 = 10\text{ M}\Omega$
- $R_2 = 220\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

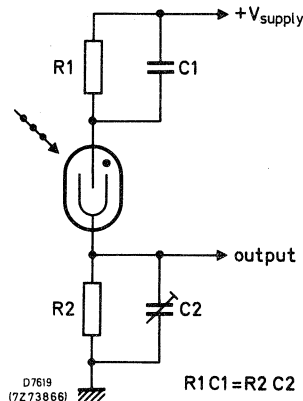
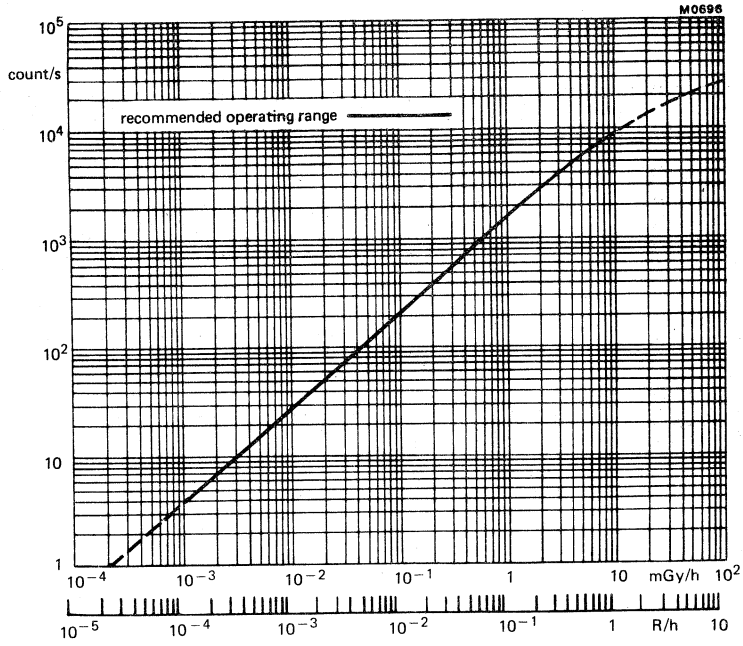
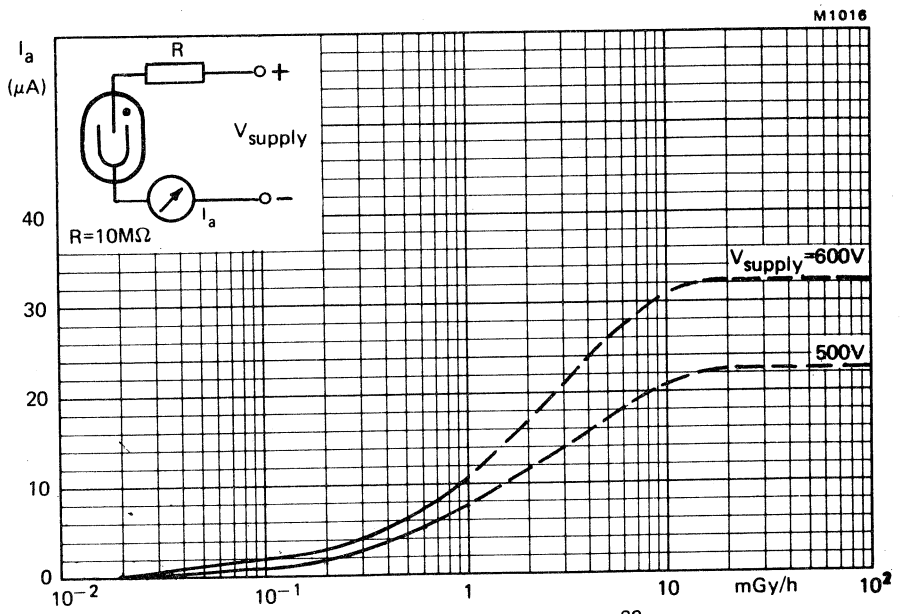


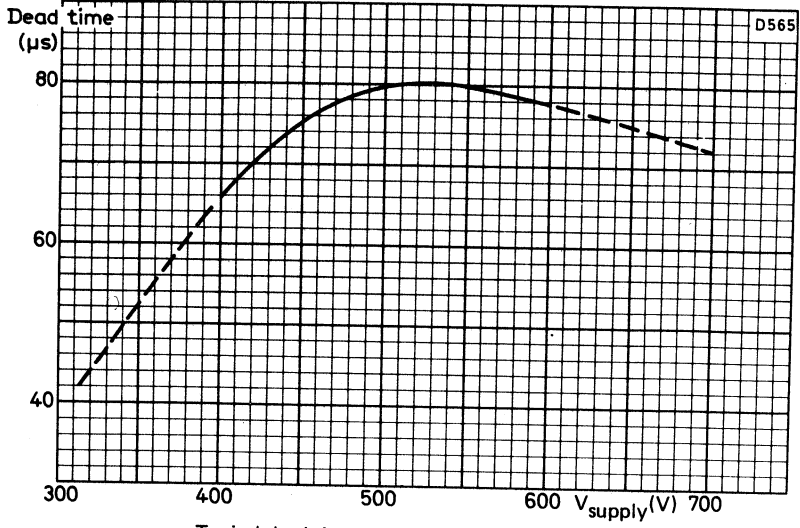
Fig.2



Typical counting rate as a function of dose rate (¹³⁷Cs)



Typical current as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched α , β and γ radiation counter tube.

QUICK REFERENCE DATA

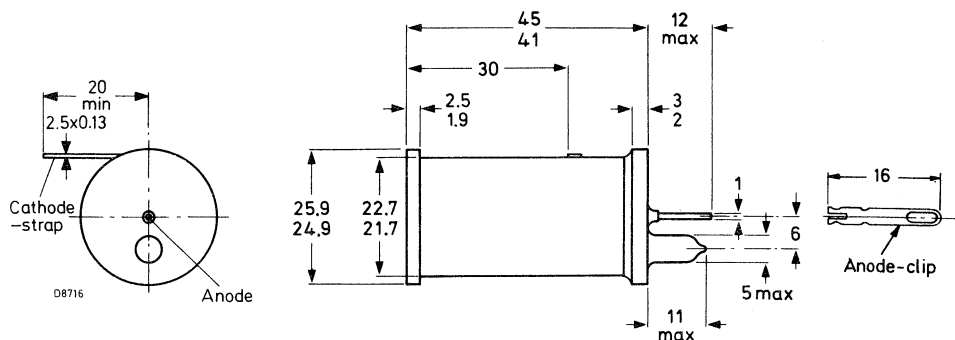
Dose rate range	10^{-3} to 3×10	mGy/h
Plateau threshold voltage	450	V
Plateau length	250	V
Recommended supply voltage	575	V
Chrome-iron cathode	910	mg/cm ²
Mica window (19.8 mm diameter)	1.5 to 2.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	1.5 to 2.0	mg/cm ²
Useful diameter	19.8	mm
Material	mica	

CATHODE

Thickness	910	mg/cm ²
Sensitive length	37	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	2.5	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	350	V
Plateau threshold voltage	max.	450	V
Plateau length		250	V
Recommended supply voltage		575	V
Plateau slope	max.	0.02	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	15	count/min.
Dead time, at recommended supply voltage	max.	175	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	700	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$	5×10^{10}	count
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MEASURING CIRCUIT

R = 10 $\text{M}\Omega$

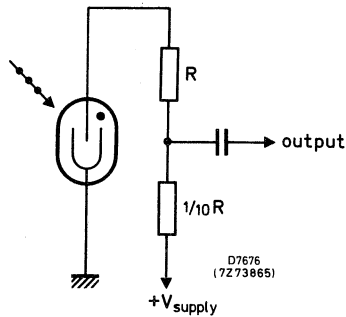
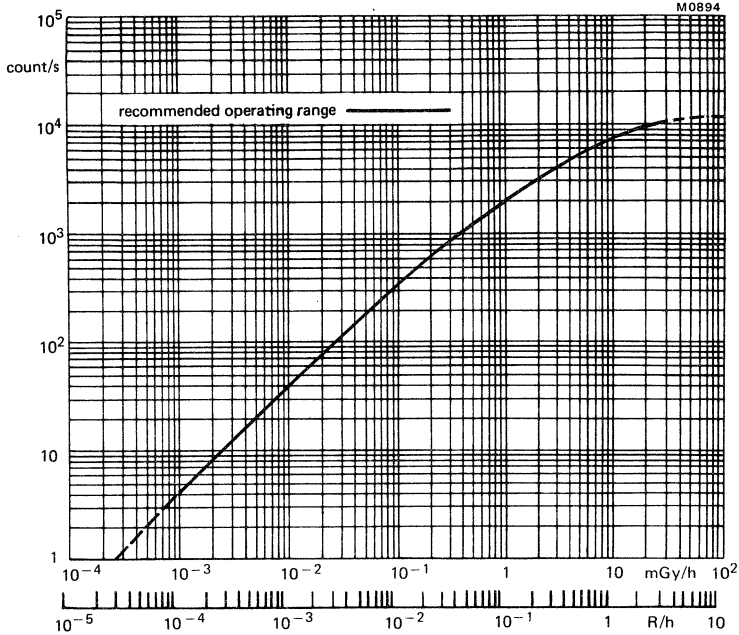
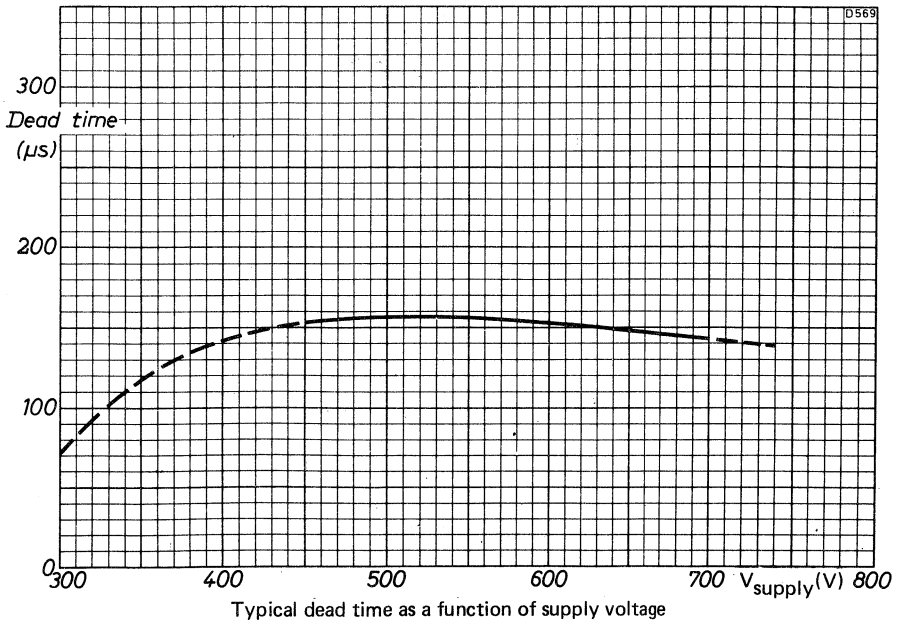


Fig.2



Typical counting rate as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched α , β and γ radiation counter tube.

QUICK REFERENCE DATA

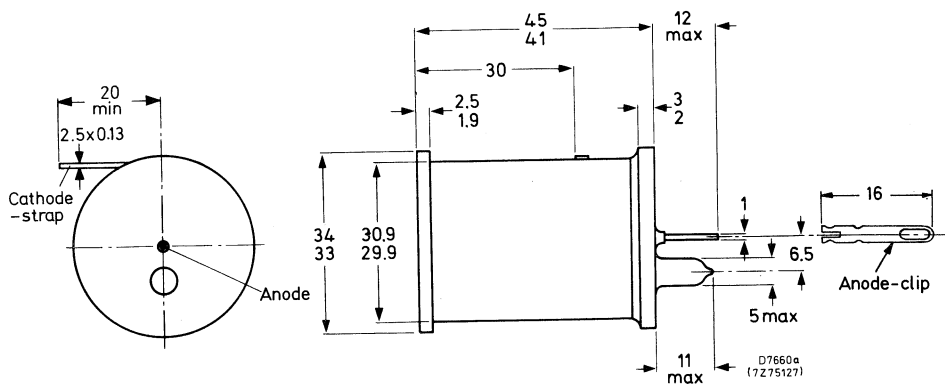
Dose rate range	10^{-3} to 2×10	mGy/h
Plateau threshold voltage	450	V
Plateau length	250	V
Recommended supply voltage	575	V
Chrome-iron cathode	980	mg/cm ²
Mica window (27.8 mm diameter)	1.5 to 2.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	1.5 to 2.0	mg/cm ²
Useful diameter	27.8	mm
Material	mica	

CATHODE

Thickness	980	mg/cm ²
Sensitive length	37	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	3.5	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	375	V
Plateau threshold voltage	max.	450	V
Plateau length		250	V
Recommended supply voltage		575	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	25	count/min
Dead time, at recommended supply voltage	max.	190	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	700	V
Ambient temperature continuous operating	max..	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 10\text{ M}\Omega$

$R_2 = 220\text{ k}\Omega$

$C_1 = 1\text{ pF}$

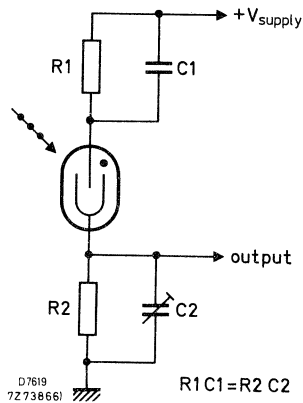
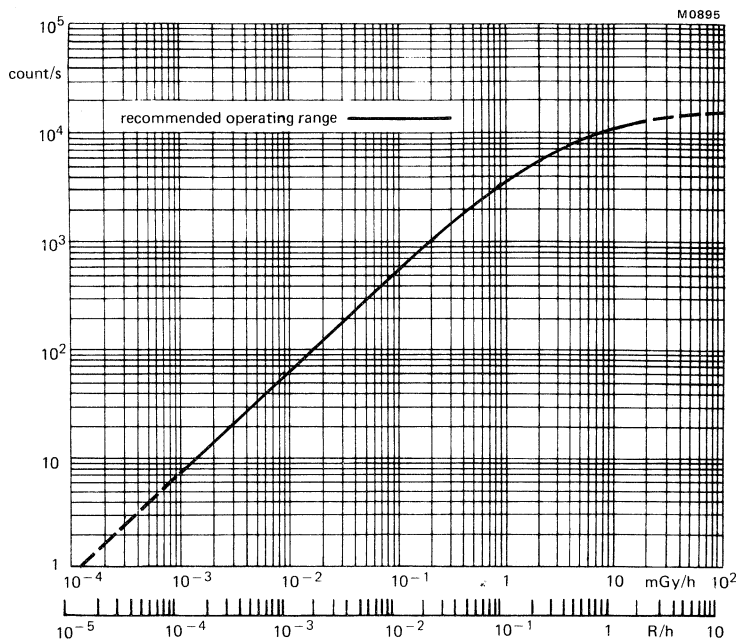
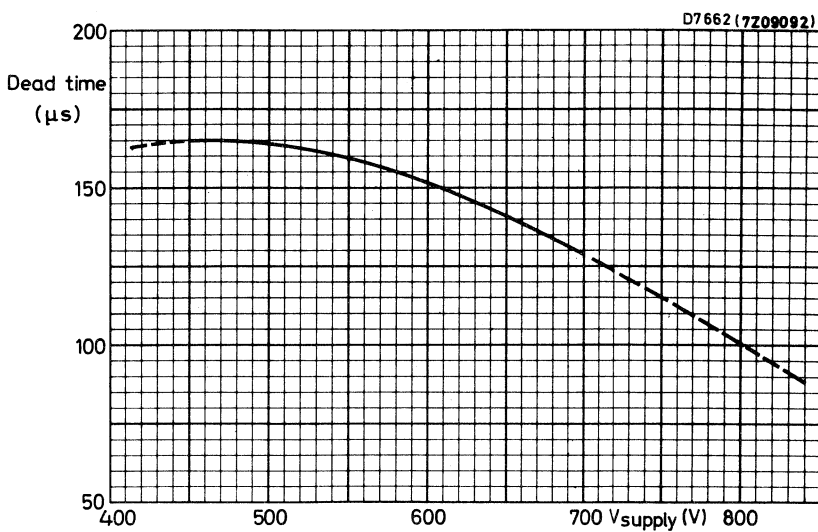


Fig.2



Typical counting rate as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

QUICK REFERENCE DATA

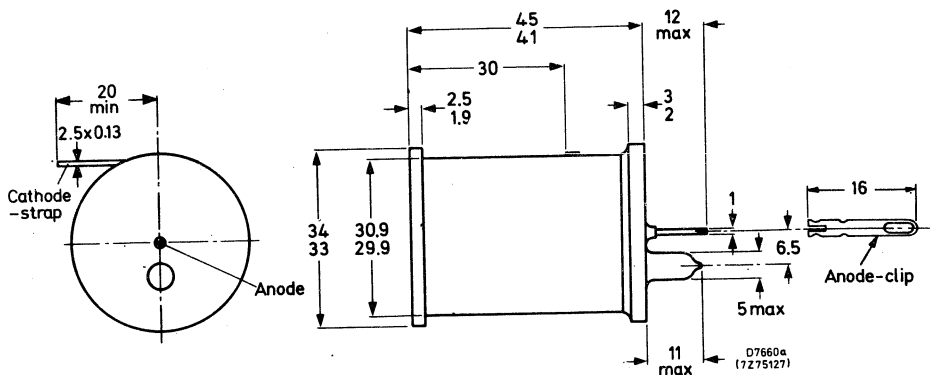
Dose rate range	10^{-3} to 2×10	mGy/h
Plateau threshold voltage	450	V
Plateau length	250	V
Recommended supply voltage	575	V
Chrome-iron cathode	980	mg/cm ²
Mica window (27.8 mm diameter)	2.0 to 3.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig. 1



WINDOW

Thickness
Useful diameter
Material

2.0 to 3.0 mg/cm²
27.8 mm
mica

CATHODE

Thickness
Sensitive length
Material

980 mg/cm²
37 mm
chrome-iron
neon, argon, halogen

FILLING

CAPACITANCE
Anode to cathode

3.5 pF

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	375	V
Plateau threshold voltage	max.	450	V
Plateau length		250	V
Recommended supply voltage		575	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	25	count/min
Dead time, at recommended supply voltage	max.	190	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	700	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

- $R_1 = 10\text{ M}\Omega$
- $R_2 = 220\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

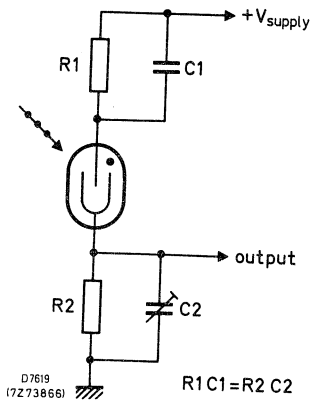
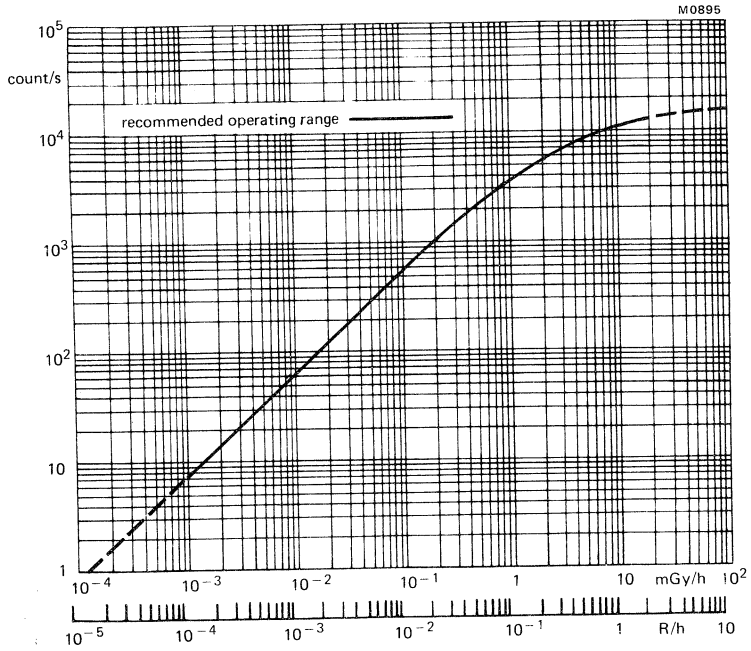
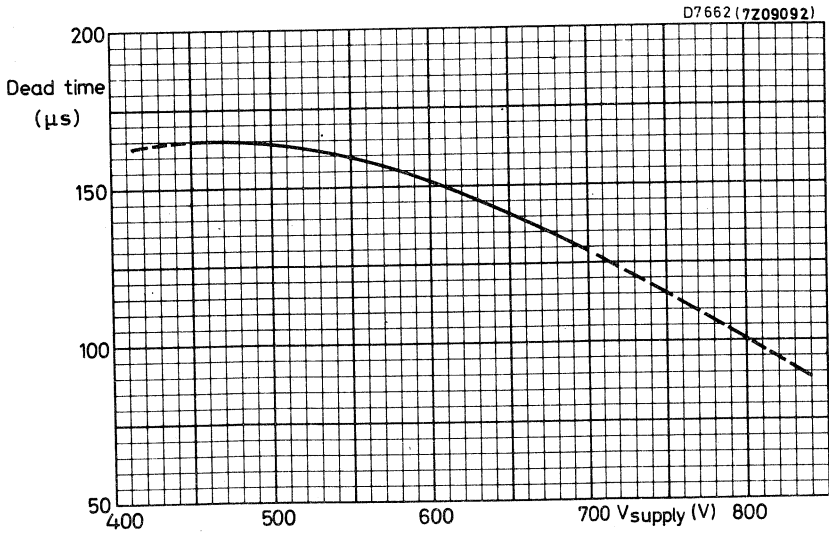


Fig.2



Typical counting rate as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched α , β and γ radiation counter tube for measurement of low levels of radiation in combination with a guard counter tube, e.g. ZP1700.

QUICK REFERENCE DATA

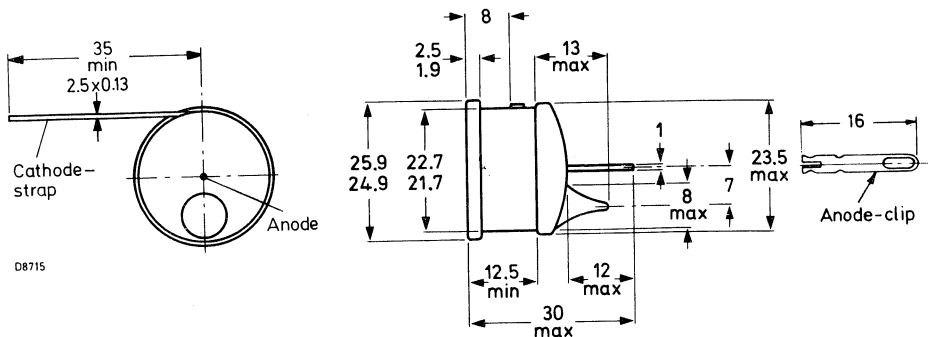
Dose rate range	10^{-3} to 10^2	mGy/h	←
Plateau threshold voltage	500	V	
Plateau length	200	V	
Recommended supply voltage	600	V	
Chrome-iron cathode	910	mg/cm ²	
Mica window (19.8 mm diameter)	1.5 to 2.0	mg/cm ²	

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	1.5 to 2.0	mg/cm ²
Useful diameter	19.8	mm
Material	mica	

CATHODE

Thickness	910	mg/cm ²
Sensitive length	12	mm
Material	chrome-iron	

FILLING

CAPACITANCE

neon, argon, halogen

Anode to cathode

1.0 pF

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	350	V
Plateau threshold voltage	max.	500	V
Plateau length		200	V
Recommended supply voltage		600	V
Plateau slope	max.	0.09	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	5	count/min
Background in anti-coincidence circuit with guard counter tube ZP1700 (shielded with 100 mm Fe and 30 mm Pb), at recommended supply voltage, Fe outside	max.	1.2	count/min
Dead time, at recommended supply voltage	max.	65	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	$\text{M}\Omega$
Anode voltage	max.	700	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

- $R_1 = 4.7\text{ M}\Omega$
- $R_2 = 100\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

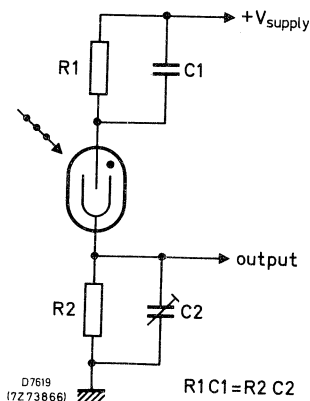
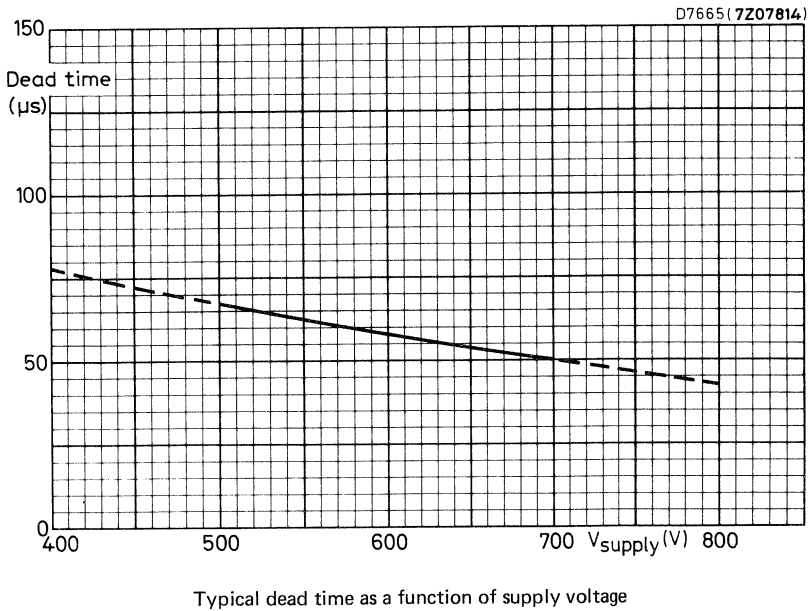
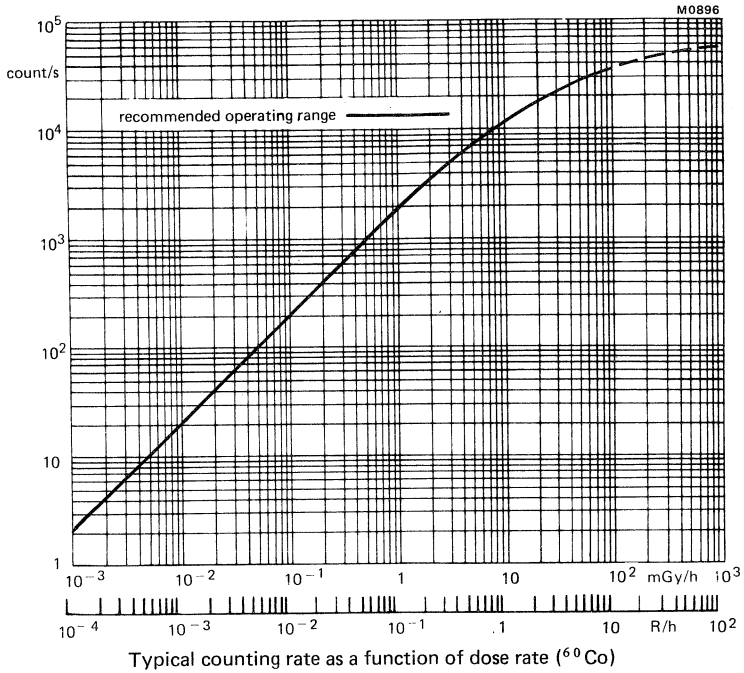


Fig.2



GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

QUICK REFERENCE DATA

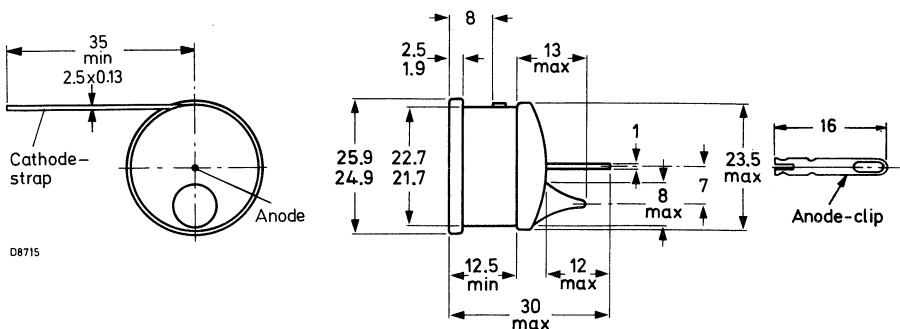
Dose rate range	10^{-3} to 10^2	mGy/h	←
Plateau threshold voltage	500	V	
Plateau length	200	V	
Recommended supply voltage	600	V	
Chrome-iron cathode	910	mg/cm ²	
Mica window (19.8 mm diameter)	2.0 to 3.0	mg/cm ²	

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm ←

Fig.1



WINDOW

Thickness	2.0 to 3.0	mg/cm ²
Useful diameter	19.8	mm
Material	mica	

CATHODE

Thickness	910	mg/cm ²
Sensitive length	12	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.0	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	350	V
Plateau threshold voltage	max.	500	V
Plateau length		200	V
Recommended supply voltage		600	V
Plateau slope	max.	0.09	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	8	count/min
Dead time, at recommended supply voltage	max.	65	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.2	M Ω
Anode voltage	max.	700	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

- $R_1 = 4.7\text{ M}\Omega$
- $R_2 = 100\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

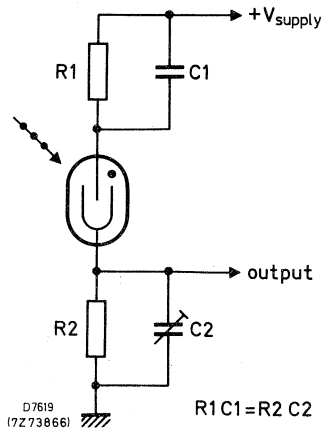
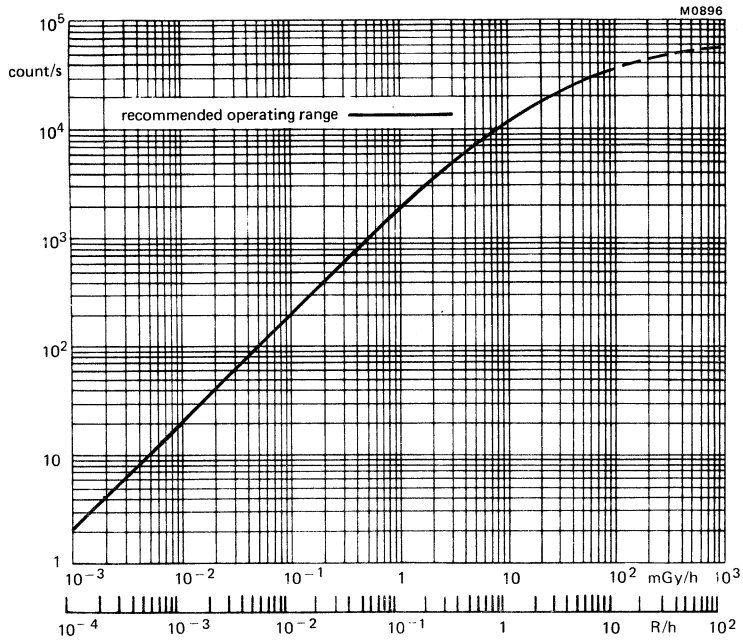
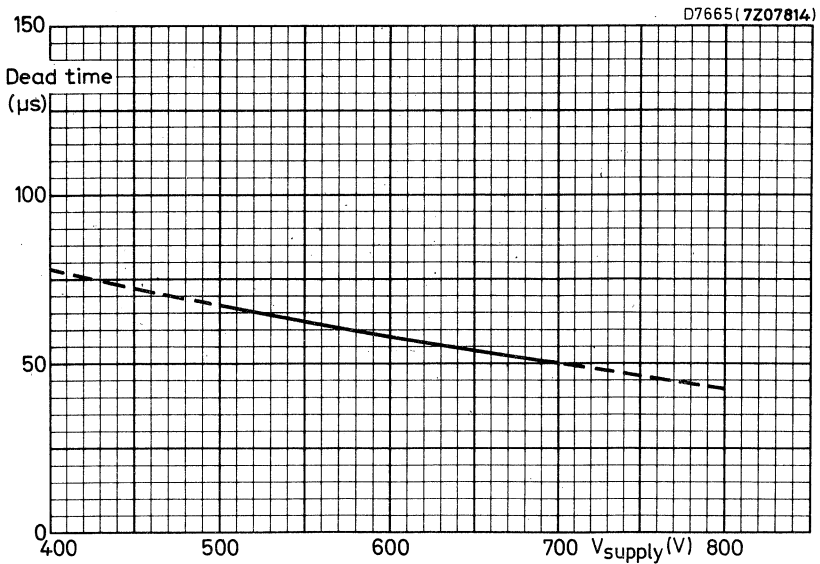


Fig.2



Typical counting rate as a function of dose rate (⁶⁰Co)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

End window halogen quenched α , β and γ radiation counter tube for measurement of low levels of radiation in combination with a guard counter tube, e.g. ZP1700.

QUICK REFERENCE DATA

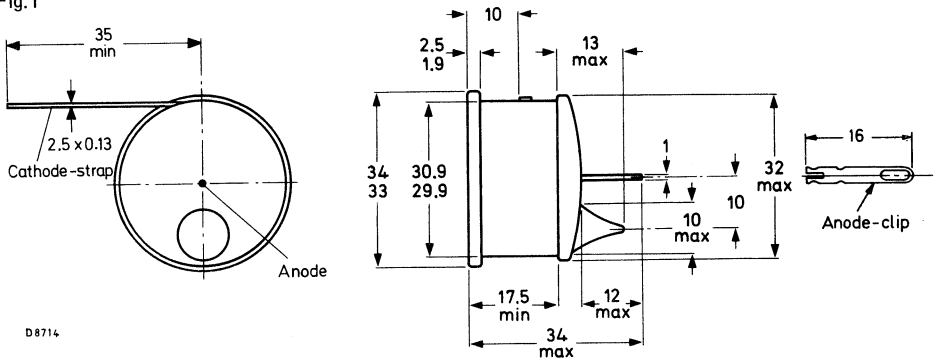
Dose rate range	10^{-3} to 3×10	mGy/h
Plateau threshold voltage	500	V
Plateau length	250	V
Recommended supply voltage	625	V
Chrome-iron cathode	980	mg/cm ²
Mica window (27.8 mm diameter)	1.5 to 2.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig. 1



WINDOW

Thickness	1.5 to 2.0	mg/cm ²
Useful diameter	27.8	mm
Material	mica	

CATHODE

Thickness	980	mg/cm ²
Sensitive length	16	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.4	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	375 V
Plateau threshold voltage	max.	500 V
Plateau length		250 V
Recommended supply voltage		625 V
Plateau slope	max.	0.07 %/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	9 count/min
Background in anti-coincidence circuit with guard counter tube ZP1700 (shielded with 100 mm Fe and 30 mm Pb), at recommended supply voltage, Fe outside	max.	2 count/min
Dead time, at recommended supply voltage	max.	60 μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7 $\text{M}\Omega$
Anode voltage	max.	750 V
Ambient temperature continuous operating	max.	+70 $^{\circ}\text{C}$
	min.	-40 $^{\circ}\text{C}$
storage	max.	+75 $^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

$R_1 = 10\text{ M}\Omega$

$R_2 = 220\text{ k}\Omega$

$C_1 = 1\text{ pF}$

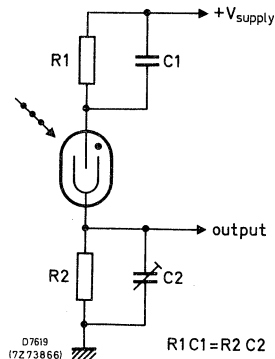
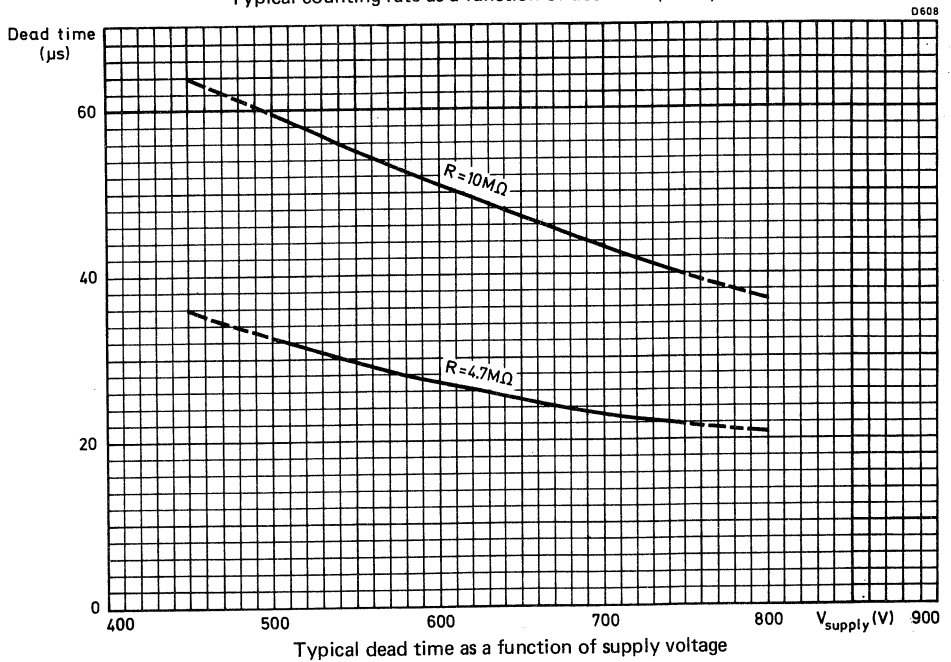
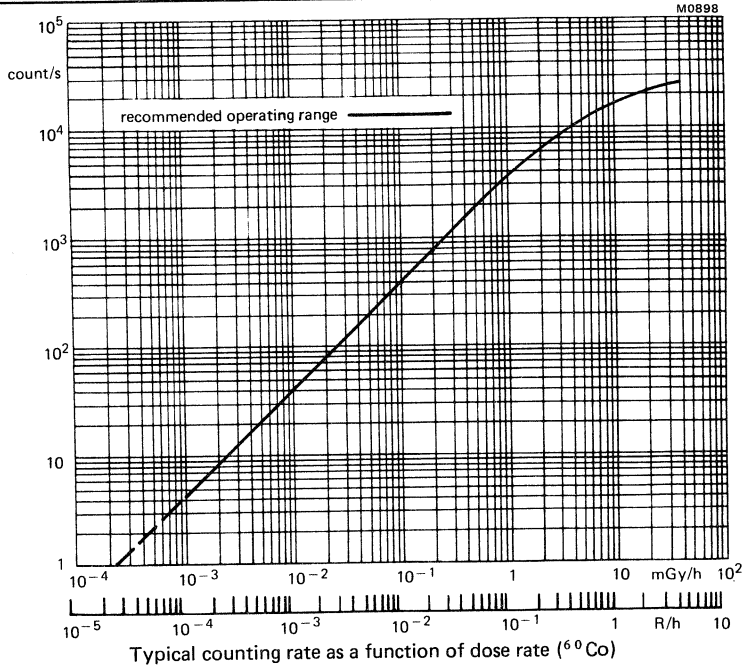


Fig.2



GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

QUICK REFERENCE DATA

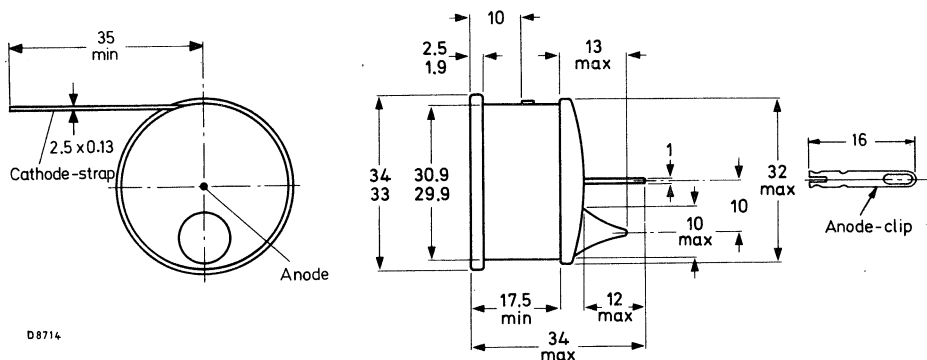
Dose rate range	10^{-3} to 3×10	mGy/h
Plateau threshold voltage	500	V
Plateau length	250	V
Recommended supply voltage	625	V
Chrome-iron cathode	980	mg/cm ²
Mica window (27.8 mm diameter)	2.0 to 3.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	2.0 to 3.0	mg/cm ²
Useful diameter	27.8	mm
Material	mica	

CATHODE

Thickness	980	mg/cm ²
Sensitive length	16	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	1.4	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	375 V
Plateau threshold voltage	max.	500 V
Plateau length		250 V
Recommended supply voltage		625 V
Plateau slope	max.	0.07 %/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	18 count/min
Dead time, at recommended supply voltage	max.	60 μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7 $\text{M}\Omega$
Anode voltage	max.	750 V
Ambient temperature continuous operating	max.	+70 $^{\circ}\text{C}$
	min.	-40 $^{\circ}\text{C}$
storage	max.	+75 $^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

- $R_1 = 10\text{ M}\Omega$
- $R_2 = 220\text{ k}\Omega$
- $C_1 = 1\text{ pF}$

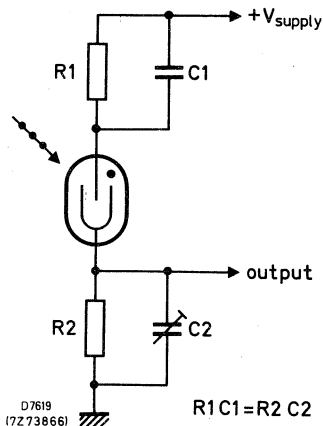
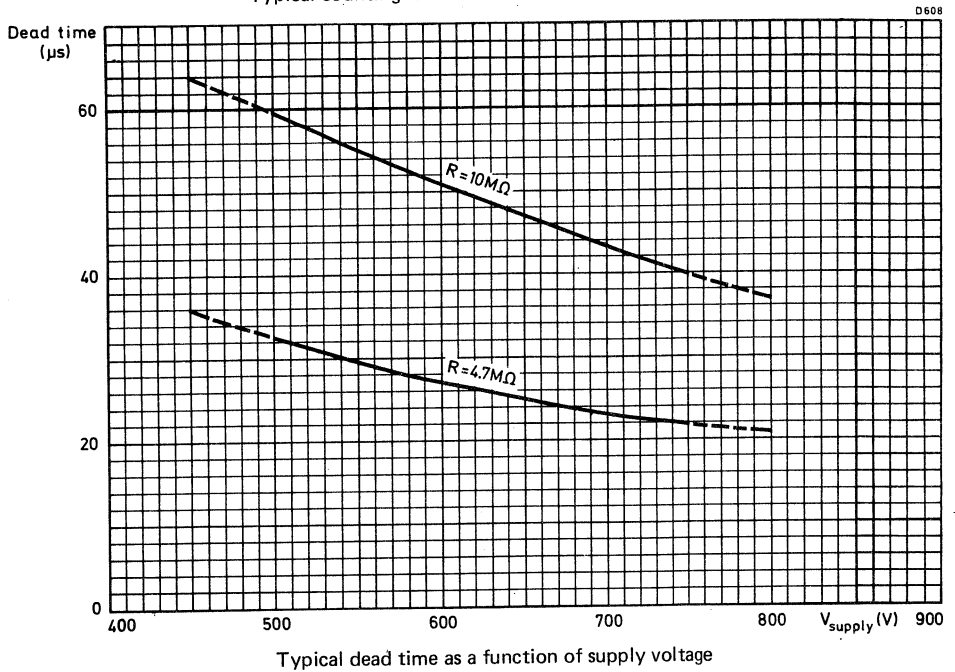
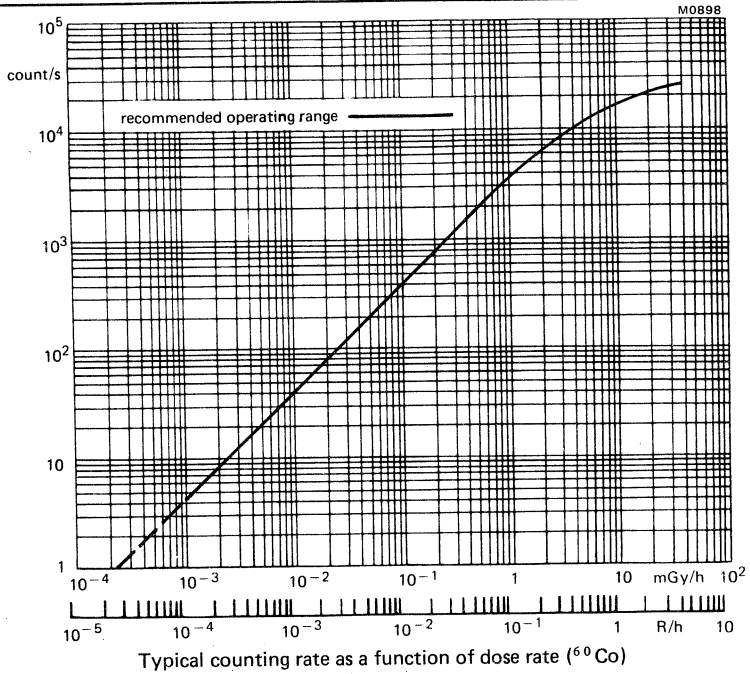


Fig.2



GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

QUICK REFERENCE DATA

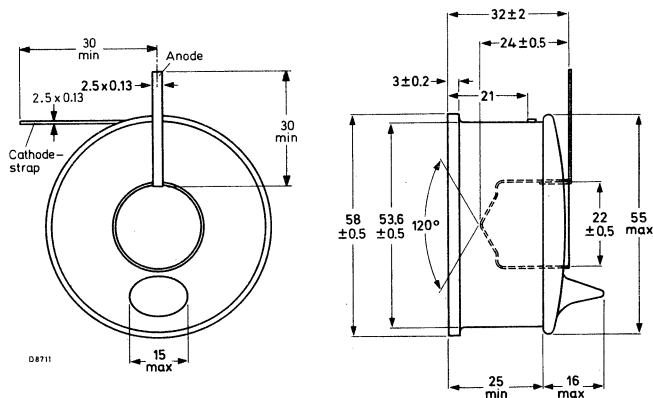
Dose rate range	3×10^{-4} to 1	mGy/h
Plateau threshold voltage	700	V
Plateau length	200	V
Recommended supply voltage	800	V
Chrome-iron cathode	950	mg/cm ²
Mica window (51 mm diameter)	3.5 to 4.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig. 1



WINDOW

Thickness	3.5 to 4.0	mg/cm ²
Useful diameter	51	mm
Material	mica	

CATHODE

Thickness	950	mg/cm ²
Sensitive length	22	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	5.0	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	400	V
Plateau threshold voltage	max.	700	V
Plateau length		200	V
Recommended supply voltage		800	V
Plateau slope	max.	0.04	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	45	count/min
Dead time, at recommended supply voltage	max.	45	μs

LIMITING VALUES (Absolute max. rating system)

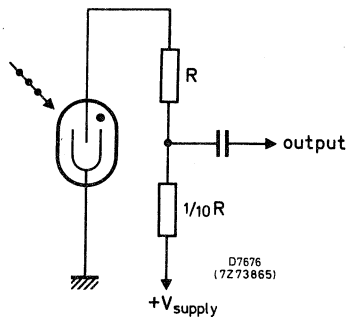
→ Anode resistor	min.	3.9	$\text{M}\Omega$
→ Anode voltage	max.	900	V
Ambient temperature			
continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

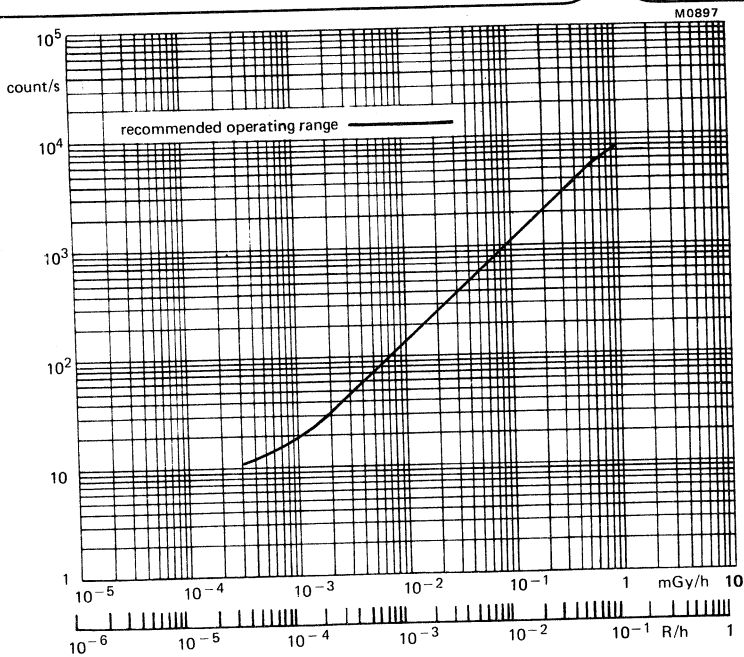
LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$	10^{10}	count
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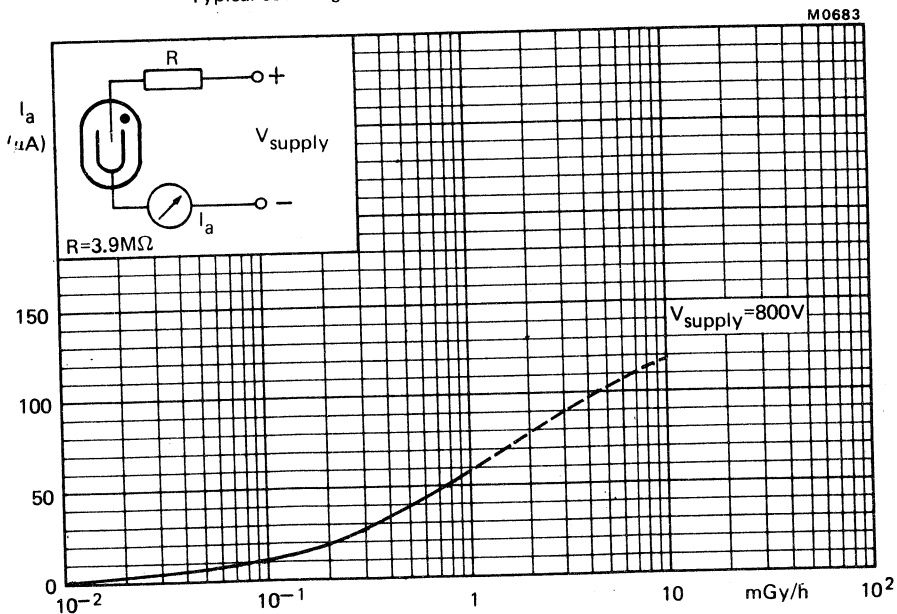
MEASURING CIRCUIT

$R = 4.7\text{ M}\Omega$

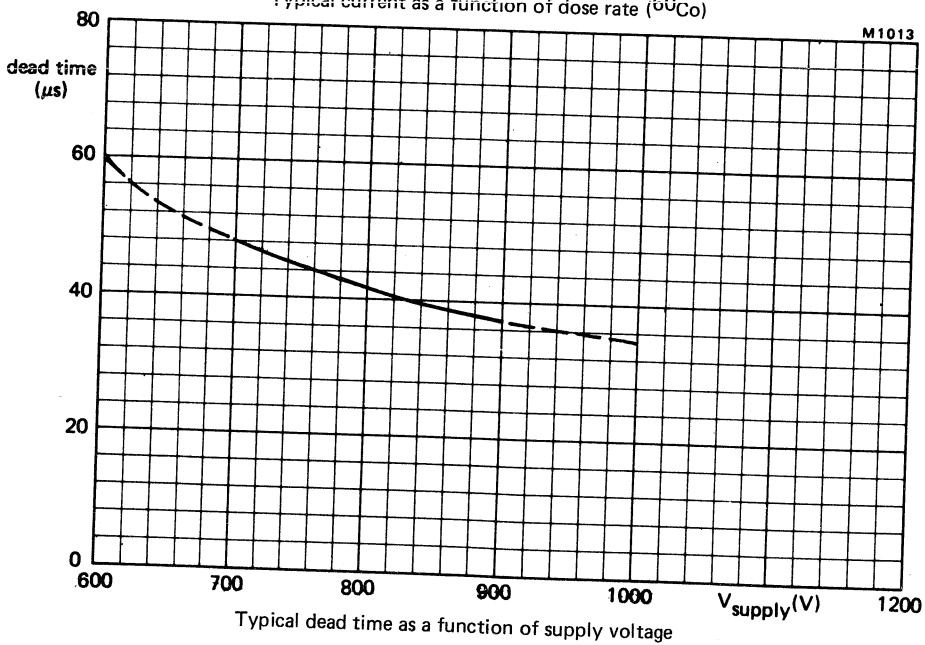
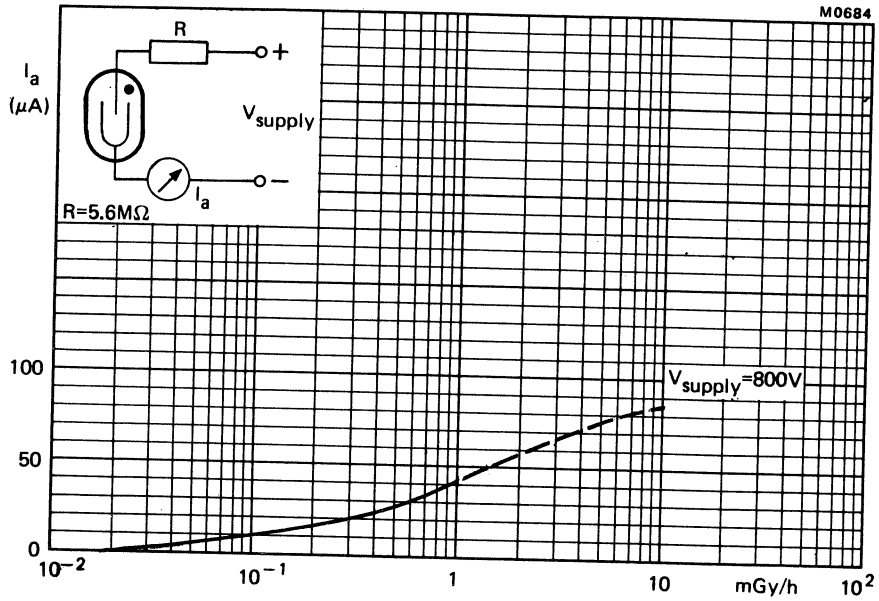




Typical counting rate as a function of dose rate (^{60}Co)



Typical current as a function of dose rate (^{60}Co)



GEIGER-MÜLLER TUBE

End window halogen quenched β and γ radiation counter tube.

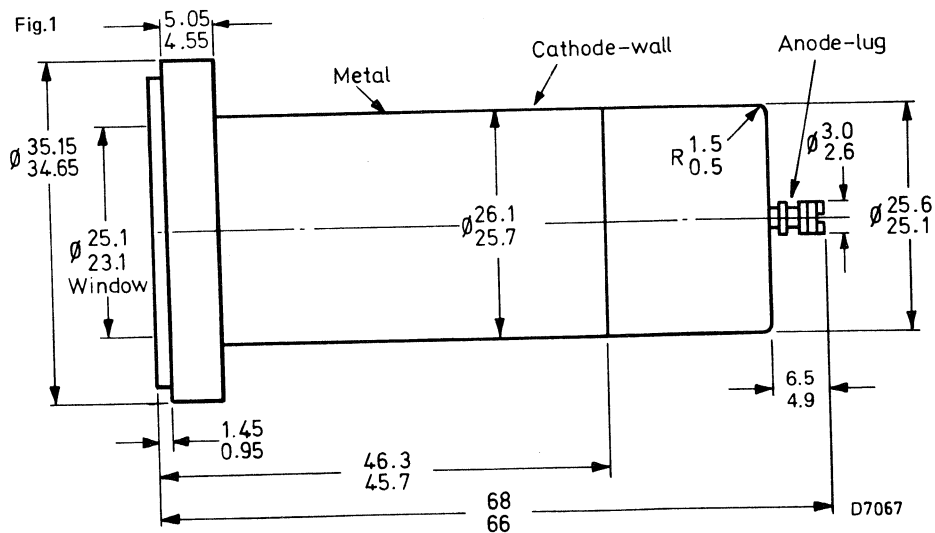
QUICK REFERENCE DATA

Dose rate range	10^{-3} to 2×10	mGy/h
Threshold voltage	550	V
Plateau length	150	V
Recommended supply voltage	600	V
Chrome-iron cathode	690	mg/cm ²
Mica window thickness (24.1 mm diameter)	1.5 to 2.5	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm



WINDOW

Thickness	1.5 to 2.5*	mg/cm ²
Effective diameter	24.1	mm
Material	mica	

CATHODE

Thickness	690	mg/cm ²
Sensitive length	26	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode 5.0 pF

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25^\circ\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	500	V
Threshold voltage	max.	550	V
Plateau length	min.	150	V
Recommended supply voltage (mid-plateau)		600	V
Plateau slope	max.	0.15	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	25	count/min
Dead time, at recommended supply voltage	max.	70	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.7	$\text{M}\Omega$
Anode voltage	max.	700	V
Ambient temperature	max.	+70	$^\circ\text{C}$
continuous operating	min.	-40	$^\circ\text{C}$
storage	max.	+75	$^\circ\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25^\circ\text{C}$ 5×10^{10} count

MEASURING CIRCUIT

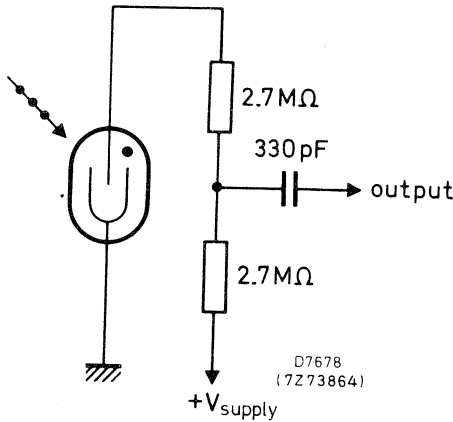
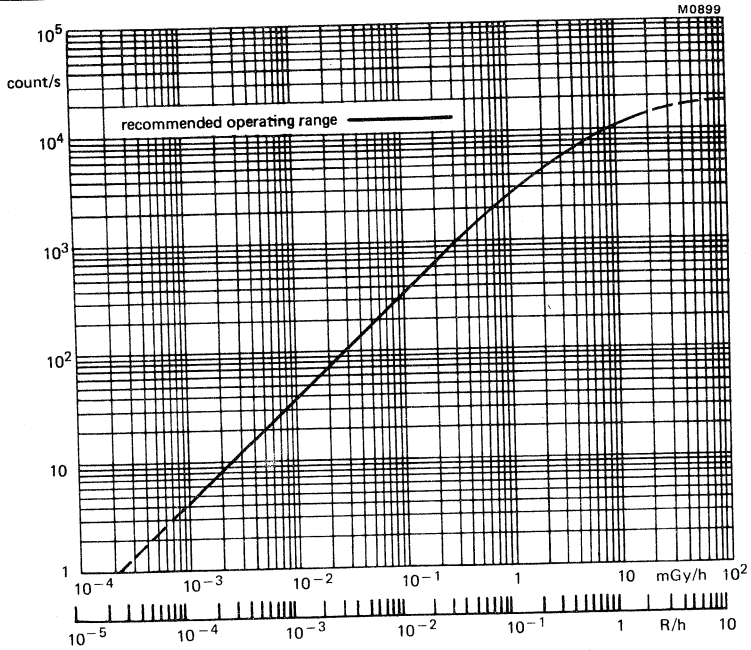
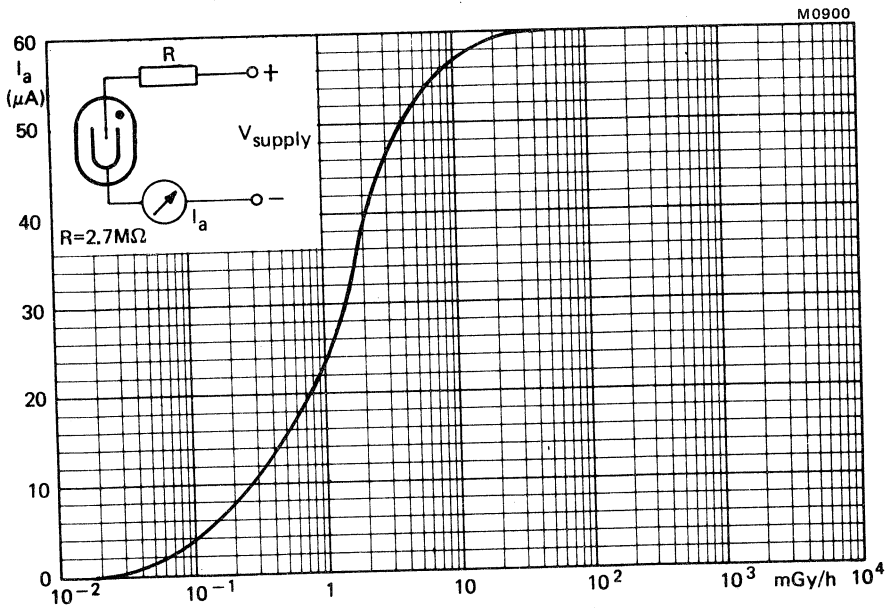


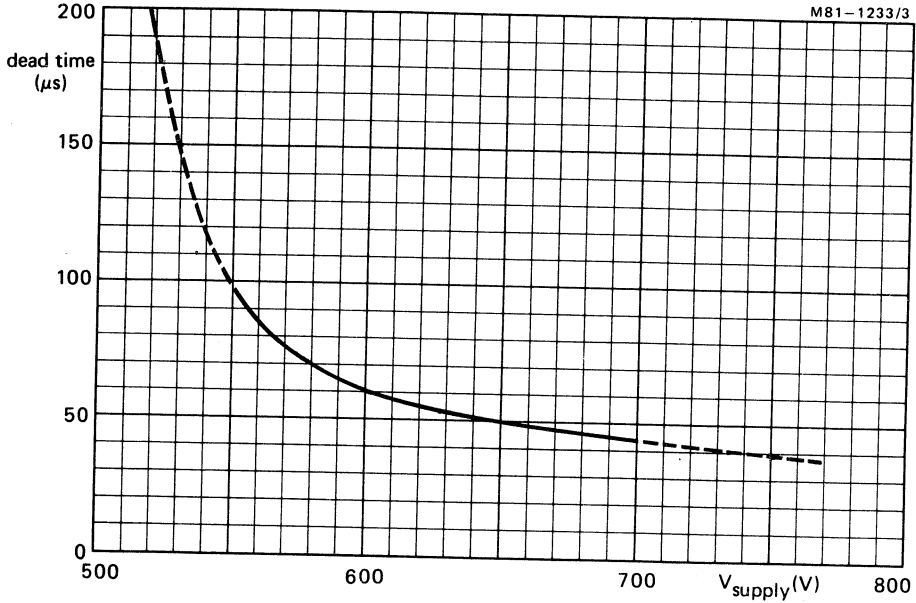
Fig.2



Typical counting rate as a function of dose rate (^{137}Cs)



Typical current as a function of dose rate (^{137}Cs)



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBES

End window halogen quenched β and γ radiation counter tubes.

QUICK REFERENCE DATA

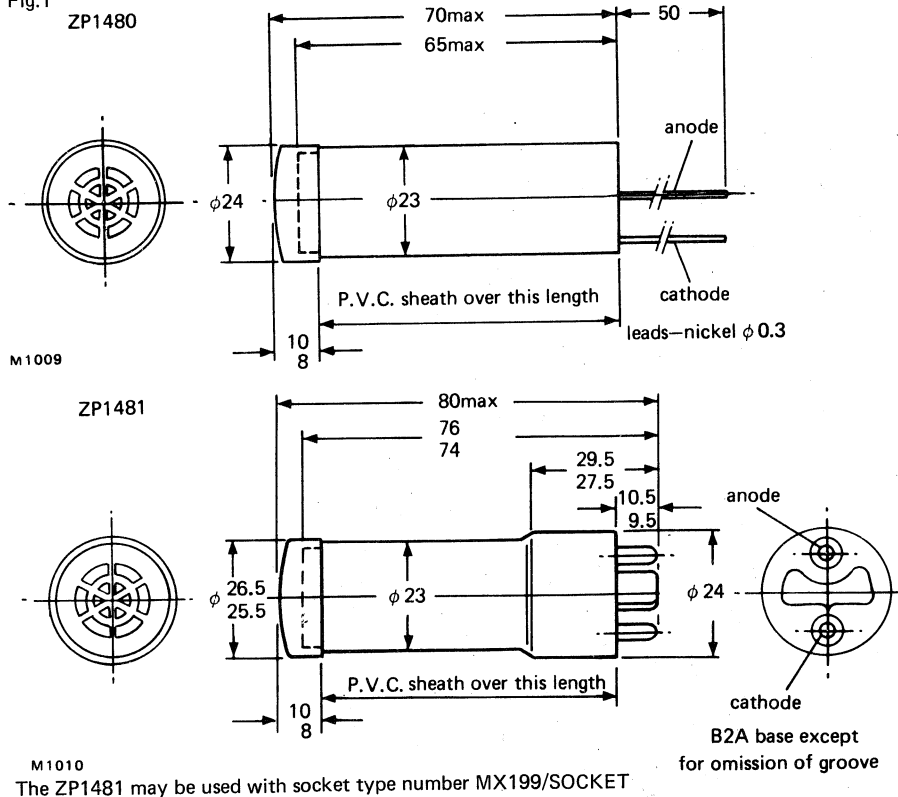
Dose rate range	10^{-3} to 2×10	mGy/h
Plateau threshold voltage	400	V
Plateau length	100	V
Recommended supply voltage	450	V
Chrome-iron cathode	2000	mg/cm ²
Mica window (17 mm diameter)	2.5 to 3.0	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



WINDOW

Thickness	2.5 to 3.0	mg/cm ²
Useful diameter	17	mm
Material	mica	

CATHODE

→ Thickness	2000	mg/cm ²
Sensitive length	38	mm
Material	chrome-iron	

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode	3.5	pF
------------------	-----	----

OPERATING CHARACTERISTICS (Ambient temperature ≈ 25 °C)

Measured in circuit of Fig.2

Starting voltage	max.	350	V
Plateau threshold voltage	max.	400	V
Plateau length		100	V
Recommended supply voltage		450	V
Plateau slope	max.	0.2	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	30	count/min
Dead time, at recommended supply voltage	max.	120	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	2.7	MΩ
Anode voltage	max.	500	V
Ambient temperature continuous operating	max.	+70	°C
	min.	-40	°C
storage	max.	+75	°C

LIFE EXPECTANCY

Life expectancy at ≈ 25 °C		5 x 10 ¹⁰	count
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MEASURING CIRCUIT

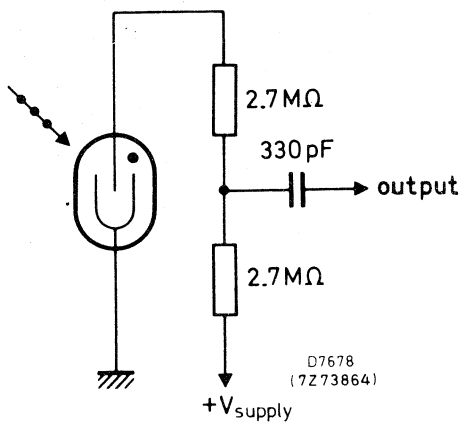
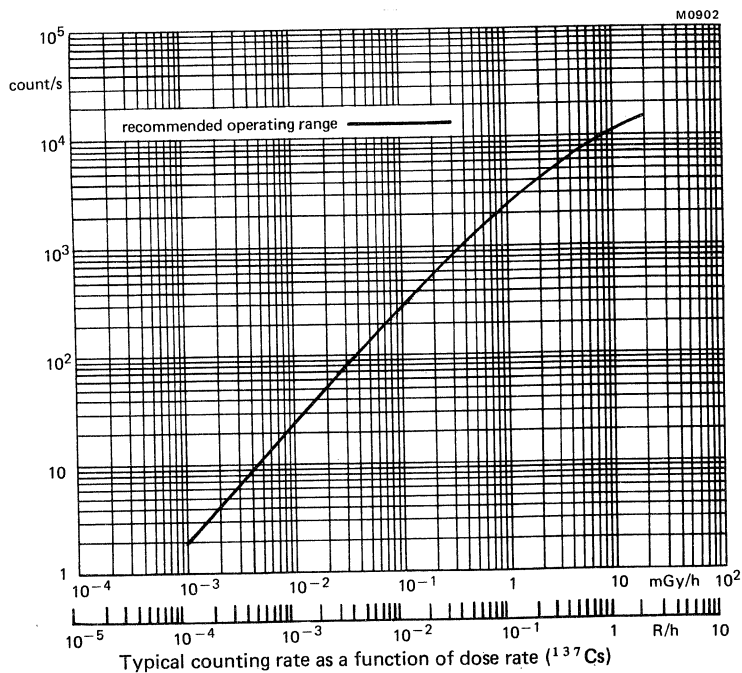
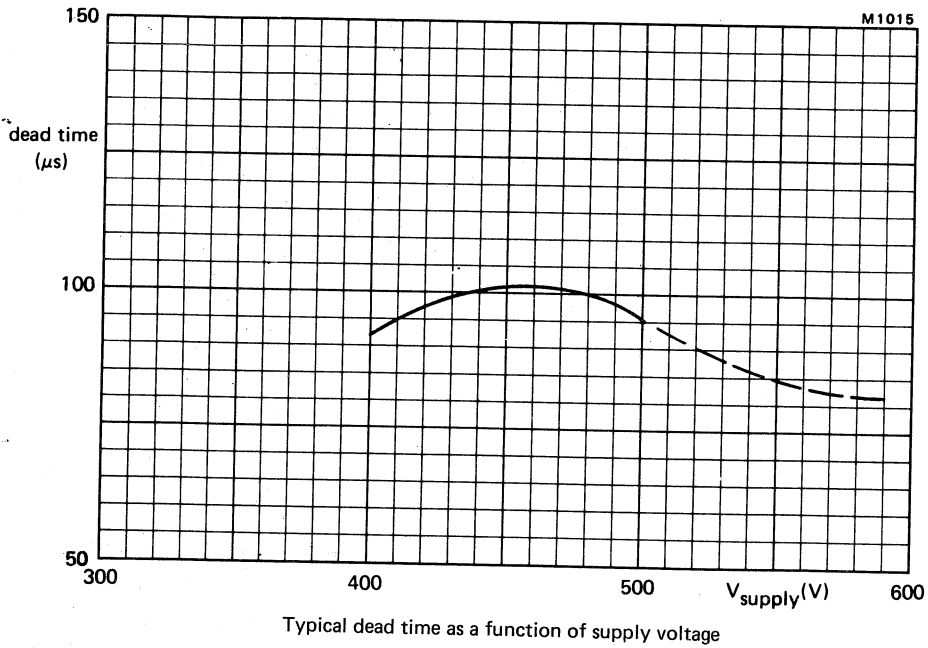
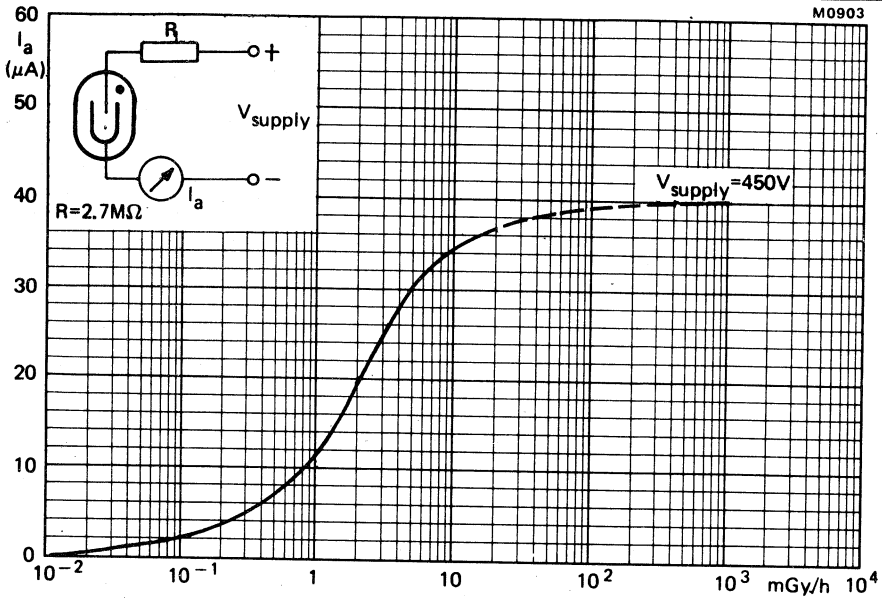


Fig.2





OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	1450	V
Plateau threshold voltage	max.	1600	V
Plateau length		400	V
Recommended supply voltage		1800	V
Plateau slope	max.	0.07	%/V
Background (shielded with 50 mm Pb with an inner liner of 3 mm Al), at recommended supply voltage	max.	25	count/min
Dead time, at recommended supply voltage	max.	110	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	4.7	$\text{M}\Omega$
Anode voltage	max.	2000	V
Ambient temperature			
continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	0	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 10^{10} count

MEASURING CIRCUIT

$R = 4.7\text{ M}\Omega$

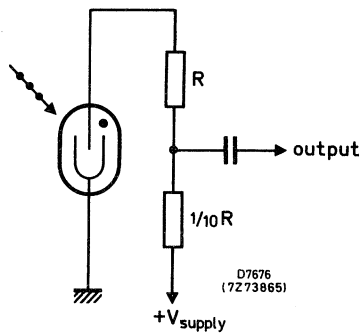
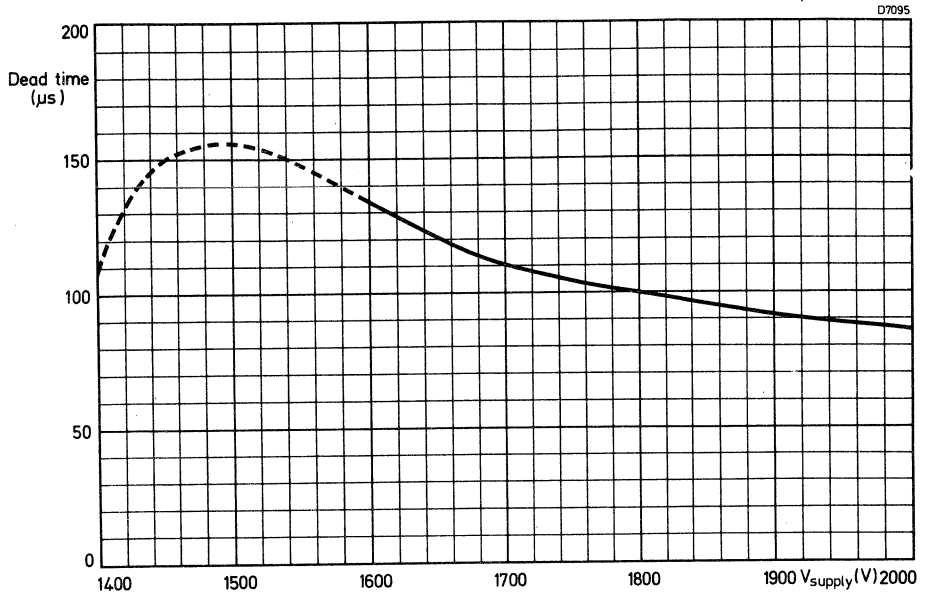


Fig.2



Typical dead time as a function of supply voltage

GEIGER-MÜLLER TUBE

Side window organically quenched X-ray counter tube.

QUICK REFERENCE DATA

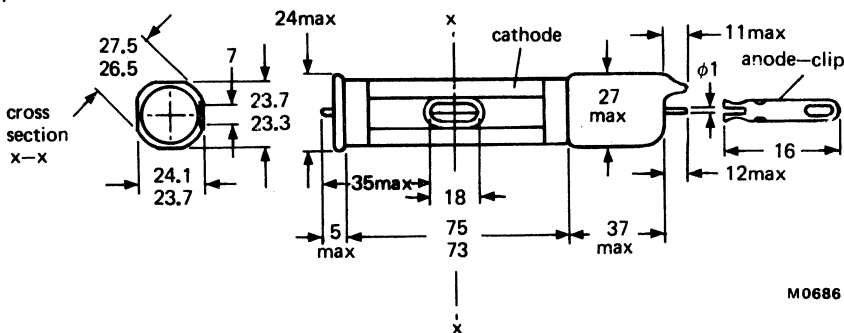
Energy range	2.5 to 40	keV
Wavelength range	0.03 to 0.5	nm
Operating voltage range	1500 to 1800	V
Chrome-iron cathode		
Mica window (7 x 18 mm)	2.0 to 2.5	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm ←

Fig.1



M0686

WINDOW

Thickness	2.0 to 2.5	mg/cm ²
Dimensions	7 x 18	mm
Material	mica	

CATHODE

Sensitive length	67	mm
Material	chrome-iron	

FILLING

Gas pressure	xenon and organic vapour	40	kPa
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CAPACITANCE

Anode to cathode	2.0	pF
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OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Recommended supply voltage (note 1)		1550	V
Geiger threshold voltage	min.	1900	V
Operating voltage for pulse amplitude where $V_p \approx 1\text{ mV}$ (note 2)		1460 to 1540	V
Operating voltage for pulse amplitude where $V_p \approx 10\text{ mV}$ (note 2)		1690 to 1770	V
Energy resolution (notes 2 and 3) see page 3	max.	22	%

LIMITING VALUES (Absolute max. rating system)

Anode voltage	max.	1850	V
Ambient temperature continuous operating	max.	+50	$^{\circ}\text{C}$
	min.	-20	$^{\circ}\text{C}$
storage	max.	+50	$^{\circ}\text{C}$

MEASURING CIRCUIT

$R_1 = 2.2\text{ k}\Omega$

$R_2 = 100\text{ k}\Omega$

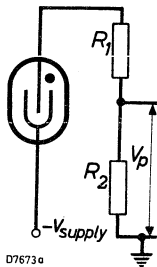
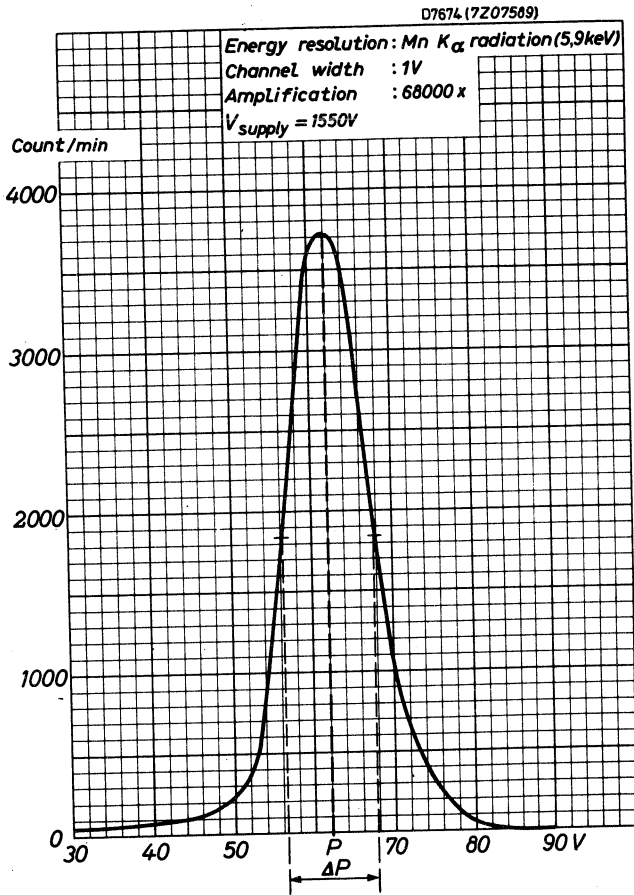


Fig.2

NOTES

1. For maximum tube life, the supply voltage should be kept as low as possible.
2. For Mn $K\alpha$ radiation (5.9 keV)
3. P = average pulse height, ΔP = width of pulse height at half maximum value.



Typical energy resolution curve

GEIGER-MÜLLER TUBE

Halogen quenched cosmic ray guard counter tube for low background measurements in combination with radiation counter tube ZP1441 or ZP1451 in an anti-coincidence circuit.

QUICK REFERENCE DATA

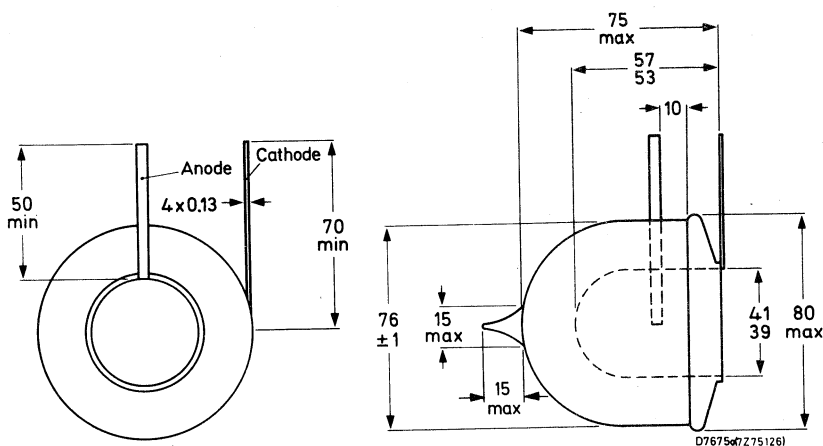
Dose rate range	3×10^{-4} to 3×10^{-1}	mGy/h
Plateau threshold voltage	800	V
Plateau length	400	V
Recommended supply voltage	1000	V
Chrome-iron cathode	760	mg/cm ²

This data must be read in conjunction with General Information Geiger-Müller tubes.

MECHANICAL DATA

Dimensions in mm

Fig.1



CATHODE AND ANODE

Thickness

760 mg/cm²

Material

chrome-iron

FILLING

neon, argon, halogen

CAPACITANCE

Anode to cathode

8.0 pF

OPERATING CHARACTERISTICS (Ambient temperature $\approx 25\text{ }^{\circ}\text{C}$)

Measured in circuit of Fig.2

Starting voltage	max.	650	V
Plateau threshold voltage	max.	800	V
Plateau length		400	V
Recommended supply voltage		1000	V
Plateau slope	max.	0.03	%/V
Background (shielded with 100 mm Fe with an inner liner of 30 mm Pb), at recommended supply voltage, Fe outside	max.	70	count/min
Dead time, at recommended supply voltage	max.	1000	μs

LIMITING VALUES (Absolute max. rating system)

Anode resistor	min.	10	$\text{M}\Omega$
Anode voltage	max.	1200	V
Ambient temperature continuous operating	max.	+70	$^{\circ}\text{C}$
	min.	-40	$^{\circ}\text{C}$
storage	max.	+75	$^{\circ}\text{C}$

LIFE EXPECTANCY

Life expectancy at $\approx 25\text{ }^{\circ}\text{C}$ 5×10^{10} count

MEASURING CIRCUITS

For use as a guard counter tube in an anti-coincidence in combination with ZP1441 or ZP1451, see Fig.3.

$R = 10\text{ M}\Omega$

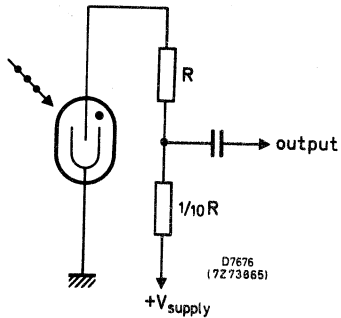


Fig.2

$R_1 = R_2 = 10\text{ M}\Omega$

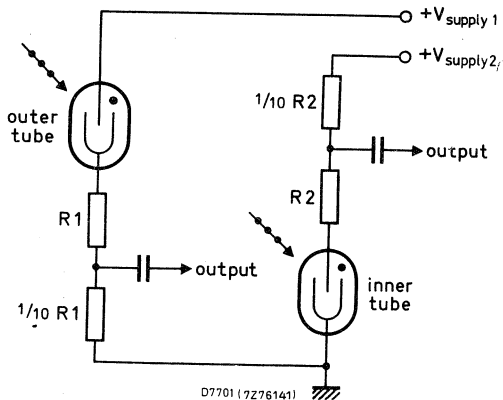
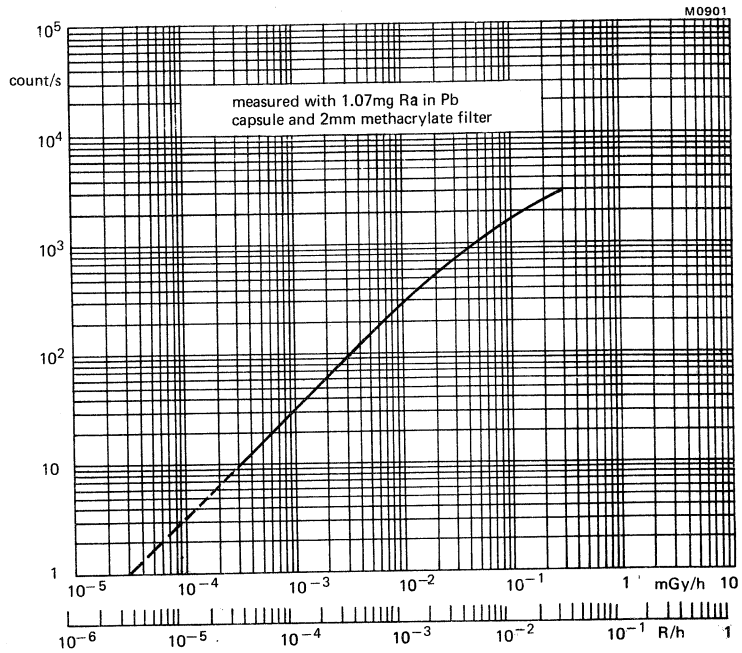


Fig.3



Typical counting rate as a function of dose rate

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