MAGNETIC PRODUCTS

DATA HANDBOOK

Soft Ferrites

BOOK MA01 1993

Philips Components

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In striving for state-of-the-art perfection, we continuously improve components and processes with respect to environmental demands. Our components offer no hazard to the environment in normal use when operated or stored within the limits specified in the data sheet.

Some components unavoidably contain substances that, if exposed by accident or misuse, are potentially hazardous to health. Users of these components are informed of the danger by warning notices in the data sheets supporting the components. Where necessary the warning notices also indicate safety precautions to be taken and disposal instructions to be followed. Obviously users of these components, in general the set-making industry, assume responsibility towards the consumer with respect to safety matters and environmental demands.

All used or obsolete components should be disposed of according to the regulations applying at the disposal location. Depending on the location, electronic components are considered to be 'chemical', 'special' or sometimes 'industrial' waste. Disposal as domestic waste is usually not permitted.

Contents list

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

INTRODUCTION

1.0 THE NATURE OF SOFT FERRITES

1.1 Composition

Ferrites are dark grey or black ceramic materials. They are very hard, brittle and chemically inert. Most modern magnetically soft ferrites have a cubic (spinel) structure.

The general composition of such ferrites is $MeFe_2O_4$ where Me represents one or several of the divalent transition metals such as manganese (Mn), zinc (Zn), nickel (Ni), cobalt (Co), copper (Cu), iron (Fe) or magnesium (Mg).

The most popular combinations are manganese and zinc (MnZn) or nickel and zinc (NiZn). These compounds exhibit good magnetic properties below a certain temperature, called the Curie Temperature (T_c). They can easily be magnetized and have a rather high intrinsic resistivity. These materials can be used up to very high frequencies without laminating as is the normal requirement for magnetic metals.

NiZn ferrites have a very high resistivity and are therefore most suitable for frequencies over 1 MHz but MnZn ferrites exhibit higher permeabilities (μ_i) and saturation induction levels (B_s).

For certain special applications, single crystal ferrites can be produced but the majority of ferrites are manufactured as polycrystalline ceramics.

1.2 Manufacturing process

The following description of the production process is typical for the manufacture of our range of soft ferrites, which is marketed under the trade name "Ferroxcube".

1.2.1 Raw materials

The raw materials used are oxides or carbonates of the constituent metals. The final material grade determines the necessary purity of the raw materials used, which, as a result is reflected in the overall cost.

1.2.2 Proportions of the composition

The base materials are weighed into the correct proportions required for the final composition.

1.2.3 Mixing

The powders are mixed to obtain a uniform distribution of the components.

1.2.4 Pre-sintering

The mixed oxides are calcined at approximately 1000 °C. A solid state reaction takes place between the constituents and, at this stage, a ferrite is already formed.

Pre-sintering is not essential but provides a number of advantages during the remainder of the production process.

1.2.5 Milling and granulation

The pre-sintered material is milled to a specific particle size, usually in a slurry with water. A small proportion of organic binder is added and then the slurry is spray-dried to form granules suitable for the forming process.

1.2.6 Forming

Most ferrite parts are formed by pressing. The granules are poured into a suitable die and then compressed. The organic binder acts in a similar way to an adhesive and a so-called "green" product is formed. It is still very fragile and requires sintering to obtain the real ferrite properties.

For some products, for example, long rods or tubes, the material is mixed into a dough and extruded through a suitable orifice. The final products are cut to the required length before or after sintering.

1.2.7 Sintering

The "green" cores are loaded on refractory plates and sintered at a temperature between 1150 °C and 1300 °C depending on the ferrite grade. A linear shrinkage of up to 20% (50% in volume) takes place. The sintering may take place in tunnel kilns having a fixed temperature and atmosphere distribution or in box kilns where temperature and atmosphere are computer controlled as a function of time. The latter type is more suitable for high grade ferrites which need a very stringent control in conditions.

1.2.8 Finishing

After sintering, the ferrite core has the required magnetic properties, and dimensions are typically within 2% of nominal because of spread in shrinkage. If this tolerance is too large or if some surfaces require a smooth finish (e.g. mating faces between core halves) a grinding operation is necessary. Usually diamond-coated wheels are used. For high permeability materials very smooth, glossy polished, pole faces are required. If an artificial airgap is called for in the application, it may be provided by undercutting the appropriate pole face.

1.3 Magnetism in ferrites

A sintered ferrite consists of small crystals, typically 10 - 20 μm in dimension. Domains exist within these crystals (Weiss domains) in which the molecular magnets are already aligned (ferrimagnetism). When a driving magnetic field (H) is applied to the material the domains progressively align with it, as shown in Fig.1.1.

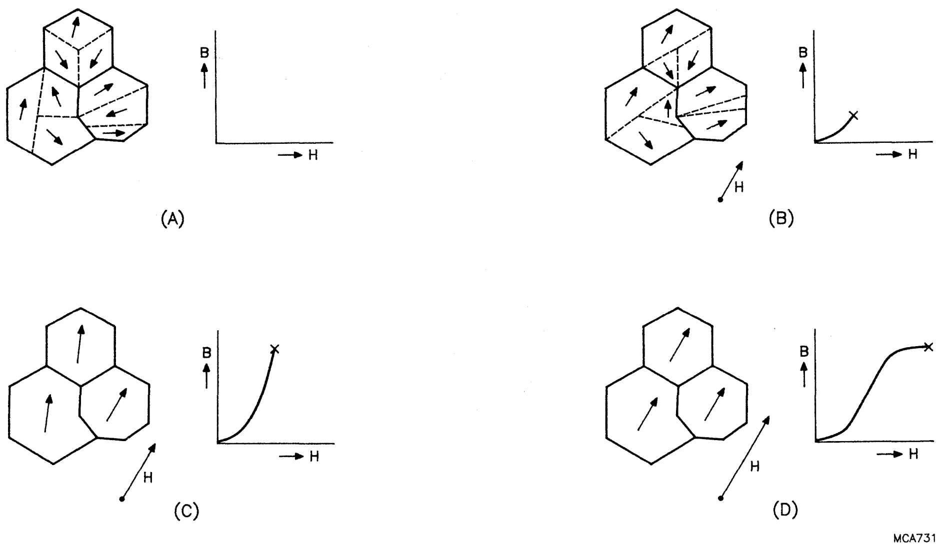


Fig.1.1 Alignment of domains.

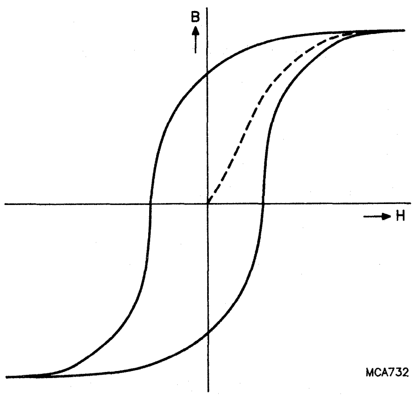


Fig.1.2 Hysteresis loop.

During this magnetization process energy barriers have to be overcome. Therefore the magnetization will always lag behind the field. A so-called hysteresis loop (Fig.1.2) is the result.

If the resistance against magnetization is small, a large induced flux will result at a given magnetic field. The value of the permeability is high. Also the shape of the hysteresis loop has a marked influence on other properties, for example, power losses.

2.0 EXPLANATION OF TERMS AND FORMULAE

2.1 Symbols and units

SYMBOL	UNIT	DESCRIPTION
A_e	mm^2	effective cross-sectional area of a core
A_{min}	mm^2	minimum cross-sectional area of a core
A_L	nH	inductance factor
B	T	magnetic flux density
B_r	T	remanence
B_s	T	saturation flux density
$\hat{B}$	T	peak flux density
C	F	capacitance
D_F	-	disaccommodation factor
f	Hz	frequency
G	µm	gap length
H	A/m	magnetic field strength
H_c	A/m	coercivity
$\hat{H}$	A/m	peak magnetic field strength
I	A	current
l_e	mm	effective magnetic path length
L	H	inductance
N	-	number of turns
P_V	mW/cm^3	specific power loss of core material
Q	-	quality factor
T_c	°C	Curie temperature
V_e	mm^3	effective volume of a core
α_F	K^{-1}	temperature factor of permeability
$\tan\delta/\mu_i$	-	loss factor
η_B	T^{-1}	hysteresis material constant
μ	-	absolute permeability
μ_o	Hm^{-1}	magnetic constant ($4\pi . 10^{-7}$)
μ_s'	-	real component of complex series permeability
μ_s''	-	imaginary component of complex series permeability
μ_a	-	amplitude permeability
μ_e	-	effective permeability
μ_i	-	initial permeability
μ_r	-	relative permeability
μ_Δ	-	incremental permeability
ρ	Ωm	resistivity
$\Sigma(l/A)$	mm^{-1}	core factor (C1)

2.2 Definition of terms

2.2.1 Permeability

When a magnetic field is applied to a soft magnetic material, the resulting flux density is composed of that of free space plus the contribution of the aligned domains.

$B = \mu_o H + J$, or
$B = \mu_o (H + M)$

where $\mu_o = 4\pi . 10^{-7}$ H/m,

J is the magnetic polarization, and
M is the magnetization.

The ratio of flux density and applied field is called absolute permeability.

$$\frac{B}{H} = \mu_o (1 + \frac{M}{H}) = \mu_{absolute}$$

It is usual to express this absolute permeability as the product of the magnetic constant of free space (μ_o) and the relative permeability (μ_r).

$$\frac{B}{H} = \mu_o \mu_r$$

Since there are several versions of μ_r depending on conditions, the index 'r' is generally removed and replaced by the applicable symbol e.g. μ_i, μ_a, μ_Δ etc.

2.2.2 Initial permeability (μ_i)

The initial permeability is measured in a closed magnetic circuit (ring core) using a very low field strength.

$$\mu_i = \frac{1}{\mu_o} \cdot \frac{\Delta B}{\Delta H} (\Delta H \ . \ 0)$$

Initial permeability is dependent on temperature and frequency.

2.2.3 Effective permeability (μ_e)

If an airgap is introduced in a closed magnetic circuit, magnetic polarization becomes more difficult. As a result, the flux density for a given magnetic field strength is lower.

Effective permeability is dependent on the initial permeability (μ_i) of the soft magnetic material and the dimensions of airgap and circuit.

$$\mu_e = \frac{\mu_i}{1 + (G / l_e \cdot \mu_i)}$$

where
G is the gap length, and
l_e is the effective length of magnetic circuit.

2.2.4 Amplitude permeability (μ_a)

The relationship between higher field strength and flux densities without the presence of a bias field is given by the amplitude permeability.

$$\mu_a = \frac{1}{\mu_o} \cdot \frac{\hat{B}}{\hat{H}}$$

Since the BH loop is far from linear, values depend on the applied field peak strength.

2.2.5 Incremental permeability (μ_Δ)

The permeability observed when an alternating magnetic field is superimposed on a static bias field H_{DC} is called the incremental permeability.

$$\mu_\Delta = \frac{1}{\mu_o} [\frac{\Delta B}{\Delta H}] H_{DC}$$

If the amplitude of the alternating field is negligibly small, the permeability is then called the reversable permeability (μ_{rev}).

2.2.6 Complex permeability (μ)

A coil consisting of windings on a soft magnetic core will never be an ideal inductance with phase angle + 90°. There will always be losses of some kind, causing a phase shift δ, which can be represented by a series or parallel resistance as shown in Figs 2.1 and 2.2.

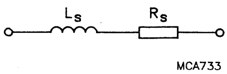


Fig.2.1 Series representation.

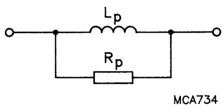


Fig.2.2 Parallel representation.

For series representation,

$$\overline{Z} = j\omega L_s + R_s$$

and for parallel representation,

$$\overline{Z} = \frac{1}{1/j\omega L_p + 1/R_p}$$

The magnetic losses are accounted for if a resistive term is added to the permeability.

$$\mu = \mu_s' - j\mu_s'' \text{ or}$$

$$\frac{1}{\mu} = \frac{1}{\mu_p'} - \frac{1}{\mu_p''}$$

The phase shift caused by magnetic losses is given by:

$$\tan\delta_m = \frac{R_s}{\omega L_s} = \frac{\mu_s''}{\mu_s^{\circ}} \text{ or}$$

$$\tan\delta_m = \frac{\omega L_p}{R_p} = \frac{\mu_p'}{\mu_p''}$$

For calculations on inductors and also to characterise ferrites, the series representation is generally used (μ_s' and μ_s"). In some applications e.g. signal transformers, the use of the parallel representation (μ_p' and μ_p") is more convenient.

The relationship between the representations is given by:

$$\mu_p' = \mu_s' (1 + \tan^2\delta) \text{ , and}$$

$$\mu_p'' = \mu_s'' (1 + \frac{1}{\tan^2\delta})$$

2.2.7 Loss factor ($\tan\delta/\mu_i$)

The magnetic losses which cause the phase shift δ can be split up into three components:

- hysteresis losses
- Eddy current losses
- residual losses.

This gives the formula:

$$\tan\delta_m = \tan\delta_h + \tan\delta_F + \tan\delta_r$$

Figure 2.3 shows the magnetic losses as a function of frequency.

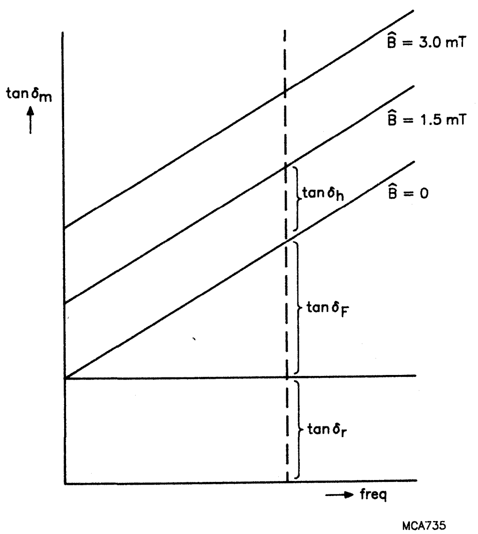


Fig.2.3 Magnetic losses ($\tan\delta_m$) as a function of frequency.

Hysteresis losses vanish for very low field strength. Eddy current losses increase with frequency and are negligible at very low frequency. The remaining part is called residual loss. It can be proven that for a gapped magnetic circuit, the following relationship is valid:

$$\frac{(\tan\delta_m)_{gapped}}{\mu_e - 1} = \frac{\tan\delta_m}{\mu_i - 1}$$

Since μ_i and μ_e are usually much greater than 1, a good approximation is:

$$\frac{(\tan\delta_m)_{gapped}}{\mu_e} = \frac{\tan\delta_m}{\mu_i}$$

From this formula, the magnetic losses in a gapped circuit can be derived from:

$$(\tan\delta_m)_{gapped} = \frac{\tan\delta_m}{\mu_i} \cdot \mu_e$$

Normally, the index 'm' is dropped when material properties are discussed:

$$(\tan\delta)_{gapped} = \frac{\tan\delta}{\mu_i} \cdot \mu_e$$

In material specifications, the loss factor ($\tan\delta/\mu_i$) is used to describe the magnetic losses. These include residual and Eddy current losses, but not hysteresis losses.

For inductors used in filter applications, the quality factor (Q) is often used as a measure of performance. It is defined as:

$$Q = \frac{1}{\tan\delta} = \frac{\omega L}{R_{tot}} = \frac{\text{reactance}}{\text{total resistance}}$$

The total resistance includes the effective resistance of the winding at the design frequency.

2.2.8 HYSTERESIS MATERIAL CONSTANT (η_B)

If the flux density of a core is increased, hysteresis losses are more noticeable. Their contribution to the total losses can be obtained by means of two measurements, usually at the induction levels of 1.5 mT and 3 mT. The hysteresis constant is found from:

$$\eta_B = \frac{\Delta \tan\delta_m}{\mu_e \cdot \Delta\hat{B}}$$

The hysteresis loss factor for a certain flux can be calculated using η_B.

$$\frac{\tan\delta_h}{\mu_e} = \eta_B \cdot B$$

This formula is also the IEC definition for the hysteresis constant.

2.2.9 EFFECTIVE CORE DIMENSIONS ($\Sigma(l/A)$, A_e, l_e, V_e)

To facilitate calculations on non-uniform soft magnetic cores, a set of effective dimensions is given on each data sheet. These dimensions, namely effective area (A_e), effective length (l_e) and effective volume (V_e) define a hypothetical ring core which would have the same magnetic properties as the non-uniform core.

The reactance of the ideal ring core would be:

$$\frac{l_e}{\mu \, . \, A_e}$$

For the non-uniform core shapes, this is usually writtn as:

$$\frac{1}{\mu_e} \cdot \Sigma\frac{l}{A}$$

the core factor being divided by the permeability. The inductance of the core can now be calculated using this core factor:

$$L = \frac{\mu_0 N^2}{\frac{1}{\mu_e} \cdot \Sigma \frac{l}{A}}$$

$$= \frac{1.257 \cdot 10^{-9} N^2}{\frac{1}{\mu_e} \cdot \Sigma \frac{l}{A}} \text{ (in H)}$$

The effective area is used to calculate the flux density in a core,

for sine wave:

$$\hat{B} = \frac{U \sqrt{2} \, . \, 10^9}{\omega \; A_e \; N} \text{ (in mT)}$$

$$= \frac{2.25U \, . \, 10^8}{f \; N \; A_e} \text{ (in mT)}$$

for square wave:

$$\hat{B} = \frac{0.25\hat{U} \, . \, 10^9}{f \; N \; A_e} \text{ (in mT)}$$

where:

A_e is the effective area in mm^2
U is the voltage in V
f is the frequency in Hz
N is the number of turns.

The magnetic field strength (H) is calculated using l_e:

$$\hat{H} = \frac{I \cdot N \cdot \sqrt{2}}{l_e} \text{ (A/m)}$$

If the cross-sectional area of a core is non-uniform, there will always be a point where the real cross-section is minimal. This value is known as A_{min}, and is used to calculate the maximum flux density in a core. A well designed ferrite core avoids a large difference between A_e and A_{min}. Narrow parts of the core could saturate or cause much higher hysteresis losses.

2.2.10 INDUCTANCE FACTOR (A_L)

To make the calculation of the inductance of a coil easier, the inductance factor, known as the A_L value, is given in each data sheet. The inductance of the core is defined as:

$$L = N^2 \quad A_L$$

The value is calculated using the core factor and the effective permeability:

$$A_L = \frac{\mu_o \quad \mu_e \cdot 10^6}{\Sigma \frac{l}{A}}$$

$$= \frac{1.257 \, \mu_e}{\Sigma \frac{l}{A}} \text{ (nH)}$$

2.2.11 MAGNETIZATION CURVES (H_c, B_r, B_s)

If an alternating field is applied to a soft magnetic material, a hysteresis loop is obtained. For very high field strength, the maximum attainable flux density is reached. This is known as the saturation flux density (B_s).

If the field is removed, the material returns to a state where, depending on the material grade, a certain flux density remains. This is the remanent flux density (B_r).

This remanent flux returns to zero for a certain negative field strength which is referred to as coercivity (H_c).

These points are clearly shown in Fig.2.4.

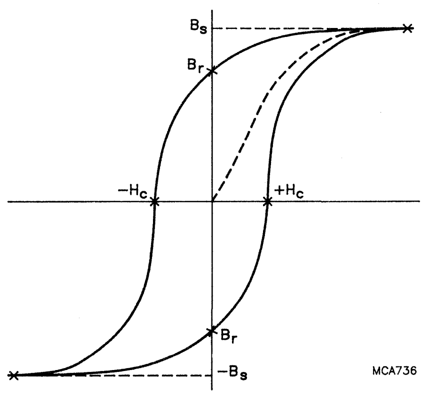


Fig.2.4 Typical BH curve showing points B_s, B_r and H_c.

2.2.12 TEMPERATURE DEPENDENCY OF THE PERMEABILITY (T_c, α_F)

The permeability of a ferrite is a function of temperature. It generally increases with temperature to a maximum value and then drops sharply to a value of 1. The temperature at which this happens is called the Curie temperature (T_c). Typical curves of our grades are given in the material data section.

For filter applications, the temperature dependence of the permeability is a very important parameter. A filter coil should be designed in such a way that the combination it forms with a high quality capacitor results in a LC filter with an excellent temperature stability.

The temperature coefficient (TC) of the permeability is given by:

$$TC = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)_{T1}} \cdot \frac{1}{T_2 - T_1}$$

For a gapped magnetic circuit, the influence of the permeability temperature dependence is reduced by the factor μ_e/μ_i. Hence:

$$TC_{gapped} = \frac{\mu_e}{(\mu_i)_{T1}} \cdot \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)^2_{T1}} \cdot \frac{1}{T_2 - T_1}$$

$$= \mu_e \ \alpha_F \text{, so}$$

$$\alpha_F = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)^2_{T1}} \cdot \frac{1}{T_2 - T_1}$$

Or, to be more precise, if the change in permeability over the specified area is rather large:

$$\alpha_F = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)_{T1} \ (\mu_i)_{T2}} \cdot \frac{1}{T_2 - T_1}$$

The temperature factors (α_F) for several temperature trajectories of the grades intended for filter applications are given in the material specifications. They offer a simple means to calculate the temperature coefficient of any coil made with these ferrites.

2.2.13 Time stability

When a soft magnetic material is given a magnetic or thermal disturbance, the permeability rises suddenly and then decreases slowly with time. For a defined time interval, this 'disaccommodation' can be expressed as:

$$D = \frac{\mu_1 - \mu_2}{\mu_1}$$

The decrease of permeability appears to be almost proportional to the logarithm of time. For this reason, IEC has defined a disaccommodation coefficient:

$$d = \frac{\mu_1 - \mu_2}{\mu_1 \log_{10}(t_2/t_1)}$$

As with temperature dependence, the influence of disaccommodation on the inductance drift of a coil will be reduced by μ_e/μ_i.

Therefore, a disaccommodation factor D_F is defined:

$$D_F = \frac{d}{\mu_i} = \frac{\mu_1 - \mu_2}{\mu_1^2 \log_{10}(t_2/t_1)}$$

The variability with time of a coil can now be predicted by:

$$\frac{L_1 - L_2}{L_1} = \mu_e \ D_F$$

2.2.14 Resistivity (ρ)

Ferrite is a semiconductor with a DC resistivity in the crystallites of the order of 10^{-3} Ωm for a MnZn type ferrite, and about 30 Ωm for a NiZn ferrite.

Since there is an isolating layer between the crystals, the bulk resistivity is much higher: 0.1 - 10 Ωm for MnZn ferrites and 10^4 - 10^6 Ωm for NiZn and LiZn ferrites.

This resistivity depends on temperature and measuring frequency, which is clearly demonstrated in Tables 2.1 and 2.2 which show resistivity as a function of temperature for different material grades and types.

Table 2.1 Resistivity as a function of temperature - grade 3C80

TEMPERATURE (°C)	RESISTIVITY (Ωm)
-20	≈ 10
0	≈ 7
20	≈ 4
50	≈ 2
100	≈ 1

Table 2.2 Resistivity as a function of temperature - grade 4C6

TEMPERATURE (°C)	RESISTIVITY (Ωm)
0	≈ 5.10^7
20	≈ 10^7
60	≈ 10^6
100	≈ 10^5

At higher frequencies the crystal boundaries are more or less short circuited by their capacitance and the measured resistivity decreases, as shown in Tables 2.3 and 2.4.

Table 2.3 Resistivity as a function of frequency - MnZn ferrites

FREQUENCY (MHz)	RESISTIVITY (Ωm)
0.1	≈ 2
1	≈ 0.5
10	≈ 0.1
100	≈ 0.01

Table 2.4 Resistivity as a function of frequency - NiZn ferrites

FREQUENCY (MHz)	RESISTIVITY (Ωm)
0.1	≈ 10^5
1	≈ 5.10^4
10	≈ 10^4
100	≈ 10^3

2.2.15 PERMITTIVITY (ε)

The basic permittivity of all ferrites is of the order of 10. This is valid for MnZn and NiZn materials . Also the isolating material on the grain boundaries has a permittivity of approximately 10. However, if the bulk permittivity of a ferrite is measured, very different values of apparent permittivity result. This is caused by the conductivity inside the crystallites. The complicated network of more or less leaky capacitors also shows a strong frequency dependance.

Tables 2.5 and 2.6 show the relationship between permittivity and frequency for both MnZn and NiZn ferrites.

Table 2.5 Permittivity as a function of frequency - MnZn ferrites

FREQUENCY (MHz)	PERMITTIVITY (ε_r)
0.1	≈ 2.10^5
1	≈ 10^5
10	≈ 5.10^4
100	≈ 10^4

Table 2.6 Permittivity as a function of frequency - NiZn ferrites

FREQUENCY (MHz)	PERMITTIVITY (ε_r)
0.001	≈100
0.01	50
1	25
10	15
100	12

3.0 QUALITY

Our ferrite cores are produced to meet constantly high quality standards. High quality components in mass production require advanced production techniques as well as background knowledge of the product itself. The quality standard is achieved in our ferrite production centres by implementation of a quality assurance system based on Statistical Process Control (SPC).

To implement SPC, the production is divided in stages which correspond to production steps or groups of steps. The output of each stage is statistically checked in accordance with MIL STD 414 and 105D.

The obtained results are measured against built-in control, warning and reject levels. If an unfavourable trend is observed in the results from a production stage, corrective action is immediately taken. Quality is no longer 'inspected-in', but 'built-in' by continuous improvement.

The system is applicable for the total manufacturing process including,

- raw materials
- production process, and
- finished products.

All our production centres are aiming to comply with the ISO 9000 quality system.

3.1 Aspects of quality

When describing the quality of a product, three aspects must be taken into account:

- Delivery quality
- Fitness for use
- Reliability

3.1.1 Delivery quality

After production, the ferrite components are tested once again for their main characteristics. Tests are conducted in accordance with the guidelines specified by the CENELEC Electronic Components Committee (CECC). A sampling system, in accordance with IEC 410 is used, and the Acceptable Quality Levels (AQL's) are set for different classes of defect, major defects having lower AQL's than minor defects.
Customers may follow the same system to carry out incoming inspections. If the percentage of defects does not exceed the specified level, the probability that the batch will be accepted is high (> 90%), but rejection is still possible.

If the reject level is much lower than specified, quality complaints will disappear. We aim at very low reject levels to eventually allow any customers to dispose with incoming inspection.

3.1.2 Fitness for use

This is a measure of component quality up to the point where the component has been assembled into the equipment and is quoted in parts per million (PPM). After assembly, the component should function fully. The PPM concept covers the possibility of failures that occur during assembly. It includes line rejects that may occur for any reason.

For ferrite cores, co-operation between the component supplier and the customer is a very important aspect. The core is generally a building block for a wound component and many things can go wrong during the assembly process, but the core is not always the problem. A mutual quality control programme can be established to minimize line rejects for a specific application. For some product lines, levels of 50 PPM have already been realized.

3.1.3 Reliability

Ferrite cores are known for their reliability. Once the assembly process has been successfully concluded, no real threats for the life of the ferrite are known.

Reliability is mainly governed by the quality of the total assembly of the wound component. Extreme thermal shocks should be avoided. Some data are available for RM cores assembled with the recommended Philips bobbins and clips.

– Vibration test, IEC 68-2-6 (test Fc)

- no failures
- less than 0.1% drift of inductance value

– Bump test, IEC 68-2-29 (test Eb)

- no failures
- less than 0.03% drift of inductance value

3.2 Classification of defects

If a component does not comply with the specification published in this handbook, it is considered to be defective. Defects are divided into two classes:

- Major defects

These defects lead to a malfunction of the finished wound components.

- Minor defects

These defects do not have a severe influence on the function of the wound component. Often, they have a negative effect on the visual appearance of the end product, or they slightly disturb the assembly process.

Table 3.1 Classification of defects per product line

CORE TYPE	CLASSIFICATION OF FAILURES	
	MAJOR DEFECTS	MINOR DEFECTS
RM P X EP H PH	• A_L • critical dimensions	• power loss • secondary dimensions
E EFD ETD/ER EC U I	• A_L • critical dimensions	• power loss • secondary dimensions
ring cores rods tubes beads wideband chokes	• A_L min • critical dimensions • Z min	• A_L max • power loss • dielectric strength of coating • secondary dimensions

Table 3.2 AQL values and inspection levels

CORE TYPE	APPLICATION AREA	FAULT TYPE	CLASSIFICATION OF FAULT			
			MAJOR		MINOR	
			AQL	LEVEL	AQL	LEVEL
P RM X	filter applications	electrical mechanical	1% 0.65%	(I) (I)	2.5% 4%	(S3) (S3)
P RM X EP H	general transformer applications	electrical mechanical	1.5% 0.65%	(S4) (I)	4% 4%	(S3) (S3)
E EFD ETD/ER EC U I		electrical mechanical	1% 1%	(I) (I)	4% 4%	(S3) (S3)
ring cores rods, tubes beads chokes		electrical mechanical	0.65% 0.65%	(S3) (S3)	2.5% 2.5%	(S3) (S3)

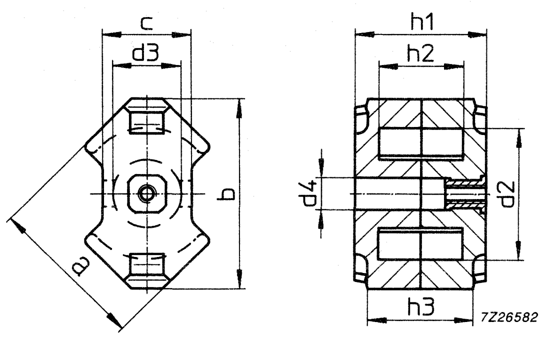


Fig.3.1 RM core.

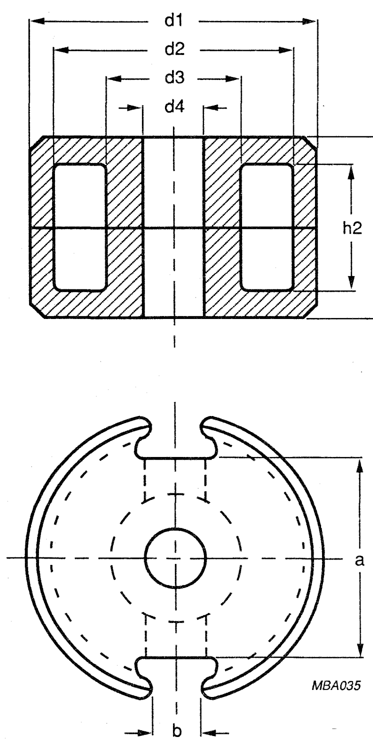


Fig.3.2 P core.

Table 3.3 Classification of mechanical defects

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
RM	3.1	h_2 min.	a
		h_3	b
		d_2 min.	c
		d_3 max.	h_1
		d_4	h_2 max.
			d_2 max.
			d_3 min.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
P	3.2	h_2 min.	a
		d_2 min.	b
		d_3 max.	h_1
		d_1 max.	h_2 max.
		d_4	d_2 max.
			d_3 min.
			d_1 min.

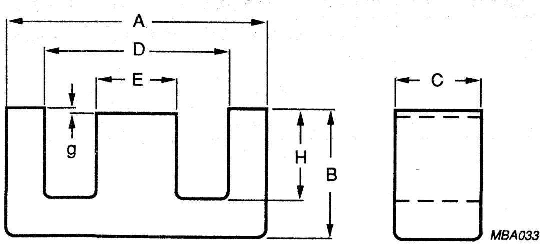


Fig.3.3 E core.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
E	3.3	A max.	A min.
		B max.	B min.
		C max.	C min.
		D min.	D max.
		E max.	E min.
		H min.	H max.

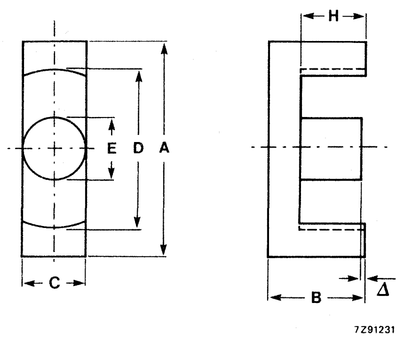


Fig.3.4 ETD core.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
ETD/ER EFD	3.4	A max.	A min.
		B max.	B min.
		C max.	C min.
		D min.	D max.
		E max.	E min.
		H min.	H max.

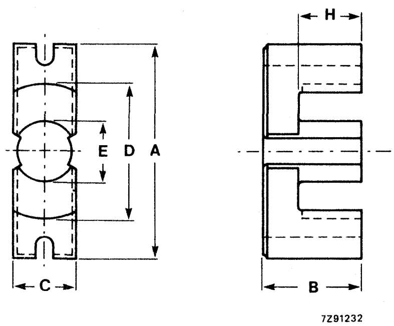


Fig.3.5 EC core.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
EC	3.5	A max.	A min.
		B max.	B min.
		C max.	C min.
		D min.	D max.
		E max.	E min.
		H min.	H max.

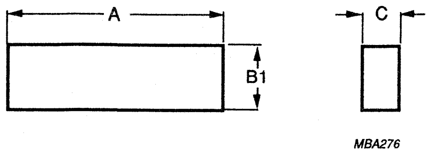


Fig.3.6 I core.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
I	3.6		A
		B max.	B1 min.
		C max.	C min.

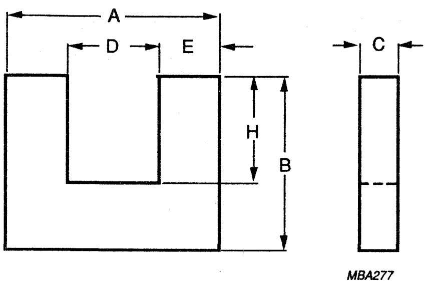


Fig.3.7 U cores.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
U	3.7		A
			B
		C max.	C min.
		D min.	
		E max.	E min.
		H min.	

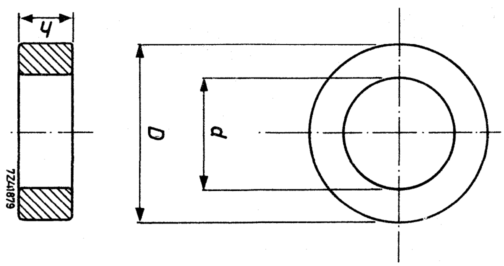


Fig.3.8 Ring cores.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
ring cores	3.8	h max.	h min.
		D max.	D min.
		d min.	d max.

CORE TYPE	FIG. NO	FAULT CLASSIFICATION	
		MAJOR FAULT	MINOR FAULT
rods,	3.9	D max.	D min.
tubes,		d min.	d max.
beads,			L
multi-hole tubes			H

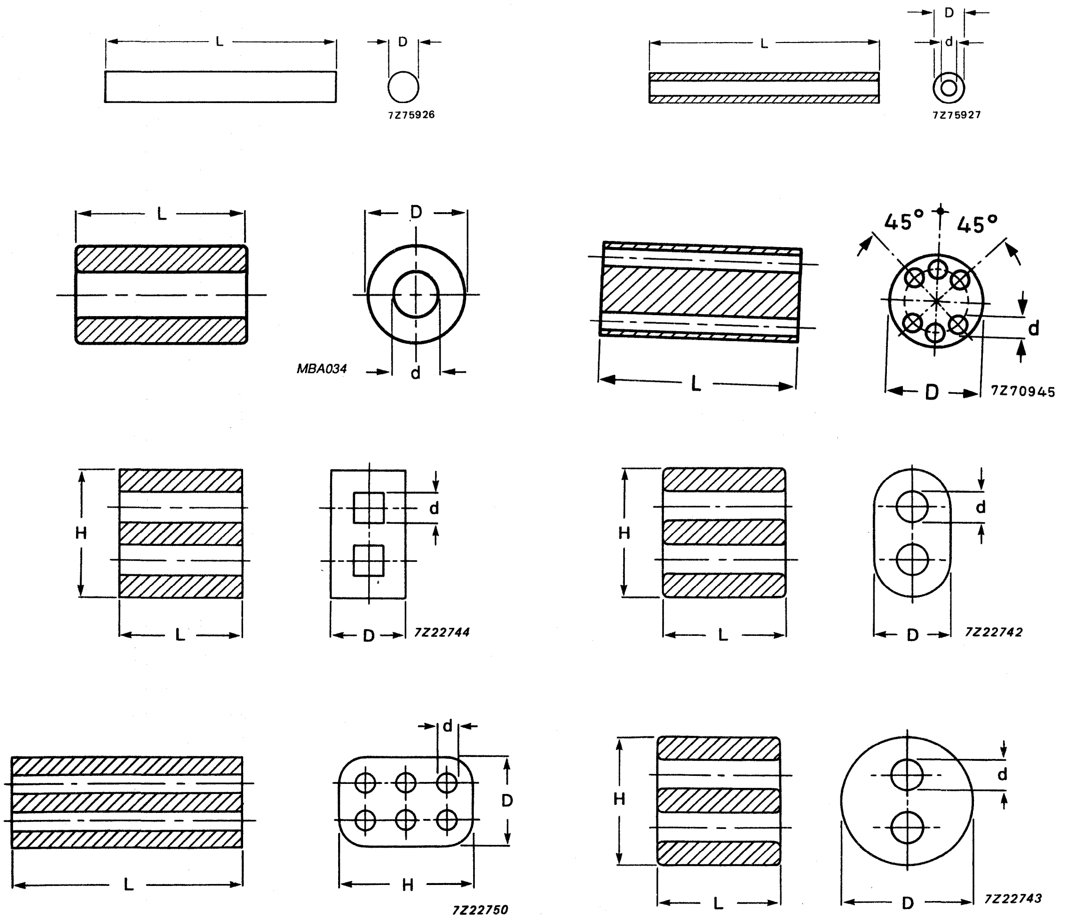


Fig.3.9 Rods, tubes, beads, multi-hole tubes.

4.0 ORDERING INFORMATION

The products in this handbook are identified by an 11 digit code number. All physical and technical properties of the product are described by these 11 digits. It is therefore recommended for use on technical drawings and equipment parts lists.

This 11 digit code may also appear on some packing material inside boxes, e.g. on blister packs for P cores and RM cores.

Smallest Packing Quantities (SPQ) are packs which are ready for shipment to our customers. The information on the labels consists of:

technical information:	name of product
	11 digit code number
	delivery and/or production batch numbers.
logistic information:	12 digit code number
	quantity
	country of origin
	production week
	production centre.

The Philips 12 digit code used on the packing labels, provides full logistic information as well.

The 12th digit is used as packing indicator. Products in standard packing quantities have a last digit ranging from 1 to 6. The current number is a result of developments in the past. For a range of preferred products, smaller packing units are also available for sampling and design-in support. These are identified by a '9' as the 12th digit.

During all stages of the production process, data are collected and documented with reference to a unique batch number. With this batch number it is always possible to trace the results of process steps afterwards. In case of customer complaints the batch number should always be referred to. It is printed on the label of the product packing.

```
4322 020 9252
CH 10
BATCH 5000
ORIG A670   RPC KB
QTY 100     DATE 9211
TYPE RNG76/38/13-8C11
CODENO 4322 020 92521
```

	=11 NC product code
	=production code
BATCH	=batchnumber
ORIG	=country of origin
RPC	=production center
QTY	=quantity
DATE	=production week
TYPE	=product type description
CODENO	=ordering code

ENVIRONMENTAL ASPECTS OF SOFT FERRITES

Our range of soft ferrites has the general composition $MeFe_2O_4$ where Me represents one or several of divalent transition metals such as manganese (Mn), zinc (Zn), nickel (Ni), or magnesium (Mg). Most popular combinations are manganese and zinc (MnZn) or nickel and zinc (NiZn).

To be more specific, all grades starting with digit 3 are based on the MnZn composition. The main constituents of, for instance, 3C85 are:

Fe_2O_3	71%
MnO	20%
ZnO	9%

Grades starting with digit 4 are based on the NiZn composition. As an example, the main constituents of 4A11 are:

Fe_2O_3	50%
NiO	24%
ZnO	26%

General warning rules

- With strong acids, the metals iron, manganese, nickel and zinc may be extracted on a small scale.
- In the event of a fire, dust particles with metal oxides will be formed.
- Disposal with industrial waste, depending on local rules and circumstances.

5.0 APPLICATIONS

Soft ferrites are used wherever effective coupling between an electric current and a magnetic flux is required.

They form an essential part of inductors and transformers used in todays main application areas:

- Telecommunications
- Power conversion
- Interference suppression.

The function that the soft magnetic material performs may be one or more of the following:

Filtering

Filter network with well defined pass-band.
High Q-values for selectivity, good temperature stability.

Material requirements:
- low losses
- defined temperature factor to compensate temperature drift of capacitor
- very stable with time.

(4C6, 3D3, 3H3, 3H1)

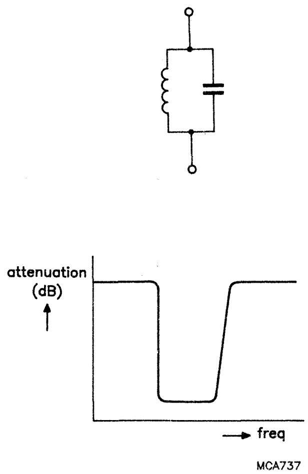


Fig.5.1 Filter application.

Blocking/suppression/decoupling

Unwanted high frequency signals are blocked, wanted signals can pass.
Coupling and decoupling.

Material requirements:
- high impedance in covered frequency range.

(3E25, 3C11, 3C85, 3F3, 4A11, 4A15, 4C65, 3S1, 4S2)

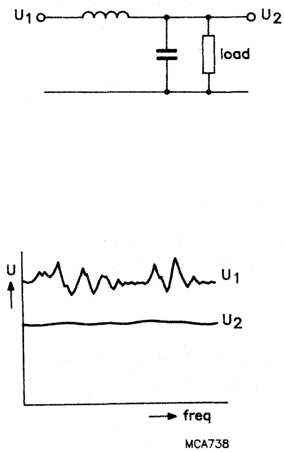


Fig.5.2 Blocking/suppression/decoupling application.

Delaying pulses

The inductor will block current until saturated. Leading edge is delayed depending on design of magnetic circuit.

Material requirements:
• high permeability.

(3E25, 3E5)

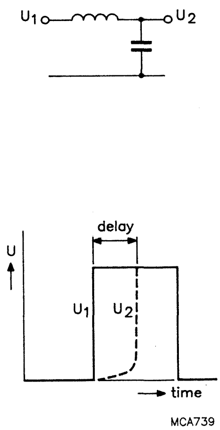


Fig.5.3 Pulse delay application.

Smoothing/storage of energy

Inductor stores energy and delivers it to the load during the off-time of a Switched Mode Power Supply (SMPS).

Material requirements:
• high saturation level.

(3C85, 3C80, 3F3, 2P-iron powder grade)

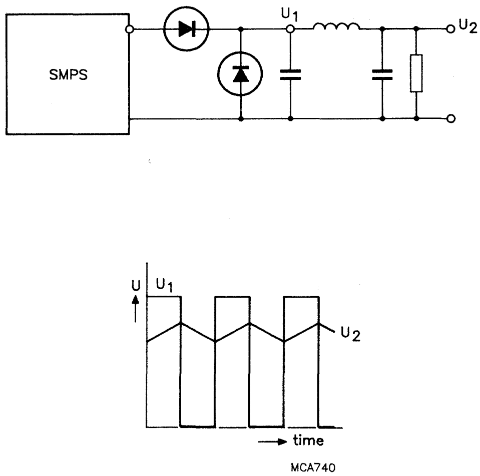


Fig.5.4 Smoothing/storage application.

Pulse transformers/general purpose transformers

Pulse or AC signals are transmitted and if required transformed to a higher or lower voltage level.
Galvanic separation.
Safety requirements.
Impedance matching.

Material requirements:
- high permeability
- low distortion
- low DC sensitivity.

(3B3, 3H1, 3C11, 3E1, 3E4, 3E25, 3E5, 3E6)

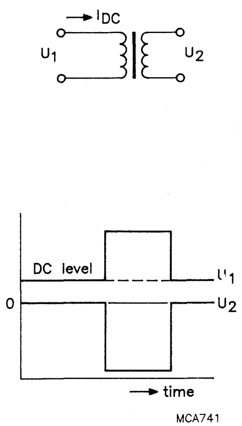


Fig.5.5 Pulse and general purpose transformer application.

Power transformers

Transformer transmits energy, transforms voltage to required level and provides galvanic separation (safety).

Material requirements:
- low power losses
- high saturation.

(3C80, 3C10, 3C85, 3F3, 3F4, 4F1)

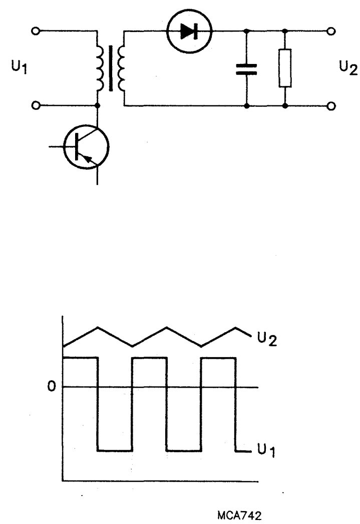


Fig.5.6 Power transformer application.

Tuning

LC filters are often used to tune circuits in audio, video and measuring equipment.
Narrow bandwidth often not wanted.

Material requirements:

- moderate losses up to high frequencies
- reasonable temperature stability.

(3D3, 4A11, 6B1, 4C65, 4D1, 4E1, 1P-iron powder grades)

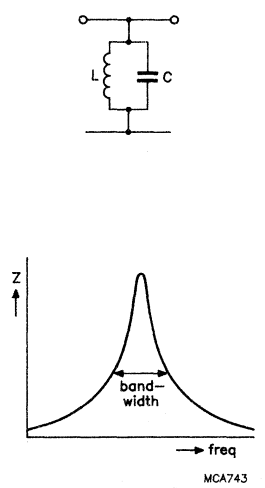


Fig.5.7 Tuning application.

5.1 Ferrites for telecommunications

Telecommunications is the first important branch of technology where ferrites have been used on a large scale. Today, against many predictions, it still is an important, growing market for ferrite cores.

Most important applications are in:

- filter coils, and
- pulse and matching transformers

5.1.1 FILTER COILS

P cores, RM cores and X cores have been developed specially for this application.

The P core is the oldest design. It is still rather popular because the closed shape provides excellent magnetic screening.

RM cores are a later design, leading to a more economic usage of the surface area on the PCB. X cores also have this advantage plus more room to get the leads out of the coil.

For filter coils, the following design parameters are important:

- low losses, high Q value
- precise inductance value
- high stability over periods of time
- fixed temperature dependence.

5.1.1.1 Q values

The quality factor (Q) of a filter coil should generally be as high as possible. For this reason filter materials such as 3H3, 3D3 and 4C6 have low magnetic losses in their frequency ranges (100 kHz, 2 MHz and 10 MHz respectively).

Losses in a coil can be divided into:

- winding losses, due to:
  the DC resistance of the wire
  eddy-current losses in the wire
  dielectric losses in insulation.
- core losses, due to:
  hysteresis losses in the core material
  eddy-current and residual losses in the core material.

Losses appear as series resistances in the coil.

$$\frac{R_{tot}}{L} = \frac{R_0}{L} + \frac{R_{ec}}{L} + \frac{R_d}{L} + \frac{R_h}{L} + \frac{R_{e+r}}{L} \ (\Omega/H)$$

As a general rule, maximum Q is obtained when the sum of the winding losses is made equal to the sum of the core losses.

DC resistive losses

The DC resistive losses in a winding are given by:

$$\frac{R_0}{L} \ (\Omega/H)$$

Eddy-current losses in the winding

The eddy-current losses in a winding are given by:

$$\frac{R_{ec}}{L} = \frac{C_{wCu} V_{Cu} f^2 d^2}{\mu_e} \ (\Omega/H)$$

Where C_{wCu} is the eddy-current loss factor for the winding and depends on the dimensions of the coil former and core, and V_{Cu} is the volume of conductor in mm^3; d is the diameter of a single wire in mm.

Dielectric losses

The capacitances associated with the coil are not loss free. They have a loss factor ($\tan\delta_c$) which also increases the effective coil resistance:

$$\frac{R_d}{L} = \omega^3 LC \left(\frac{2}{Q} + \tan\delta_c\right) \ (\Omega/H)$$

Hysteresis losses

The effective series resistance due to hysteresis losses is calculated from the core hysteresis constant, the peak flux density, the effective permeability and the operating frequency:

$$\frac{R_h}{L} = \omega\eta B\hat{B}\mu_e \; (\Omega/H)$$

Eddy-current and residual losses

The effective series resistance due to eddy-current and residual losses is calculated from the loss factor ($\tan\delta/\mu i$).

$$\frac{R_{e+r}}{L} = \omega\mu_e \, (\tan\delta/\mu_i) \; (\Omega/H)$$

5.1.1.2 Coil design

The specification of an inductor usually includes:

- the inductance
- minimum Q at the operating frequency
- applied alternating voltage
- maximum size
- maximum and minimum temperature coefficient
- range of adjustment
- variability.

To satisfy these requirements, the designer has the choice of:

- core size
- material grade
- A_L value
- type of conductor (solid or bunched)
- type of adjuster.

5.1.1.3 Frequency, core type and material grade

The operating frequency is a useful guide to the choice of core type and material.

- Frequencies below 20 kHz: the highest Q will be obtained with large, high inductance-factor cores in Ferroxcube 3H1 or 3H3 material. Winding wire should be solid, with minimum-thickness insulation.

Note: high inductance factors are associated with high temperature coefficients of inductance.

- Frequencies between 20 kHz and 200 kHz; high Q will generally be obtained with a core also in Ferroxcube 3H1 or 3H3. Maximum Q will not necessarily be obtained from the largest-size core, particularly at higher frequencies, so the choice of inductance factor is less important. Bunched, stranded conductors should be used to reduce eddy-current losses in the copper. Above 50 kHz, the strands should not be thicker than 0.07 mm.

- Frequencies between 200 kHz and 2 MHz; use a core of Ferroxcube 3D3 material. Bunched conductors of maximum strand diameter 0.04 mm are recommended.

- Frequencies between 2 MHz and 12 MHz; use a core of Ferroxcube 4C6. Bunched conductors of maximum strand diameter 0.04 mm are recommended for frequencies up to 5 MHz. Solid conductors should be used at frequencies between 5 MHz and 12 MHz.

5.1.1.4 Signal level

In most applications, the alternating signal voltage is low. It is good practice wherever possible, to keep the operating flux density of the core below 1 mT, at which level the effect of hysteresis is usually negligible. At higher flux densities, it may be necessary to allow for some hysteresis loss and inductance change.

The expression for third harmonic voltage U_3 ($U_3/U_1 \approx 0.6\tan\delta_h$) may be used as a guide to the amount of distortion. For low distortion, RM cores with small hysteresis loss factors should be used.

5.1.1.5 DC polarization

The effect of a steady, superimposed magnetic field, whether due to an external field or a DC component of winding current on a cored inductor, reduces the inductance obtained with a given number of turns. As with other characteristics, the amount of the decrease depends on the value of the effective permeability, becoming less at lower permeabilities. However, for most applications the effect is not serious. Ferroxcube material grade 3B8 has been developed specially for applications involving DC polarization.

5.1.1.6 Design procedure

(i) On the basis of the operating characteristics and design limitations, select the core size, material grade, inductance factor and conductor type using the information given in the data sheets.

(ii) Check that the range of adjustment is sufficient to cover the tolerance on A_L or μ_e and that of the resonating capacitor. Make an allowance of about 1% for circuit strays.

(iii) Calculate the number of turns required from the A_L or α value for the core.

(iv) Select a conductor size to fill the coilformer.

(v) From the voltage across the inductor (E_{RMS}), determine the peak flux density (B). If this is in excess of 1 mT, check that the hysteresis loss and distortion are acceptable.

The iso-Q curve shown in Fig.5.8 is an example of what can be achieved using a RM6-s core in material grade 3H1.

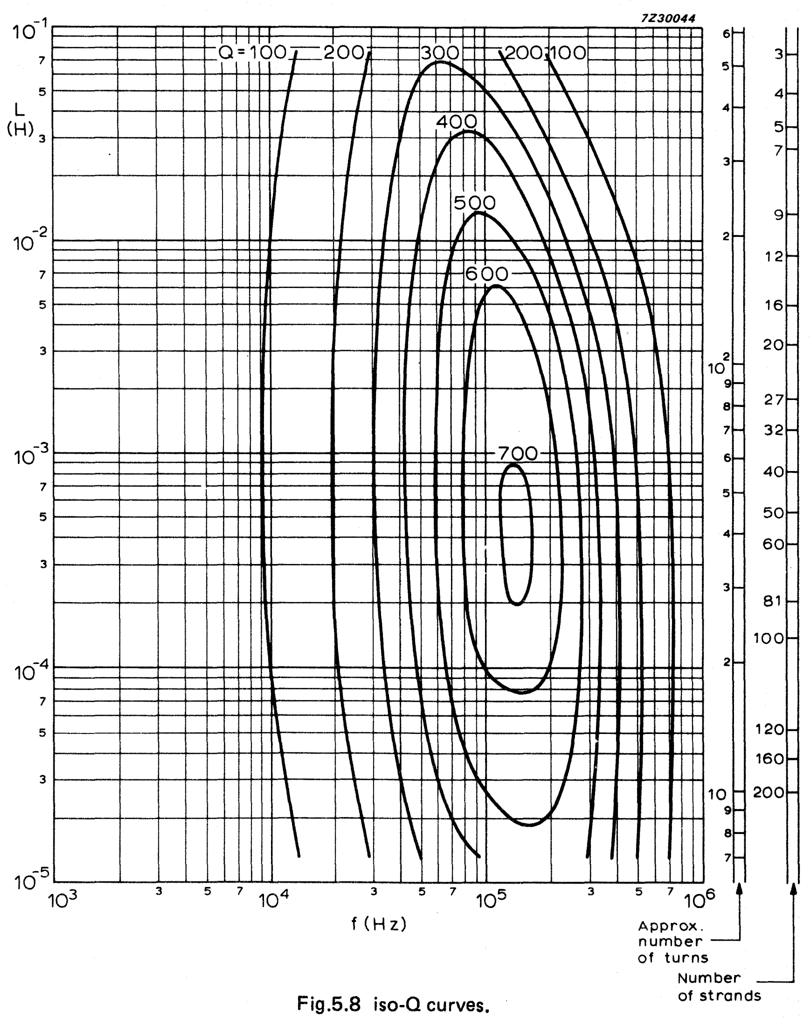


Fig.5.8 iso-Q curves.

5.1.1.7 A_L value

Since the airgap in pot cores, square cores and cross cores can be ground to any length, any value of A_L can be provided within the limits set by the core size. In practice, the range of A_L values has been standardized with values chosen to cover the majority of application requirements.

If a core set is provided with an asymmetrical airgap, this airgap is ground in the upper half. This half is marked with the FXC grade and A_L value.

Most pre-adjusted cores are provided with an injection-moulded nut for the adjuster.

Continuously variable adjusters can be supplied for pre-adjusted cores of most A_L values. These are specially recommended for filter coils; maximum adjustment range is 10% to 30%, depending on core type.

5.1.1.8 α and A_L factors

The α factor for a given core is the number of turns required for an inductance of 1 mH. For other values of inductance, $N = \alpha\sqrt{L}$, where L is the inductance in mH (10^{-3} H).

The A_L factor is the inductance per turn squared (in nH) for a given core.

$L = N^2A_L$, L in nH (10^{-9} H).

The measured A_L value of a core will depend slightly on the coil used for this measurement.

For very low A_L values (e.g. 16 or 25) the contribution of the stray inductance will be quite high, resulting in a marked influence of the position of the coil in the core and its number of turns.

5.1.1.9 Conversion from μ_e to α and A_L values

Figs 5.9 to 5.11 provide a quick reference to convert μ_e values into α and A_L values (or vice versa).

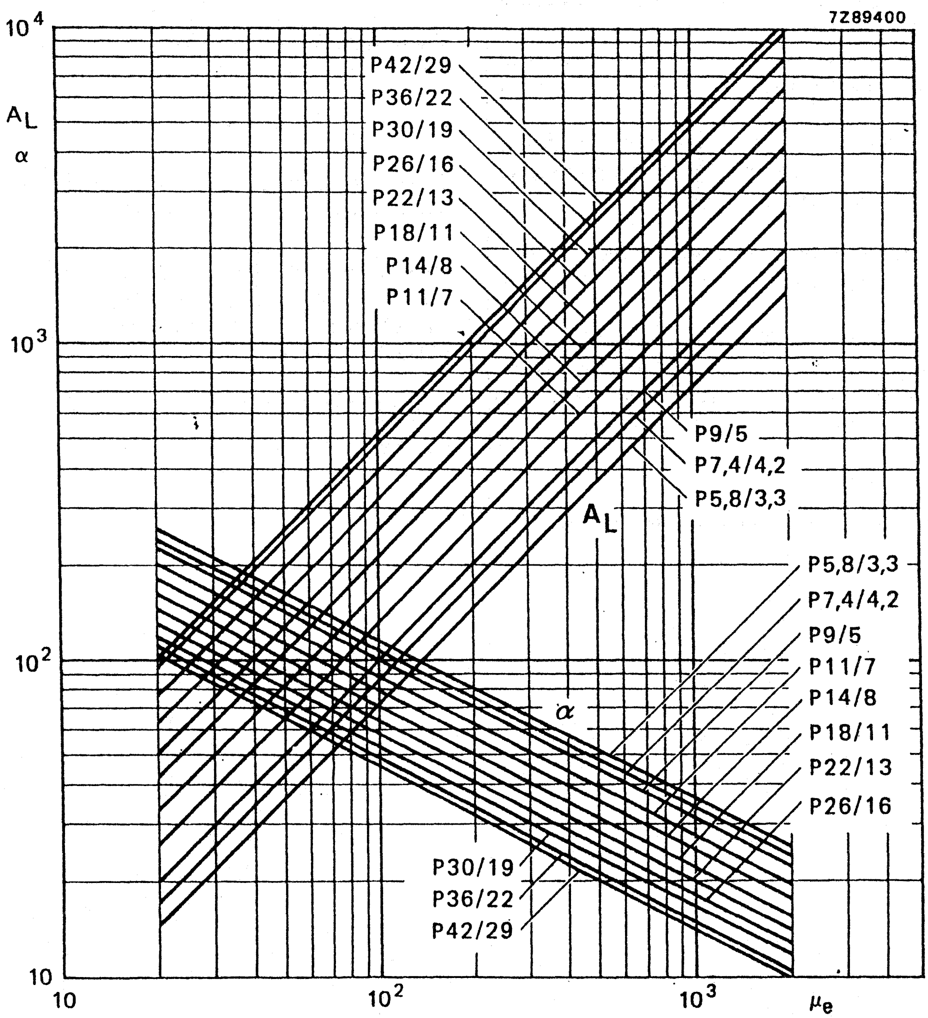


Fig.5.9 Conversion graph for P cores.

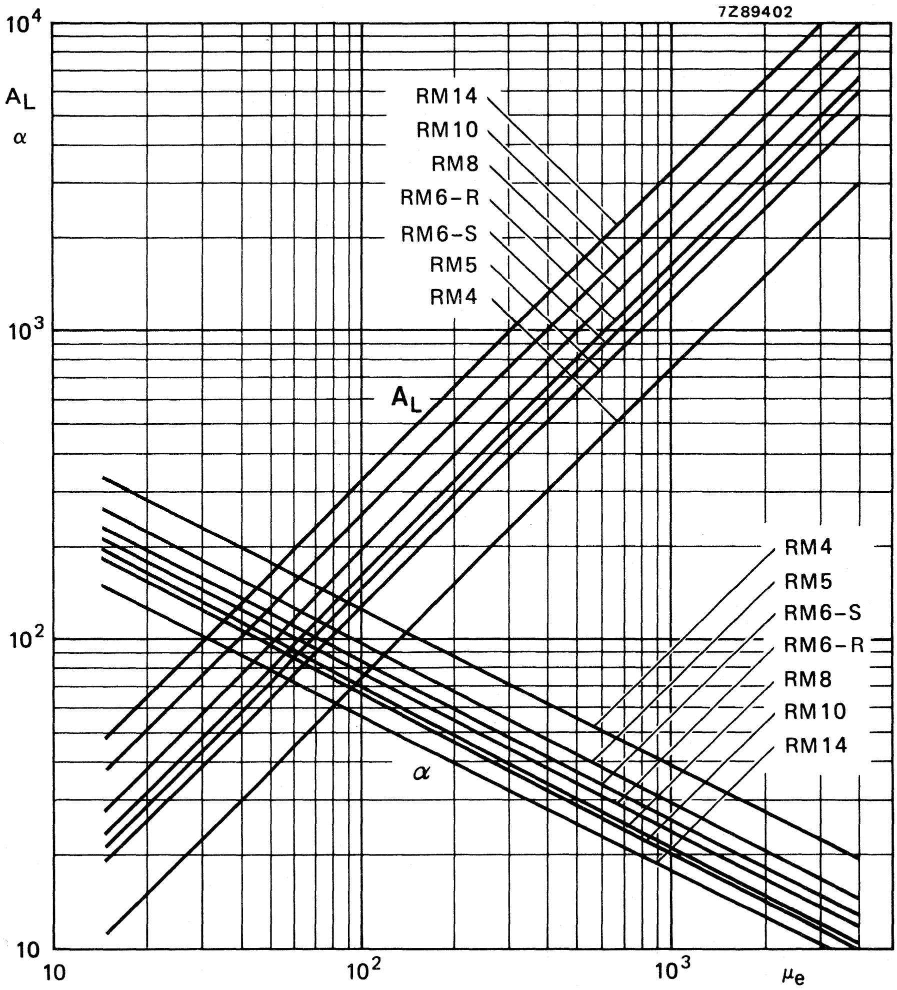


Fig.5.10 Conversion graph for RM cores.

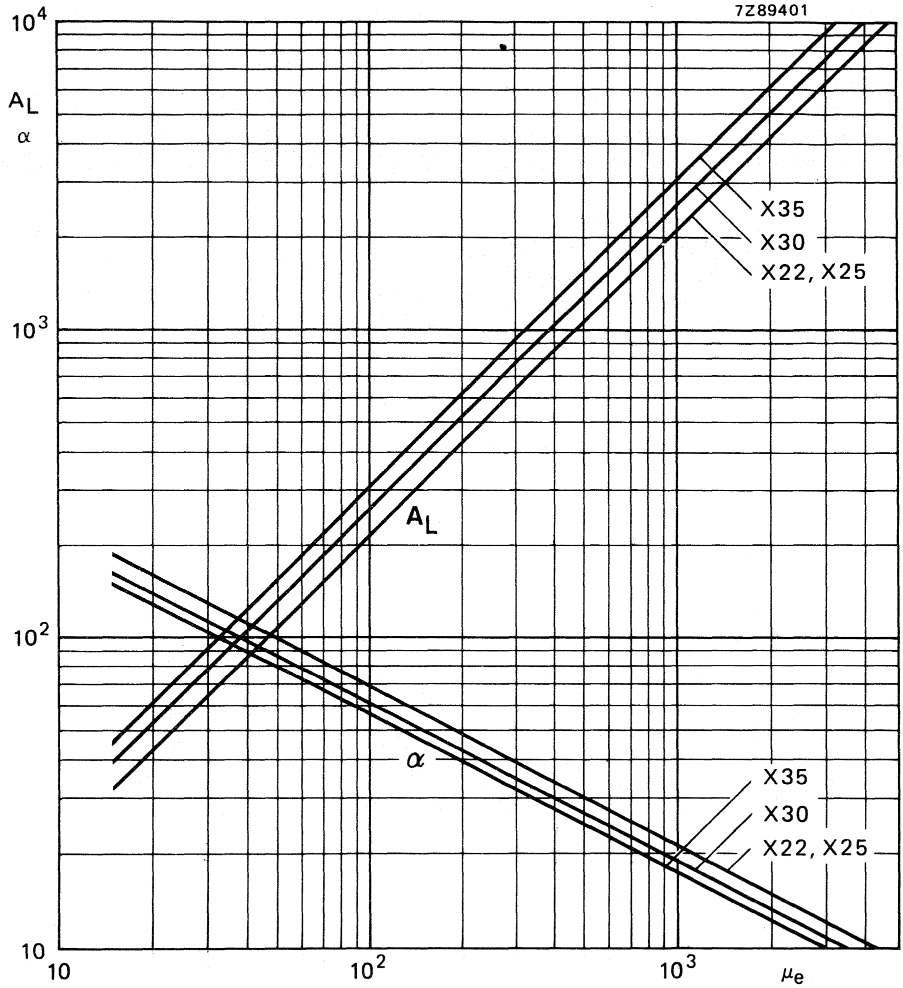


Fig.5.11 Conversion graph for X cores.

5.1.1.10 Inductance adjusters

A major feature of a FXC core assembly is its adjustment mechanism. It allows the cores to be set to a very accurate value (± 0.1%).

The inductance adjustment is achieved by inserting a tube or cylinder, manufactured from Ferroxcube or carbonyl-iron powder into the central hole of the core. This acts as a partial magnetic shunt across the airgap. The adjuster consists of this tube moulded into a thermoplastic carrier which has been threaded at one end. This screws into a nut which is injection moulded or cemented into the lower half of the core. The magnetic tubes are centreless ground to give very close diameter tolerances.

Inductance stability

The stability of a correctly assembled pot, square or cross core depends mainly on the stability of the ferrite's permeability.

The permeability of a ferrite may change with temperature, time, mechanical pressure, magnetic polarization and other factors. The most important changes affecting the inductance stability of the assembly are:

- variation of permeability with temperature (temperature coefficient)
- variation of permeability with time (disaccommodation).

Changes in inductance may also occur due to:

- movement of the adjuster after final setting
- movement of the coil former
- relative movement of the core halves
- movement of the mechanical components of the assembly.

Small movements of this kind are usually caused by changes in temperature, mechanical vibration or shock.

The achievement of acceptable long-term inductance stability is mainly a matter of careful assembly and suitable stabilizing treatment before final adjustment.
If the inductor is to be used in a critical circuit, it should be artificially aged by temperature cycling. The long-term change in inductance of an assembly so treated should not be greater than $500 \cdot 10^{-6}$, assuming an ambient temperature between 25 °C and 40 °C that does not vary by more than 15 K.

The change in inductance of an RM core assembly using clips with earthing spikes when subjected to IEC 68-2-6, test Fc, (vibration conditions) is less than $1000 \cdot 10^{-6}$. Such severe conditions are unlikely to be encountered in practice.

Bump tests of RM-core assemblies with earthing spikes (IEC 68-2-29, test Eb), have also been carried out. The observed change in the inductance of RM6-R cores of 3H1 material was less than $300 \cdot 10^{-6}$.

Inductance adjusters are available in several versions. Figure 5.12 shows the principle outline.

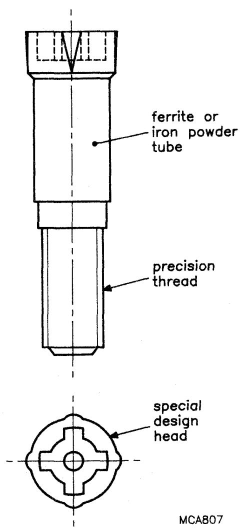


Fig.5.12 Inductance adjuster outline.

A survey of adjusters is given in Table 5.2; this includes the catalogue number of the adjuster, its colour code, and the material of the core, FXC (Ferrite) or cip (carbonyl-iron powder).

The data sheets include lists of recommended adjusters for the A_L values in various grades. The table also lists the maximum inductance variation (ΔL/L in %). In some cases, the choice of adjuster is optional and depends on the application. For that reason, a suggestion is given for minimum, average and maximum inductance variation where applicable.

Figure 5.13 shows a typical curve of a specified adjuster in a core set, pre-adjusted on A_L.

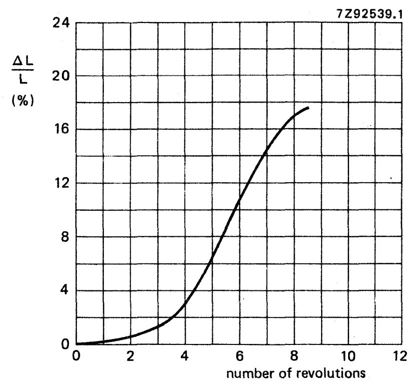


Fig.5.13 Typical curve of a specified adjuster in a core set, pre-adjusted on A_L.

Dependent on size, the screw-head of the adjuster is suited for tools of M1.4, M1.7, and M2.6. An adjusting tool, combining M1.4 and M1.7 is available (catalogue number 4322 058 0326) as well as a tool combining M2 and M2.6 (catalogue number 4322 058 0327). For customers who wish to make the adjuster tool themselves, the four outlines are depicted in Fig.5.14.

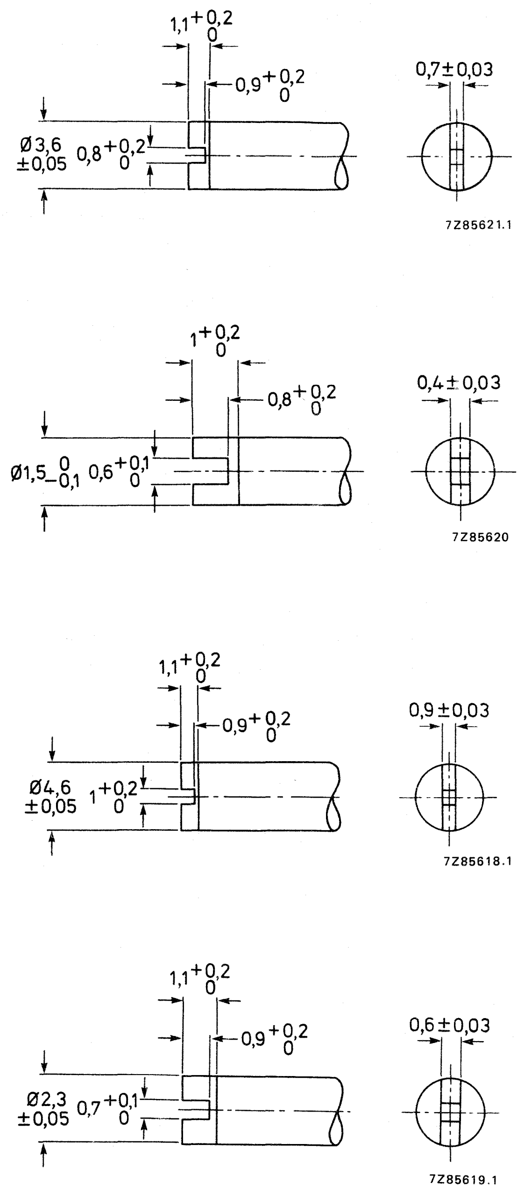


Fig.5.14 Dimensions of tools for adjusters.

Table 5.2 Survey of adjusters

CORE TYPE	CATALOGUE NUMBER	COLOUR CODE	MATERIAL*
P9/5, P11/7	4322 021 3981	brown	FXC
	4322 021 3984	yellow	cip
	4322 021 3985	green	cip
	4322 021 3989	grey	FXC
P14/8	4322 021 3970	black	FXC
	4322 021 3971	brown	FXC
	4322 021 3972	red	cip
	4322 021 3973	orange	cip
	4322 021 3974	yellow	FXC
	4322 021 3975	green	cip
	4322 021 3978	white	FXC
	4322 021 3979	grey	FXC
P18/11	4322 021 3960	black	FXC
	4322 021 3961	brown	FXC
	4322 021 3962	red	FXC
	4322 021 3963	orange	cip
	4322 021 3964	yellow	cip
	4322 021 3965	green	cip
	4322 021 3967	violet	FXC
	4322 021 3968	white	FXC
P22/13, RM8, X30	4322 021 3840	black	FXC
	4322 021 3841	brown	FXC
	4322 021 3842	red	cip
	4322 021 3843	orange	cip
	4322 021 3844	yellow	FXC
	4322 021 3845	green	cip
	4322 021 3848	white	FXC
	4322 021 3849	grey	FXC
P26/16	4322 021 3941	brown	FXC
	4322 021 3942	red	cip
	4322 021 3945	green	cip
	4322 021 3948	white	FXC
	4322 021 3949	grey	FXC
P30/19, RM10	4322 021 3832	red	cip
	4322 021 3834	yellow	cip
	4322 021 3838	white	FXC
	4322 021 3839	grey	FXC

* FXC = Ferrite; cip = carbonyl-iron powder.

Table 5.2 Survey of adjusters (continued)

CORE TYPE	CATALOGUE NUMBER	COLOUR CODE	MATERIAL*
P36/22, P42/29, X35	4322 021 3924	yellow	cip
	4322 021 3928	white	cip
	4322 021 3929	grey	FXC
RM4, RM5	4322 021 3870	black	FXC
	4322 021 3871	brown	FXC
	4322 021 3872	red	cip
	4322 021 3875	green	cip
	4322 021 3878	white	FXC
	4322 021 3879	grey	FXC
RM6-R, RM6-S, X22	4322 021 3860	black	FXC
	4322 021 3861	brown	FXC
	4322 021 3862	red	cip
	4322 021 3864	yellow	cip
	4322 021 3865	green	cip
	4322 021 3867	violet	FXC
	4322 021 3868	white	FXC
	4322 021 3869	grey	FXC

* FXC = Ferrite; cip = carbonyl-iron powder.

The thread of both the nut and the adjuster are closely toleranced (4H) to allow smooth rotation without backlash or friction. The gauge-measured maximum torque of the threaded part for the adjusters is:

M1.4 types ≤ 4 mNm
M1.7 types ≤ 8 mNm
M2 types ≤ 10 mNm
M2.6 types ≤ 15 mNm

5.1.2 PULSE AND SIGNAL TRANSFORMERS

Pulse and signal transformers, also known as wideband transformers, are frequently used in communications systems, and modern digital networks such as, for example, ISDN.

They provide impedance matching and transform signal amplitudes to provide DC isolation or a combination of these. Signal power levels are usually low. In order to transmit analogue signals or digital pulses without much distortion, good wideband characteristics are needed.

The principal function of the transformer core is to provide optimum coupling between the windings.
The general equivalent circuit of a signal transformer is shown in Fig.5.15.

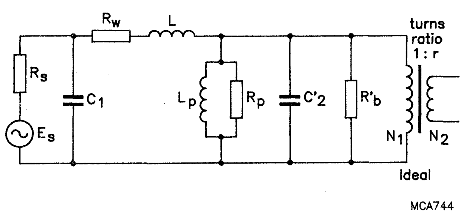


Fig.5.15 Simplified equivalent circuit of a transformer.

The elements of the circuit depicted in Fig.5.15 may be defined as follows.

E_s = source voltage
R_s = source resistance
R_w = total winding resistance = $R_1 + R_2'$ where R_1 is the primary winding resistance and R_2' is the secondary winding resistance referred to the primary
L = total leakage inductance ≈ the primary inductance with the secondary shorted
L_p = open circuit inductance
R_p = the shunt loss resistance representing the core loss
N_1, N_2' = the primary and referred secondary self or stray capacitances respectively
R_b' = load resistance referred to the primary
r = turns ratio

A high permeability core with polished pole faces results in a large flux contribution, improving the coupling. Open circuit inductance will be high, leakage inductance is kept low.

Ring cores are also suitable since they have no airgap and full use is made of the high permeability of the ferrite.

The frequency response of a practical transformer is shown in Fig.5.16.

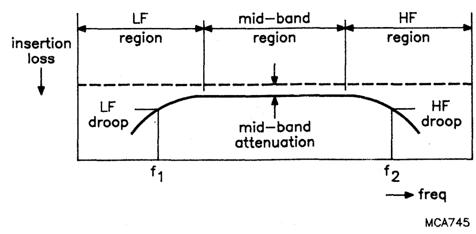


Fig.5.16 Transmission characteristic of a wideband transformer.

The corresponding distortion of a rectangular pulse by the same circuit is shown in Fig.5.17.

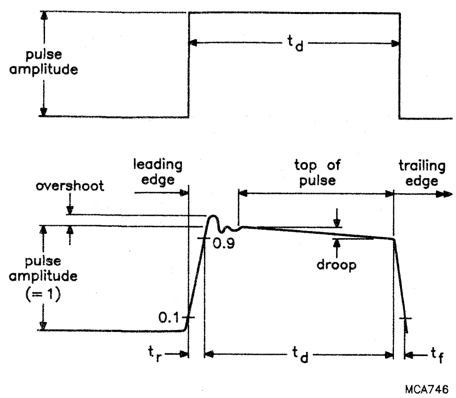


Fig.5.17 An ideal rectangular pulse (a) and the main pulse distortions (b) that may be introduced by a transformer.

The shunt inductance (L_p) is responsible for the low frequency droop in the analogue transformer since its reactance progressively shunts the circuit as the frequency decreases. In the case of the pulse transformer, the shunt inductance causes the top of the pulse to droop because, during the pulse, the magnetizing current in L_p rises approximately linearly with time causing an increasing voltage drop across the source resistance.

The winding resistance is the main cause of the mid-band attenuation in low frequency analogue transformers. In a pulse transformer, it attenuates the output pulse but usually has little effect on the pulse distortion.

The high frequency droop of an analogue transformer may be due to either the increasing series reactance of the leakage inductor or the decreasing shunt reactance of the self-capacitances, or a combination of both as the frequency increases. In a pulse transformer, the leakage inductance, self-capacitances and the source or load resistance combines to slow down, or otherwise distort the leading and trailing edge responses.

Suitable core types for this application are:

- P cores
- RM cores
- EP cores
- ring cores

in the material grades 3E25, 3E1, 3E4 and 3E5.

If the signal is superimposed on a DC current, core saturation may become a problem. In that case, a lower permeability material grade such as 3B8 or 3C85 is recommended.

5.2 Ferrites for power conversion

Power conversion is a major application area for modern ferrites. Originally designed for use as line output transformers in television receivers, power cores are now being used in a wide range of applications. The introduction of Switched Mode Power Supplies (SMPS) has stimulated the development of a number of new ferrite grades and core shapes to be used in the manufacture of power transformers, output chokes and input filters.

Power transformers and inductors generally operate under loss or saturation limited conditions which require special power ferrites with high saturation levels and low losses.

Output chokes must tolerate high DC currents; this means a gapped magnetic circuit or a special material with a very high saturation level such as iron powder.

Input chokes prevent mains pollution generated by the SMPS. Therefore grades are generally used which provide maximum blocking impedances at the switching frequencies.

5.2.1 Switched Mode Power Supply circuits

The basic arrangement of a Switched Mode Power Supply (SMPS) is shown in Fig.5.18.

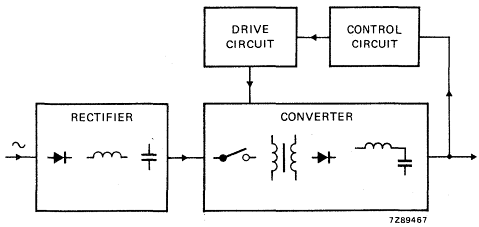


Fig.5.18 Block diagram of a Switched Mode Power Supply.

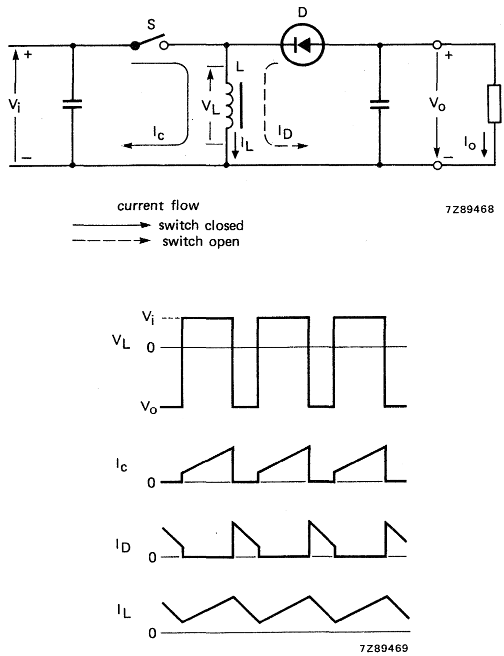


Fig.5.19 Basic circuit of a DC to DC flyback converter with associated waveforms.

In this configuration, the power input is rectified and filtered, and the resulting DC voltage is chopped by a switch at a high frequency. The chopped waveform is applied to the primary of a transformer and the secondary output is rectified and filtered to give the required DC output. The output voltage is sensed by a control circuit which supplies a correction signal to the drive circuit to vary the ON-OFF time of the switched waveform and compensate for any change at the output. This system can operate from a battery or any other DC input.

Numerous circuit designs can be used to convert DC input voltage to the required DC output voltage. However, some preliminary design selection has to be made to determine the type of converter circuit to use. Since the emphasis is on the design of SMPS using magnetic components the different designs are considered with this in mind.

If the circuits are analysed in this way, three broad basic converter designs can be distinguished, based upon the magnetic converting device.

These are:

- flyback converters
- forward converters, and
- push-pull converters.

5.2.1.1 Flyback converter

Figure 5.19 shows the basic circuit of a flyback converter and its associated waveforms.

When the switch is closed (transistor conducts), the supply voltage is connected across the inductor and the output diode is non-conducting. The current rises linearly, storing energy, until the switch is opened. When this happens, the voltage across the inductor reverses and the stored energy is transferred into the output capacitor and load. By varying the conduction time of the transistor at a given frequency, the amount of energy stored in the inductor during each ON cycle can be controlled. This allows the output of the SMPS to be controlled and changed.

This basic circuit can be developed into a practical circuit using an inductor with two windings (see Fig.5.20).

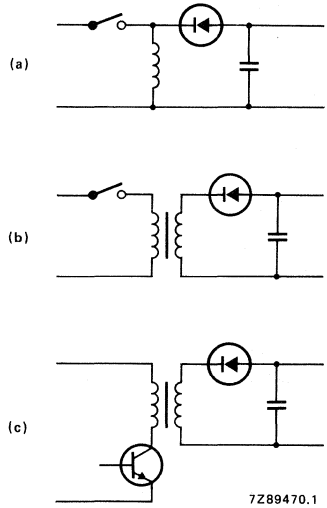


Fig.5.20 Practical flyback converter circuit.

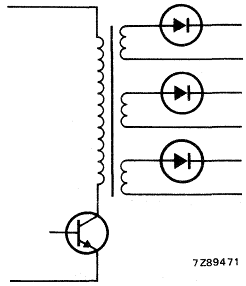


Fig.5.21 Multiple output flyback converter circuit.

In a flyback converter, all the energy to be transferred to the output capacitor and load is, at first, stored in the inductor. It is therefore possible to obtain line isolation by adding a secondary winding to the inductor (although an inductor with more than one winding appears in schematic diagrams as a transformer, it is referred to as an inductor in accordance with its function).

Another advantage of the flyback converter is that no smoothing choke is required in the output circuit. This is important in high-voltage supplies and in power supplies with a number of output circuits (see Fig.5.21).

A disadvantage of this type of converter is that the output capacitor is charged only during the transistor's OFF cycle. Hence the output capacitor ripple current is high when compared with the other types of converters. Another disadvantage of the flyback converter concerns the energy stored in the inductor. The inductor is driven in one direction only; this requires a larger core in a flyback design than for an equivalent design using a forward or push-pull converter.

5.2.1.2 Forward converter

The basic circuit of the forward converter, together with its associated voltage and current waveforms is shown in Fig.5.22.

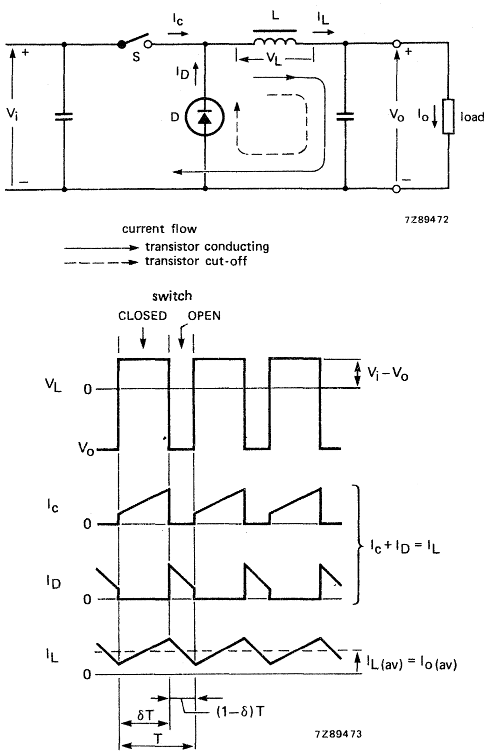


Fig.5.22 Basic circuit of a DC to DC forward converter with associated waveforms.

When the switch is closed (transistor conducts), the current rises linearly and flows through the inductor into the capacitor and the load. During this ON cycle, energy is transferred to the output and stored in the inductor 'L'. When the switch is opened, the energy stored in the inductor causes the current to continue to flow to the output via the diode.

As with the flyback converter, the amount of energy stored in the inductor can be varied by controlling the ON-OFF cycles. This provides control of the output of the forward converter.

A more practical forward converter circuit with a line-isolation transformer is shown in Fig.5.23.

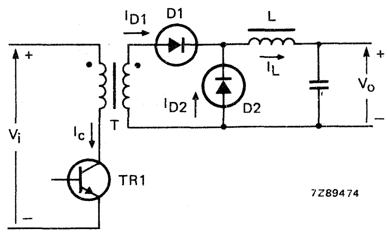


Fig.5.23 Forward converter with line isolation transformer.

The need for a separate transformer for line isolation is an obvious disadvantage of this converter circuit when compared with the flyback converter.

A major advantage of the forward converter in comparison with the flyback converter is the lower ripple voltage at the output. The high-frequency ripple current feeding into the smoothing capacitor is limited by the inductor. This makes this type of design suitable for low-voltage supplies.

Multiple outputs in a forward converter can be obtained by using more secondary windings on the transformer. However, each of these windings requires two diodes, an inductor and a capacitor which can cause regulation difficulties and is expensive.

Under certain conditions, a better approach is the combination of forward and flyback converters. A dual-output converter where this principle is demonstrated is shown in Fig.5.24.

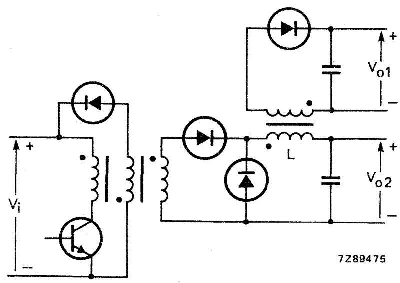


Fig.5.24 Dual-output forward converter.

Here the energy is stored in the inductor, to provide power to another output. At the end of the transistor's conduction cycle, the voltage across the inductor is equal to the output voltage V_{o1}. Therefore, if V_{o1} is stabilized, V_{o2} will also be stabilized. The amount of energy that can be stored in the inductor is clearly limited. However, this circuit is a practical alternative in cases where a constant-load second output is required which is 30% or less of the value of the main output voltage.

In Fig.5.24, the transformer has a tertiary winding and a series diode. The purpose of the additional winding and diode is as follows: during the conduction cycle of the transistor, the magnetizing current increases linearly to some final value. As soon as the transistor is turned off, the magnetizing current is transferred via the additional winding and diode to the DC supply. The demagnetizing winding should be tightly coupled with the primary winding to avoid voltage spikes during the switching of the transistors. The demagnetizing winding and diode ensure a return of the transformer's magnetic energy back to the DC supply and also limits the transistor collector voltage to twice the value of the DC input voltage.

5.2.1.3 Push-pull converter

The basic circuit of the push-pull converter, with voltage and current waveforms is shown in Fig.5.25.

The push-pull converter is an arrangement of two forward converters operating in antiphase (push-pull action). With switch S1 closed (Fig.5.25.a) diode D2 conducts and energy is simultaneously stored in the inductor and supplied to the load. With S1 and S2 open (Fig.5.25.b),the energy stored in the inductor continues to support the load current via the parallel diodes D1 and D2, which are now acting as flywheel diodes. When switch S2 closes (Fig.5.25.c), diode D1 continues to conduct, diode D2 stops conducting and the process repeats itself.

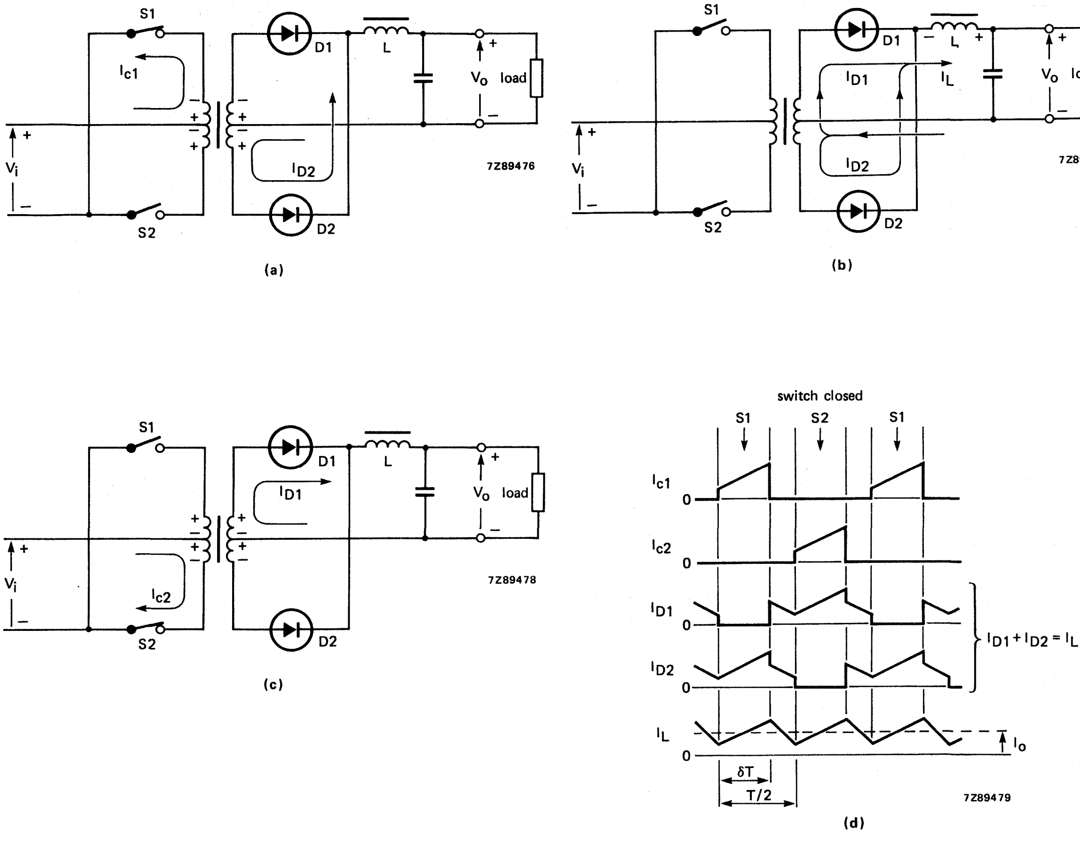


Fig.5.25 Basic circuit of a DC to DC push-pull converter with associated waveforms.

A practical push-pull converter circuit is shown in Fig.5.26.

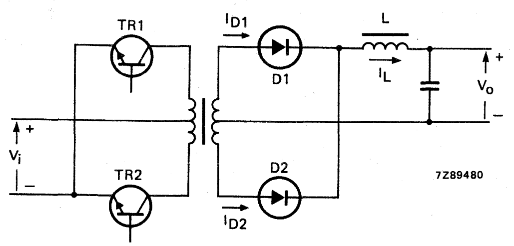


Fig.5.26 Conventional push-pull converter circuit.

A push-pull converter circuit doubles the frequency of the ripple current in the output filter and, therefore, reduces the output ripple voltage. A further advantage of the push-pull operation is that the transformer core is excited alternately in both directions in contrast to both the forward and flyback converters. Therefore, for the same operating conditions and power throughput, a push-pull converter design can use a smaller transformer core.

Multiple outputs can be constructed by using several secondary windings, each with its own output diodes, inductor and smoothing capacitor. The method of storing energy in the output choke can also be used in this example (see Fig.5.24 and associated description, section 5.2.1.2, Forward converter).

5.2.1.4 Converter selection

In each of the three basic converter designs there are several different circuit possibilities. In the flyback and forward converters, single and two-transistor designs can be used. If two transistors are used, they will switch simultaneously. This type of circuit preference is determined by the allowable collector-emitter voltage and collector current of the transistor. In push-pull converter designs, the primary of the transformer can be connected in several ways (see Fig.5.27).

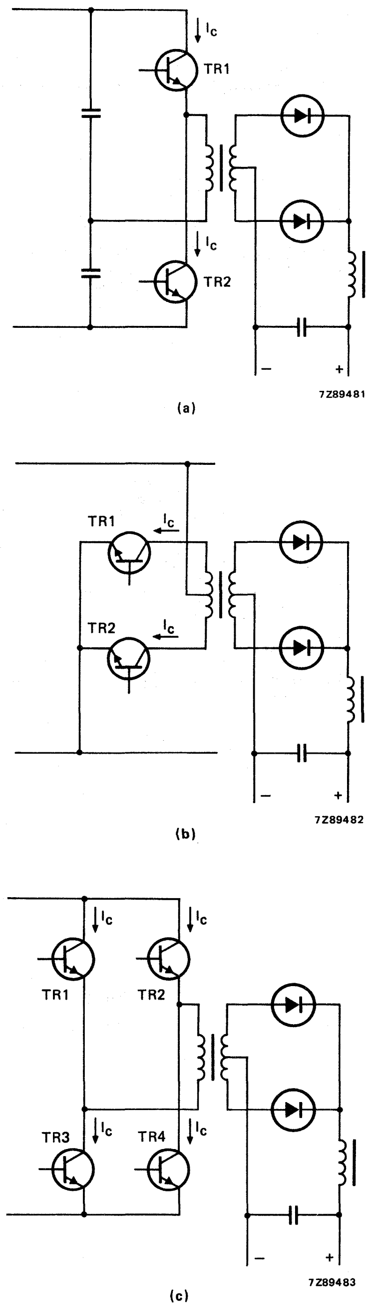


Fig.5.27 Several push-pull converter circuits.

Depending upon how the transformer primary is driven, it is possible to differentiate between single-ended (Fig.5.27.a), push-pull (Fig.5.27.b) and full-bridge circuits (Fig.5.27.c). Decisions on circuit details are determined by the transistor capabilities.

For a particular converter design, the first selection that should be considered is the type of converter circuit to use. To aid in this initial converter circuit selection, Fig.5.28 offers a rough guide to the type of converter, its output voltage and power capability. This selection has to be considered along with other requirements, including line isolation, ripple content, overall efficiency, multiple outputs, etc.

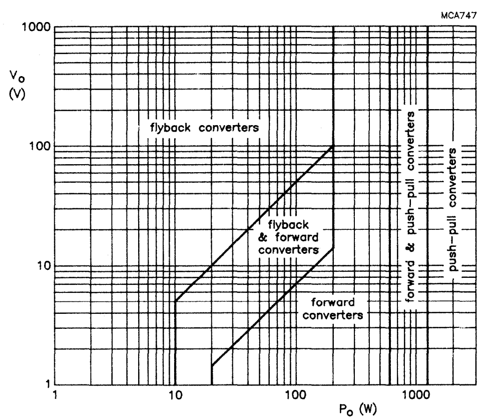


Fig.5.28 Converter circuit selection as a function of output voltage and throughput power.

Table 5.3 summarizes the most significant properties of a converter design. It shows the relative strengths and weaknesses of the three types of converters with regard to these characteristics.

Table 5.3 Converter design selection chart

FUNCTION	TYPE OF CONVERTER CIRCUIT		
	FLYBACK	**FORWARD**	**PUSH-PULL**
Circuit simplicity	+	0	-
Number of components	+	0	-
Drive circuitry	+	0	-
Output ripple	-	0	+
Choke volume	not required	0	+
Transformer volume	-	0	+
Mains isolation	+	-	+
High power	-	0	+
High voltage	+	0	0
Multiple outputs	+	0	0

+ Favourable
0 Average
- Unfavourable

For a high performance, high power, single output supply, where ripple is well below 1%, the push-pull design is the obvious choice. For smaller power versions of this type of supply, the forward, or double-forward converter provides a useful alternative to the push-pull converter.

In high-voltage supplies, the flyback converter is the most suitable circuit and should be considered as a preference. In multiple-output supplies, the flyback converter is again normally the first choice because it avoids the necessity of providing a number of output windings on the inductor, together with a single diode and capacitor for each.

5.2.1.5 Core selection

Table 5.4 shows which core type could be considered suitable for the different types of converter design.

Table 5.4 Converter design by selection of core type

CORE TYPE	TYPE OF CONVERTER CIRCUIT		
	FLYBACK	FORWARD	PUSH-PULL
E cores	+	+	0
ETD cores	0	+	+
EC cores	-	0	+
U cores	+	0	0
RM cores	0	+	0
EP cores	-	+	0
P cores	-	+	0
Ring cores	-	+	+

\+ Favourable
0 Average
\- Unfavourable

The power-handling capability of a given core is determined by frequency, its geometry and available winding area, and by other factors which depend on the specific application.

Operating frequency

The preferred operating frequency of a Switched Mode Power Supply is greater than 20 kHz to avoid audible noise from the transformer. With modern ferrites the practical upper limit has shifted to at least 1 MHz.

Ambient temperature

Ambient temperature, together with the maximum core temperature, determines the maximum temperature rise, which in turn fixes the permissible total power dissipation in the transformer. Normally, a maximum ambient temperature of 60 °C has been assumed. This allows a 40 °C temperature rise from the ambient to the centre of the transformer for a maximum core temperature of 100 °C. There is a tendency however towards higher temperatures to increase power throughput.

Flux density

To avoid saturation in the cores the flux density in the minimum cross-section must not exceed the saturation flux density of the material at 100 °C. The allowable total flux is the product of this flux density and the minimum core area and must not be exceeded even under transient conditions, that is, when a load is suddenly applied at the power supply output, and maximum duty factor occurs together with maximum supply voltage. Under steady-state conditions, where maximum duty factor occurs with minimum supply voltage, the flux is reduced from its absolute maximum permissible value by the ratio of the minimum to maximum supply voltage (at all higher supply voltages the voltage control loop reduces the duty factor and keeps the steady-state flux constant).

The minimum to maximum supply voltage ratio is normally taken as 1:1.72, this being typical for most applications.

Winding-window utilization

The gaps of 4 mm on each side of the windings (see Figs 5.29 and 5.30) ensure compliance with IEC435 mains isolation requirements. If these gaps are omitted, the maximum throughput power is increased to P' where:

$$P' = P\sqrt{\frac{\text{winding area}}{\text{winding area} - 8}} \text{ (mm)}$$

that is, by about 25% for small cores and about 10% for large cores.

The maximum percentage of copper in the available winding area is generally about 50%, corresponding to windings of circular cross-section and insulation equal to 25% of the wire diameter.

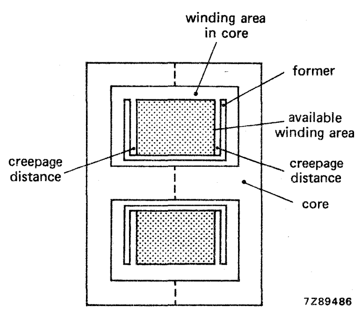


Fig.5.29 Section through core showing airgap; to allow for creepage distance for 230 V mains isolation, a gap of 4 mm is left at each side of the winding.

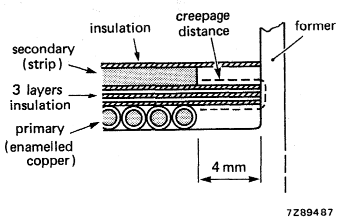


Fig.5.30 Detailed section of winding showing how creepage distance is measured.

F_W and F_R ratios

The term F_W is the winding copper factor and is defined as:

$$F_W = \frac{A_{Cu}}{A_W}$$

where:
A_{Cu} is the total cross-sectional area of the copper in the windings, and A_W is the available winding area.

F_R is defined as:

$$F_R = \frac{\text{AC winding resistance}}{\text{DC winding resistance}}$$

Both F_W and F_R ratios depend on conductor sizes and winding configuration employed in any particular transformer design, and these will depend on the required input and output voltages, etc. Achievable F_W and F_R ratios for normal solid wire and strip conductors depend on the particular transformer specification and can only be assessed for particular cases.

5.2.1.6 Selecting the correct core type

The choice of a core type for a specific design depends on the design considerations detailed in para. 5.2.1.5 and also on the personal preference of the designer. Table 5.5 gives an overview of core types as a function of power throughput, and this may be useful to the designer for an initial selection.

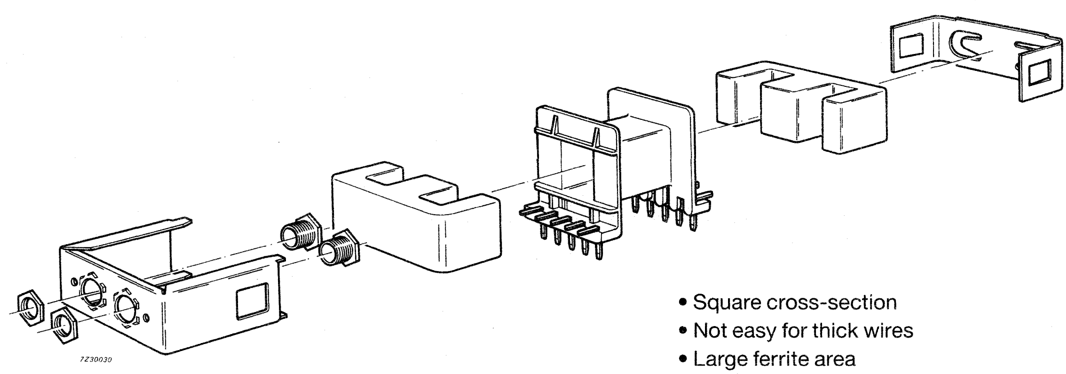
Table 5.5 Power throughput for different core types (at 100 kHz switching frequency)

POWER RANGE (W)	CORE TYPE
< 5	RM4, P11/7, R14, EF12.6, U10
5 - 10	RM5, P14/8
10 - 20	RM6, E20, P18/11, R23, U15, EFD15
20 - 50	RM8, P22/13, U20, RM10, ETD29, E25, R26/10, EFD20
50 - 100	ETD29, ETD34, EC35, EC41, RM12, P30/19, R26/20, EFD25
100 - 200	ETD34, ETD39, ETD44, EC41, EC52, RM14, P36/22, E30, R56, U25, U30, E42, EFD30
200 - 500	ETD44, ETD49, E55, EC52, E42, P42/29, U37
> 500	E65, EC70, U93, U100

Each of the core types has been developed for a specific application, therefore they all have advantages and drawbacks depending on, for example, converter type and winding technique.

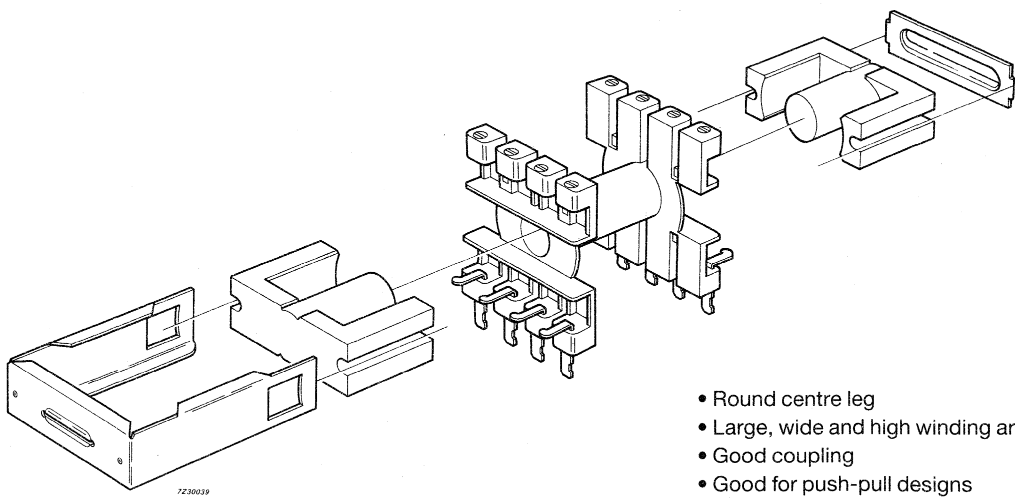
The choice will also often be governed by available production equipment. For instance, a factory with a long history of winding RM cores for telecom filter applications will tend to also choose RM cores if they launch into the SMPS business.

Figs 5.31 to 5.38 provide an overview of the core types available.



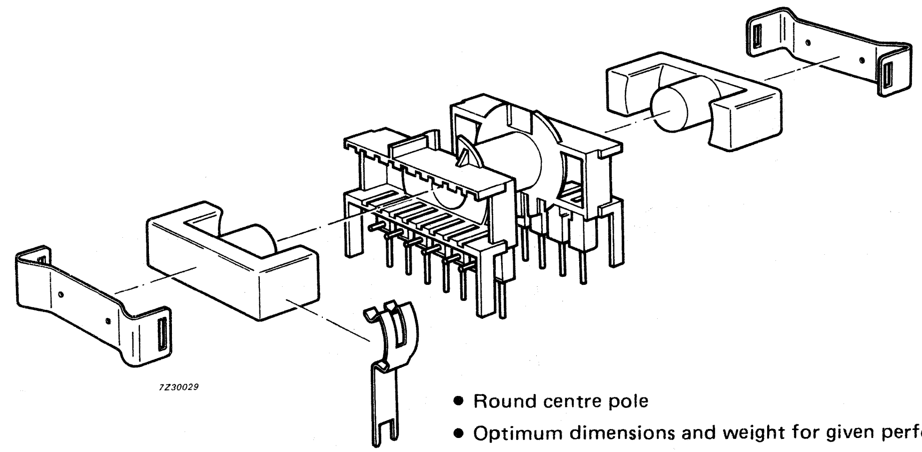
- Square cross-section
- Not easy for thick wires
- Large ferrite area
- Smaller winding area
- Simple shape, easy to manufacture

Fig.5.31 E core exploded view.



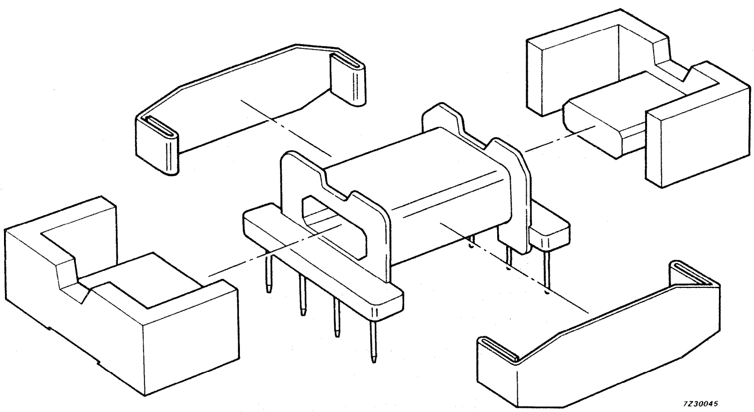
- Round centre leg
- Large, wide and high winding area
- Good coupling
- Good for push-pull designs

Fig.5.32 EC core exploded view.



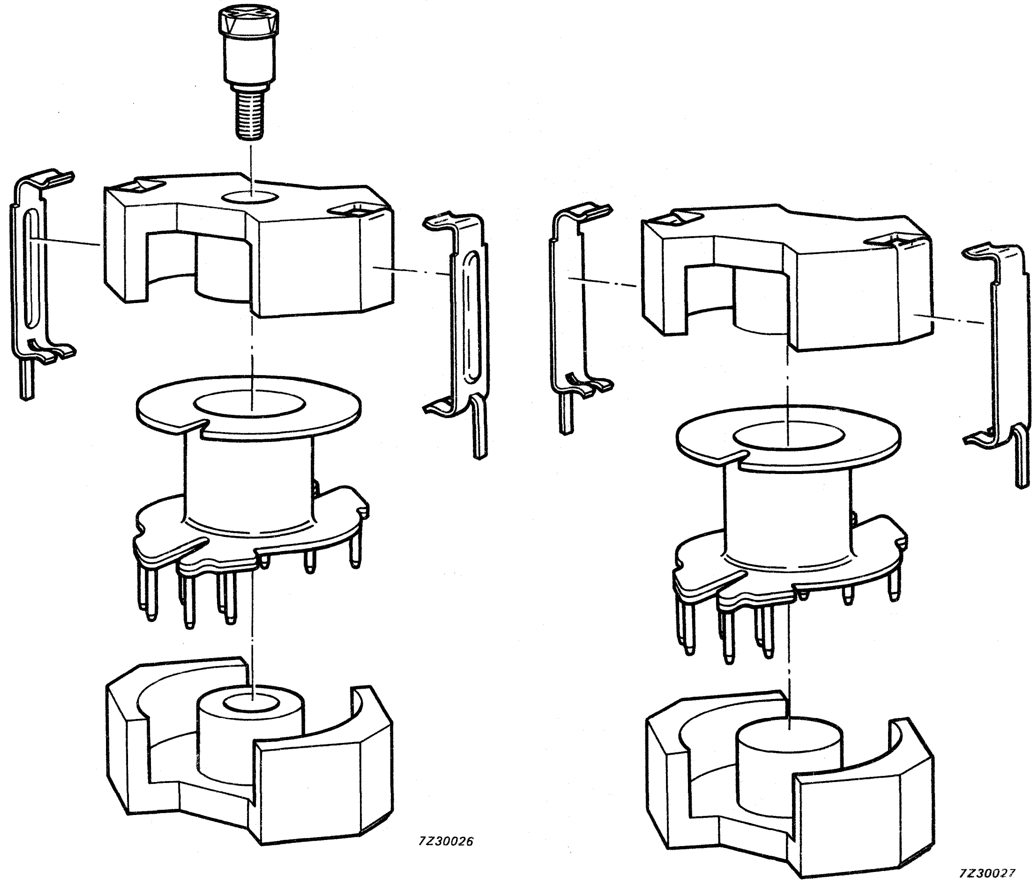
- Round centre pole
- Optimum dimensions and weight for given performance
- Can be fully mechanized
- Efficient mounting parts

Fig.5.33 ETD core exploded view.



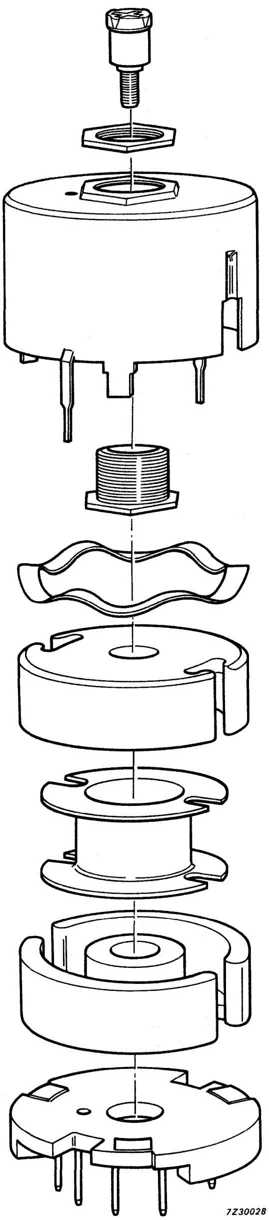
- Very low building height
- Very high throughput power density
- Complete range of accessories, including SMD coil formers

Fig.5.33A EFD core exploded view.



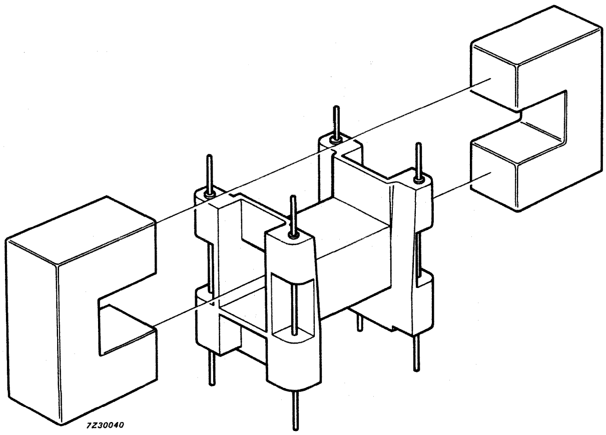
- Good screening
- Wider slots to get leads out
- Simple mounting system
- Easy for automatic winding
- Small surface area on PCB
- Good for high frequency low power

Fig.5.34 RM core exploded view.



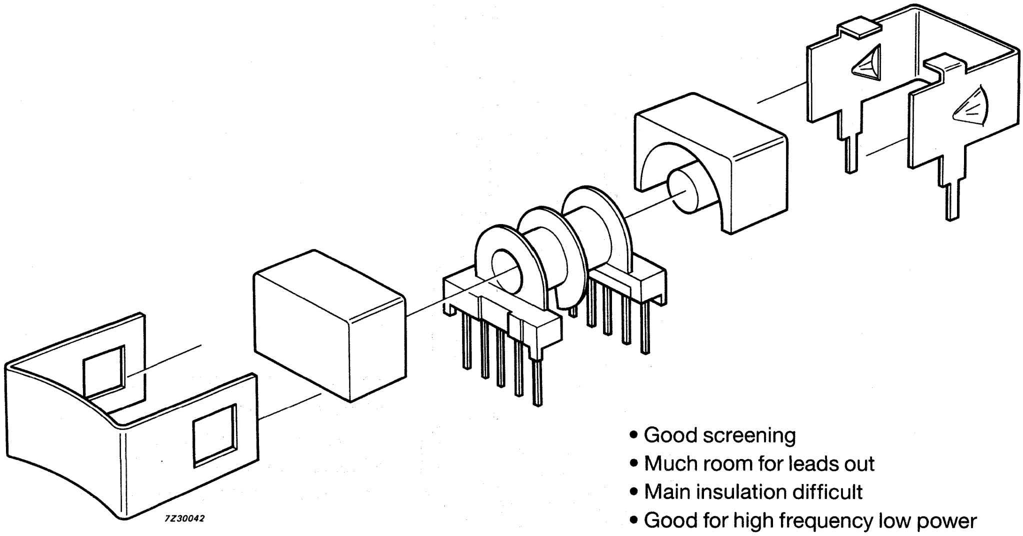
- Excellent screening
- Short winding length
- Difficult to get leads out
- Mains insulation very difficult
- Good for high frequency low power

Fig.5.35 P core exploded view.



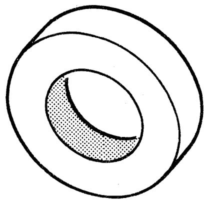
- Simple shape
- Can be stacked for very high power
- TV - U cores have round leg and are excellent for high voltage power

Fig.5.36 U core exploded view.



- Good screening
- Much room for leads out
- Main insulation difficult
- Good for high frequency low power

Fig.5.37 EP core exploded view.



- Simple shape
- Very low stray flux
- Low leakage inductance
- Not easy to wind

Fig.5.38 Ring core.

5.2.1.7 Choice of ferrite grade for power transformers

A full range of power ferrites is available for any application (see Table 5.6)

Table 5.6 Core availability

CORE TYPE	MATERIAL GRADE				
	3C80	3C10	3C85	3F3	3F4
E - CORES	•		•	•	
EFD - CORES			•	•	•
ETD - CORES	•		•	•	
EC - CORES	•		•		
U - CORES	•	•			
RM - CORES			•	•	•
P - CORES			•	•	•
EP - CORES			•	•	
RING CORES			•	•	•

The main characteristics of the grades are:

3C80 Low frequency grade (< 100 kHz) for "real" power transformers. Main use in TV applications.

3C10 Low frequency grade with improved saturation level. Suitable for flyback converters e.g. (Line Output Transformers)

3C85 Medium frequency (< 200 kHz) grade for industrial use. Loss levels much lower than for 3C80 for all frequencies.

3F3 High frequency grade (up to 1 MHz). Top material for modern high frequency designs.

3F4 High frequency grade (up to 3 MHz). Specially recommended for resonant supplies.

Figures 5.39 and 5.40 show loss information for the material grades measured at a frequency of 100 kHz and magnetic flux density (B) of 100 mT, and at a frequency of 500 kHz and magnetic flux density of 50 mT respectively. What can be gained by the use of a better ferrite grade is clearly demonstrated in Figs 5.41 and 5.42.

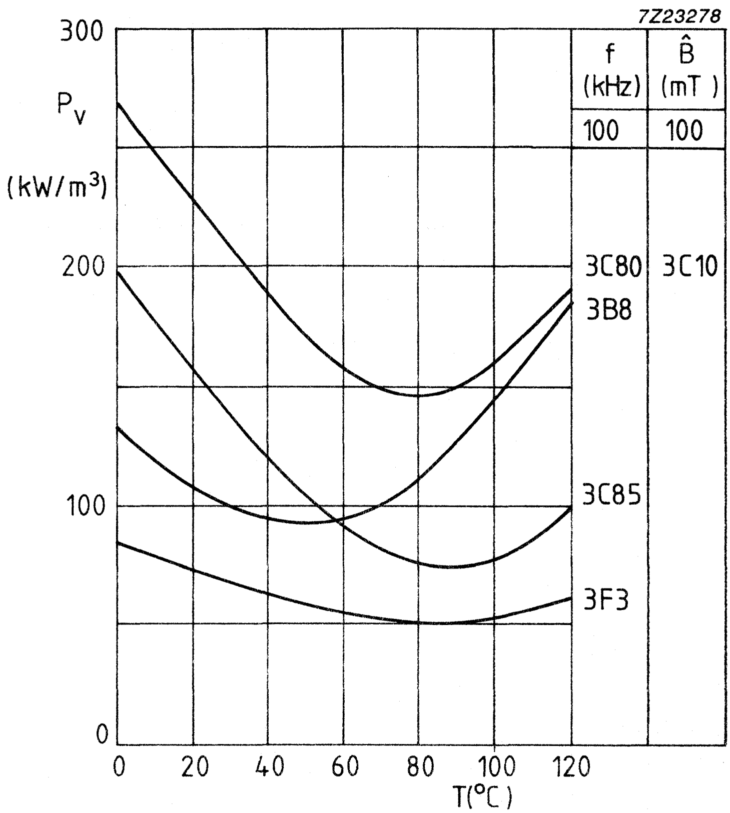


Fig.5.39 Specific power loss (P_V) as a function of temperature; f = 100 kHz, B = 100 mT.

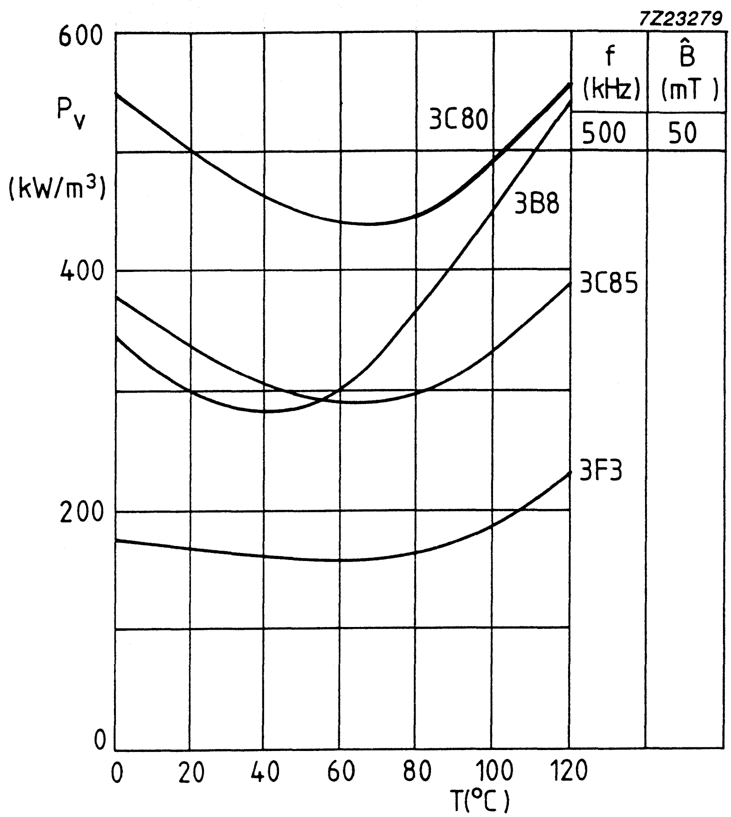


Fig.5.40 Specific power loss (P_V) as a function of temperature; f = 500 kHz, B = 50 mT.

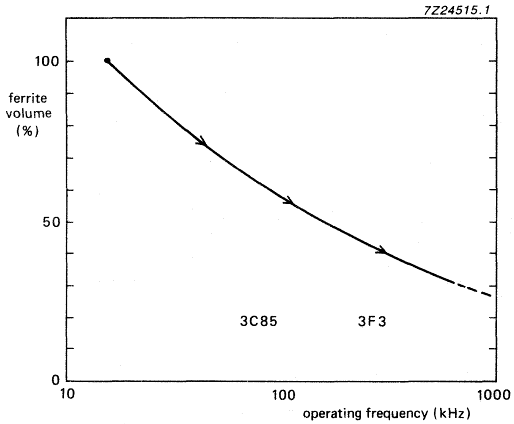


Fig.5.41 Decrease of ferrite volume in power supplies with increasing switching frequency.

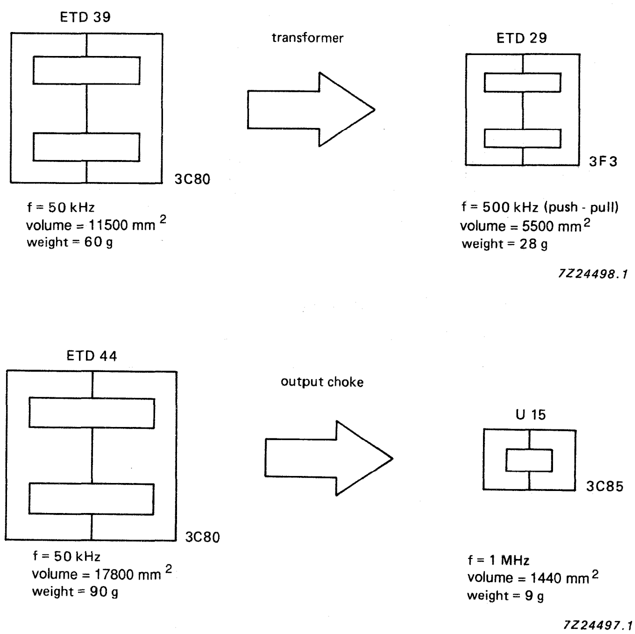


Fig.5.42 Decrease of ferrite component size for increasing frequency.

Soft Ferrites

Introduction

The performance factor ($f \cdot B_{max}$) is a measure of the power throughput that a ferrite core can handle at a loss level of 200 mW/cm^3. This level is considered to be acceptable for a good medium size transformer design. From the graph it is clear that for low frequencies there is not much difference between the grades, because the cores are saturation limited. At higher frequencies, the differences between the grades increase. There is an optimum operating frequency for each material grade. It is evident that in order to increase power throughput or power density a higher operating frequency and a better ferrite should be chosen.

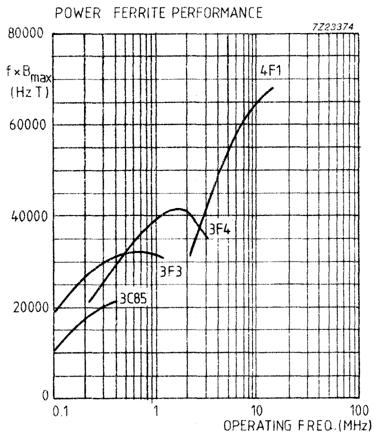


Fig.5.43 Performance factor ($f \cdot B_{max}$) as a function of frequency for material grades 3C80, 3C85, 3F3, 3F4 and 4F1.

Output chokes

Output chokes for Switched Mode Power Supplies have to operate with a DC load causing a bias magnetic field H_{DC}.

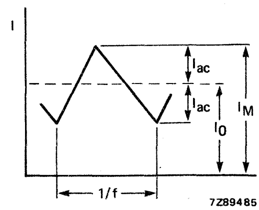


Fig.5.44 Choke waveform.

In a closed ferrite circuit, this can easily lead to saturation. Power ferrites such as 3C80, 3C85 or 3F3 start saturating at field strengths of about 50 A/m. Permeability drops sharply, as can be seen in the graphs (μ_Δ) of the material data section. The choke loses its effectivity.

There are two remedies against this effect:

- use gapped ferrite cores
- use a material with a low permeability and high saturation.

Gapped core sets

The effect of an airgap in the circuit is that a much higher field strength is needed to saturate a core.

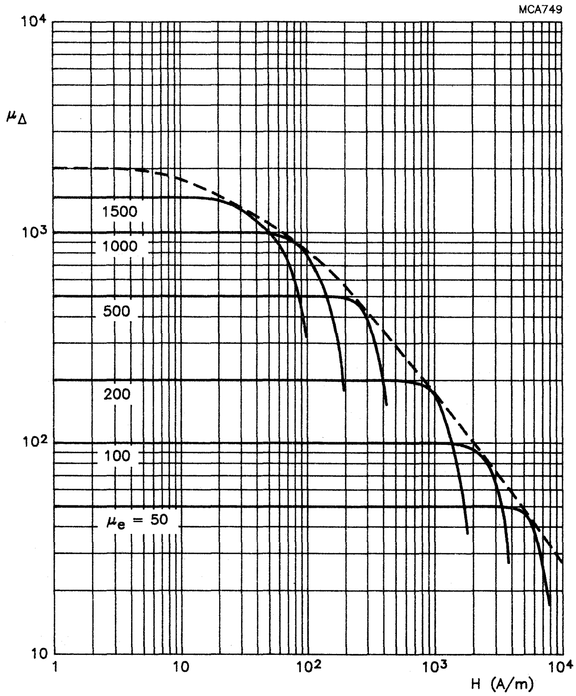


Fig.5.45 Effect of increased gap length.

For each operating condition an optimum airgap length can be found. In a design, the maximum output current (I) and the value of inductance (L) necessary to smoothen the ripple to the required level are known. The product I^2L is a measure of the energy which is stored in the core during one half cycle.

Using this I^2L value and the graphs given for a number of core types, the proper airgap can be selected.

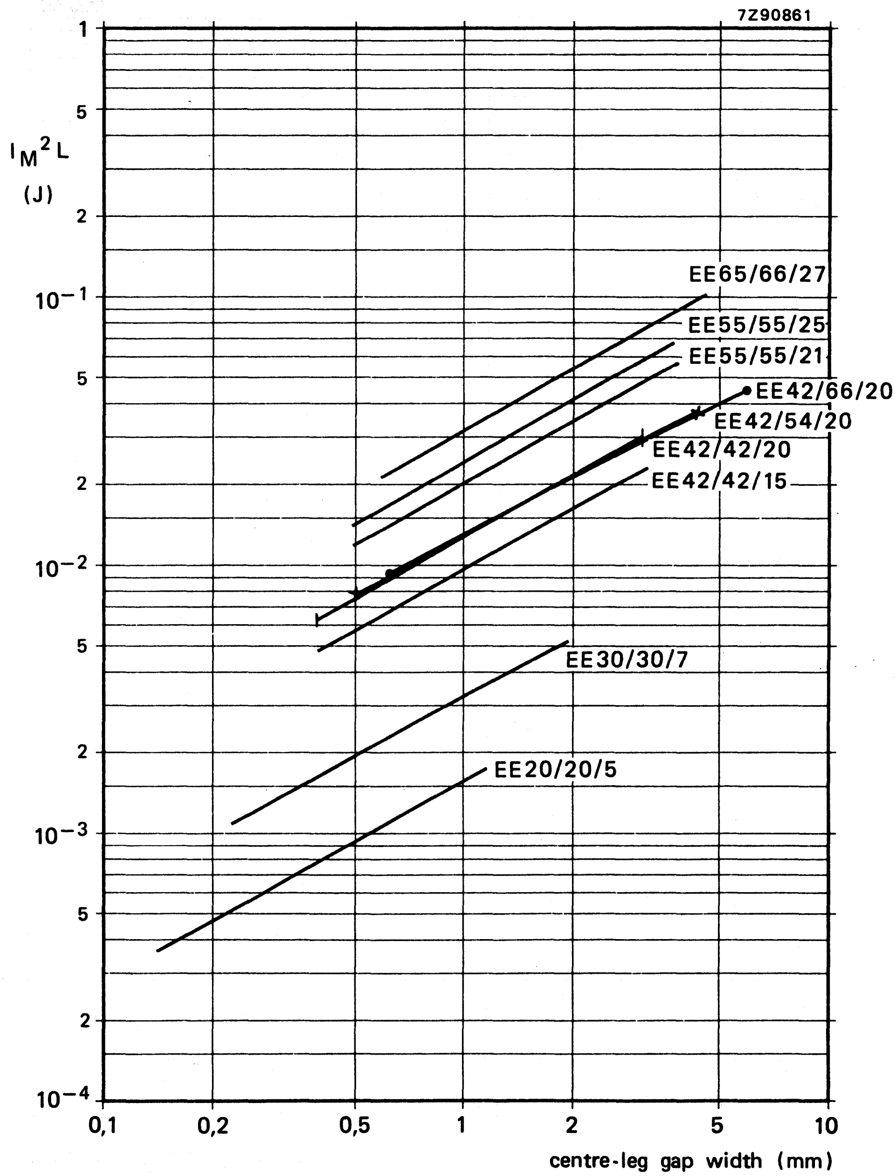


Fig.5.46 I^2L graph for E cores.

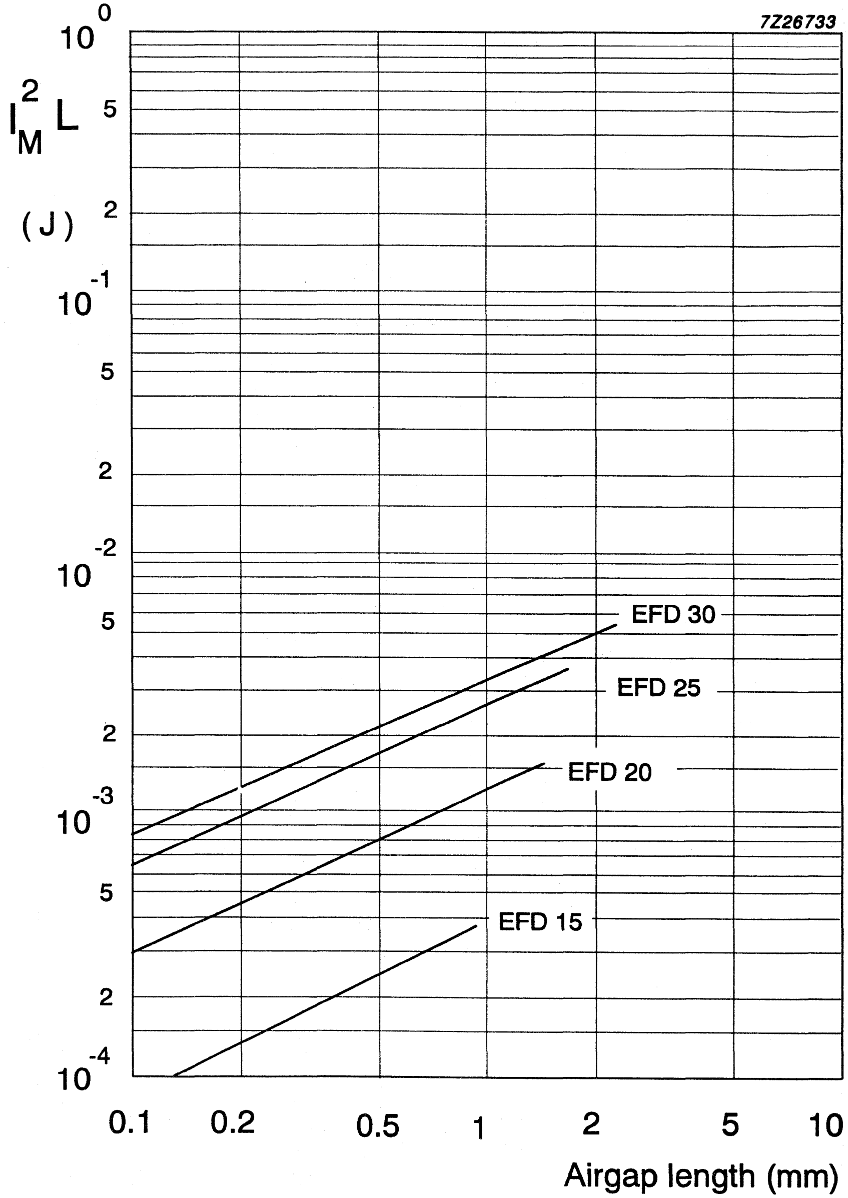


Fig.5.46A I^2L graph for EFD cores.

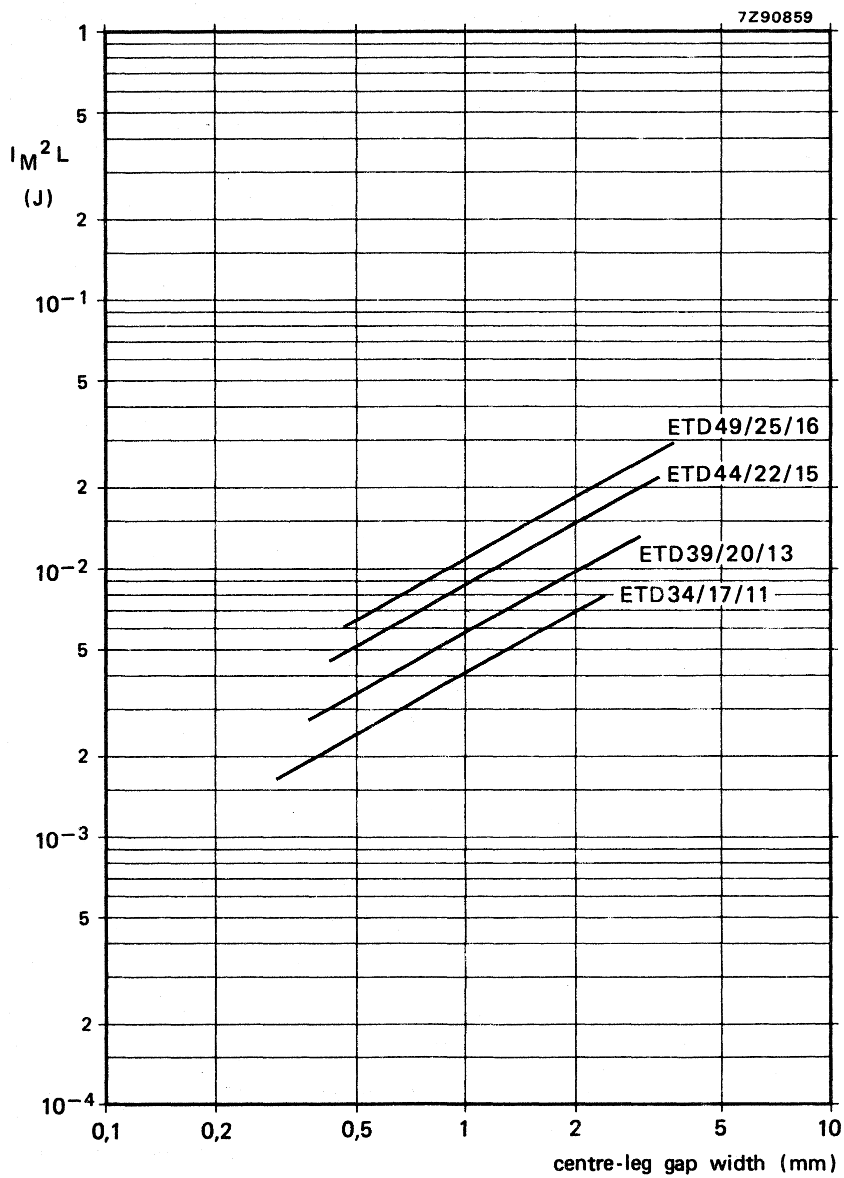


Fig.5.47 I^2L graph for ETD cores.

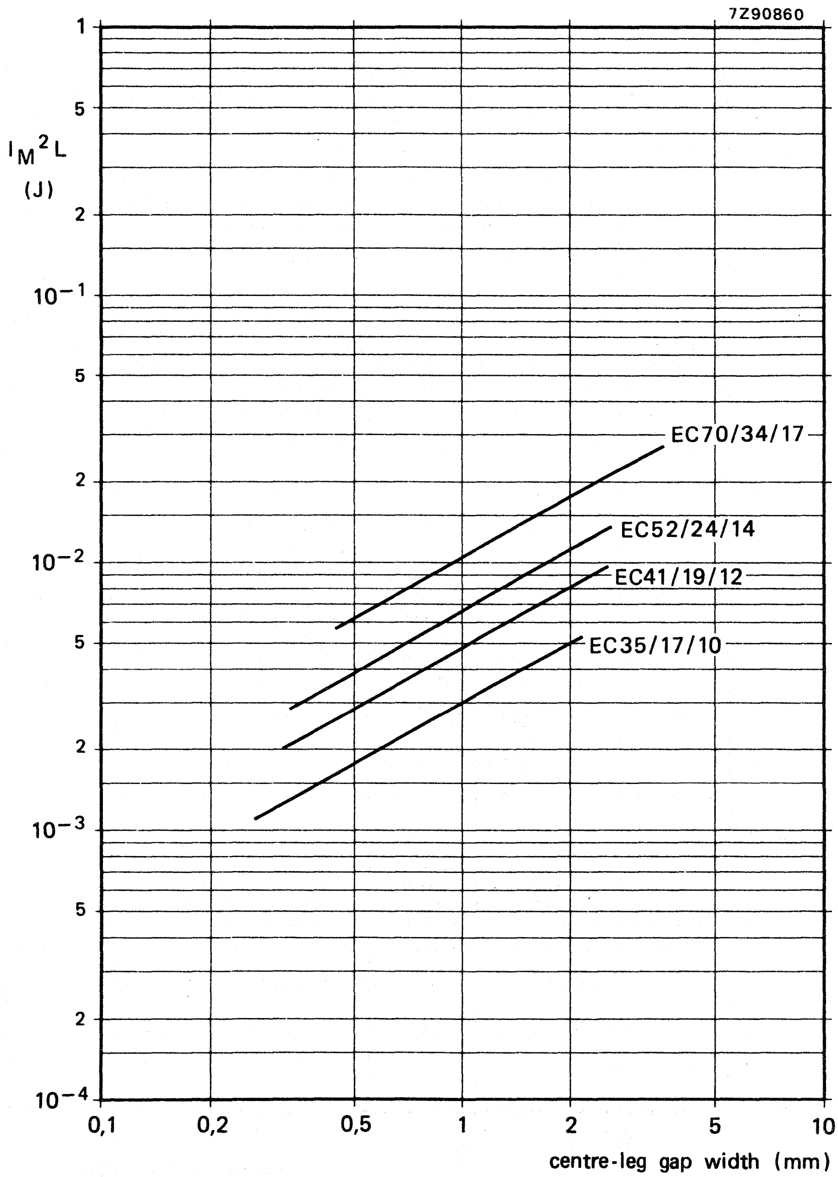


Fig.5.48 I^2L graph for EC cores.

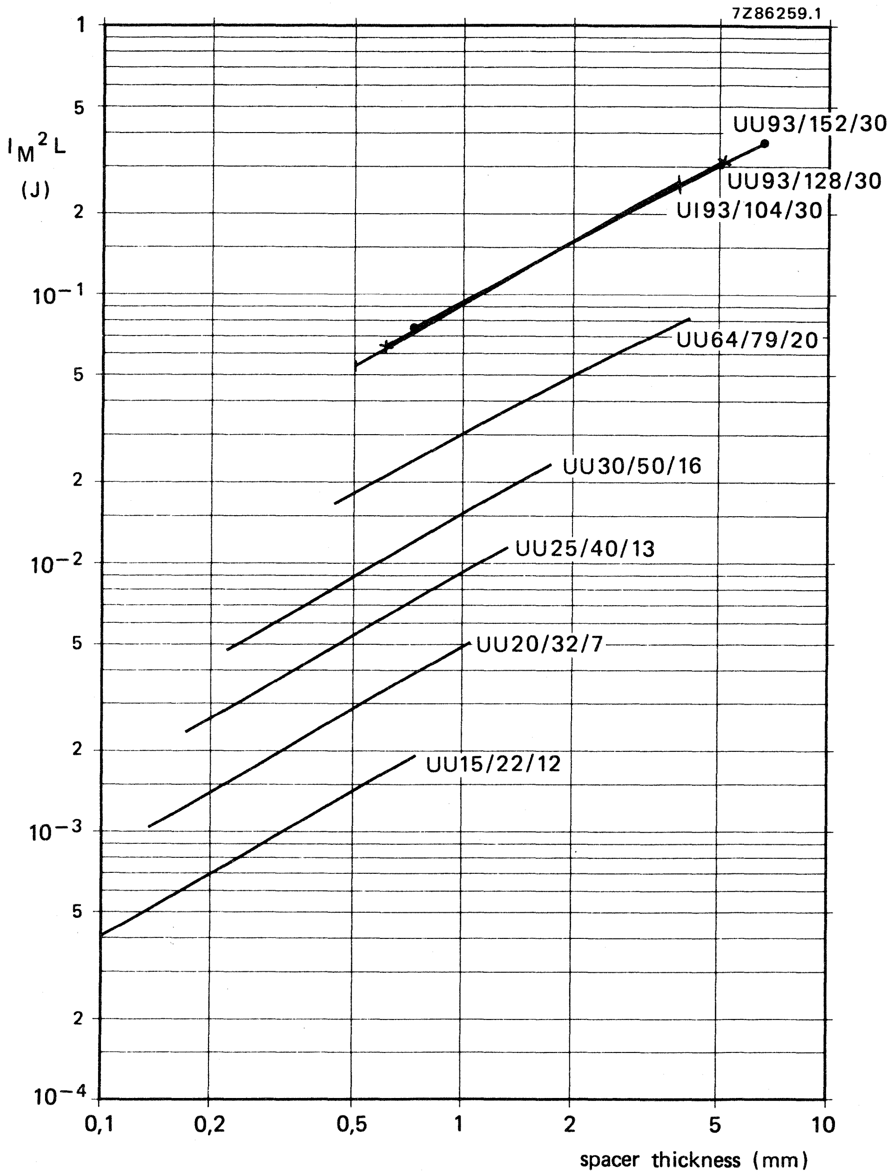


Fig.5.49 I^2L graph for U cores.

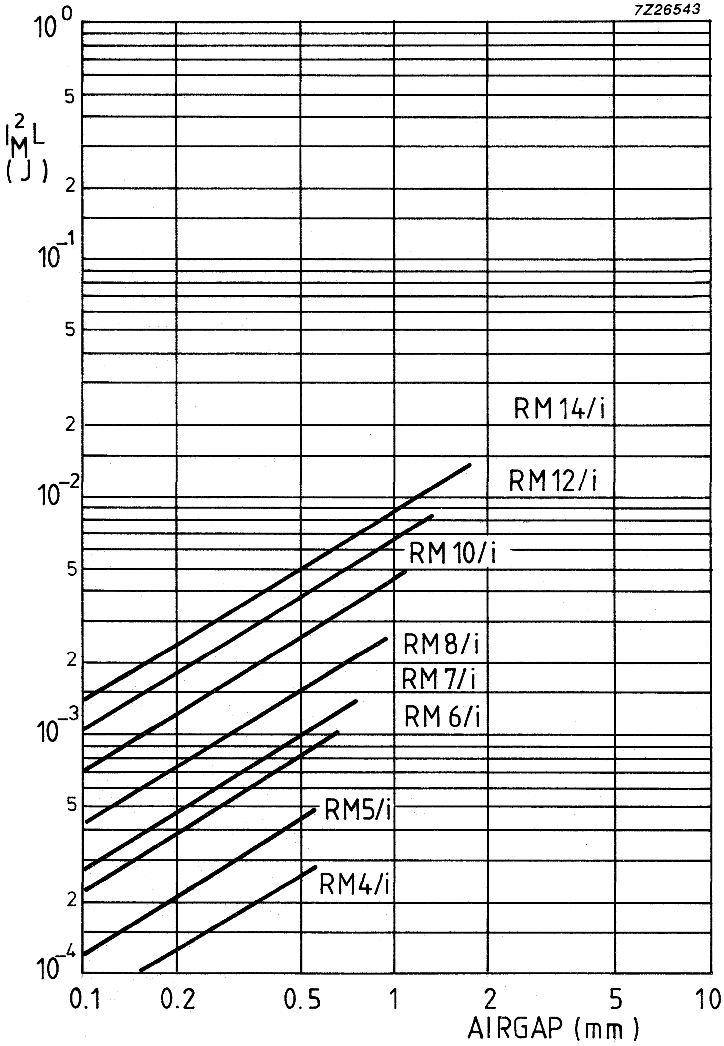


Fig.5.50 I^2L graph for RM cores.

Iron powder ring cores

Ring cores made from compressed iron powder have a rather low permeability (max. 90) combined with a very high saturation level (up to 1500 mT). The permeability is so low because the isolating coating on the iron particles act as a so called distributed airgap. Therefore, our 2P ring core range can operate under bias fields of up to 2000 A/m.

Input filters (current compensated chokes)

To avoid the conduction of switching noise from a SMPS into the mains, an input filter is generally necessary. The magnetic circuit in these filters is usually a pair of U cores or a ring core.

Since the noise signal is mainly common mode, current compensation can be used to avoid saturation.

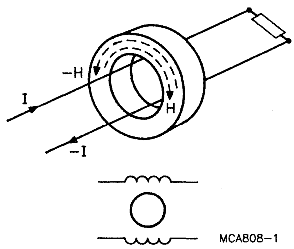


Fig.5.51 Current compensated choke.

Two separate windings on the core cause opposing magnetic fields when the load current passes through them (current compensation). The common mode noise signal however, is blocked by the full inductance caused by the high permeability ferrite.

If, for some reason, current compensation is not complete or impossible, high permeability grades will saturate. In that case one of the power grades may be a better compromise. Another important factor in the design process is the frequency range of the interference signal. High permeability ferrites have a limited bandwidth as can be seen from Fig.5.52.

These grades only perform well as an inductance below the frequency where ferromagnetic resonance occurs. Above this cut-off frequency, a coil will have a highly resistive character and the Q-factor of the LC filter circuit will be limited and thus, also the impedance. A better result could have been obtained with a grade having a lower permeability.

Figure 5.53 provides a quick method of choosing the right ferrite grade for the job.

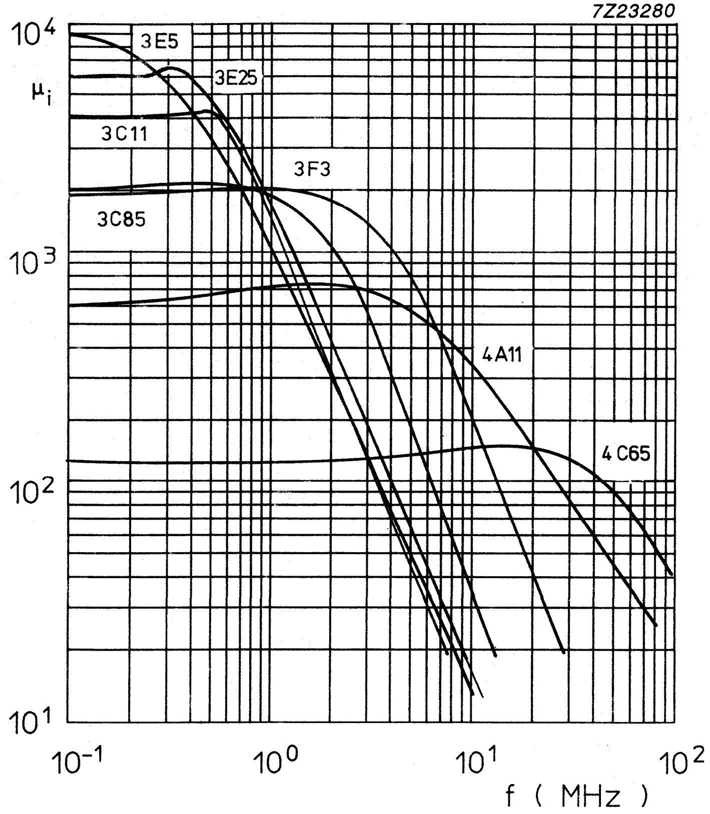


Fig.5.52 Permeability as a function of frequency of different material grades.

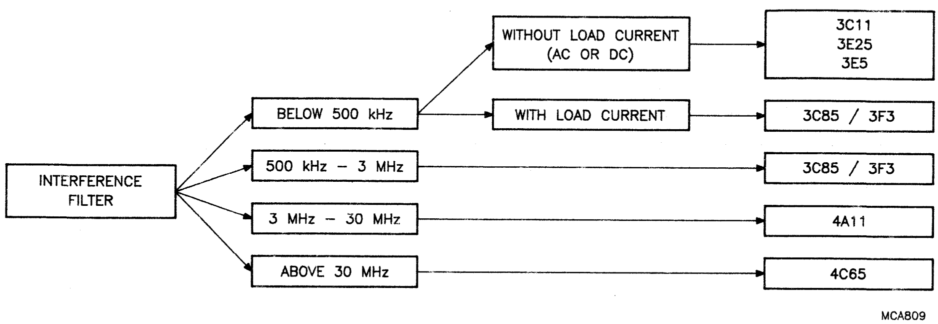


Fig.5.53 Selection chart for materials used in input filters.

Magnetic regulators

Saturable inductors provide a means of efficiently regulating several independent outputs in an SMPS by blocking varying amounts of energy from the secondary of the transformer. This eliminates the need for feedback between secondary and primary and allows improved isolation of input and output. The circuits required are both simple and economic and can be easily integrated.

A schematic of a saturable inductor circuit (without regulation) together with associated waveforms is shown in Fig.5.54.

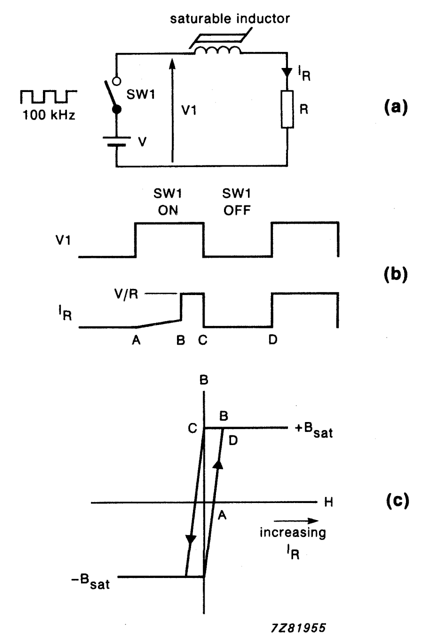


Fig.5.54 Schematic of a saturable inductor and associated waveforms (without regulation).

During a typical cycle:

- switch SW1 is closed (point A on timing diagram), the inductance of the saturable inductor limits the rate of current rise until the core becomes saturated
- with the core saturated (point B), the only impedance to current flow is the very small resistance of the inductor, which can be regarded as a short circuit with power being transferred unimpeded to the load resistor
- switch SW1 is opened (C). Because the saturable inductor has a rectangular B-H loop, the flux remains unchanged even when H has fallen to zero. Since there has been no change in flux, there is no inductance and the current can fall instantaneously
- switch SW1 is reclosed. As the flux in the core is still saturated and remains unchanged, there is no resistance to the current flow to the load.

A schematic of a regulated circuit and its associated waveforms is shown in Fig.5.55.

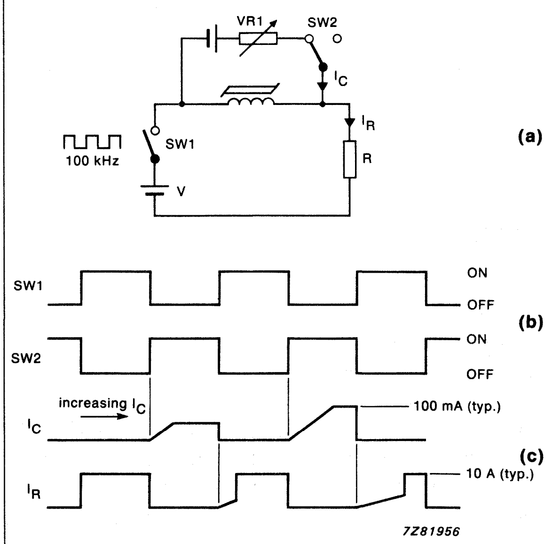


Fig.5.55 Schematic of a saturable inductor and associated waveforms (with regulation).

In this circuit, the inductor is saturated while switch SW1 is closed, thus reducing the period during which energy is conducted from the transformer to the load. Varying the level of this control current, in effect, pulse width modulates the main output voltage waveform (see Fig.5.56), thus regulating the output voltage across the load.

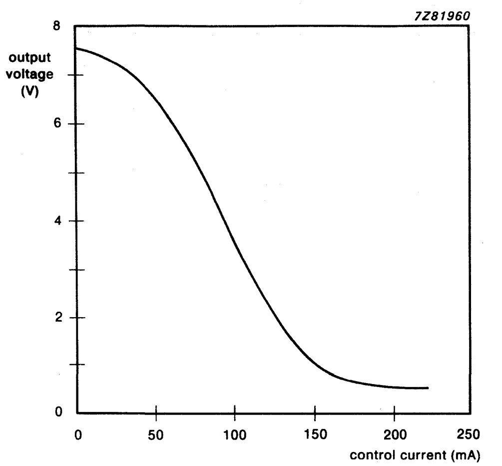


Fig.5.56 Typical control curve for a 3R1 ring core (size 14 x 9 x 5 mm, with 15 turns).

The new 3R1 ferrite material is an excellent alternative to the amorphous metal for the cores of saturable inductors of SMPS. The suitability of 3R1 for these cores derives from:

- a rectangular B-H loop
- high saturation flux level
- low coercive force.

The performance of 3R1 is comparable to that of amorphous metal making it an excellent material for applications such as output regulation and spike suppression.

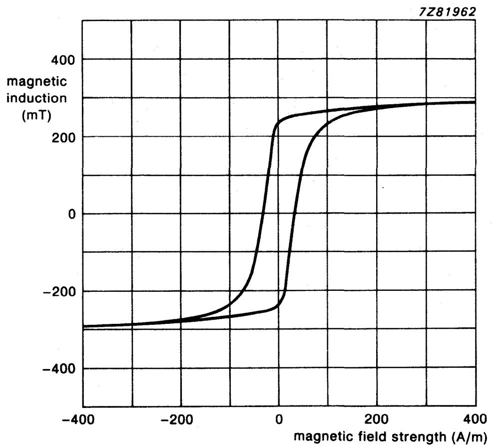


Fig.5.57 Properties of 3R1 ferrite material; f = 100 kHz, T = 25 °C

5.3 Ferrites for Interference Suppression and Electromagnetic Compatability (EMC)

With the ever increasing intensive use of electronic equipment Electromagnetic Compatibility (EMC) has become an important item. Laws specify limits of the level of interference caused by equipment (EMR) and also the sensitivity of equipment to incoming interference (EMS).

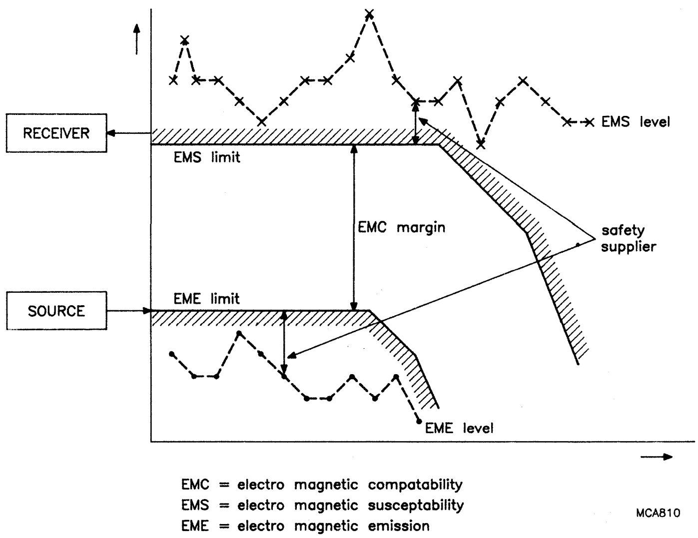


Fig.5.58 Principles of Electromagnetic Compatability (EMC).

Limiting curves are defined by organizations such as CISPR and FCC. Since the density of equipment increases, laws will become more stringent in the near future.

During the design phase, problems with interference can be avoided to some extent. Often additional suppression components such as capacitors and coils will be necessary to meet the required levels. Inductive components are very effective in blocking interfering signals, especially at high frequencies. The principles of suppression are shown in Fig.5.59.

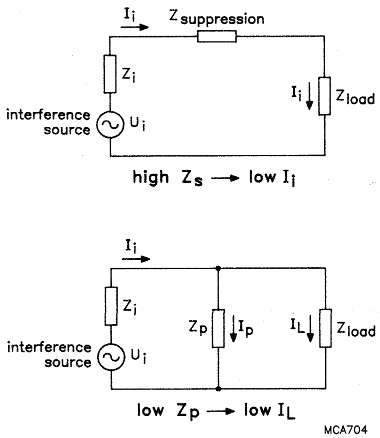


Fig.5.59 Basic suppression circuits.

Capacitors are used as a shunt impedance for the unwanted signal.
Unfortunately for high frequencies, most capacitors do not have the low impedance one might expect because of parasitic inductance or resistance.

Inductors are used in series with the load impedance. They provide a low impedance for the wanted signal, but a high impedance for the interfering, unwanted, signal.

Philips have a full range of beads, beads on wire and wideband chokes to suit every application. Rods and tubes are also often used for this application after they have been coiled by the user.

5.3.1 INTERFERENCE SUPPRESSION BEADS

A range of beads is available in two material grades, especially developed for suppression purposes.

They can easily be shifted on existing wires in the equipment.

- 3S1 for frequencies up to 30 MHz
- 4S2 for frequencies from 10 to 1000 MHz.

The material grades and beads are fully guaranteed for their main feature, impedance as a function of frequency.

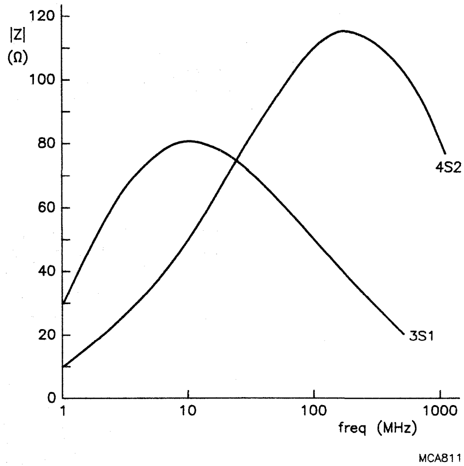


Fig.5.60 Impedance as a function of frequency for material grades 3S1 and 4S2; bead size 5 x 2 x 10 mm.

The grade 3S1 has a high permeability and is therefore rather sensitive for DC load. In applications where a high DC current is flowing,4S2 can be a better choice (see graphs 5.61 and 5.62).

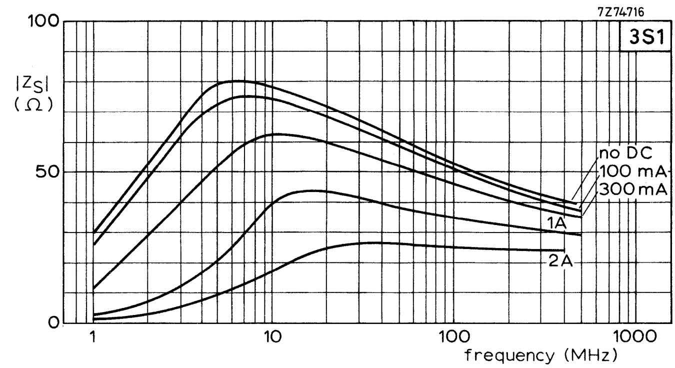


Fig.5.61 Impedance as a function of frequency at different DC levels for material grade 3S1.

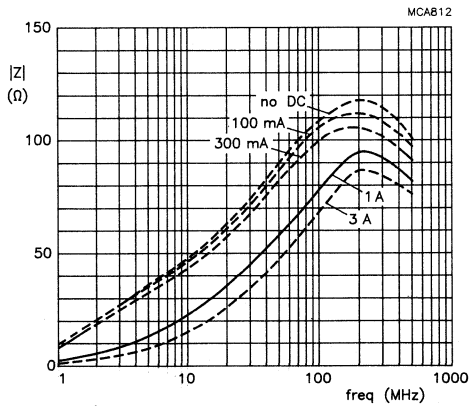


Fig.5.62 Impedance as a function of frequency at different DC levels for material grade 4S2.

5.3.2 Beads on wire

This product range consists of suppression beads, already mounted on presoldered 0.6 mm wire and taped on standard reels. These can be handled by automatic placement machines.

5.3.3 Wideband chokes

Wideband chokes are wired multihole beads. Since they have up to 2 1/2 turns of wire their impedance values are rather high over a broad frequency range,hence their name.

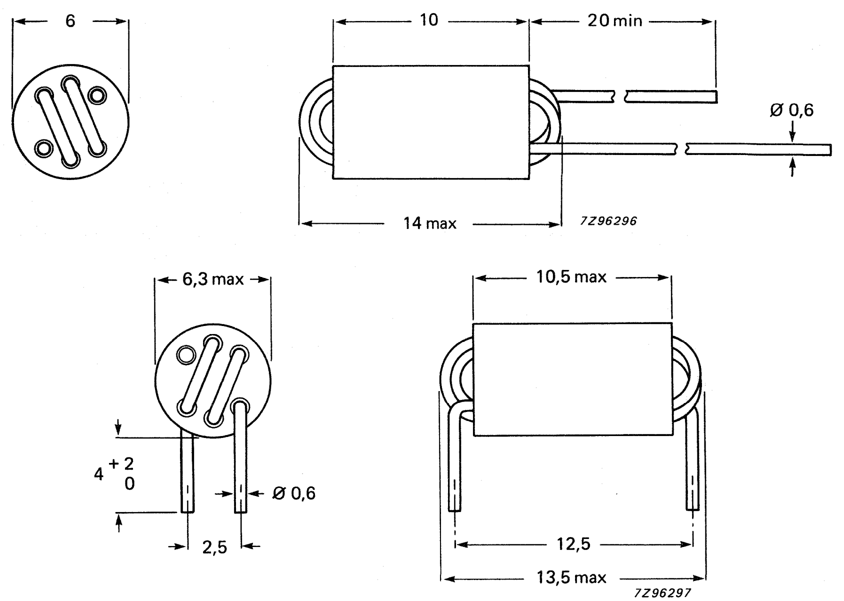


Fig.5.63 Outline of wide band chokes.

The magnetic circuit is closed, so there is little stray field. The DC resistance is very low since only a short length of 0.6 mm copper wire is used.

5.3.4 Rods and tubes

Rods and tubes are generally used to increase the inductance of a coil. The magnetic circuit is very open and therefore the mechanical dimensions have more influence on the inductance than the ferrite's permeability (see Fig.5.65) unless the rod is very slender.

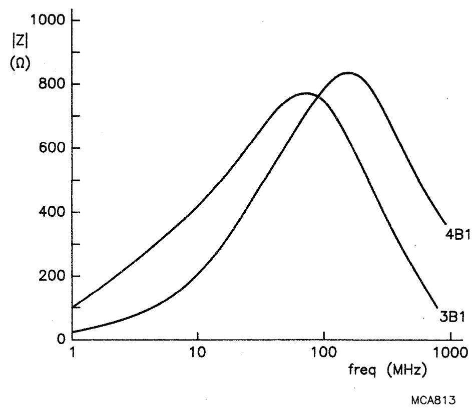


Fig.5.64 Impedance as a function of frequency for a wideband choke.

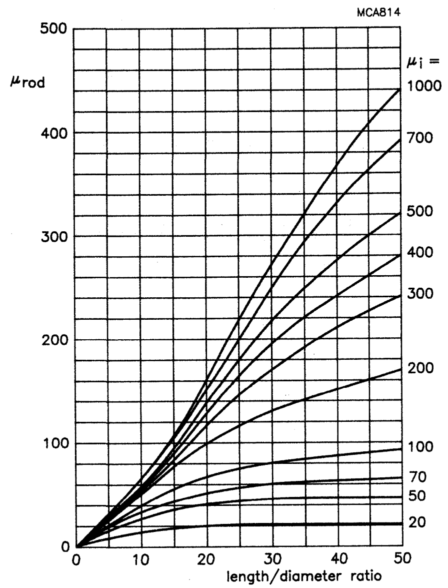


Fig.5.65 Rod permeability (μ_{rod}) as a function of length to diameter ratio with material permeability as a parameter.

In order to establish the effect of a rod on the inductance of a coil, the following procedure should be carried out.

- calculate the length to diameter ratio of the rod (l/d).
- find this value on the horizontal axis and draw a vertical line.
- the intersection of this line with the curve of the material permeability gives the effective rod permeability (μ_{Rod}).

The inductance of the coil, provided the winding covers the whole length of the rod is given by:

$$L = \mu_0 \mu_{rod} \frac{N^2 A}{l} \text{ (H)}$$

where N = number of turns
where A = cross sectional area of rod
where l = length of coil.

MATERIAL GRADE SPECIFICATION

Material grade specifications

Survey

Properties specified in this section are related to room temperature (25 °C) unless otherwise stated. They have been measured on sintered, non ground ring cores of dimensions Ø 25 × Ø 15 × 10 mm which are not subjected to external stresses.

Products generally do not fully comply with the material specification. Deviations may occur due to shape, size and grinding operations etc.

Specified product properties are given in the data sheets or product drawings.

Survey of material grades

FERRITE GRADE	μ_i at 25 °C	B_{sat} (mT) at 25 °C	T_c (°C)	ρ (Ωm)	FERRITE TYPE	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
4C6	100	≈ 380	≥ 350	≈ 10^5	NiZn	telecom filters low signal transformers pulse transformers	RM, P, X EP ring cores
3D3	750	≈ 400	≥ 200	≈ 2	MnZn		
3H1	2300	≈ 400	≥ 130	≈ 1	MnZn		
3H3	2000	≈ 450	≥ 160	≈ 2	MnZn		
3E1	3800	≈ 400	≥ 125	≈ 1	MnZn		
3E4	4700	≈ 400	≥ 125	≈ 1	MnZn		
3E5	10000	≈ 350	≥ 120	≈ 0.5	MnZn		
3E6	15000	≈ 400	≥ 130	≈ 0.1	MnZn		
3B8	2300	≈ 500	≥ 200	≈ 1	MnZn	power conversion general purpose transformers	RM, P, E, EFD, ETD, ER EC, U, I, EP ring cores
3C10	1800	≈ 500	≥ 190	≈ 1	MnZn		
3C15	1800	≈ 500	≥ 190	≈ 1	MnZn		
3C30	1800	≈ 500	≥ 220	≈ 2	MnZn		
3C80	2000	≈ 500	≥ 200	≈ 1	MnZn		
3C85	2000	≈ 500	≥ 200	≈ 2	MnZn		
3F3	1800	≈ 500	≥ 200	≈ 2	MnZn		
3F4	750	≈ 450	≥ 220	≈ 10	MnZn		
4F1	≈ 80	≈ 300	≥ 260	≈ 10^5	NiZn		
3S1	4000	≈ 400	≥ 125	≈ 1	MnZn	suppression	beads, SMD beads, beads on wire
4S2	700	≈ 350	≥ 150	≈ 10^5	NiZn		
4C65	125	≈ 350	≥ 350	≈ 10^5	NiZn	suppression pulse transformers miscellaneous	ring cores
4A11	700	≈ 350	≥ 125	≈ 10^5	NiZn		
4A15	1200	≈ 350	≥ 125	≈ 10^5	NiZn		
3C11	4300	≈ 400	≥ 125	≈ 1	MnZn		
3E25	6000	≈ 400	≥ 125	≈ 0.5	MnZn		
3C2	900	≈ 400	≥ 150	≈ 0.1	MnZn	deflection coils	yoke rings
2A2	350	≈ 250	≥ 135	≈ 10^6	MgZn		
2B1	350	≈ 250	≥ 125	≈ 10^6	MgZn		

Survey of material grades

FERRITE GRADE	μ_i at 25 °C	B_{sat} (mT) at 25 °C	T_c (°C)	ρ (Ωm)	FERRITE TYPE	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
4E1	15	≈ 200	≥ 500	≈ 10^5	NiZn	tuning suppression miscellaneous	ring cores rods, tubes wide band chokes
4D2	60	≈ 240	≥ 400	≈ 10^5	NiZn		
4B1	250	≈ 350	≥ 250	≈ 10^5	NiZn		
6B1	250	≈ 350	≥ 250	≈ 10^5	LiZn		
3B1	900	≈ 400	≥ 150	≈ 0.2	MnZn		
3R1	800	≈ 450	≥ 230	≈ 1	MnZn	magnetic regulators	ring cores

Survey of material grades

IRON POWDER GRADE	μ_i at 25 °C	B_{sat} (mT) at 25 °C	MAXIMUM OPERATING TEMPERATURE (°C)	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
1P04	4	–	130	tuning	rods, pins
1P11	11	–	130		
1P30	30	–	140		
2P40	40	950	140	suppression	ring cores, U cores
2P50	50	1000	140		
2P65	65	1150	140		
2P80	80	1400	140		
2P90	90	1600	140		

Typical mechanical and thermal properties

PROPERTY	UNIT	MnZn FERRITE	NiZn FERRITE	LiZn FERRITE
Young's modulus	N/mm^2	(90-150) × 10^3	(80-150) × 10^3	140 × 10^3
Ultimate compression strength	N/mm^2	200-600	200-700	–
Ultimate tensile strength	N/mm^2	20-65	30-60	25
Vickers hardness	N/mm^2	600-700	800-900	800
Linear expansion coefficient	K^{-1}	(10-12) × 10^{-6}	(7-8) × 10^{-6}	(7.5-9.0) × 10^{-6}
Specific heat	$J.kg^{-1}. K^{-1}$	700-800	750	–
Heat conductivity	$J.mm^{-1}. s^{-1}. K^{-1}$	(3.5-5.0) × 10^{-3}	(3.5-5.0) × 10^{-3}	–

Material grade specification 1P..

Material grade specification - 1P04

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	4 ± 10%	
$\tan\delta/\mu_i$	3 MHz, 0.1 mT, 25 °C 100 MHz, 0.1 mT, 25 °C	≈ 800.10^{-6} ≈ 3000.10^{-6}	
α_F	25 - 55 °C	≈ 10.10^{-6}	K^{-1}
T_{max}		130	°C

Material grade specification - 1P11

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	11 ± 10%	
$\tan\delta/\mu_i$	1 MHz, 0.1 mT, 25 °C 50 MHz, 0.1 mT, 25 °C	≈ 350.10^{-6} ≈ 2000.10^{-6}	
α_F	25 - 55 °C	≈ 15.10^{-6}	K^{-1}
T_{max}		130	°C

Material grade specification - 1P30

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	30 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C 5 MHz, 0.1 mT, 25 °C	≈ 300.10^{-6} ≈ 2500.10^{-6}	
α_F	25 - 55 °C	≈ 3.10^{-6}	K^{-1}
T_{max}		140	°C

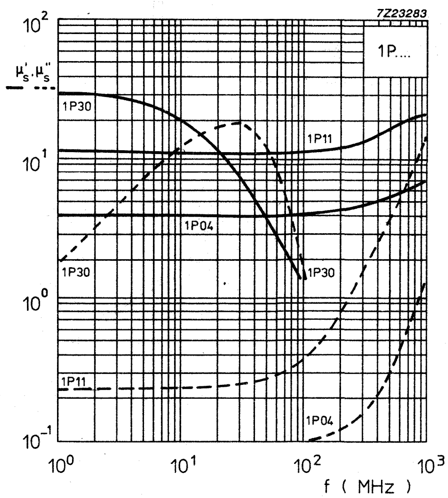


Fig.1 Complex permeability as a function of frequency.

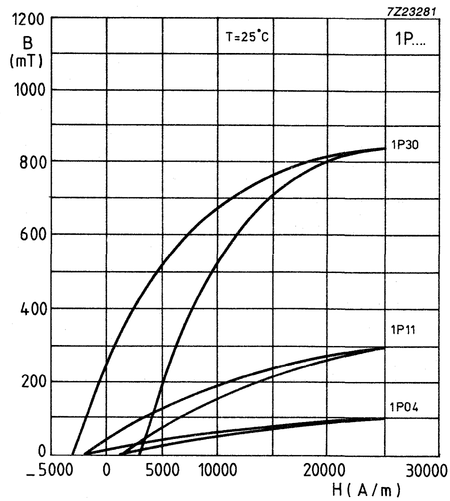


Fig.2 Typical B-H loops.

Material grade specification 1P..

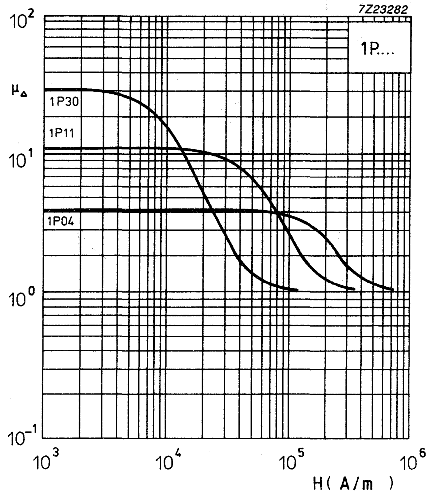


Fig.3 Incremental permeability as a function of magnetic field strength.

Material grade specification 2A2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	350 ± 25%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 200 ≈ 130	mT mT
P_V	16 kHz, 100 mT, 25 °C 16 kHz, 100 mT, 85 °C	≤ 250 ≤ 200	kW/m³ kW/m³
H_c	from 800 A/m	≤ 60	A/m
ρ	DC	≈ 10^6	Ωm
T_c		≥ 135	°C
density		≈ 4300	kg/m³

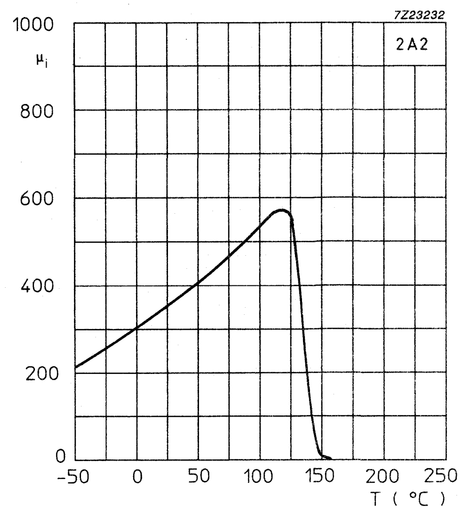


Fig.2 Initial permeability as a function of temperature.

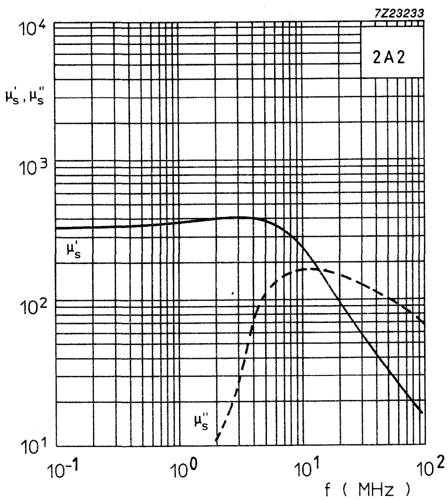


Fig.1 Complex permeability as a function of frequency.

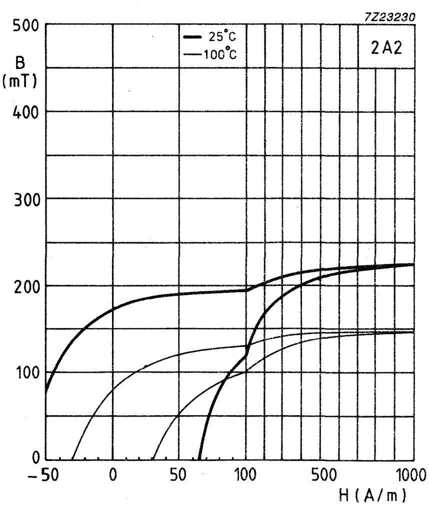


Fig.3 Typical B-H loops.

Material grade specification 2A2

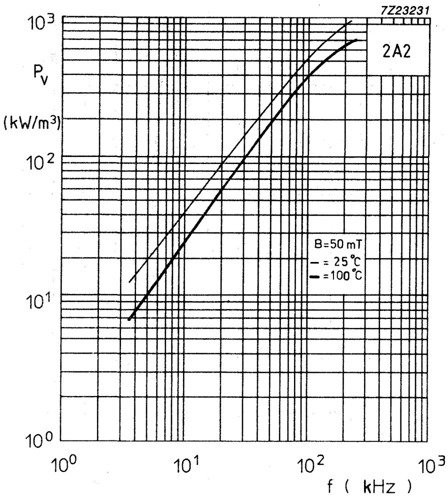


Fig.4 Specific power loss as a function of frequency.

Material grade specification 2B1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	500 ± 25%	
B	10 kHz, 250 A/m, 25 °C	≈ 200	mT
	10 kHz, 250 A/m, 100 °C	≈ 130	mT
P_V	16 kHz, 100 mT, 25 °C	≤ 150	kW/m³
	16 kHz, 100 mT, 100 °C	≤ 60	kW/m³
	64 kHz, 100 mT, 25 °C	≤ 650	kW/m³
	64 kHz, 100 mT, 100 °C	≤ 320	kW/m³
H_c	from 800 A/m	≤ 30	A/m
ρ	DC, 25 °C	≈ 10^6	Ωm
T_c		≥ 125	°C
density		≈ 4500	kg/m³

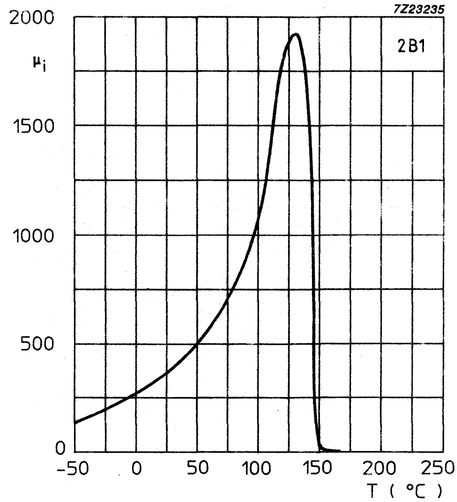


Fig.2 Initial permeability as a function of temperature.

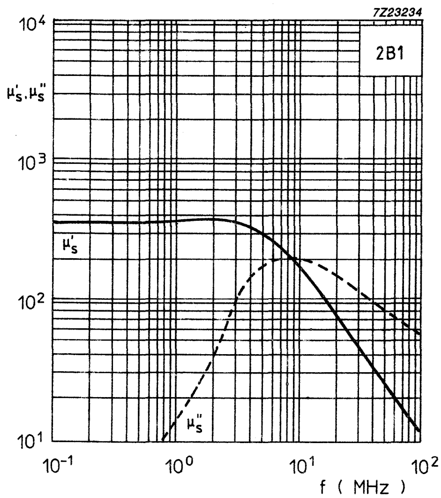


Fig.1 Complex permeability as a function of frequency.

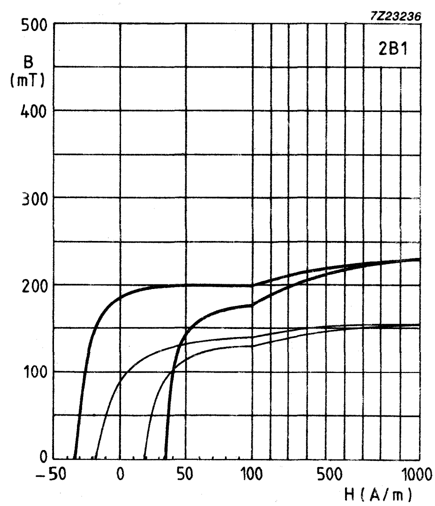


Fig.3 Typical B-H loops.

Material grade specification

2B1

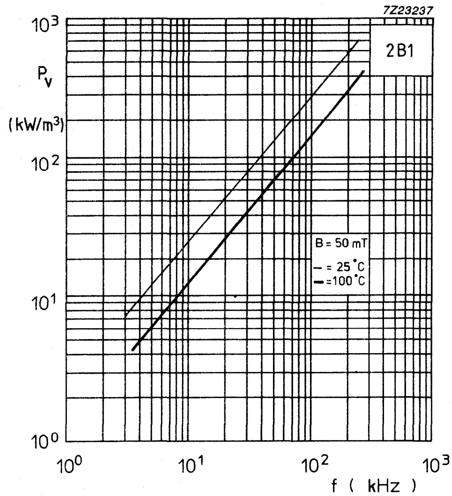


Fig.4 Specific power loss as a function of frequency.

Material grade specification 2P..

Material grade specification - 2P40

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	40 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	≈ 1500.10^{-6}	
B_r	from 25.10^3 A/m	≈ 250	mT
H_c	from 25.10^3 A/m	≈ 2000	A/m
B	at H = 25.10^3 A/m	≈ 950	mT
α_F	25 - 55 °C	≈ 10.10^{-6}	K^{-1}
T_{max}		140	°C

Material grade specification - 2P80

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	80 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	≈ 1000.10^{-6}	
B_r	from 25.10^3 A/m	≈ 400	mT
H_c	from 25.10^3 A/m	≈ 1200	A/m
B	at H = 25.10^3 A/m	≈ 1400	mT
α_F	25 - 55 °C	≈ 15.10^{-6}	K^{-1}
T_{max}		140	°C

Material grade specification - 2P50

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	50 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	≈ 1500.10^{-6}	
B_r	from 25.10^3 A/m	≈ 300	mT
H_c	from 25.10^3 A/m	≈ 1800	A/m
B	at H = 25.10^3 A/m	≈ 1000	mT
α_F	25 - 55 °C	≈ 20.10^{-6}	K^{-1}
T_{max}		140	°C

Material grade specification - 2P90

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	90 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	≈ 1000.10^{-6}	
B_r	from 25.10^3 A/m	≈ 450	mT
H_c	from 25.10^3 A/m	≈ 900	A/m
B	at H = 25.10^3 A/m	≈ 1600	mT
α_F	25 - 55 °C	≈ 15.10^{-6}	K^{-1}
T_{max}		140	°C

Material grade specification - 2P65

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	65 ± 10%	
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	≈ 1000.10^{-6}	
B_r	from 25.10^3 A/m	≈ 350	mT
H_c	from 25.10^3 A/m	≈ 1500	A/m
B	at H = 25.10^3 A/m	≈ 1150	mT
α_F	25 - 55 °C	≈ 15.10^{-6}	K^{-1}
T_{max}		140	°C

Material grade specification

2P..

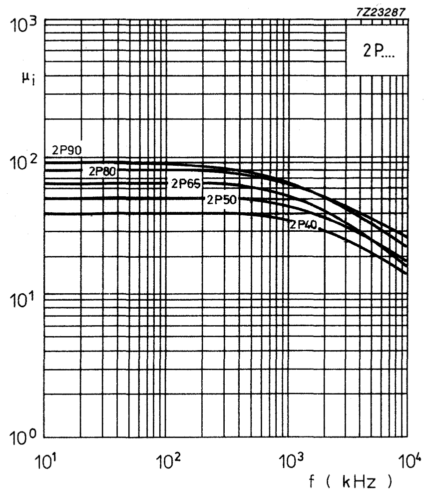


Fig.1 Initial permeability as a function of frequency.

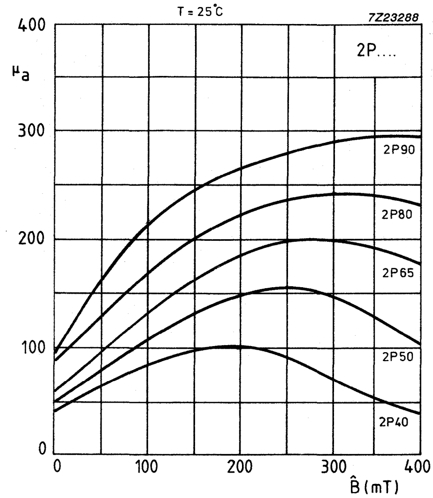


Fig.3 Amplitude permeability as a function of peak flux density.

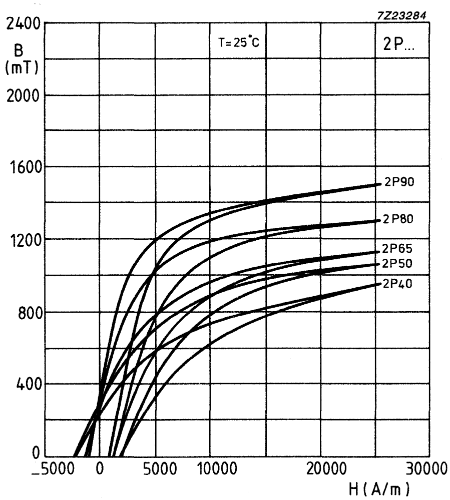


Fig.2 Typical B-H loops.

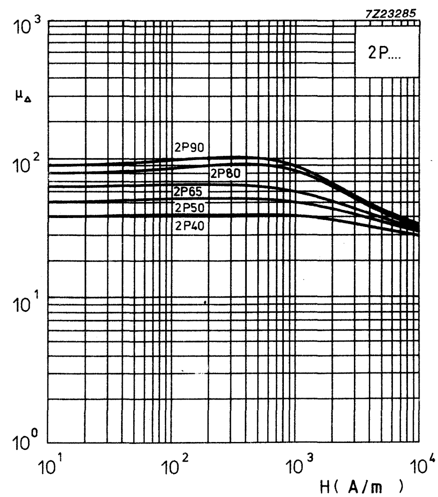


Fig.4 Incremental permeability as a function of magnetic field strength.

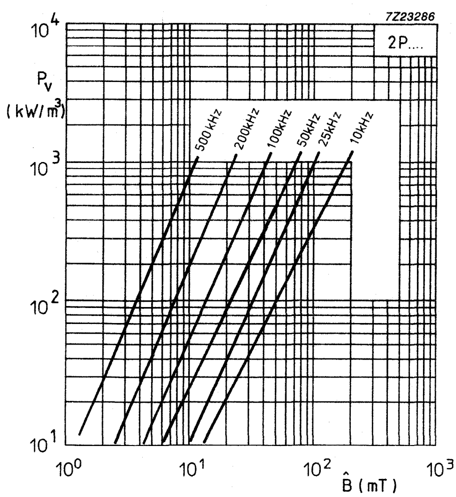


Fig.5 Specific power loss as a function of peak flux density with frequency as parameter.

Material grade specification 3B1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	900 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 330 ≈ 200	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	$\leq 50.10^{-6}$	
ρ	DC, 25 °C	≈ 0.2	Ωm
T_C		≥ 150	°C
density		≈ 4800	kg/m³

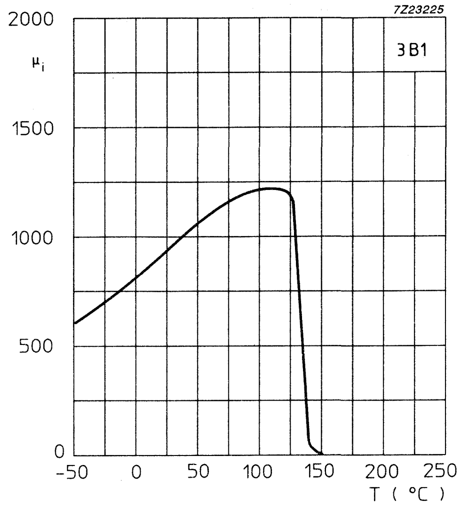


Fig.2 Initial permeability as a function of temperature.

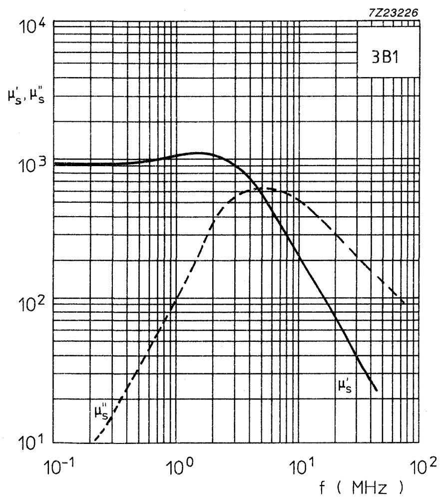


Fig.1 Complex permeability as a function of frequency.

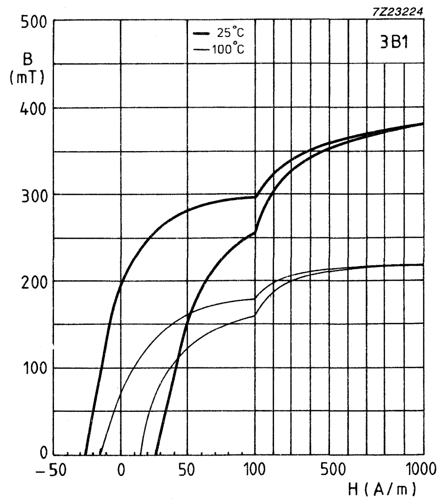


Fig.3 Typical B-H loops.

Material grade specification 3B8

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	2300 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 420 ≈ 330	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C	$\leq 5.10^{-6}$	
P_V	25 kHz, 200 mT, 25 °C 100 kHz, 100 mT, 25 °C	≤ 140 ≤ 155	kW/m^3 kW/m^3
ρ	DC, 25 °C	≈ 2	Ωm
T_C		≥ 200	°C
density		≈ 4800	kg/m^3

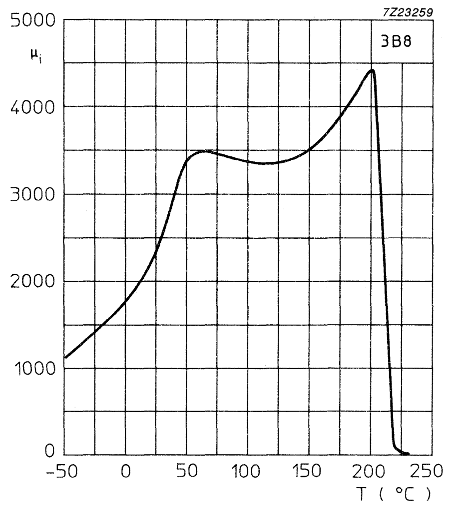


Fig.2 Initial permeability as a function of temperature.

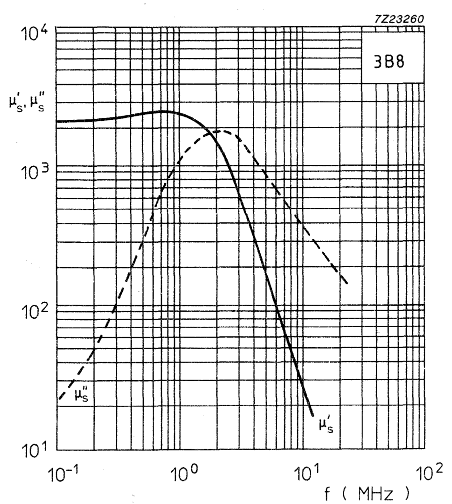


Fig.1 Complex permeability as a function of frequency.

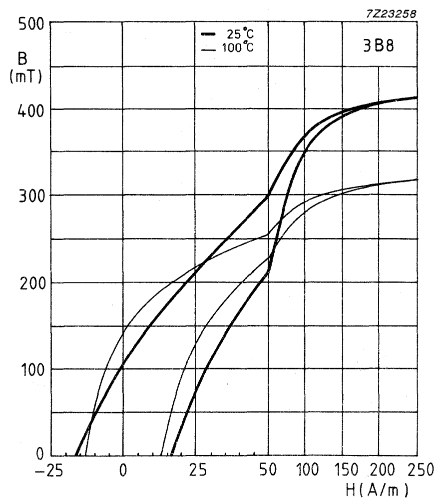


Fig.3 Typical B-H loops.

Material grade specification

3B8

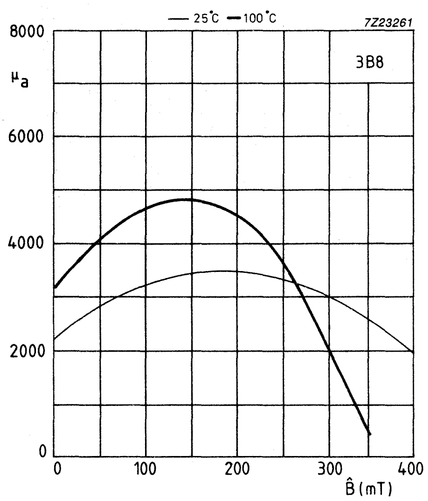


Fig.4 Amplitude permeability as a function of peak flux density.

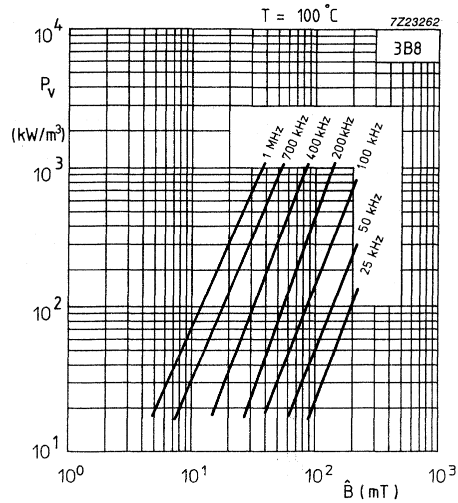


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

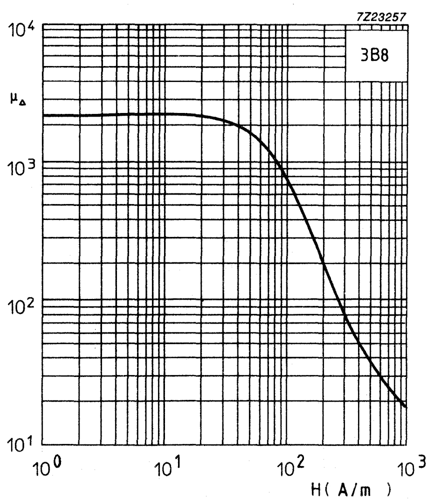


Fig.5 Incremental permeability as a function of magnetic field strength.

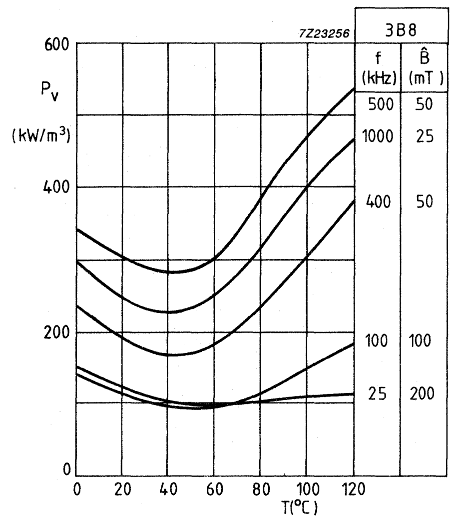


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C10

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	1800 ± 20%	
μ_a	25 kHz, 200 mT, 25 °C 25 kHz, 200 mT, 100 °C	5000 ± 25% 6000 ± 25%	
B	10 kHz, 250 A/m, 100 °C	≥ 350	mT
P_V	25 kHz, 200 mT, 100 °C	≤ 170	kW/m^3
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 190	°C
density		≈ 4800	kg/m^3

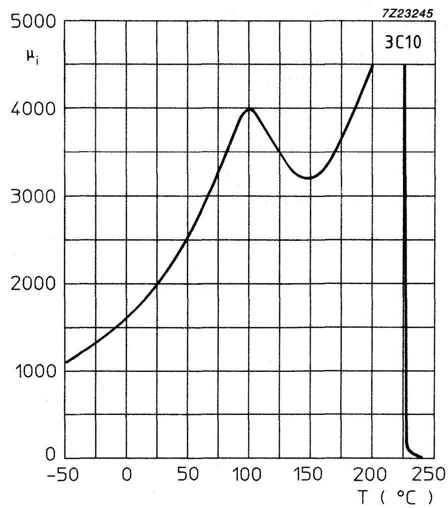


Fig.2 Initial permeability as a function of temperature.

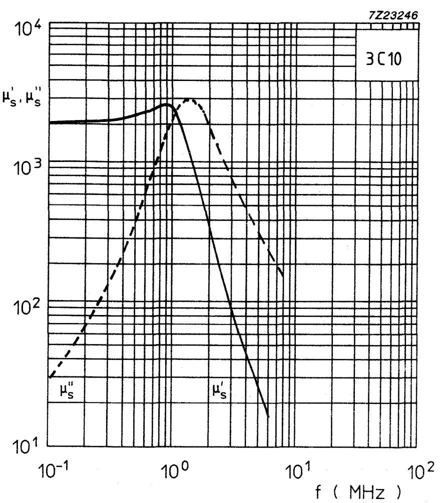


Fig.1 Complex permeability as a function of frequency.

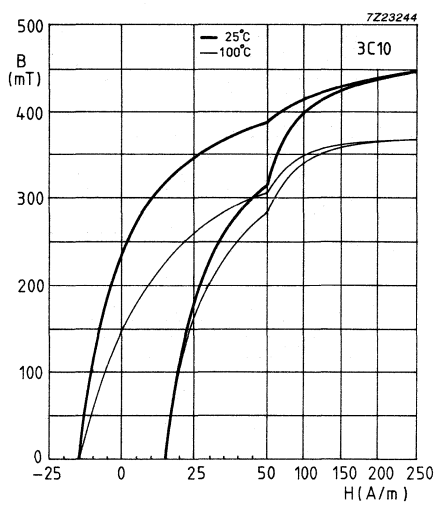


Fig.3 Typical B-H loops.

Material grade specification **3C10**

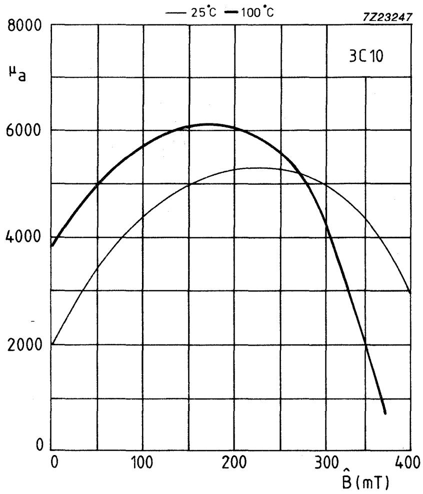


Fig.4 Amplitude permeability as a function of peak flux density.

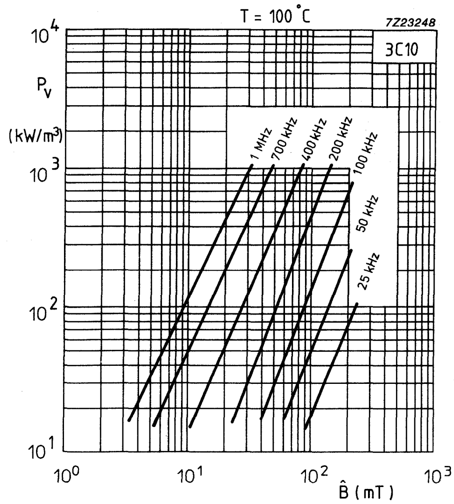


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

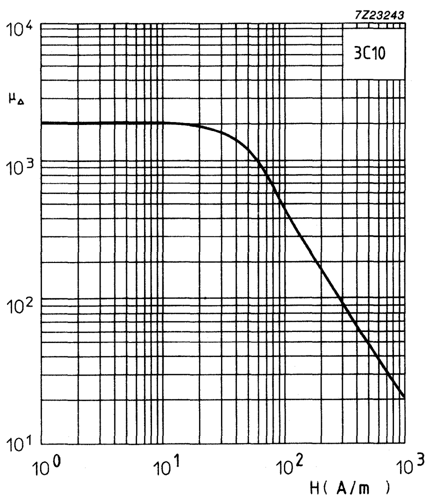


Fig.5 Incremental permeability as a function of magnetic field strength.

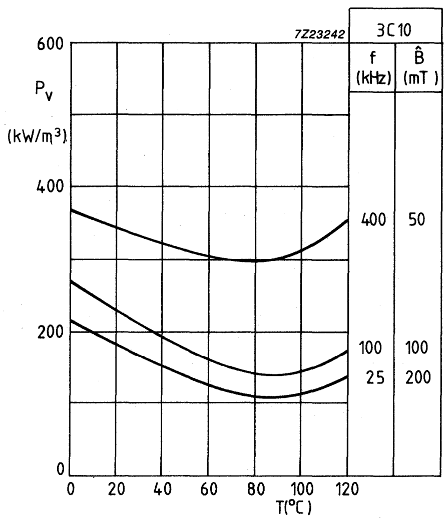


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C11

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	4300 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≥ 350 ≥ 180	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C 300 kHz, 0.1 mT, 25 °C	$\leq 20.10^{-6}$ $\leq 200.10^{-6}$	
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 125	°C
density		≈ 4900	kg/m^3

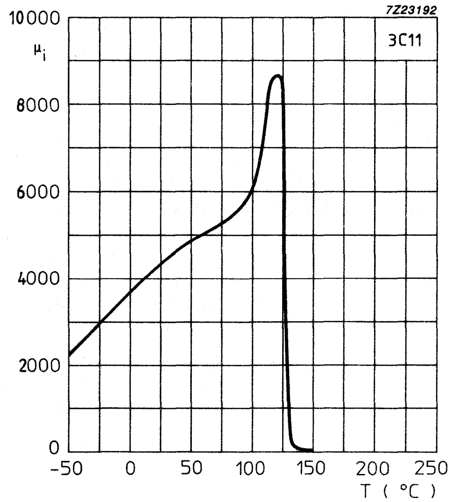


Fig.2 Initial permeability as a function of temperature.

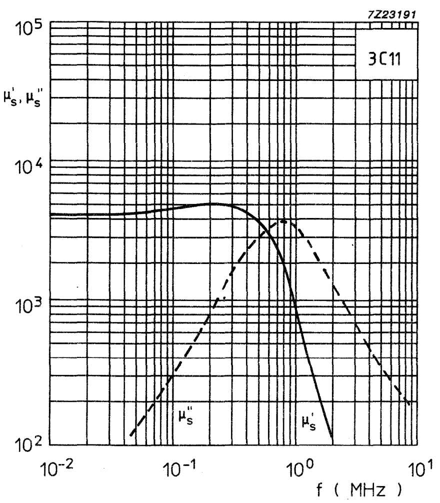


Fig.1 Complex permeability as a function of frequency.

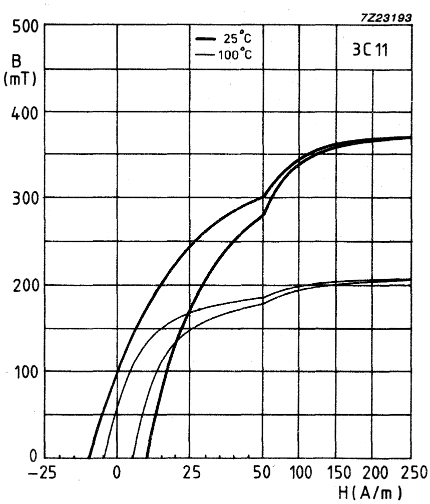


Fig.3 Typical B-H loops.

Material grade specification

3C11

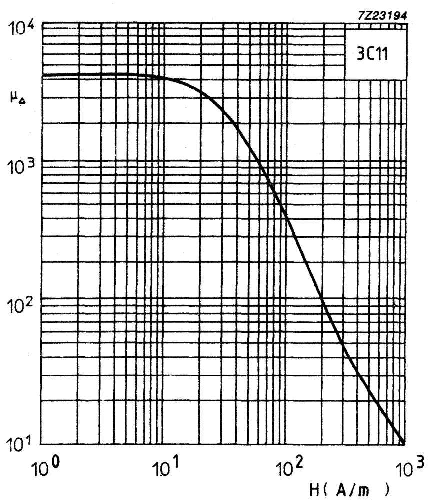


Fig.4 Incremental permeability as a function of magnetic field strength.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	1800 ± 20%	
μ_a	10 kHz, 200 mT, 100 °C	5500 ± 25%	
B	10 kHz, 250 A/m, 100 °C	≥ 350	mT
P_v	25 kHz, 200 mT, 100 °C	≤ 140	kW/m³
	100 kHz, 100 mT, 100 °C	≤ 165	kW/m³
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 190	°C
density		≈ 4800	kg/m³

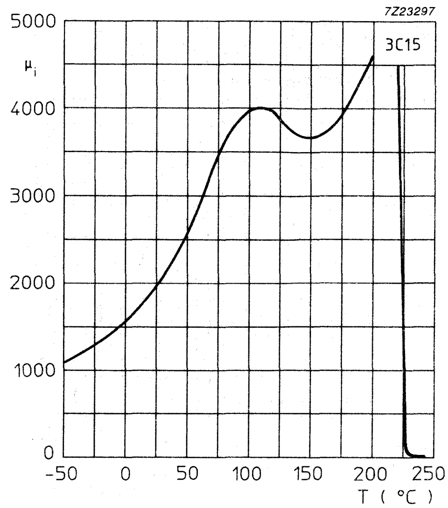


Fig.2 Initial permeability as a function of temperature.

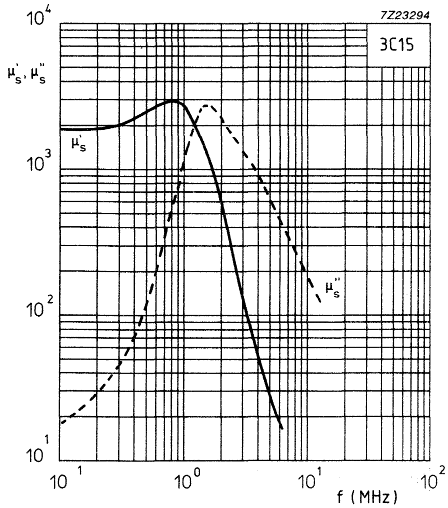


Fig.1 Complex permeability as a function of frequency.

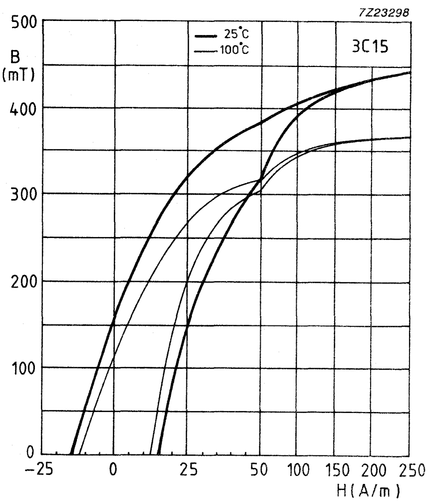


Fig.3 Typical B-H loops.

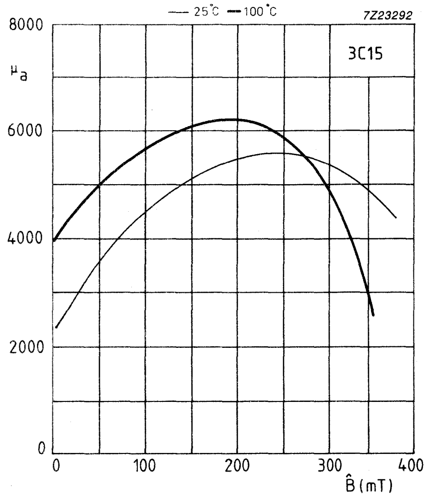


Fig.4 Amplitude permeability as a function of peak flux density.

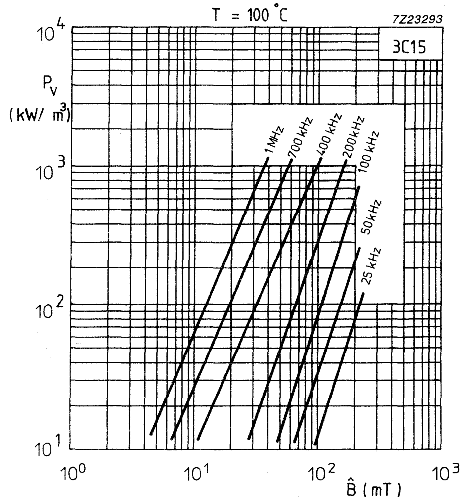


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

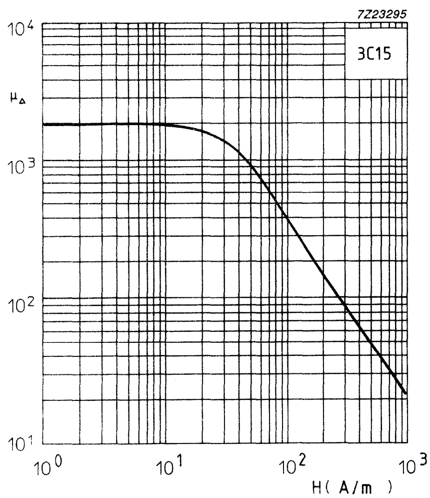


Fig.5 Incremental permeability as a function of magnetic field strength.

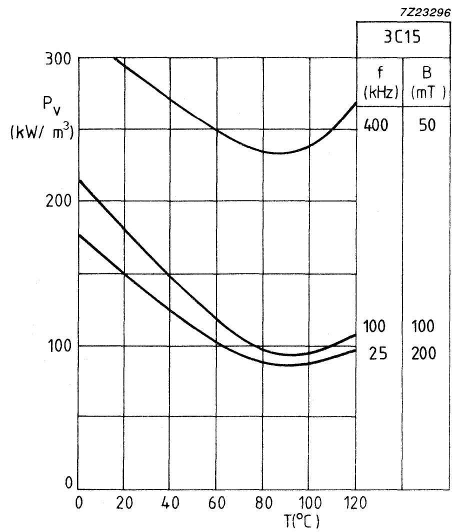


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	900 ± 25%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 250 ≈ 200	mT mT
P_V	16 kHz, 100 mT, 25 °C 16 kHz, 100 mT, 85 °C 64 kHz, 100 mT, 25 °C 64 kHz, 100 mT, 85 °C	≤ 100 ≤ 120 ≤ 450 ≤ 500	kW/m^3 kW/m^3 kW/m^3 kW/m^3
H_c	from 800 A/m	≤ 40	A/m
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 150	°C
density		≈ 4800	kg/m^3

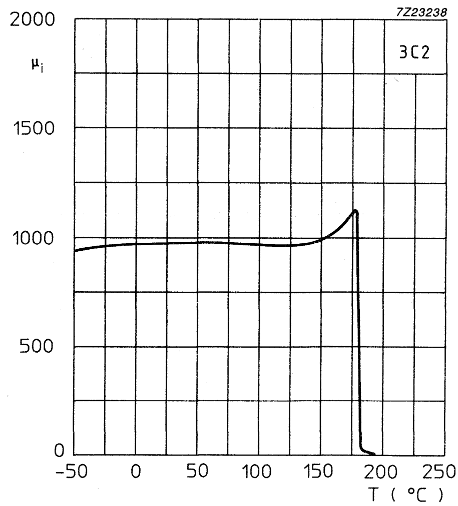


Fig.2 Initial permeability as a function of temperature.

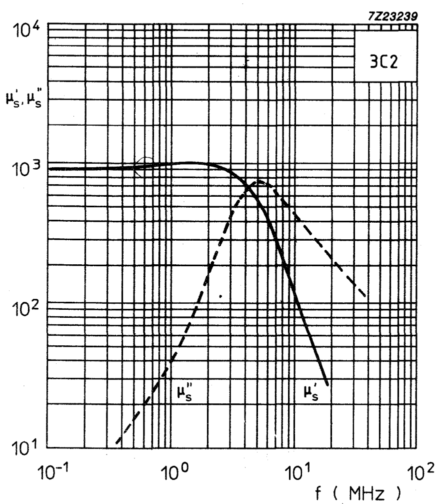


Fig.1 Complex permeability as a function of frequency.

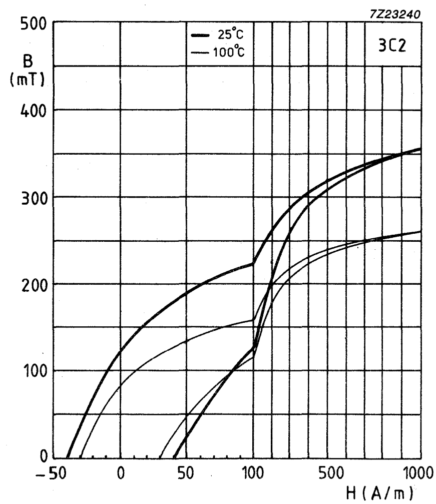


Fig.3 Typical B-H loops.

Material grade specification 3C2

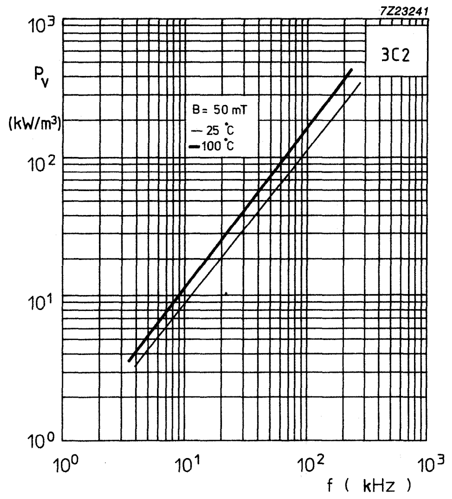


Fig.4 Specific power loss as a function of frequency.

Preliminary
Material grade specification

3C30

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	1800 ± 20%	
μ_a	25 kHz, 200 mT, 100 °C	4500 ± 25%	
B	10 kHz, 250 A/m, 100 °C	≥ 360	mT
P_v	25 kHz, 200 mT, 100 °C	≤ 100	kW/m³
	100 kHz, 100 mT, 100 °C	≤ 90	kW/m³
ρ	DC, 25 °C	≈ 2	Ωm
T_c		≥ 240	°C
density		≈ 4800	kg/m³

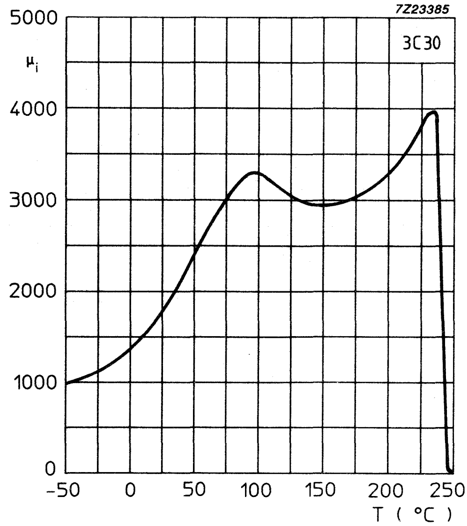


Fig.2 Initial permeability as a function of temperature.

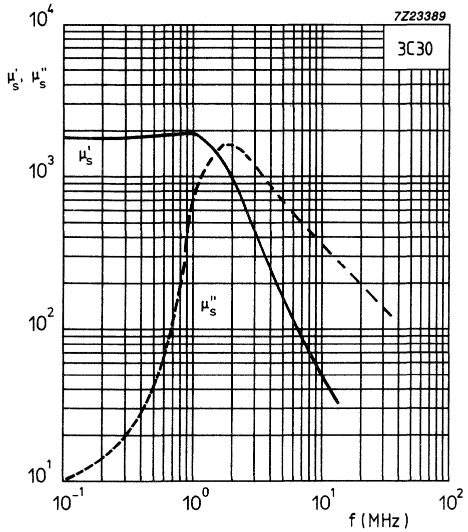


Fig.1 Complex permeability as a function of frequency.

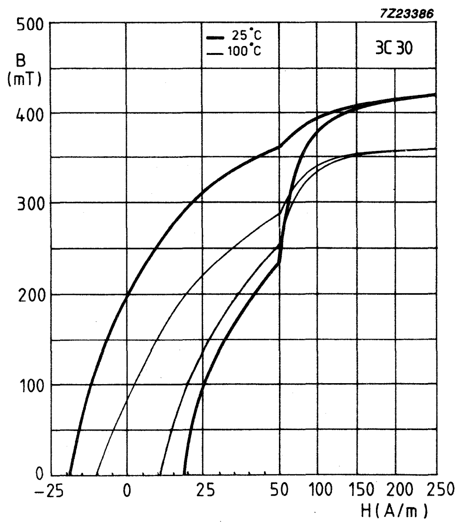


Fig.3 Typical B-H loops.

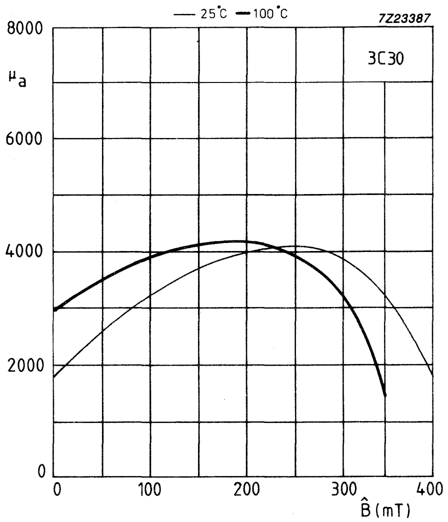


Fig.4 Amplitude permeability as a function of peak flux density.

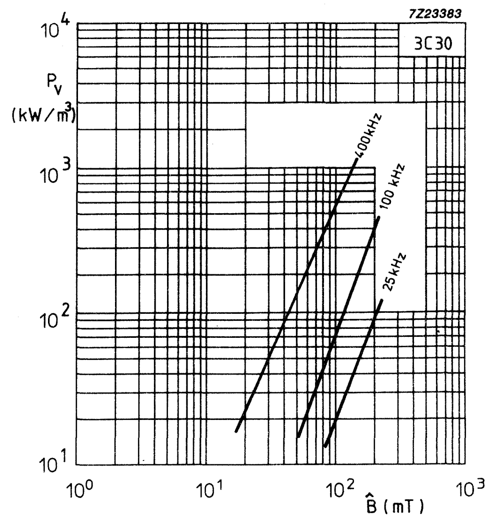


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

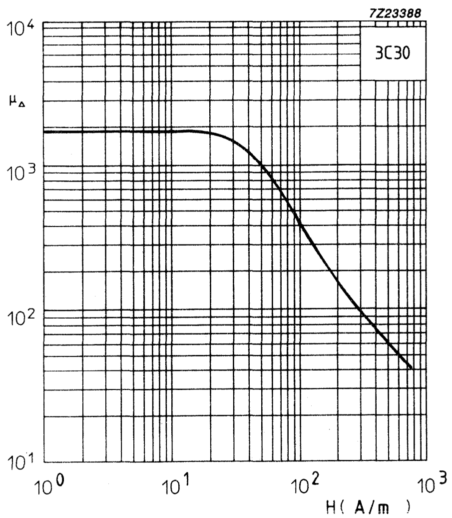


Fig.5 Incremental permeability as a function of magnetic field strength.

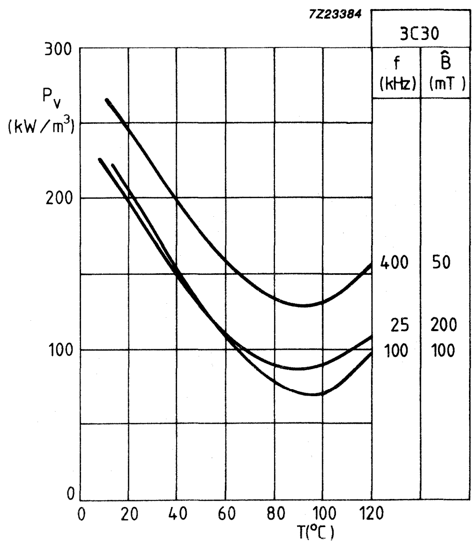


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C80

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	2000 ± 20%	
μ_a	25 kHz, 200 mT, 25 °C 25 kHz, 200 mT, 100 °C	4500 ± 25% 5500 ± 25%	mT mT
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 420 ≈ 330	mT mT
P_V	25 kHz, 200 mT, 100 °C	≤ 200	kW/m³
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 200	°C
density		≈ 4800	kg/m³

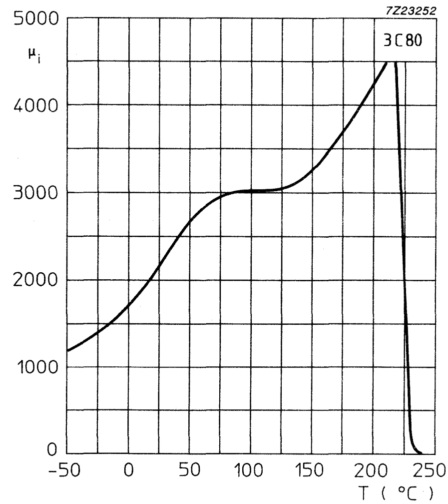


Fig.2 Initial permeability as a function of temperature.

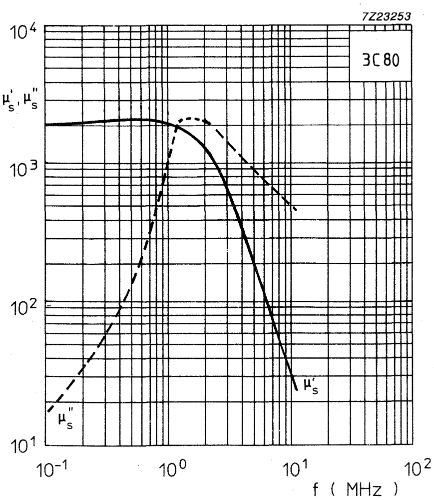


Fig.1 Complex permeability as a function of frequency.

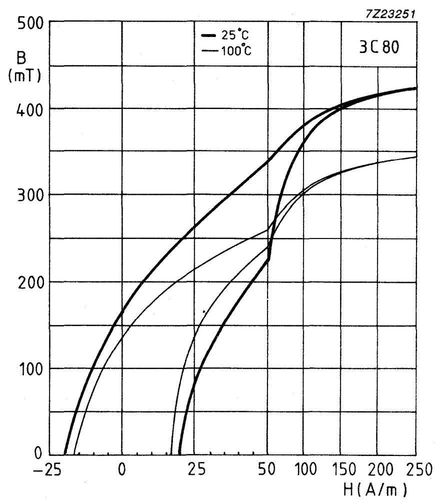


Fig.3 Typical B-H loops.

Material grade specification

3C80

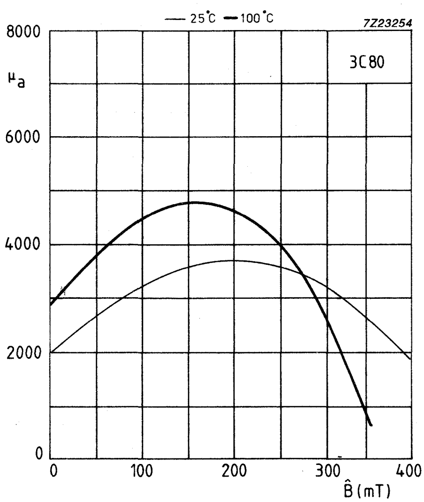


Fig.4 Amplitude permeability as a function of peak flux density.

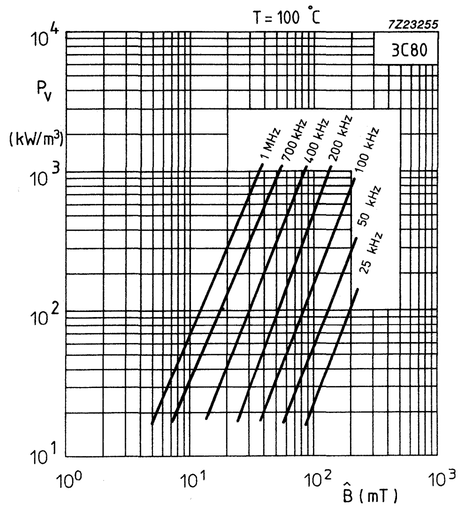


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

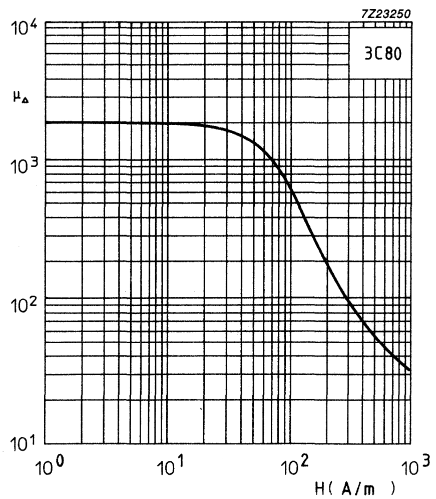


Fig.5 Incremental permeability as a function of magnetic field strength.

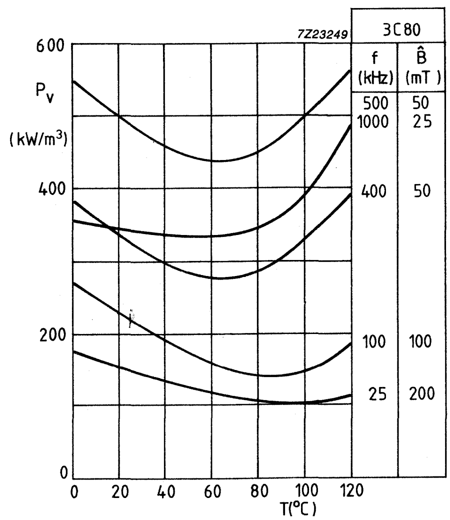


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C85

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	2000 ± 20%	
μ_a	25 kHz, 200 mT, 25 °C	4500 ± 25%	
	25 kHz, 200 mT, 100 °C	5500 ± 25%	
B	10 kHz, 250 A/m, 25 °C	≥ 400	mT
	10 kHz, 250 A/m, 100 °C	≥ 330	mT
P_V	25 kHz, 200 mT, 100 °C	≤ 140	kW/m^3
	100 kHz, 100 mT, 100 °C	≤ 165	kW/m^3
ρ	DC, 25 °C	≈ 2	Ωm
T_c		≥ 200	°C
density		≈ 4800	kg/m^3

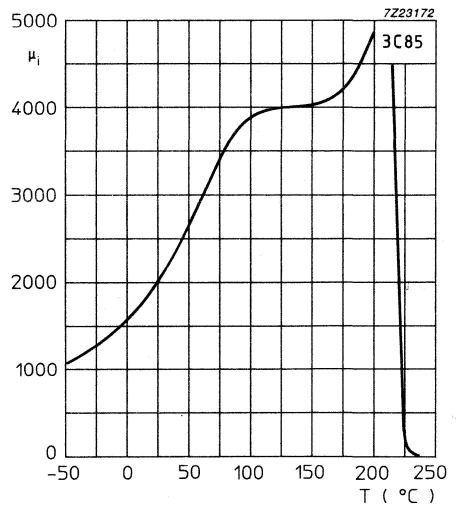


Fig.2 Initial permeability as a function of temperature.

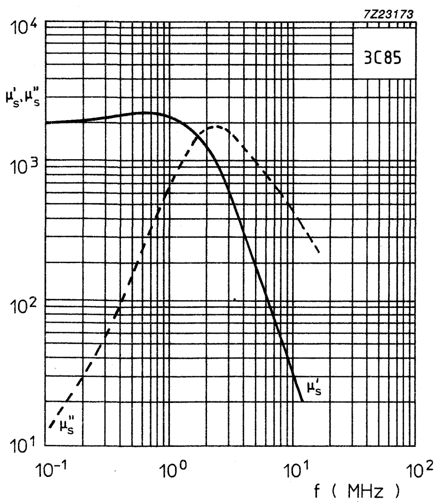


Fig.1 Complex permeability as a function of frequency.

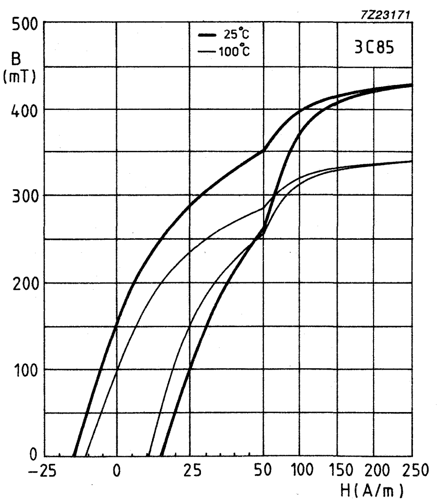


Fig.3 Typical B-H loops.

Material grade specification 3C85

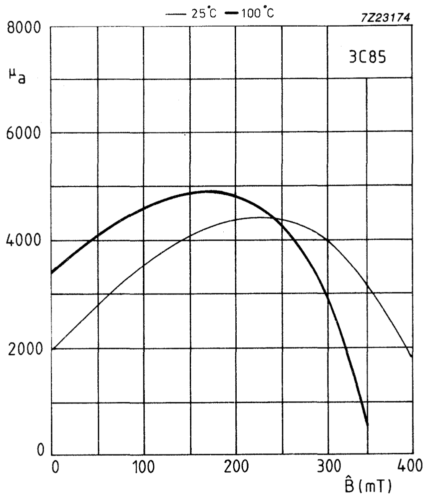


Fig.4 Amplitude permeability as a function of peak flux density.

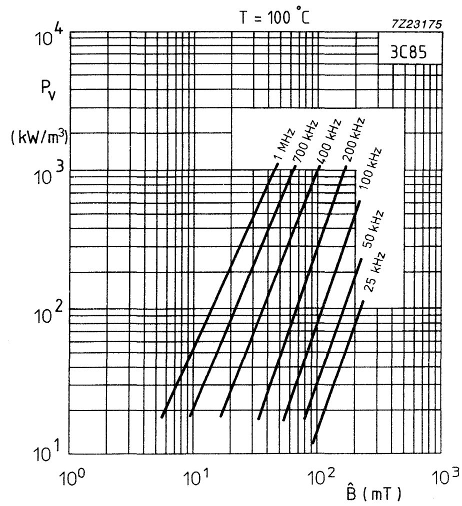


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

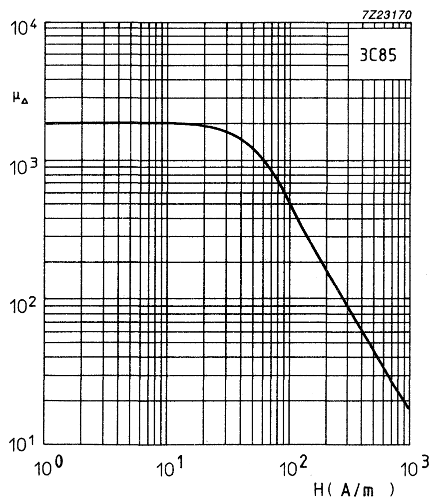


Fig.5 Incremental permeability as a function of magnetic field strength.

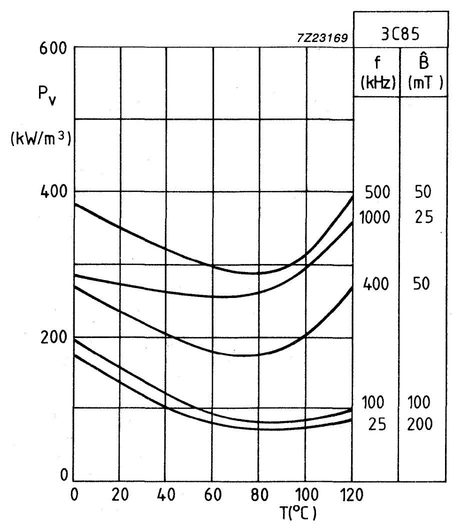


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3D3

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	750 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 320 ≈ 260	mT mT
$\tan\delta/\mu_i$	300 kHz, 0.1 mT, 25 °C 1 MHz, 0.1 mT, 25 °C	$\leq 10.10^{-6}$ $\leq 30.10^{-6}$	
η_B	100 kHz, 1.5 - 3 mT, 25 °C	$\leq 1.8.10^{-3}$	T^{-1}
D_F	10 kHz, 0.1 mT, 25 °C	$\leq 12.10^{-6}$	
α_F	≤ 10 kHz, 0.1 mT, 25 - 70 °C	$(1.5 \pm 1).10^{-6}$	K^{-1}
ρ	DC, 25 °C	≈ 2	Ωm
T_c		≥ 200	°C
density		≈ 4700	kg/m^3

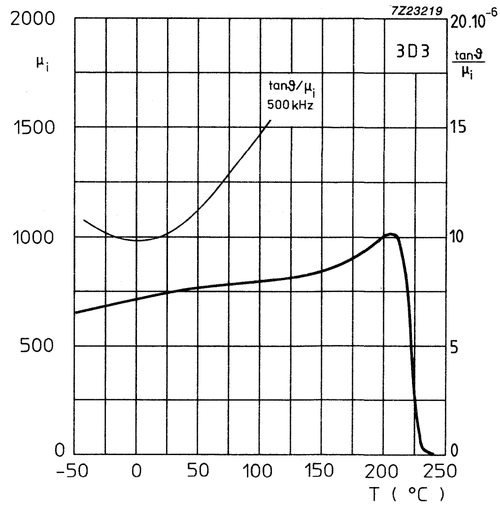


Fig.2 Initial permeability and loss factor as a function of temperature.

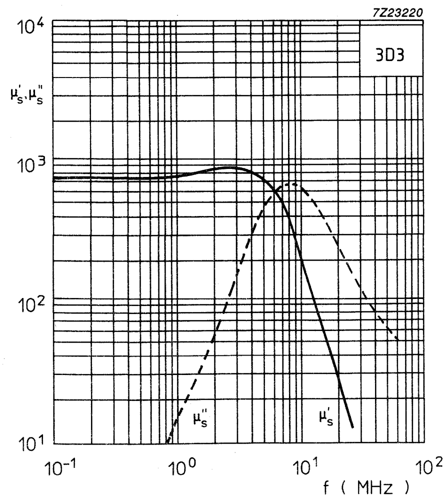


Fig.1 Complex permeability as a function of frequency.

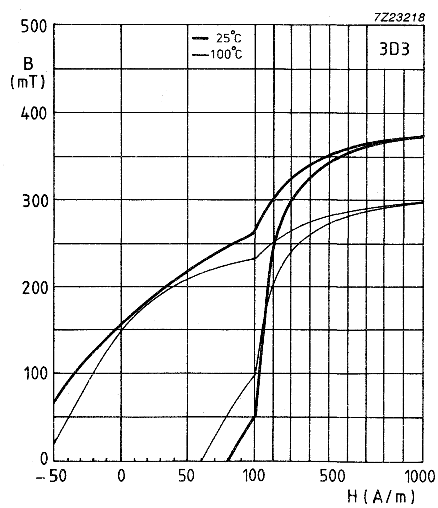


Fig.3 Typical B-H loops.

Material grade specification 3E1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	3800 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 350 ≈ 200	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C 300 kHz, 0.1 mT, 25 °C	$\leq 20.10^{-6}$ $\leq 150.10^{-6}$	
η_B	10 kHz, 1.5 - 3 mT, 25 °C	$\leq 1.2.10^{-3}$	T^{-1}
D_F	10 kHz, 0.1 mT, 25 °C	$\leq 5.10^{-6}$	
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 125	°C
density		≈ 4800	kg/m³

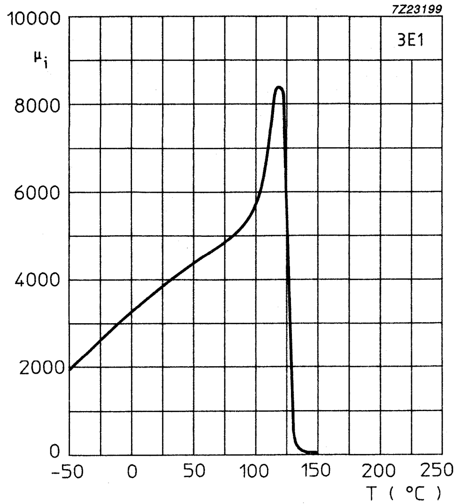


Fig.2 Initial permeability as a function of temperature.

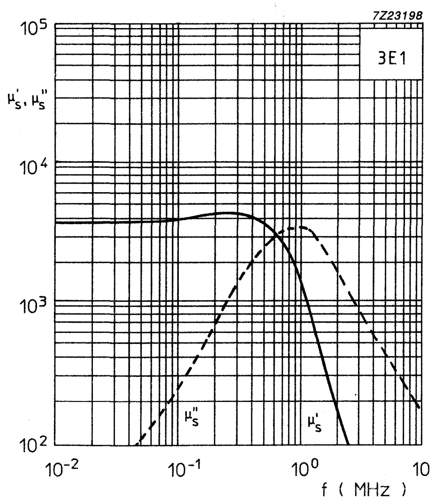


Fig.1 Complex permeability as a function of frequency.

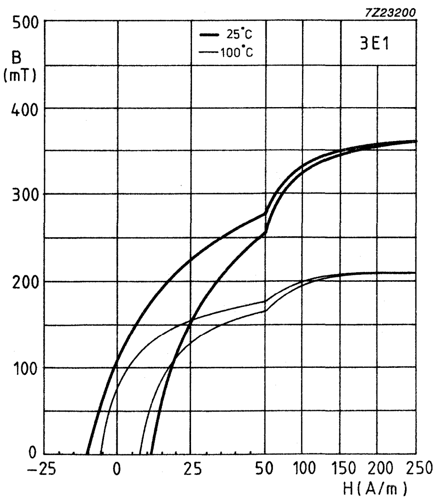


Fig.3 Typical B-H loops.

Material grade specification 3E1

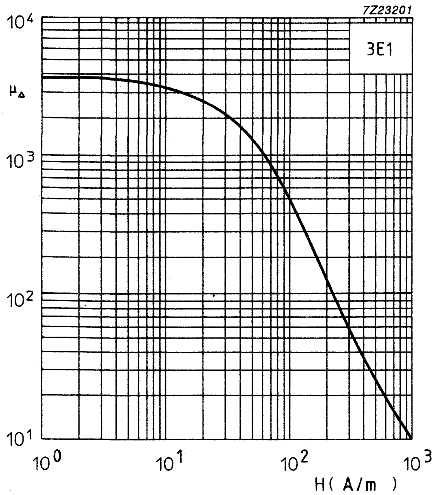


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3F4

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	750 ± 20%	
μ_a	25 kHz, 200 mT, 25 °C	≈ 1300	
	25 kHz, 200 mT, 100 °C	≈ 1400	
B	10 kHz, 250 A/m, 25 °C	≥ 350	mT
	10 kHz, 250 A/m, 100 °C	≥ 300	mT
P_V	1 MHz, 30 mT, 100 °C	≤ 300	kW/m³
	3 MHz, 10 mT, 100 °C	≤ 300	kW/m³
ρ	DC, 25 °C	≈ 10	Ωm
T_c		≥ 220	°C
density		≈ 4700	kg/m³

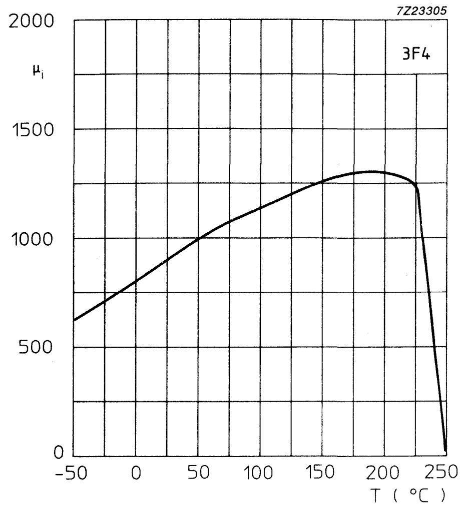


Fig.2 Initial permeability as a function of temperature.

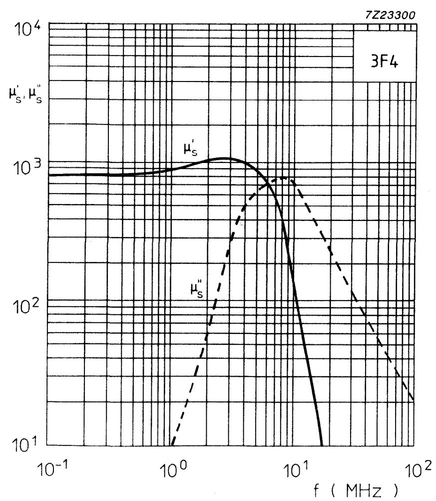


Fig.1 Complex permeability as a function of frequency.

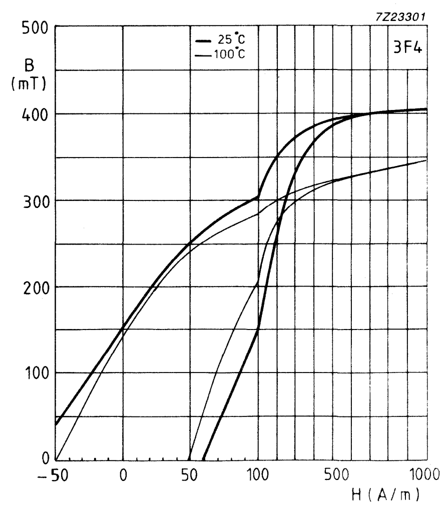


Fig.3 Typical B-H loops.

Material grade specification 3F4

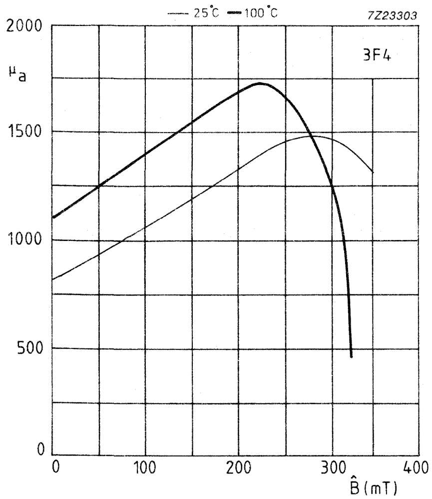


Fig.4 Amplitude permeability as a function of peak flux density.

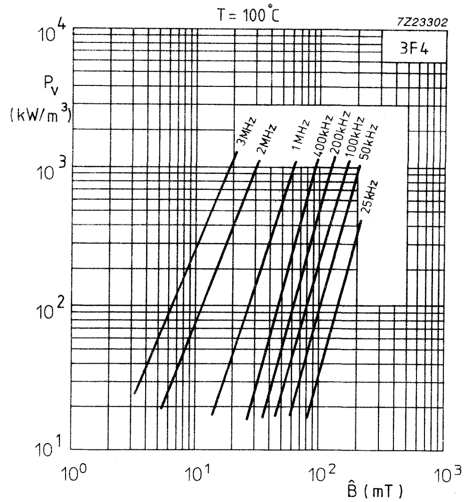


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

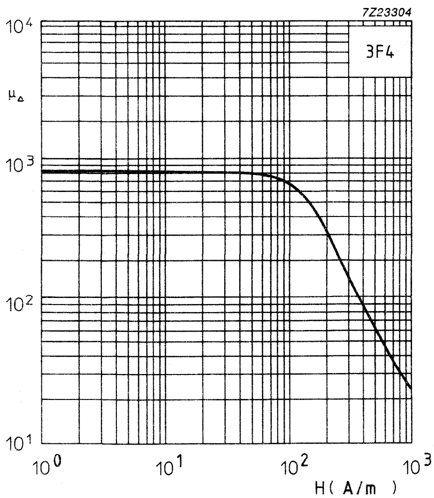


Fig.5 Incremental permeability as a function of magnetic field strength.

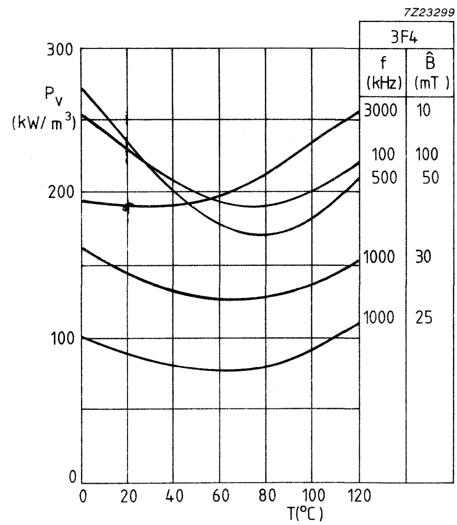


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification **3H1**

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	2300 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 350 ≈ 210	mT mT
$\tan\delta/\mu_i$	10 kHz, 0.1 mT, 25 °C 100 kHz, 0.1 mT, 25 °C	$\leq 1.5.10^{-6}$ $\leq 5.10^{-6}$	
η_B	10 kHz, 1.5 - 3 mT, 25 °C	$\leq 1.10^{-3}$	T^{-1}
D_F	10 kHz, 0.1 mT, 25 °C	$\leq 4.5.10^{-6}$	
α_F	≤ 10 kHz, 0.1 mT, 5 - 25 °C ≤ 10 kHz, 0.1 mT, 25 - 55 °C ≤ 10 kHz, 0.1 mT, 25 - 70 °C	$(1 \pm 0.5).10^{-6}$ $(1 \pm 0.5).10^{-6}$ $(1 \pm 0.5).10^{-6}$	K^{-1} K^{-1} K^{-1}
ρ	DC, 25 °C	≈ 1	Ωm
T_C		≥ 130	°C
density		≈ 4800	kg/m^3

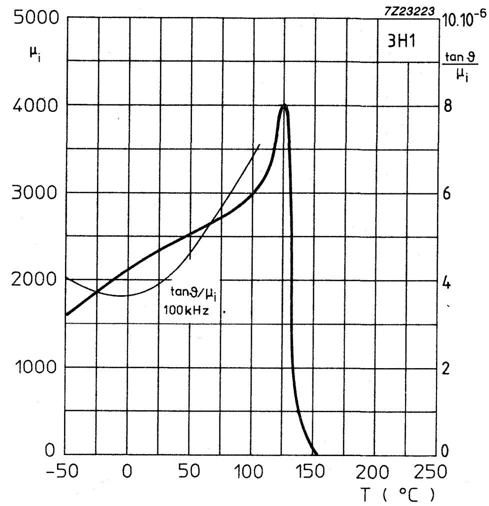


Fig.2 Initial permeability and loss factor as a function of temperature.

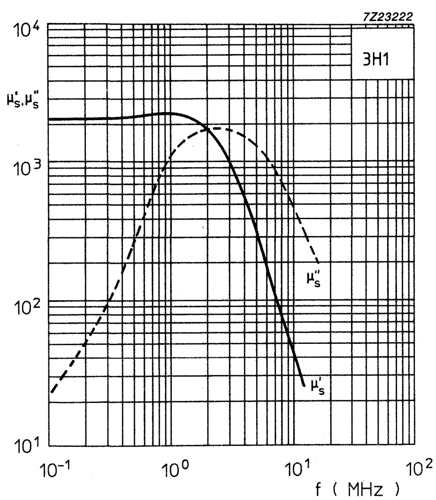


Fig.1 Complex permeability as a function of frequency.

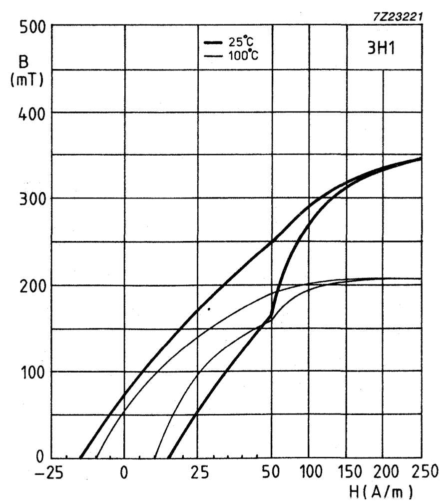


Fig.3 Typical B-H loops.

Material grade specification 3H3

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	2000 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 330 ≈ 250	mT mT
$\tan\delta/\mu_i$	30 kHz, 0.1 mT, 25 °C 100 kHz, 0.1 mT, 25 °C	$\leq 1.6.10^{-6}$ $\leq 2.5.10^{-6}$	
η_B	100 kHz, 1.5 - 3 mT, 25 °C	$\leq 0.6.10^{-3}$	T^{-1}
D_F	10 kHz, 0.1 mT, 25 °C 10 kHz, 0.1 mT, 40 °C	$\leq 3.10^{-6}$ $\leq 3.10^{-6}$	
α_F	≤ 10 kHz, 0.1 mT, 5 - 25 °C ≤ 10 kHz, 0.1 mT, 25 - 55 °C ≤ 10 kHz, 0.1 mT, 25 - 70 °C	$(0.7 \pm 0.3).10^{-6}$ $(0.7 \pm 0.3).10^{-6}$ $(0.7 \pm 0.3).10^{-6}$	K^{-1} K^{-1} K^{-1}
ρ	DC, 25 °C	≈ 2	Ωm
T_C		≥ 160	°C
density		≈ 4700	kg/m^3

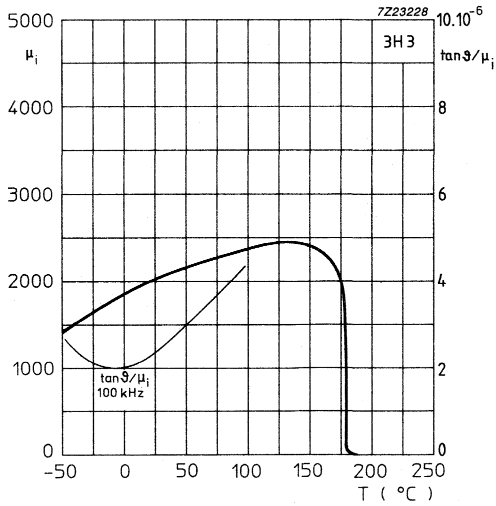


Fig.2 Initial permeability and loss factor as a function of temperature.

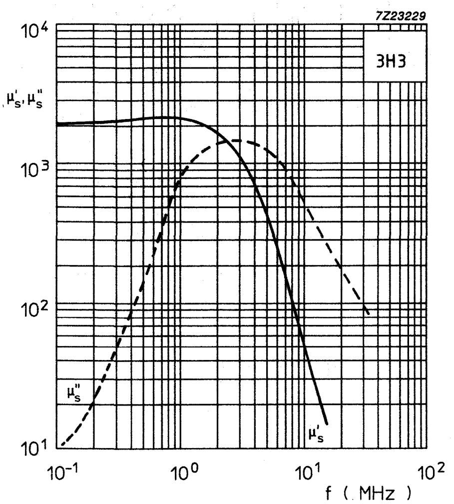


Fig.1 Complex permeability as a function of frequency.

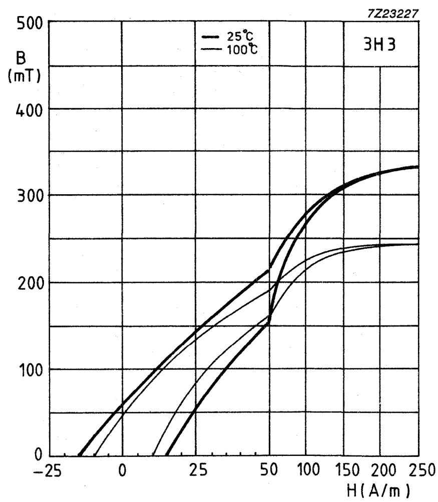


Fig.3 Typical B-H loops.

Material grade specification 3R1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	800 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 390 ≈ 300	mT mT
B_r	from 1 kA/m, 25 °C from 1 kA/m, 100 °C	340 ± 25 250 ± 25	mT mT
H_c	after 1 kA/m, 25 °C after 1 kA/m, 100 °C	42 ± 10 20 ± 5	A/m A/m
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 200	°C
density		≈ 4700	kg/m^3

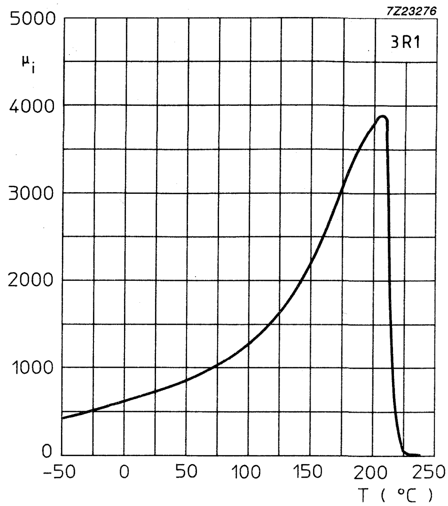


Fig.2 Initial permeability as a function of temperature.

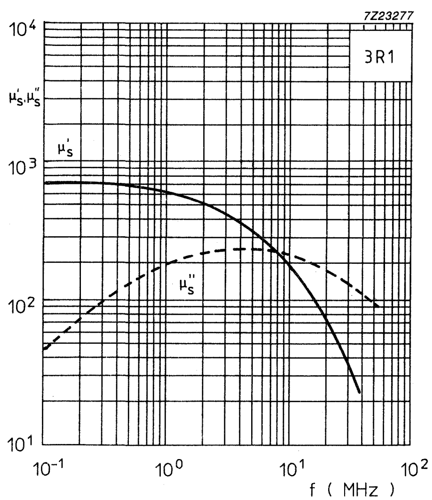


Fig.1 Complex permeability as a function of frequency.

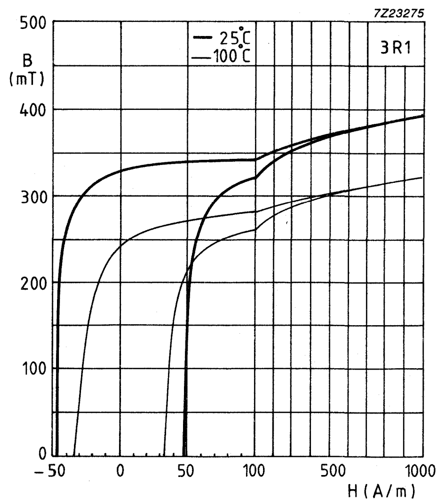


Fig.3 Typical B-H loops.

Material grade specification 3S1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	≈ 4000	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 350 ≈ 180	mT mT
|Z|*	1 MHz, 25 °C 10 MHz, 25 °C	≥ 30 ≥ 60	Ω Ω
ρ	DC, 25 °C	≈ 1	Ωm
T_C		≥ 125	°C
density		≈ 4900	kg/m^3

* measured on a bead ∅5 x ∅2 x 10 mm

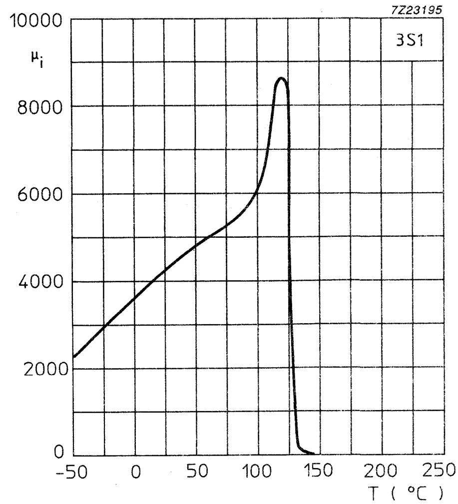


Fig.2 Initial permeability as a function of temperature.

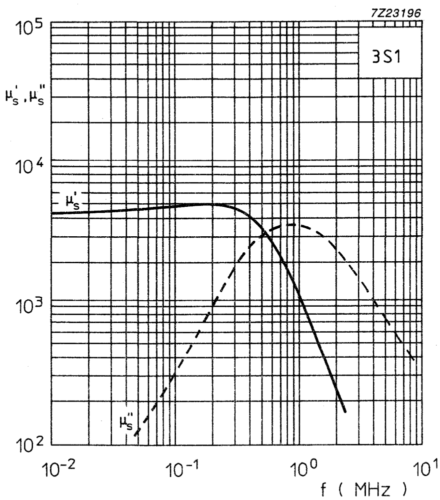


Fig.1 Complex permeability as a function of frequency.

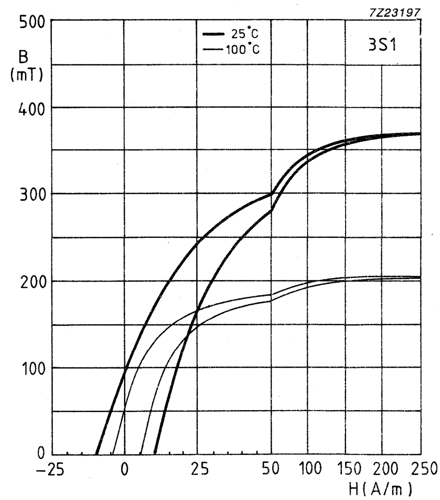


Fig.3 Typical B-H loops.

Material grade specification 4A11

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	700 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 270 ≈ 180	mT mT
$\tan\delta/\mu_i$	1 MHz, 0.1 mT, 25 °C 3 MHz, 0.1 mT, 25 °C	$\leq 100.10^{-6}$ $\leq 1000.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_C		≥ 125	°C
density		≈ 5100	kg/m^3

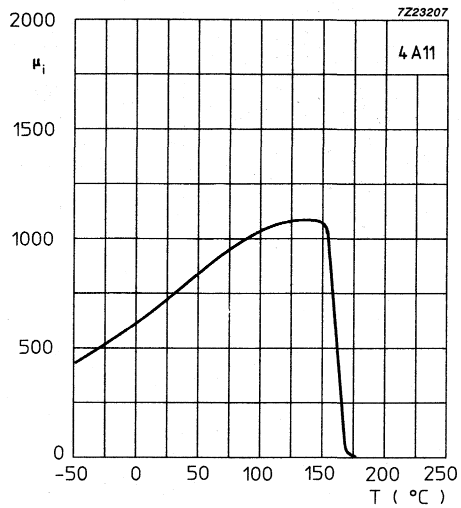


Fig.2 Initial permeability as a function of temperature.

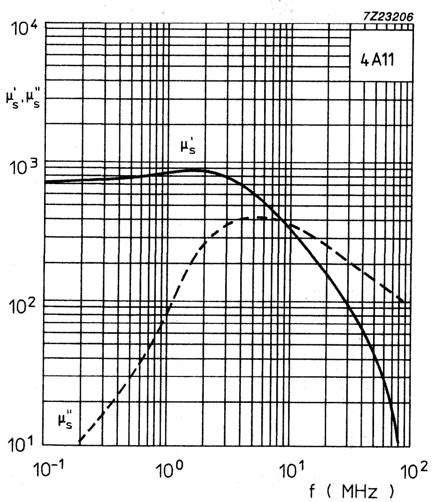


Fig.1 Complex permeability as a function of frequency.

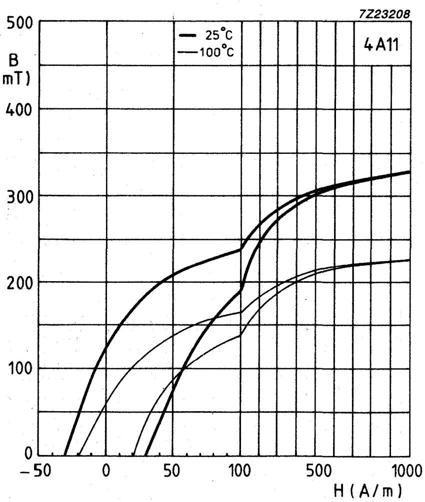


Fig.3 Typical B-H loops.

Material grade specification 4A15

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤10 kHz, 0.1 mT, 25 °C	1200 ±20%	
B	10 kHz, 250 A/m, 25 °C	≈300	mT
	10 kHz, 250 A/m, 100 °C	≈180	mT
$\tan\delta/\mu_i$	1 MHz, 0.1 mT, 25 °C	$\leq 250.10^{-6}$	
	3 MHz, 0.1 mT, 25 °C	$\leq 1500.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_c		≥125	°C
density		≈5100	kg/m³

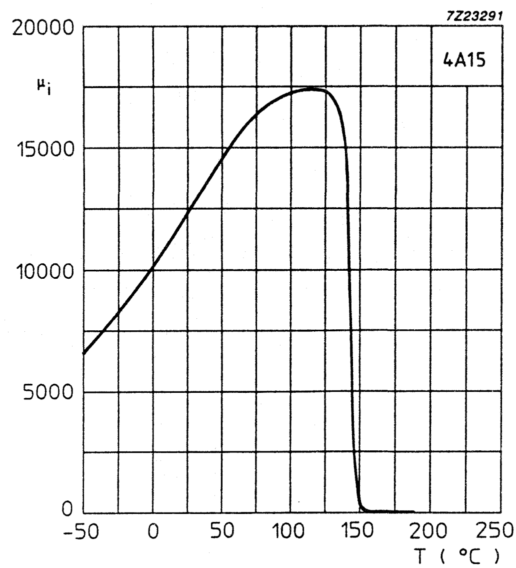


Fig.2 Initial permeability as a function of temperature.

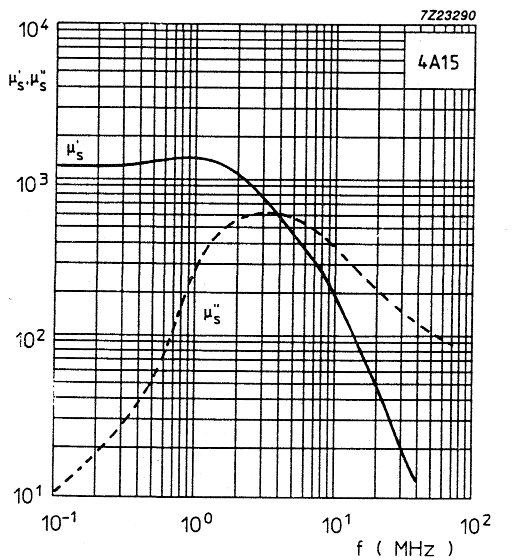


Fig.1 Complex permeability as a function of frequency.

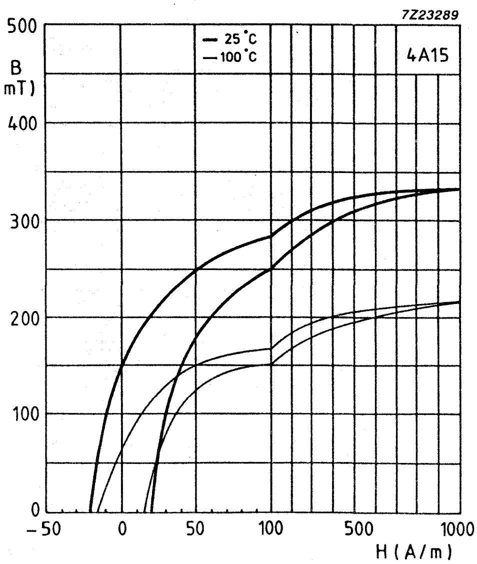


Fig.3 Typical B-H loops.

Material grade specification 4B1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	250 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 310 ≈ 260	mT mT
$\tan\delta/\mu_i$	1 MHz, 0.1 mT, 25 °C 3 MHz, 0.1 mT, 25 °C	$\leq 90.10^{-6}$ $\leq 300.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_c		≥ 250	°C
density		≈ 4600	kg/m^3

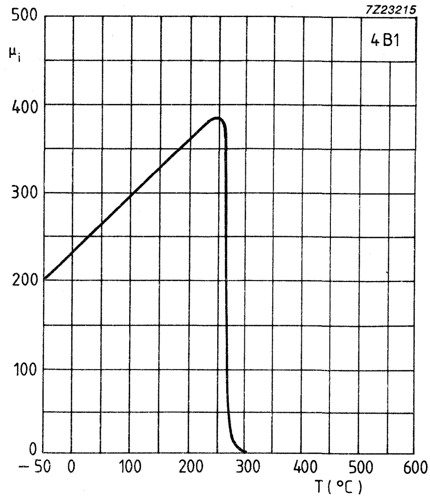


Fig.2 Initial permeability as a function of temperature.

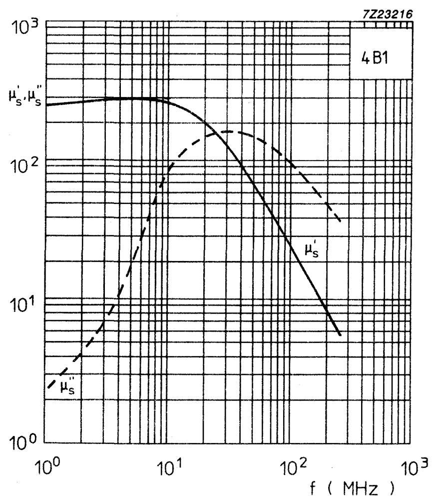


Fig.1 Complex permeability as a function of frequency.

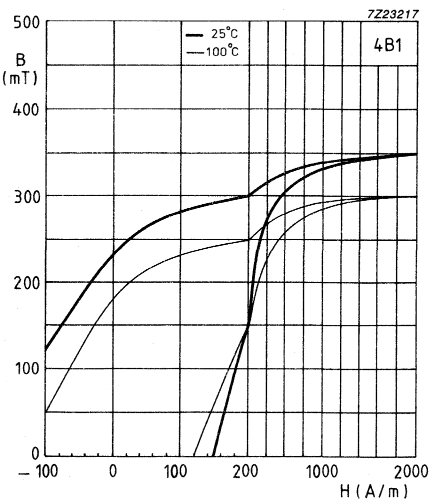


Fig.3 Typical B-H loops.

Material grade specification 4C6

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	$\leq$ 10 kHz, 0.1 mT, 25 °C	100 ± 20%	
B	10 kHz, 250 A/m, 25 °C	≈ 300	mT
	10 kHz, 250 A/m, 100 °C	≈ 250	mT
$\tan\delta/\mu_i$	3 MHz, 0.1 mT, 25 °C	$\leq 60.10^{-6}$	
	10 MHz, 0.1 mT, 25 °C	$\leq 100.10^{-6}$	
η_B	100 kHz, 1.5 - 3 mT, 25 °C	$\leq 20.10^{-3}$	T^{-1}
D_F	100 kHz, 0.1 mT, 25 °C	$\leq 10.10^{-6}$	
α_F	$\leq$ 10 kHz, 0.1 mT, 5 - 25 °C	$(3 \pm 3).10^{-6}$	K^{-1}
	$\leq$ 10 kHz, 0.1 mT, 25 - 55 °C	$(3 \pm 3).10^{-6}$	K^{-1}
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_c		≥ 350	°C
density		≈ 4500	kg/m³

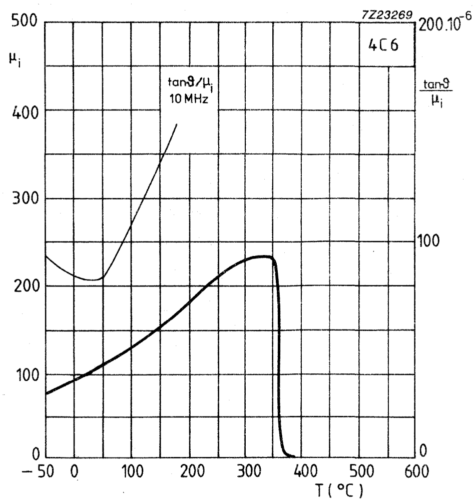


Fig.2 Initial permeability and loss factor as a function of temperature.

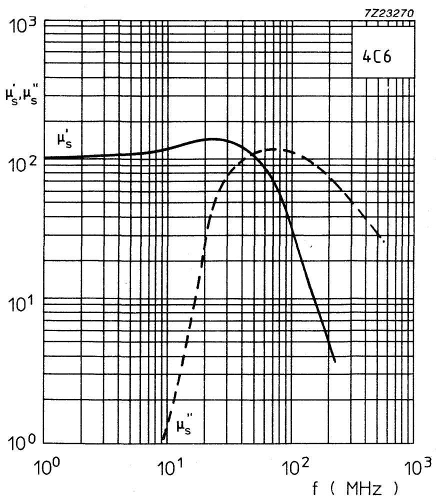


Fig.1 Complex permeability as a function of frequency.

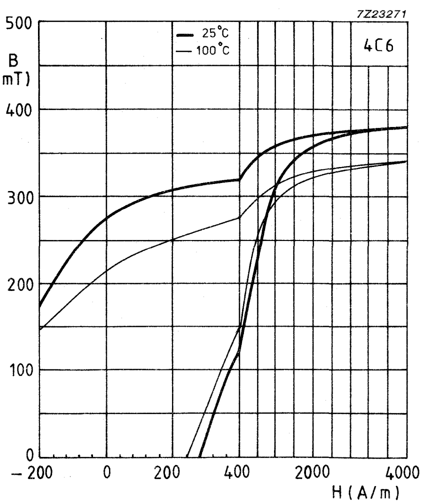


Fig.3 Typical B-H loops.

Material grade specification
3E25

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C 100 kHz, 0.1 mT, 25 °C	6000 ± 20% 6000 + 30%/ - 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≥ 350 ≥ 180	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C 300 kHz, 0.1 mT, 25 °C	$\leq 25.10^{-6}$ $\leq 200.10^{-6}$	
ρ	DC, 25 °C	≈ 0.5	Ωm
T_C		≥ 125	°C
density		≈ 4900	kg/m^3

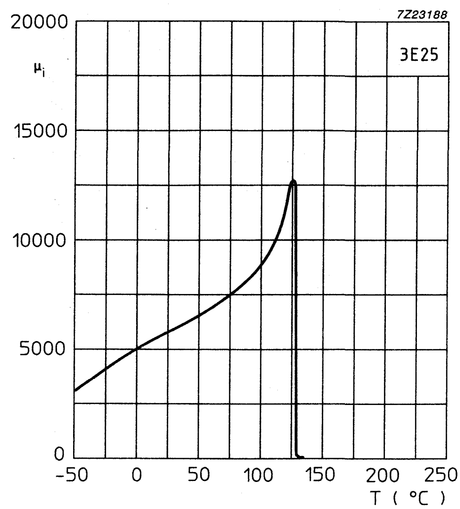


Fig.2 Initial permeability as a function of temperature.

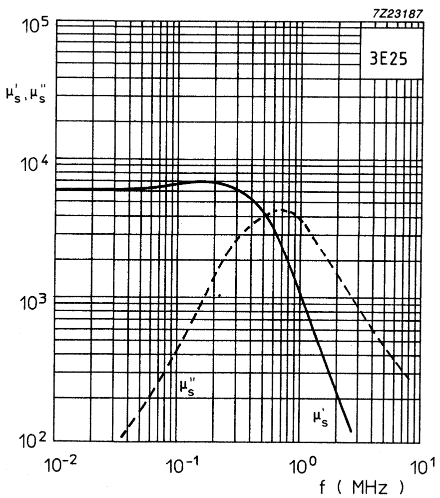


Fig.1 Complex permeability as a function of frequency.

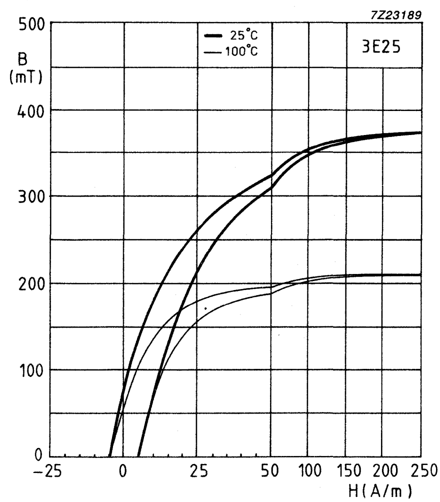


Fig.3 Typical B-H loops.

Material grade specification 3E25

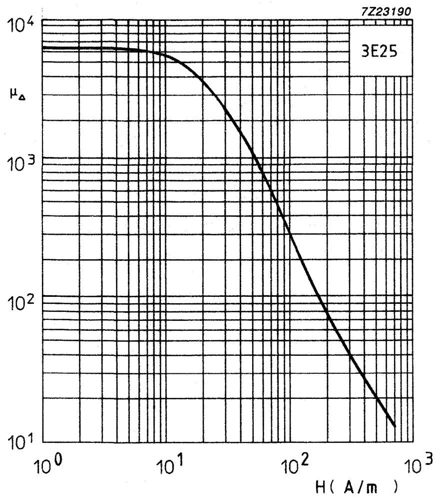


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3E4

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	4700 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 360 ≈ 210	mT mT
$\tan\delta/\mu_i$	100 kHz, 0.1 mT, 25 °C 300 kHz, 0.1 mT, 25 °C	$\leq 20.10^{-6}$ $\leq 150.10^{-6}$	
η_B	10 kHz, 1.5 - 3 mT, 25 °C	$\leq 1.10^{-3}$	T^{-1}
D_F	10 kHz, 0.1 mT, 25 °C	$\leq 5.10^{-6}$	
ρ	DC, 25 °C	≈ 1	Ωm
T_c		≥ 125	°C
density		≈ 4800	kg/m^3

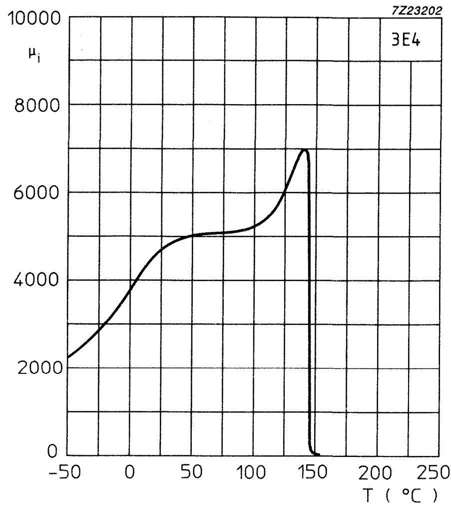


Fig.2 Initial permeability as a function of temperature.

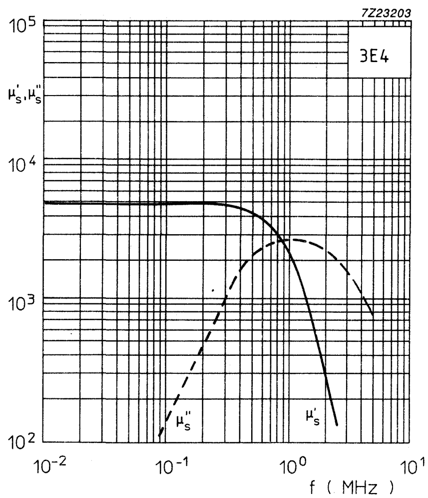


Fig.1 Complex permeability as a function of frequency.

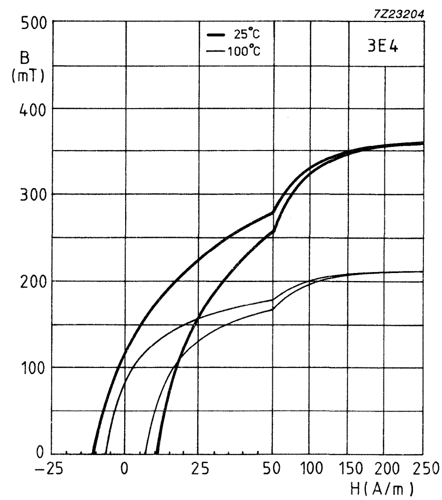


Fig.3 Typical B-H loops.

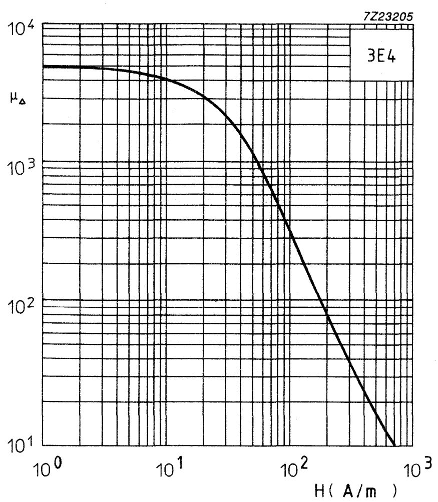


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification

3E5

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	10000 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 380 ≈ 210	mT mT
$\tan\delta/\mu_i$	30 kHz, 0.1 mT, 25 °C 100 kHz, 0.1 mT, 25 °C	$\leq 25.10^{-6}$ $\leq 75.10^{-6}$	
η_B	10 kHz, 1.5 - 3 mT, 25 °C	$\leq 1.10^{-3}$	T^{-1}
ρ	DC, 25 °C	≈ 0.5	Ωm
T_C		≥ 125	°C
density		≈ 4900	kg/m^3

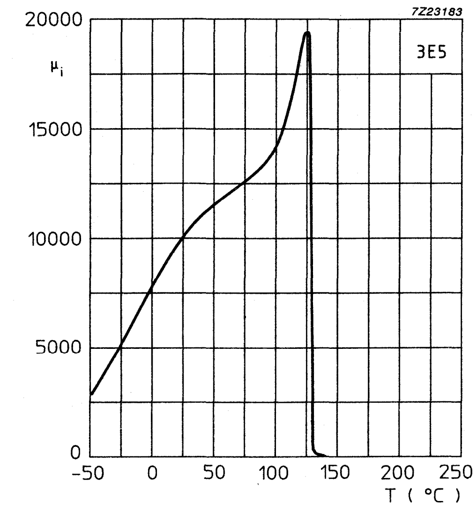


Fig.2 Initial permeability as a function of temperature.

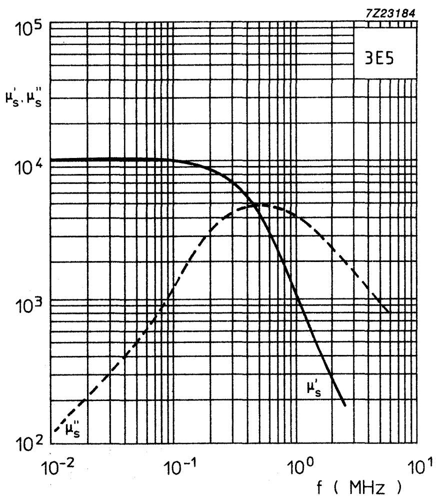


Fig.1 Complex permeability as a function of frequency.

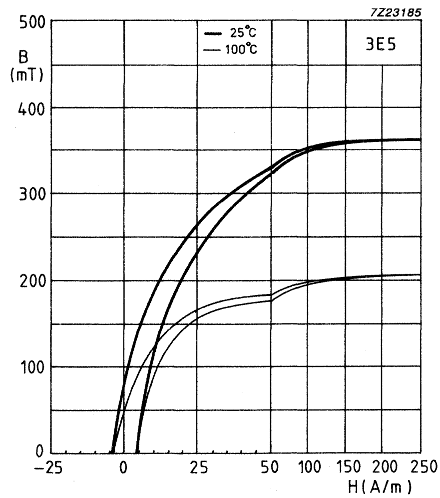


Fig.3 Typical B-H loops.

Material grade specification 3E5

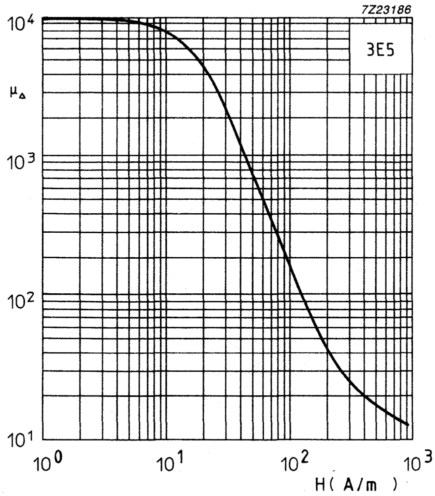


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3E6

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	15000 ± 20%	
B	10 kHz, 250 A/m, 25 °C	≈ 380	mT
	10 kHz, 250 A/m, 100 °C	≈ 210	mT
tan δ/μ_i	10 kHz, 0.1 mT, 25 °C	≤ 10.10^{-6}	
	30 kHz, 0.1 mT, 25 °C	≤ 30.10^{-6}	
η_B	10 kHz, 1.5-3 mT, 25 °C	≤ 1.10^{-3}	T^{-1}
ρ	DC, 25 °C	≈ 0.5	Ωm
T_c		≥ 130	°C
density		≈ 4900	kg/m³

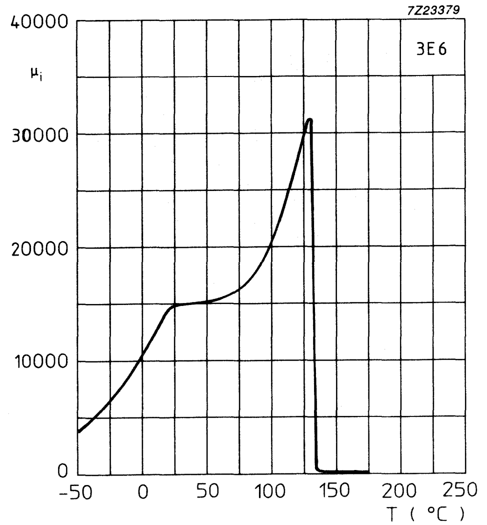


Fig.2 Initial permeability as a function of temperature.

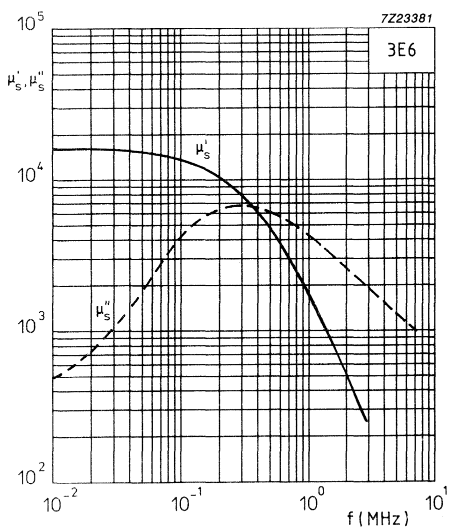


Fig.1 Complex permeability as a function of frequency.

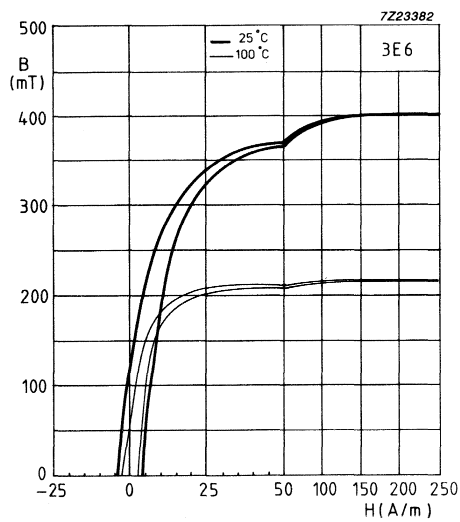


Fig.3 Typical B-H loops.

Material grade specification 3E6

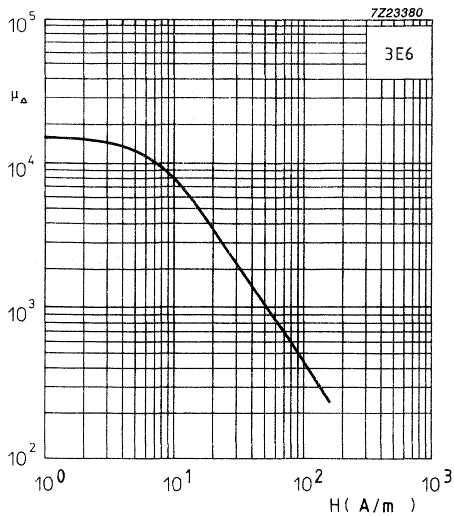


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3F3

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	1800 ± 20%	
μ_a	25 kHz, 200 mT, 25 °C 25 kHz, 200 mT, 100 °C	≈ 4000 ≈ 4000	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≥ 400 ≥ 330	mT mT
P_V	100 kHz, 100 mT, 100 °C 400 kHz, 50 mT, 100 °C	≤ 80 ≤ 150	kW/m^3 kW/m^3
ρ	DC, 25 °C	≈ 2	Ωm
T_c		≥ 200	°C
density		≈ 4750	kg/m^3

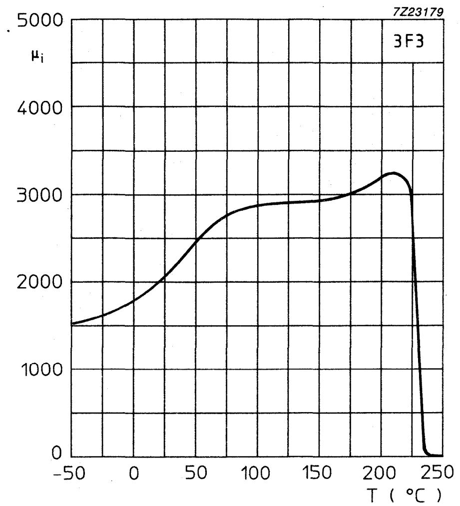


Fig.2 Initial permeability as a function of temperature.

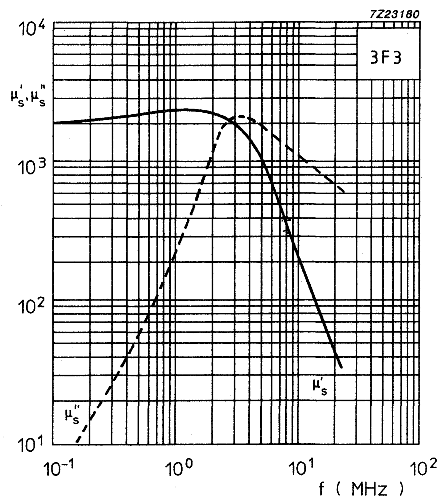


Fig.1 Complex permeability as a function of frequency.

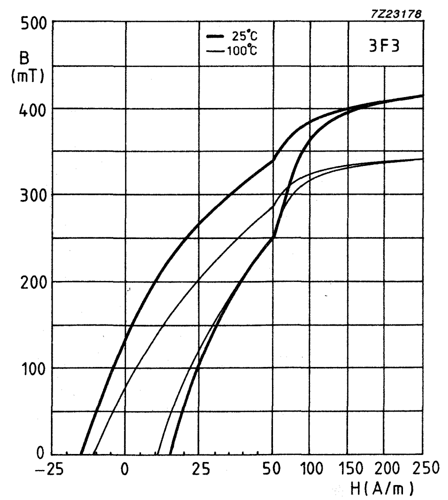


Fig.3 Typical B-H loops.

Material grade specification 3F3

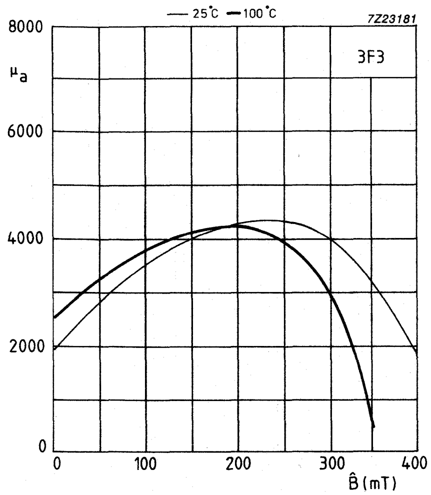


Fig.4 Amplitude permeability as a function of peak flux density.

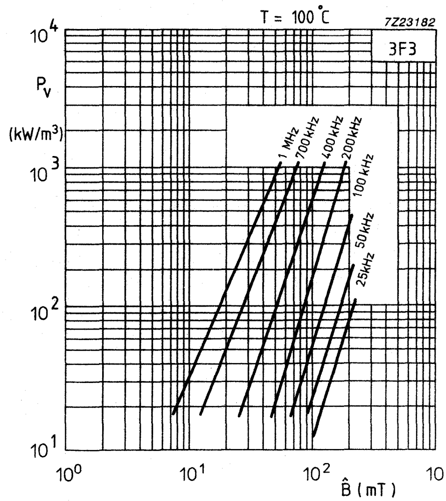


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

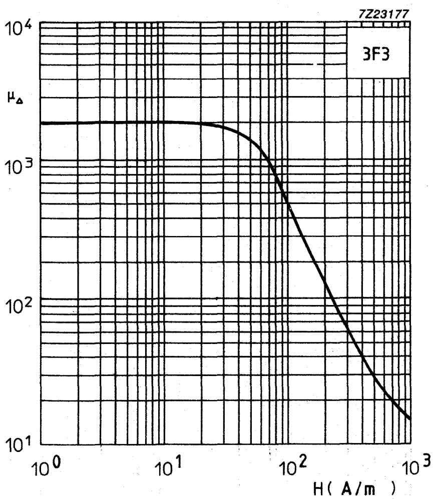


Fig.5 Incremental permeability as a function of magnetic field strength.

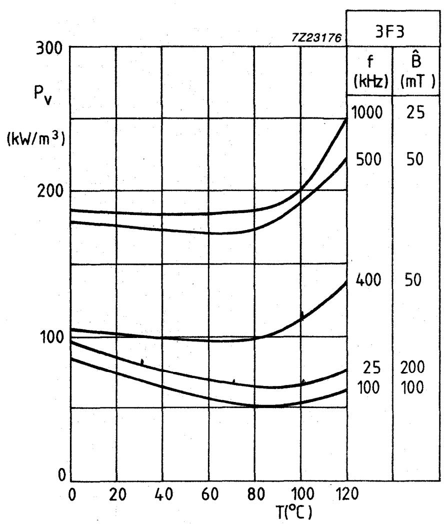


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 4C65

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	125 ± 20%	
B	10 kHz, 250 A/m, 25 °C	≈ 300	mT
	10 kHz, 250 A/m, 100 °C	≈ 250	mT
$\tan\delta/\mu_i$	3 MHz, 0.1 mT, 25 °C	$\leq 80.10^{-6}$	
	10 MHz, 0.1 mT, 25 °C	$\leq 130.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_c		≥ 350	°C
density		≈ 4500	kg/m^3

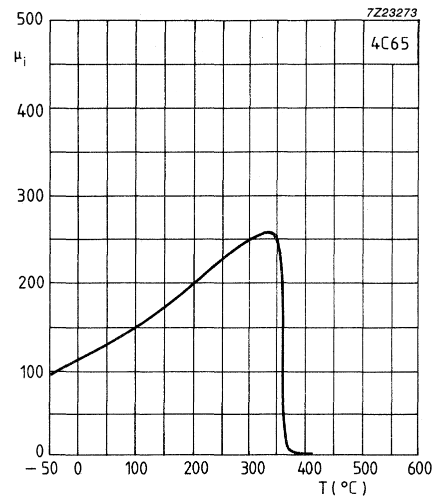


Fig.2 Initial permeability as a function of temperature.

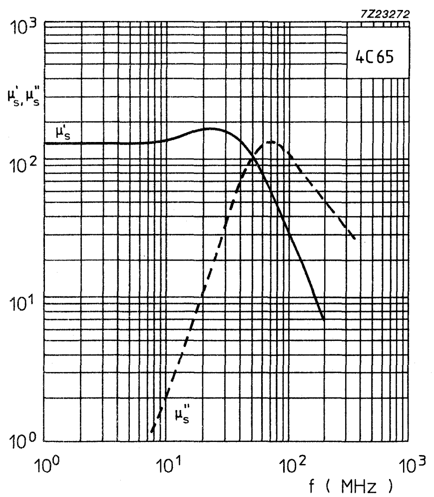


Fig.1 Complex permeability as a function of frequency.

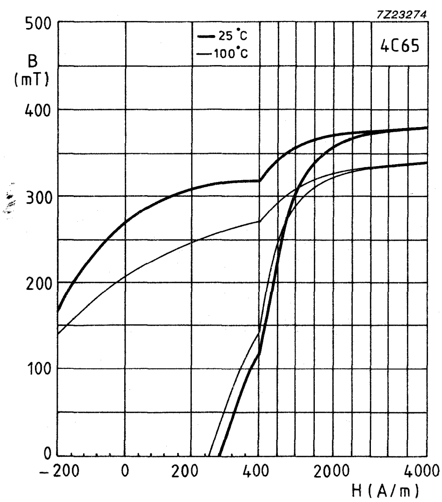


Fig.3 Typical B-H loops.

Material grade specification 4D2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	60 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 200 ≈ 180	mT mT
$\tan\delta/\mu_i$	10 MHz, 0.1 mT, 25 °C 30 MHz, 0.1 mT, 25 °C	$\leq 100.10^{-6}$ $\leq 600.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_C		≥ 400	°C
density		≈ 4200	kg/m^3

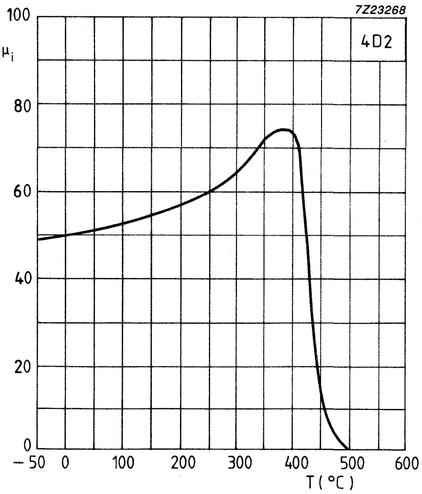


Fig.2 Initial permeability as a function of temperature.

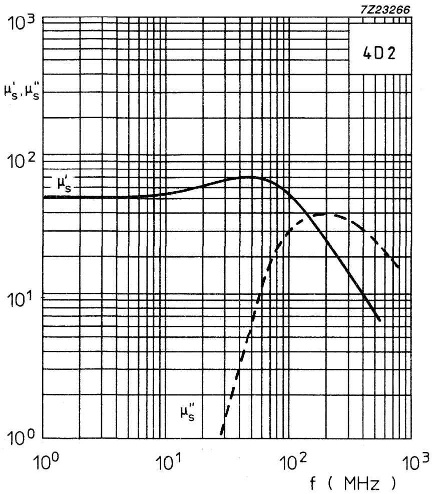


Fig.1 Complex permeability as a function of frequency.

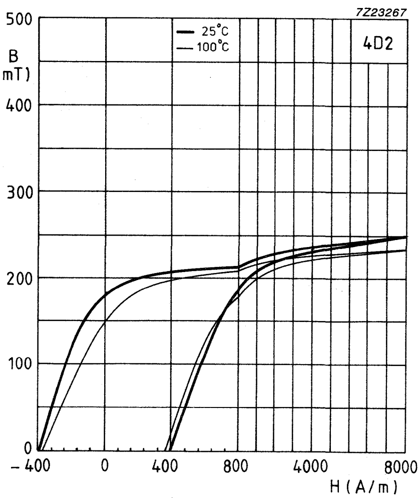


Fig.3 Typical B-H loops.

Material grade specification 4E1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	15 ± 20%	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 80 ≈ 75	mT mT
$\tan\delta/\mu_i$	10 MHz, 0.1 mT, 25 °C 30 MHz, 0.1 mT, 25 °C	≤ 300.10^{-6} ≤ 350.10^{-6}	
ρ	DC, 25 °C	≈ 10^5	Ωm
T_c		≥ 500	°C
density		≈ 3700	kg/m^3

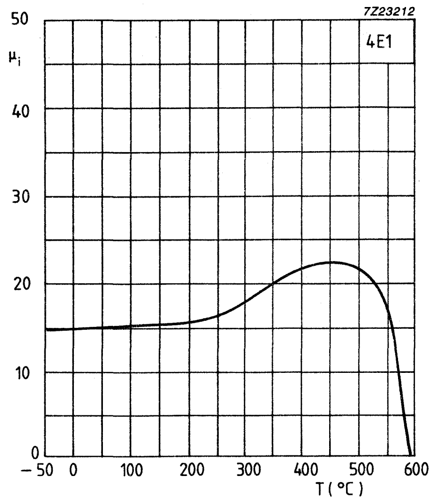


Fig.2 Initial permeability as a function of temperature.

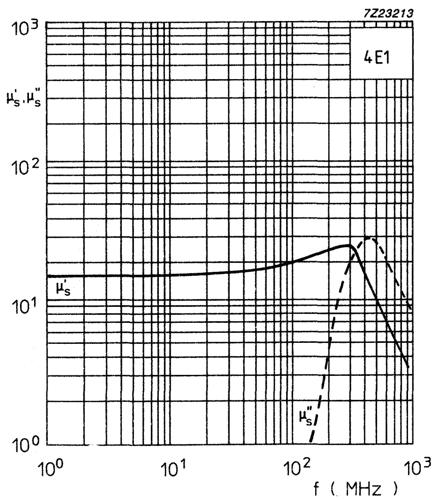


Fig.1 Complex permeability as a function of frequency.

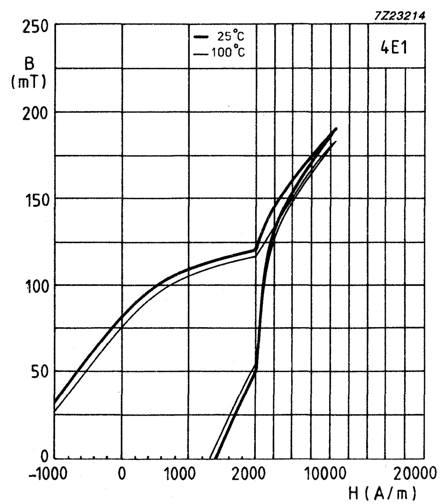


Fig.3 Typical B-H loops.

Preliminary
Material grade specification

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	≈ 80	
μ_a	25 kHz, 200 mT, 25 °C	≈ 400	
	25 kHz,, 200 mT, 100 °C	≈ 300	
B	10 kHz, 250 A/m, 25 °C	≥ 50	mT
	10 kHz, 250 A/m, 100 °C	≥ 100	mT
P_V	3 MHz, 10 mT, 100 °C	≤ 200	kW/m³
	10 MHz, 5 mT, 100 °C	≤ 200	kW/m³
ρ	DC, 25 °C	≈ 10^5	Ωm
T_c		≥ 260	°C
density		≈ 4600	kg/m³

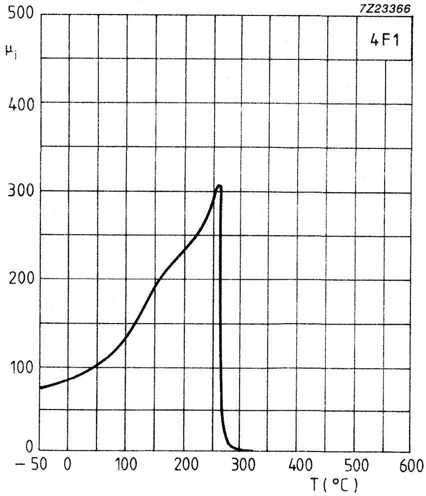


Fig.2 Initial permeability as a function of temperature.

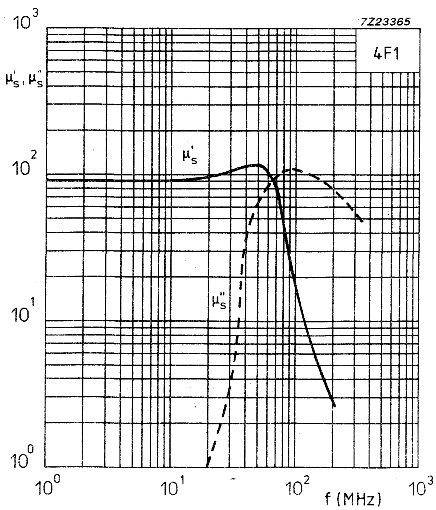


Fig.1 Complex permeability as a function of frequency.

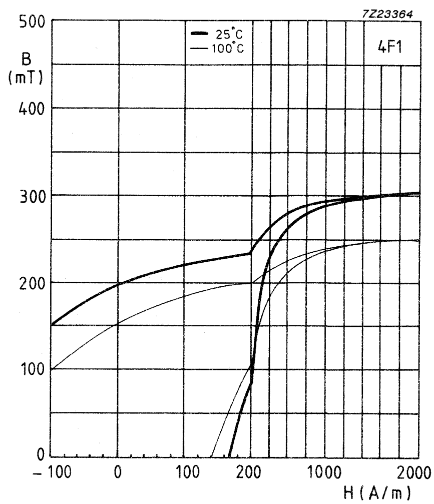


Fig.3 Typical B-H loops.

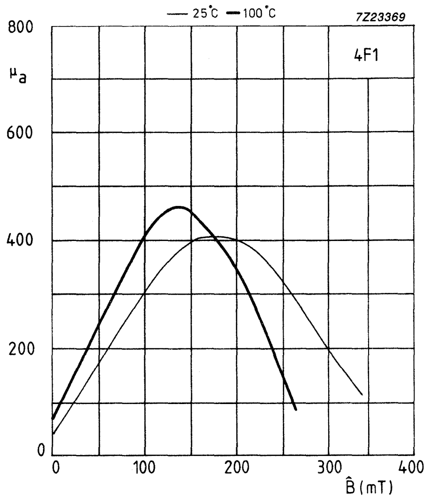


Fig.4 Amplitude permeability as a function of peak flux density.

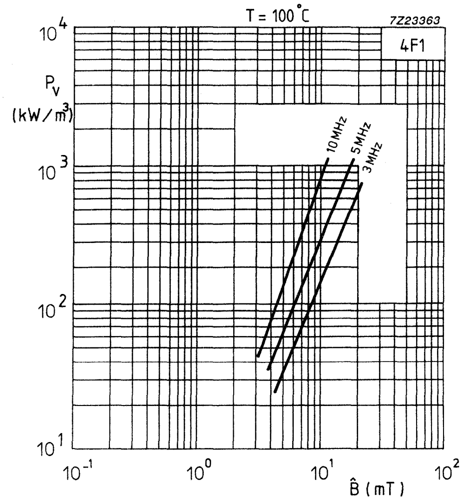


Fig.6 Specific power loss as a function of peak flux density with frequency as parameter.

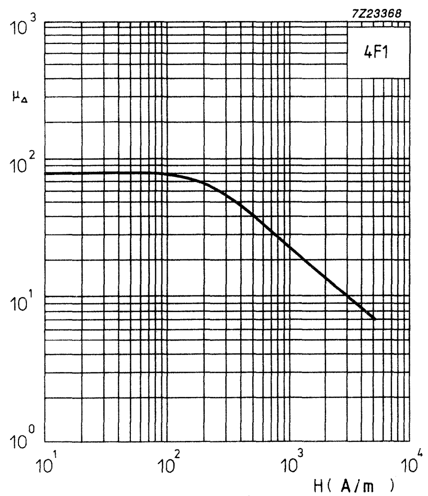


Fig.5 Incremental permeability as a function of magnetic field strength.

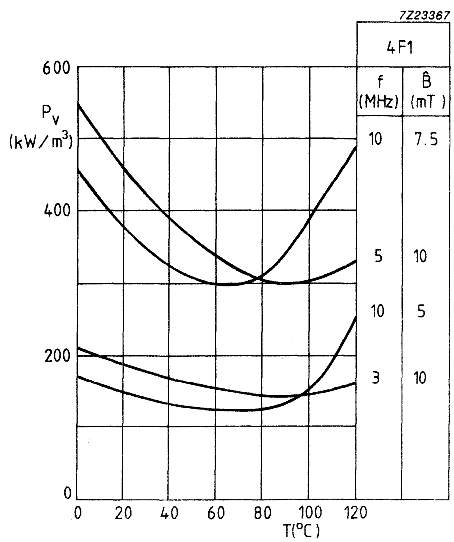


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 4S2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	≈ 700	
B	10 kHz, 250 A/m, 25 °C 10 kHz, 250 A/m, 100 °C	≈ 270 ≈ 180	mT mT
|Z|*	30 MHz, 25 °C 300 MHz, 25 °C	≥ 50 ≥ 90	Ω Ω
ρ	DC, 25 °C	≈ 10^5	Ωm
T_c		≥ 125	°C
density		≈ 5000	kg/m^3

* measured on a bead ∅5 x ∅2 x 10 mm

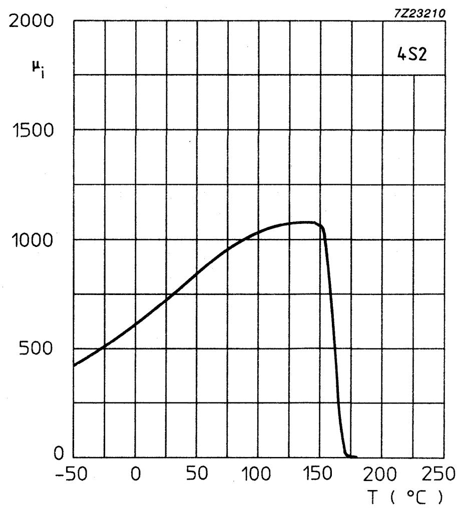


Fig.2 Initial permeability as a function of temperature.

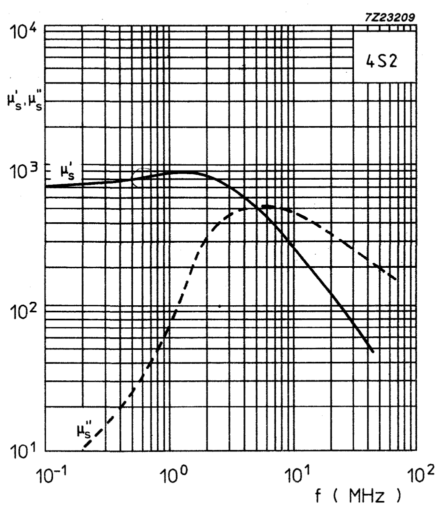


Fig.1 Complex permeability as a function of frequency.

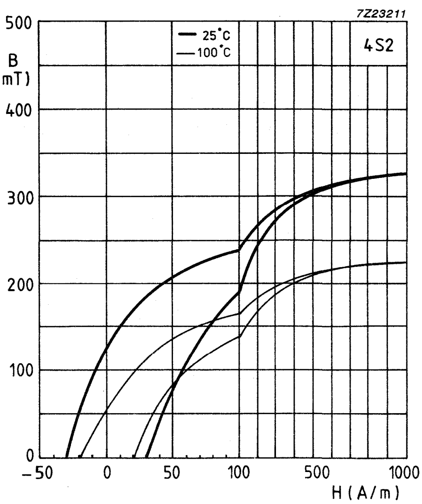


Fig.3 Typical B-H loops.

Material grade specification — 6B1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	≤ 10 kHz, 0.1 mT, 25 °C	250 ± 20%	
B	10 kHz, 250 A/m, 25 °C	≈ 320	mT
	10 kHz, 250 A/m, 100 °C	≈ 270	mT
$\tan\delta/\mu_i$	1 MHz, 0.1 mT, 25 °C	$\leq 90.10^{-6}$	
	3 MHz, 0.1 mT, 25 °C	$\leq 300.10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_c		≥ 250	°C
density		≈ 4700	kg/m^3

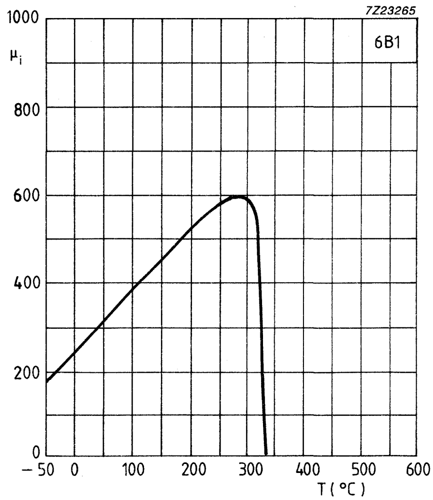


Fig.2 Initial permeability as a function of temperature.

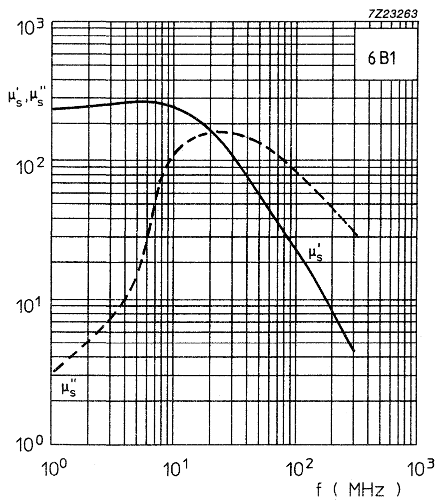


Fig.1 Complex permeability as a function of frequency.

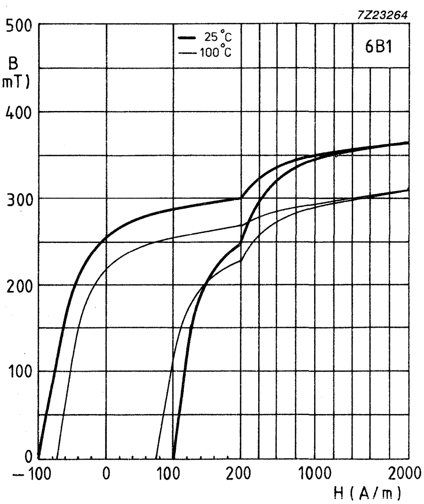


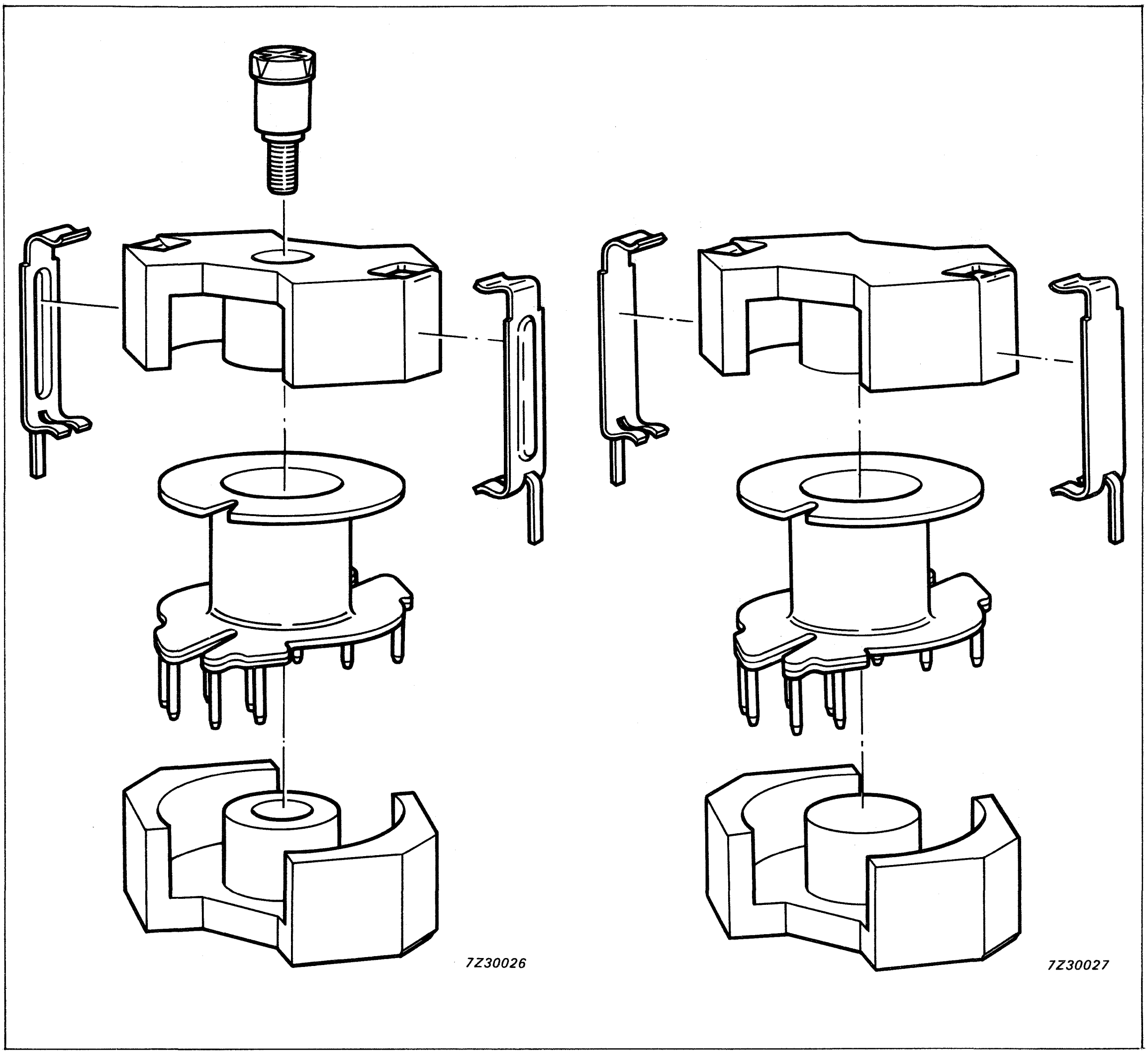
Fig.3 Typical B-H loops.

RM CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

RM4 to RM14/I
RM cores and accessories



RM cores and accessories RM4

Dimensions in mm

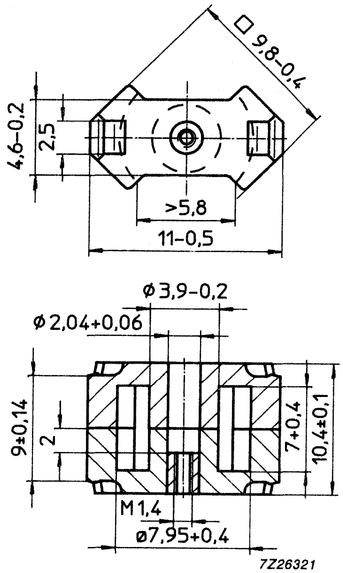


Fig.1 RM4 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.94	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	21.3	mm
A_e	effective area	11.0	mm^2
A_{min}	minimum area	8.1	mm^2
	mass of set	≈ 2.5	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	16 ± 3%	≈ 24	≈ 1500	4322 022 7780	4322 022 5780
	25 ± 3%	≈ 38	≈ 700	4322 022 7781	4322 022 5781
	65 ± 25%	≈ 100	≈ 0	–	4322 022 5779
3D3	40 ± 3%	≈ 62	≈ 400	4322 022 7742	4322 022 5742
	63 ± 3%	≈ 96	≈ 200	4322 022 7743	4322 022 5743
	400 ± 25%	≈ 610	≈ 0	–	4322 022 5739
3H3	63 ± 3%	≈ 96	≈ 200	4322 022 7753	4322 022 5753
	100 ± 3%	≈ 152	≈ 120	4322 022 7754	4322 022 5754
	160 ± 3%	≈ 242	≈ 60	4322 022 7755	4322 022 5755
	900 ± 25%	≈ 1360	≈ 0	–	4322 022 5750
3H1	63 ± 3%	≈ 96	≈ 200	4322 022 7723	4322 022 5723
	100 ± 3%	≈ 152	≈ 120	4322 022 7724	4322 022 5724
	160 ± 3%	≈ 242	≈ 60	4322 022 7725	4322 022 5725
	950 ± 25%	≈ 1440	≈ 0	–	4322 022 5720

* clamping force 20 ± 10 N

RM cores and accessories RM4/I

Dimensions in mm

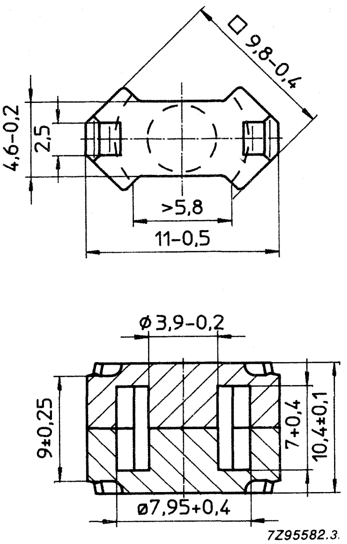


Fig.2 RM4/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.69	mm^{-1}
V_e	effective volume	322	mm^3
l_e	effective length	23.3	mm
A_e	effective area	13.8	mm^2
A_{min}	minimum area	11.5	mm^2
	mass of set	≈ 2.8	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3F3	100 ± 3%	≈ 134	≈ 170	4322 022 5714
	160 ± 3%	≈ 215	≈ 100	4322 022 5715
	250 ± 10%	≈ 336	≈ 50	4322 022 5716
	950 ± 25%	≈ 1280	≈ 0	4322 022 5710

* clamping force 10 ± 5 N

RM cores and accessories RM4/I

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	1800 ± 25%	≈ 2400	4322 022 5770
3E4	2500 + 40/- 30%	≈ 3360	4322 022 5791
3E5	3500 + 40/- 30%	≈ 4700	4322 022 5775

* clamping force 10 ± 5 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥ 315	–	≤ 0.05	≤ 0.07

Dimensions in mm

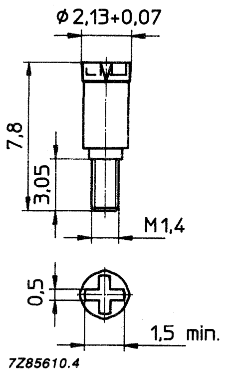


Fig.3 RM4 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3870	black
4322 021 3871	brown
4322 021 3872	red
4322 021 3875	green
4322 021 3878	white
4322 021 3879	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	40	–		4322 021 3875	20	–	
	63	–		4322 021 3875	14	4322 021 3872	27
	100	4322 021 3875	9	4322 021 3872	17	4322 021 3871	22
	160	4322 021 3875	6	4322 021 3871	14	4322 021 3879	19
	250	4322 021 3872	7	4322 021 3879	12	4322 021 3870	17

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 20 mm

Dimensions in mm

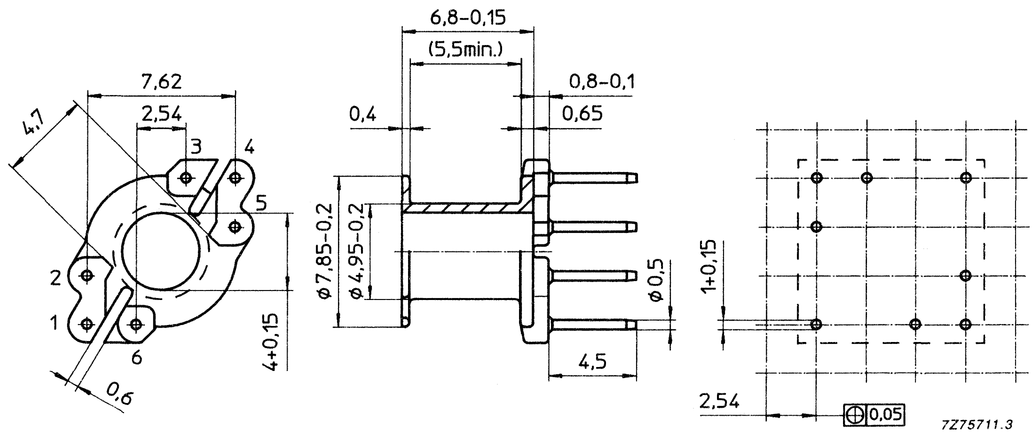


Fig.4 RM4, RM4/I coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	6	all	7.4	5.5	4322 021 3442

RM cores and accessories RM4, RM4/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	5	4322 021 3190	clamping force ≈ 10 N each material: steel, Ag plated
mounting clip	6	4322 021 3429	clamping force ≈ 5 N each material: stainless steel, SnPb plated

Dimensions in mm

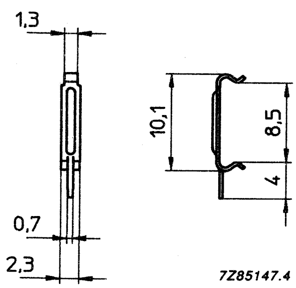


Fig.5 Mounting clip.

Dimensions in mm

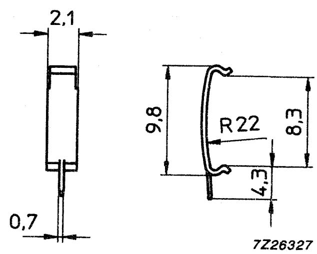


Fig.6 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

RM cores and accessories RM5

Dimensions in mm

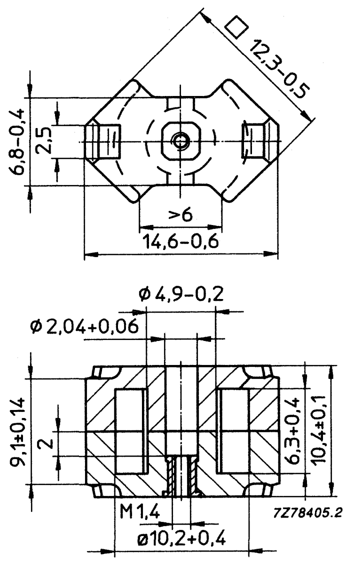


Fig.1 RM5 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.01	mm^{-1}
V_e	effective volume	450	mm^3
l_e	effective length	21.4	mm
A_e	effective area	21.2	mm^2
A_{min}	minimum area	14.8	mm^2
	mass of set	≈ 3.0	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 20	≈ 1200	4322 022 7981	4322 022 5981
	40 ± 3%	≈ 33	≈ 500	4322 022 7982	4322 022 5982
	120 ± 25%	≈ 95	≈ 0	–	4322 022 5984
3D3	63 ± 3%	≈ 51	≈ 400	4322 022 7943	4322 022 5943
	100 ± 3%	≈ 82	≈ 210	4322 022 7944	4322 022 5944
	800 ± 25%	≈ 630	≈ 0	–	4322 022 5940
3H3	160 ± 3%	≈ 130	≈ 130	4322 022 7955	4322 022 5955
	250 ± 3%	≈ 200	≈ 70	4322 022 7956	4322 022 5956
	315 ± 3%	≈ 250	≈ 50	4322 022 7957	4322 022 5957
	1650 ± 25%	≈ 1310	≈ 0	–	4322 022 5970
3H1	160 ± 3%	≈ 130	≈ 130	4322 022 7925	4322 022 5925
	250 ± 3%	≈ 200	≈ 70	4322 022 7926	4322 022 5926
	315 ± 3%	≈ 250	≈ 50	4322 022 7927	4322 022 5927
	1800 ± 25%	≈ 1430	≈ 0	–	4322 022 5920

* clamping force 25 ± 10 N

RM cores and accessories RM5/I

Dimensions in mm

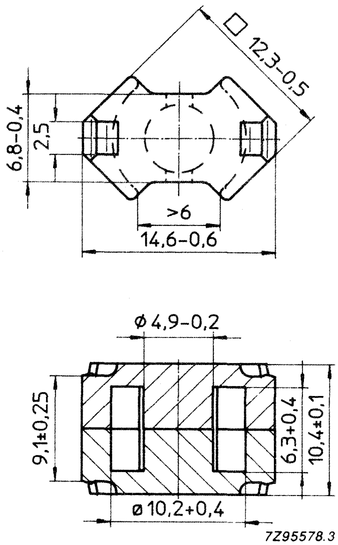


Fig.2 RM5/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.935	mm^{-1}
V_e	effective volume	574	mm^3
l_e	effective length	23.2	mm
A_e	effective area	24.8	mm^2
A_{min}	minimum area	18.1	mm^2
	mass of set	≈ 3.3	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	100 ± 3%	≈ 74	≈ 300	4322 022 5947
	160 ± 3%	≈ 119	≈ 160	4322 022 5948
	250 ± 3%	≈ 186	≈ 90	4322 022 5949
	2000 ± 25%	≈ 1490	≈ 0	4322 022 5946
3C85	100 ± 3%	≈ 74	≈ 300	4322 025 0404
	160 ± 3%	≈ 119	≈ 160	4322 025 0405
	250 ± 3%	≈ 186	≈ 90	4322 025 0406
	1800 ± 25%	≈ 1340	≈ 0	4322 025 0400
3F3	100 ± 3%	≈ 74	≈ 300	4322 025 0414
	160 ± 3%	≈ 119	≈ 160	4322 025 0415
	250 ± 3%	≈ 186	≈ 90	4322 025 0416
	1700 ± 25%	≈ 1270	≈ 0	4322 025 0410

* clamping force 12 ± 5 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	3150 ± 25%	≈ 2350	4322 022 5990
3E4	4500 + 40/- 30%	≈ 3350	4322 022 5991
3E5	6700 + 40/- 30%	≈ 4980	4322 022 5992
3E6	9500 + 40/- 30%	≈ 7050	4322 022 5916

* clamping force 12 ± 5 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.16	–	–
3C85	≥ 315	≤ 0.09	≤ 0.11	–
3F3	≥ 315	–	≤ 0.08	≤ 0.11

RM cores and accessories RM5

Dimensions in mm

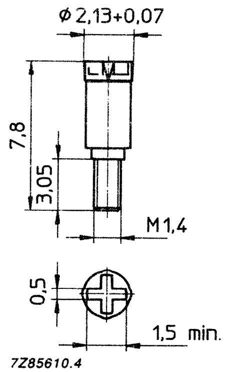


Fig.3 RM5 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3870	black
4322 021 3871	brown
4322 021 3872	red
4322 021 3875	green
4322 021 3878	white
4322 021 3879	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	63	–		4322 021 3875	12	4322 021 3872	23
	100	4322 021 3875	8	4322 021 3872	15	4322 021 3871	24
	160	4322 021 3872	9	4322 021 3871	15	4322 021 3879	27
	250	4322 021 3872	6	4322 021 3871	10	4322 021 3879	17
	315	4322 021 3871	8	4322 021 3879	14	4322 021 3878	21
	400	4322 021 3871	6	4322 021 3870	13	4322 021 3878	17
3D3	25	–		4322 021 3875	19	–	
	40	–		4322 021 3875	16	–	
	63	–		4322 021 3875	11	4322 021 3872	20
	100	4322 021 3875	7	4322 021 3872	16	–	
4C6	16	–		4322 021 3875	18	–	
	25	–		4322 021 3875	15	–	
	40	–		4322 021 3875	9	4322 021 3872	17
	63	4322 021 3875	6	4322 021 3872	8	–	

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 25 mm

Dimensions in mm

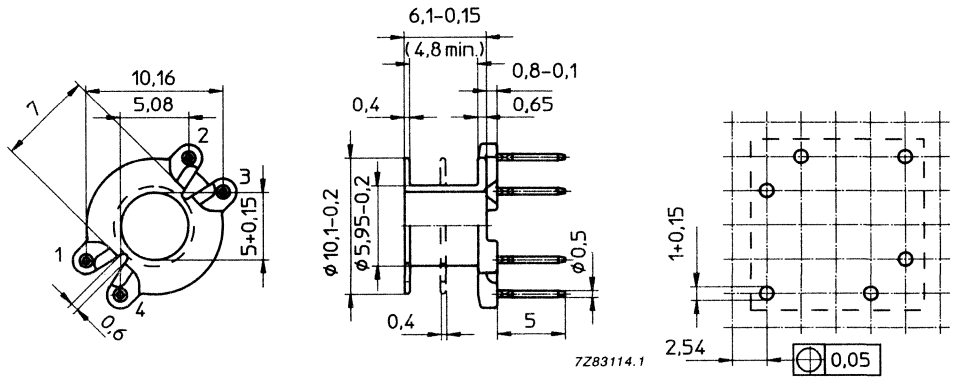


Fig.4 RM5, RM5/I coil former, 4 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	4	all	9.5	4.8	4322 021 3445
2	4	all	2 x 4.35	2 x 2.2	4322 021 3448

Dimensions in mm

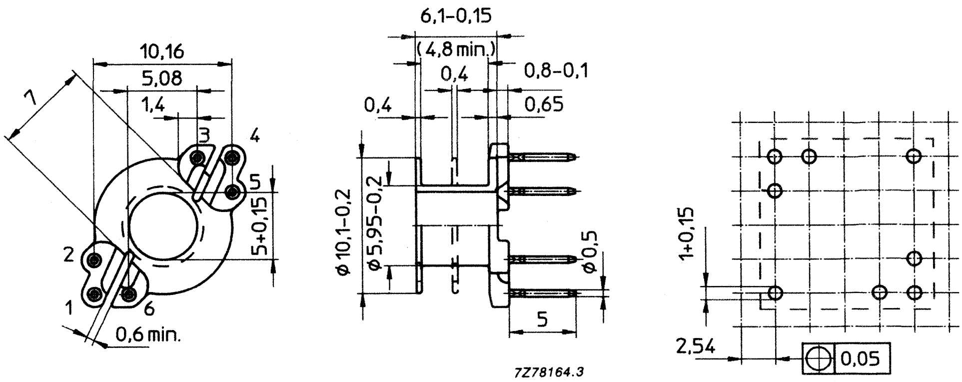


Fig.5 RM5, RM5/I coil former, 6 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	5	1,2,3,5,6	9.5	4.8	4322 021 3446
1	6	all	9.5	4.8	4322 021 3447
2	5	1,2,3,5,6	2 x 4.35	2 x 2.2	4322 021 3449
2	6	all	2 x 4.35	2 x 2.2	4322 021 3450

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	6	4322 021 3190	clamping force ≈ 12 N each material: steel, Ag plated
mounting clip	7	4322 021 3429	clamping force ≈ 6 N each material: stainless steel, SnPb plated

Dimensions in mm

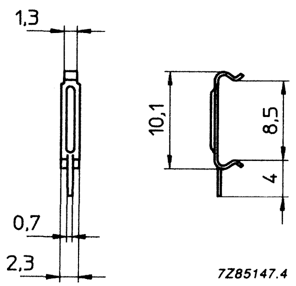


Fig.6 Mounting clip.

Dimensions in mm

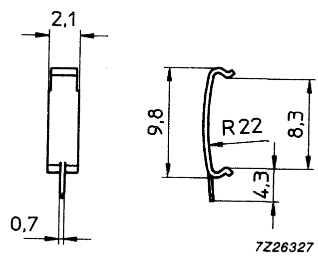


Fig.7 Mounting clip.

Solderability: IEC 68-2-20, part 2, test Ta, method 1.

RM cores and accessories RM6R

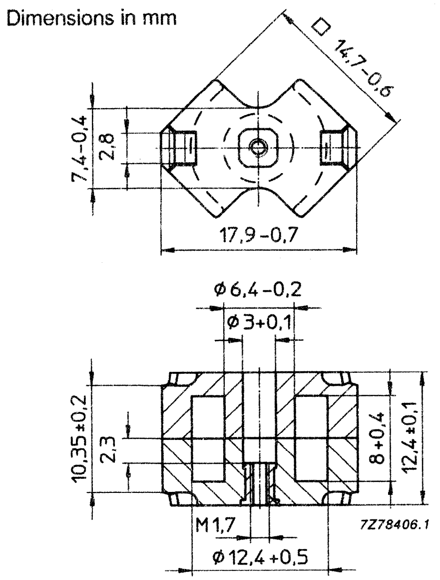


Fig.1 RM6R core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.810	mm^{-1}
V_e	effective volume	810	mm^3
l_e	effective length	25.6	mm
A_e	effective area	32.0	mm^2
A_{min}	minimum area	23.8	mm^2
	mass of set	≈ 4.5	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 16	≈ 2500	4322 022 7581	4322 022 5581
	40 ± 3%	≈ 26	≈ 1000	4322 022 7582	4322 022 5582
	63 ± 3%	≈ 41	≈ 400	4322 022 7583	4322 022 5583
	150 ± 25%	≈ 97	≈ 0	–	4322 022 5566
3D3	63 ± 3%	≈ 41	≈ 700	4322 022 7543	4322 022 5543
	100 ± 3%	≈ 65	≈ 400	4322 022 7544	4322 022 5544
	160 ± 3%	≈ 103	≈ 200	4322 022 7545	4322 022 5545
	1000 ± 25%	≈ 650	≈ 0	–	4322 022 5540
3H3	160 ± 3%	≈ 103	≈ 230	4322 022 7555	4322 022 5555
	200 ± 3%	≈ 129	≈ 160	4322 022 7568	4322 022 5568
	250 ± 3%	≈ 161	≈ 110	4322 022 7556	4322 022 5556
	315 ± 3%	≈ 203	≈ 90	4322 022 7557	4322 022 5557
	400 ± 3%	≈ 258	≈ 70	4322 022 7558	4322 022 5558
	2200 ± 25%	≈ 1420	≈ 0	–	4322 022 5562
3H1	160 ± 3%	≈ 103	≈ 230	4322 022 7525	4322 022 5525
	250 ± 3%	≈ 161	≈ 110	4322 022 7526	4322 022 5526
	315 ± 3%	≈ 203	≈ 90	4322 022 7527	4322 022 5527
	400 ± 3%	≈ 258	≈ 70	4322 022 7528	4322 022 5528
	2450 ± 25%	≈ 1580	≈ 0	–	4322 022 5520

* clamping force 40 ± 20 N

RM cores and accessories RM6R

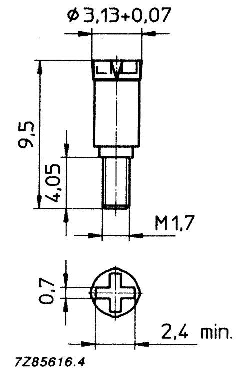


Fig.2 RM6R inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3860	black
4322 021 3861	brown
4322 021 3862	red
4322 021 3864	yellow
4322 021 3865	green
4322 021 3867	violet
4322 021 3868	white
4322 021 3869	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	40	–		4322 021 3864	17	4322 021 3865	20
	63	4322 021 3864	12	4322 021 3865	14	4322 021 3862	22
	100	4322 021 3865	10	4322 021 3862	16	–	
	160	4322 021 3865	6	4322 021 3862	11	4322 021 3868	19
	200	4322 021 3862	8	4322 021 3868	15	4322 021 3867	18
	250	4322 021 3868	12	4322 021 3867	14	4322 021 3861	19
	315	4322 021 3868	10	4322 021 3861	15	4322 021 3860	20
	400	4322 021 3867	9	4322 021 3860	16	4322 021 3869	24
	630	4322 021 3860	10	4322 021 3869	15	–	
	1000	4322 021 3860	6	4322 021 3869	10	–	
	1250	–		4322 021 3869	8	–	
3D3	40	–		4322 021 3864	17	4322 021 3865	20
	63	4322 021 3864	12	4322 021 3865	14	4322 021 3862	23
	100	4322 021 3865	9	4322 021 3862	16	4322 021 3868	27
	160	4322 021 3862	10	4322 021 3868	17	–	
4C6	25	–		4322 021 3864	18	4322 021 3865	20
	40	4322 021 3864	12	4322 021 3865	14	4322 021 3862	20
	63	4322 021 3865	8	4322 021 3862	12	–	

COIL FORMER DATA

Coil former material:	phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	180 °C
Resistance to soldering heat:	430 °C, 2 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	25 mm

Dimensions in mm

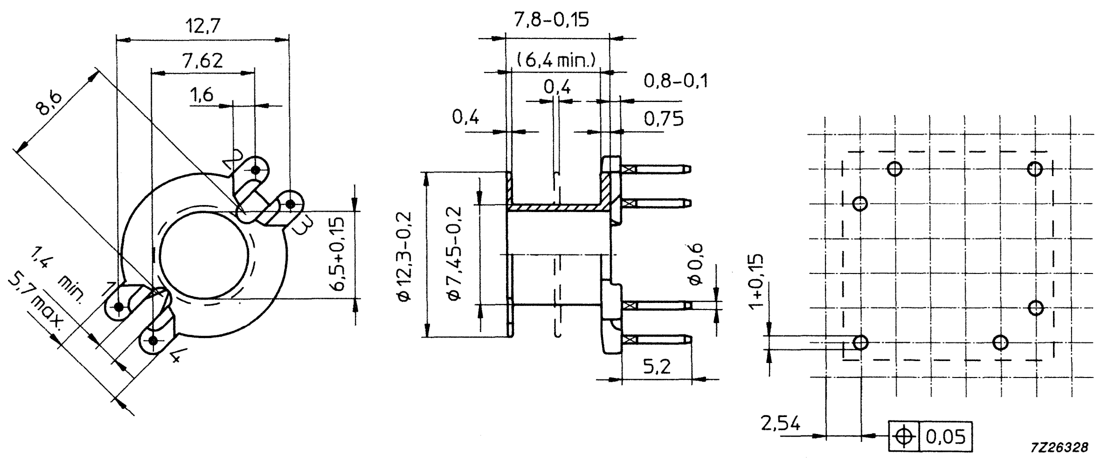


Fig.3 RM6R coil former, 4 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	4	all	15	6.4	4322 021 3451
2	4	all	2 x 7.0	2 x 3.0	4322 021 3452

RM cores and accessories | RM6R

Dimensions in mm

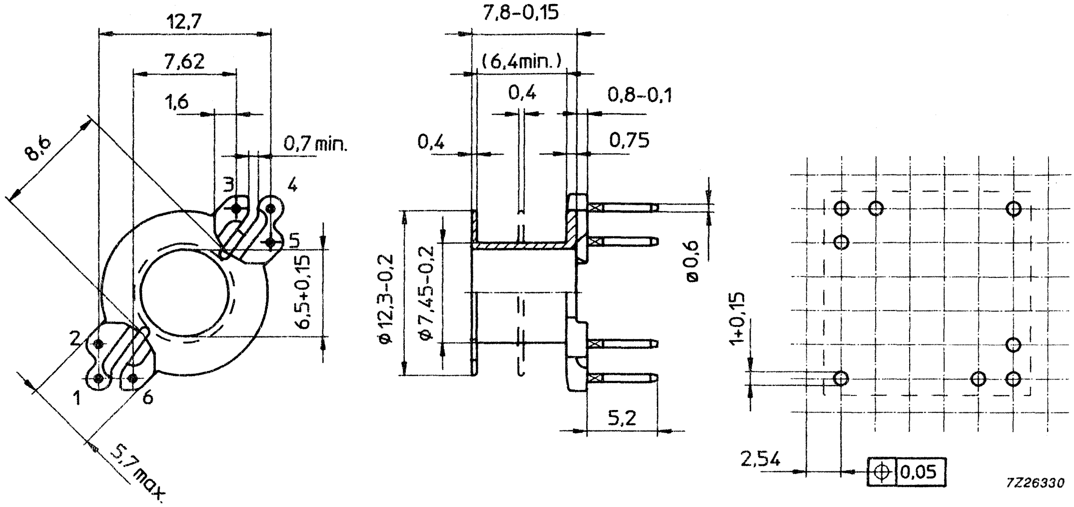


Fig.4 RM6R coil former, 6 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	5	1,2,3,5,6	15	6.4	4322 021 3453
1	6	all	15	6.4	4322 021 3454
2	5	1,2,3,5,6	2 x 7.0	2 x 3.0	4322 021 3455
2	6	all	2 x 7.0	2 x 3.0	4322 021 3456

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	5	4322 021 3178	clamping force ≈ 20 N each material: steel, Ag plated
mounting clip	6	4322 021 3430	clamping force ≈ 10 N each material: stainless steel, SnPb plated

Dimensions in mm

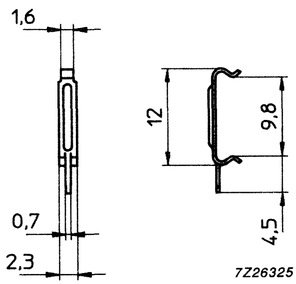


Fig.5 Mounting clip.

Dimensions in mm

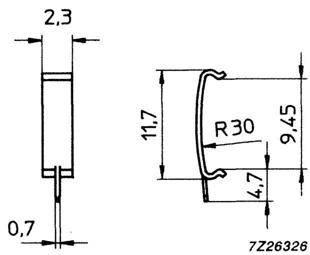


Fig.6 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

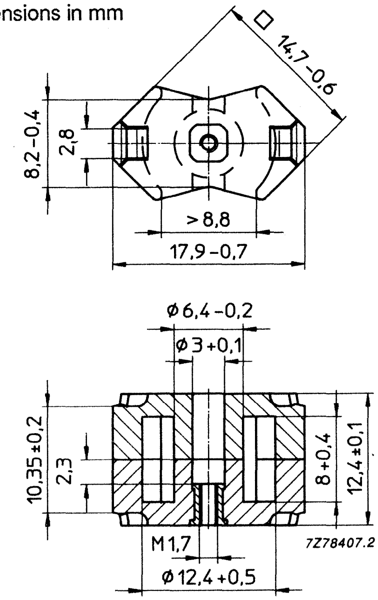


Fig.1 RM6S core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.863	mm^{-1}
V_e	effective volume	840	mm^3
l_e	effective length	27.3	mm
A_e	effective area	31.0	mm^2
A_{min}	minimum area	23.8	mm^2
	mass of set	≈ 4.5	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 17	≈ 2000	4322 022 6781	4322 022 4781
	40 ± 3%	≈ 27	≈ 1000	4322 022 6782	4322 022 4782
	63 ± 3%	≈ 43	≈ 400	4322 022 6783	4322 022 4783
	140 ± 25%	≈ 96	≈ 0	–	4322 022 4778
3D3	63 ± 3%	≈ 43	≈ 700	4322 022 6743	4322 022 4743
	100 ± 3%	≈ 69	≈ 400	4322 022 6744	4322 022 4744
	160 ± 3%	≈ 110	≈ 200	4322 022 6745	4322 022 4745
	950 ± 25%	≈ 650	≈ 0	–	4322 022 4740
3H3	160 ± 3%	≈ 110	≈ 230	4322 022 6755	4322 022 4755
	200 ± 3%	≈ 137	≈ 160	4322 022 6768	4322 022 4768
	250 ± 3%	≈ 171	≈ 110	4322 022 6756	4322 022 4756
	315 ± 3%	≈ 216	≈ 90	4322 022 6757	4322 022 4757
	400 ± 3%	≈ 274	≈ 70	4322 022 6758	4322 022 4758
	2100 ± 25%	≈ 1440	≈ 0	–	4322 022 4750
3H1	160 ± 3%	≈ 110	≈ 230	4322 022 6725	4322 022 4725
	250 ± 3%	≈ 171	≈ 110	4322 022 6726	4322 022 4726
	315 ± 3%	≈ 216	≈ 90	4322 022 6727	4322 022 4727
	400 ± 3%	≈ 274	≈ 70	4322 022 6728	4322 022 4728
	2300 ± 25%	≈ 1580	≈ 0	–	4322 022 4721

* clamping force 40 ± 20 N

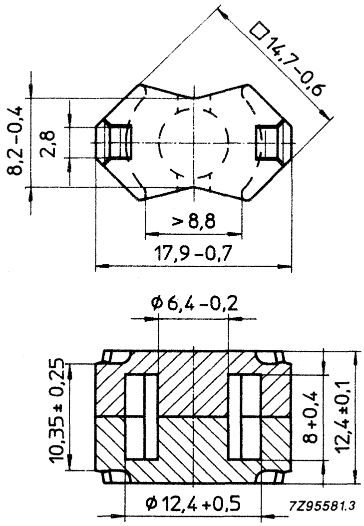


Fig.2 RM6/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.784	mm^{-1}
V_e	effective volume	1090	mm^3
l_e	effective length	29.2	mm
A_e	effective area	37.0	mm^2
A_{min}	minimum area	31.2	mm^2
	mass of set	≈ 4.9	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	63 ± 3%	≈ 39	≈ 950	4322 022 4772
	100 ± 3%	≈ 62	≈ 500	4322 022 4774
	160 ± 3%	≈ 100	≈ 160	4322 022 4773
	250 ± 3%	≈ 156	≈ 150	4322 022 4788
	2600 ± 25%	≈ 1620	≈ 0	4322 022 4785
3C85	63 ± 3%	≈ 39	≈ 950	4322 025 0503
	100 ± 3%	≈ 62	≈ 500	4322 025 0504
	160 ± 3%	≈ 100	≈ 300	4322 025 0505
	250 ± 3%	≈ 156	≈ 150	4322 025 0506
	315 ± 3%	≈ **197**	≈ **80**	4322 025 **0507**
	400 ± 3%	≈ **250**	≈ **50**	4322 025 **0508**
	630 ± 5%	≈ **390**	≈ **30**	4322 025 **0509**
	2350 ± 25%	≈ 1470	≈ 0	4322 025 0500
3F3	63 ± 3%	≈ 39	≈ 950	4322 025 0513
	100 ± 3%	≈ 62	≈ 500	4322 025 0514
	160 ± 3%	≈ 100	≈ 300	4322 025 0515
	250 ± 3%	≈ 156	≈ 150	4322 025 0516
	2150 ± 25%	≈ 1350	≈ 0	4322 025 0511

* clamping force 20 ± 10 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	4100 ± 25%	≈ 2600	4322 022 4786
3E4	5750 + 40%- 30%	≈ 3590	4322 022 4793
3E5	8600 + 40% - 30%	≈ 5370	4322 022 4787
3E6	12 500 + 40%- 30%	≈ 6200	4322 022 4784

* clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.30	–	–
3C85	≥ 315	≤ 0.17	≤ 0.20	–
3F3	≥ 315	–	≤ 0.14	≤ 0.20

Dimensions in mm

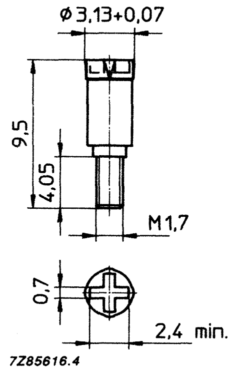


Fig.3 RM6S inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3860	black
4322 021 3861	brown
4322 021 3862	red
4322 021 3864	yellow
4322 021 3865	green
4322 021 3867	violet
4322 021 3868	white
4322 021 3869	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	40	–		4322 021 3864	17	4322 021 3865	20
	63	4322 021 3864	12	4322 021 3865	14	4322 021 3862	22
	100	4322 021 3865	10	4322 021 3862	16	–	
	160	4322 021 3865	6	4322 021 3862	11	4322 021 3868	19
	200	4322 021 3862	8	4322 021 3868	15	4322 021 3867	18
	250	4322 021 3868	12	4322 021 3867	14	4322 021 3861	19
	315	4322 021 3868	10	4322 021 3861	15	4322 021 3860	20
	400	4322 021 3867	9	4322 021 3860	16	4322 021 3869	24
	630	4322 021 3860	10	4322 021 3869	15	–	
	1000	4322 021 3860	6	4322 021 3869	10	–	
	1250	–		4322 021 3869	8	–	
3D3	40	–		4322 021 3864	17	4322 021 3865	20
	63	4322 021 3864	12	4322 021 3865	14	4322 021 3862	23
	100	4322 021 3865	9	4322 021 3862	16	4322 021 3868	27
	160	4322 021 3862	10	4322 021 3868	17	–	
4C6	25	–		4322 021 3864	18	4322 021 3865	20
	40	4322 021 3864	12	4322 021 3865	14	4322 021 3862	20
	63	4322 021 3865	8	4322 021 3862	12	–	

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 30 mm

Dimensions in mm

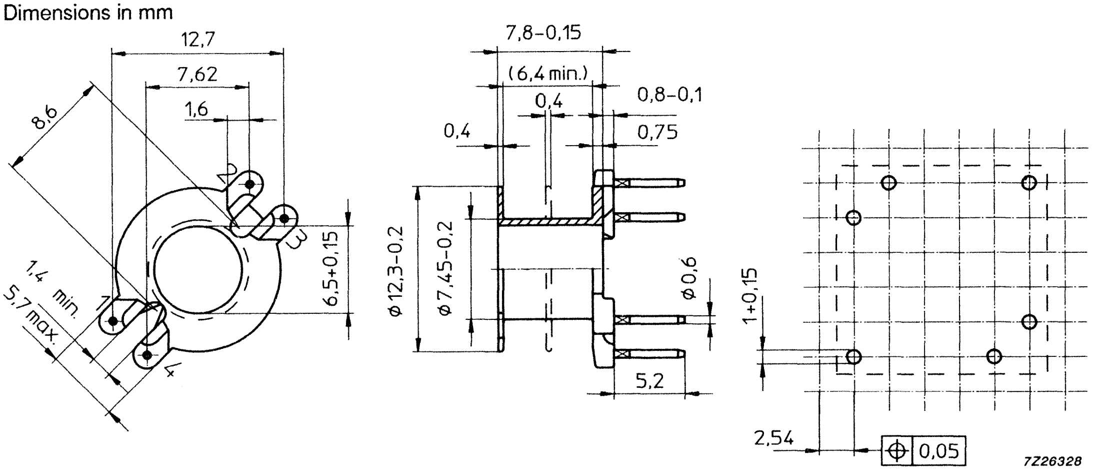


Fig.4 RM6, RM6/I coil former, 4 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	4	all	15	6.4	4322 021 3451
2	4	all	2 x 7.0	2 x 3.0	4322 021 3452

Dimensions in mm

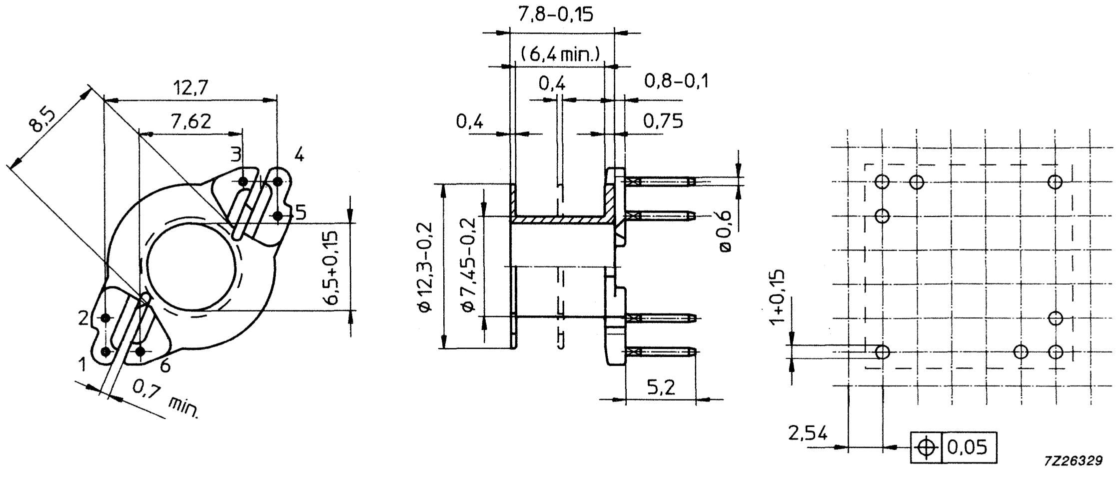


Fig.5 RM6, RM6/I coil former, 6 pins.

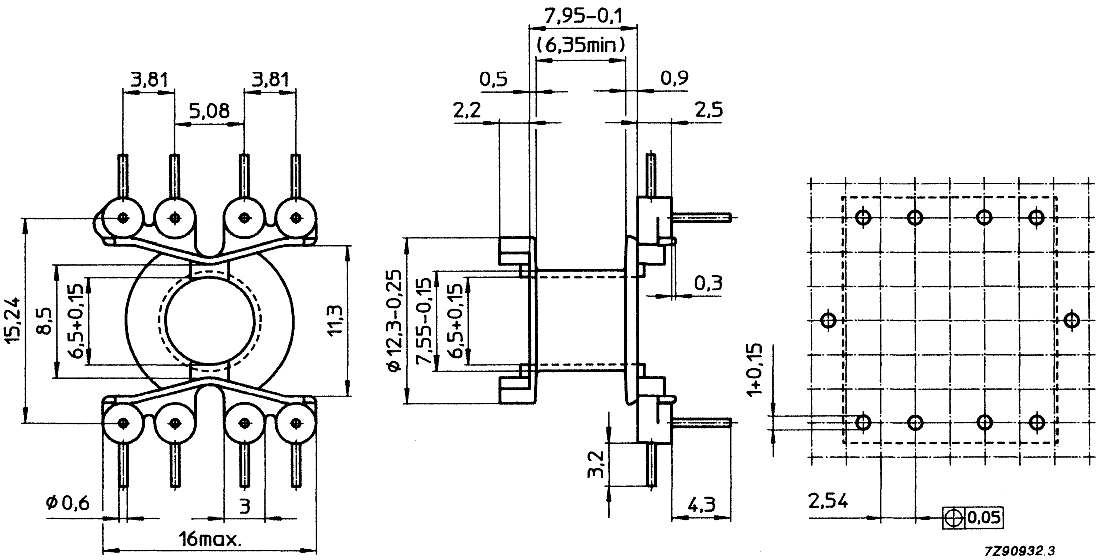
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	5	1,2,3,5,6	15	6.4	4322 021 3457
1	6	all	15	6.4	4322 021 3458
2	5	1,2,3,5,6	2 x 7.0	2 x 3.0	4322 021 3459
2	6	all	2 x 7.0	2 x 3.0	4322 021 3460

DIL COIL FORMER DATA

Coil former material:	polybutyleneterephthalate (PBT), glass reinforced, flame retardent in accordance with UL 94V-0
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	400 °C, 2 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	31 mm

Dimensions in mm



7Z90932.3

Fig.6 RM6, RM6/I coil former, 8 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	15.7	6.2	4322 021 3404

RM cores and accessories RM6S, RM6S/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	7	4322 021 3178	clamping force ≈ 20 N each material: steel, Ag plated
mounting clip	8	4322 021 3430	clamping force ≈ 10 N each material: stainless steel, SnPb plated

Dimensions in mm

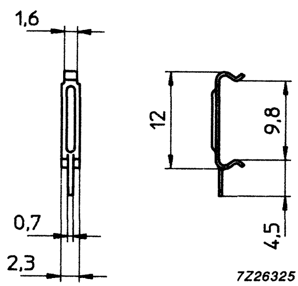


Fig.7 Mounting clip.

Dimensions in mm

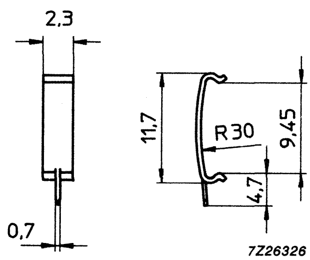


Fig.8 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

Dimensions in mm

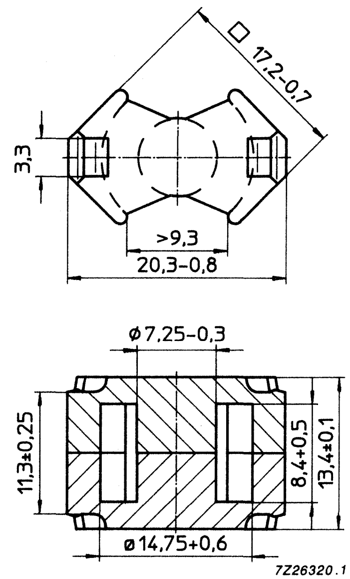


Fig.1 RM7/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.680	mm^{-1}
V_e	effective volume	1325	mm^3
I_e	effective length	30.0	mm
A_e	effective area	44.1	mm^2
A_{min}	minimum area	39.6	mm^2
	mass of set	≈ 7.7	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 89	≈ 400	4322 025 0065
	250 ± 3%	≈ 139	≈ 200	4322 025 0066
	3000 ± 25%	≈ 1670	≈ 0	4322 025 0060
3C85	100 ± 3%	≈ 56	≈ 800	4322 025 0044
	160 ± 3%	≈ 89	≈ 400	4322 025 0045
	250 ± 3%	≈ 139	≈ 200	4322 025 0046
	2700 ± 25%	≈ 1500	≈ 0	4322 025 0040
3F3	160 ± 3%	≈ 89	≈ 400	4322 025 0085
	250 ± 3%	≈ 139	≈ 200	4322 025 0086
	2500 ± 25%	≈ 1390	≈ 0	4322 025 0080

* clamping force 40 ± 20 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	4750 ± 25%	≈ 2570	4322 025 0099
3E4	6600 + 40/- 30%	≈ 3590	4322 025 0090
3E5	10000 + 40/- 30%	≈ 5370	4322 025 0095

* clamping force 25 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥315	≤0.40	–	–
3C85	≥315	≤0.20	≤0.24	–
3F3	≥315	–	≤0.15	≤0.25

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 35 mm

Dimensions in mm

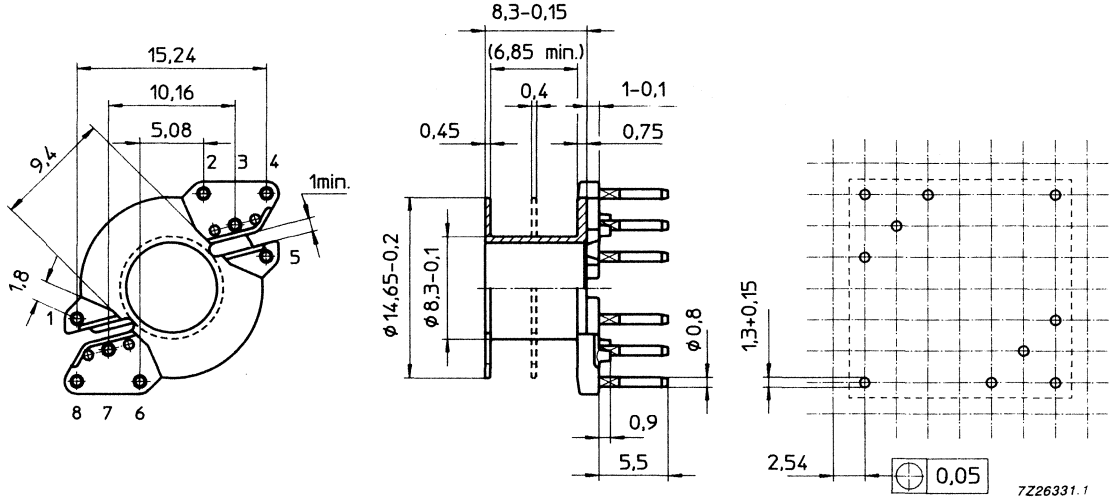


Fig.2 RM7/I coil former, 8 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	4	1,2,5,6	21	6.85	4322 021 3461
1	5	1,2,4,5,8	21	6.85	4322 021 3462
1	8	all	21	6.85	4322 021 3463
2	5	1,2,4,5,8	2 x 9.8	2 x 3.2	4322 021 3464
2	8	all	2 x 9.8	2 x 3.2	4322 021 3465

RM cores and accessories RM7/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4313 021 0395	clamping force ≈ 20 N each material: stainless steel, SnPb plated

Dimensions in mm

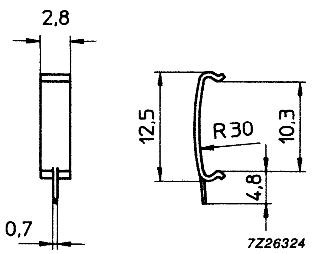


Fig.3 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

RM cores and accessories RM8

Dimensions in mm

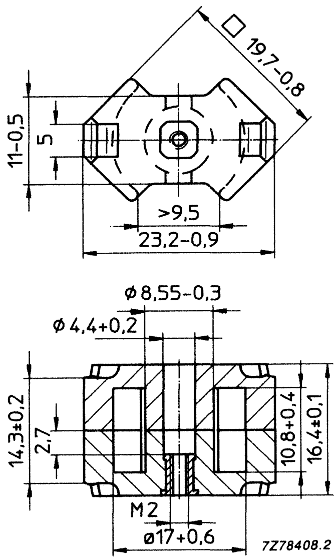


Fig.1 RM8 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.683	mm^{-1}
V_e	effective volume	1850	mm^3
l_e	effective length	35.5	mm
A_e	effective area	52.0	mm^2
A_{min}	minimum area	39.5	mm^2
	mass of set	≈ 10.9	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	40 ± 3%	≈ 22	≈ 2700	4322 022 7182	4322 022 5182
	63 ± 3%	≈ 34	≈ 1200	4322 022 7183	4322 022 5183
	180 ± 25%	≈ 97	≈ 0	–	4322 022 5181
3D3	100 ± 3%	≈ 54	≈ 750	4322 022 7144	4322 022 5144
	160 ± 3%	≈ 87	≈ 400	4322 022 7145	4322 022 5145
	1240 ± 25%	≈ 670	≈ 0	–	4322 022 5140
3H3	250 ± 3%	≈ 135	≈ 210	4322 022 7156	4322 022 5156
	315 ± 3%	≈ 170	≈ 160	4322 022 7157	4322 022 5157
	400 ± 3%	≈ 220	≈ 130	4322 022 7158	4322 022 5158
	630 ± 5%	≈ 340	≈ 100	4322 022 7160	4322 022 5160
	2850 ± 25%	≈ 1540	≈ 0	–	4322 022 5170
3H1	250 ± 3%	≈ 135	≈ 210	4322 022 7126	4322 022 5126
	315 ± 3%	≈ 170	≈ 160	4322 022 7127	4322 022 5127
	400 ± 3%	≈ 220	≈ 130	4322 022 7128	4322 022 5128
	630 ± 5%	≈ 340	≈ 100	4322 022 7130	4322 022 5130
	3150 ± 25%	≈ 1700	≈ 0	–	4322 022 5120

* clamping force 60 ± 30 N

RM cores and accessories RM8/I

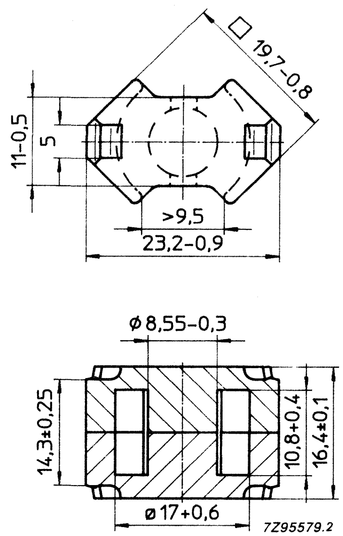


Fig.2 RM8/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.604	mm^{-1}
V_e	effective volume	2440	mm^3
l_e	effective length	38.4	mm
A_e	effective area	63.0	mm^2
A_{min}	minimum area	55.4	mm^2
	mass of set	≈ 12.0	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 77	≈ 550	4322 022 5147
	250 ± 3%	≈ 120	≈ 300	4322 022 5148
	315 ± 3%	≈ 151	≈ 250	4322 022 5149
	400 ± 3%	≈ 192	≈ 180	4322 022 5150
	3600 ± 25%	≈ 1730	≈ 0	4322 022 5146
3C85	**100 ± 3%**	**≈ 50**	**≈ 1100**	**4322 022 0144**
	160 ± 3%	≈ 77	≈ 550	4322 025 0145
	250 ± 3%	≈ 120	≈ 300	4322 025 0146
	315 ± 3%	≈ 151	≈ 250	4322 025 0147
	400 ± 3%	≈ 192	≈ 180	4322 025 0148
	3250 ± 25%	≈ 1560	≈ 0	4322 025 0120
3F3	160 ± 3%	≈ 77	≈ 550	4322 025 0165
	250 ± 3%	≈ 120	≈ 300	4322 025 0166
	315 ± 3%	≈ 151	≈ 250	4322 025 0167
	400 ± 3%	≈ 192	≈ 180	4322 025 0168
	3000 ± 25%	≈ 1440	≈ 0	4322 025 **0144**

* clamping force 30 ± 10 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	5800 ± 25%	≈ 2800	4322 022 5186
3E4	8000 + 40% - 30%	≈ 3800	4322 022 5187
3E5	12500 + 40% - 30%	≈ 6000	4322 022 5198
3E6	18 000 + 40% - 30%	≈ 7200	4322 025 0191

* clamping force 30 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.70	–	–
3C85	≥ 315	≤ 0.40	≤ 0.45	–
3F3	≥ 315	–	≤ 0.27	≤ 0.47

RM cores and accessories RM8

Dimensions in mm

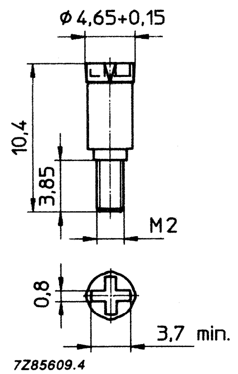


Fig.3 RM8 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3840	black
4322 021 3841	brown
4322 021 3842	red
4322 021 3843	orange
4322 021 3844	yellow
4322 021 3845	green
4322 021 3848	white
4322 021 3849	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1,	63	–		4322 021 3845	19	4322 021 3842	25
3H3	100	4322 021 3845	12	4322 021 3842	16	4322 021 3843	21
	160	4322 021 3845	8	4322 021 3843	14	4322 021 3844	18
	250	4322 021 3842	7	4322 021 3844	12	4322 021 3848	18
	315	4322 021 3844	9	4322 021 3848	15	4322 021 3841	19
	400	4322 021 3844	7	4322 021 3848	12	4322 021 3841	15
	630	4322 021 3844	5	4322 021 3841	10	4322 021 3840	16
	1000	4322 021 3841	6	4322 021 3840	10	–	
	1250	–		4322 021 3840	8	–	
3D3	40	–		4322 021 3845	27	–	
	63	–		4322 021 3845	17	4322 021 3842	24
	100	4322 021 3845	11	4322 021 3842	15	4322 021 3843	20
	160	4322 021 3845	7	4322 021 3843	13	4322 021 3844	17
4C6	40	–		4322 021 3845	18	4322 021 3842	23
	63	4322 021 3845	12	4322 021 3842	16	4322 021 3843	20
	100	4322 021 3845	6	4322 021 3843	11	4322 021 3848	19
	160	4322 021 3843	7	4322 021 3848	12	–	

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 42 mm

Dimensions in mm

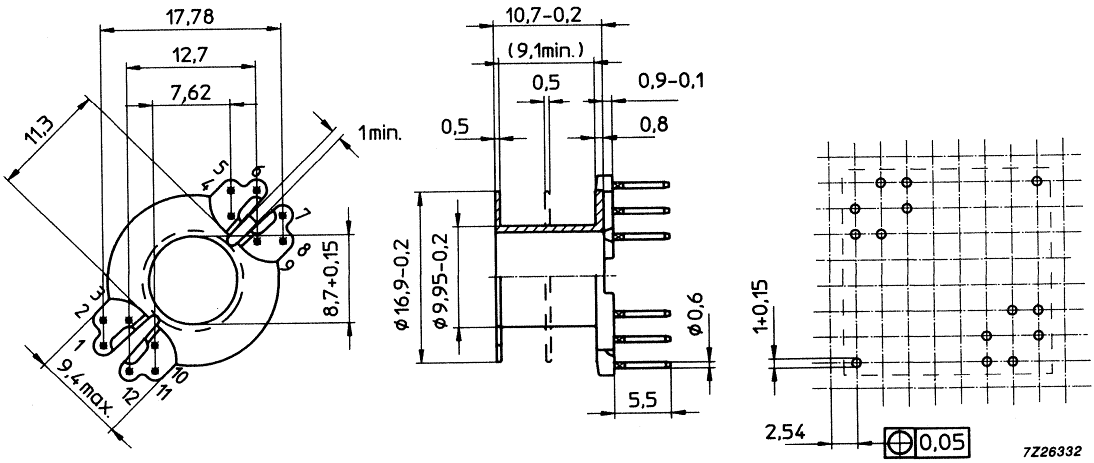


Fig..4 RM8, RM8/I coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	4	3,4,9,10	31	9.1	4322 021 3486
1	5	1,2,5,8,11	31	9.1	4322 021 3466
1	8	1,2,5,6,7,8,11,12	31	9.1	4322 021 3467
1	12	all	31	9.1	4322 021 3468
2	5	1,2,5,8,11	2 x 14.5	2 x 4.3	4322 021 3469
2	8	1,2,5,6,7,8,11,12	2 x 14.5	2 x 4.3	4322 021 3470
2	12	all	2 x 14.5	2 x 4.3	4322 021 3471

RM cores and accessories

RM8/I

DIL COIL FORMER DATA

Coil former material: polybutyleneterephthalate (PBT), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 42 mm

Dimensions in mm

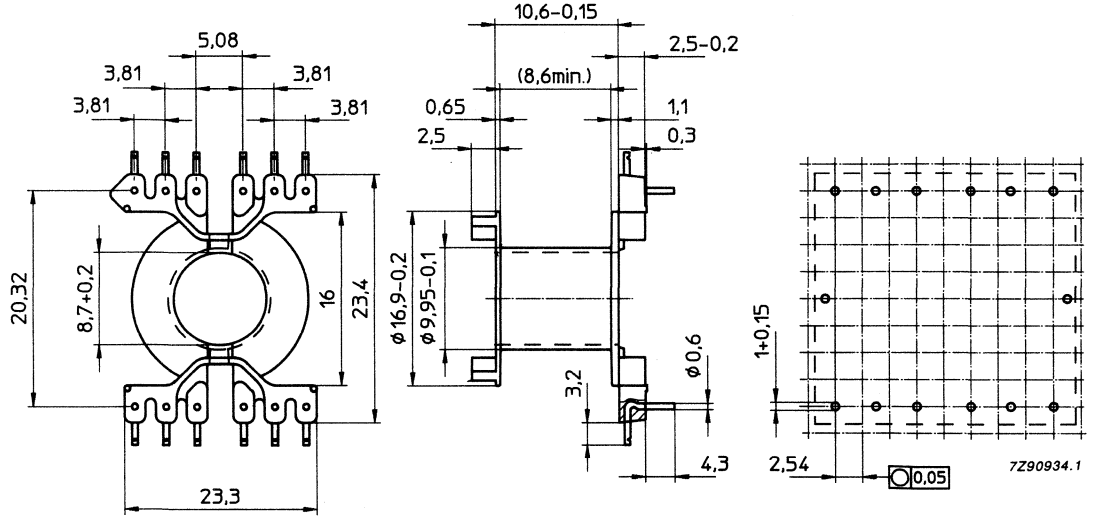


Fig.5 RM8/I DIL coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	12	all	30.9	8.6	4322 021 3405

RM cores and accessories | RM8, RM8/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	6	4322 021 3184	clamping force ≈ 30 N each material: steel, Ag plated
mounting clip	7	4322 021 3431	clamping force ≈ 15 N each material: stainless steel, SnPb plated

Dimensions in mm

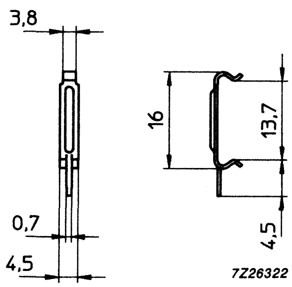


Fig.6 Mounting clip.

Dimensions in mm

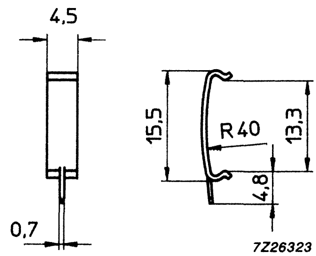


Fig.7 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

RM cores and accessories RM10

Dimensions in mm

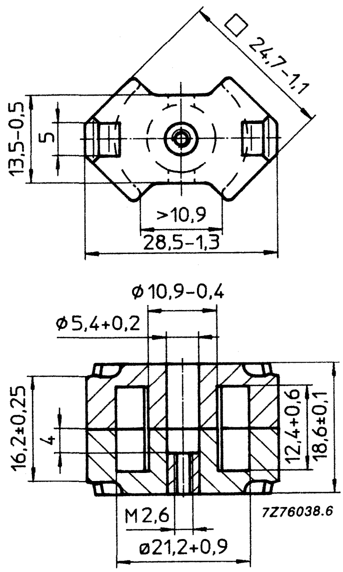


Fig.1 RM10 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.501	mm^{-1}
V_e	effective volume	3470	mm^3
l_e	effective length	41.7	mm
A_e	effective area	83.2	mm^2
A_{min}	minimum area	65.3	mm^2
	mass of set	≈ 20	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	250 ± 3%	≈ 100	≈ 400	4322 022 7026	4322 022 5026
	315 ± 3%	≈ 126	≈ 300	4322 022 7027	4322 022 5027
	400 ± 3%	≈ 160	≈ 230	4322 022 7028	4322 022 5028
	630 ± 3%	≈ 251	≈ 130	4322 022 7030	4322 022 5030
	4500 ± 25%	≈ 1800	≈ 0	−	4322 022 5020

* clamping force 60 ± 20 N

RM cores and accessories RM10/I

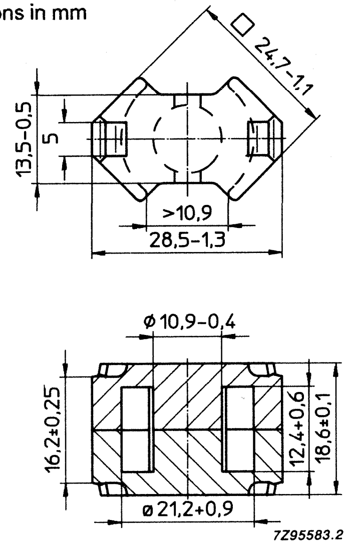


Fig.2 RM10/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.462	mm^{-1}
V_e	effective volume	4310	mm^3
l_e	effective length	44.6	mm
A_e	effective area	96.6	mm^2
A_{min}	minimum area	80.9	mm^2
	mass of set	≈ 22	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 59	≈ 900	4322 022 5046
	250 ± 3%	≈ 92	≈ 500	4322 022 5048
	315 ± 3%	≈ 116	≈ 400	4322 022 5049
	400 ± 3%	≈ 147	≈ 300	4322 022 5050
	630 ± 3%	≈ 232	≈ 150	4322 022 5052
	4950 ± 25%	≈ 1820	≈ 0	4322 022 5040
3C85	160 ± 3%	≈ 59	≈ 900	4322 022 5099
	250 ± 3%	≈ 92	≈ 500	4322 022 5086
	315 ± 3%	≈ 116	≈ 400	4322 022 5087
	400 ± 3%	≈ 147	≈ 300	4322 022 5088
	630 ± 3%	≈ 232	≈ 150	4322 022 5089
	4400 ± 25%	≈ 1620	≈ 0	4322 022 5060
3F3	160 ± 3%	≈ 59	≈ 900	4322 025 0265
	250 ± 3%	≈ 92	≈ 500	4322 025 0266
	315 ± 3%	≈ 116	≈ 400	4322 025 0267
	400 ± 3%	≈ 147	≈ 300	4322 025 0268
	630 ± 3%	≈ 232	≈ 150	4322 025 0269
	4050 ± 25%	≈ 1490	≈ 0	4322 025 0260

* clamping force 60 ± 20 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	8000 ± 25%	≈ 2900	4322 022 5090
3E4	11000 + 40/- 30%	≈ 4040	4322 022 5093
3E5	16000 + 40/- 30%	≈ 5900	4322 022 5094

* clamping force 60 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 1.20	–	–
3C85	≥ 315	≤ 0.65	≤ 0.80	–
3F3	≥ 315	–	≤ 0.48	≤ 0.82

RM cores and accessories RM10

Dimensions in mm

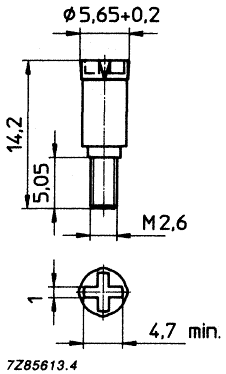


Fig.3 RM10 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3832	red
4322 021 3834	yellow
4322 021 3838	white
4322 021 3839	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	160	–		4322 021 3832	16	4322 021 3834	26
	250	4322 021 3832	10	4322 021 3834	16	4322 021 3838	19
	315	4322 021 3832	8	4322 021 3834	14	4322 021 3838	15
	400	4322 021 3832	6	4322 021 3838	11	–	
	630	–		4322 021 3838	8	4322 021 3839	20
	1000	4322 021 3838	5	4322 021 3839	11	–	

COIL FORMER DATA

Coil former material:	phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	180 °C
Resistance to soldering heat:	430 °C, 2 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	52 mm

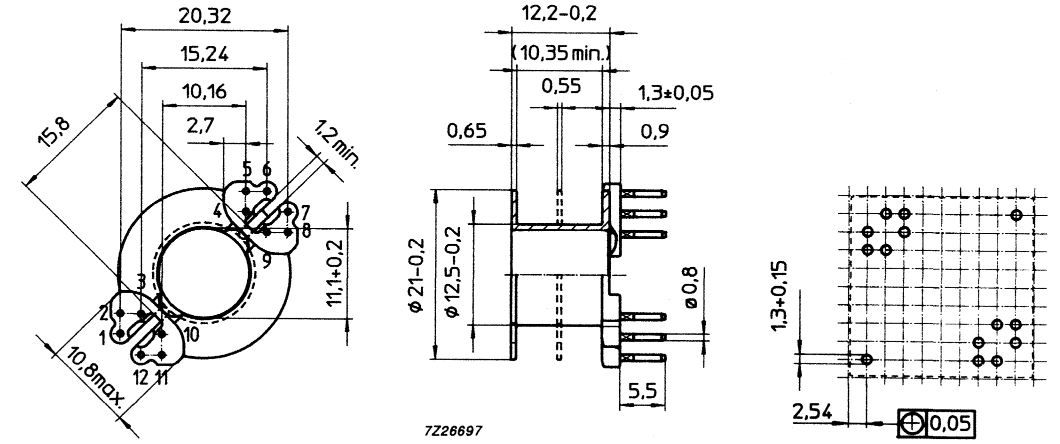


Fig.4 RM10, RM10/I coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	5	3,4,6,9,10	43	10.4	4322 021 3472
1	8	1,3,4,6,7,9,10,12	43	10.4	4322 021 3473
1	10	1,3,4,5,6,7,8,9,10,12	43	10.4	4322 021 3474
1	11	1,2,3,4,5,6,7,8,10,11,12	43	10.4	4322 021 3475
1	12	all	43	10.4	4322 021 3476
2	5	3,4,6,9,10	2 x 20.5	2 x 4.9	4322 021 3477
2	8	1,3,4,6,7,9,10,12	2 x 20.5	2 x 4.9	4322 021 3478
2	10	1,3,4,5,6,7,8,9,10,12	2 x 20.5	2 x 4.9	4322 021 3479
2	11	1,2,3,4,5,6,7,8,10,11,12	2 x 20.5	2 x 4.9	4322 021 3480
2	12	all	2 x 20.5	2 x 4.9	4322 021 3481

RM cores and accessories RM10/I

DIL COIL FORMER DATA

Coil former material: polybutyleneterephthalate (PBT), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 52 mm

Dimensions in mm

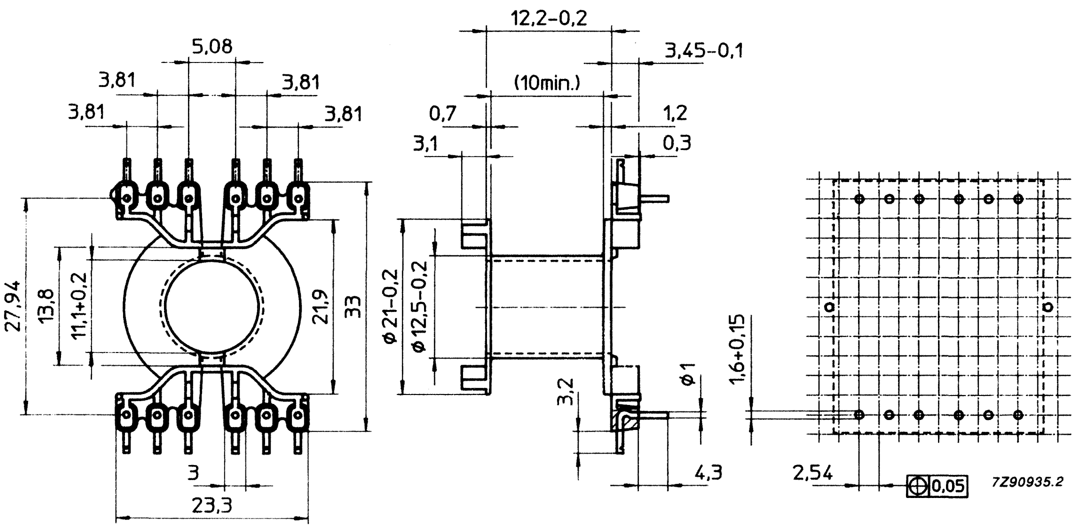


Fig.5 RM10/I coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	12	all	44.2	10.0	4322 021 3406

RM cores and accessories RM10, RM10/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	6	4322 021 3432	clamping force ≈ 30 N each material: stainless steel, SnPb plated

Dimensions in mm

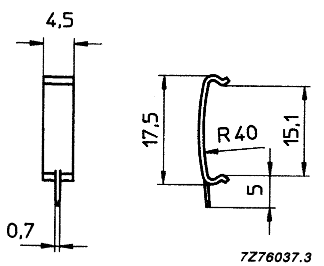


Fig.6 Mounting clip.

Solderability: IEC 68-2-20, part 2, test Ta, method 1.

RM cores and accessories RM12/I

Dimensions in mm

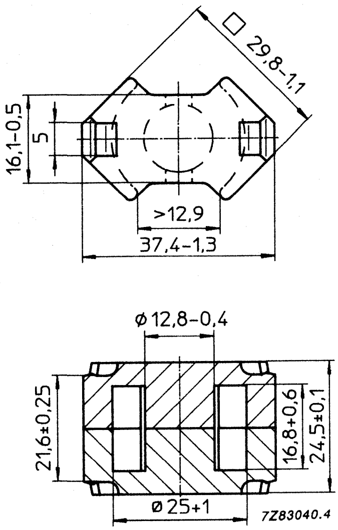


Fig.1 RM12/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.388	mm^{-1}
V_e	effective volume	8340	mm^3
l_e	effective length	56.6	mm
A_e	effective area	146	mm^2
A_{min}	minimum area	125	mm^2
	mass of set	≈ 45	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 49	≈ 1400	4322 025 0645
	250 ± 3%	≈ 77	≈ 800	4322 025 0646
	315 ± 5%	≈ 97	≈ 550	4322 025 0647
	400 ± 5%	≈ 123	≈ 450	4322 025 0648
	6200 ± 25%	≈ 1910	≈ 0	4322 025 0640
3C85	160 ± 3%	≈ 49	≈ 1400	4322 025 0605
	250 ± 3%	≈ 77	≈ 800	4322 025 0606
	315 ± 5%	≈ 97	≈ 550	4322 025 0607
	400 ± 5%	≈ 123	≈ 450	4322 025 0608
	5500 ± 25%	≈ 1700	≈ 0	4322 025 0600
3F3	160 ± 3%	≈ 49	≈ 1400	4322 025 0625
	250 ± 3%	≈ 77	≈ 800	4322 025 0626
	315 ± 5%	≈ 97	≈ 550	4322 025 0627
	400 ± 5%	≈ 123	≈ 450	4322 025 0628
	5050 ± 25%	≈ 1560	≈ 0	4322 025 0620

* clamping force 70 ± 20 N

RM cores and accessories RM12/I

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	9200 ± 25%	≈ 2850	4322 025 0670
3E4	13300 + 40/- 30%	≈ 4100	4322 025 0660

* clamping force 70 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 2.35	–	–
3C85	≥ 315	≤ 1.30	≤ 1.50	–
3F3	≥ 315	–	≤ 0.92	≤ 1.60

RM cores and accessories | RM12/I

DIL COIL FORMER DATA

Coil former material: polybutyleneterephthalate (PBT), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 61 mm

Dimensions in mm

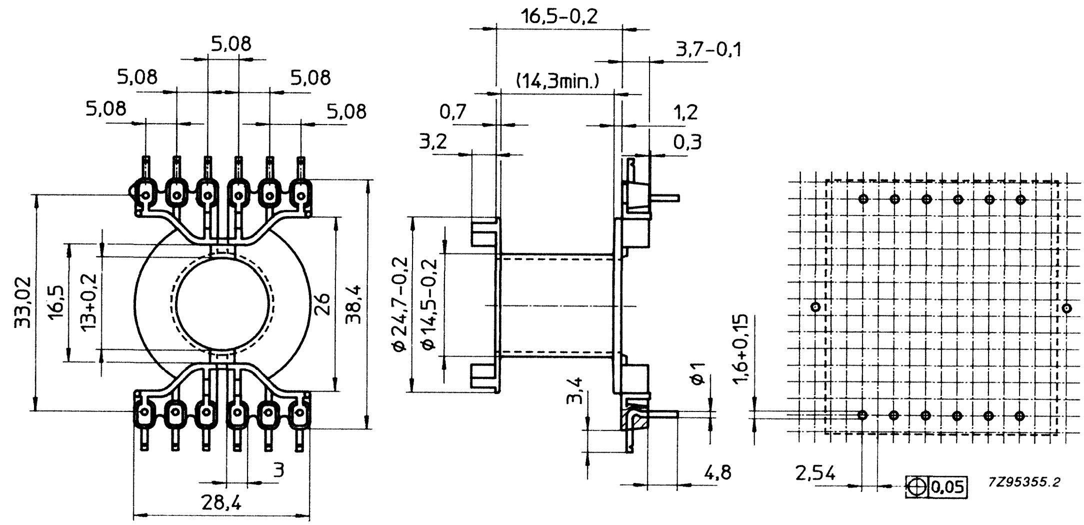


Fig.2 RM12/I DIL coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	12	all	75.0	14.3	4322 021 3411

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3491	clamping force ≈ 35 N each material: stainless steel, SnPb plated

Dimensions in mm

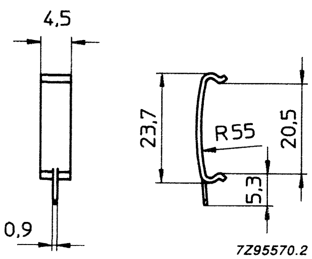


Fig.3 Mounting clip.

Solderability: IEC 68-2-20, part 2,
test Ta, method 1.

RM cores and accessories | RM14/I

Dimensions in mm

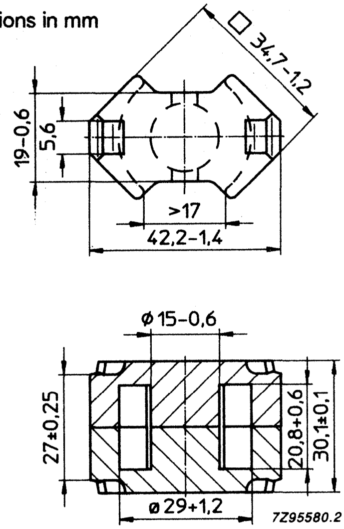


Fig.1 RM14/I core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.353	mm^{-1}
V_e	effective volume	13900	mm^3
l_e	effective length	70.0	mm
A_e	effective area	198	mm^2
A_{min}	minimum area	168	mm^2
	mass of set	≈ 74	g

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	250 ± 3%	≈ 70	≈ 950	4322 025 0386
	315 ± 3%	≈ 88	≈ 700	4322 025 0387
	400 ± 3%	≈ 112	≈ 550	4322 025 0388
	630 ± 5%	≈ 177	≈ 250	4322 025 0390
	1000 ± 5%	≈ 281	≈ 150	4322 025 0391
	7100 ± 25%	≈ 1990	≈ 0	4322 025 0380
3C85	250 ± 3%	≈ 70	≈ 950	4322 025 0316
	315 ± 3%	≈ 88	≈ 700	4322 025 0317
	400 ± 3%	≈ 112	≈ 550	4322 025 0318
	630 ± 5%	≈ 177	≈ 250	4322 025 0320
	1000 ± 5%	≈ 281	≈ 150	4322 025 0321
	6250 ± 25%	≈ 1750	≈ 0	4322 025 0300
3F3	250 ± 3%	≈ 70	≈ 950	4322 025 0366
	315 ± 3%	≈ 88	≈ 700	4322 025 0367
	400 ± 3%	≈ 112	≈ 550	4322 025 0368
	630 ± 5%	≈ 177	≈ 250	4322 025 0370
	1000 ± 5%	≈ 281	≈ 150	4322 025 0371
	5700 ± 25%	≈ 1600	≈ 0	4322 025 0360

* clamping force 80 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 3.9	–	–
3C85	≥ 315	≤ 2.15	≤ 2.50	–
3F3	≥ 315	–	≤ 1.55	≤ 2.65

RM cores and accessories RM14/I

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0
Pin material: CuSn, SnPb plated
Maximum operating temperature: 180 °C
Resistance to soldering heat: 430 °C, 2 s
Solderability: IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn: 71 mm

Dimensions in mm

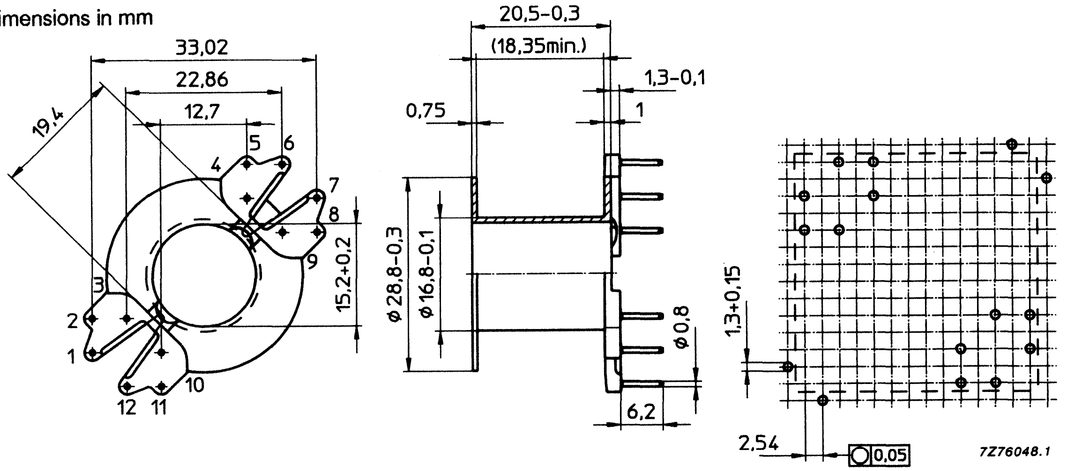


Fig.2 RM14/I coil former, 12 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	10	1,2,3,4,6,7,9,10,11,12	112	18.4	4322 021 3352
1	12	all	112	18.4	4322 021 3353

RM cores and accessories RM14/I

DIL COIL FORMER DATA

Coil former material: polybutyleneterephthalate (PBT), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 71 mm

Dimensions in mm

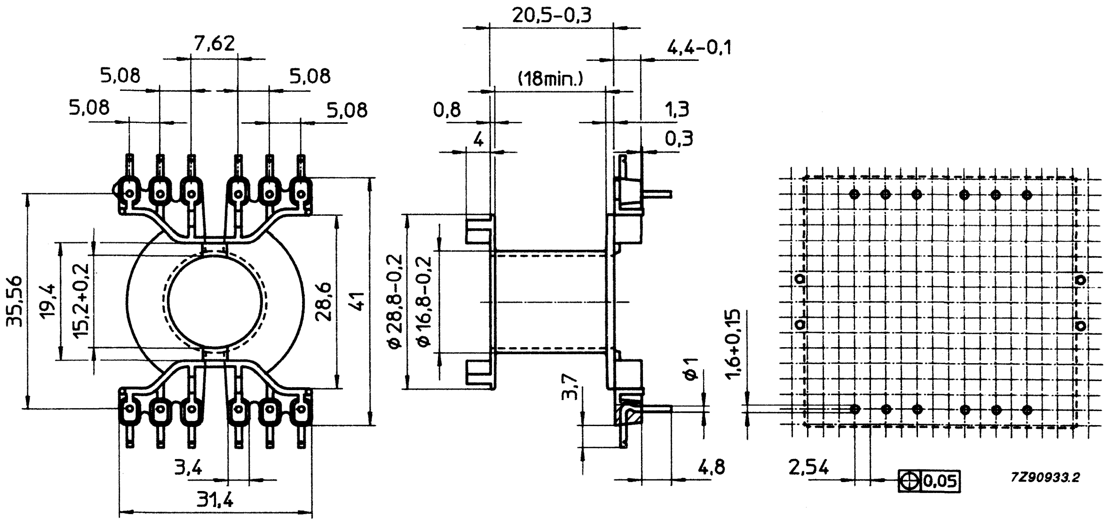


Fig.3 RM14/I DIL coil former, 112 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	12	all	111.0	18.0	4322 021 3407

RM cores and accessories

RM14/I

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	4	4322 021 3492	clamping force ≈ 40 N each material: stainless steel, SnPb plated

Dimensions in mm

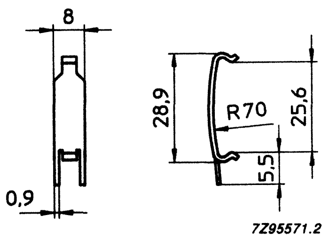


Fig.4 Mounting clip.

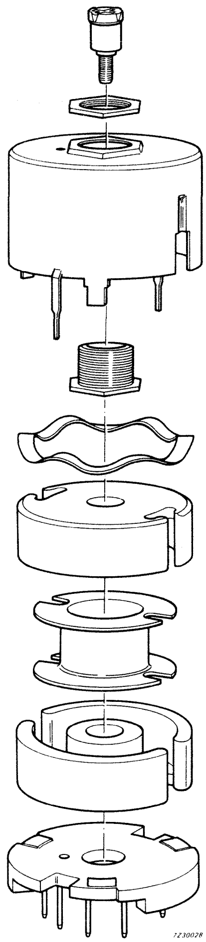
Solderability: IEC 68-2-20, part 2, test Ta, method 1.

P CORES AND ACCESSORIES
PH CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

P7.4/4.2 to P66/56
P cores and accessories
PH5.6 to PH26/9.2
PH cores and accessories



P cores and accessories

P7.4/4.2

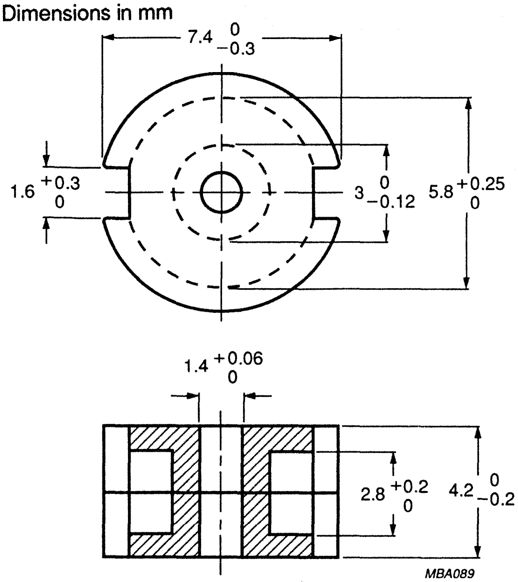


Fig.1 P7.4/4.2 core halves.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.43	mm^{-1}
V_e	effective volume	70.0	mm^3
l_e	effective length	10.0	mm
A_e	effective area	7.0	mm^2
A_{min}	minimum area	5.18	mm^2
	mass of set	≈ 0.5	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	63 ± 3%	≈ 70	≈ 200	–	4322 025 0703
	100 ± 3%	≈ 110	≈ 100	–	4322 025 0704
	970 ± 25%	≈ 1100	≈ 0	–	4322 025 0700

* clamping force 20 ± 5 N

P cores and accessories P7.4/4.2

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

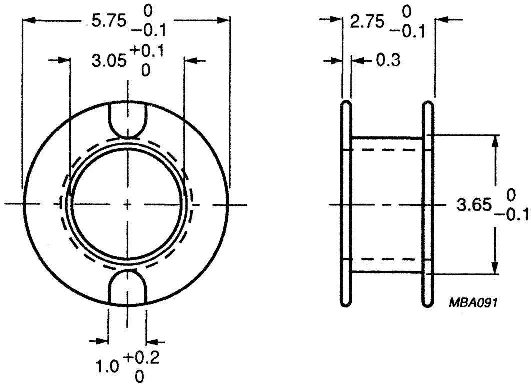


Fig.2 P7.4/4.2 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	2.2	1.95	14.6	4322 021 3299

P cores and accessories P9/5

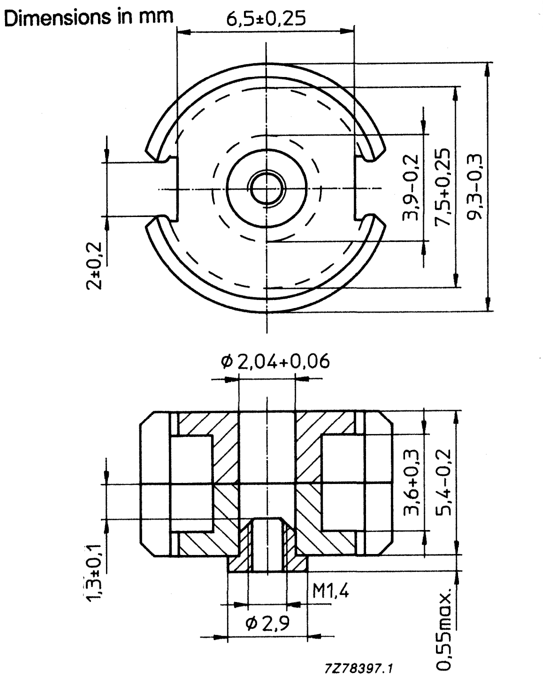


Fig.1 P9/5 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.24	mm^{-1}
V_e	effective volume	126	mm^3
l_e	effective length	12.5	mm
A_e	effective area	10.1	mm^2
A_{min}	minimum area	8.0	mm^2
	mass of set	≈ 0.8	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	16 ± 3%	≈ 16	≈ 1100	4322 022 6180	4322 022 4180
	25 ± 3%	≈ 25	≈ 500	4322 022 6181	4322 022 4181
	40 ± 3%	≈ 40	≈ 300	4322 022 6182	4322 022 4182
	100 ± 25%	≈ 100	≈ 0	–	4322 022 4179
3D3	40 ± 3%	≈ 40	≈ 400	4322 022 6142	4322 022 4142
	63 ± 3%	≈ 63	≈ 200	4322 022 6143	4322 022 4143
	630 ± 25%	≈ 630	≈ 0	–	4322 022 4140
3H1	63 ± 3%	≈ 63	≈ 200	4322 022 6123	4322 022 4123
	100 ± 3%	≈ 100	≈ 120	4322 022 6124	4322 022 4124
	160 ± 3%	≈ 160	≈ 70	4322 022 6125	4322 022 4125
	1260 ± 25%	≈ 1260	≈ 0	–	4322 022 4120

* clamping force 25 ± 5 N

P cores and accessories P9/5

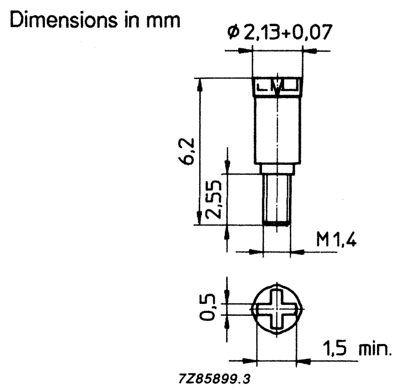


Fig.2 P9/5 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3981	brown
4322 021 3984	yellow
4322 021 3985	green
4322 021 3989	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	63	4322 021 3985	11	4322 021 3984	18	4322 021 3981	35
	100	4322 021 3985	7	4322 021 3984	11	4322 021 3981	22
	160	4322 021 3984	9	4322 021 3981	14	4322 021 3989	15
	250	4322 021 3984	6	4322 021 3989	10	–	
4C6	16	–		4322 021 3985	15	4322 021 3984	27
	25	–		4322 021 3985	16	4322 021 3984	27
	40	4322 021 3985	7	4322 021 3984	11	–	

P cores and accessories P9/5

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

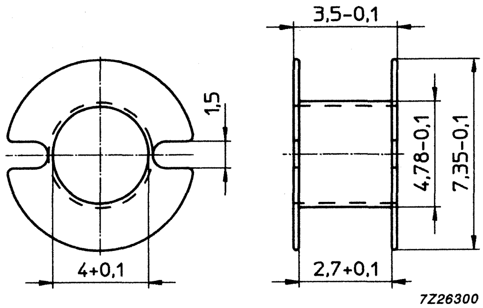


Fig.3 P9/5 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	3.4	2.7	19	4322 021 3170

P cores and accessories P11/7

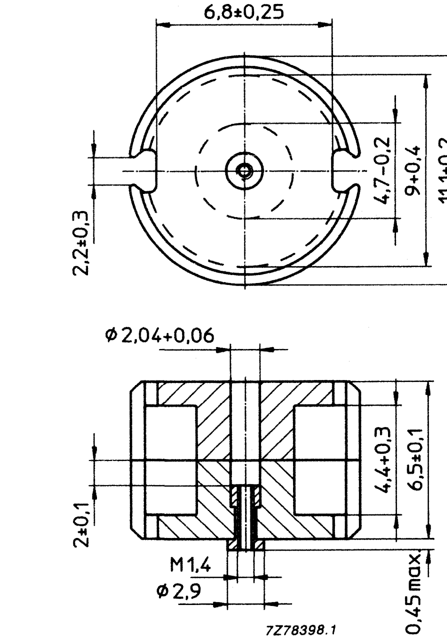


Fig.1 P11/7 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.956	mm^{-1}
V_e	effective volume	251	mm^3
l_e	effective length	15.5	mm
A_e	effective area	16.2	mm^2
A_{min}	minimum area	13.3	mm^2
	mass of set	≈ 1.8	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 19	≈ 1000	4322 022 2181	4322 022 0181
	40 ± 3%	≈ 31	≈ 400	4322 022 2182	4322 022 0182
	120 ± 25%	≈ 100	≈ 0	–	4322 022 0179
3D3	63 ± 3%	≈ 48	≈ 350	4322 022 2143	4322 022 0143
	100 ± 3%	≈ 76	≈ 200	4322 022 2144	4322 022 0144
	800 ± 25%	≈ 610	≈ 0	–	4322 022 0139
3H3	160 ± 3%	≈ 122	≈ 110	4322 022 2155	4322 022 0155
	250 ± 3%	≈ 190	≈ 70	4322 022 2156	4322 022 0156
	1650 ± 25%	≈ 1250	≈ 0	–	4322 022 0150
3H1	160 ± 3%	≈ 122	≈ 110	4322 022 2125	4322 022 0125
	250 ± 3%	≈ 190	≈ 70	4322 022 2126	4322 022 0126
	1800 ± 25%	≈ 1360	≈ 0	–	4322 022 0120

* clamping force 35 ± 10 N

P cores and accessories | P11/7

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	100 ± 3%	≈ 76	≈ 200	4322 022 0190
	160 ± 3%	≈ 122	≈ 110	4322 022 0191
	250 ± 3%	≈ 190	≈ 70	4322 022 0192
	1800 ± 25%	≈ 1370	≈ 0	4322 022 0188
3F3	100 ± 3%	≈ 76	≈ 200	4322 022 0171
	160 ± 3%	≈ 122	≈ 110	4322 022 0172
	250 ± 3%	≈ 190	≈ 70	4322 022 0173
	1550 ± 25%	≈ 1170	≈ 0	4322 022 0169

* clamping force 35 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.07	–	–
3F3	≥ 315	–	≤ 0.03	≤ 0.05

P cores and accessories P11/7

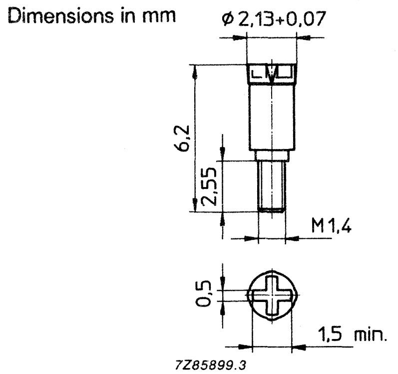


Fig.2 P11/7 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3981	brown
4322 021 3984	yellow
4322 021 3985	green
4322 021 3989	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	100	4322 021 3985	7	4322 021 3984	13	4322 021 3981	24
	160	4322 021 3984	7	4322 021 3981	15	4322 021 3989	22
	250	4322 021 3981	10	4322 021 3989	14	–	
3D3	16	4322 021 3985	12	4322 021 3984	19	–	
	25	–		4322 021 3985	18	4322 021 3984	27
	40	–		4322 021 3985	15	4322 021 3984	24
	63	4322 021 3985	10	4322 021 3984	18	–	
	100	4322 021 3985	6	4322 021 3984	11	–	
4C6	16	–		4322 021 3985	13	4322 021 3984	19
	25	–		4322 021 3985	15	4322 021 3984	22
	40	4322 021 3985	9	4322 021 3984	16	–	

P cores and accessories P11/7

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

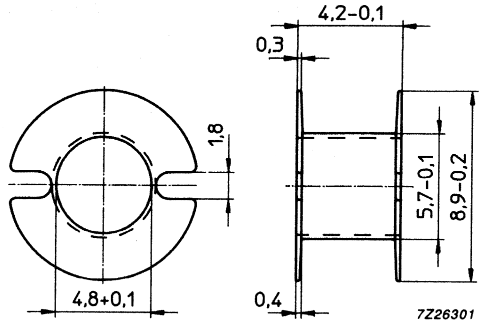


Fig.3 P11/7 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	5.5	3.2	23	4322 021 3024

P cores and accessories

P11/7

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (4 pins)	4	4322 021 3018	**Material:**	phenolformaldehyde (PF), glass reinforced
			Flammability:	in accordance with UL94V-0
			Maximum operating temperature:	180 °C
			Pins:	CuSn, SnPb plated
Container	5	4322 021 3051	**Material:**	nickel plated brass
			Earth pins:	presoldered
Spring	6	4322 021 3062	**Material:**	NiCr steel
			Spring force:	≈ 35 N when mounted

Dimensions in mm

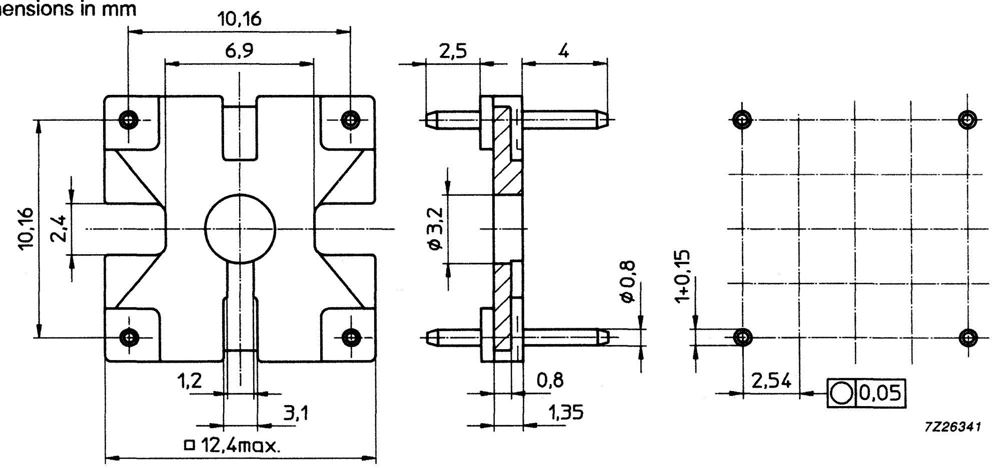


Fig.4 P11/7 tag plate.

P cores and accessories P11/7

Dimensions in mm

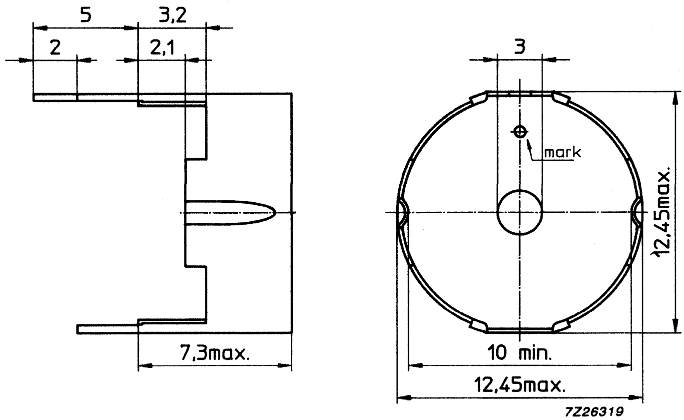


Fig. 5 P11/7 container.

Dimensions in mm

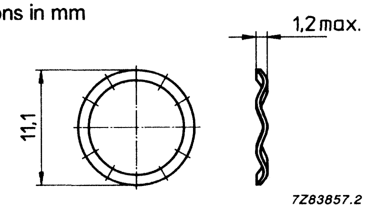


Fig. 6 P11/7 spring.

P cores and accessories | P14/8

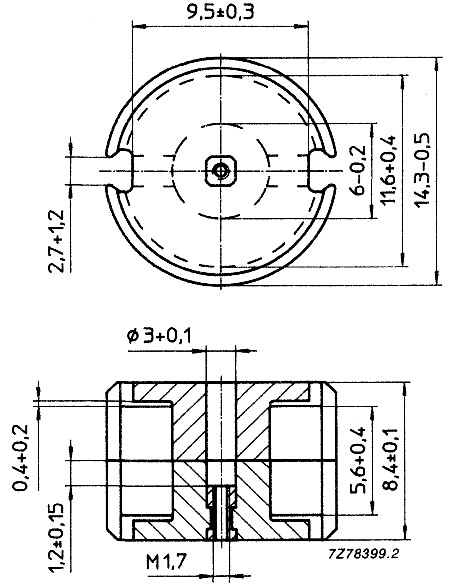


Fig.1 P14/8 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.789	mm^{-1}
V_e	effective volume	495	mm^3
l_e	effective length	19.8	mm
A_e	effective area	25.1	mm^2
A_{min}	minimum area	19.8	mm^2
	mass of set	≈ 3.2	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 16	≈ 1700	4322 022 2381	4322 022 0381
	40 ± 3%	≈ 25	≈ 800	4322 022 2382	4322 022 0382
	63 ± 3%	≈ 40	≈ 350	4322 022 2383	4322 022 0383
	160 ± 25%	≈ 100	≈ 0	–	4322 022 0380
3D3	63 ± 3%	≈ 40	≈ 550	4322 022 2343	4322 022 0343
	100 ± 3%	≈ 63	≈ 300	4322 022 2344	4322 022 0344
	1000 ± 25%	≈ 630	≈ 0	–	4322 022 0340
3H3	160 ± 3%	≈ 100	≈ 180	4322 022 2355	4322 022 0355
	250 ± 3%	≈ 157	≈ 110	4322 022 2356	4322 022 0356
	315 ± 3%	≈ 198	≈ 80	4322 022 2357	4322 022 0357
	400 ± 3%	≈ 252	≈ 60	4322 022 2358	4322 022 0358
	2150 ± 25%	≈ 1350	≈ 0	–	4322 022 0360
3H1	160 ± 3%	≈ 100	≈ 180	4322 022 2325	4322 022 0325
	250 ± 3%	≈ 157	≈ 110	4322 022 2326	4322 022 0326
	315 ± 3%	≈ 198	≈ 80	4322 022 2327	4322 022 0327
	400 ± 3%	≈ 252	≈ 60	4322 022 2328	4322 022 0328
	2350 ± 25%	≈ 1480	≈ 0	–	4322 022 0321

* clamping force 60 ± 20 N

P cores and accessories P14/8

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE
3B8	160 ± 3%	≈ 100	≈ 180	4322 022 0385
	250 ± 3%	≈ 157	≈ 110	4322 022 0386
	315 ± 3%	≈ 198	≈ 80	4322 022 0387
	400 ± 3%	≈ 252	≈ 60	4322 022 0388
	2350 ± 25%	≈ 1480	≈ 0	4322 022 0397
3C85	160 ± 3%	≈ 100	≈ 180	4322 022 0367
	250 ± 3%	≈ 157	≈ 110	4322 022 0368
	315 ± 3%	≈ 198	≈ 80	4322 022 0369
	400 ± 3%	≈ 252	≈ 60	4322 022 0370
	2150 ± 25%	≈ 1350	≈ 0	4322 022 0366
3F3	160 ± 3%	≈ 100	≈ 180	4322 022 0393
	250 ± 3%	≈ 157	≈ 110	4322 022 0394
	315 ± 3%	≈ 198	≈ 80	4322 022 0395
	400 ± 3%	≈ 252	≈ 60	4322 022 0396
	2000 ± 25%	≈ 1250	≈ 0	4322 022 0392
3F4	1000 ± 25%	≈ 630	≈ 0	4322 025 3300

* clamping force 60 ± 20 N

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L* (nH)	μ_e	ORDERING CODE
3E1	3700 ± 25%	≈ 2350	4322 022 0379
3E4	5300 + 40/- 30%	≈ 3300	4322 022 0377

* clamping force 60 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.15	–	–
3C85	≥ 315	≤ 0.08	≤ 0.10	
3F3	≥ 315	–	≤ 0.06	≤ 0.10

3F4: P(W) at 1 MHz, 30 mT, 100 °C ≤ 0.15
P(W) at 3 MHz, 10 mT, 100 °C ≤ 0.15

P cores and accessories | P14/8

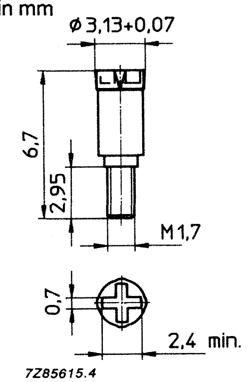


Fig.2 P14/8 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3970	black
4322 021 3971	brown
4322 021 3972	red
4322 021 3973	orange
4322 021 3974	yellow
4322 021 3975	green
4322 021 3978	white
4322 021 3979	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	100	4322 021 3975	9	4322 021 3973	14	4322 021 3974	19
	160	4322 021 3972	11	4322 021 3978	17	4322 021 3971	23
	250	4322 021 3978	11	4322 021 3971	15	4322 021 3970	19
	315	4322 021 3978	9	4322 021 3970	15	4322 021 3979	19
	400	4322 021 3971	9	4322 021 3979	15	–	
	630	4322 021 3971	6	4322 021 3979	10	–	
3D3	40	–		4322 021 3975	16	4322 021 3973	24
	63	–		4322 021 3975	13	4322 021 3973	20
	100	4322 021 3973	11	4322 021 3974	15	–	
4C6	25	–		4322 021 3975	16	4322 021 3973	20
	40	4322 021 3975	12	4322 021 3973	18	4322 021 3972	22
	63	4322 021 3973	10	4322 021 3972	13	–	

P cores and accessories | P14/8

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

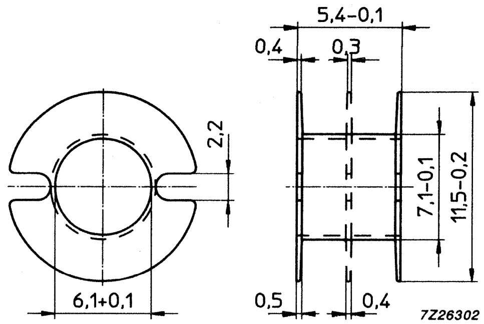


Fig.3 P14/8 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	9.7	4.2	29	4322 021 3025
2	2 x 4.5	2 x 1.9	29	4322 021 3026

P cores and accessories P14/8

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate	4	4322 021 3044	**Material:** **Flammability:** **Maximum operating temperature:** **Pins:**	phenolformaldehyde (PF) glass reinforced in accordance with UL94V-0 180 °C CuSn, SnPb plated
Container	5	4322 021 3052	**Material:** **Earth pins:**	nickel plated brass presoldered
Spring	6	4322 021 3063	**Material:** **Spring force:**	NiCr steel ≈ 60 N when mounted

Dimensions in mm

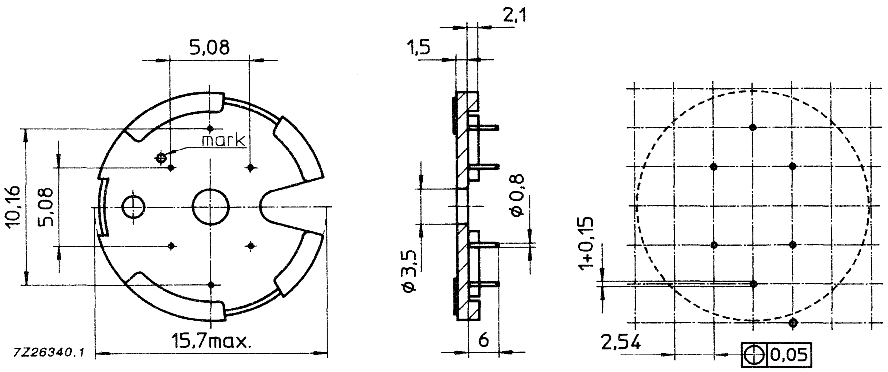


Fig.4 P14/8 tag plate.

Dimensions in mm

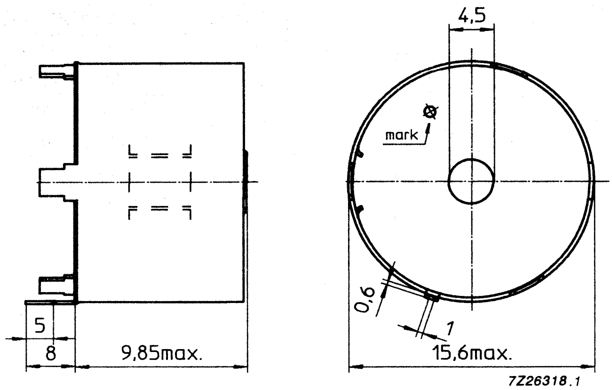


Fig.5 P14/8 container.

Dimensions in mm

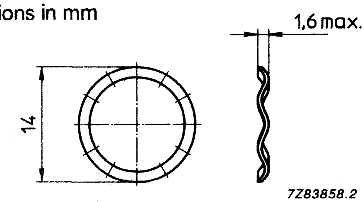


Fig.6 P14/8 spring.

P cores and accessories P18/11

Dimensions in mm

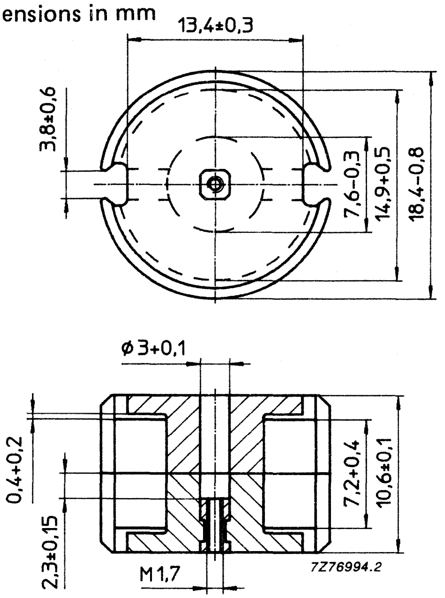


Fig.1 P18/11 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.597	mm^{-1}
V_e	effective volume	1120	mm^3
l_e	effective length	25.8	mm
A_e	effective area	43.3	mm^2
A_{min}	minimum area	36.1	mm^2
	mass of set	≈ 6.0	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 12	≈ 3500	4322 022 2581	4322 022 0581
	40 ± 3%	≈ 19	≈ 1800	4322 022 2582	4322 022 0582
	63 ± 3%	≈ 30	≈ 750	4322 022 2583	4322 022 0583
	210 ± 25%	≈ 100	≈ 0	–	4322 022 0580
3D3	63 ± 3%	≈ 30	≈ 1100	4322 022 2543	4322 022 0543
	100 ± 3%	≈ 48	≈ 550	4322 022 2544	4322 022 0544
	160 ± 3%	≈ 76	≈ 300	4322 022 2545	4322 022 0545
	1400 ± 25%	≈ 670	≈ 0	–	4322 022 0540
3H3	160 ± 3%	≈ 76	≈ 350	4322 022 2555	4322 022 0555
	250 ± 3%	≈ 119	≈ 200	4322 022 2556	4322 022 0556
	315 ± 3%	≈ 149	≈ 150	4322 022 2557	4322 022 0557
	400 ± 3%	≈ 190	≈ 120	4322 022 2558	4322 022 0558
	3100 ± 25%	≈ 1470	≈ 0	–	4322 022 0550
3H1	160 ± 3%	≈ 76	≈ 350	4322 022 2525	4322 022 0525
	250 ± 3%	≈ 119	≈ 200	4322 022 2526	4322 022 0526
	315 ± 3%	≈ 149	≈ 150	4322 022 2527	4322 022 0527
	400 ± 3%	≈ 190	≈ 120	4322 022 2528	4322 022 0528
	3400 ± 25%	≈ 1620	≈ 0	–	4322 022 0521

* clamping force 80 ± 20 N

P cores and accessories P18/11

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 76	≈ 350	4322 022 0591
	250 ± 3%	≈ 119	≈ 200	4322 022 0592
	315 ± 3%	≈ 149	≈ 150	4322 022 0590
	400 ± 3%	≈ 190	≈ 120	4322 022 0594
	3400 ± 25%	≈ 1620	≈ 0	4322 022 0577
3C85	160 ± 3%	≈ 76	≈ 350	4322 022 0586
	250 ± 3%	≈ 119	≈ 200	4322 022 0587
	315 ± 3%	≈ 149	≈ 150	4322 022 0588
	400 ± 3%	≈ 190	≈ 120	4322 022 0589
	3100 ± 25%	≈ 1470	≈ 0	4322 022 0578
3F3	160 ± 3%	≈ 76	≈ 350	4322 022 0568
	250 ± 3%	≈ 119	≈ 200	4322 022 0569
	315 ± 3%	≈ 149	≈ 150	4322 022 0570
	400 ± 3%	≈ 190	≈ 120	4322 022 0571
	2850 ± 25%	≈ 1350	≈ 0	4322 022 0566
3F4	1400 ± 25%	≈ 670	≈ 0	4322 025 3400

* clamping force 80 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.35	–	–
3C85	≥ 315	≤ 0.18	≤ 0.22	–
3F3	≥ 315	–	≤ 0.13	≤ 0.22

3F4: P(W) at 1 MHz, 30 mT, 100 °C ⩽ 0.35
P(W) at 3 MHz, 10 mT, 100 °C ⩽ 0.35

P cores and accessories

P18/11

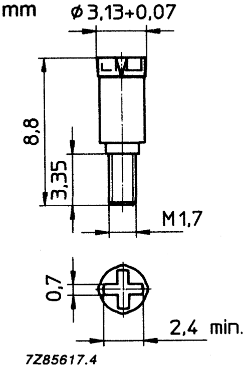


Fig.2 P18/11 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3960	black
4322 021 3961	brown
4322 021 3962	red
4322 021 3963	orange
4322 021 3964	yellow
4322 021 3965	green
4322 021 3967	violet
4322 021 3968	white

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	63	4322 021 3965	12	4322 021 3964	17	4322 021 3963	20
	100	4322 021 3965	9	4322 021 3963	15	4322 021 3961	29
	160	4322 021 3964	9	4322 021 3962	18	4322 021 3961	28
	250	4322 021 3962	12	4322 021 3968	14	4322 021 3961	18
	315	4322 021 3962	9	4322 021 3961	14	4322 021 3967	20
	400	4322 021 3968	9	4322 021 3967	16	4322 021 3960	24
	630	4322 021 3967	10	4322 021 3960	15	–	
	1000	4322 021 3967	6	4322 021 3960	10	–	
	1250	–		4322 021 3960	8	–	
3D3	40	–		4322 021 3965	15	4322 021 3964	20
	63	4322 021 3965	13	4322 021 3964	17	4322 021 3963	20
	100	4322 021 3965	9	4322 021 3963	14	4322 021 3962	24
	160	4322 021 3963	8	4322 021 3962	15	–	
4C6	25	4322 021 3965	13	4322 021 3964	15	4322 021 3963	19
	40	4322 021 3965	13	4322 021 3964	17	4322 021 3963	20
	63	4322 021 3965	8	4322 021 3963	12	–	

P cores and accessories | P18/11

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

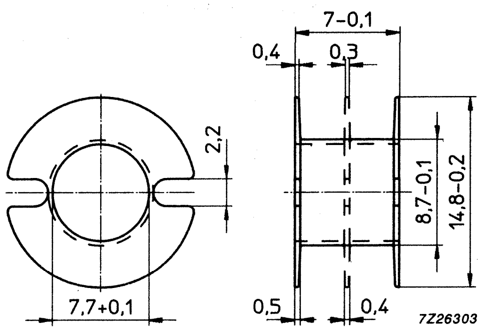


Fig.3 P18/11 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	18	5.8	37	4322 021 3027
2	2 x 8.7	2 x 2.6	37	4322 021 3028
3	3 x 5.4	3 x 1.6	37	4322 021 3029

P cores and accessories P18/11

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (8 pins)	4	4322 021 3045	**Material:** **Flammability:** **Maximum operating temperature:** **Pins:**	phenolformaldehyde (PF), glass reinforced in accordance with UL94V-0 180 °C CuSn, SnPb plated
Container	5	4322 021 3053	**Material:** **Earth pins:**	nickel plated brass presoldered
Spring	6	4322 021 3064	**Material:** **Spring force:**	NiCr steel ≈ 100 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

Dimensions in mm

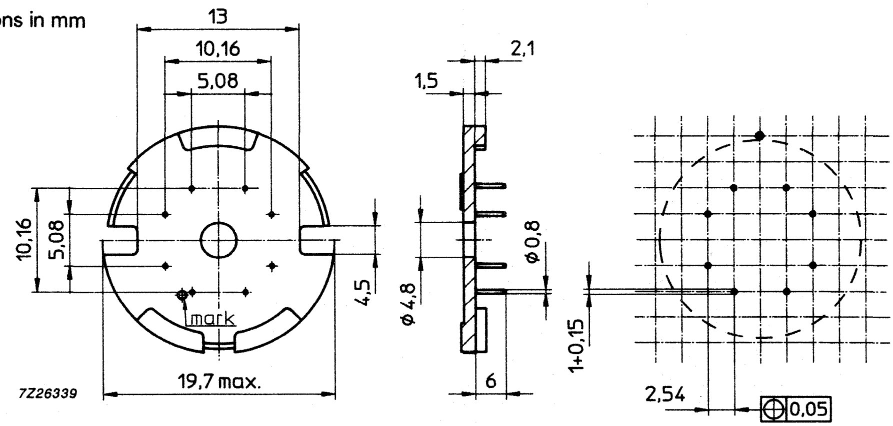


Fig. 4 P18/11 tag plate.

P cores and accessories

P18/11

Dimensions in mm

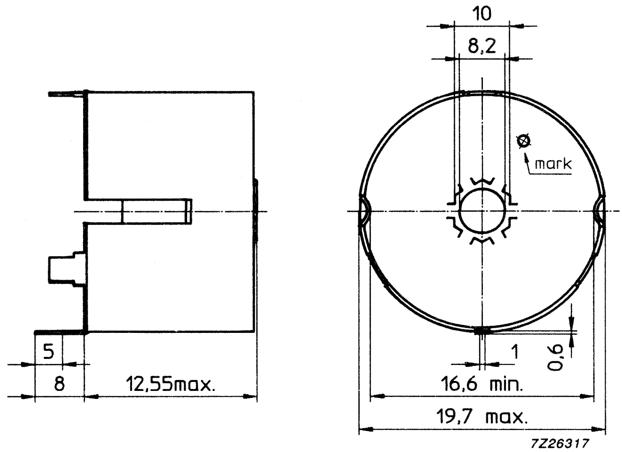


Fig.5 P18/11 container.

Dimensions in mm

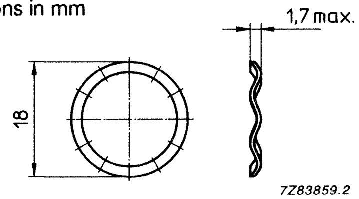


Fig.6 P18/11 spring.

Dimensions in mm

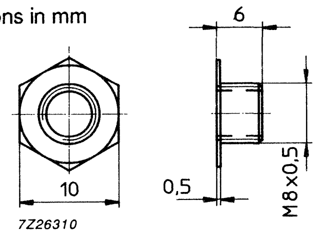


Fig.8 P18/11 bush.

Dimensions in mm

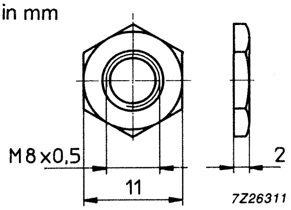


Fig.7 P18/11 nut.

P cores and accessories P22/13

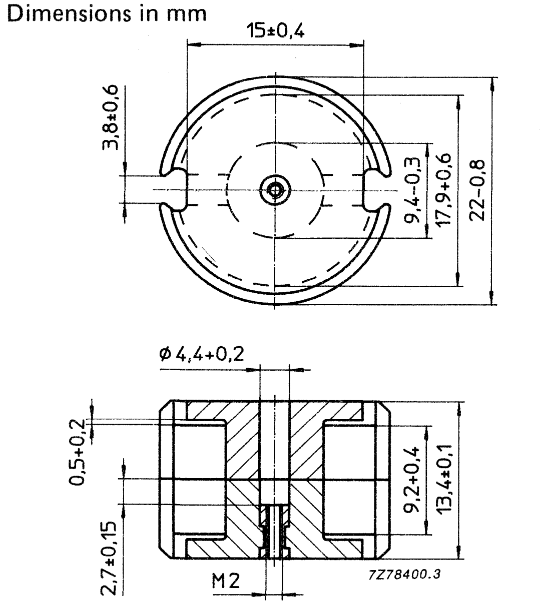


Fig.1 P22/13 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.497	mm^{-1}
V_e	effective volume	2000	mm^3
l_e	effective length	31.5	mm
A_e	effective area	63.4	mm^2
A_{min}	minimum area	51.3	mm^2
	mass of set	≈ 12	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	25 ± 3%	≈ 10	≈ 5600	4322 022 2781	4322 022 0781
	40 ± 3%	≈ 16	≈ 2900	4322 022 2782	4322 022 0782
	63 ± 3%	≈ 25	≈ 1400	4322 022 2783	4322 022 0783
	250 ± 25%	≈ 100	≈ 0	–	4322 022 0779
3D3	100 ± 3%	≈ 40	≈ 900	4322 022 2744	4322 022 0744
	160 ± 3%	≈ 64	≈ 500	4322 022 2745	4322 022 0745
	1700 ± 25%	≈ 670	≈ 0	–	4322 022 0740
3H3	160 ± 3%	≈ 64	≈ 500	4322 022 2755	4322 022 0755
	250 ± 3%	≈ 99	≈ 300	4322 022 2756	4322 022 0756
	315 ± 3%	≈ 125	≈ 250	4322 022 2757	4322 022 0757
	400 ± 3%	≈ 158	≈ 170	4322 022 2758	4322 022 0758
	630 ± 3%	≈ 249	≈ 100	4322 022 2760	4322 022 0760
	3900 ± 25%	≈ 1540	≈ 0	–	4322 022 0759
3H1	160 ± 3%	≈ 64	≈ 500	4322 022 2725	4322 022 0725
	250 ± 3%	≈ 99	≈ 300	4322 022 2726	4322 022 0726
	315 ± 3%	≈ 125	≈ 250	4322 022 2727	4322 022 0727
	400 ± 3%	≈ 158	≈ 170	4322 022 2728	4322 022 0728
	630 ± 3%	≈ 249	≈ 100	4322 022 2730	4322 022 0730
	4300 ± 25%	≈ 1700	≈ 0	–	4322 022 0720

* clamping force 140 ± 30 N

P cores and accessories

P22/13

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	160 ± 3%	≈ 64	≈ 500	4322 022 0791
	250 ± 3%	≈ 99	≈ 300	4322 022 0792
	315 ± 3%	≈ 125	≈ 250	4322 022 0793
	400 ± 3%	≈ 158	≈ 170	4322 022 0794
	630 ± 3%	≈ 249	≈ 100	4322 022 0795
	4300 ± 25%	≈ 1700	≈ 0	4322 022 0797
3C85	160 ± 3%	≈ 64	≈ 500	4322 022 0785
	250 ± 3%	≈ 99	≈ 300	4322 022 0786
	315 ± 3%	≈ 125	≈ 250	4322 022 0787
	400 ± 3%	≈ 158	≈ 170	4322 022 0788
	630 ± 3%	≈ 249	≈ 100	4322 022 0789
	3900 ± 25%	≈ 1540	≈ 0	4322 022 0777
3F3	160 ± 3%	≈ 64	≈ 500	4322 022 0765
	250 ± 3%	≈ 99	≈ 300	4322 022 0766
	315 ± 3%	≈ 125	≈ 250	4322 022 0767
	400 ± 3%	≈ 158	≈ 170	4322 022 0768
	630 ± 3%	≈ 249	≈ 100	4322 022 0769
	3550 ± 25%	≈ 1410	≈ 0	4322 022 0764
3F4	1700 ± 25%	≈ 670	≈ 0	4322 025 3500

* clamping force 140 ± 30 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 0.56	–	–
3C85	≥ 315	≤ 0.32	≤ 0.38	–
3F3	≥ 315	–	≤ 0.22	≤ 0.40

3F4: P(W) at 1 MHz, 30 mT, 100 °C ≤ 0.60
P(W) at 3 MHz, 10 mT, 100 °C ≤ 0.60

Dimensions in mm

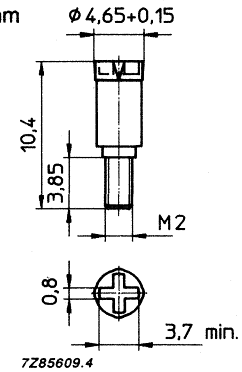


Fig.2 P22/13 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3840	black
4322 021 3841	brown
4322 021 3842	red
4322 021 3843	orange
4322 021 3844	yellow
4322 021 3845	green
4322 021 3848	white
4322 021 3849	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1, 3H3	100	4322 021 3845	12	4322 021 3842	16	4322 021 3843	21
	160	4322 021 3842	11	4322 021 3844	18	4322 021 3848	28
	250	4322 021 3844	11	4322 021 3848	18	4322 021 3849	23
	315	4322 021 3844	9	4322 021 3849	18	4322 021 3841	22
	400	4322 021 3848	12	4322 021 3841	17	4322 021 3840	28
	630	4322 021 3841	11	4322 021 3840	18	–	
	1000	4322 021 3841	7	4322 021 3840	11	–	
	1250	4322 021 3841	5	4322 021 3840	9	–	
3D3	40	–		4322 021 3845	19	4322 021 3843	27
	63	–		4322 021 3845	16	4322 021 3843	25
	100	4322 021 3845	12	4322 021 3842	16	4322 021 3844	27
	160	4322 021 3842	10	4322 021 3844	17	4322 021 3849	28
	250	4322 021 3844	11	4322 021 3849	18	–	
4C6	25	4322 021 3845	14	4322 021 3842	16	–	
	40	–		4322 021 3845	16	4322 021 3843	24
	63	4322 021 3845	10	4322 021 3842	15	4322 021 3843	19
	100	4322 021 3845	6	4322 021 3843	10	4322 021 3848	20

P cores and accessories P22/13

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

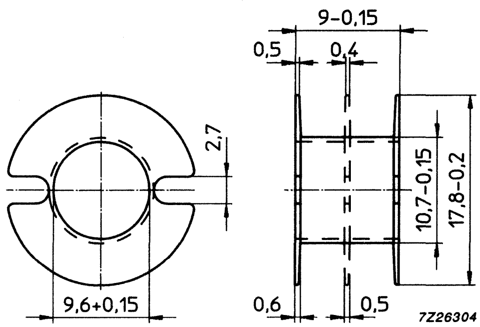


Fig.3 P22/13 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	28	7.5	44	4322 021 3030
2	2 x 13	2 x 3.5	44	4322 021 3031
3	3 x 8.2	3 x 2.1	44	4322 021 3032

P cores and accessories P22/13

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (8 pins)	4	4322 021 3046	**Material:**	phenolformaldehyde (PF), glass reinforced
			Flammability:	in accordance with UL94V-0
			Maximum operating temperature:	180 °C
			Pins:	CuSn, SnPb plated
Container	5	4322 021 3054	**Material:**	nickel plated brass
			Earth pins:	presoldered
Spring	6	4322 021 3065	**Material:**	NiCr steel
			Spring force:	≈ 140 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

Dimensions in mm

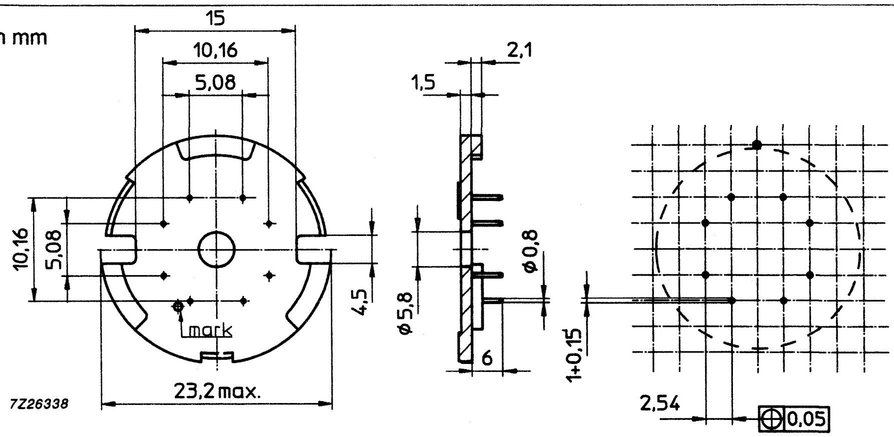


Fig.4 P22/13 tag plate.

P cores and accessories

P22/13

Dimensions in mm

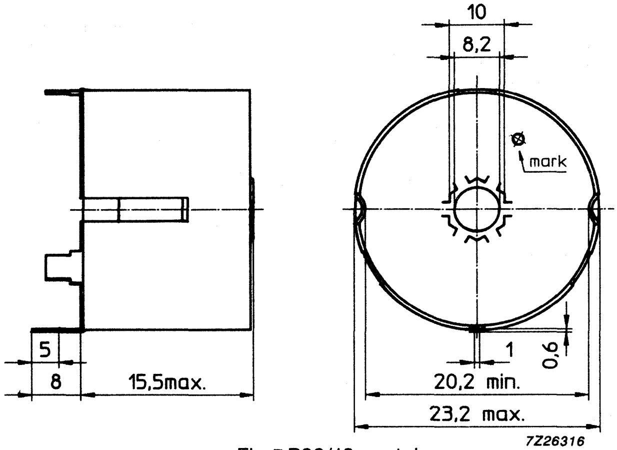


Fig. 5 P22/13 container.

Dimensions in mm

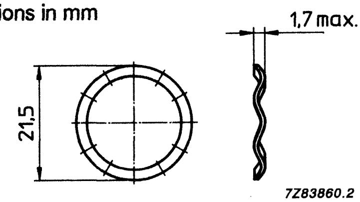


Fig. 6 P22/13 spring.

Dimensions in mm

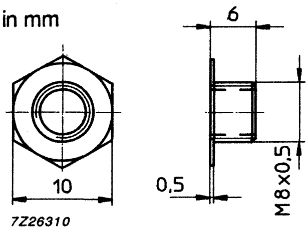


Fig. 8 P22/13 bush.

Dimensions in mm

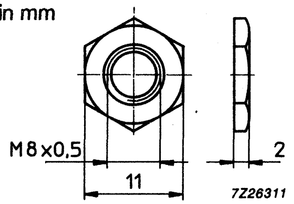


Fig. 7 P22/13 nut.

P cores and accessories

P26/16

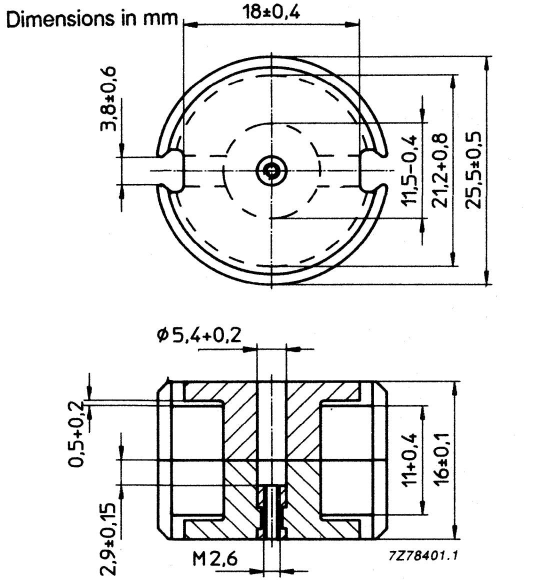


Fig.1 P26/16 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.400	mm^{-1}
V_e	effective volume	3530	mm^3
l_e	effective length	37.6	mm
A_e	effective area	93.9	mm^2
A_{min}	minimum area	76.5	mm^2
	mass of set	≈ 20	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
4C6	63 ± 3%	≈ 20	≈ 2500	4322 022 2983	4322 022 0983
	100 ± 3%	≈ 32	≈ 1100	4322 022 2984	4322 022 0984
	310 ± 25%	≈ 100	≈ 0	−	4322 022 0980
3D3	100 ± 3%	≈ 32	≈ 1600	4322 022 2944	4322 022 0944
	160 ± 3%	≈ 51	≈ 900	4322 022 2945	4322 022 0945
	250 ± 3%	≈ 80	≈ 500	4322 022 2946	4322 022 0946
	2150 ± 25%	≈ 680	≈ 0	−	4322 022 0949
3H3	160 ± 3%	≈ 51	≈ 900	4322 022 2955	4322 022 0955
	250 ± 3%	≈ 80	≈ 500	4322 022 2956	4322 022 0956
	315 ± 3%	≈ 100	≈ 370	4322 022 2957	4322 022 0957
	400 ± 3%	≈ 127	≈ 260	4322 022 2958	4322 022 0958
	630 ± 3%	≈ 200	≈ 150	4322 022 2960	4322 022 0960
	5000 ± 25%	≈ 1590	≈ 0	−	4322 022 0951
3H1	160 ± 3%	≈ 51	≈ 900	4322 022 2925	4322 022 0925
	250 ± 3%	≈ 80	≈ 500	4322 022 2926	4322 022 0926
	315 ± 3%	≈ 100	≈ 370	4322 022 2927	4322 022 0927
	400 ± 3%	≈ 127	≈ 260	4322 022 2928	4322 022 0928
	630 ± 3%	≈ 200	≈ 150	4322 022 2930	4322 022 0930
	5550 ± 25%	≈ 1760	≈ 0	−	4322 022 0972

* clamping force 200 ± 50 N

P cores and accessories P26/16

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	250 ± 3%	≈ 80	≈ 500	4322 022 0986
	315 ± 3%	≈ 100	≈ 370	4322 022 0987
	400 ± 3%	≈ 127	≈ 260	4322 022 0988
	630 ± 3%	≈ 200	≈ 150	4322 022 0989
	5550 ± 25%	≈ 1760	≈ 0	4322 022 0985
3C85	250 ± 3%	≈ 80	≈ 500	4322 025 3026
	315 ± 3%	≈ 100	≈ 370	4322 025 3027
	400 ± 3%	≈ 127	≈ 260	4322 025 3028
	630 ± 3%	≈ 200	≈ 150	4322 025 3030
	5000 ± 25%	≈ 1590	≈ 0	4322 022 0973
3F3	250 ± 3%	≈ 80	≈ 500	4322 025 3046
	315 ± 3%	≈ 100	≈ 370	4322 025 3047
	400 ± 3%	≈ 127	≈ 260	4322 025 3048
	630 ± 3%	≈ 200	≈ 150	4322 025 3050
	4600 ± 25%	≈ 1460	≈ 0	4322 022 0950

* clamping force 200 ± 50 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 1.0	–	–
3C85	≥ 315	≤ 0.56	≤ 0.67	–
3F3	≥ 315	–	≤ 0.40	≤ 0.65

P cores and accessories P26/16

Dimensions in mm

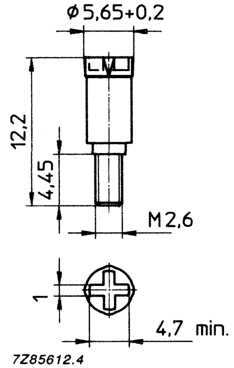


Fig.2 P26/16 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3941	brown
4322 021 3942	red
4322 021 3945	green
4322 021 3948	white
4322 021 3949	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1,	63	–		4322 021 3945	18	4322 021 3942	25
3H3	100	–		4322 021 3945	15	4322 021 3942	22
	160	4322 021 3945	10	4322 021 3942	15	4322 021 3948	28
	250	4322 021 3942	11	4322 021 3948	18	4322 021 3941	21
	315	4322 021 3942	9	4322 021 3948	14	4322 021 3941	17
	400	4322 021 3942	7	4322 021 3941	13	4322 021 3949	25
	630	4322 021 3941	8	4322 021 3949	16	–	
	1000	4322 021 3941	5	4322 021 3949	9	–	
	1600	–		4322 021 3949	6	–	
3D3	63	–		4322 021 3945	22	–	
	100	–		4322 021 3945	14	4322 021 3942	21
	160	4322 021 3945	10	4322 021 3942	14	4322 021 3948	23
	250	4322 021 3942	9	4322 021 3948	15	4322 021 3949	27
	400	4322 021 3948	9	4322 021 3949	17	–	
4C6	63	–		4322 021 3945	15	4322 021 3942	21
	100	4322 021 3945	10	4322 021 3942	15	–	

P cores and accessories | P26/16

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

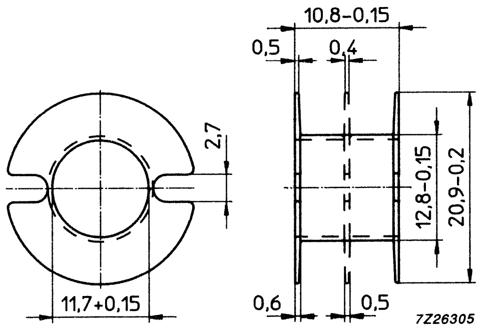


Fig.3 P26/16 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	39	9.3	53	4322 021 3033
2	2 x 19	2 x 4.4	53	4322 021 3034
3	3 x 12	3 x 2.7	53	4322 021 3035

P cores and accessories P26/16

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (8 pins)	4	4322 021 3047	**Material:**	phenolformaldehyde (PF), glass reinforced
			Flammability:	in accordance with UL94V-0
			Maximum operating temperature:	180 °C
			Pins:	CuSn, SnPb plated
Container	5	4322 021 3055	**Material:**	nickel plated brass
			Earth pins:	presoldered
Spring	6	4322 021 3066	**Material:**	NiCr steel
			Spring force:	≈ 200 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

Dimensions in mm

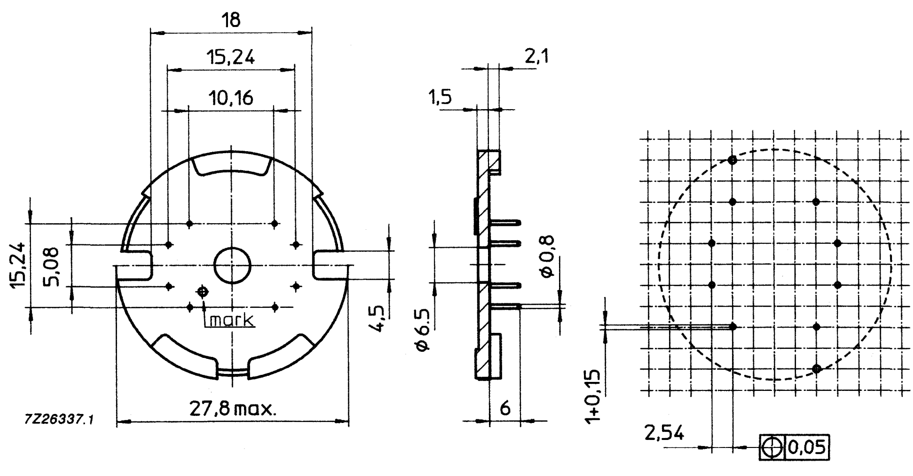


Fig.4 P26/16 tag plate.

P cores and accessories P26/16

Dimensions in mm

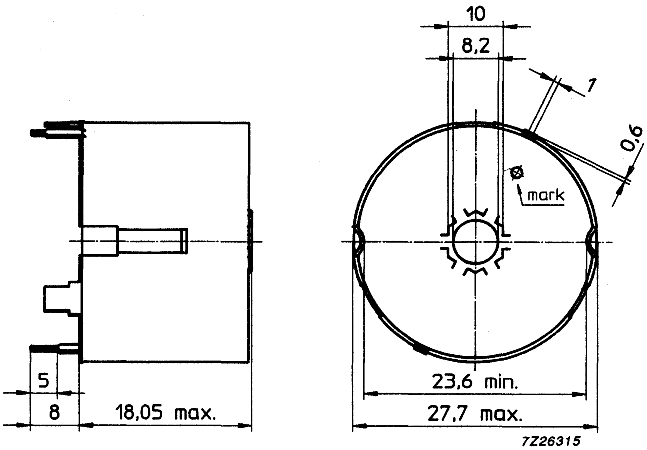


Fig.5 P26/16 container.

Dimensions in mm

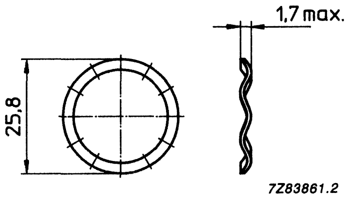


Fig.6 P26/16 spring.

Dimensions in mm

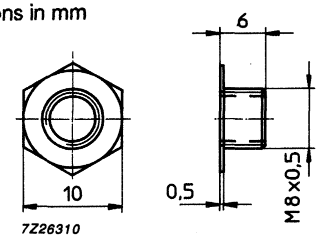


Fig.8 P26/16 bush.

Dimensions in mm

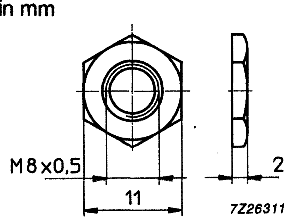


Fig.7 P26/16 nut.

P cores and accessories P30/19

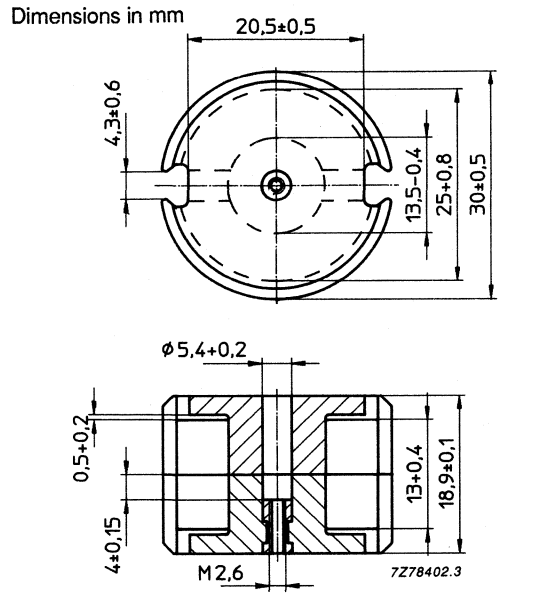


Fig.1 P30/19 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.330	mm^{-1}
V_e	effective volume	6190	mm^3
l_e	effective length	45.2	mm
A_e	effective area	137	mm^2
A_{min}	minimum area	115	mm^2
	mass of set	≈ 34	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	250 ± 3%	≈ 66	≈ 700	4322 022 3126	4322 022 1126
	315 ± 3%	≈ 83	≈ 550	4322 022 3124	4322 022 1124
	400 ± 3%	≈ 105	≈ 400	4322 022 3128	4322 022 1128
	630 ± 3%	≈ 165	≈ 250	4322 022 3130	4322 022 1130
	1000 ± 3%	≈ 263	≈ 140	4322 022 3131	4322 022 1131
	1600 ± 5%	≈ 420	≈ 80	–	4322 022 1132
	7050 ± 25%	≈ 1850	≈ 0	–	4322 022 1120

* clamping force 250 ± 50 N

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	250 ± 3%	≈ 66	≈ 700	4322 022 1184
	315 ± 3%	≈ 83	≈ 550	4322 022 1185
	400 ± 3%	≈ 105	≈ 400	4322 022 1186
	630 ± 3%	≈ 165	≈ 250	4322 022 1187
	7050 ± 25%	≈ 1850	≈ 0	4322 022 1182
3C85	250 ± 3%	≈ 66	≈ 700	4322 022 1164
	315 ± 3%	≈ 83	≈ 550	4322 022 1165
	400 ± 3%	≈ 105	≈ 400	4322 022 1166
	630 ± 3%	≈ 165	≈ 250	4322 022 1167
	6300 ± 25%	≈ 1650	≈ 0	4322 022 1160
3F3	250 ± 3%	≈ 66	≈ 700	4322 022 1151
	315 ± 3%	≈ 83	≈ 550	4322 022 1152
	400 ± 3%	≈ 105	≈ 400	4322 022 1153
	630 ± 3%	≈ 165	≈ 250	4322 022 1154
	5750 ± 25%	≈ 1500	≈ 0	4322 022 1148

* clamping force 250 ± 50 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 1.75	–	–
3C85	≥ 315	≤ 1.00	≤ 1.20	–
3F3	≥ 315	–	≤ 0.70	≤ 1.20

Dimensions in mm

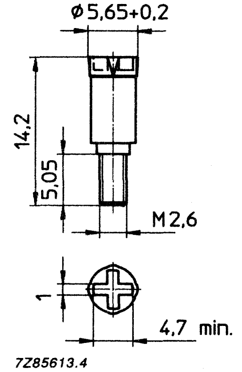


Fig.2 P30/19 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3832	red
4322 021 3834	yellow
4322 021 3838	white
4322 021 3839	grey
4322 021 3941	brown

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	250	4322 021 3832	10	4322 021 3834	16	4322 021 3838	20
	400	4322 021 3832	7	4322 021 3941	16	–	
	630	4322 021 3834	6	4322 021 3941	10	4322 021 3839	21
	1000	4322 021 3838	5	4322 021 3839	13	–	
	1600	–		4322 021 3839	8	–	
	2500	–		4322 021 3839	5	–	

P cores and accessories P30/19

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

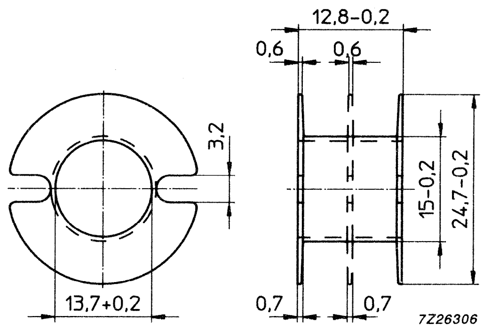


Fig.3 P30/19 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	55	11	62	4322 021 3036
2	2 x 26	2 x 5.1	62	4322 021 3037
3	3 x 16	3 x 3.2	62	4322 021 3038

P cores and accessories P30/19

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (9 pins)	4	4322 021 3048	**Material:**	phenolformaldehyde (PF), glass reinforced
			Flammability:	in accordance with UL94V-0
			Maximum operating temperature:	180 °C
			Pins:	CuSn, SnPb plated
Container	5	4322 021 3056	**Material:**	nickel plated brass
			Earth pins:	presoldered
Spring	6	4322 021 3067	**Material:**	NiCr steel
			Spring force:	≈ 250 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

Dimensions in mm

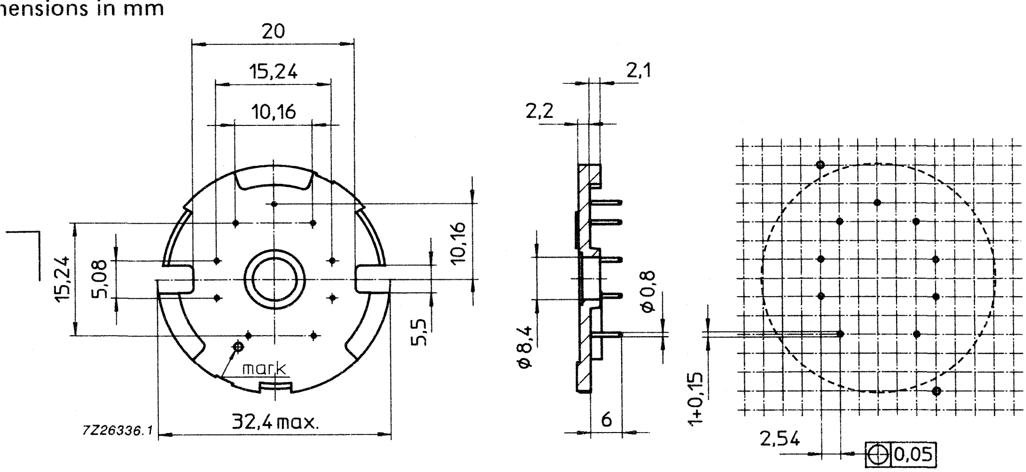


Fig.4 P30/19 tag plate.

P cores and accessories P30/19

Dimensions in mm

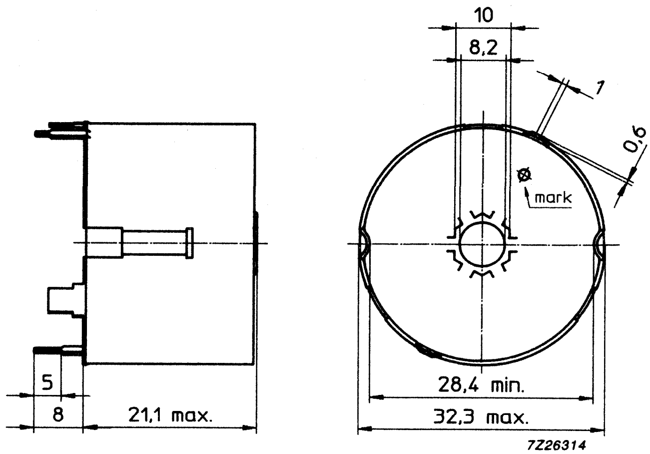


Fig.5 P30/19 container.

Dimensions in mm

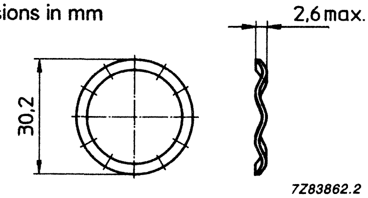


Fig.6 P30/19 spring.

Dimensions in mm

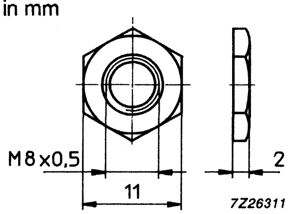


Fig.7 P30/19 nut.

Dimensions in mm

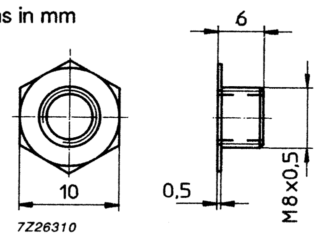


Fig.8 P30/19 bush.

P cores and accessories P36/22

Dimensions in mm

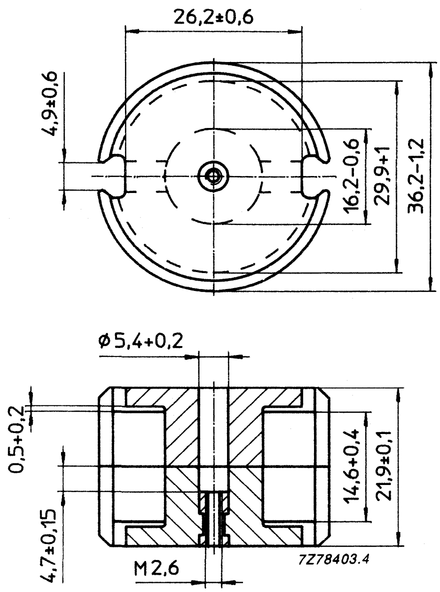


Fig.1 P36/22 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.264	mm^{-1}
V_e	effective volume	10700	mm^3
l_e	effective length	53.2	mm
A_e	effective area	202	mm^2
A_{min}	minimum area	172	mm^2
	mass of set	≈ 54	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	400 ± 3%	≈ 84	≈ 640	4322 022 3328	4322 022 1328
	630 ± 3%	≈ 132	≈ 380	4322 022 3330	4322 022 1330
	1000 ± 3%	≈ 210	≈ 200	4322 022 3331	4322 022 1331
	1600 ± 5%	≈ 336	≈ 110	4322 022 3332	4322 022 1332
	9000 ± 25%	≈ 1890	≈ 0	–	4322 022 1320

* clamping force 350 ± 50 N

P cores and accessories

P36/22

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3B8	250 ± 3%	≈ 53	≈ 1100	4322 022 1381
	315 ± 3%	≈ 66	≈ 800	4322 022 1382
	400 ± 3%	≈ 84	≈ 600	4322 022 1383
	630 ± 3%	≈ 132	≈ 400	4322 022 1384
	9000 ± 25%	≈ 1890	≈ 0	4322 022 1378
3C85	250 ± 3%	≈ 53	≈ 1100	4322 022 1364
	315 ± 3%	≈ 66	≈ 800	4322 022 1365
	400 ± 3%	≈ 84	≈ 600	4322 022 1366
	630 ± 3%	≈ 132	≈ 400	4322 022 1367
	8000 ± 25%	≈ 1680	≈ 0	4322 022 1360
3F3	250 ± 3%	≈ 53	≈ 1100	4322 022 1351
	315 ± 3%	≈ 66	≈ 800	4322 022 1352
	400 ± 3%	≈ 84	≈ 600	4322 022 1353
	630 ± 3%	≈ 132	≈ 400	4322 022 1354
	7350 ± 25%	≈ 1540	≈ 0	4322 022 1350

* clamping force 350 ± 50 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3B8	≥ 315	≤ 3.0	–	-
3C85	≥ 315	≤ 1.70	≤ 2.00	-
3F3	≥ 315	–	≤ 1.20	≤ 2.0

P cores and accessories P36/22

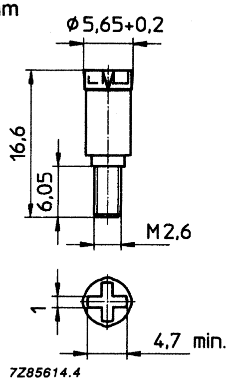


Fig.2 P36/22 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3924	yellow
4322 021 3928	white
4322 021 3929	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	100	–		4322 021 3924	17	4322 021 3928	28
	160	–		4322 021 3924	15	4322 021 3928	24
	250	–		4322 021 3924	11	4322 021 3928	18
	400	4322 021 3924	8	4322 021 3928	12	–	
	630	4322 021 3924	5	4322 021 3928	8	–	
	1000	4322 021 3928	5	4322 021 3929	20	–	
	1250	–		4322 021 3929	17	–	
	1600	–		4322 021 3929	12	–	
	2500	–		4322 021 3929	8	–	

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

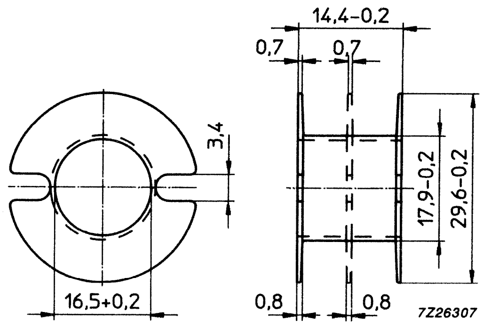


Fig.3 P36/22 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	75	12.5	74	4322 021 3039
2	2 x 35	2 x 5.8	74	4322 021 3040
3	3 x 22	3 x 3.6	74	4322 021 3041

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate (10 pins)	4	4322 021 3049	**Material:**	phenolformaldehyde (PF), glass reinforced
			Flammability:	in accordance with UL94V-0
			Maximum operating temperature:	180 °C
			Pins:	CuSn, SnPb plated
Container	5	4322 021 3057	**Material:**	nickel plated brass
			Earth pins:	presoldered
Spring	6	4322 021 3068	**Material:**	NiCr steel
			Spring force:	≈ 350 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

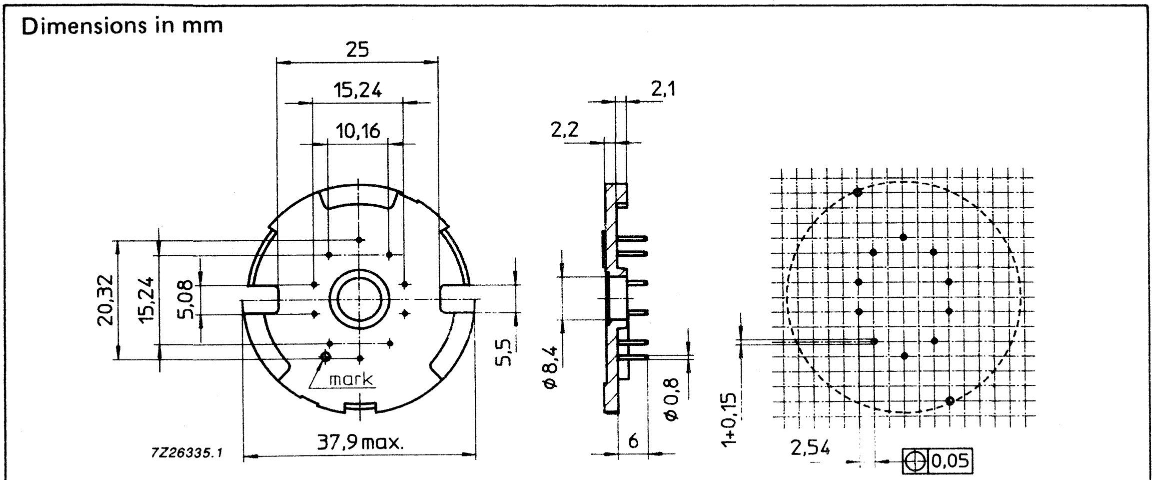


Fig.4 P36/22 tag plate.

P cores and accessories P36/22

Dimensions in mm

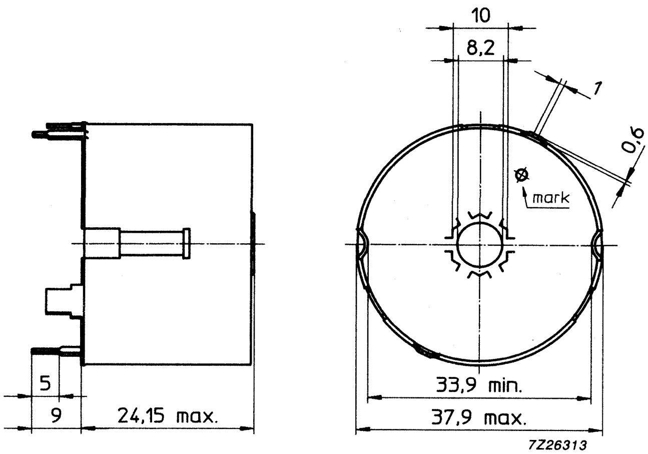


Fig.5 P36/22 container.

Dimensions in mm

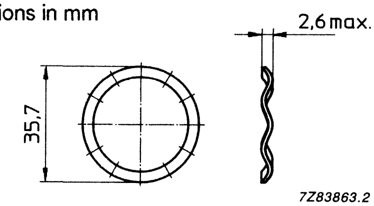


Fig.6 P36/22 spring.

Dimensions in mm

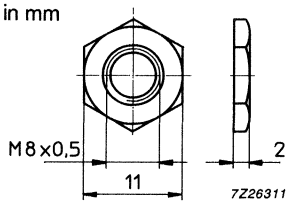


Fig.7 P36/22 nut.

Dimensions in mm

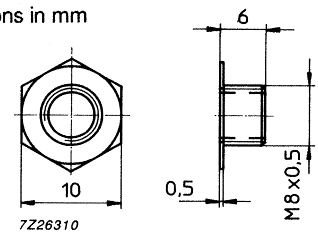


Fig.8 P36/22 bush.

P cores and accessories | P42/29

Dimensions in mm

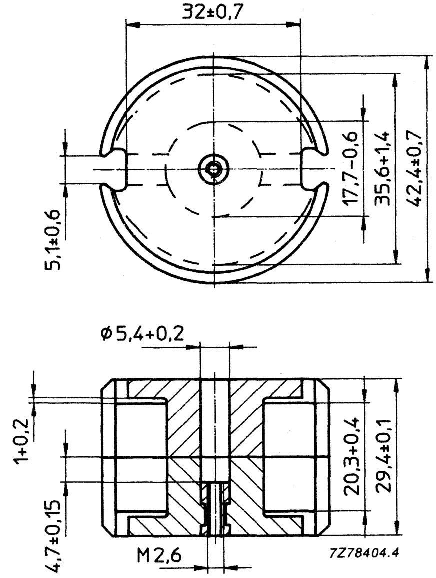


Fig.1 P42/29 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.259	mm^{-1}
V_e	effective volume	18200	mm^3
l_e	effective length	68.6	mm
A_e	effective area	265	mm^2
A_{min}	minimum area	214	mm^2
	mass of set	≈ 104	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	315 ± 3%	≈ 65	≈ 1100	4322 022 3527	4322 022 1527
	400 ± 3%	≈ 81	≈ 830	4322 022 3528	4322 022 1528
	630 ± 3%	≈ 130	≈ 450	4322 022 3530	4322 022 1530
	1000 ± 3%	≈ 205	≈ 270	4322 022 3531	4322 022 1531
	1600 ± 5%	≈ 325	≈ 150	4322 022 3532	4322 022 1532
	9500 ± 25%	≈ 1930	≈ 0	−	4322 022 1520

* clamping force 550 ± 100 N

P cores and accessories P42/29

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C85	315 ± 3%	≈ 65	≈ 1100	4322 022 1593
	400 ± 3%	≈ 81	≈ 800	4322 022 1594
	630 ± 3%	≈ 130	≈ 500	4322 022 1595
	8500 ± 25%	≈ 1750	≈ 0	4322 022 1590
3F3	315 ± 3%	≈ 65	≈ 1100	4322 022 1583
	400 ± 3%	≈ 81	≈ 800	4322 022 1584
	630 ± 3%	≈ 130	≈ 500	4322 022 1585
	7700 ± 25%	≈ 1600	≈ 0	4322 022 1580

* clamping force 550 ± 100 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 315	≤ 2.90	≤ 3.40	–
3F3	≥ 315	–	≤ 2.0	≤ 3.50

P cores and accessories P42/29

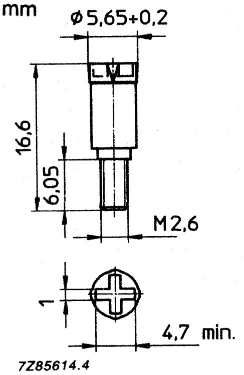


Fig.2 P42/29 inductance adjuster.

INDUCTANCE ADJUSTERS – GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3924	yellow
4322 021 3928	white
4322 021 3929	grey

Material of head and thread: Polypropylene (PP), glass fibre reinforced

Maximum operating temperature: 100 °C

INDUCTANCE ADJUSTER SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	100	–		4322 021 3924	14	4322 021 3928	23
	250	–		4322 021 3924	10	4322 021 3928	16
	400	4322 021 3924	7	4322 021 3928	11	–	
	630	–		4322 021 3928	7	4322 021 3929	28
	1000	–		4322 021 3929	18	–	
	1600	–		4322 021 3929	11	–	

P cores and accessories P42/29

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

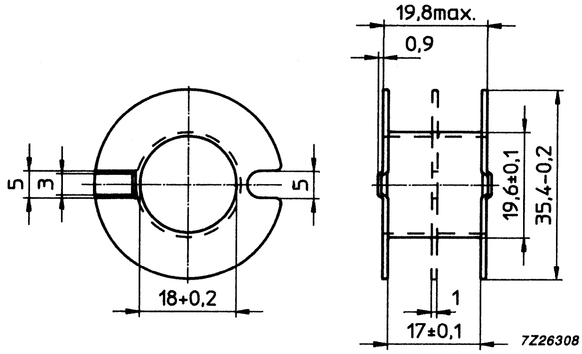


Fig.3 P42/29 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	140	17.7	86	4322 021 3042
2	2 x 63	2 x 8	86	4322 021 3043

P cores and accessories P42/29

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS	
Tag plate	4	4322 021 3050	**Material:** **Flammability:** **Maximum operating temperature:** **Pins:**	phenolformaldehyde (PF), glass reinforced in accordance with UL94V-0 180 °C CuSn, SnPb plated
Container	5	4322 021 3058	**Material:** **Earth pins:**	nickel plated brass presoldered
Spring	6	4322 021 3069	**Material:** **Spring force:**	NiCr steel ≈ 550 N when mounted
Nut	7	4322 021 3071	**Material:**	nickel plated brass
Bush	8	4322 021 3072	**Material:**	nickel plated brass

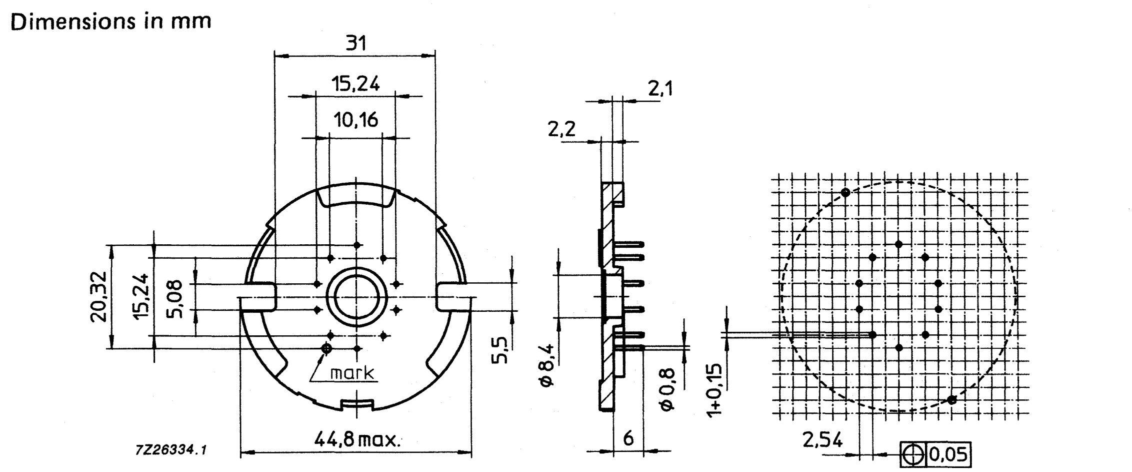


Fig.4 P42/29 tag plate.

P cores and accessories P42/29

Dimensions in mm

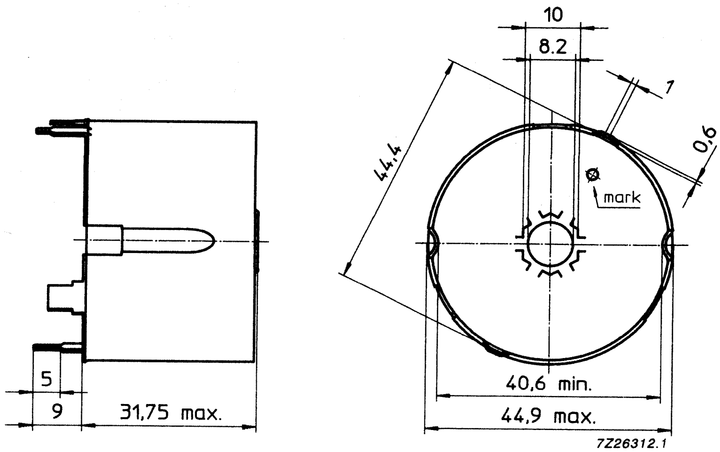


Fig.5 P42/29 container.

Dimensions in mm

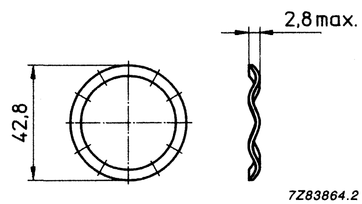


Fig.6 P42/29 spring.

Dimensions in mm

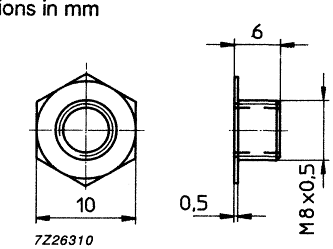


Fig.8 P42/29 bush.

Dimensions in mm

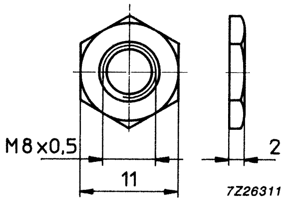


Fig.7 P42/29 nut.

P cores and accessories P66/56

Dimensions in mm

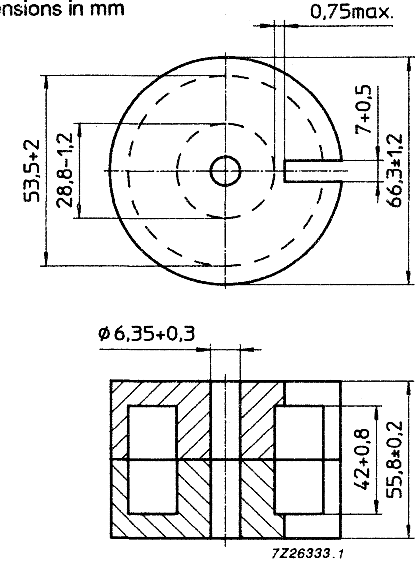


Fig.1 P66/56 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.172	mm^{-1}
V_e	effective volume	88300	mm^3
l_e	effective length	123.0	mm
A_e	effective area	717.0	mm^2
A_{min}	minimum area	591	mm^2
	mass of set	≈ 550	g

CORE SETS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3E1	≥ 14000	≈ 2500	≈ 0	–	4322 022 1700

* clamping force 1000 ± 300 N

P cores and accessories P66/56

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced

Maximum operating temperature: 130 °C

Flammability: in accordance with UL94V-2

Dimensions in mm

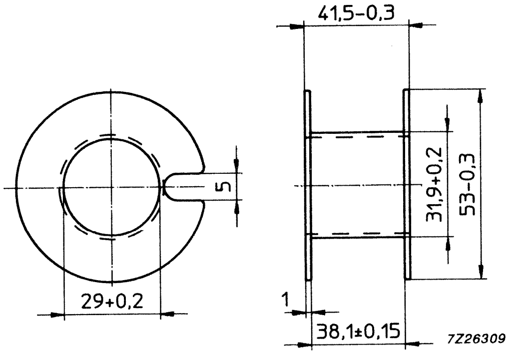


Fig.2 P66/56 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE WINDING LENGTH (mm)	ORDERING CODE
1	400	37.9	130	4322 021 3132

PH cores and accessories PH 5.6/3.6

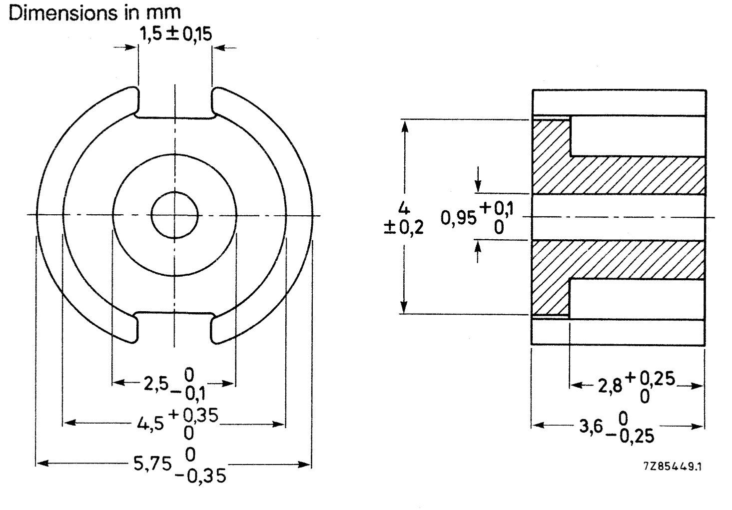


Fig.1 PH5.6/3.6 core half.

CORE HALVES

GRADE	ORDERING CODE
3D3	4322 020 5421

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced

Maximum operating temperature: 130 °C

Flammability: in accordance with UL94V-2

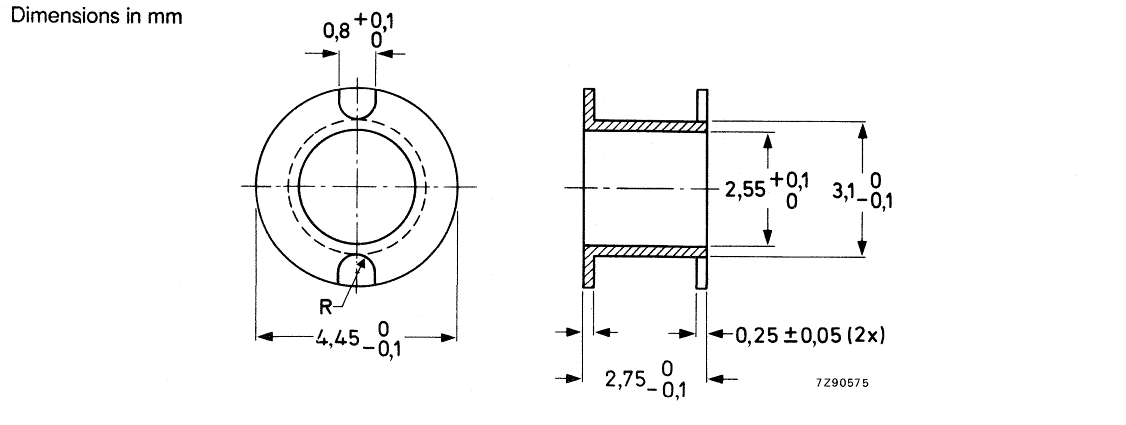


Fig.2 PH5.6/3.6 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	ORDERING CODE
1	1.9	2.05	11.7	4322 021 3354

Dimensions in mm

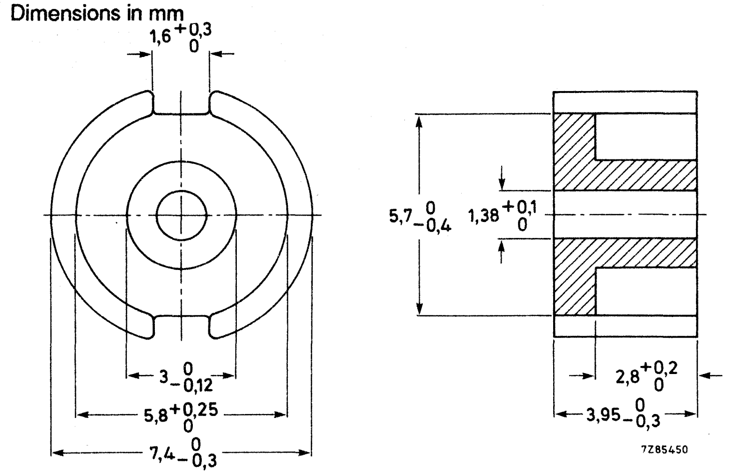


Fig.1 PH7.4/3.9 core half.

CORE HALVES

GRADE	ORDERING CODE
3D3	4322 020 5451

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

Dimensions in mm

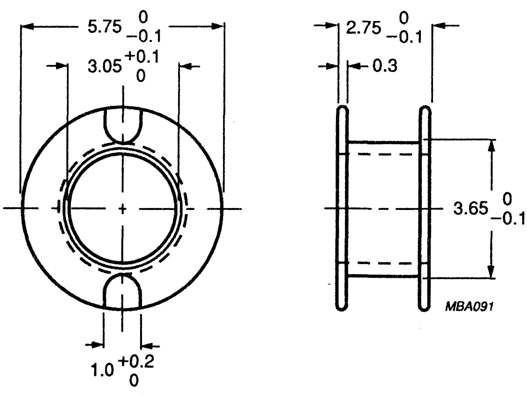


Fig.2 PH7.4/3.9 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	ORDERING CODE
1	2.2	2.0	14.6	4322 021 3299

PH cores and accessories | PH 9.4/4.8

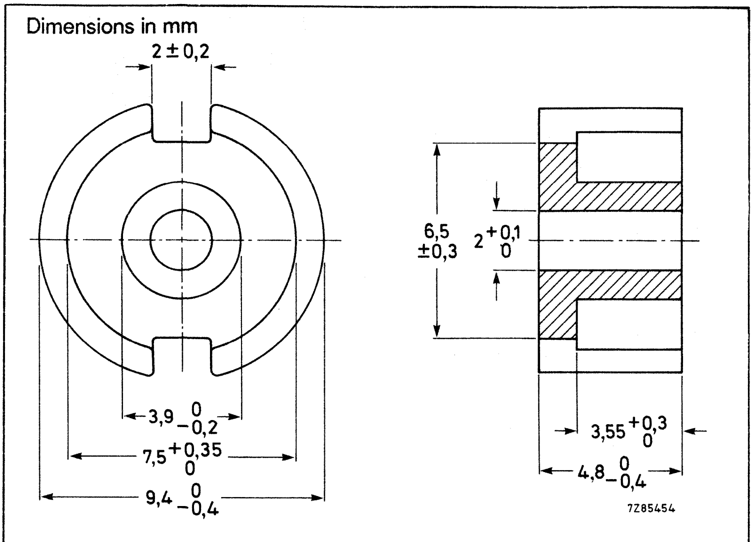


Fig.1 PH9.4/4.8 core half.

CORE HALVES

GRADE	ORDERING CODE
3D3	4322 020 5471

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced

Maximum operating temperature: 130 °C

Flammability: in accordance with UL94V-2

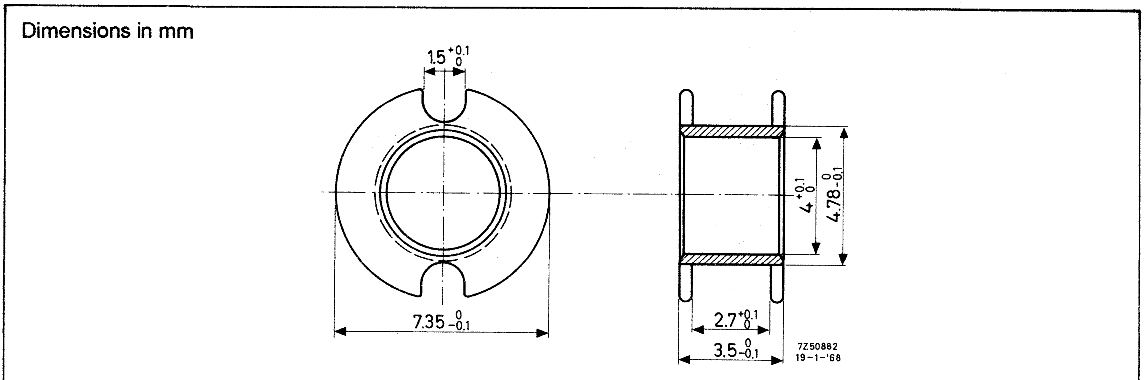


Fig.2 PH9.4/4.8 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	ORDERING CODE
1	3.4	2.7	19	4322 021 3170

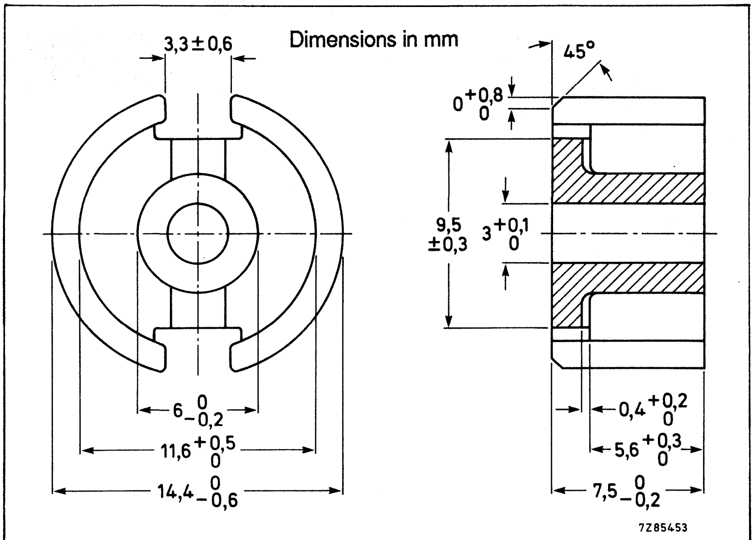


Fig.1 PH14/7.5 core half.

CORE HALVES

GRADE	ORDERING CODE
3H1	4322 020 5480

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

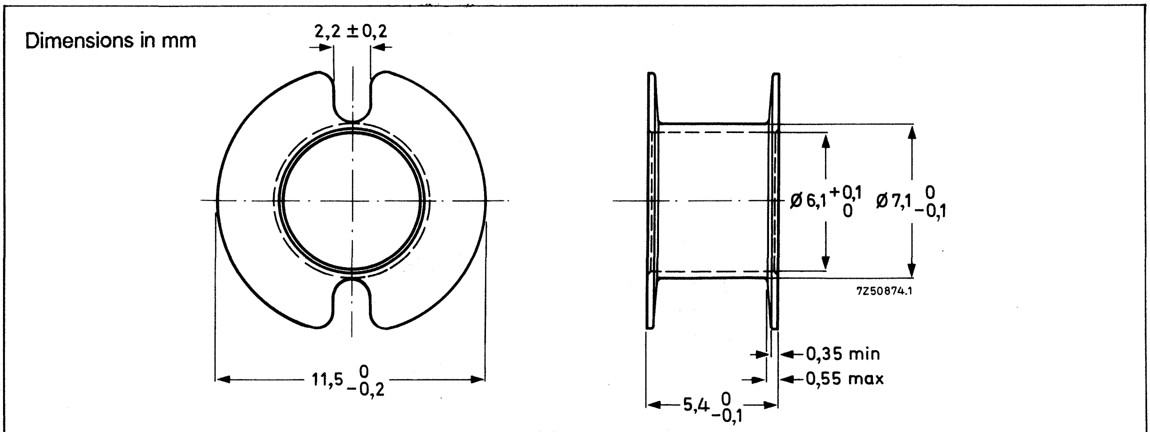


Fig.2 PH14/7.5 coil former.

WINDING DATA

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	ORDERING CODE
1	9.7	4.2	29	4322 021 3025

PH cores and accessories PH 26/9.2

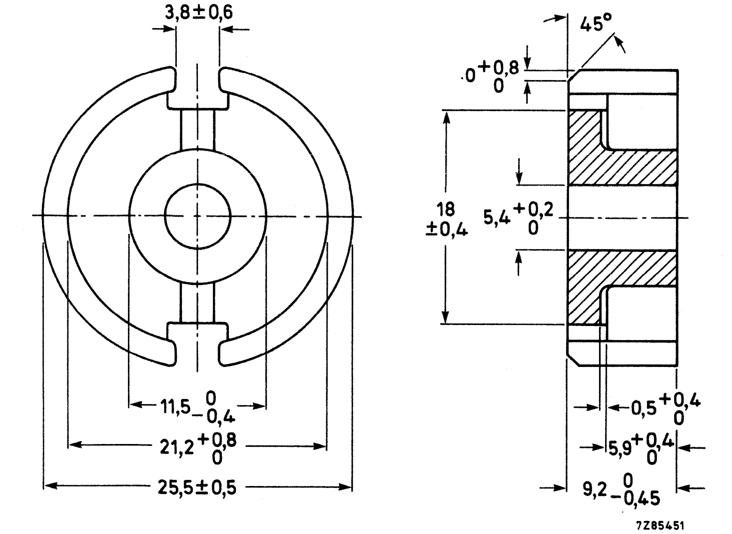


Fig.1 PH26/9.2 core half.

CORE HALVES

GRADE	ORDERING CODE
3H1	4322 020 5490

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-2

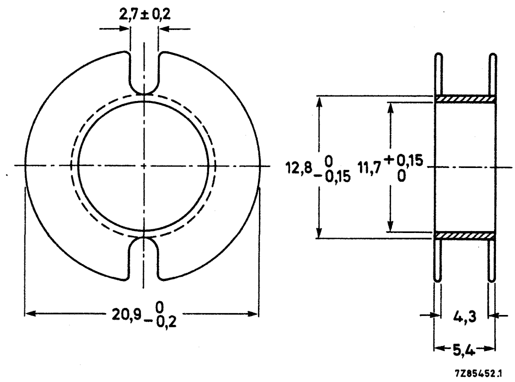


Fig.2 PH26/9.2 coil former.

WINDING DATA

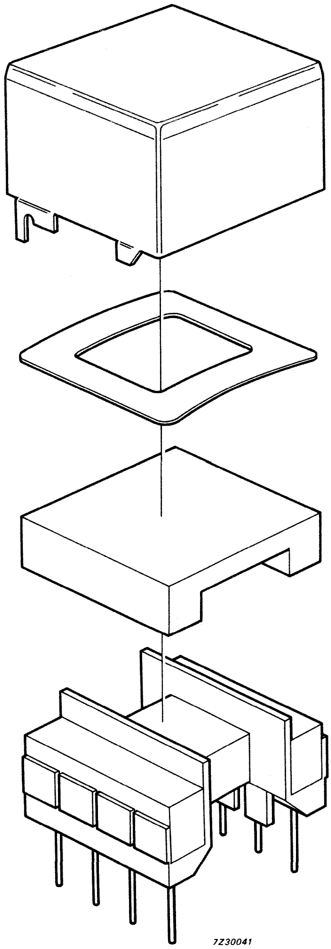
NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	ORDERING CODE
1	22	4.3	14.6	4322 021 3370

H CORES

Philips Components

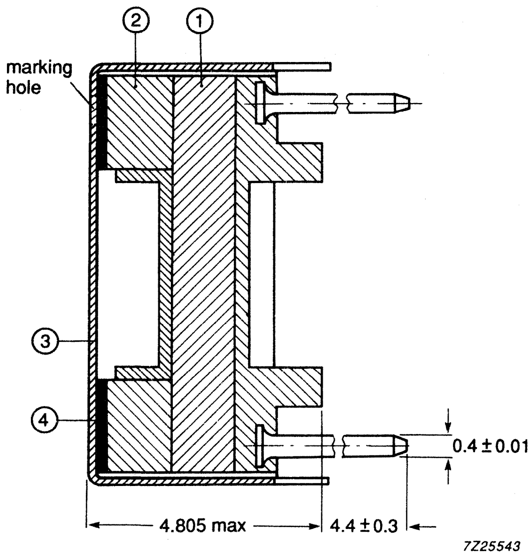
Data sheet	
status	Product specification
date of issue	December 1992

H7 to H20
H cores



H cores

H7



Dimensions in mm

Fig.1 Core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.4	mm^{-1}
V_e	effective volume	57	mm^3
l_e	effective length	17.5	mm
A_e	effective area	3.3	mm^2
	mass of set	≈ 0.8	g

SETS

GRADE	A_L*	μ_e	ORDERING CODE FOR COMPLETE SET
3E25	≥ 700	≥ 3000	4322 020 3302

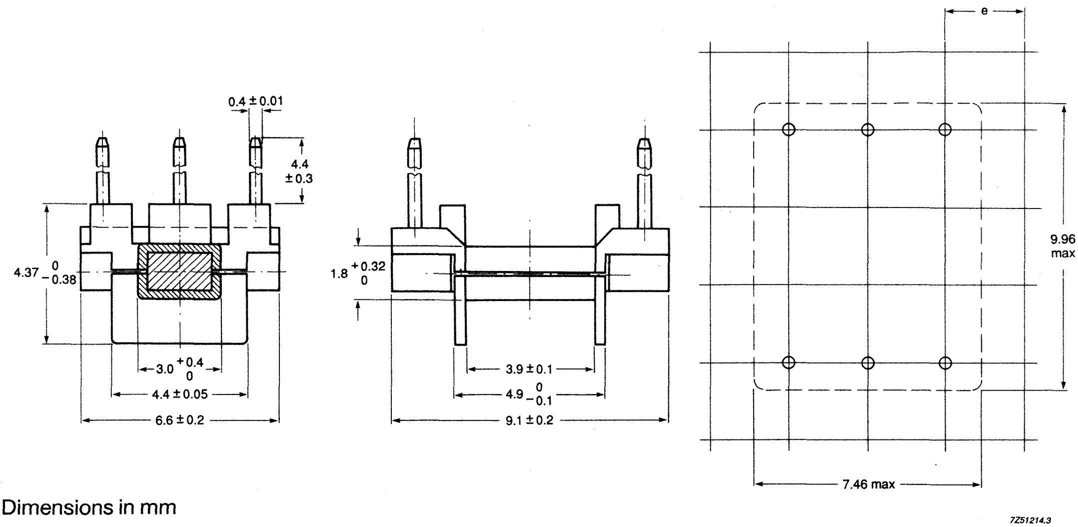
* clamping force 1.5 N, $\hat{B}$ = 1 mT

A complete H7 set consists of:

1. H-shaped core with coil former attached to it.
2. "Window"-core to close the magnetic circuit.
3. Container made of nickel plated brass.
4. Phosphor bronze spring.

COIL FORMER DATA

Coil former material:	phenolformaldehyde (PF), glass reinforced flame retardent in accordance to UL94-V0
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	280 °C, 6 s 400 °C, 2 s
Solderability:	IEC68-2-20, Part 2, Test TA, Method 1



Dimensions in mm

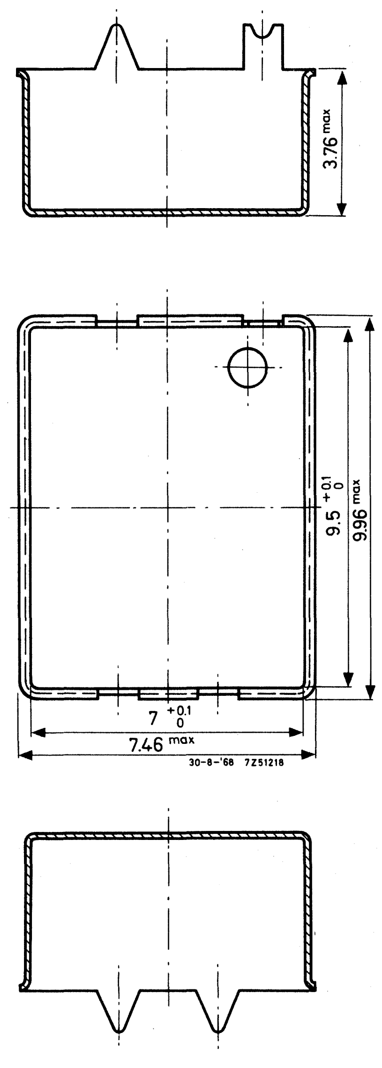
Fig.2 Coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)
1	6	3.1	3.8	13.4

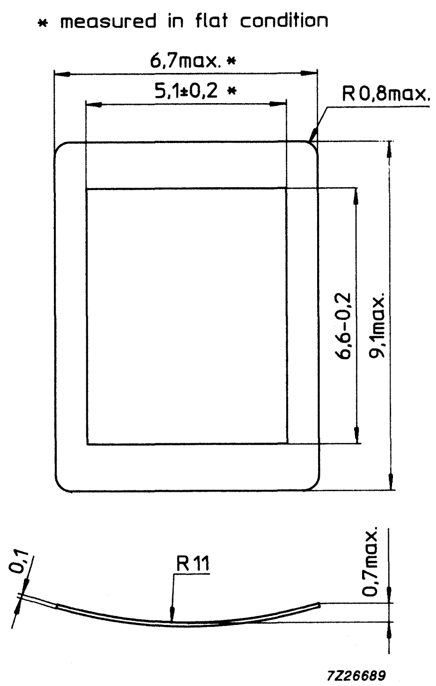
MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
container	3	4322 021 2018	material: nickel plated brass
spring	4	4322 021 2038	material: nickel plated phosphor bronze



Dimensions in mm

Fig. 3 Container.



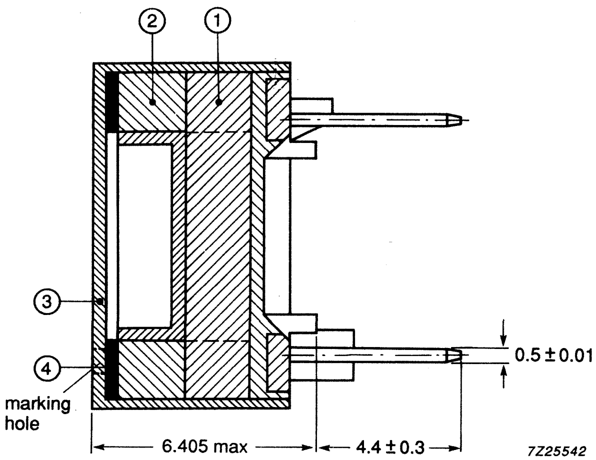
Dimensions in mm

Fig.4 Spring.

H cores | H10

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.0	mm^{-1}
V_e	effective volume	170	mm^3
l_e	effective length	22.5	mm
A_e	effective area	7.5	mm^2
	mass of set	≈ 2	g



Dimensions in mm

Fig.1 Core set.

SETS

GRADE	A_L*	μ_e	ORDERING CODE FOR COMPLETE SET
3E25	≥ 1600	≥ 3800	4322 020 3304
3E25	≥ 1600	≥ 3800	4322 020 3306**

* clamping force 1.5 N, $\hat{B}$ = 1 mT

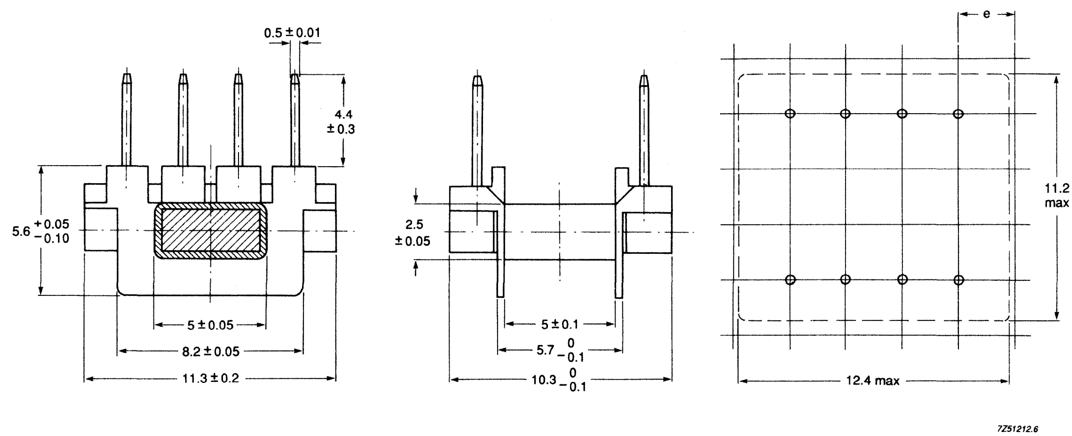
** improved resistance to soldering heat.

A complete H10 set consists of:

1. H-shaped core with coil former attached to it.
2. "Window"-core to close the magnetic circuit.
3. Container made of nickel plated brass.
4. Phosphor bronze spring.

COIL FORMER DATA

Coil former material:	polyamide 6.6, glass reinforced
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	120 °C
Resistance to soldering heat:	280 °C, 6 s 350 °C, 2 s
Solderability:	IEC68-2-20, Part 2, Test TA, Method 1



Dimensions in mm

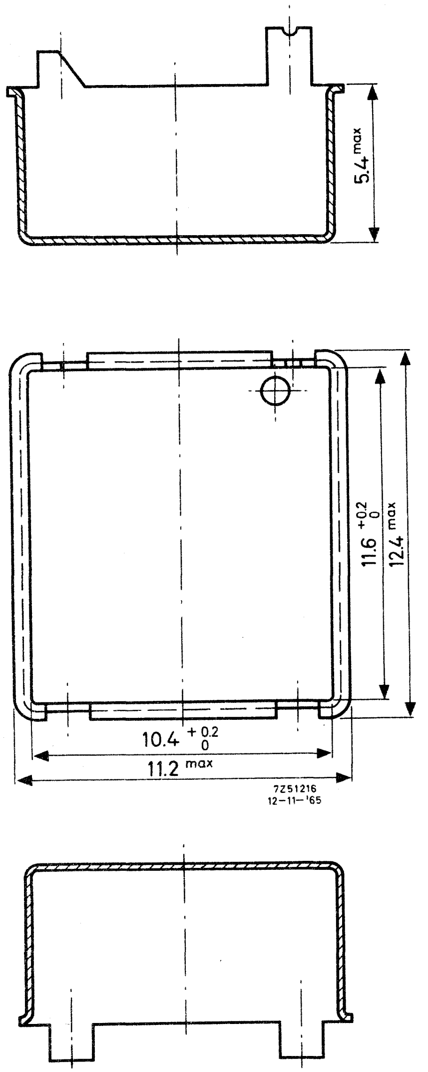
Fig.2 Coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)
1	8	7.6	4.9	21.7

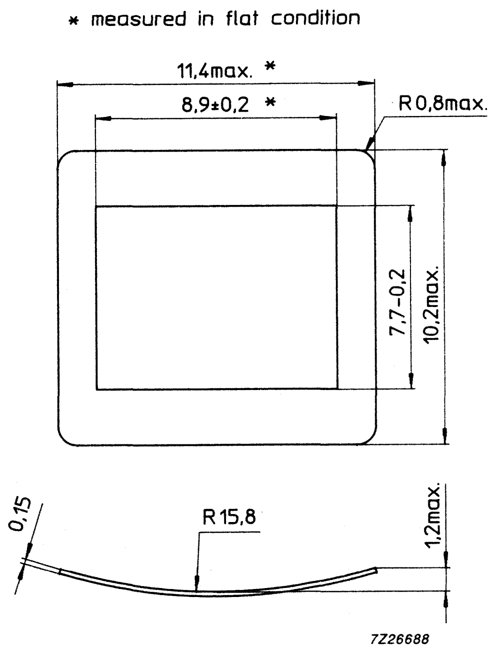
MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
container	3	4322 021 2002	material: nickel plated brass
spring	4	4322 021 2039	material: nickel plated phosphor bronze



Dimensions in mm

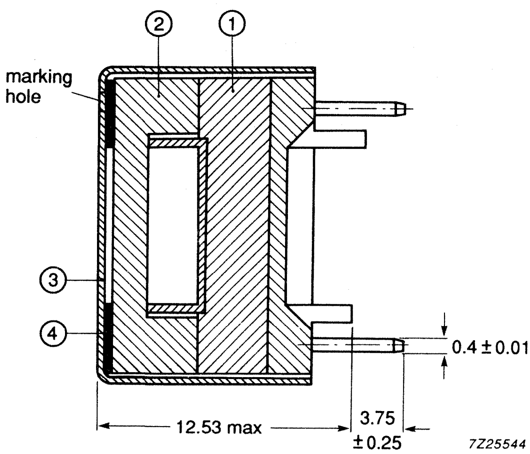
Fig. 3 Container.



Dimensions in mm

Fig.4 Spring.

H cores H16



Dimensions in mm

Fig.1 Core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	1240	mm^3
l_e	effective length	35.7	mm
A_e	effective area	34.9	mm^2
	mass of set	≈ 9.5	g

SETS

GRADE	A_L*	μ_e	ORDERING CODE FOR COMPLETE SET
3E25	≥ 4500	≥ 3650	4322 020 3303

* clamping force 1.5 N, $\hat{B}$ = 1 mT

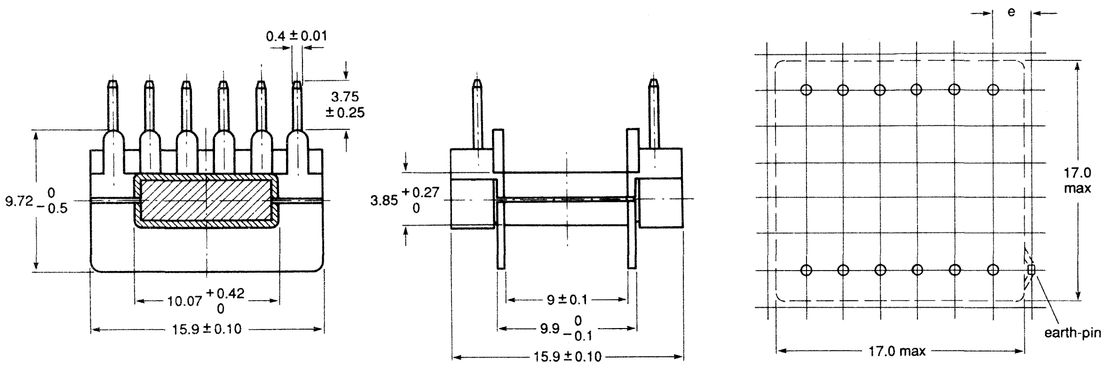
A complete H16 set consists of:

1. H-shaped core with coil former attached to it.
2. U-shaped core to close the magnetic circuit.
3. Container made of nickel plated brass.
4. Phosphor bronze spring.

H cores H16

COIL FORMER DATA

Coil former material:	polyester glass reinforced
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	280 °C, 6 s 400 °C, 2 s
Solderability:	IEC68-2-20, Part 2, Test TA, Method 1



Dimensions in mm

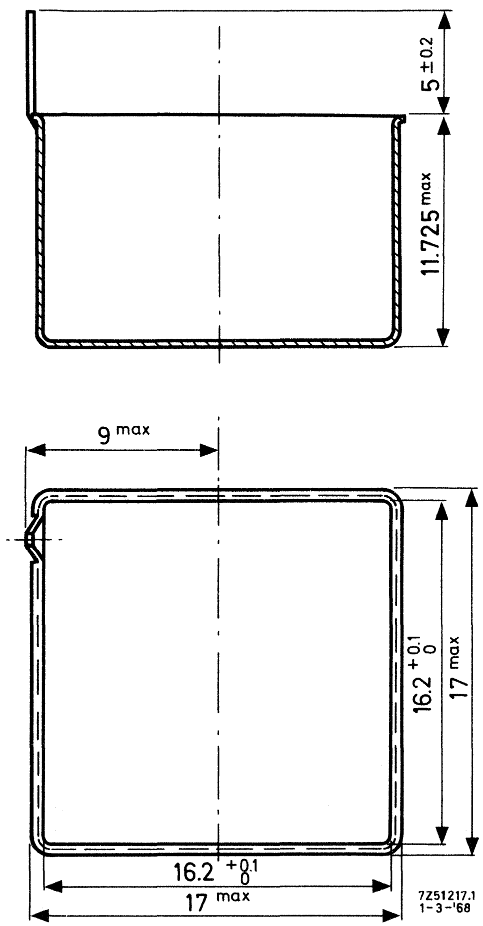
Fig.2 Coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)
1	12	21	8.9	39.6

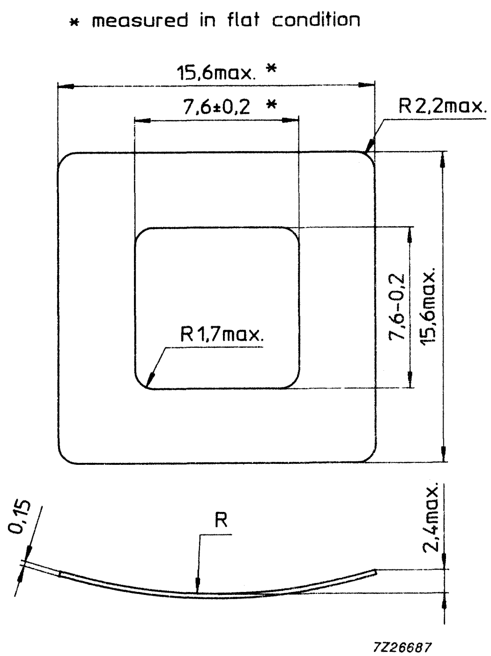
MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
container	3	4322 021 2018	material: nickel plated brass
spring	4	4322 021 2040	material: nickel plated phosphor bronze



Dimensions in mm

Fig. 3 Container.



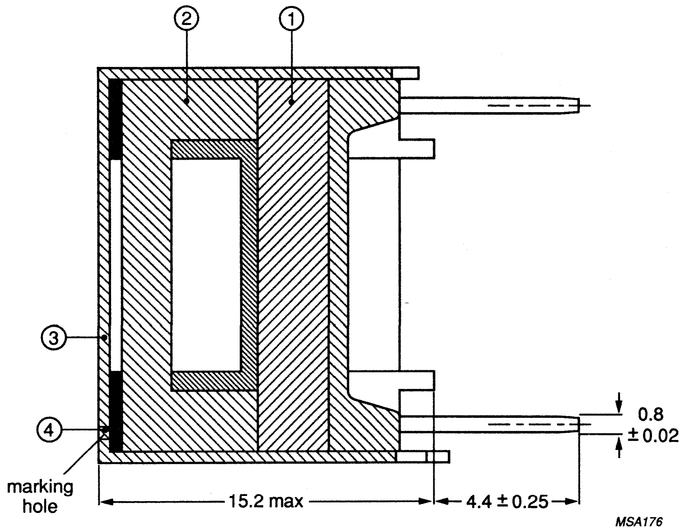
Dimensions in mm

Fig.4 Spring.

H cores H20

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.88	mm^{-1}
V_e	effective volume	1930	mm^3
l_e	effective length	41.2	mm
A_e	effective area	47	mm^2
	mass of set	≈ 15	g



Dimensions in mm

Fig.1 Core set.

SETS

GRADE	A_L*	μ_e	ORDERING CODE FOR COMPLETE SET
3E25	≥ 5500	≥ 3850	4322 020 3300

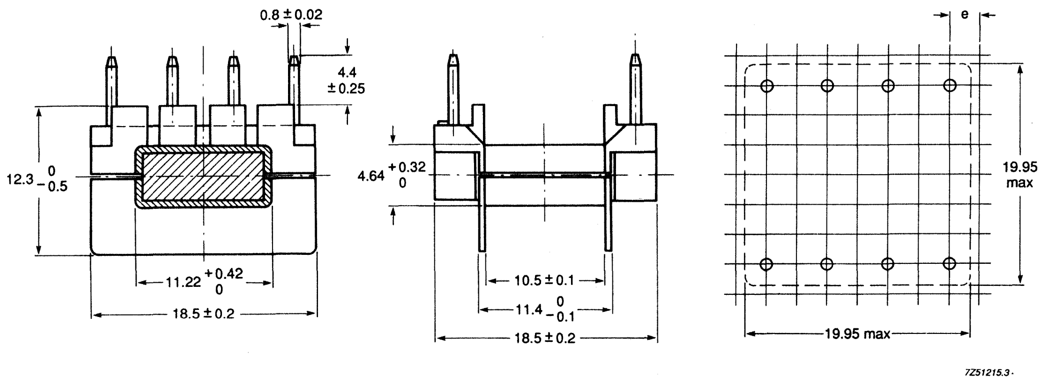
* clamping force 1.5 N, $\hat{B}$ = 1 mT

A complete H20 set consists of:

1. H-shaped core with coil former attached to it.
2. U-shaped core to close the magnetic circuit.
3. Container made of nickel plated brass.
4. Phosphor bronze spring.

COIL FORMER DATA

Coil former material:	polyester glass reinforced
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	280 °C, 6 s 400 °C, 2 s
Solderability:	IEC68-2-20, Part 2, Test TA, Method 1



Dimensions in mm

Fig.2 Coil former.

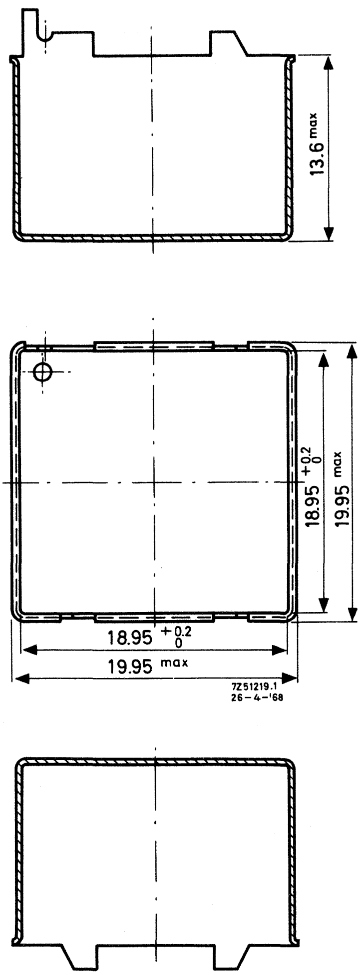
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)
1	8	35	10.4	44

H cores H20

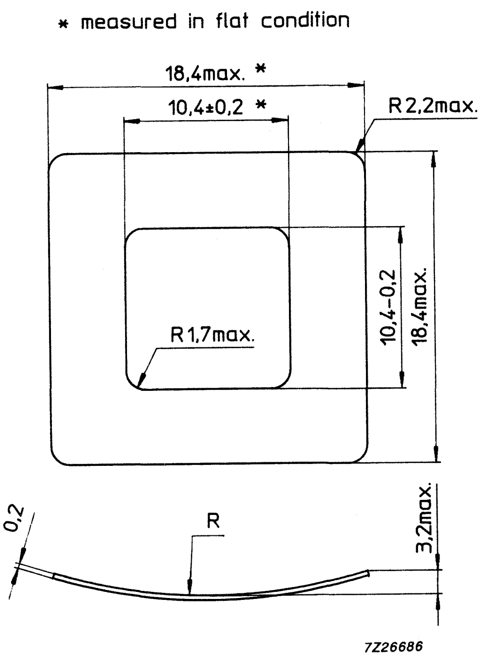
MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
container	3	4322 021 2000	material: nickel plated brass
spring	4	4322 021 2041	material: nickel plated phosphor bronze



Dimensions in mm

Fig. 3 Container.



Dimensions in mm

Fig.4 Spring.

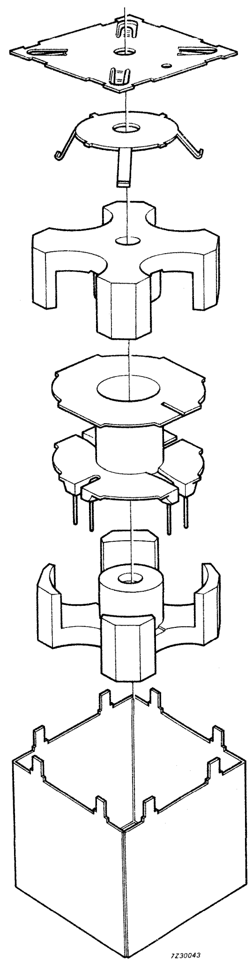
X CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

X22 to X35

X cores and accessories



X cores and accessories

X22

Dimensions in mm

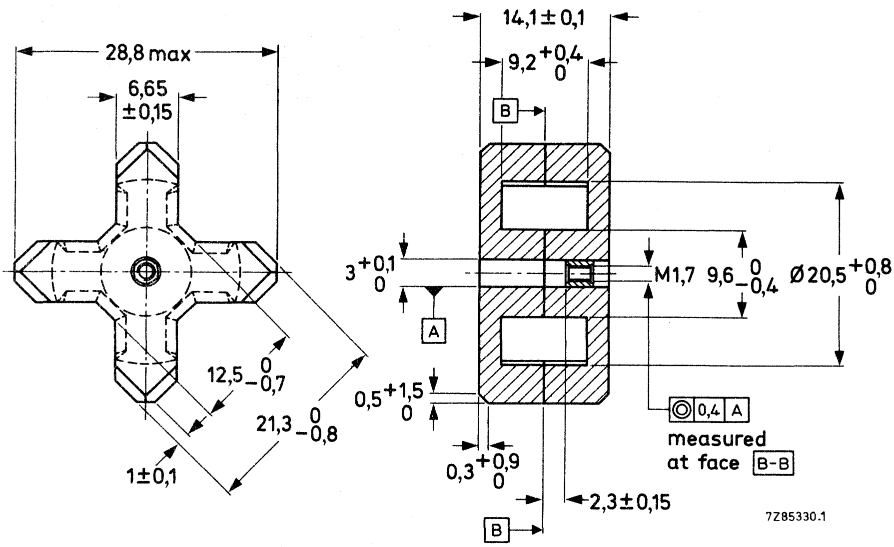


Fig.1 Core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.575	mm^{-1}
V_e	effective volume	2510	mm^3
l_e	effective length	38	mm
A_e	effective area	66	mm^2
A_{min}	minimum area	62.1	mm^2
	mass of set	≈ 12	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	400 ± 3%	≈ 180	≈ 200	4322 022 6528	–
	630 ± 3%	≈ 290	≈ 120	4322 022 6530	–
	1000 ± 10%	≈ 460	≈ 60	4322 022 6531	–
	3900 ± 25%	≈ 1760	≈ 0	–	4322 022 4520
4C6	220 ± 25%	≈ 100	≈ 0	–	4322 022 4580
3D3	1500 ± 25%	≈ 680	≈ 0	–	4322 022 4540
3B8	3900 ± 25%	≈ 1760	≈ 0	–	4322 022 4560

* clamping force 100 ± 30 N

X cores and accessories X22

Dimensions in mm

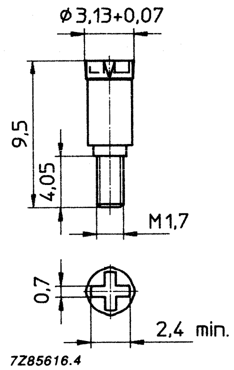


Fig.2 Inductance adjuster.

INDUCTANCE ADJUSTERS - GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3860	black
4322 021 3861	brown
4322 021 3867	violet
4322 021 3868	white
4322 021 3869	grey

INDUCTANCE ADJUSTERS - SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	160	–		4322 021 3868	20	–	
	250	4322 021 3868	13	4322 021 3867	15	4322 021 3861	21
	400	4322 021 3868	8	4322 021 3861	13	4322 021 3860	20
	630	4322 021 3861	8	4322 021 3860	13	4322 021 3869	17

X cores and accessories

X22

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, test TA, method 1

Average length of turn: 49 mm

Dimensions in mm

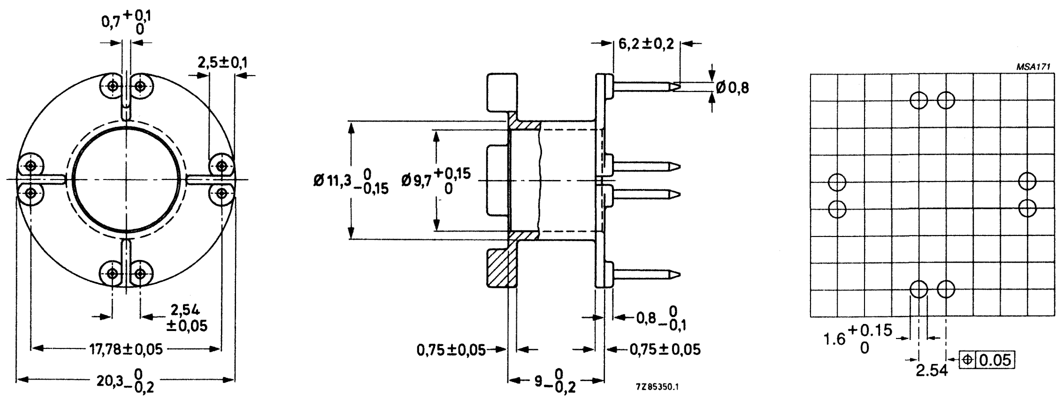


Fig.3 Coil former.

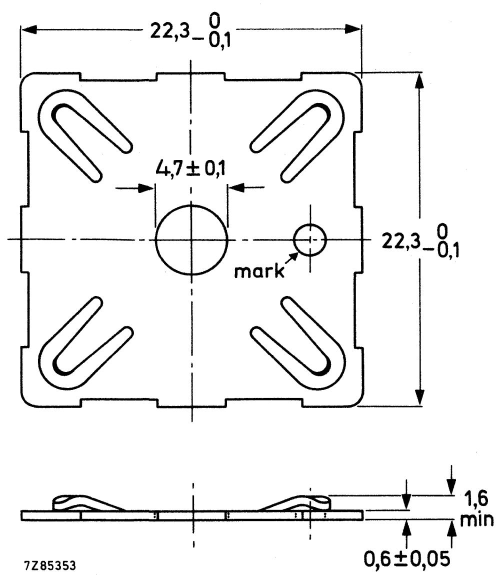
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITION	WINDING AREA (mm^2)	WINDING WIDTH (mm^2)	ORDERING CODE
1	8	all	33.9	7.2	4322 021 3287

X cores and accessories X22

MOUNTING PARTS

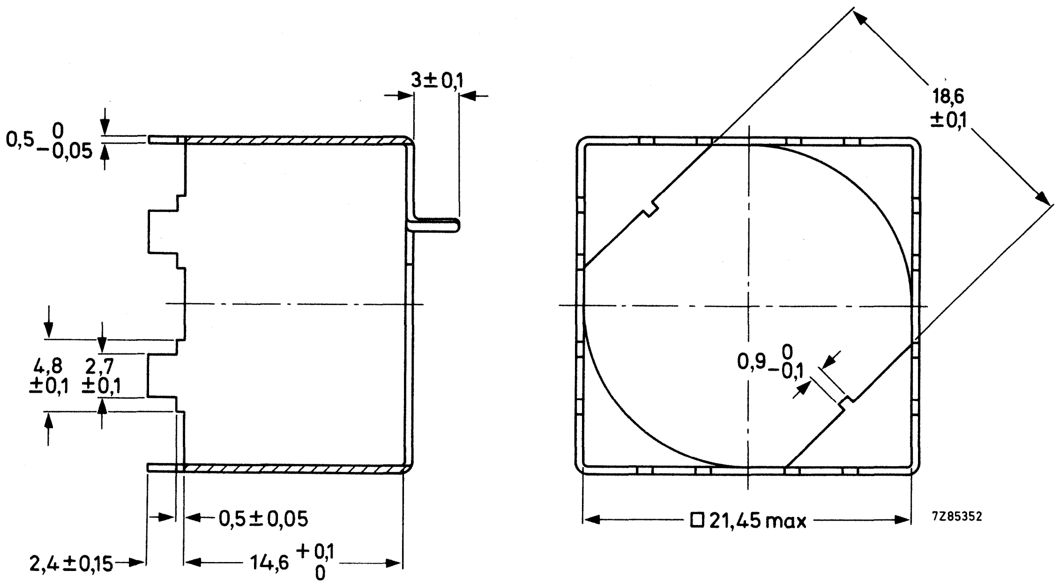
ITEM	FIG. NO.	ORDERING CODE	REMARKS
cover	4	4322 021 3023	material: phosphor bronze, nickel plated
container	5	4322 021 3004	material: brass, nickel plated



Dimensions in mm

Fig.4 Cover.

X cores and accessories X22



Dimensions in mm

Fig.5 Container.

X cores and accessories X30

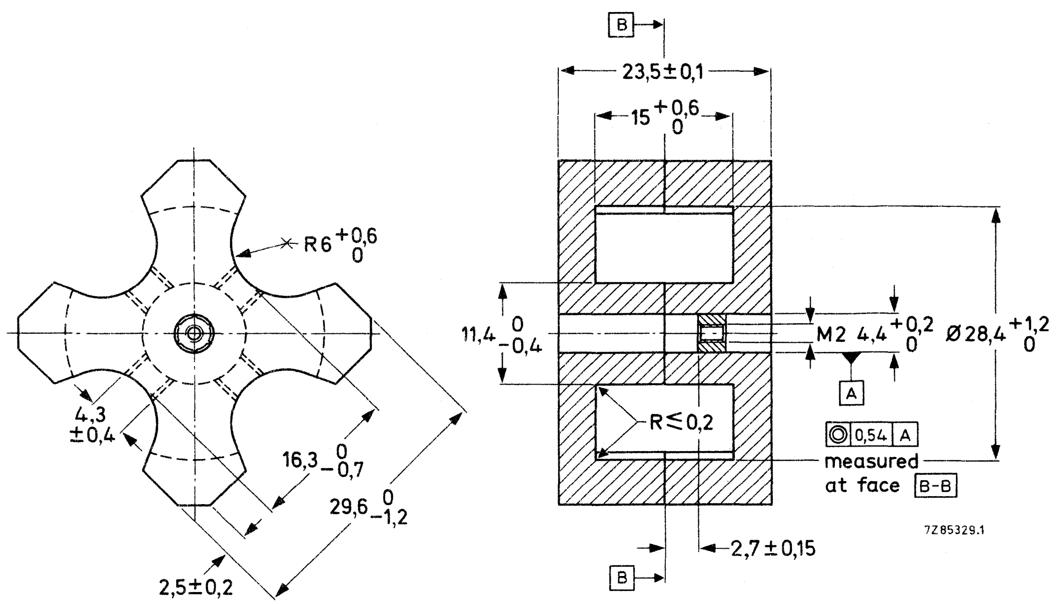


Fig.1 Core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.490	mm^{-1}
V_e	effective volume	6360	mm^3
l_e	effective length	55.8	mm
A_e	effective area	114	mm^2
A_{min}	minimum area	82.6	mm^2
	mass of set	≈ 38	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	400 ± 3%	≈ 150	≈ 250	4322 022 3928	4322 022 1928
	630 ± 3%	≈ 250	≈ 170	4322 022 3930	4322 022 1930
	1000 ± 10%	≈ 400	≈ 100	4322 022 3931	4322 022 1931
	1600 ± 10%	≈ 625	≈ 50	4322 022 3932	4322 022 1932
	4900 ± 25%	≈ 1960	≈ 0	–	4322 025 1300
3B8	4900 ± 25%	≈ 1960	≈ 0	–	4322 025 1320

* clamping force 200 ± 50 N

X cores and accessories X30

Dimensions in mm

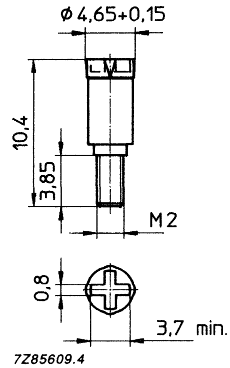


Fig.2 Inductance adjuster.

INDUCTANCE ADJUSTERS - GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3840	black
4322 021 3841	brown
4322 021 3843	orange
4322 021 3849	grey

INDUCTANCE ADJUSTERS - SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	315	4322 021 3843	7	4322 021 3849	18	4322 021 3841	20
	400	4322 021 3843	6	4322 021 3849	14	4322 021 3841	16
	630	–		4322 021 3841	10	4322 021 3840	19
	1000	4322 021 3841	6	4322 021 3840	9	–	
	1600	–		4322 021 3840	5	–	

X cores and accessories X30

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL94V-0
Pin material: CuSn, SnPb plated
Maximum operating temperature: 180 °C
Resistance to soldering heat: 430 °C, 2 s
Solderability: IEC 68-2-20, Part 2, test TA, method 1
Average length of turn: 65 mm

Dimensions in mm

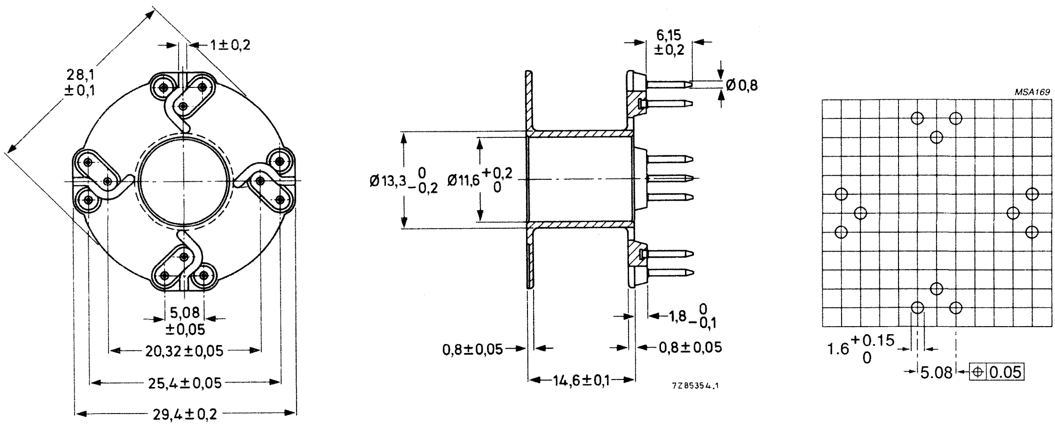


Fig.3 Coil former.

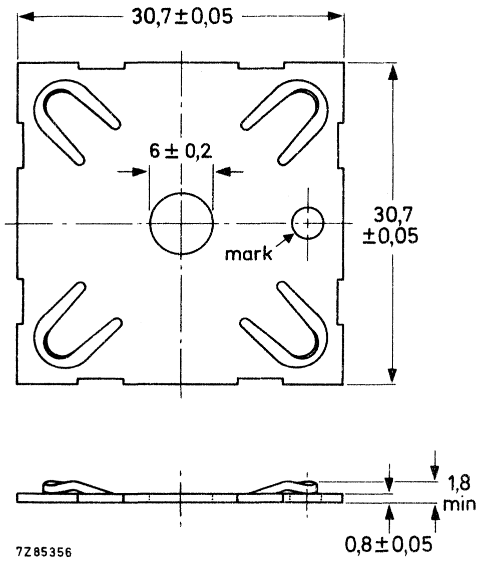
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITION	WINDING AREA (mm^2)	WINDING WIDTH (mm^2)	ORDERING CODE
1	12	all	97	12.8	4322 021 3342

X cores and accessories X30

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
cover	4	4322 021 3115	material: phosphor bronze, nickel plated
container	5	4322 021 3117	material: brass, nickel plated
container	6	4322 021 3362	material: brass, nickel plated
spring	7	4322 021 3021	material: phosphor bronze

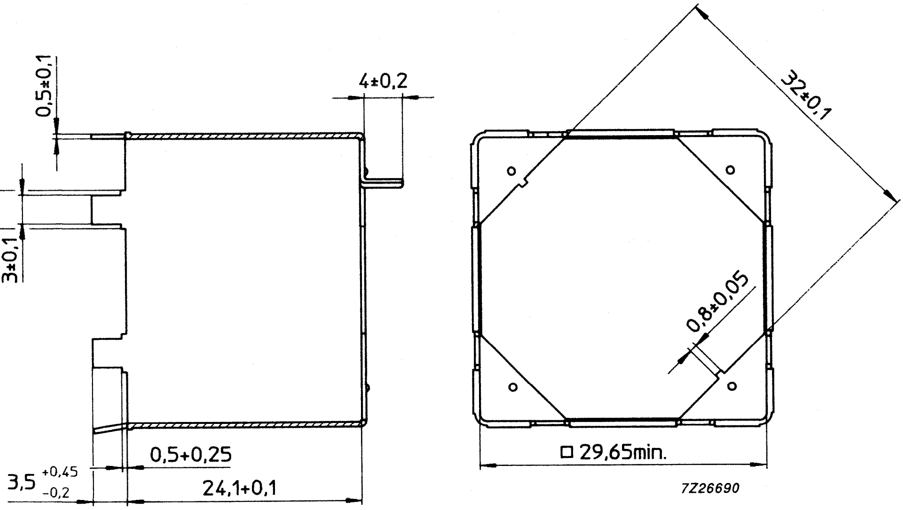


Dimensions in mm

Fig.4 Cover.

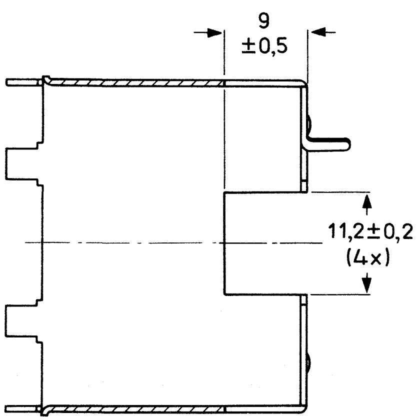
X cores and accessories

X30



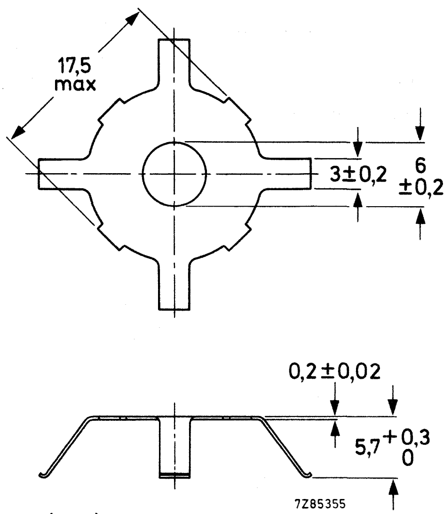
Dimensions in mm

Fig.5 Container.



Dimensions in mm

Fig.6 Container.



Dimensions in mm

Fig.7 Spring.

X cores and accessories X35

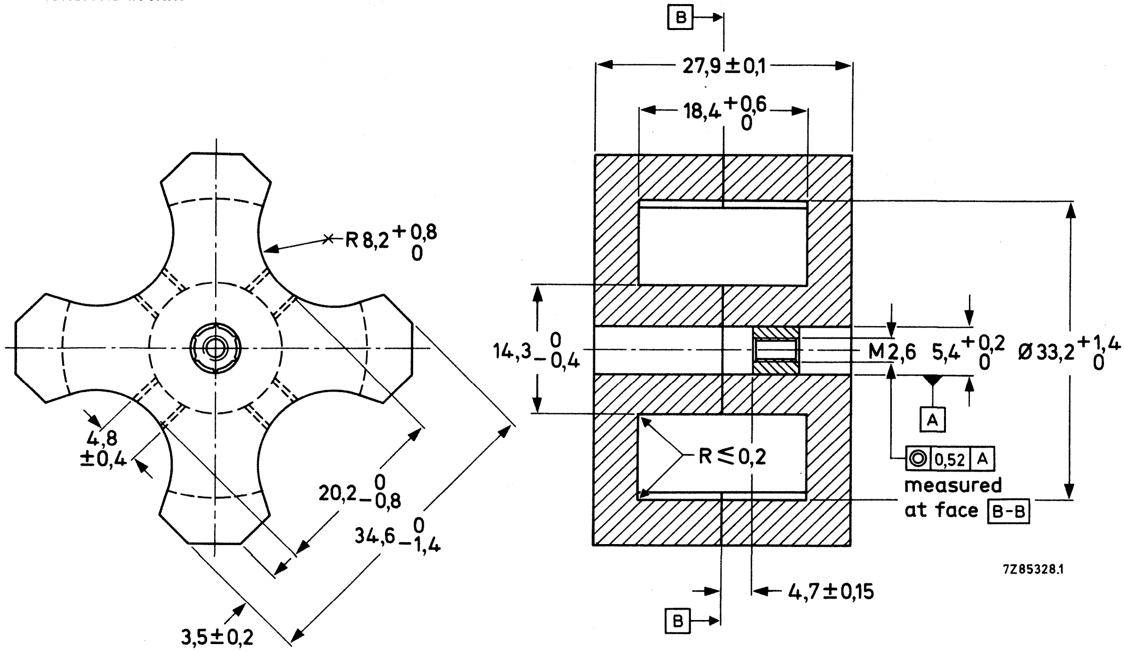


Fig.1 Core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.410	mm^{-1}
V_e	effective volume	11000	mm^3
l_e	effective length	67.3	mm
A_e	effective area	164	mm^2
A_{min}	minimum area	132	mm^2
	mass of set	≈ 58	g

CORE SETS FOR FILTER APPLICATIONS

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (WITH NUT)	ORDERING CODE (WITHOUT NUT)
3H1	400 ± 3%	≈ 130	≈ 500	4322 022 7328	4322 022 5328
	630 ± 3%	≈ 200	≈ 300	4322 022 7330	4322 022 5330
	1000 ± 3%	≈ 325	≈ 150	4322 022 7331	4322 022 5331
	1600 ± 5%	≈ 500	≈ 80	4322 022 7332	4322 022 5332
	6050 ±25%	≈ 2000	≈ 0	–	4322 022 5320
3B8	6050 ±25%	≈ 2000	≈ 0	–	4322 022 5300

Dimensions in mm

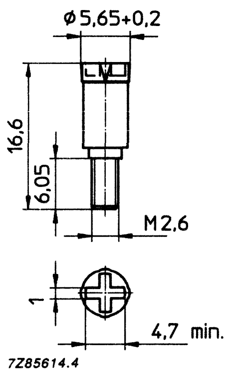


Fig.2 Inductance adjuster.

INDUCTANCE ADJUSTERS - GENERAL DATA

ORDERING CODE	COLOUR
4322 021 3924	yellow
4322 021 3928	white
4322 021 3929	grey

INDUCTANCE ADJUSTERS - SELECTION CHART

GRADE	A_L	LOW ADJUSTMENT	%	MEDIUM ADJUSTMENT	%	HIGH ADJUSTMENT	%
3H1	315	4322 021 3924	8	4322 021 3938	15	–	
	400	4322 021 3924	8	4322 021 3928	12	–	
	630	–		4322 021 3928	7	4322 021 3929	27
	1000	–		4322 021 3929	17	–	
	1600	–		4322 021 3929	9	–	

X cores and accessories X35

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, test TA, method 1

Average length of turn: 77 mm

Dimensions in mm

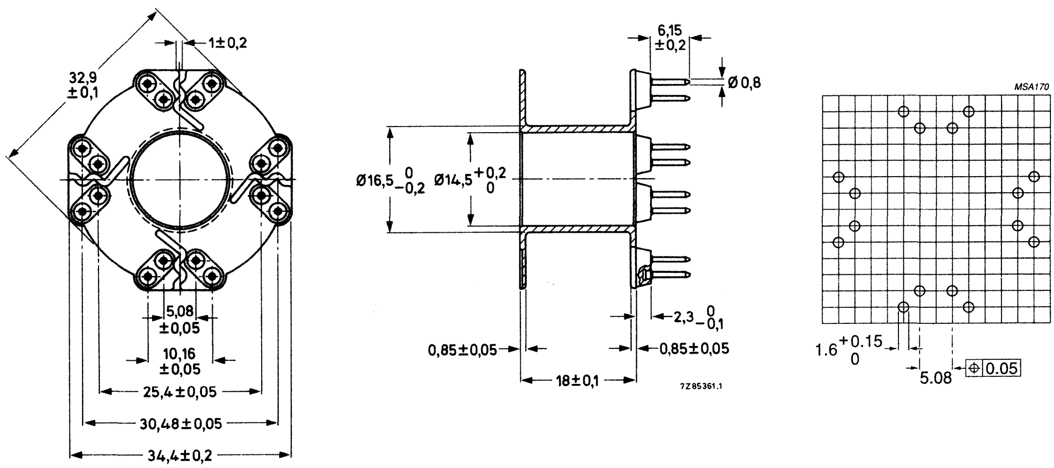


Fig.3 Coil former.

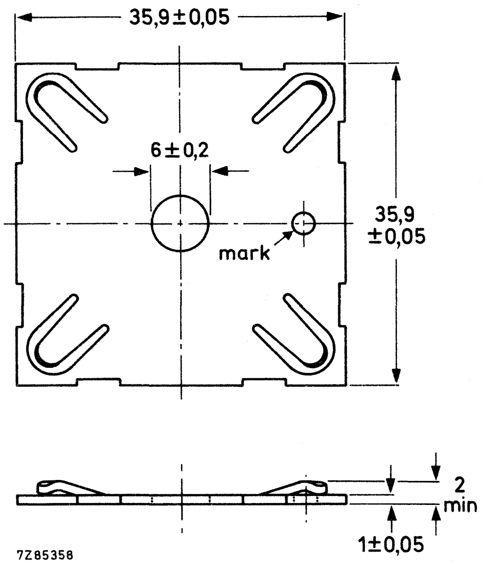
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITION	WINDING AREA (mm^2)	WINDING WIDTH (mm^2)	ORDERING CODE
1	16	all	135	16.1	4322 021 3343

X cores and accessories X35

MOUNTING PARTS

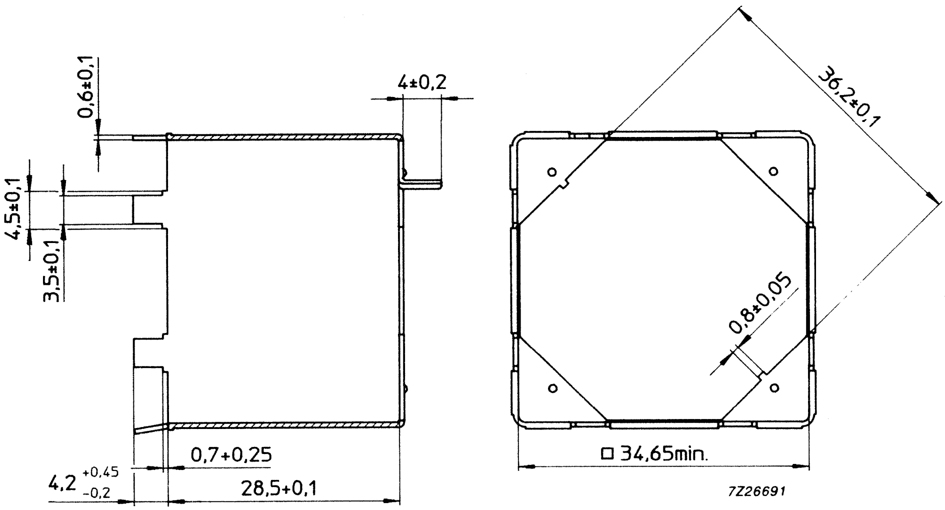
ITEM	FIG. NO.	ORDERING CODE	REMARKS
cover	4	4322 021 3116	material: phosphor bronze, nickel plated
container	5	4322 021 3118	material: brass, nickel plated
container	6	4322 021 3363	material: brass, nickel plated
spring	7	4322 021 3022	material: phosphor bronze



Dimensions in mm

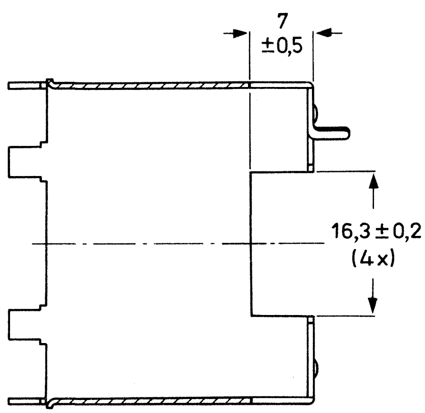
Fig.4 Cover.

X cores and accessories X35



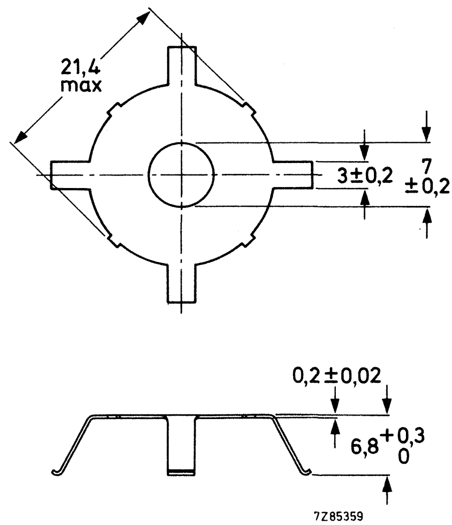
Dimensions in mm

Fig.5 Container.



Dimensions in mm

Fig.6 Container.



Dimensions in mm

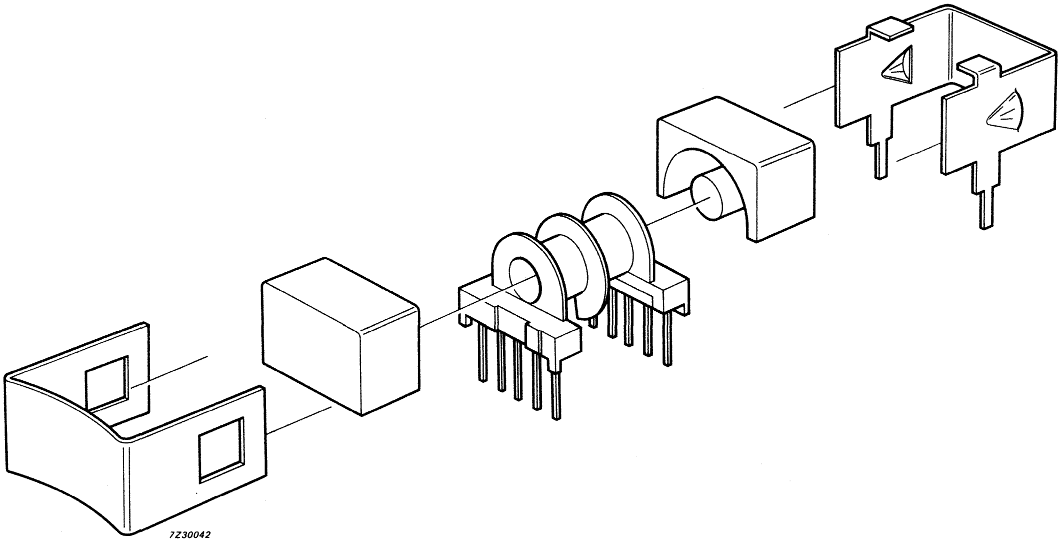
Fig.7 Spring.

EP CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

EP7 to EP13
EP cores and accessories



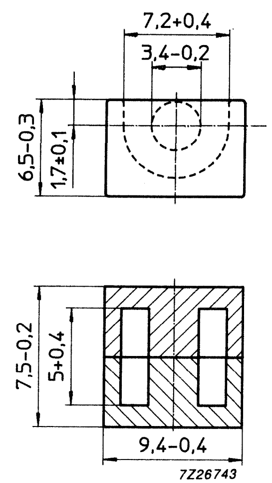


Fig.1 EP7 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	1.52	mm^{-1}
V_e	effective volume	162	mm^3
l_e	effective length	15.7	mm
A_e	effective area	10.3	mm^2
A_{min}	minimum area	8.5	mm^2
	mass of core set	≈ 1.4	g

Customized airgaps on request

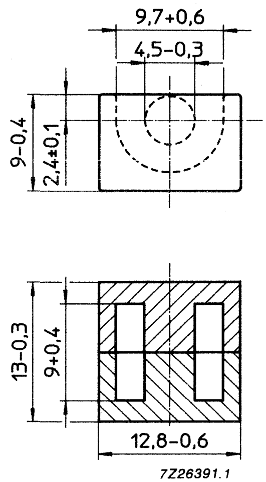
CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L (nH)	μ_e	AIRGAP (µm)	ORDERING CODE (SET)
3F3	1000 ± 25%	≈ 1200	≈ 0	4322 025 0840

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L (nH)	μ_e	ORDERING CODE (SET)
3E1	2100 ± 25%	≈ 2400	4322 025 0860
3E5	5200 + 40%/–30%	≈ 6300	4322 025 0820

EP cores and accessories EP13



Dimensions in mm

Fig.1 EP13 core set.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	1.24	mm^{-1}
V_e	effective volume	472	mm^3
l_e	effective length	24.2	mm
A_e	effective area	19.5	mm^2
$A_{min.}$	minimum area	14.9	mm^2
	mass of core set	≈ 5	g

Customized airgaps on request

CORE SETS FOR GENERAL PURPOSE TRANSFORMERS AND POWER APPLICATIONS

GRADE	A_L (nH)	μ_e	AIRGAP (μm)	ORDERING CODE (SET)
3C85	100 ± 3%	≈ 100	≈ 230	4322 025 1003
	160 ± 3%	≈ 160	≈ 130	4322 025 1004
	250 ± 3%	≈ 250	≈ 75	4322 025 1006
	315 ± 3%	≈ 310	≈ 50	4322 025 1007
	1475 ± 25%	≈ 1460	≈ 0	4322 025 1014
3F3	160 ± 3%	≈ 160	≈ 125	4322 025 1094
	250 ± 3%	≈ 250	≈ 70	4322 025 1096
	315 ± 3%	≈ 310	≈ 50	4322 025 1097
	1325 ± 25%	≈ 1310	≈ 0	4322 025 1090

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 315	≤ 0.08	≤ 0.09	–
3F3	≥ 315	≤ 0.06	≤ 0.05	≤ 0.1

CORE SETS OF HIGH PERMEABILITY GRADES

GRADE	A_L (nH)	μ_e	ORDERING CODE (SET)
3E1	2600 ± 25%	≈ 2560	4322 025 1033
3E25	4400 + 40%/–30%	≈ 4340	4322 025 1080
3E5	7000 + 40%/–30%	≈ 5400	4322 025 1077
3E6	10000 + 40%/–30%	≈ 7700	4322 025 1020

COIL FORMER DATA

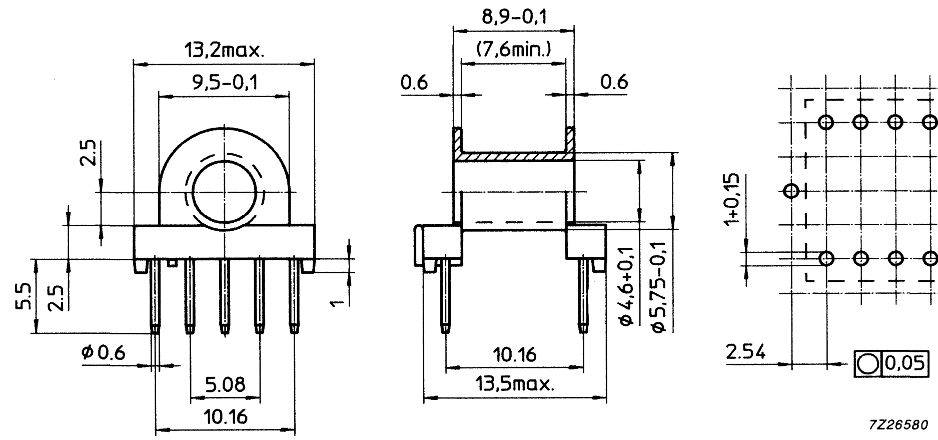
Coil former material: phenolformaldehyde (PF) glass reinforced flame retardent in accordance with UL94V-0

Pin material: CuSn - Ni flash, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC68-2-20, part 2, Test TA, Method 1



Dimensions in mm

Fig.2 Coil former.

WINDING DATA

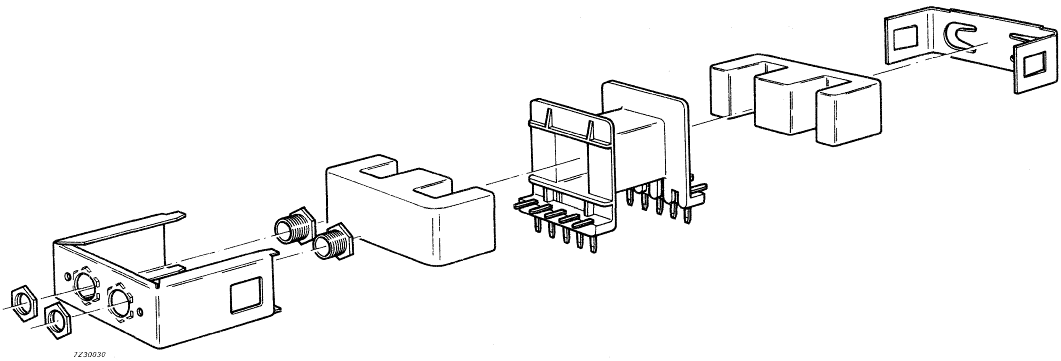
NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH (mm)	ORDERING CODE (SET)
1	10	13.8	8.7	23.8	4322 021 3503

E CORES AND ACCESSORIES

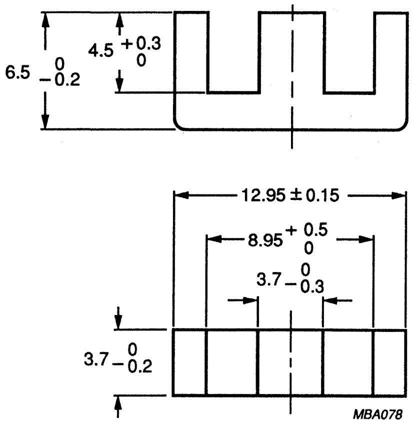
Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

E13/7/4 to E65/32/27
E cores and accessories



E cores and accessories E13/7/4 (EF12.6)



Dimensions in mm

Fig.1 E13/7/4 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.27	mm^{-1}
V_e	effective volume	384	mm^3
l_e	effective length	29.6	mm
A_e	effective area	13.0	mm^2
	mass of core half	≈ 0.9	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	900 ± 25%	≈ 1600	4312 020 3447
	50	≈ 250	≈ 450	4312 020 4616
	150	≈ 110	≈ 200	4312 020 4508
	500	≈ 45	≈ 80	4312 020 4509
3C85	≈ 0	900 ± 25%	≈ 1600	4312 020 4510
	50	≈ 250	≈ 450	4312 020 4511
	150	≈ 110	≈ 200	4312 020 4512
	500	≈ 45	≈ 80	4312 020 4513
3F3	≈ 0	700 ± 25%	≈ 1300	4312 020 4556
	50	≈ 245	≈ 440	4312 020 4557
	150	≈ 110	≈ 200	4312 020 4558
	500	≈ 45	≈ 80	4312 020 4559
3C11	≈ 0	1200 ± 25%	≈ 2200	4312 020 4514

* measured in combination with an ungapped core half, clamping force 15 ± 5 N

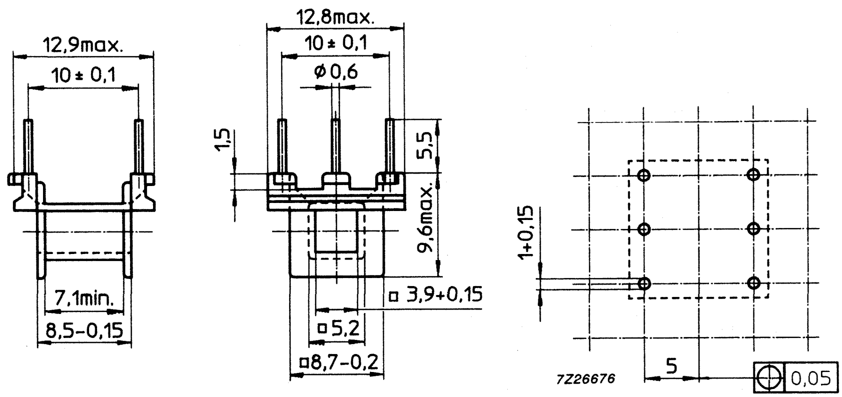
PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.1	-	-
3C85	≥ 320	≤ 0.06	≤ 0.07	-
3F3	≥ 320	-	≤ 0.05	≤ 0.07

E cores and accessories E13/7/4 (EF12.6)

COIL FORMER DATA

Coil former material:	polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-0
Pin material:	CuZn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	350 °C, 2 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	24 mm



Dimensions in mm

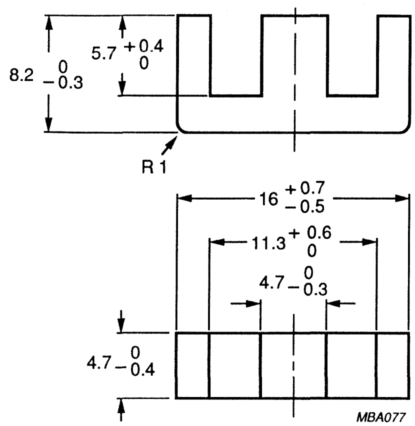
Fig.2 E13/7/4 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	6	all	11.6	7.2	4312 021 2620

E cores and accessories

E16/8/5 (EF16)



Dimensions in mm

Fig.1 E16/8/5 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.87	mm^{-1}
V_e	effective volume	754	mm^3
l_e	effective length	37.6	mm
A_e	effective area	20.1	mm^2
	mass of core half	≈ 2.3	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	1000 +30% −20%	≈ 1500	4312 020 3555
	50	≈ 350	≈ 520	4312 020 4516
	150	≈ 165	≈ 240	4312 020 4517
	500	≈ 70	≈ 100	4312 020 4518
3C85	≈ 0	1000 ± 25%	≈ 1500	4312 020 4519
	50	≈ 350	≈ 520	4312 020 4520
	150	≈ 165	≈ 240	4312 020 4521
	500	≈ 70	≈ 105	4312 020 4522
3F3	≈ 0	900 ± 25%	≈ 1300	4312 020 4560
	50	≈ 340	≈ 500	4312 020 4561
	150	≈ 165	≈ 240	4312 020 4562
	500	≈ 70	≈ 100	4312 020 4563
3C11	≈ 0	1800 ± 25%	≈ 2700	4312 020 4523

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.20	-	-
3C85	≥ 320	≤ 0.12	≤ 0.14	-
3F3	≥ 320	-	≤ 0.10	≤ 0.15

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-0

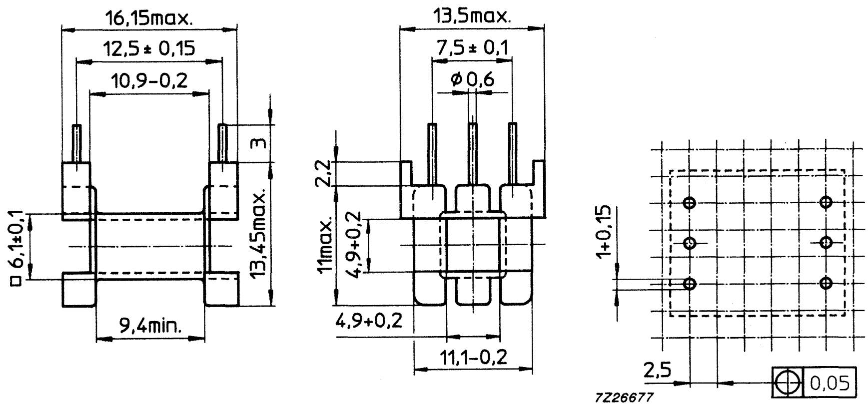
Pin material: CuZn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 350 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 33 mm



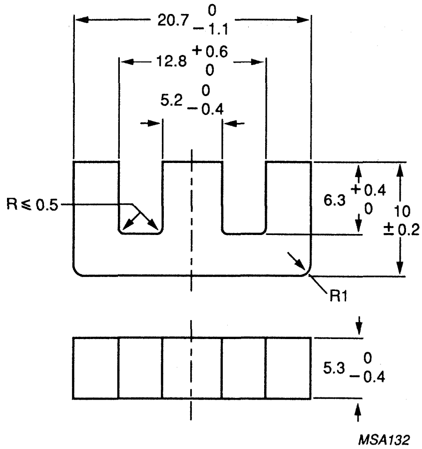
Dimensions in mm

Fig.2 E16/8/5 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	6	all	21.6	9.9	4312 021 2623

E cores and accessories E20/10/5



Dimensions in mm

Fig.1 E20/10/5 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.37	mm^{-1}
V_e	effective volume	1340	mm^3
l_e	effective length	42.8	mm
A_e	effective area	31.2	mm^2
A_{min}	minimum area	25.5	mm^2
	mass of core half	≈ 4	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	1300 ± 25%	≈ 1430	4312 020 3407
	50	≈ 460	≈ 510	4312 020 3536
	150	≈ 210	≈ 230	4312 020 3537
	500	≈ 85	≈ 100	4312 020 4538
3C85	≈ 0	1300 ± 25%	≈ 1430	4312 020 4539
	50	≈ 460	≈ 510	4312 020 4540
	150	≈ 210	≈ 230	4312 020 4541
	500	≈ 85	≈ 100	4312 020 4542
3F3	≈ 0	1150 ± 25%	≈ 1270	4312 020 4552
	50	≈ 450	≈ 510	4312 020 4578
	150	≈ 210	≈ 230	4312 020 4579
	500	≈ 85	≈ 100	4312 020 4580
3C11	≈ 0	2600 ± 25%	≈ 2850	4312 020 3597

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.50	-	-
3C85	≥ 320	≤ 0.25	≤ 0.27	-
3F3	≥ 320	-	≤ 0.15	≤ 0.25

E cores and accessories — E20/10/5

COIL FORMER DATA

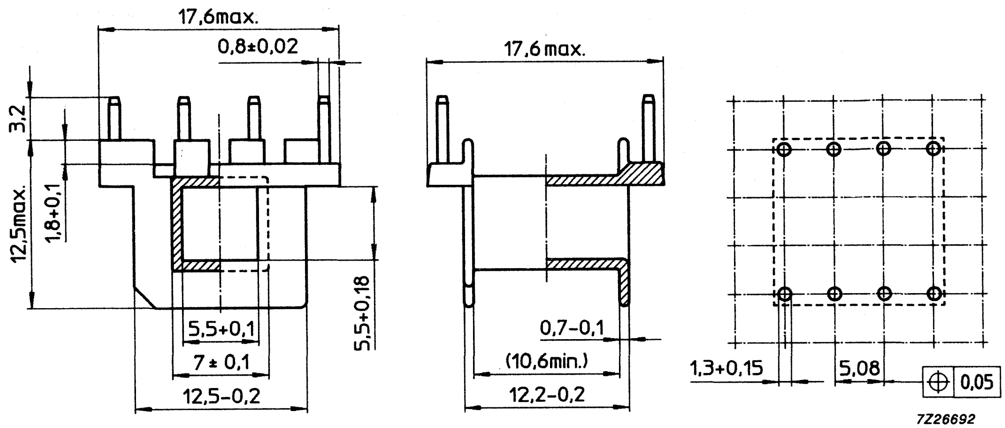
Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1



Dimensions in mm

Fig.2 E20/10/5 coil former.

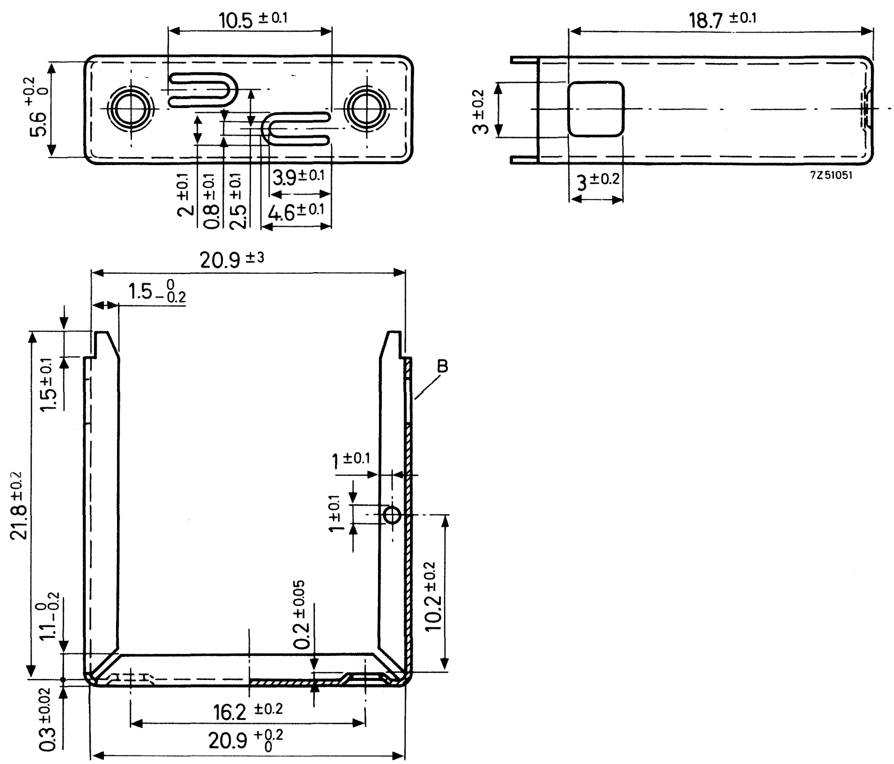
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	8	27	10.6	38	4322 021 2024

E cores and accessories | E20/10/5

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	3	4322 021 2016	material: brass Ni plated
spring	4	4322 021 2022	material: phosphor bronze, Ni plated

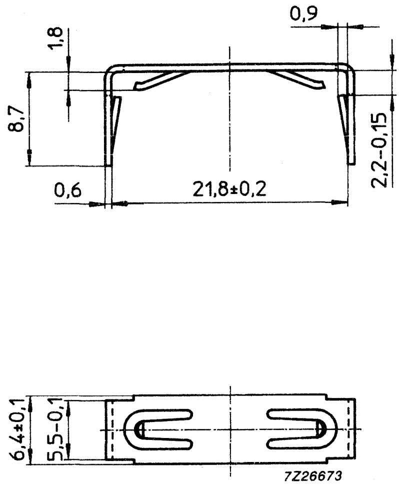


Dimensions in mm

Fig.3 Clasp.

E cores and accessories

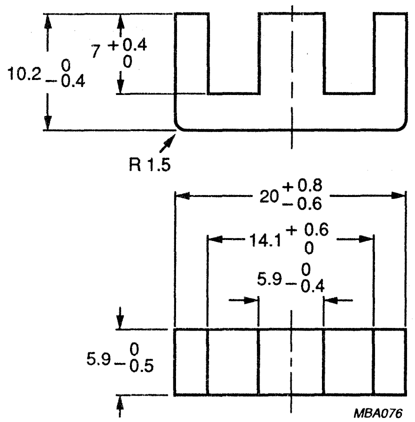
E20/10/5



Dimensions in mm

Fig.4 Spring.

E cores and accessories E20/10/6 (EF20)



Dimensions in mm

Fig.1 E20/10/6 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.34	mm^{-1}
V_e	effective volume	1500	mm^3
l_e	effective length	44.9	mm
A_e	effective area	33.5	mm^2
	mass of core half	≈ 3.7	g

CORE HALVES

GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C8	≈ 0	1350 ± 25%	≈ 1450	4312 020 3504
	50	≈ 540	≈ 580	4312 020 3550
	150	≈ 250	≈ 270	4312 020 3551
	500	≈ 100	≈ 110	4312 020 4524
3C85	≈ 0	1350 ± 25%	≈ 1450	4312 020 4525
	50	≈ 540	≈ 580	4312 020 4526
	150	≈ 250	≈ 270	4312 020 4527
	500	≈ 100	≈ 110	4312 020 4528
3F3	≈ 0	1200 ± 25%	≈ 1300	4312 020 4554
	50	≈ 520	≈ 550	4312 020 4565
	150	≈ 250	≈ 270	4312 020 4566
	500	≈ 100	≈ 110	4312 020 4567
3C11	≈ 0	2600 ± 25%	≈ 2770	4312 020 3556

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

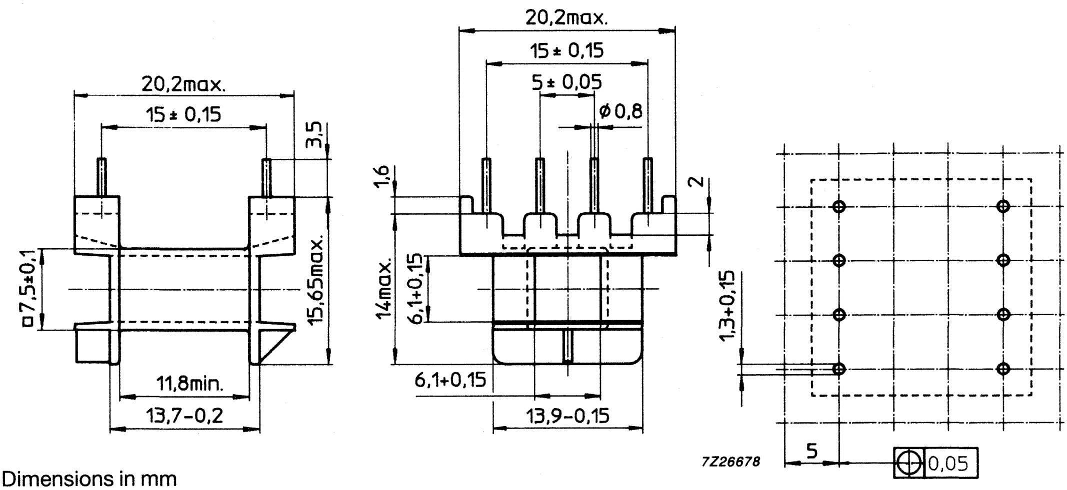
PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.40	-	-
3C85	≥ 320	≤ 0.24	≤ 0.27	-
3F3	≥ 320	-	≤ 0.20	≤ 0.30

E cores and accessories | E20/10/6 (EF20)

COIL FORMER DATA

Coil former material:	polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-0
Pin material:	CuZn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	350 °C, 2 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	39 mm



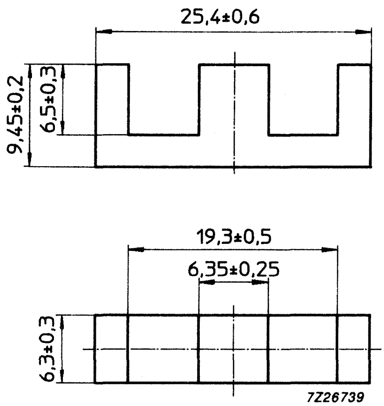
Dimensions in mm

Fig.2 E20/10/6 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	8	all	35	11.8	4312 021 2621

E cores and accessories E25/9/6



Dimensions in mm

Fig.1 E25/9/6 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	1860	mm^3
l_e	effective length	47.4	mm
A_e	effective area	38.4	mm^2
A_{min}	minimum area	37.0	mm^2
	mass of core half	≈ 4.8	g

CORE HALVES

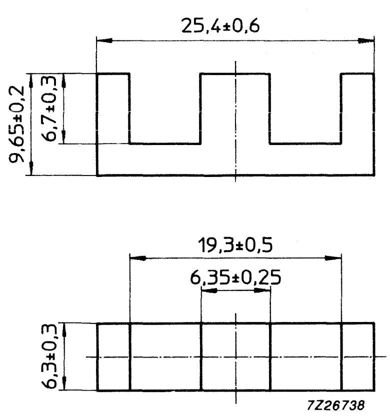
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	2000 ± 25%	≈ 1950	4312 020 4406
3E25	≈ 0	2900 ± 25%	≈ 2800	4312 020 4409

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 0.3	≤ 0.4	–

E cores and accessories E25/10/6



Dimensions in mm

Fig.1 E25/10/6 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	1.28	mm^{-1}
V_e	effective volume	1890	mm^3
l_e	effective length	49.2	mm
A_e	effective area	38.4	mm^2
A_{min}	minimum area	37.0	mm^2
	mass of core half	≈ 4.8	g

CORE HALVES

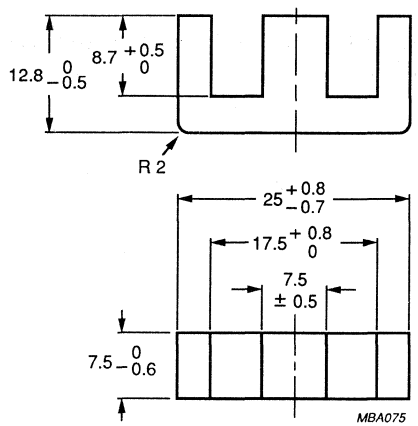
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	2000 ± 25%	≈ 2000	4312 020 4408
3E25	≈ 0	2900 ± 25%	≈ 2950	4312 020 4411

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 0.3	≤ 0.4	–

E cores and accessories | E25/13/7 (EF25)



Dimensions in mm

Fig.1 E25/13/7 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.09	mm^{-1}
V_e	effective volume	3020	mm^3
l_e	effective length	57.5	mm
A_e	effective area	52.5	mm^2
	mass of core half	≈ 8	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	$μ_e$	ORDERING CODE
3C80	≈ 0	2000 ± 25%	≈ 1750	4312 020 3402
	50	≈ 900	≈ 780	4312 020 3545
	150	≈ 410	≈ 360	4312 020 3546
	500	≈ 165	≈ 150	4312 020 4501
3C85	≈ 0	1900 ± 25%	≈ 1750	4312 020 4529
	50	≈ 900	≈ 780	4312 020 4530
	150	≈ 410	≈ 360	4312 020 4531
	500	≈ 165	≈ 150	4312 020 4532
3F3	≈ 0	1600 ± 25%	≈ 1400	4312 020 4555
	50	≈ 865	≈ 750	4312 020 4569
	150	≈ 400	≈ 350	4312 020 4570
	500	≈ 165	≈ 150	4312 020 4571
3C11	≈ 0	3100 ± 25%	≈ 2700	4312 020 4648

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.8	-	-
3C85	≥ 320	≤ 0.47	≤ 0.55	-
3F3	≥ 320	-	≤ 0.35	≤ 0.60

E cores and accessories E25/13/7 (EF25)

COIL FORMER DATA

Coil former material: polybutyleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

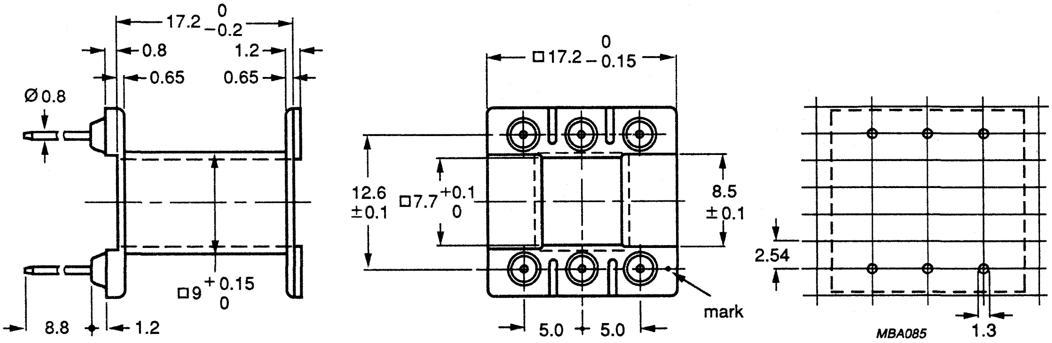
Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderabilty: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 49 mm



Dimensions in mm

Fig.2 E25/13/7 coil former, vertical mounting.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	6	all	56	15.7	4312 021 2625

E cores and accessories E25/13/7 (EF25)

COIL FORMER DATA

Coil former material: polybutyleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

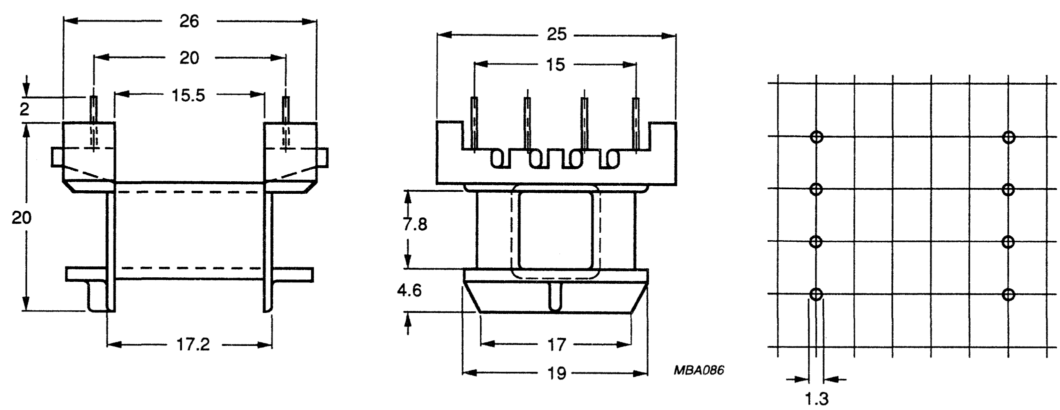
Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderabilty: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 49 mm



Dimensions in mm

Fig.3 E25/13/7 coil former, horizontal mounting.

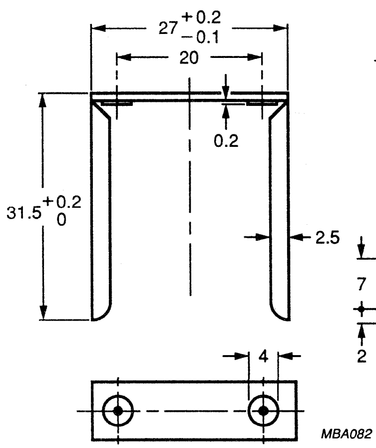
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	8	all	56	15.7	4312 021 2626

E cores and accessories E25/13/7 (EF25)

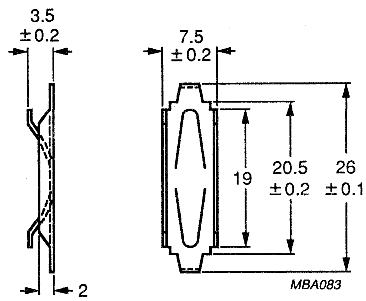
MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
Clasp	4	4312 021 2612	material: steel, Ni plated
Spring	5	4312 021 2619	material: stainless steel



Dimensions in mm

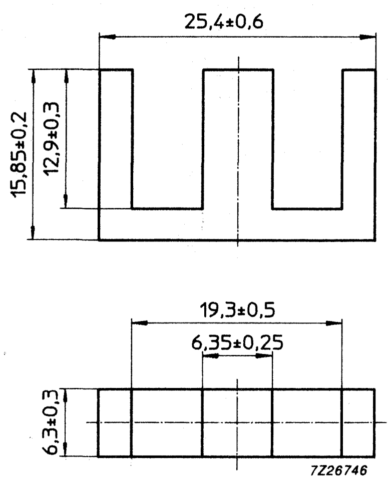
Fig.4 Clasp.



Dimensions in mm

Fig.5 Spring.

E cores and accessories E25/16/6



Dimensions in mm

Fig.1 E25/16/6 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	1.93	mm^{-1}
V_e	effective volume	2840	mm^3
l_e	effective length	74.0	mm
A_e	effective area	38.4	mm^2
A_{min}	minimum area	37.0	mm^2
	mass of core half	≈ 7.1	g

CORE HALVES

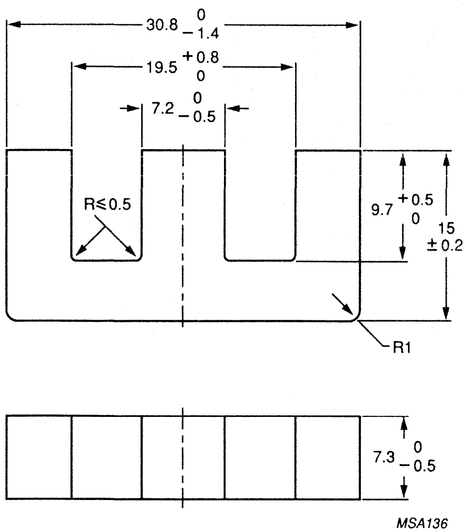
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	1400 ± 25%	≈ 2150	4312 020 4407
3E25	≈ 0	2200 ± 25%	≈ 3400	4312 020 4410

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 0.5	≤ 0.7	–

E cores and accessories E30/15/7



Dimensions in mm

Fig.1 E30/15/7 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.12	mm^{-1}
V_e	effective volume	4000	mm^3
l_e	effective length	67.0	mm
A_e	effective area	60.0	mm^2
A_{min}	minimum area	49.0	mm^2
	mass of core half	≈ 11	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	1900 ± 25%	≈ 1700	4312 020 3455
	100	≈ 480	≈ 430	4312 020 3533
	200	≈ 300	≈ 260	4312 020 3534
	500	≈ 150	≈ 140	4312 020 3480
	800	≈ 110	≈ 100	4312 020 3535
3C85	≈ 0	1900 ± 25%	≈ 1700	4312 020 4543
	100	≈ 480	≈ 430	4312 020 4544
	200	≈ 300	≈ 260	4312 020 4545
	500	≈ 150	≈ 140	4312 020 4546
	800	≈ 110	≈ 100	4312 020 4547
3F3	≈ 0	1600 ± 25%	≈ 1400	4312 020 4553
	100	≈ 470	≈ 420	4312 020 4564
	200	≈ 300	≈ 270	4312 020 4568
	500	≈ 150	≈ 140	4312 020 4577
	800	≈ 110	≈ 100	4312 020 4581
3C11	≈ 0	3300 ± 25%	≈ 2930	4312 020 4647

* measured in combination with an ungapped core half, clamping force 20 ± 10 N

E cores and accessories — E30/15/7

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 0.90	-	-
3C85	≥ 320	≤ 0.65	≤ 0.75	-
3F3	≥ 320	-	≤ 0.45	≤ 0.75

COIL FORMER DATA

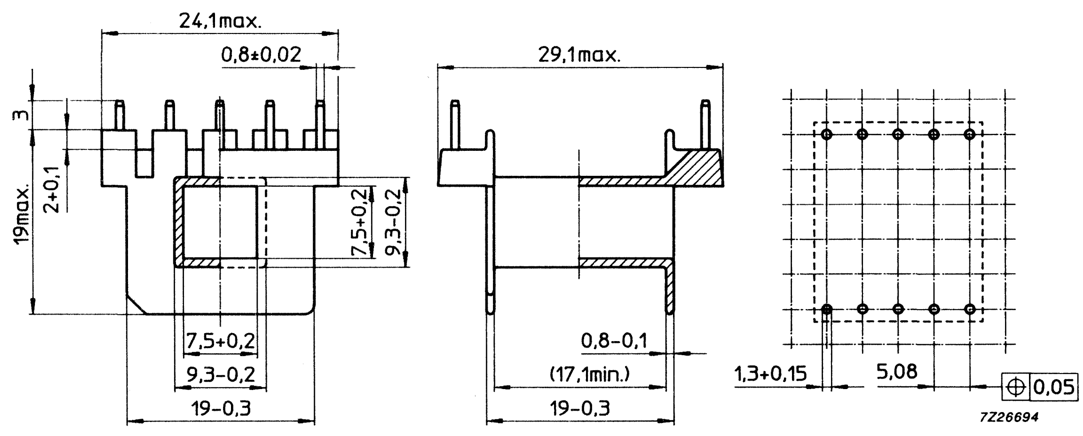
Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1



Dimensions in mm

Fig.2 E30/15/7 coil former with pins.

WINDING DATA

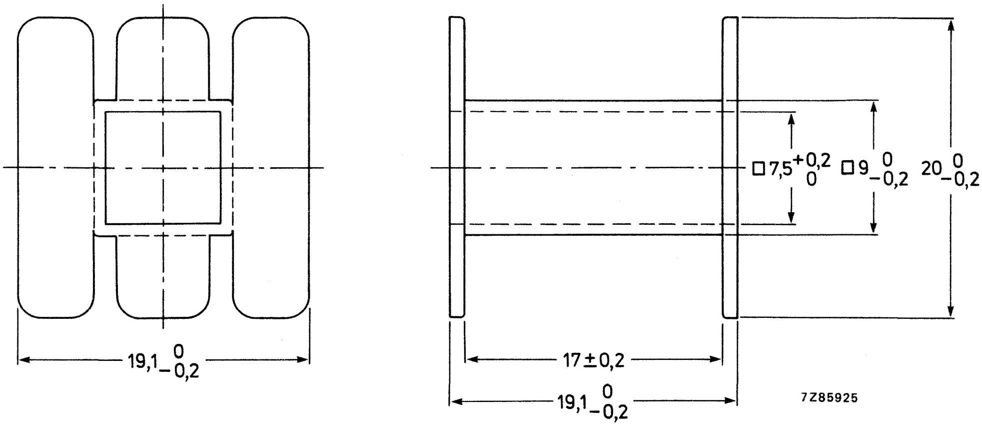
NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	10	80	17.1	56	4322 021 2025

E cores and accessories E30/15/7

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-HB

Maximum operating temperature: 130 °C



Dimensions in mm

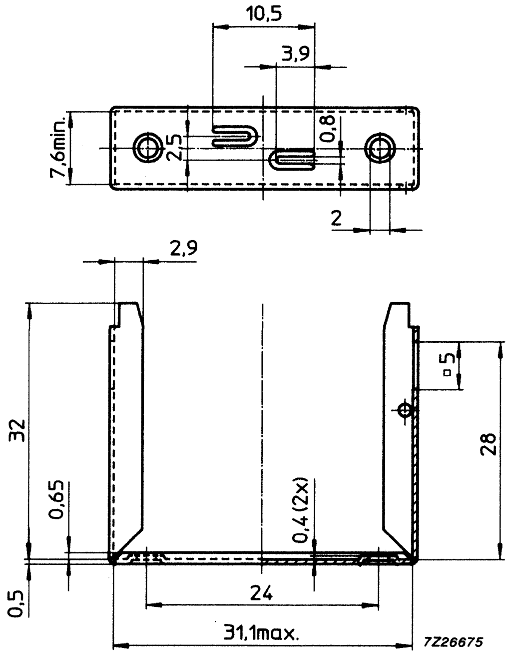
Fig.3 E30/15/7 coil former without pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	0	80	16.8	56	4312 021 2855

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	4	4322 021 2017	material: brass Ni plated
spring	5	4322 021 2023	material: CrNi steel



Dimensions in mm

Fig.4 Clasp.

E cores and accessories E30/15/7

Dimensions in mm

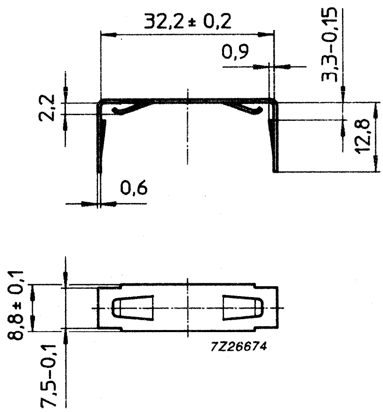
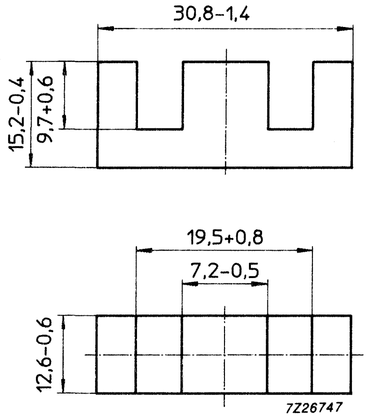


Fig.5 Spring.

E cores and accessories | E30/15/13



Dimensions in mm

Fig.1 E30/15/13 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	0.657	mm^{-1}
V_e	effective volume	6830	mm^3
l_e	effective length	67.0	mm
A_e	effective area	102	mm^2
A_{min}	minimum area	84.0	mm^2
	mass of core half	≈ 19	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	3000 ± 25%	≈ 1570	4312 020 4689

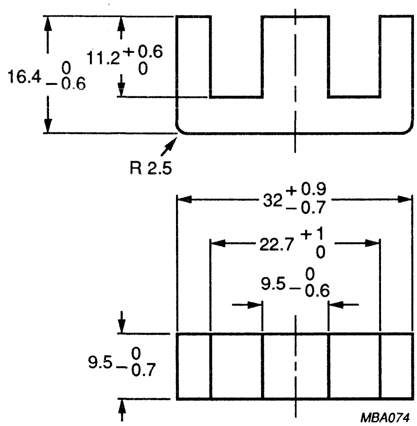
* measured in combination with an ungapped core half, clamping force 30 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 1.0	≤ 1.2	−

E cores and accessories

E32/16/9 (EF32)



Dimensions in mm

Fig.1 E32/16/9 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.894	mm^{-1}
V_e	effective volume	6180	mm^3
l_e	effective length	74	mm
A_e	effective area	83	mm^2
	mass of core half	≈ 17	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	2200 ± 25%	≈ 1560	4312 020 3540
	100	≈ 730	≈ 520	4312 020 3541
	200	≈ 460	≈ 320	4312 020 3542
	500	≈ 240	≈ 170	4312 020 3543
	800	≈ 170	≈ 120	4312 020 3544
3C85	≈ 0	2200 ± 25%	≈ 1560	4312 020 4533
	100	≈ 730	≈ 520	4312 020 4534
	200	≈ 460	≈ 320	4312 020 4535
	500	≈ 240	≈ 170	4312 020 4536
	800	≈ 170	≈ 120	4312 020 4537
3F3	≈ 0	2000 ± 25%	≈ 1400	4312 020 4572
	100	≈ 710	≈ 500	4312 020 4573
	200	≈ 450	≈ 320	4312 020 4574
	500	≈ 240	≈ 170	4312 020 4575
	800	≈ 170	≈ 120	4312 020 4576
3C11	≈ 0	4000 ± 25%	≈ 2850	4312 020 4649

* measured in combination with an ungapped core half, clamping force 30 ± 15 N

E cores and accessories E32/16/9 (EF32)

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	Pv (W) at f = 25 kHz; B̂ = 200 mT; T = 100 °C	Pv (W) at f = 100 kHz; B̂ = 100 mT; T = 100 °C	Pv (W) at f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 1.60	-	-
3C85	≥ 320	≤ 0.95	≤ 1.10	-
3F3	≥ 320	-	≤ 0.70	≤ 1.20

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-0

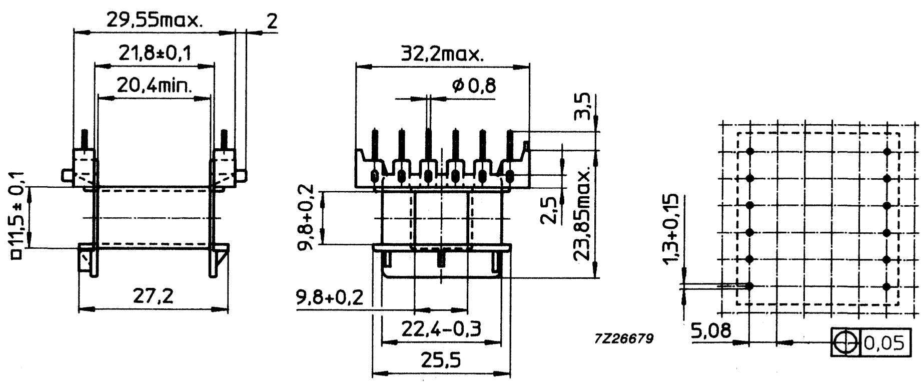
Pin material: CuZn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 350 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 60 mm



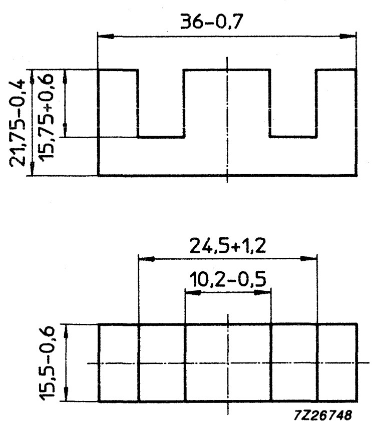
Dimensions in mm

Fig.2 E 32/16/9 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	12	all	97	20.5	4312 021 2622

E cores and accessories E36/21/15



Dimensions in mm

Fig.1 E36/21/15 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	0.608	mm^{-1}
V_e	effective volume	15200	mm^3
l_e	effective length	96.0	mm
A_e	effective area	158	mm^2
A_{min}	minimum area	151	mm^2
	mass of core half	≈ 34	g

CORE HALVES

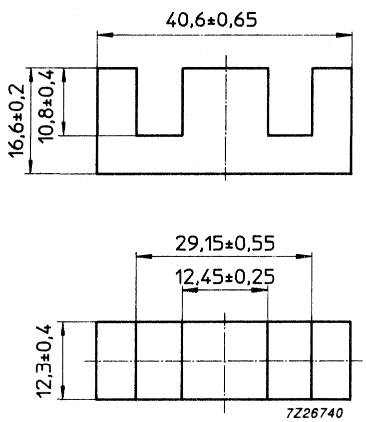
GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	3400 ± 25%	≈ 1650	3112 324 9101

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; B = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 2.1	≤ 2.5	–

E cores and accessories E41/17/12



Dimensions in mm

Fig.1 E41/17/12 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	0.517	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	77.0	mm
A_e	effective area	149	mm^2
A_{min}	minimum area	142	mm^2
	mass of core half	≈ 30	g

CORE HALVES

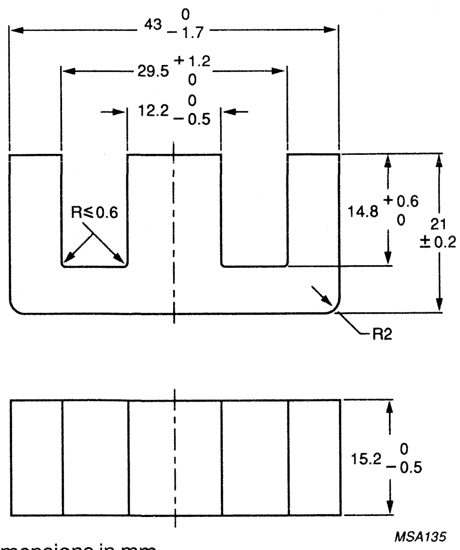
GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	5500 ± 25%	≈ 2250	4312 020 4404

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 330	≤ 2.5	–	–

E cores and accessories E42/21/15



Dimensions in mm

Fig.1 E42/21/15 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.534	mm^{-1}
V_e	effective volume	17600	mm^3
l_e	effective length	97.0	mm
A_e	effective area	182	mm^2
A_{min}	minimum area	175	mm^2
	mass of core half	≈ 44	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	3900 ± 25%	≈ 1660	4312 020 3411
	100	≈ 1400	≈ 600	4312 020 3529
	200	≈ 900	≈ 380	4312 020 3530
	500	≈ 490	≈ 210	4312 020 3528
	800	≈ 330	≈ 140	4312 020 3496
3C85	≈ 0	3900 ± 25%	≈ 1660	4312 020 3564
	100	≈ 1400	≈ 600	4312 020 4548
	200	≈ 900	≈ 380	4312 020 3581
	500	≈ 490	≈ 210	4312 020 4549
	800	≈ 330	≈ 140	4312 020 4600
3F3	≈ 0	3600 ± 25%	≈ 1530	4312 020 4550
	100	≈ 1350	≈ 580	4312 020 4582
	200	≈ 900	≈ 380	4312 020 4583
	500	≈ 490	≈ 210	4312 020 4584
	800	≈ 330	≈ 140	4312 020 4585
3C11	≈ 0	8000 ± 25%	≈ 3400	4312 020 3598

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

E cores and accessories | E42/21/15

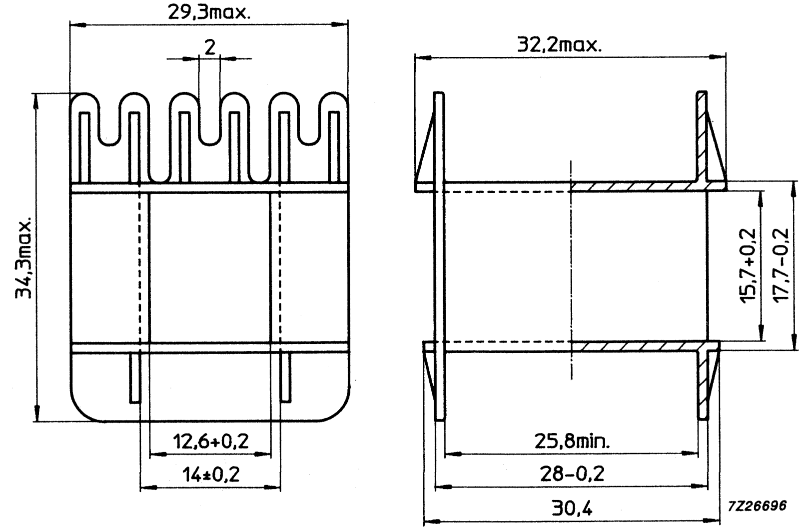
PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 4.0	-	-
3C85	≥ 320	≤ 2.8	≤ 3.2	-
3F3	≥ 320	-	≤ 2.0	≤ 3.8

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-HB

Maximum operating temperature: 130 °C



Dimensions in mm

Fig.2 E42/21/15 coil former, no pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	0	178	26	93	4312 021 2862

E cores and accessories E42/21/15

COIL FORMER DATA

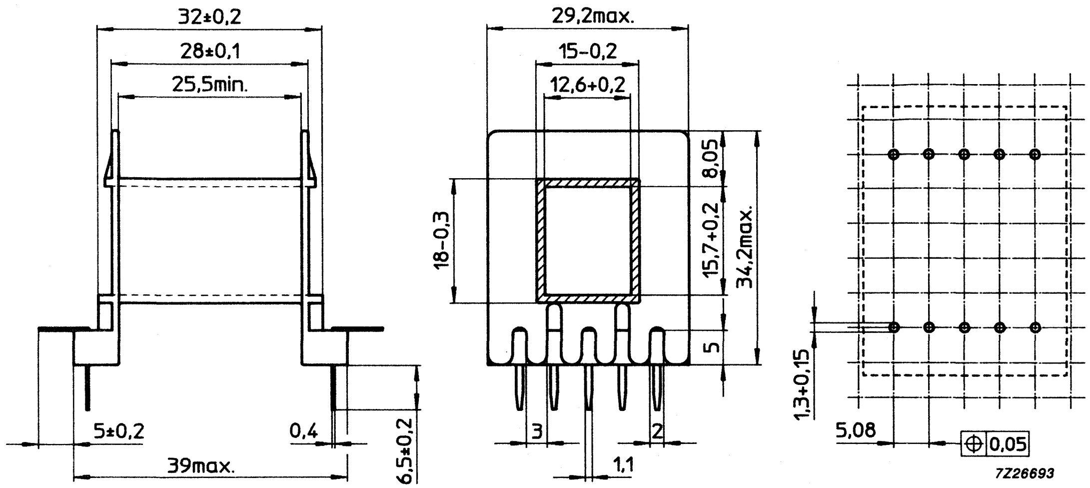
Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-HB

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1



Dimensions in mm

Fig.3 E42/21/15 coil former, 10 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	10	178	26	93	4322 021 3183

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	4	4322 021 3191	material: CrNi steel
spring	5	4322 021 3192	material: CrNi steel
bush	6	4322 021 3072	material: nickel plated brass
nut	7	4322 021 3071	material: nickel plated brass

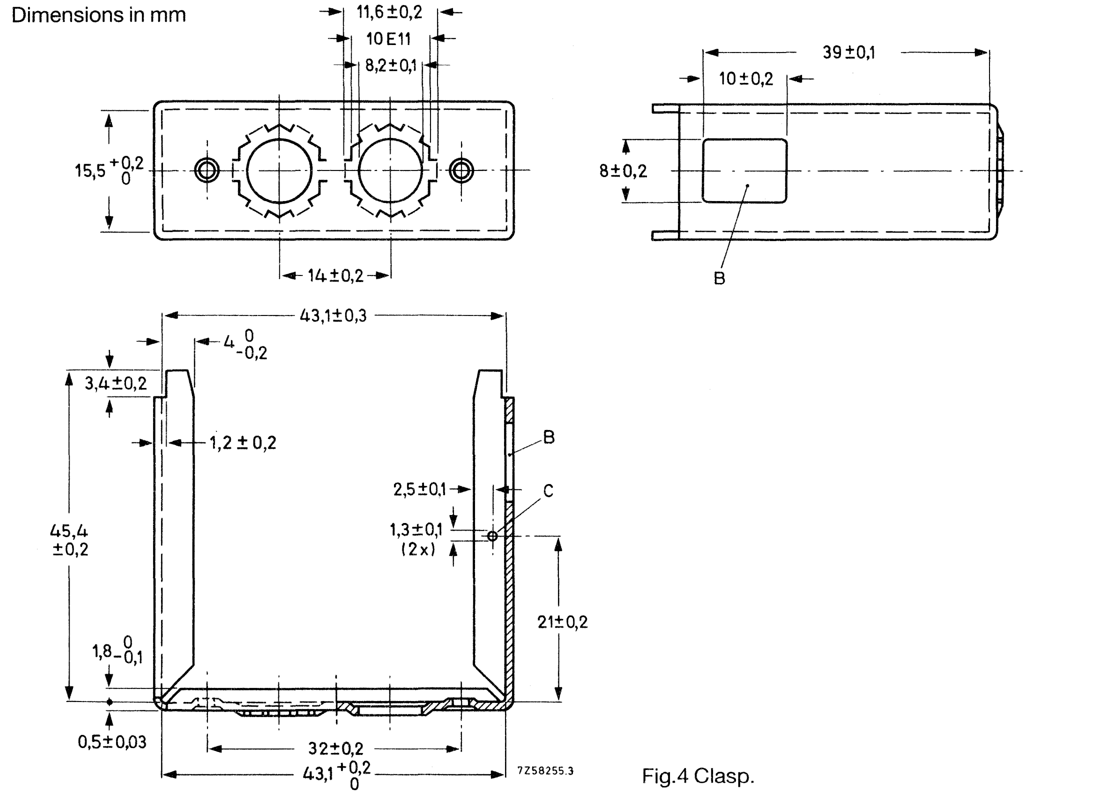


Fig.4 Clasp.

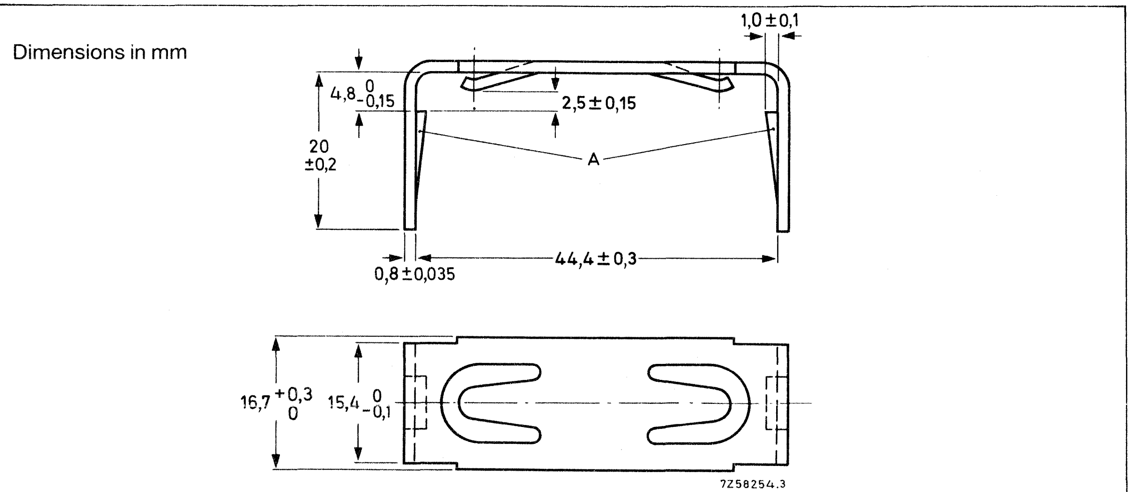


Fig.5 Spring.

E cores and accessories

E42/21/15

Dimensions in mm

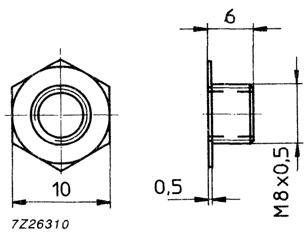


Fig.6 Bush.

Dimensions in mm

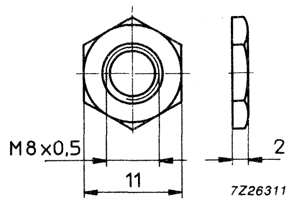


Fig.7 Nut.

E cores and accessories E42/21/20

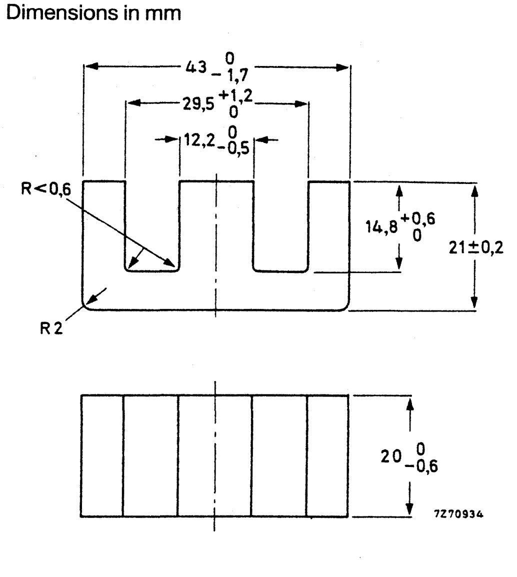


Fig.1 E42/21/20 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.415	mm^{-1}
V_e	effective volume	23100	mm^3
l_e	effective length	98.0	mm
A_e	effective area	236	mm^2
A_{min}	minimum area	236	mm^2
	mass of core half	≈ 56	g

CORE HALVES

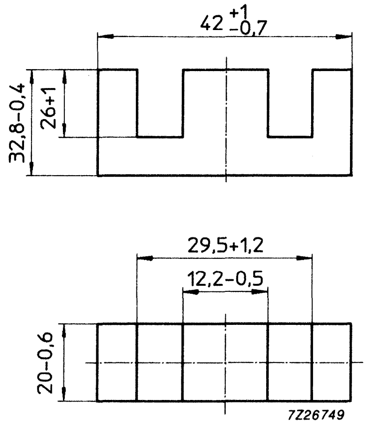
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	5000 ± 25%	≈ 1650	4312 020 3412
	100	≈ 1900	≈ 630	4312 020 3523
	200	≈ 1200	≈ 400	4312 020 3524
	500	≈ 650	≈ 210	4312 020 3525
	800	≈ 440	≈ 145	4312 020 3426
3C85	≈ 0	5000 ± 25%	≈ 1650	4312 020 3565
	100	≈ 1900	≈ 630	4312 020 4601
	200	≈ 1200	≈ 400	4312 020 4602
	500	≈ 650	≈ 210	4312 020 4603
	800	≈ 440	≈ 145	4312 020 4604
3F3	≈ 0	4600 ± 25%	≈ 1500	4312 020 4551
	100	≈ 1800	≈ 600	4312 020 4586
	200	≈ 1200	≈ 400	4312 020 4587
	500	≈ 650	≈ 210	4312 020 4588
	800	≈ 440	≈ 145	4312 020 4589

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

E cores and accessories E42/21/20

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 5.2	-	-
3C85	≥ 320	≤ 3.6	≤ 4.2	-
3F3	≥ 320	-	≤ 2.6	≤ 5.1



Dimensions in mm

Fig.1 E42/33/20 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	0.614	mm^{-1}
V_e	effective volume	34220	mm^3
l_e	effective length	145	mm
A_e	effective area	236	mm^2
A_{min}	minimum area	236	mm^2
	mass of core half	≈ 82	g

CORE HALVES

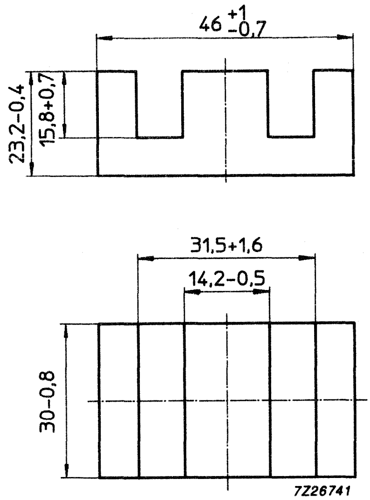
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	3600 ± 25%	≈ 1750	4312 020 3419
3C85	≈ 0	3600 ± 25%	≈ 1750	4312 020 4678
3F3	≈	3300 ± 25%	≈ 1600	4312 020 5100

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 7.5	–	–
3C85	≥ 330	≤ 4.8	≤ 6.0	–
3F3	≥ 320	–	≤ 3.8	≤ 7.0

E cores and accessories E46/23/30



Dimensions in mm

Fig.1 E46/23/30 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	0.255	mm^{-1}
V_e	effective volume	43260	mm^3
l_e	effective length	105	mm
A_e	effective area	412	mm^2
A_{min}	minimum area	385	mm^2
	mass of core half	≈ 109	g

CORE HALVES

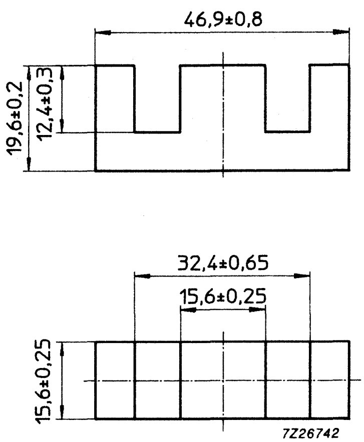
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	8300 ± 25%	≈ 1680	3112 324 9087
3C85	≈ 0	8300 ± 25%	≈ 1680	3112 324 9088

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; B = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 9.5	−	−
3C85	≥ 320	≤ 6.1	−	−

E cores and accessories E47/20/16



Dimensions in mm

Fig.1 E47/20/16 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	0.38	mm^{-1}
V_e	effective volume	20660	mm^3
l_e	effective length	88.6	mm
A_e	effective area	233	mm^2
A_{min}	minimum area	226	mm^2
	mass of core half	≈ 53	g

CORE HALVES

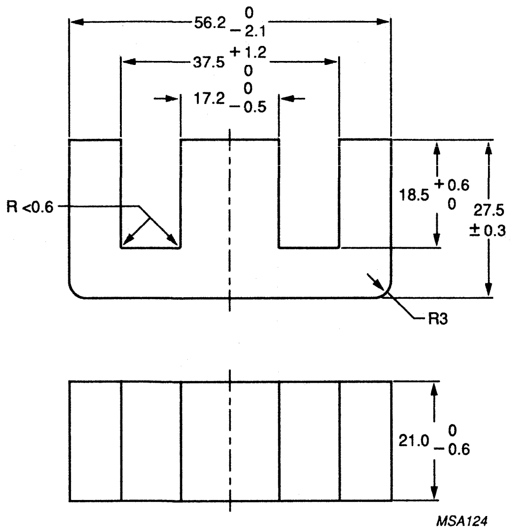
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	5400 ± 25%	≈ 1630	4312 020 4664
3C85	≈ 0	5400 ± 25%	≈ 1630	4312 020 4414

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 4.3	–	–
3C85	≥ 330	≤ 3.8	–	–

E cores and accessories E55/28/21



Dimensions in mm

Fig.1 E55/28/21 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.348	mm^{-1}
V_e	effective volume	43700	mm^3
l_e	effective length	123	mm
A_e	effective area	354	mm^2
A_{min}	minimum area	349	mm^2
	mass of core half	≈108	g

CORE HALVES

GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	6300 ± 25%	≈ 1750	4312 020 3410
	150	≈ 2100	≈ 580	4312 020 3518
	450	≈ 940	≈ 260	4312 020 3521
	1200	≈ 430	≈ 120	4312 020 3492
3C85	≈0	6300 ±25%	≈ 1750	4312 020 3591
	150	≈ 2100	≈ 580	4312 020 4605
	450	≈ 940	≈ 260	4312 020 4606
	1200	≈ 430	≈ 120	4312 020 4607
3F3	≈ 0	5700 ± 25%	≈ 1580	4312 020 4590
	150	≈ 2000	≈ 550	4312 020 4591
	450	≈ 940	≈ 260	4312 020 4592
	1200	≈ 430	≈ 120	4312 020 4593
3C11	≈ 0	12800 ± 25%	≈ 3500	4312 020 4504

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

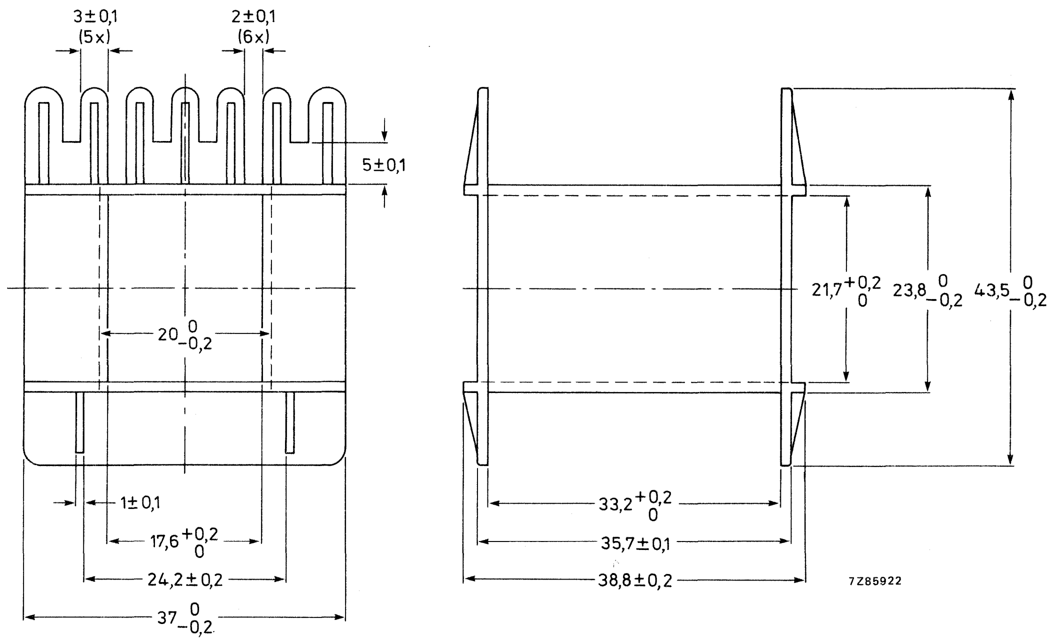
PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 10.0	-	-
3C85	≥ 320	≤ 6.7	≤ 7.8	-
3F3	≥ 320	-	≤ 4.8	≤ 10.4

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-HB

Maximum operating temperature: 130 °C



Dimensions in mm

Fig.2 E55/28/21 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm²)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	0	250	33.2	116	4312 021 2871

E cores and accessories | E55/28/21

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	3	4312 021 2609	material: steel, zinc plated
spring	4	4312 021 2613	material: steel, zinc plated

Dimensions in mm

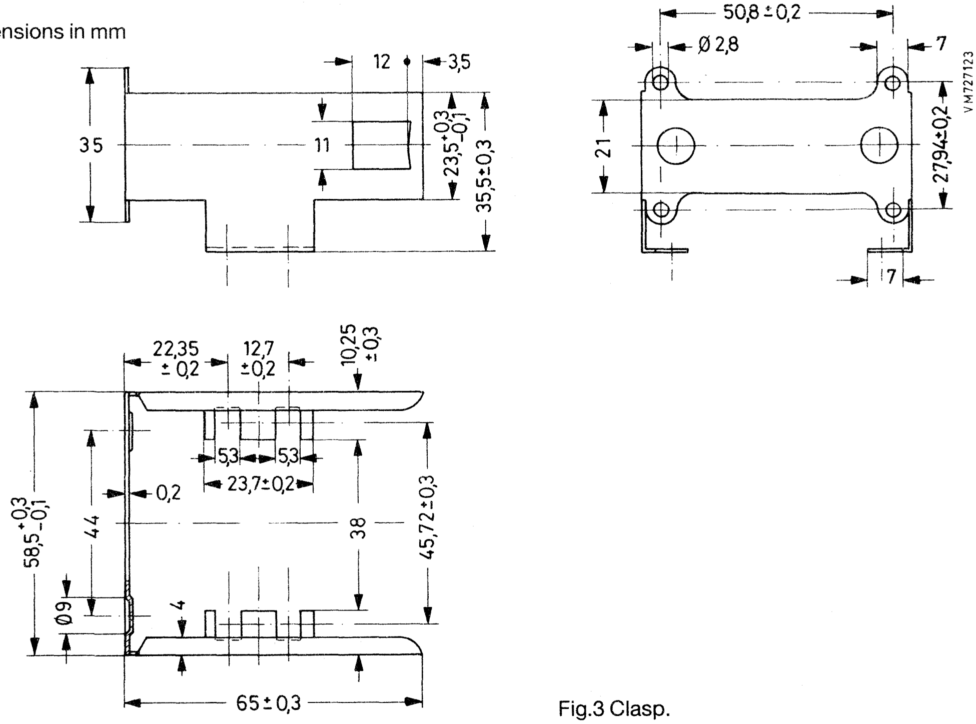


Fig.3 Clasp.

Dimensions in mm

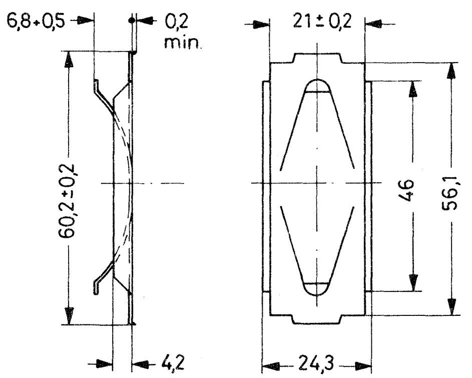
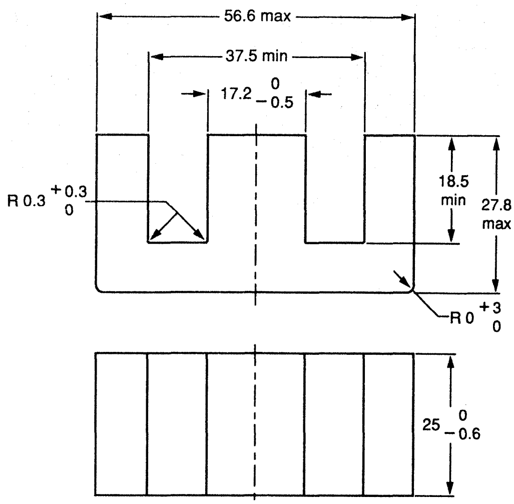


Fig.4 Spring.

E cores and accessories E55/28/25



Dimensions in mm

Fig.1 E55/28/25 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.293	mm^{-1}
V_e	effective volume	52000	mm^3
l_e	effective length	123	mm
A_e	effective area	420	mm^2
A_{min}	minimum area	420	mm^2
	mass of core half	≈ 130	g

CORE HALVES

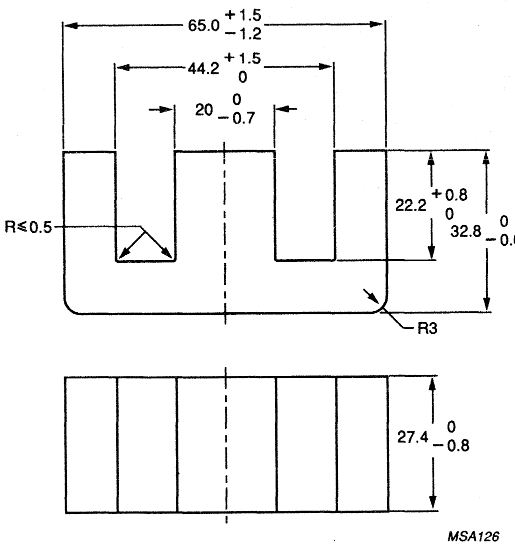
GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	7400 ± 25%	≈ 1700	4312 020 4515
	500	≈ 950	≈ 220	4312 020 4608
	1500	≈ 410	≈ 100	4312 020 4609
	2500	≈ 280	≈ 70	4312 020 4503
3C85	≈ 0	7400 ± 25%	≈ 1700	4312 020 3592
	500	≈ 950	≈ 220	4312 020 4610
	1500	≈ 410	≈ 100	4312 020 4611
3F3	≈ 0	6700 ± 25%	≈ 1540	4312 020 4599

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 11.5	-	-
3C85	≥ 320	≤ 6.8	≤ 9.6	-
3F3	≥ 320	—	≤ 5.7	≤ 13

E cores and accessories E65/32/27



Dimensions in mm

Fig.1 E65/32/27 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.275	mm^{-1}
V_e	effective volume	78200	mm^3
l_e	effective length	147	mm
A_e	effective area	532	mm^2
A_{min}	minimum area	538	mm^2
	mass of core half	≈ 200	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	8400 ± 25%	≈ 1850	4312 020 3438
	150	≈ 2900	≈ 630	4312 020 3512
	450	≈ 1300	≈ 280	4312 020 3515
	1250	≈ 600	≈ 130	4312 020 3587
3C85	≈ 0	8400 ± 25%	≈ 1850	4312 020 4612
	150	≈ 2900	≈ 630	4312 020 4613
	450	≈ 1300	≈ 280	4312 020 4614
	1250	≈ 600	≈ 130	4312 020 4615
3F3	≈ 0	7300 ± 25%	≈ 1600	4312 020 4594
	150	≈ 2800	≈ 610	4312 020 4595
	450	≈ 1300	≈ 280	4312 020 4596
	1250	≈ 600	≈ 130	4312 020 4597
3C11	≈ 0	16700 ± 25%	≈ 3650	4312 020 4505

* measured in combination with an ungapped core half, clamping force 60 ± 20 N

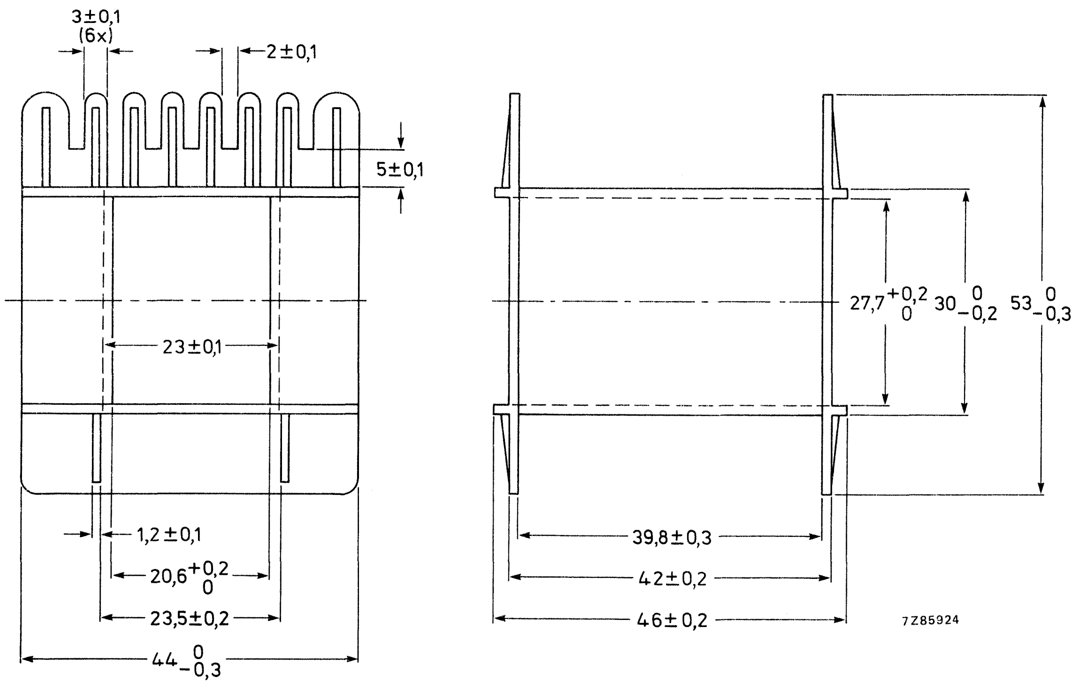
PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	Pv (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	Pv (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	Pv (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 17.0	-	-
3C85	≥ 320	≤ 12.0	≤ 14.0	-
3F3	≥ 320	-	≤ 8.8	≤ 21.5

COIL FORMER DATA

Coil former material: polyamide (PA6.6), glass reinforced, flame retardent in accordance with UL94V-HB

Maximum operating temperature: 130 °C



Dimensions in mm

Fig.2 E65/32/27 coil former.

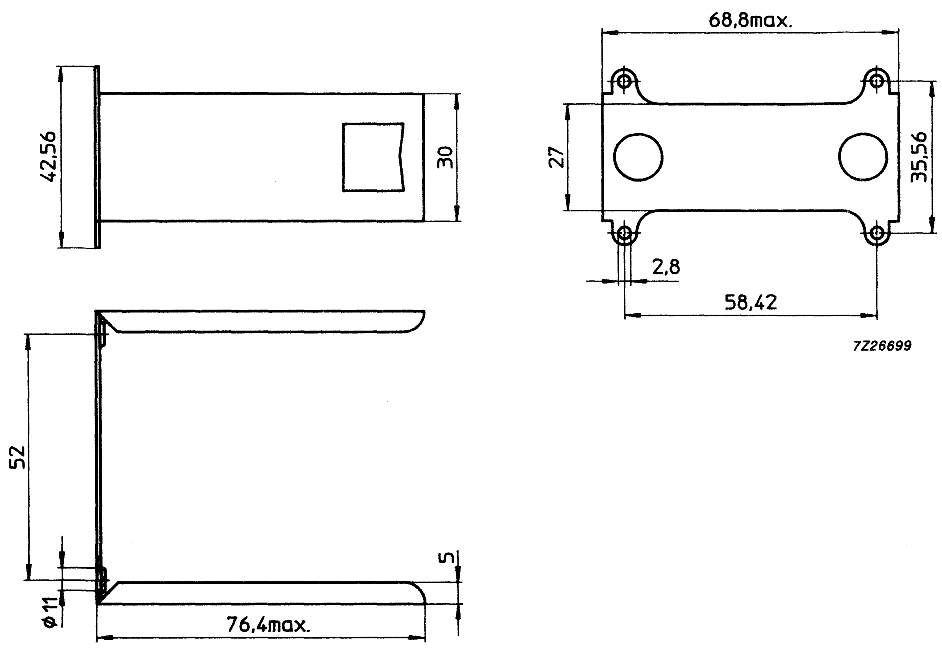
WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	0	394	39.5	150	4322 021 2872

E cores and accessories E65/32/27

MOUNTING PARTS

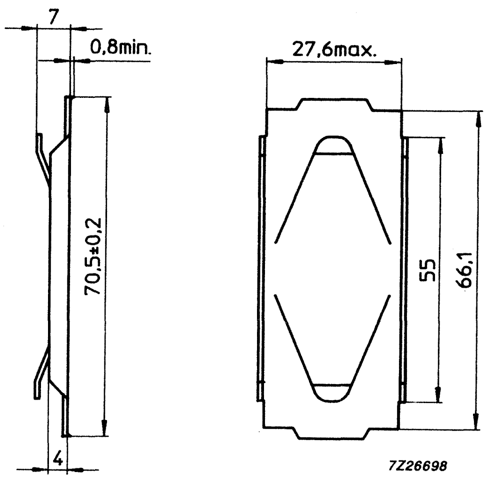
ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	3	4312 021 2611	material: steel, zinc plated
spring	4	4312 021 2614	material: steel, zinc plated



Dimensions in mm

Fig.3 Clasp.

E cores and accessories E65/32/27



Dimensions in mm

Fig.4 Spring.

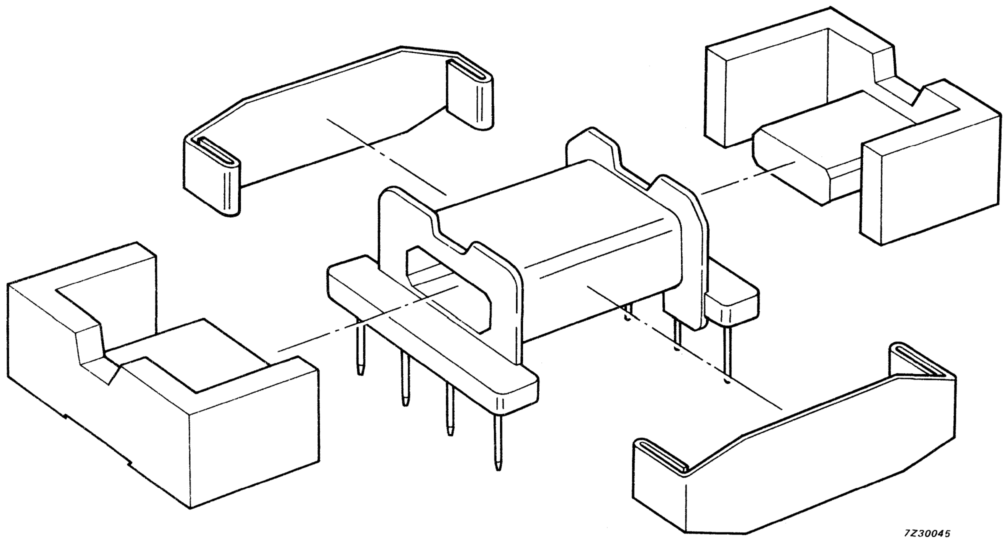
EFD CORES AND ACCESSORIES

Philips Components

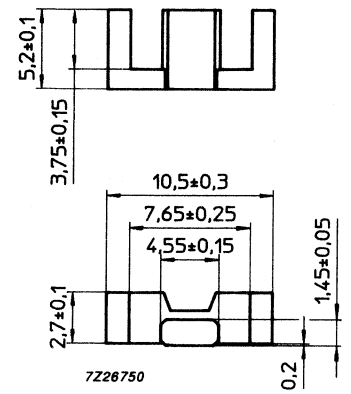
Data sheet	
status	Product specification
date of issue	December 1992

EFD10 to EFD30

EFD cores and accessories



EFD cores and accessories EFD10



Dimensions in mm

Fig.1 EFD10 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	3.3	mm^{-1}
V_e	effective volume	171	mm^3
l_e	effective length	23.7	mm
A_e	effective area	7.2	mm^2
A_{min}	minimum area	6.5	mm^2
	mass of core set	≈ 0.9	g

CORE HALVES

GRADE	A_L*	μ_e	AIRGAP (μm)	ORDERING CODE
3F3	500 ± 25%	≈ 1290	≈ 0	4322 020 5264
3F4	280 ± 25%	≈ 730	≈ 0	4322 020 5265

* measured in combination with an ungapped core half, clamping force 10 ± 5 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	P_V (W) at f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	P_V (W) at f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3F3	≥ 315	≤ 0.02	≤ 0.035	–	–
3F4	≥ 250	–	–	≤ 0.05	≤ 0.055

COIL FORMER DATA

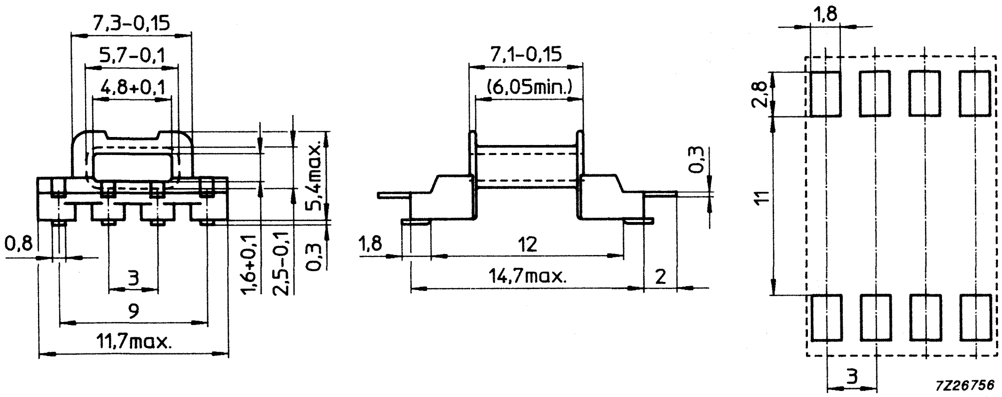
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 14.8 mm



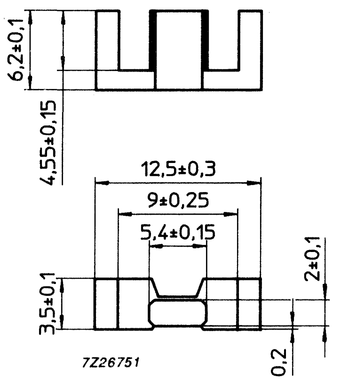
Dimensions in mm

Fig.2 EFD10 coil former (SMD).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	4.2	6.05	4322 021 0056

EFD cores and accessories EFD12



Dimensions in mm

Fig.1 EFD12 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	2.5	mm^{-1}
V_e	effective volume	325	mm^3
l_e	effective length	28.5	mm
A_e	effective area	11.4	mm^2
A_{min}	minimum area	10.7	mm^2
	mass of core set	≈ 1.7	g

CORE HALVES

GRADE	A_L*	μ_e	AIRGAP (μm)	ORDERING CODE
3F3	700 ± 25%	≈ 1370	≈ 0	4322 020 5266
3F4	380 ± 25%	≈ 760	≈ 0	4322 020 5267

* measured in combination with an ungapped core half, clamping force 15 ± 5 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	P_V (W) at f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	P_V (W) at f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3F3	≥ 315	≤ 0.04	≤ 0.065	–	–
3F4	≥ 250	–	–	≤ 0.1	≤ 0.11

COIL FORMER DATA

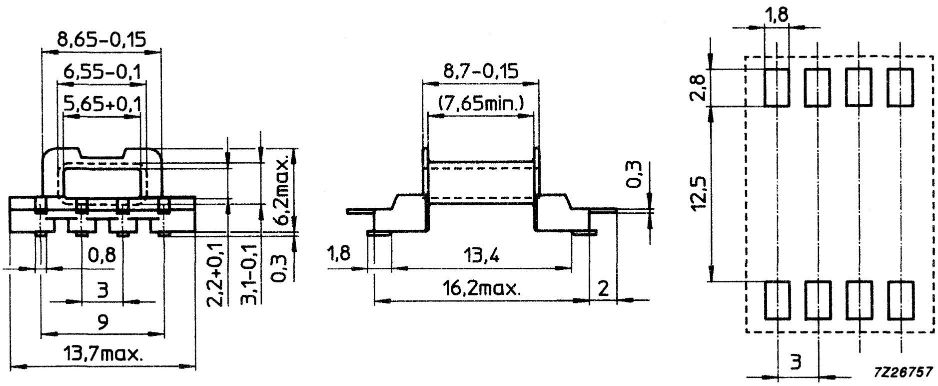
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 18.6 mm



Dimensions in mm

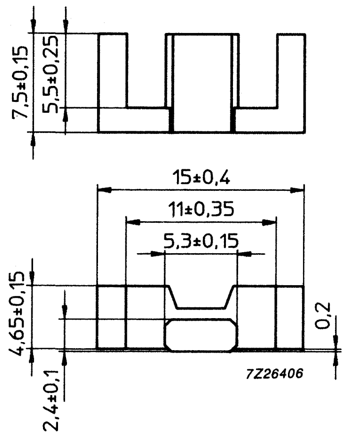
Fig.2 EFD12 coil former (SMD).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	6.5	7.65	4322 021 0057

EFD cores and accessories

EFD15



Dimensions in mm

Fig.1 EFD15 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	2.27	mm^{-1}
V_e	effective volume	510	mm^3
l_e	effective length	34.0	mm
A_e	effective area	15.0	mm^2
A_{min}	minimum area	12.2	mm^2
	mass of set	≈ 2.8	g

CORE HALVES

GRADE	A_L*	μ_e	AIRGAP (µm)	ORDERING CODE
3F3	700 ± 25%	≈ 1250	≈ 0	4312 020 4100
3F4	400 ± 25%	≈ 700	≈ 0	4312 020 4141

* measured in combination with an ungapped core half, clamping force 20 ± 5 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥ 315	–	≤ 0.06	≤ 0.10

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

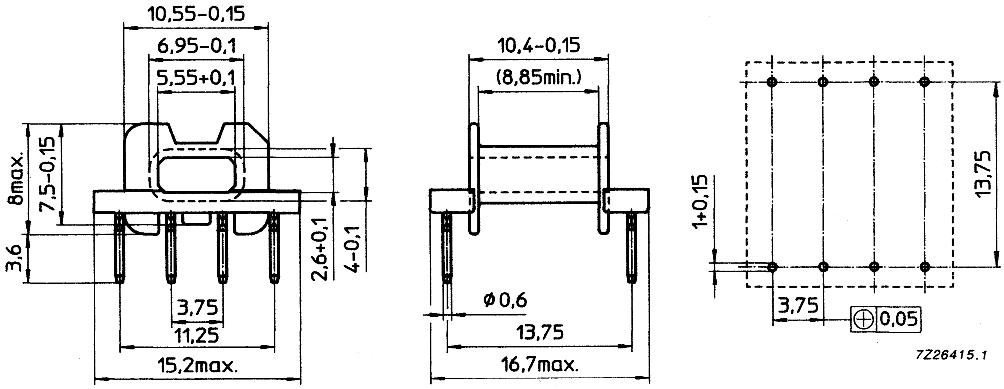
Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 26.3 mm



Dimensions in mm

Fig.2 EFD15 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	14.8	8.85	4322 021 3520

COIL FORMER DATA

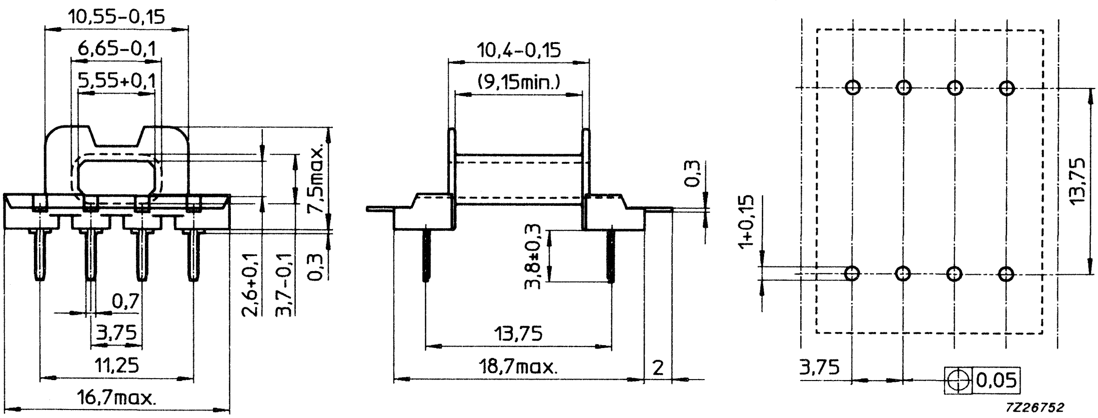
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 25.6 mm



Dimensions in mm

Fig.3 EFD15 coil former (PCB).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	16.7	9.15	4322 021 0025

COIL FORMER DATA

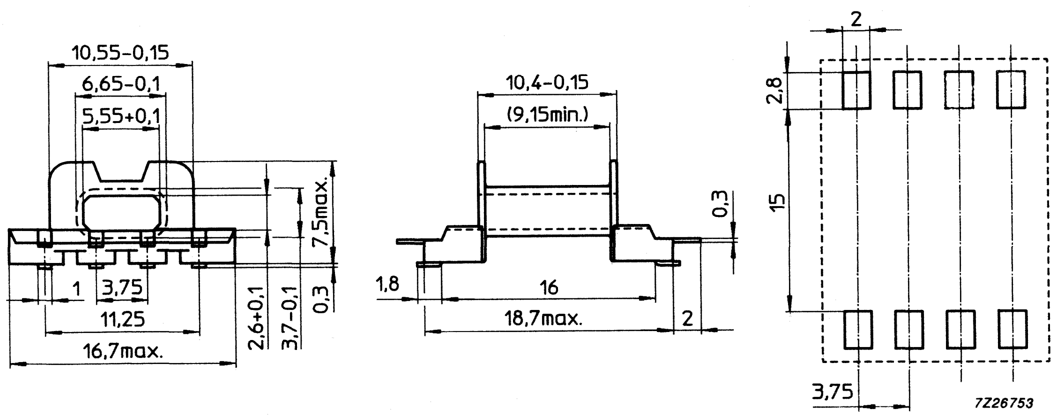
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 25.6 mm



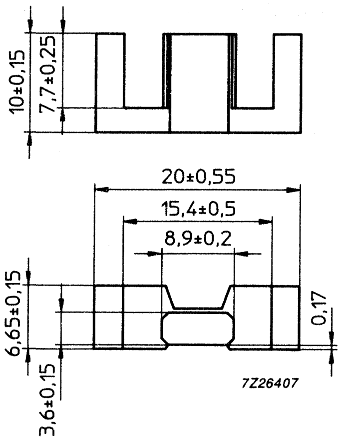
Dimensions in mm

Fig.4 EFD15 coil former (SMD).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	16.7	9.15	4322 021 0004

FOR MOUNTING INFORMATION REFER TO PAGE 556.



Dimensions in mm

Fig.1 EFD20 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	1.52	mm^{-1}
V_e	effective volume	1460	mm^3
l_e	effective length	47.0	mm
A_e	effective area	31.0	mm^2
A_{min}	minimum area	31.0	mm^2
	mass of set	≈ 7	g

CORE HALVES

GRADE	A_L*	μ_e	AIRGAP (µm)	ORDERING CODE
3F3	1150 ± 25%	≈ 1400	≈ 0	4312 020 4108
3F4	580 ± 25%	≈ 700	≈ 0	4312 020 4146

* measured in combination with an ungapped core half, clamping force 40 ± 10 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥ 315	–	≤ 0.17	≤ 0.28

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

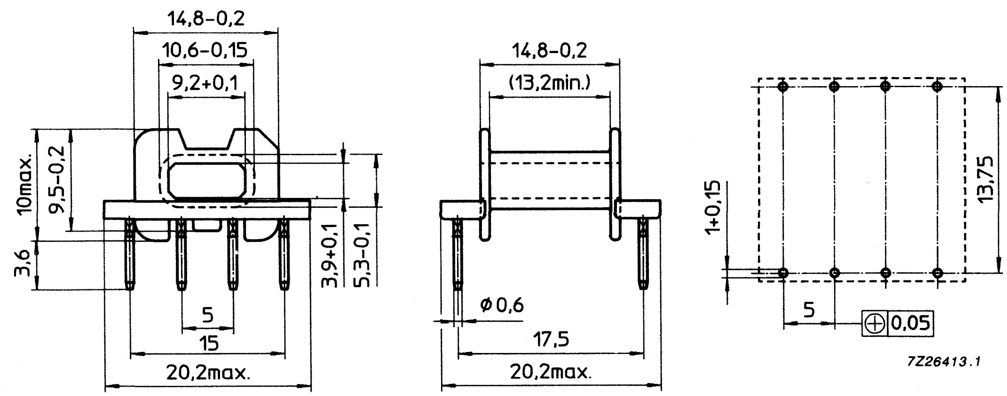
Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 36.5 mm



Dimensions in mm

Fig.2 EFD20 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	8	all	26.4	13.2	4322 021 3522

COIL FORMER DATA

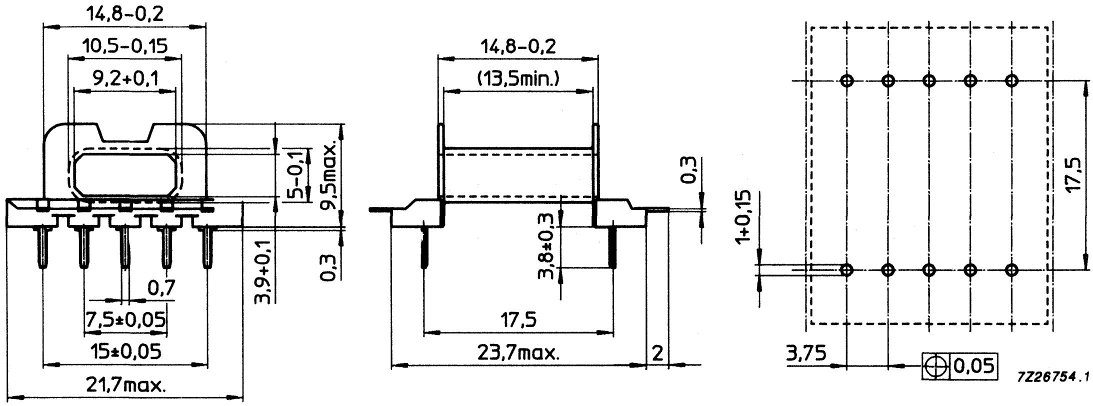
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 35.9 mm



Dimensions in mm

Fig.3 EFD20 coil former (PCB).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	10	all	29.0	13.5	4322 021 0026

COIL FORMER DATA

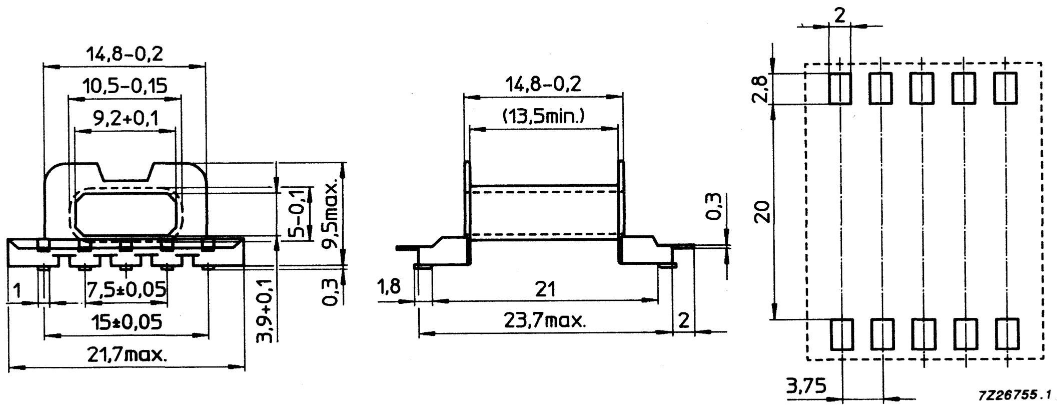
Coil former material: Liquid crystal polymer (LCP), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 35.9 mm



Dimensions in mm

Fig.4 EFD20 coil former (SMD).

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm²)	WINDING WIDTH (mm)	ORDERING CODE
1	10	all	29.0	13.5	4322 021 0007

FOR MOUNTING INFORMATION REFER TO PAGE 557.

EFD cores and accessories EFD25

Dimensions in mm

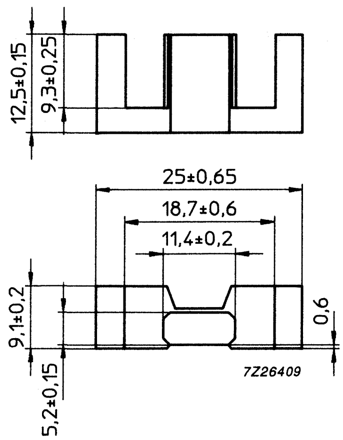


Fig.1 EFD25 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.00	mm^{-1}
V_e	effective volume	3300	mm^3
l_e	effective length	57.0	mm
A_e	effective area	58.0	mm^2
A_{min}	minimum area	57.0	mm^2
	mass of set	≈ 16	g

CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C85	2000 ± 25%	≈ 1600	≈ 0	4312 020 4120
3F3	1800 ± 25%	≈ 1450	≈ 0	4312 020 4116

* measured in combination with an ungapped core half, clamping force 70 ± 15 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 315	≤ 0.52	≤ 0.60	–
3F3	≥ 315	–	≤ 0.38	≤ 0.64

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 46.4 mm

Dimensions in mm

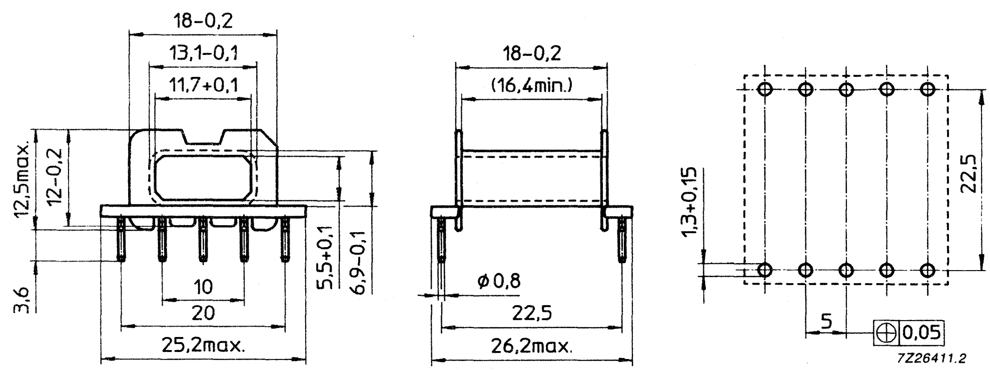


Fig.2 EFD25 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	10	all	40.2	16.4	4322 021 3524

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3516	clamping force ≈ 30 N each

Dimensions in mm

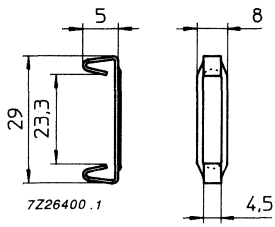


Fig.3 Mounting clip.

EFD cores and accessories

EFD30

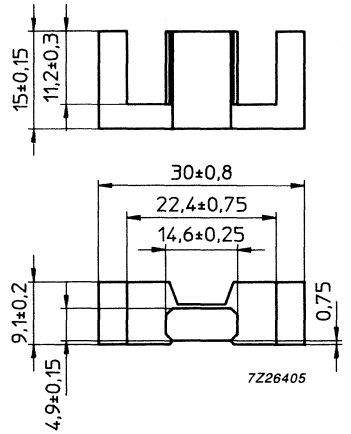


Fig.1 EFD30 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.98	mm^{-1}
V_e	effective volume	4700	mm^3
l_e	effective length	68.0	mm
A_e	effective area	69.0	mm^2
A_{min}	minimum area	69.0	mm^2
	mass of set	≈ 24	g

CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C85	2100 ± 25%	≈ 1650	≈ 0	4312 020 4128
3F3	1900 ± 25%	≈ 1500	≈ 0	4312 020 4124

* measured in combination with an ungapped core half, clamping force 90 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 315	≤ 0.74	≤ 0.86	–
3F3	≥ 315	–	≤ 0.54	≤ 0.91

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0
Pin material: CuSn, SnPb plated
Maximum operating temperature: 180 °C
Resistance to soldering heat: 430 °C, 2 s
Solderability: IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn: 52.9 mm

Dimensions in mm

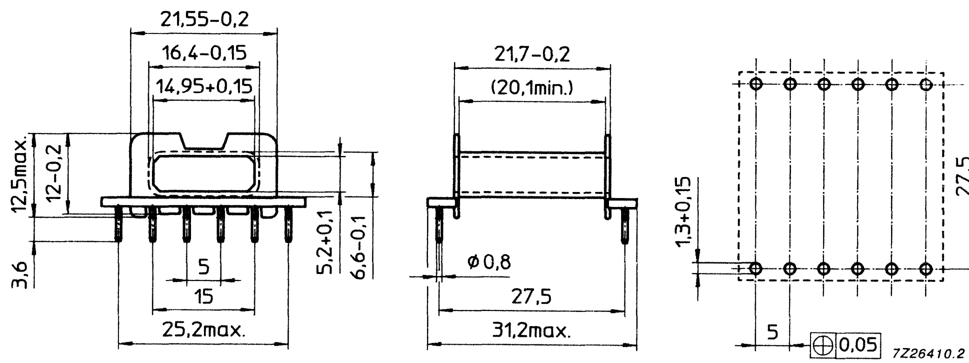


Fig.2 EFD30 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	ORDERING CODE
1	12	all	52.3	20.1	4322 021 3525

EFD cores and accessories EFD30

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3517	clamping force ≈ 35 N each

Dimensions in mm

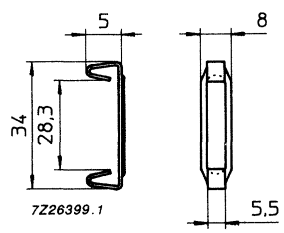


Fig.3 Mounting clip.

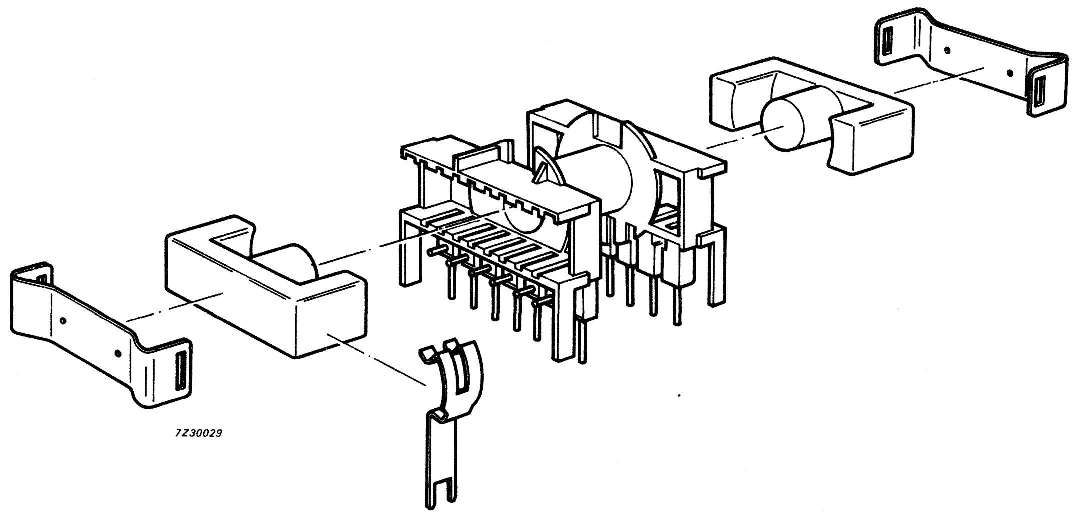
ETD CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

ETD29 to ETD59

ETD cores and accessories



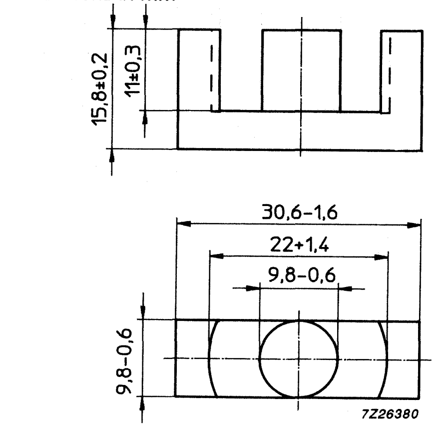


Fig.1 ETD29 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.947	mm^{-1}
V_e	effective volume	5470	mm^3
l_e	effective length	72	mm
A_e	effective area	76	mm^2
A_{min}	minimum area	71	mm^2
	mass of core half	≈ 14	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C85	≈ 0	2100 ± 25%	≈ 1580	4312 020 3750
	50	≈ 1000	≈ 750	4312 020 3751
	150	≈ 490	≈ 370	4312 020 3752
	350	≈ 260	≈ 200	4312 020 3754
	1000	≈ 120	≈ 90	4312 020 3769
3F3	≈ 0	1900 ± 25%	≈ 1430	4312 020 3800
	50	≈ 960	≈ 720	4312 020 3805
	150	≈ 470	≈ 350	4312 020 3806
	350	≈ 260	≈ 200	4312 020 3807
	1000	≈ 120	≈ 90	4312 020 3808
3C11	≈ 0	4200 ± 25%	≈ 3150	4312 020 3789

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

ETD cores and accessories ETD29

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.8	≤ 1.0	–
3F3	≥ 320	–	≤ 0.60	≤ 1.0

ETD cores and accessories ETD29

COIL FORMER DATA

Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

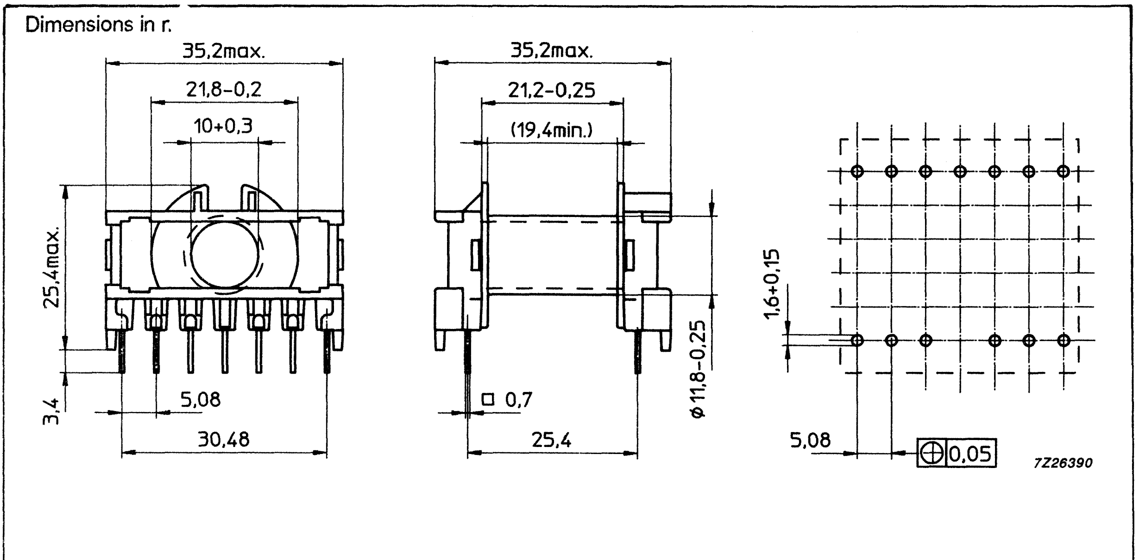


Fig.2 ETD29 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm²)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	13	90	19.4	53	4322 021 3438

ETD cores and accessories ETD29

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3437	stainless steel

Dimensions in mm

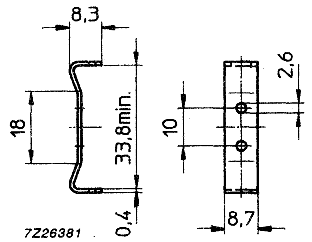


Fig.3 Mounting clip.

ETD cores and accessories ETD34

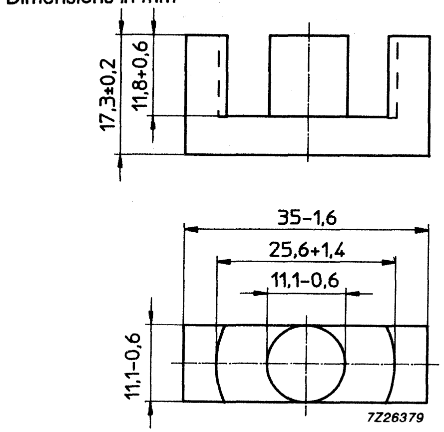


Fig.1 ETD34 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.810	mm^{-1}
V_e	effective volume	7640	mm^3
l_e	effective length	78.6	mm
A_e	effective area	97.1	mm^2
A_{min}	minimum area	91.6	mm^2
	mass of core half	≈ 20	g

CORE HALVES

GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	2500 ± 25%	≈ 1600	4312 020 3700
	100	≈ 800	≈ 520	4312 020 3701
	200	≈ 530	≈ 340	4312 020 3702
	500	≈ 230	≈ 150	4312 020 3703
	800	≈ 170	≈ 110	4312 020 3766
3C85	≈ 0	2500 ± 25%	≈ 1600	4312 020 3720
	100	≈ 800	≈ 520	4312 020 3721
	200	≈ 530	≈ 340	4312 020 3722
	500	≈ 230	≈ 150	4312 020 3723
	800	≈ 170	≈ 110	4312 020 3724
3F3	≈ 0	2300 ± 25%	≈ 1480	4312 020 3801
	100	≈ 780	≈ 500	4312 020 3809
	200	≈ 520	≈ 330	4312 020 3810
	500	≈ 230	≈ 150	4312 020 3811
	800	≈ 170	≈ 110	4312 0 20 3812

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

ETD cores and accessories ETD34

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 1.6	–	–
3C85	≥ 320	≤ 1.1	≤ 1.3	–
3F3	≥ 320	–	≤ 0.85	≤ 1.5

ETD cores and accessories ETD34

COIL FORMER DATA

Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Dimensions in mm

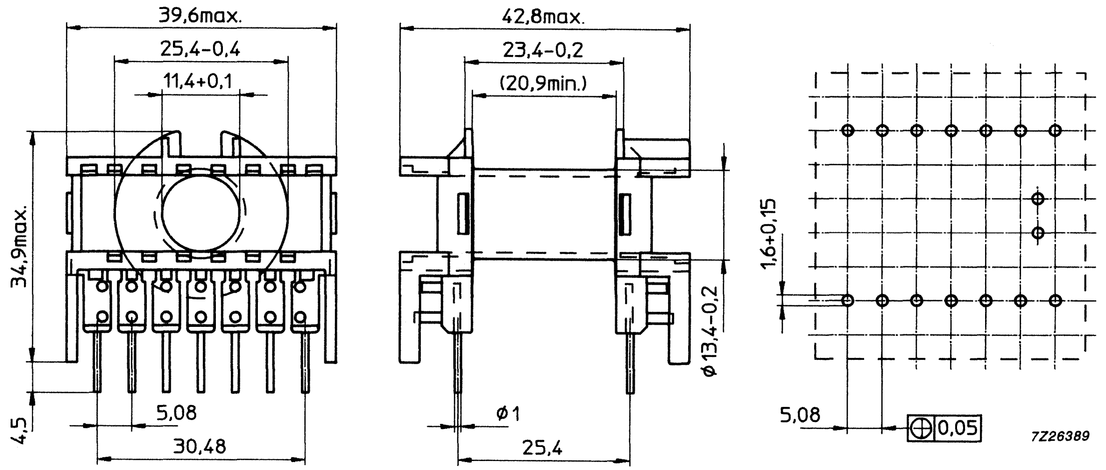


Fig.2 ETD34 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	14	123	20.9	60	4322 021 3385

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Dimensions in mm

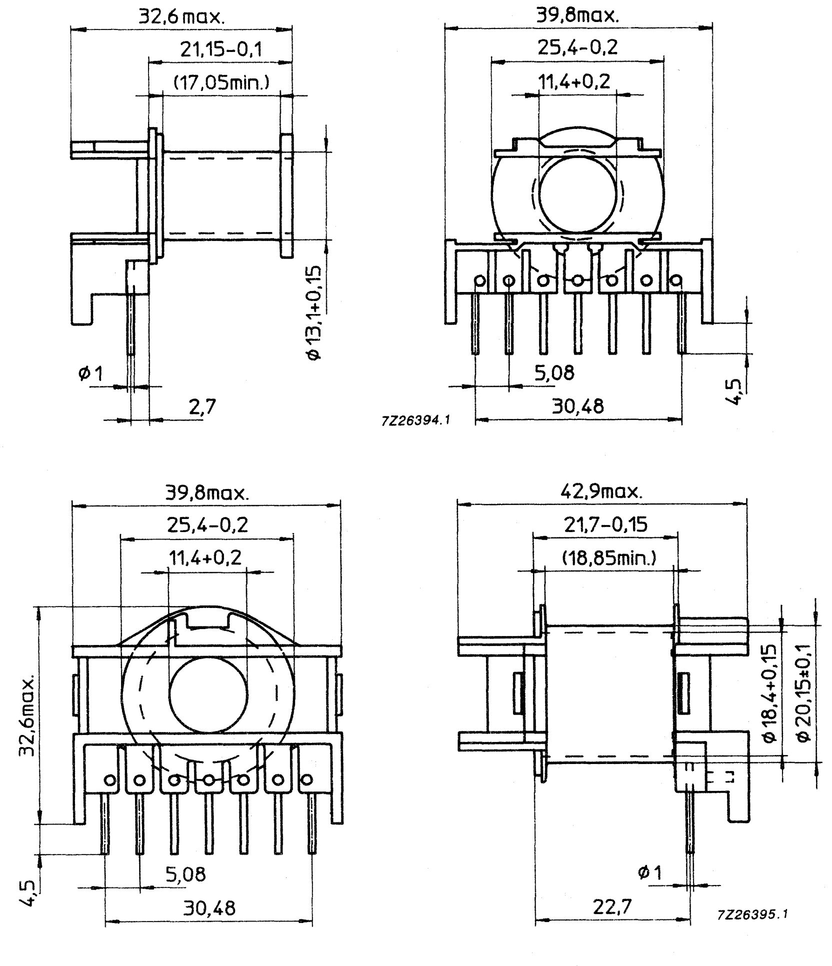
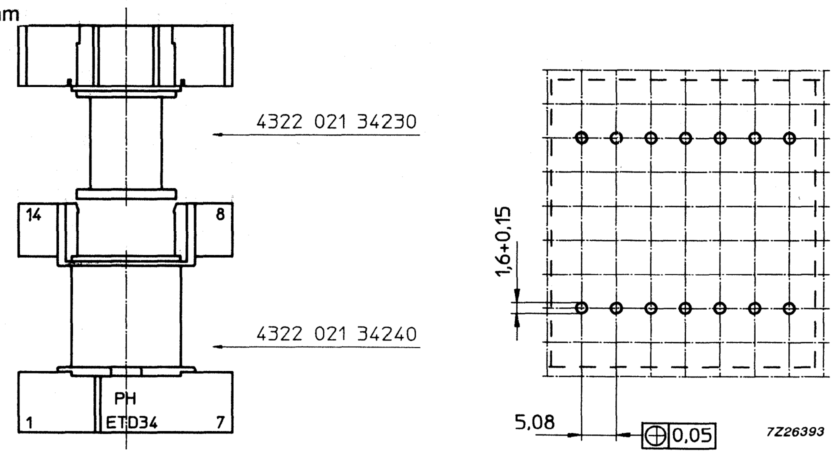


Fig.3 ETD34 coaxial coil former; for mounting grid and method of fitting, refer to Fig.4.

Dimensions in mm



Note: This coil former incorporates 8 mm creepage distance between primary and secondary windings, as well as between primary and all other conductive parts (in accordance with IEC 380 safety regulations).

Fig.4 Mounting grid and method of fitment.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	7	44.5	17	49.5	4322 021 3423
1	7	49	18.9	71	4322 021 3424

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	5	4322 021 3389	stainless steel
earthing clip	6	4322 021 3394	CuNiZn alloy, dip soldered

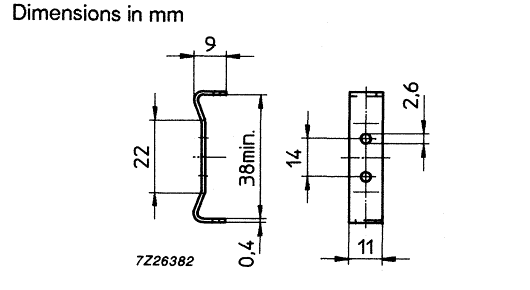


Fig.5 Mounting clip.

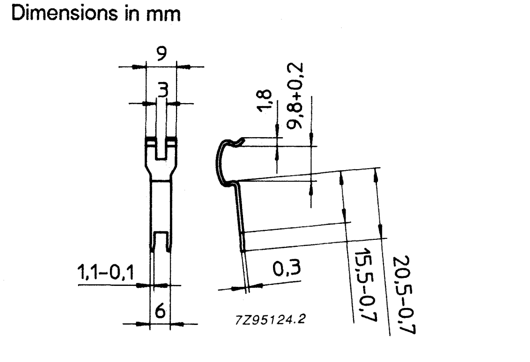


Fig.6 Earthing clip.

ETD cores and accessories ETD39

Dimensions in mm

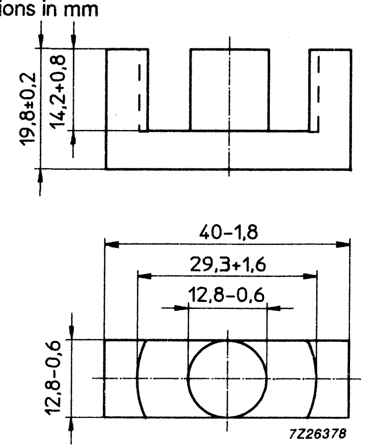


Fig.1 ETD39 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.737	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	92.2	mm
A_e	effective area	125	mm^2
A_{min}	minimum area	123	mm^2
	mass of core half	≈ 30	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	2800 ± 25%	≈ 1650	4312 020 3705
	100	≈ 1000	≈ 590	4312 020 3706
	200	≈ 660	≈ 390	4312 020 3707
	500	≈ 340	≈ 200	4312 020 3708
	800	≈ 220	≈ 130	4312 020 3763
3C85	≈ 0	2800 ± 25%	≈ 1650	4312 020 3725
	100	≈ 1000	≈ 590	4312 020 3726
	200	≈ 660	≈ 390	4312 020 3727
	500	≈ 340	≈ 200	4312 020 3728
	800	≈ 220	≈ 130	4312 020 3729
3F3	≈ 0	2600 ± 25%	≈ 1500	4312 020 3802
	100	≈ 970	≈ 570	4312 020 3813
	200	≈ 650	≈ 380	4312 020 3814
	500	≈ 340	≈ 200	4312 020 3815
	800	≈ 220	≈ 130	4312 020 3816

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

ETD cores and accessories ETD39

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 2.2	–	–
3C85	≥ 320	≤ 1.6	≤ 1.9	–
3F3	≥ 320	–	≤ 1.3	≤ 2.3

ETD cores and accessories ETD39

COIL FORMER DATA

Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

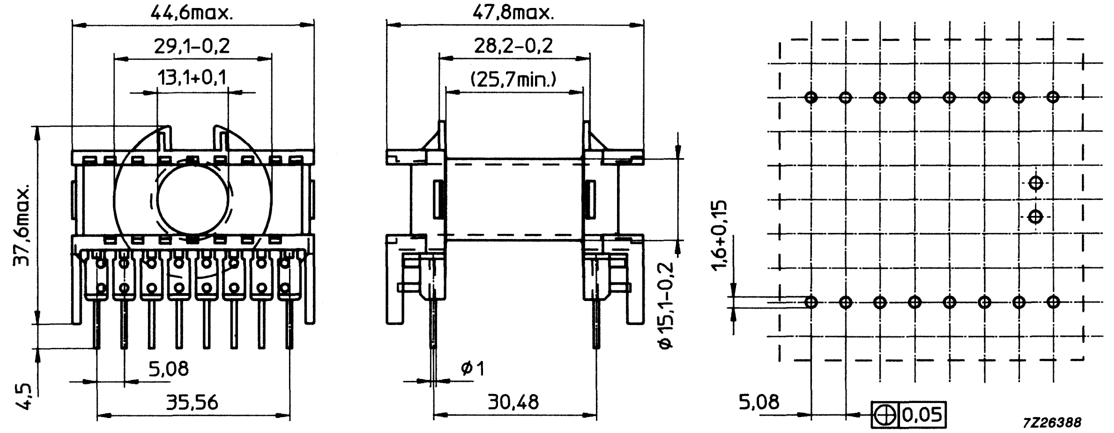


Fig.2 ETD39 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	16	177	25.7	69	4322 021 3386

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3390	stainless steel
earthing clip	4	4322 021 3395	CuNiZn alloy, dip soldered

Dimensions in mm

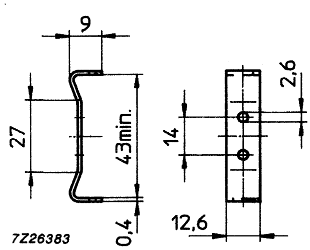


Fig.3 Mounting clip.

Dimensions in mm

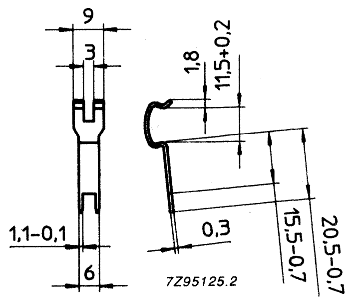


Fig.4 Earthing clip.

ETD cores and accessories

ETD44

Dimensions in mm

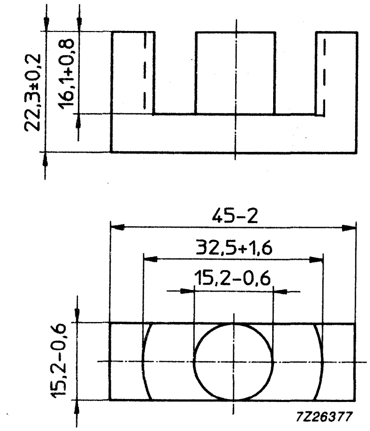


Fig.1 ETD44 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.589	mm^{-1}
V_e	effective volume	17800	mm^3
l_e	effective length	103	mm
A_e	effective area	173	mm^2
A_{min}	minimum area	172	mm^2
	mass of core half	≈ 47	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	3500 ± 25%	≈ 1650	4312 020 3710
	100	≈ 1400	≈ 660	4312 020 3759
	200	≈ 900	≈ 425	4312 020 3711
	500	≈ 460	≈ 220	4312 020 3712
	800	≈ 320	≈ 150	4312 020 3760
3C85	≈ 0	3500 ± 25%	≈ 1650	4312 020 3730
	100	≈ 1400	≈ 660	4312 020 3731
	200	≈ 900	≈ 425	4312 020 3732
	500	≈ 460	≈ 220	4312 020 3733
	800	≈ 320	≈ 150	4312 020 3734
3F3	≈ 0	3200 ± 25%	≈ 1500	4312 020 3803
	100	≈ 1350	≈ 640	4312 020 3817
	200	≈ 900	≈ 425	4312 020 3818
	500	≈ 460	≈ 220	4312 020 3819
	800	≈ 320	≈ 150	4312 020 3820

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

ETD cores and accessories ETD44

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 3.6	–	–
3C85	≥ 320	≤ 2.5	≤ 3.0	–
3F3	≥ 320	–	≤ 2.0	≤ 3.7

ETD cores and accessories ETD44

COIL FORMER DATA

Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Dimensions in mm

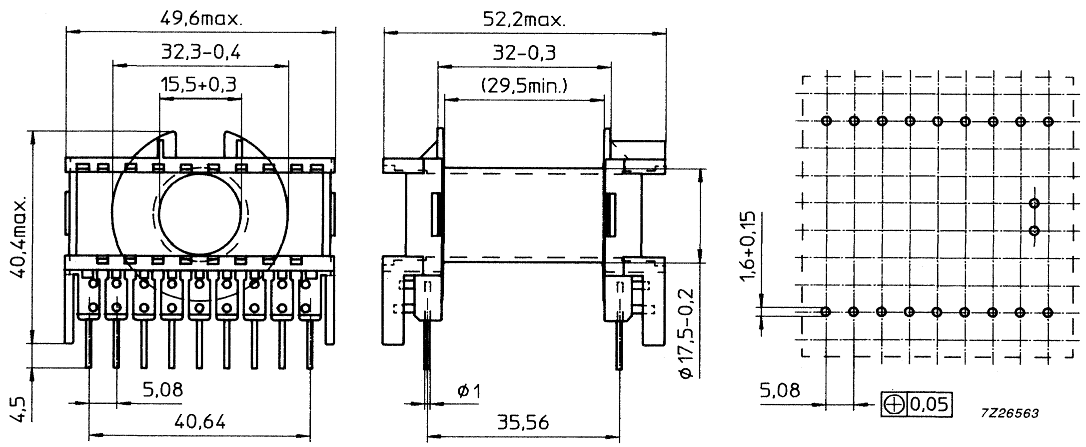


Fig.2 ETD44 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	18	214	29.5	77	4322 021 3387

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3391	stainless steel
earthing clip	4	4322 021 3396	CuNiZn alloy, dip soldered

Dimensions in mm

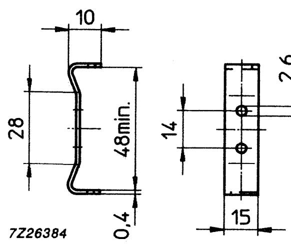


Fig.3 Mounting clip.

Dimensions in mm

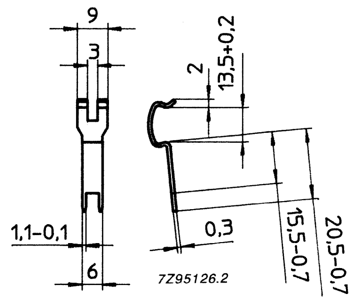


Fig.4 Earthing clip.

Dimensions in mm

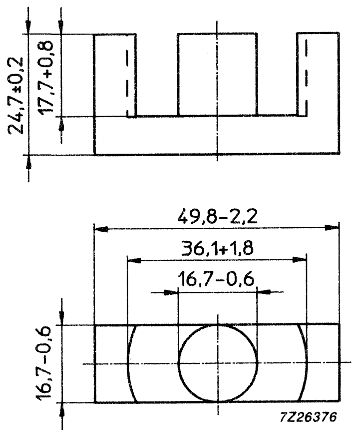


Fig.1 ETD49 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.534	mm^{-1}
V_e	effective volume	24000	mm^3
l_e	effective length	114	mm
A_e	effective area	211	mm^2
A_{min}	minimum area	209	mm^2
	mass of core half	≈ 62	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	4000 ± 25%	≈ 1700	4312 020 3715
	100	≈ 1600	≈ 690	4312 020 3770
	200	≈ 1100	≈ 470	4312 020 3716
	500	≈ 540	≈ 230	4312 020 3717
	800	≈ 380	≈ 160	4312 020 3756
	1400	≈ 250	≈ 110	4312 020 3755
3C85	≈ 0	4000 ± 25%	≈ 1700	4312 020 3735
	100	≈ 1600	≈ 690	4312 020 3736
	200	≈ 1100	≈ 470	4312 020 3737
	500	≈ 540	≈ 230	4312 020 3738
	800	≈ 380	≈ 160	4312 020 3739
	1400	≈ 250	≈ 110	4312 020 3790
3F3	≈ 0	3600 ± 25%	≈ 1550	4312 020 3804
	100	≈ 1550	≈ 670	4312 020 3821
	200	≈ 1100	≈ 470	4312 020 3822
	500	≈ 540	≈ 230	4312 020 3823
	800	≈ 380	≈ 160	4312 020 3824
	1400	≈ 250	≈ 110	4312 020 3725

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P_V (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 320	≤ 4.6	–	–
3C85	≥ 320	≤ 3.4	≤ 4.0	–
3F3	≥ 320	–	≤ 2.6	≤ 5.2

ETD cores and accessories ETD49

COIL FORMER DATA

Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Dimensions in mm

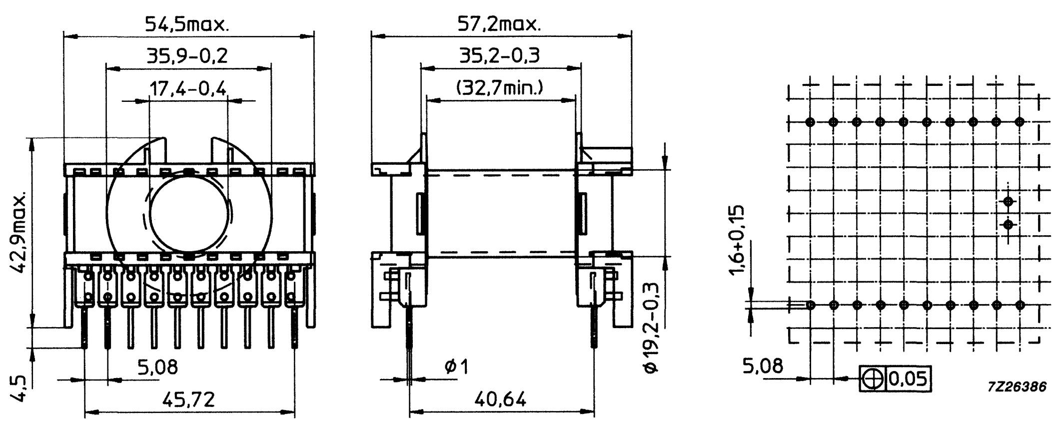


Fig.2 ETD49 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	20	273	32.7	85	4322 021 3388

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3392	stainless steel
earthing clip	4	4322 021 3397	CuNiZn alloy, dip soldered

Dimensions in mm

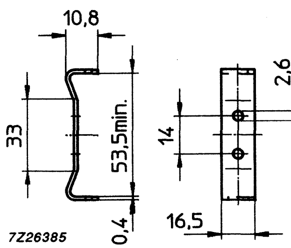


Fig.3 Mounting clip.

Dimensions in mm

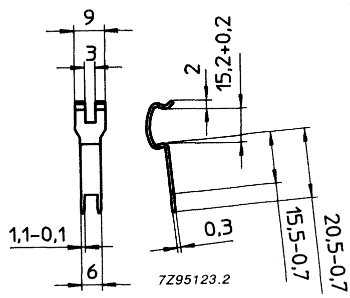
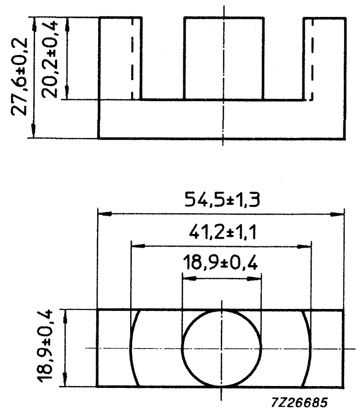


Fig.4 Earthing clip.



Dimensions in mm

Fig.1 ETD54 core half.

EFFECTIVE CORE PARAMETERS

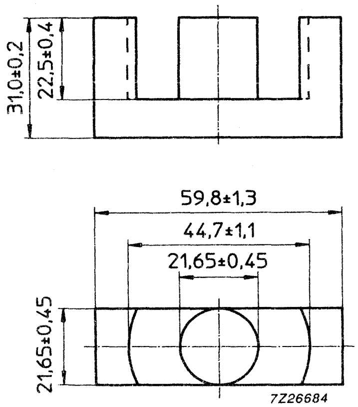
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.454	mm^{-1}
V_e	effective volume	35500	mm^3
l_e	effective length	127	mm
A_e	effective area	280	mm^2
A_{min}	minimum area	280	mm^2
	mass of core half	≈ 90	g

CORE HALVES

GRADE	A_L (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C85	4800 ± 25%	≈ 1730	≈ 0	4312 020 3792
3F3	4400 ± 25%	≈ 1590	≈ 0	4312 020 3826

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 5.0	≤ 5.9	–
3F3	≥ 320	–	≤ 4.0	≤ 8.1



Dimensions in mm

Fig.1 ETD59 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.378	mm^{-1}
V_e	effective volume	51500	mm^3
l_e	effective length	139	mm
A_e	effective area	368	mm^2
A_{min}	minimum area	368	mm^2
	mass of core half	≈ 130	g

CORE HALVES

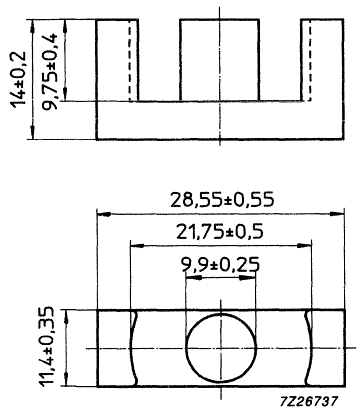
GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C85	5800 ± 25%	≈ 1740	≈ 0	4312 020 3793
3F3	5400 ± 25%	≈ 1620	≈ 0	4312 020 3827

* measured in combination with an ungapped core half, clamping force 70 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 7.2	≤ 8.5	–
3F3	≥ 320	–	≤ 5.7	≤ 12.5

ER CORES



Dimensions in mm

Fig.1 ER28 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.786	mm^{-1}
V_e	effective volume	5260	mm^3
l_e	effective length	64	mm
A_e	effective area	81.4	mm^2
A_{min}	minimum area	77	mm^2
	mass of core half	≈ 14	g

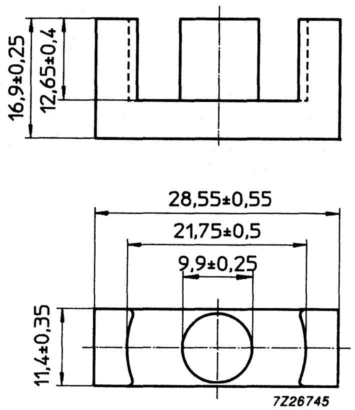
CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C80	3100 ± 25%	≈ 1940	≈ 0	4312 020 4412
3C85	3100 ± 25%	≈ 1940	≈ 0	4312 020 4419

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 1.2	–	–
3C85	≥ 330	≤ 0.9	≤ 1.1	–



Dimensions in mm

Fig.1 ER28L core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.928	mm^{-1}
V_e	effective volume	6140	mm^3
l_e	effective length	75.5	mm
A_e	effective area	81.4	mm^2
A_{min}	minimum area	77	mm^2
	mass of core half	≈ 16	g

CORE HALVES

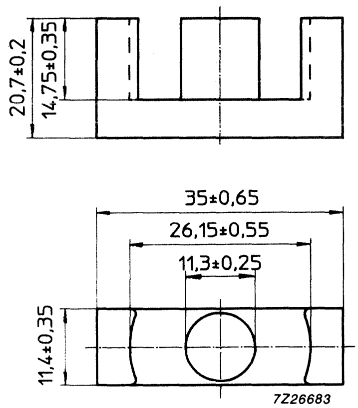
GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C80	2650 ± 25%	≈ 1950	≈ 0	4312 020 4686
3C85	2800 ± 25%	≈ 2050	≈ 0	4312 020 4687

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 1.4	–	–
3C85	≥ 330	≤ 1.0	≤ 1.3	–

ER cores ER35



Dimensions in mm

Fig.1 ER35 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.849	mm^{-1}
V_e	effective volume	9710	mm^3
l_e	effective length	90.8	mm
A_e	effective area	107	mm^2
A_{min}	minimum area	100	mm^2
	mass of core half	≈ 23	g

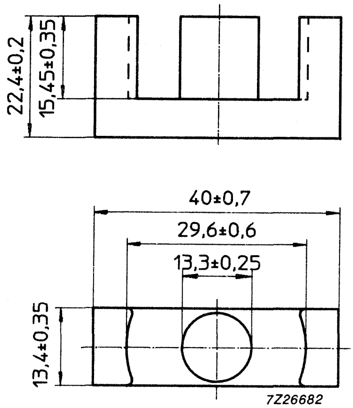
CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE
3C80	2400 ± 25%	≈ 1620	≈ 0	4312 020 4640
3C85	2400 ± 25%	≈ 1620	≈ 0	4312 020 4641

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 2.0	–	–
3C85	≥ 330	≤ 1.4	≤ 1.6	–



Dimensions in mm

Fig.1 ER40 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.658	mm^{-1}
V_e	effective volume	14600	mm^3
l_e	effective length	98	mm
A_e	effective area	149	mm^2
A_{min}	minimum area	139	mm^2
	mass of core half	≈ 37	g

CORE HALVES

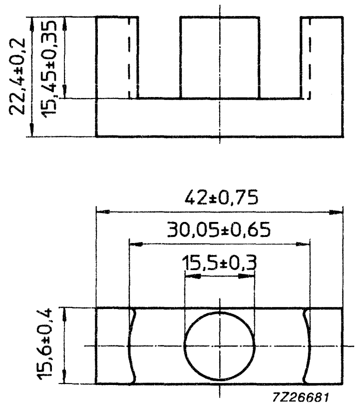
GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C80	3170 ± 25%	≈ 1660	≈ 0	4312 020 4642
3C85	3170 ± 25%	≈ 1660	≈ 0	4312 020 4643

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 3.0	–	–
3C85	≥ 330	≤ 2.1	≤ 2.4	–

ER cores | ER42



Dimensions in mm

Fig.1 ER42 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.509	mm^{-1}
V_e	effective volume	19200	mm^3
l_e	effective length	98.8	mm
A_e	effective area	194	mm^2
A_{min}	minimum area	189	mm^2
	mass of core half	≈ 48	g

CORE HALVES

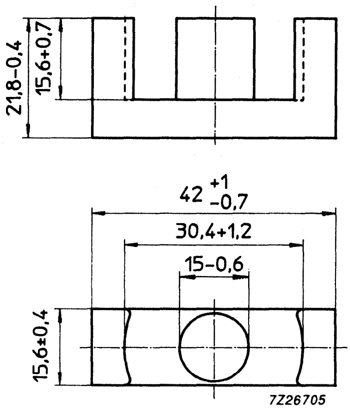
GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE
3C80	4100 ± 25%	≈ 1660	≈ 0	4312 020 4638
3C85	4100 ± 25%	≈ 1660	≈ 0	4312 020 4639

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 3.9	–	–
3C85	≥ 330	≤ 2.7	≤ 3.2	–

ER cores ER42A



Dimensions in mm

Fig.1 ER42A core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.582	mm^{-1}
V_e	effective volume	16800	mm^3
l_e	effective length	99	mm
A_e	effective area	170	mm^2
A_{min}	minimum area	170	mm^2
	mass of core half	≈ 49.1	g

CORE HALVES

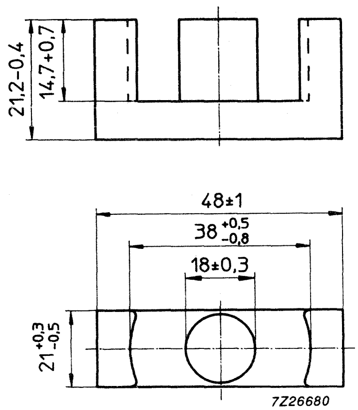
GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C80	3500 ± 25%	≈ 1620	≈ 0	4312 020 4662
3C85	3500 ± 25%	≈ 1620	≈ 0	4312 020 4666

* measured in combination with an ungapped core half, clamping force 40 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 3.5	−	−
3C85	≥ 330	≤ 2.4	≤ 2.9	−

ER cores ER48



Dimensions in mm

Fig.1 ER48 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.392	mm^{-1}
V_e	effective volume	25500	mm^3
l_e	effective length	100	mm
A_e	effective area	255	mm^2
A_{min}	minimum area	248	mm^2
	mass of core half	≈ 64	g

CORE HALVES

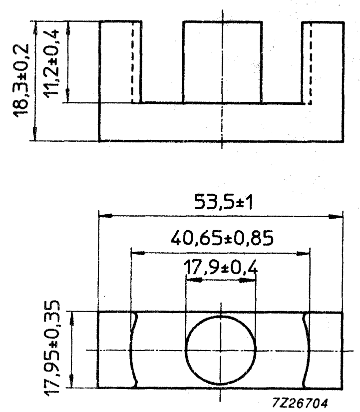
GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE
3C80	4900 ± 25%	≈ 1530	≈ 0	4312 020 3485

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 5.0	–	–

ER cores ER54



Dimensions in mm

Fig.1 ER54 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.37	mm^{-1}
V_e	effective volume	22950	mm^3
l_e	effective length	91.8	mm
A_e	effective area	250	mm^2
A_{min}	minimum area	240	mm^2
	mass of core half	≈ 61	g

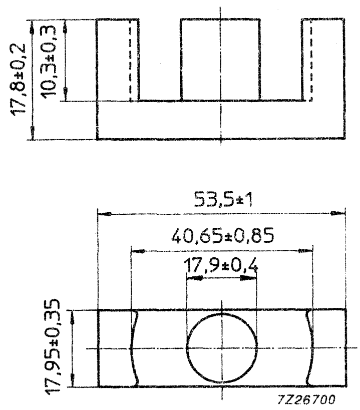
CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (μm)	ORDERING CODE
3C80	5600 ± 25%	≈ 1650	≈ 0	4312 020 4669
3C85	5600 ± 25%	≈ 1650	≈ 0	4312 020 4670

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 4.8	–	–
3C85	≥ 330	≤ 3.2	≤ 3.8	–



Dimensions in mm

Fig.1 ER54S core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.36	mm^{-1}
V_e	effective volume	22300	mm^3
l_e	effective length	89	mm
A_e	effective area	250	mm^2
A_{min}	minimum area	240	mm^2
	mass of core half	≈ 59	g

CORE HALVES

GRADE	A_L* (nH)	μ_e	AIRGAP (µm)	ORDERING CODE
3C80	5700 ± 25%	≈ 1630	≈ 0	4312 020 4667
3C85	5700 ± 25%	≈ 1630	≈ 0	4312 020 4668

* measured in combination with an ungapped core half, clamping force 50 ± 20 N

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

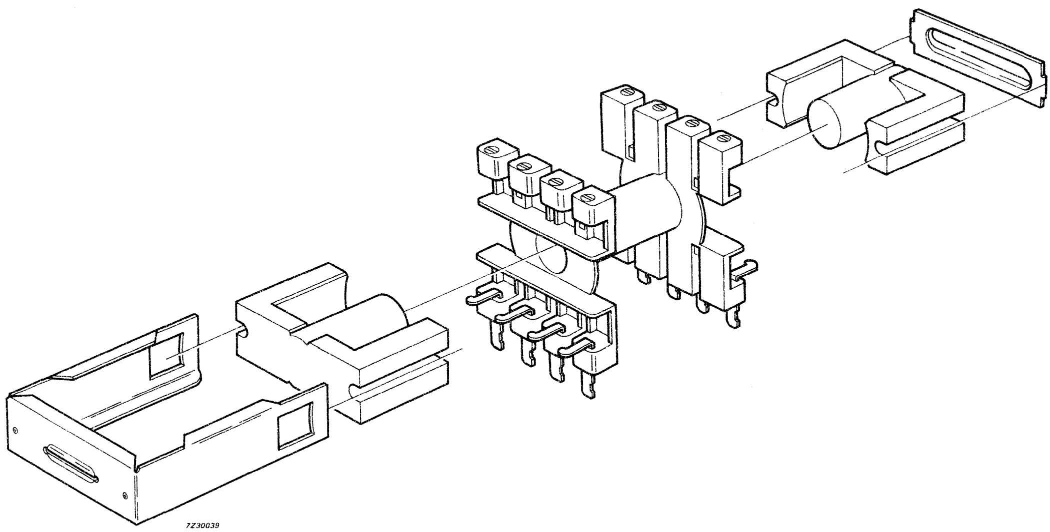
GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	CORE LOSS (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	CORE LOSS (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	CORE LOSS (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥ 330	≤ 4.8	–	–
3C85	≥ 330	≤ 3.2	≤ 3.8	–

EC CORES AND ACCESSORIES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

EC35 to EC70
EC cores and accessories



EC cores and accessories EC35

Dimensions in mm

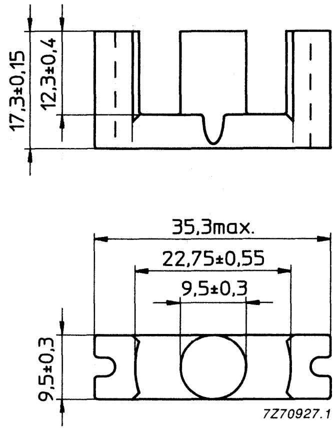


Fig.1 EC35 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.918	mm^{-1}
V_e	effective volume	6530	mm^3
l_e	effective length	77.4	mm
A_e	effective area	84.3	mm^2
A_{min}	minimum area	71	mm^2
	mass of core half	≈ 19	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	2100 ± 25%	≈ 1600	4322 020 5250

* A_L measured in combination with an ungapped core half

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 330	≤ 2.0	—

EC cores and accessories EC35

COIL FORMER DATA

Coil former material: phenolformaldehyde (PF), glass reinforced, flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 180 °C

Resistance to soldering heat: 430 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 53 mm

Dimensions in mm

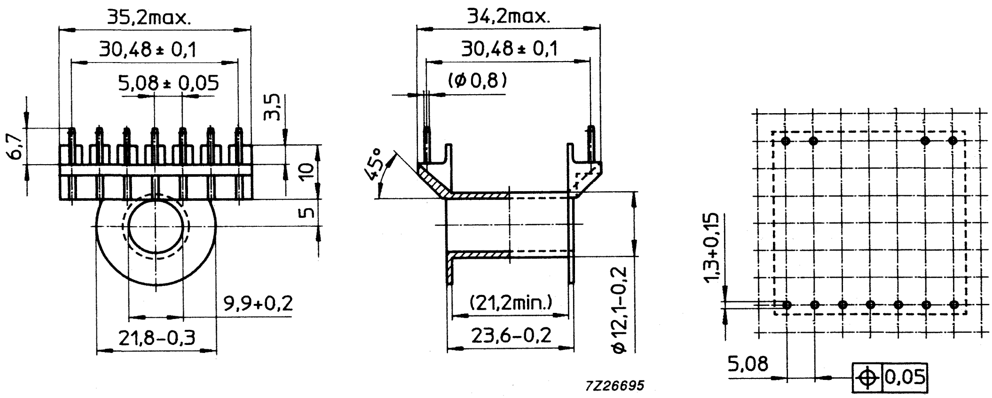


Fig.2 EC35 coil former, 11 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	11	all	99.6	21.2	4322 021 3341

COIL FORMER DATA

Coil former material: polybutyleneterephtalate (PBT), glass reinforced,flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 4 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 53 mm

Dimensions in mm

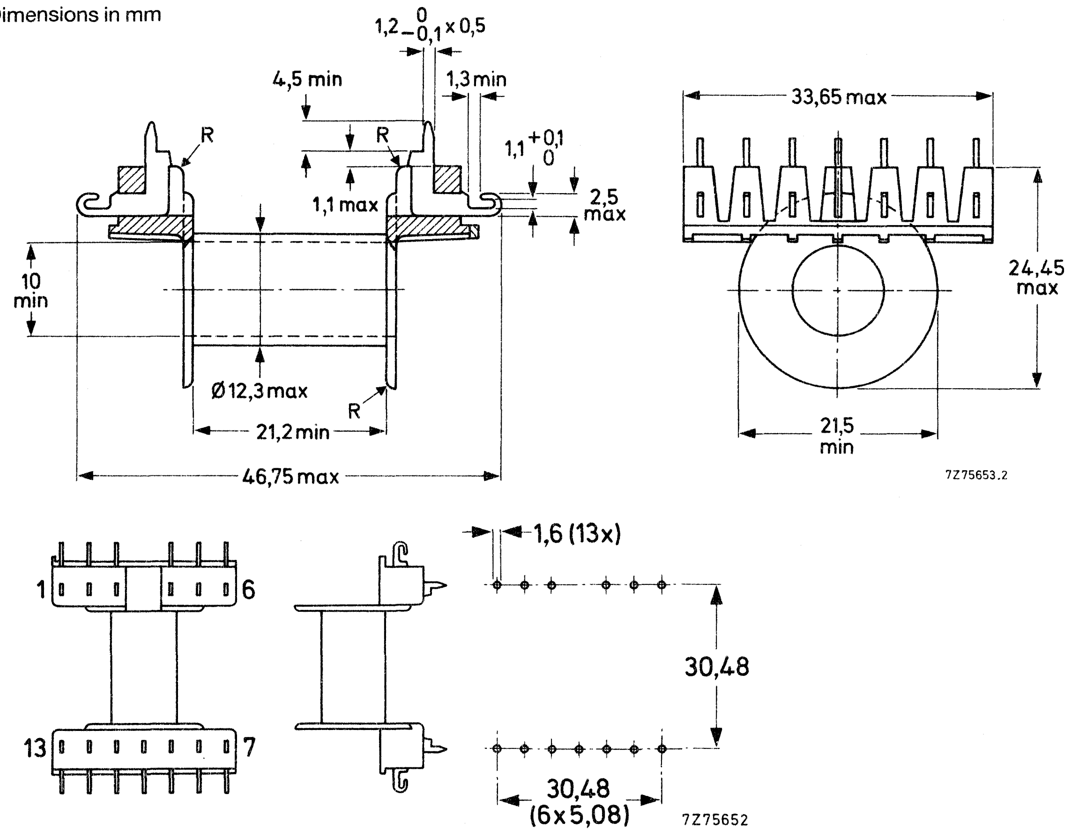


Fig.3 EC35 coil former, 13 pins.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	13	all	97	21.2	4322 021 3331

EC cores and accessories EC35

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	4	4312 021 2601	steel, zinc plated
spring	5	4312 021 2615	steel, zinc plated

Dimensions in mm

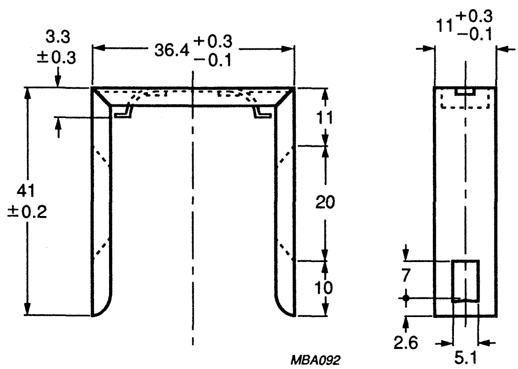


Fig.4 Clasp.

Dimensions in mm

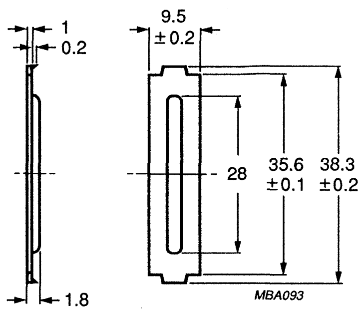


Fig.5 Spring.

EC cores and accessories | EC41

Dimensions in mm

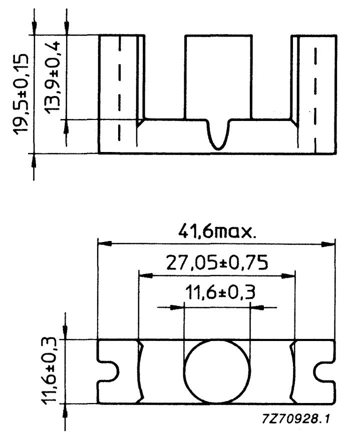


Fig.1 EC41 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.735	mm^{-1}
V_e	effective volume	10800	mm^3
l_e	effective length	89.3	mm
A_e	effective area	121	mm^2
A_{min}	minimum area	106	mm^2
	mass of core half	≈ 30	g

CORE HALVES

GRADE	AIRGAP (µm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	2700 ± 25%	≈ 1600	4322 020 5251

* A_L measured in combination with an ungapped core half

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 330	≤ 3.1	–

EC cores and accessories EC41

COIL FORMER DATA

Coil former material:	polybutyleneterephtalate (PBT), glass reinforced,flame retardent in accordance with UL 94V-0
Pin material:	CuSn, SnPb plated
Maximum operating temperature:	130 °C
Resistance to soldering heat:	400 °C, 4 s
Solderability:	IEC 68-2-20, Part 2, Test TA, method 1
Average length of turn:	62 mm

Dimensions in mm

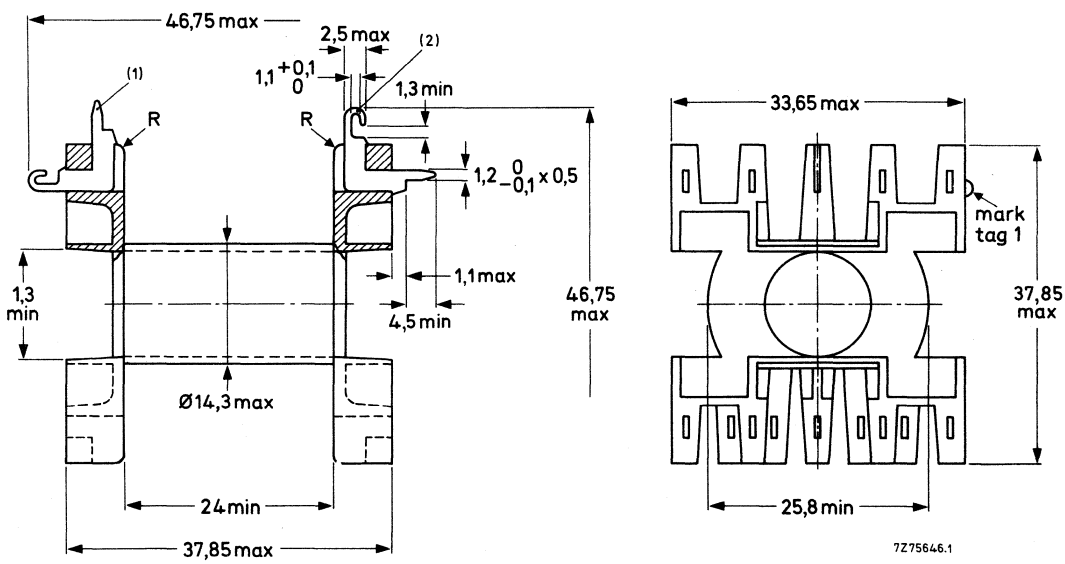


Fig.2 EC41 coil former.

EC cores and accessories | EC41

Dimensions in mm

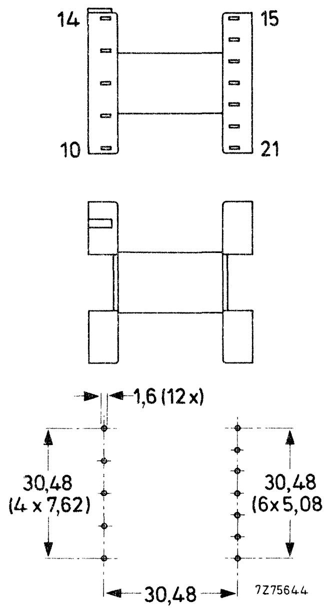


Fig.3 EC41 coil former, 12 pins (horizontal mounting).

Dimensions in mm

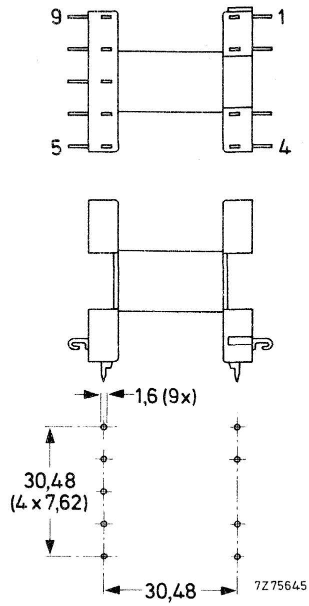


Fig.4 EC41 coil former, 9 pins (horizontal mounting).

WINDING DATA - STYLE 1, HORIZONTAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	12	10,11,12,13,14,15, 16,17,18,19,20,21	138	24	4322 021 3348

WINDING DATA - STYLE 2, HORIZONTAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	9	1,2,3,4,5,6,7,8,9	138	24	4322 021 3332

Dimensions in mm

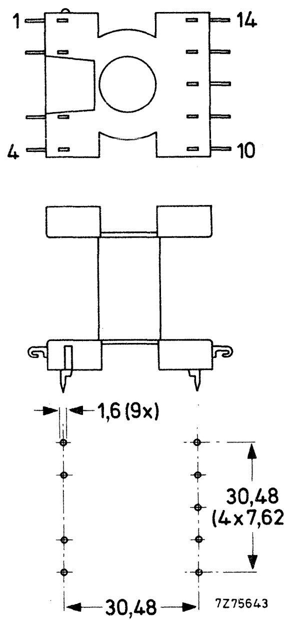


Fig.5 EC41 coil former, 9 pins (vertical mounting).

WINDING DATA - STYLE 3, VERTICAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	9	1,2,3,4,10,11,12,13,14	138	24	4322 021 3335

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	6 6	4312 021 2602 4312 021 2603	steel, zinc plated steel, zinc plated with mounting stud
spring	7	4312 021 2616	steel, zinc plated

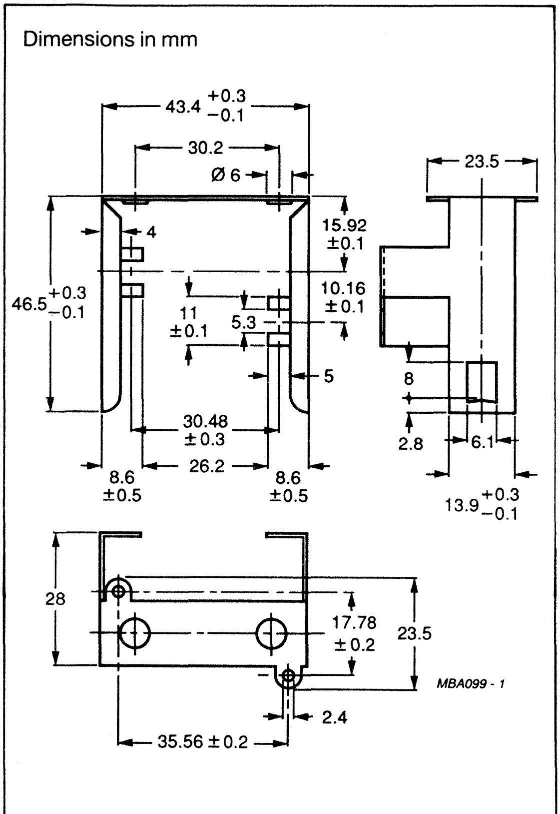


Fig.6 Clasp.

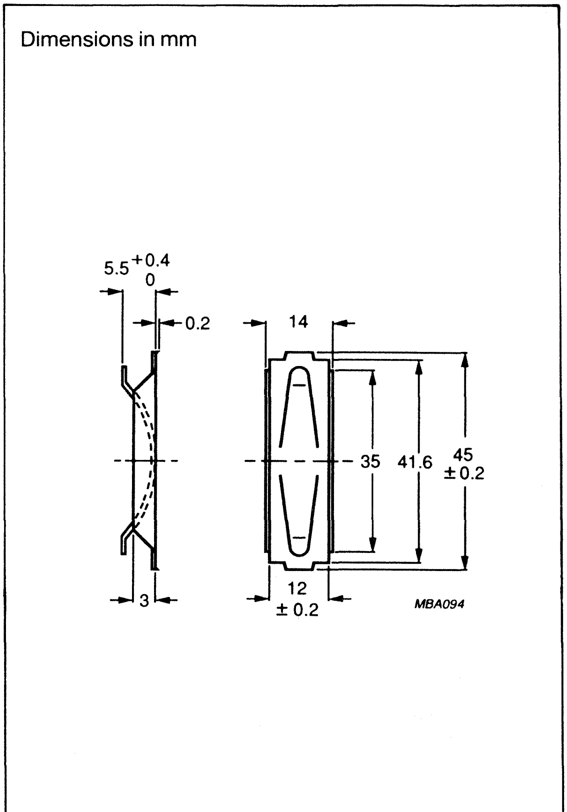


Fig.7 Spring.

EC cores and accessories EC52

Dimensions in mm

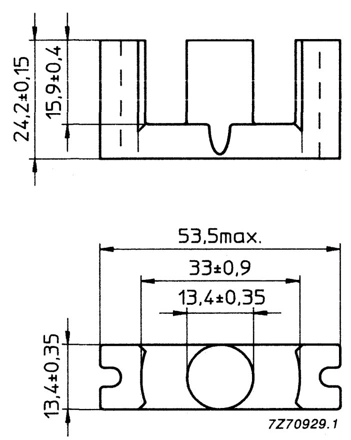


Fig.1 EC52 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.581	mm^{-1}
V_e	effective volume	18800	mm^3
l_e	effective length	105	mm
A_e	effective area	180	mm^2
A_{min}	minimum area	141	mm^2
	mass of core half	≈ 56	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	3600 ± 25%	≈ 1600	4322 020 5252

* A_L measured in combination with an ungapped core half

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 330	≤ 4.2	—

COIL FORMER DATA

Coil former material: polybutyleneterephtalate (PBT), glass reinforced,flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 4 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 70 mm

Dimensions in mm

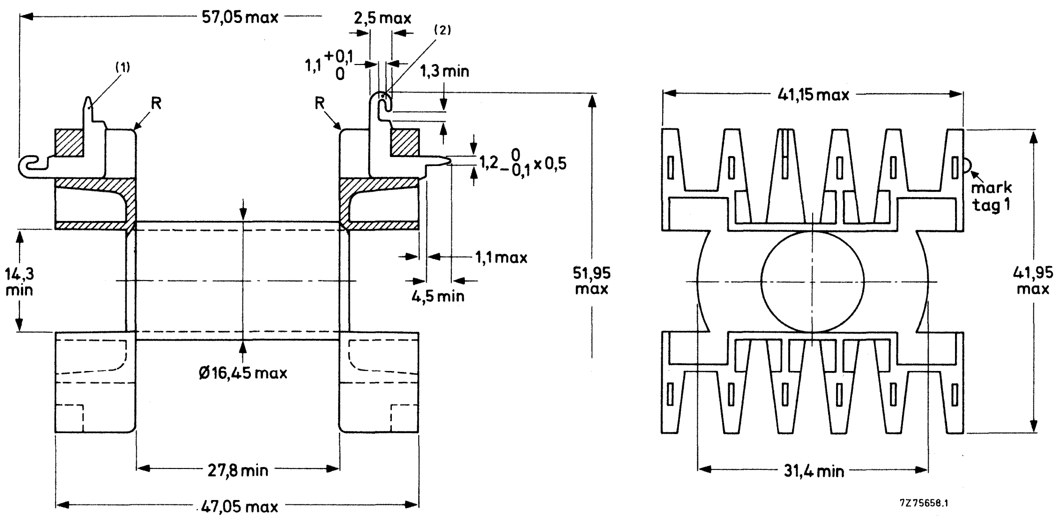


Fig.2 EC52 coil former.

EC cores and accessories EC52

Dimensions in mm

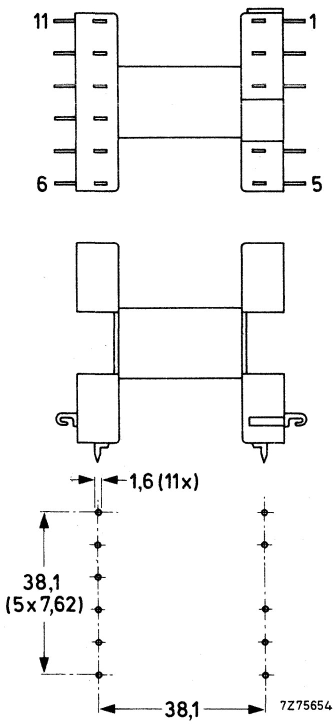


Fig.3 EC52 coil former, 11 pins (horizontal mounting).

Dimensions in mm

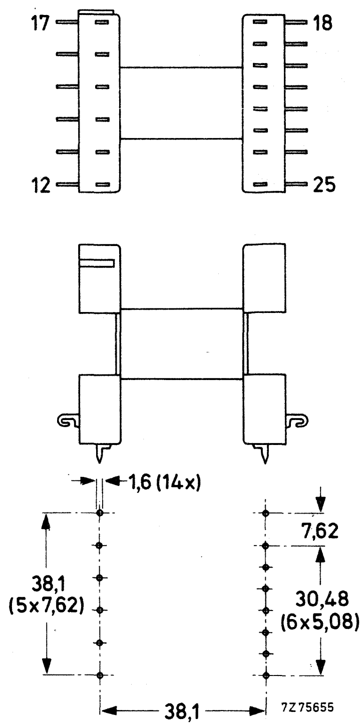


Fig.4 EC52 coil former, 14 pins (horizontal mouting).

WINDING DATA - STYLE 1, HORIZONTAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	11	all	210	27.8	4322 021 3333

WINDING DATA - STYLE 2, HORIZONTAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	14	12,13,14,15,16,17,18, 19,20,21,22,23, 24,25	210	27.8	4322 021 3350

EC cores and accessories EC52

Dimensions in mm

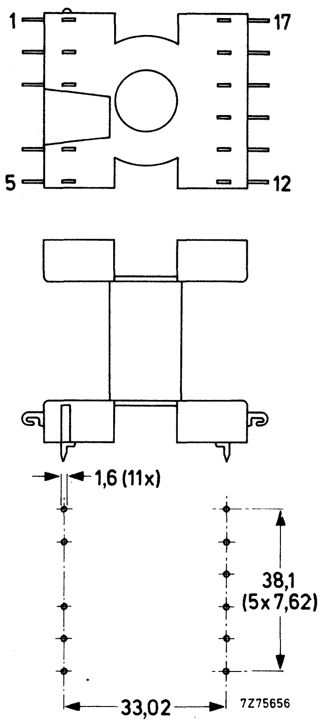


Fig.5 EC52 coil former, 11 pins (vertical mounting).

WINDING DATA - STYLE 3, VERTICAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	11	1,2,3,4,5,12, 13,14,15,16,17	210	27.8	4322 021 3336

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	6 6	4312 021 2604 4312 021 2605	steel, zinc plated steel, zinc plated with mounting stud
spring	7	4312 021 2617	steel, zinc plated

Dimensions in mm

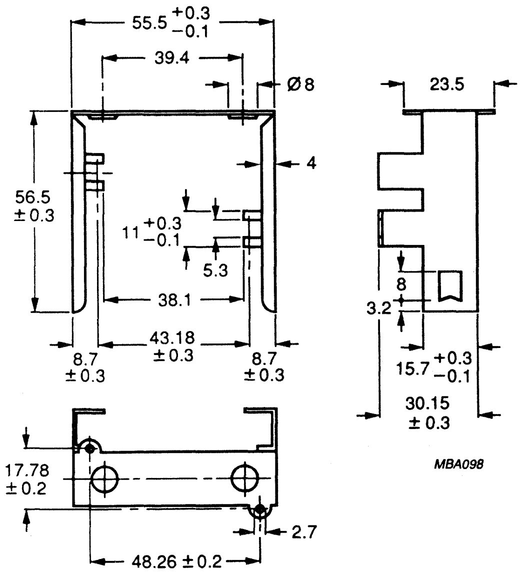


Fig.6 Clasp.

Dimensions in mm

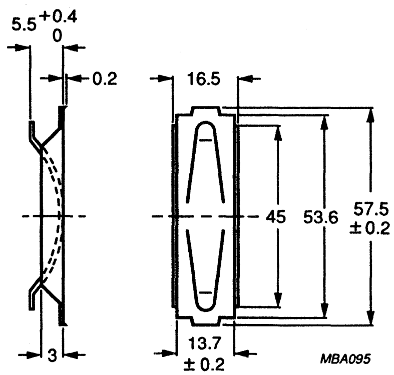


Fig.7 Spring.

EC cores and accessories EC70

Dimensions in mm

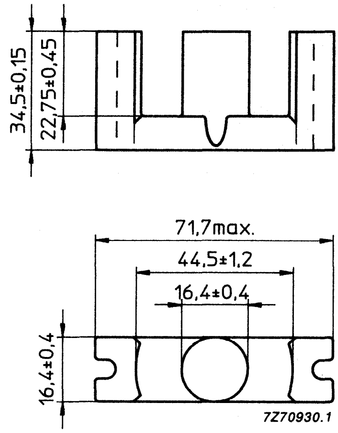


Fig.1 EC70 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.514	mm^{-1}
V_e	effective volume	40100	mm^3
l_e	effective length	144	mm
A_e	effective area	279	mm^2
A_{min}	minimum area	211	mm^2
	mass of core half	≈ 127	g

CORE HALVES

GRADE	AIRGAP (μm)	A_L* (nH)	μ_e	ORDERING CODE
3C80	≈ 0	3900 ± 25%	≈ 1600	4322 020 5253

* A_L measured in combination with an ungapped core half

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 330	≤ 8.4	–

EC cores and accessories | EC70

COIL FORMER DATA

Coil former material: polybutyleneterephtalate (PBT), glass reinforced,flame retardent in accordance with UL 94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 4 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1

Average length of turn: 96 mm

Dimensions in mm

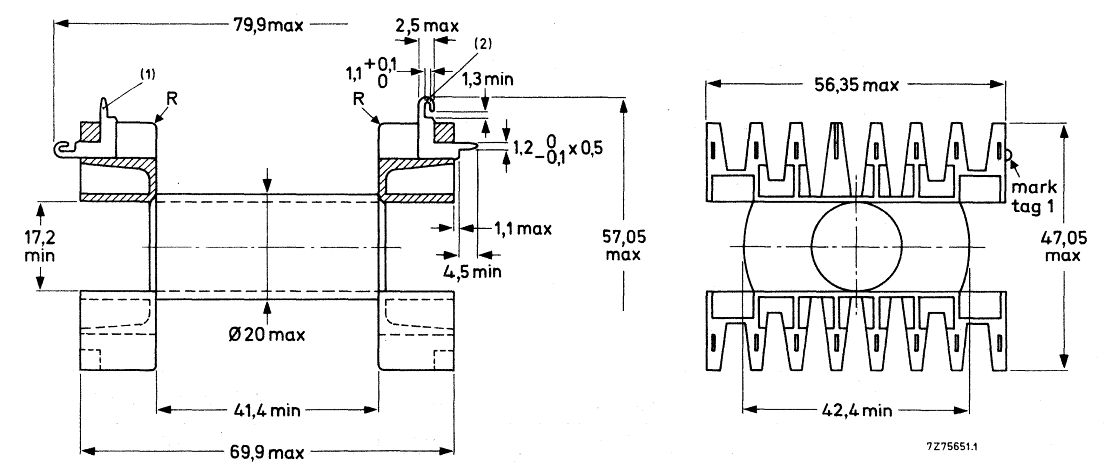


Fig.2 EC70 coil former.

EC cores and accessories EC70

Dimensions in mm

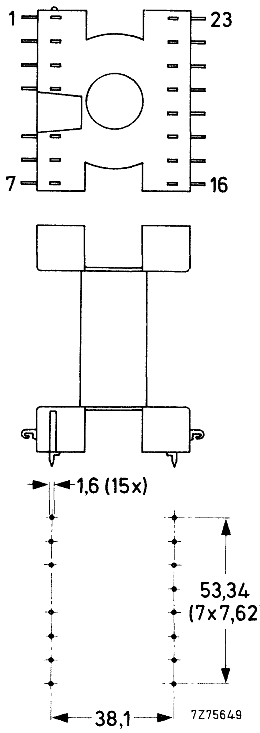


Fig.3 EC70 coil former, 15 pins (vertical mounting).

Dimensions in mm

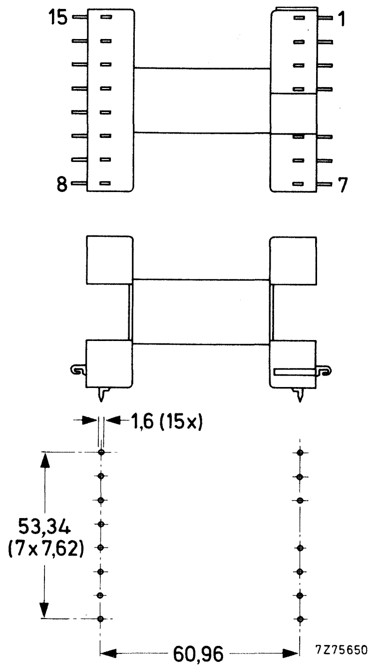


Fig.4 EC70 coil former, 15 pins (horizontal mounting).

WINDING DATA - STYLE 1, HORIZONTAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	15	all	464	41.4	4322 021 3334

WINDING DATA - STYLE 2, VERTICAL MOUNTING

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	ORDERING CODE
1	15	1,2,3,4,5,6,7,16,17, 18,19,20,21,22, 23	464	41.4	4322 021 3337

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
clasp	5 5	4312 021 2606 4312 021 2607	steel, zinc plated steel, zinc plated with mounting stud
spring	6	4312 021 2618	steel, zinc plated

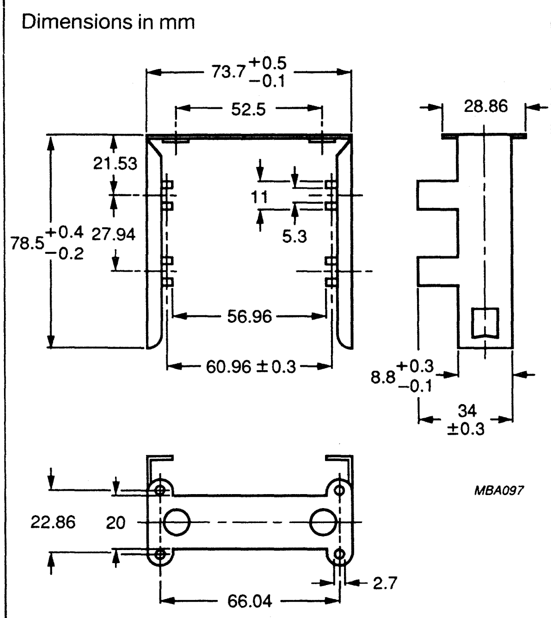


Fig.5 Clasp.

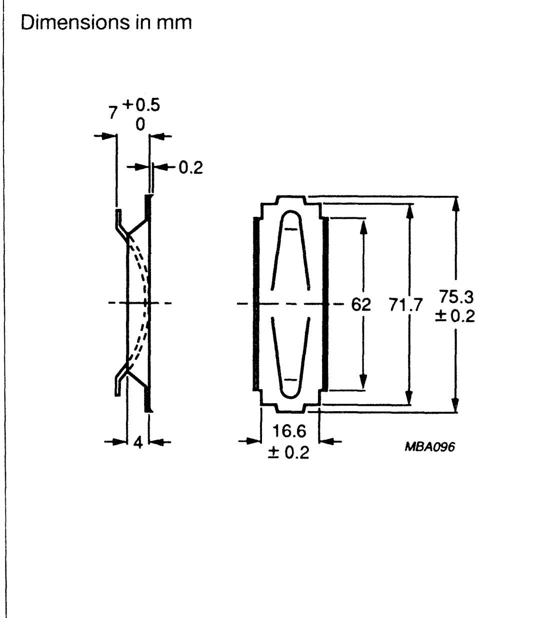


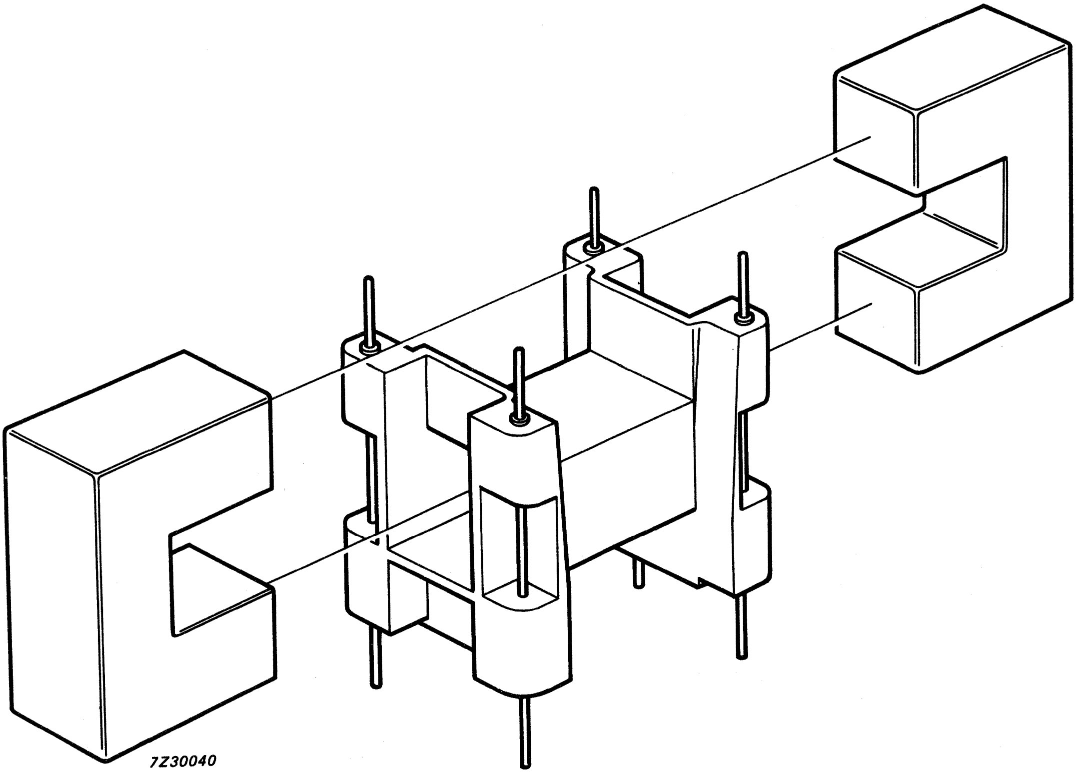
Fig.6 Spring.

U CORES, I CORES AND ACCESSORIES
U CORES FOR LINE OUTPUT TRANSFORMERS

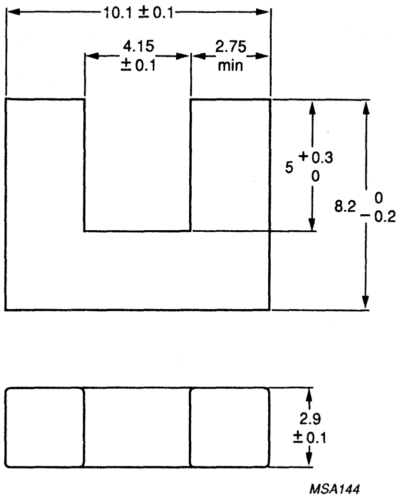
Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

U10/8/3 to U100/57/75
I15/3/3 to I100/25/25



U cores and accessories U10/8/3



Dimensions in mm

Fig.1 U10/8/3 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	4.46	mm^{-1}
V_e	effective volume	330	mm^3
l_e	effective length	38.4	mm
A_e	effective area	8.6	mm^2
	mass of core half	≈ 0.9	g

CORE HALVES

GRADE	A_L	μ_e	ORDERING CODE
3C80	540 ± 25%	≈ 1900	4312 020 4322
3C85	540 ± 25%	≈ 1900	4312 020 4328

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 320	≤ 0.05	–	–
3C85	≥ 320	–	≤ 0.05	≤ 0.06

U cores and accessories U10/8/3

COIL FORMER DATA

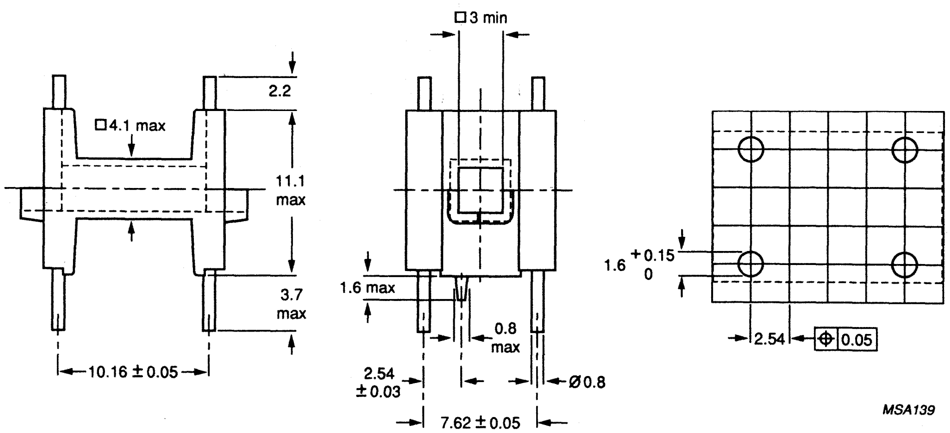
Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1



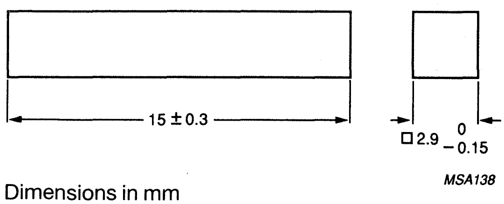
Dimensions in mm

Fig.2 U10/8/3 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	23	8	26	3122 134 0259

I cores and accessories I15/3/3



Dimensions in mm

Fig.1 I15/3/3 core.

CORE

GRADE	ORDERING CODE
3C80	4312 020 4325

COIL FORMER DATA

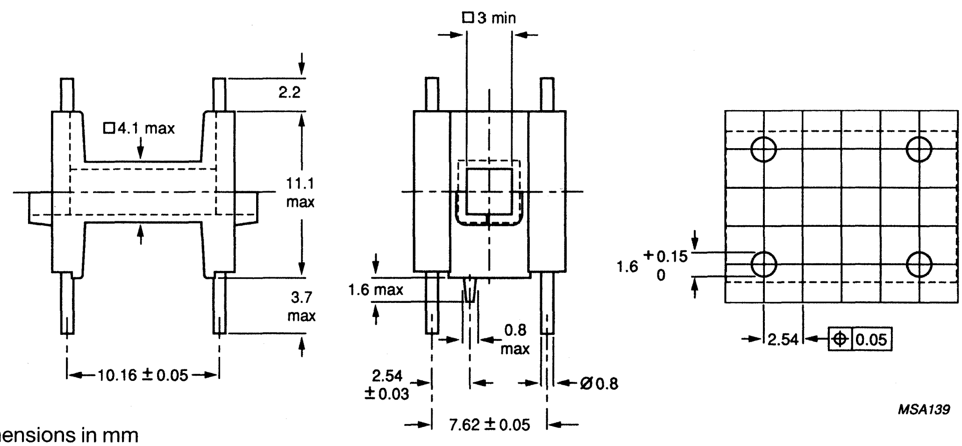
Coil former material: polybuteleneterephtalate (PBT), glass reinforced, flame retardent in accordance with UL94V-0

Pin material: CuSn, SnPb plated

Maximum operating temperature: 130 °C

Resistance to soldering heat: 400 °C, 2 s

Solderability: IEC 68-2-20, Part 2, Test TA, method 1



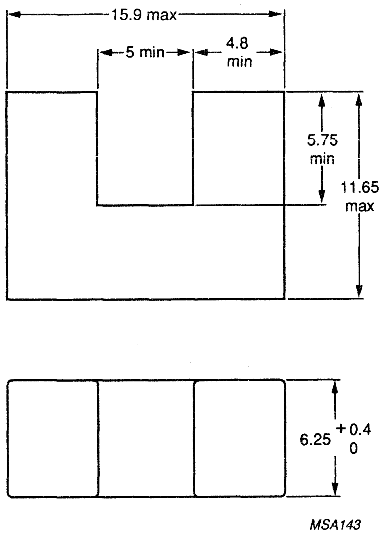
Dimensions in mm

Fig.2 I15/3/3 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm²)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	28	8	30	3122 134 0259

U cores and accessories U15/11/6



Dimensions in mm

Fig.1 U15/11/6 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/a)	core factor (C1)	1.60	mm^{-1}
V_e	effective volume	1680	mm^3
l_e	effective length	52	mm
A_e	effective area	32.3	mm^2
	mass of core half	≈ 4	g

* U15/11/6-2P90 is very suitable for output chokes or uncompensated input filters.
The core is isolated with polyurethane lacquer except for the mating faces. Its density is higher than the ferrite cores (mass ≈ 7 g).

CORE HALVES

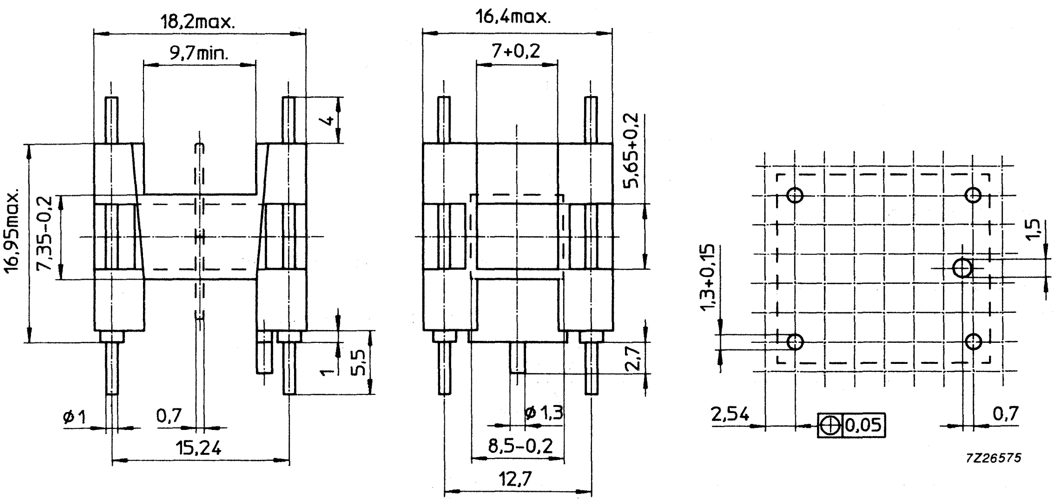
GRADE	A_L	μ_e	ORDERING CODE
3C80	1250 ± 25%	≈ 1550	4312 020 4323
3C85	1250 ± 25%	≈ 1550	4312 020 4329
3C11	2350 ± 25%	≈ 3000	4312 020 4311
3E25	3400 ± 25%	≈ 4300	4312 020 3382
2P90*	72 ± 10%	≈ 90	4330 030 6053

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 320	≤ 0.18	–	–
3C85	≥ 320	–	≤ 0.23	≤ 0.26

COIL FORMER DATA

Coil former material: polyamide 6.6 , glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-0



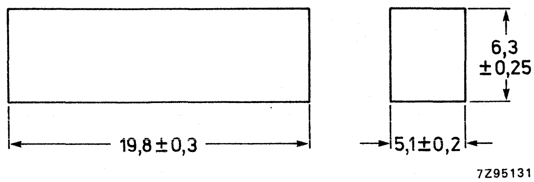
Dimensions in mm

Fig.2 U15/11/6 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm²)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	38.7	9.7	46.6	4322 021 3507
2	4	2 x 17.9	2 x 4.45	46.6	4322 021 3508

I cores and accessories I20/6/5



Dimensions in mm

Fig.1 I20/6/5 core.

CORE

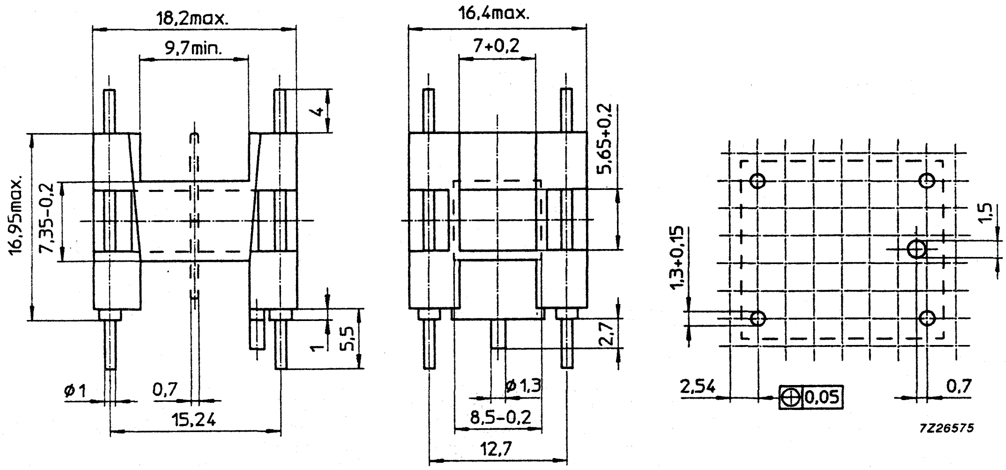
GRADE	ORDERING CODE
3C80	4312 020 4326

COIL FORMER DATA

Coil former material: polyamide 6.6, glass reinforced

Maximum operating temperature: 130 °C

Flammability: in accordance with UL94V-0



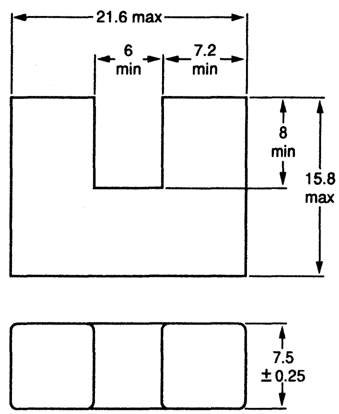
Dimensions in mm

Fig.2 I20/6/5 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	38.7	9.7	46.6	4322 021 3507
2	4	2 x 17.9	2 x 4.45	46.6	4322 021 3508

U cores and accessories U20/16/7



Dimensions in mm

Fig.1 U20/16/7 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/a)	core factor (C1)	1.21	mm^{-1}
V_e	effective volume	3800	mm^3
l_e	effective length	68	mm
A_e	effective area	56	mm^2
	mass of core half	≈ 9	g

* U20/16/7-2P90 is very suitable for output chokes or uncompensated input filters.
The core is isolated with polyurethane lacquer except for the mating faces. Its density is higher than the ferrite cores (mass ≈ 12 g).

CORE HALVES

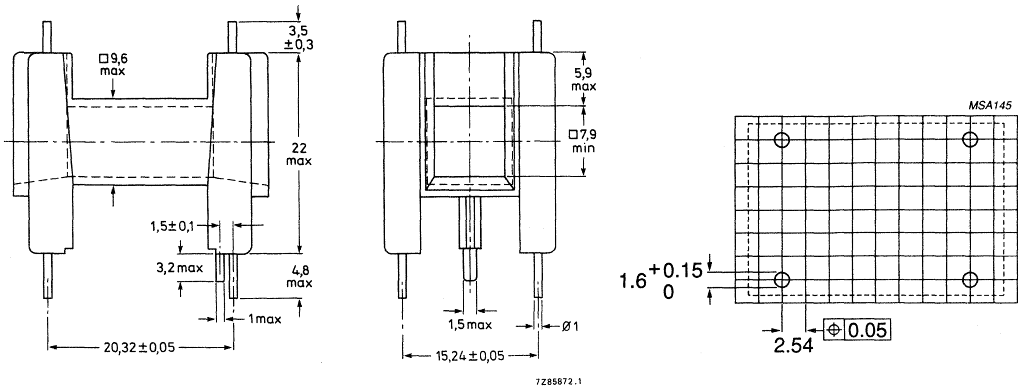
GRADE	A_L	μ_e	ORDERING CODE
3C80	1700 ± 25%	≈ 1650	4312 020 3351
3C85	1700 ± 25%	≈ 1650	4312 020 4303
3C11	3400 ± 25%	≈ 3250	4312 020 4312
3E25	4800 ± 25%	≈ 4600	4312 020 3389
2P90*	95 ± 25%	≈ 90	4330 030 6058

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 320	≤ 0.42	–	–
3C85	≥ 320	–	≤ 0.60	≤ 0.70

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-1



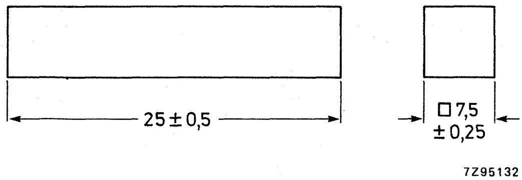
Dimensions in mm

Fig.2 U20/16/7 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	73	14.5	54	3122 137 6414

I cores and accessories I25/7/7



Dimensions in mm

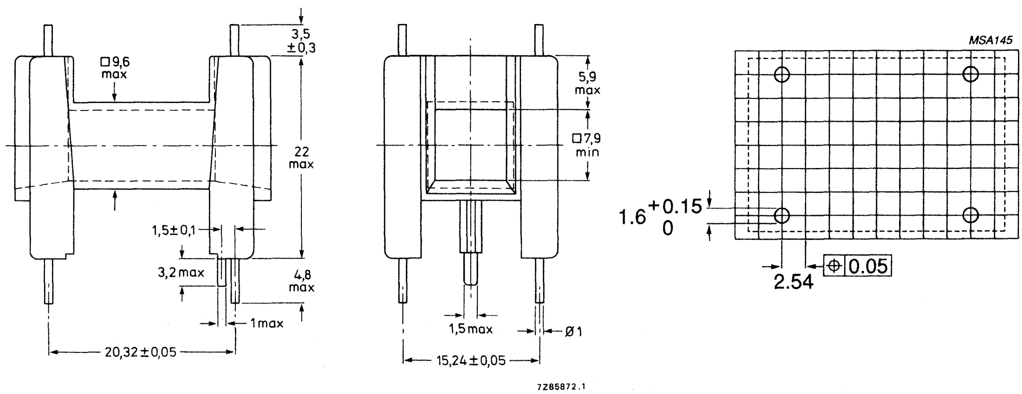
Fig.1 I25/7/7 core.

CORE

GRADE	ORDERING CODE
3C80	4312 020 4327

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-1



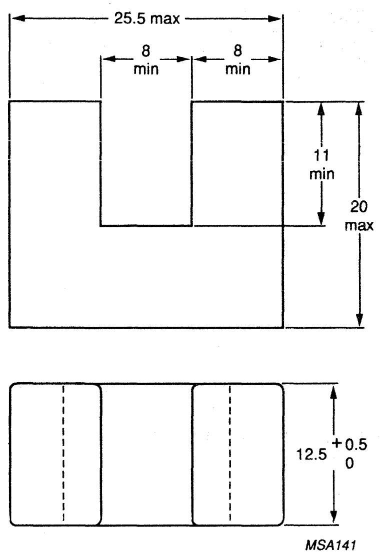
Dimensions in mm

Fig.2 I25/7/7 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	4	90	14.5	63	3122 137 6414

U cores and accessories | U25/20/13



Dimensions in mm

Fig.1 U25/20/13 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.86	mm^{-1}
V_e	effective volume	8600	mm^3
l_e	effective length	86	mm
A_e	effective area	100	mm^2
	mass of core half	≈ 21	g

CORE HALVES

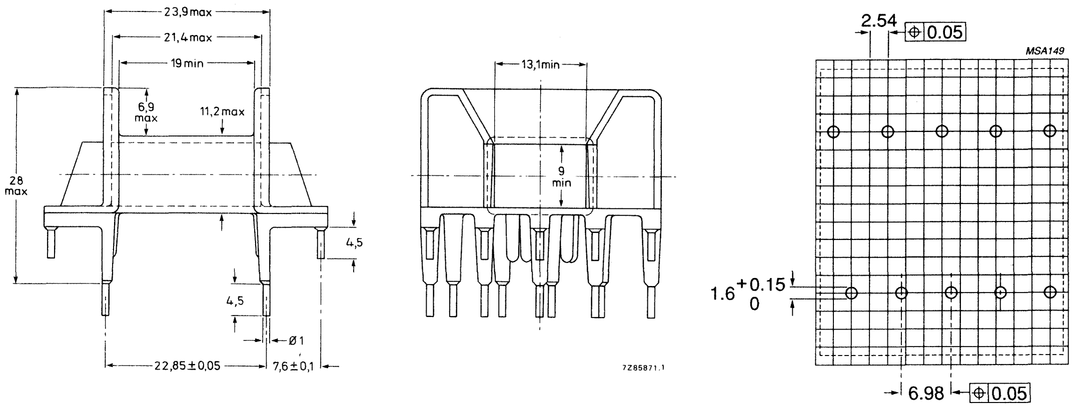
GRADE	A_L	μ_e	ORDERING CODE
3C80	2500 ± 25%	≈ 1700	4312 020 4307
3C85	2500 ± 25%	≈ 1700	4312 020 4330
3C11	5100 ± 25%	≈ 3450	4312 020 4313
3E25	6300 ± 25%	≈ 4300	3112 324 9134

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 320	≤ 1.00	–	–
3C85	≥ 320	–	≤ 1.40	≤ 1.60

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced
Maximum operating temperature: 130 °C
Flammability: in accordance with UL94V-1



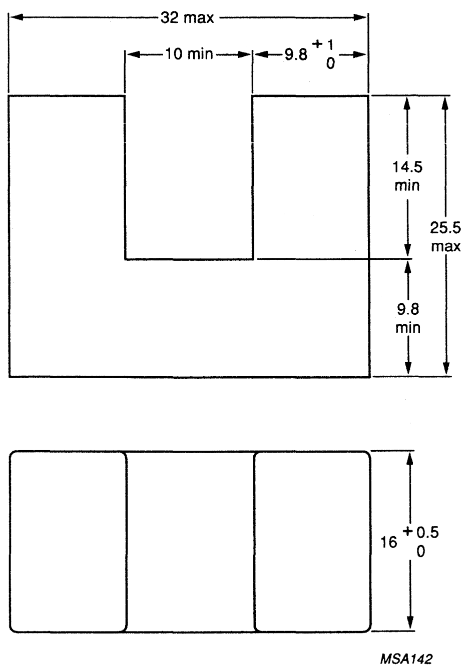
Dimensions in mm

Fig.2 U25/20/13 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	9	131	19	73	3122 137 6191

U cores and accessories U30/25/16



Dimensions in mm

Fig. 1 U30/25/16 core half.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.707	mm^{-1}
V_e	effective volume	17400	mm^3
l_e	effective length	111	mm
A_e	effective area	157	mm^2
	mass of core half	≈ 48	g

CORE HALVES

GRADE	A_L	μ_e	ORDERING CODE
3C80	3300 ± 25%	≈ 1800	4312 020 4324
3C85	3300 ± 25%	≈ 1800	4312 020 4331
3C11	6500 ± 25%	≈ 3600	4312 020 4314

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

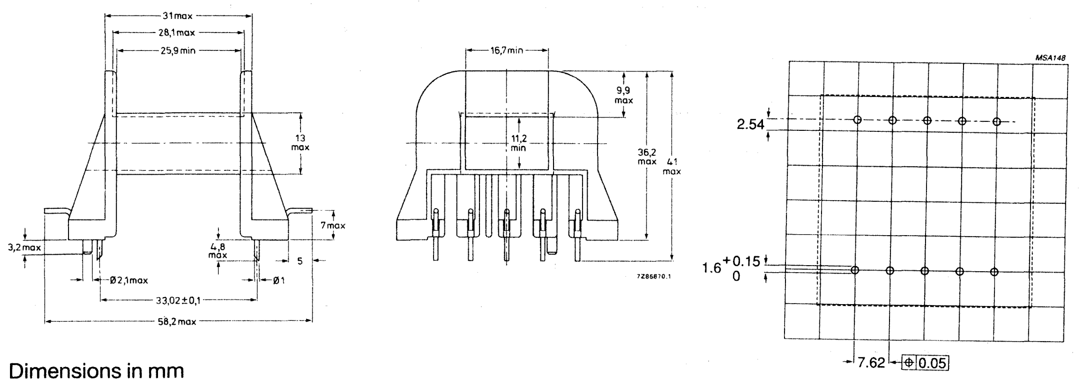
GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P_V (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥ 320	≤ 2.00	–	–
3C85	≥ 320	–	≤ 2.70	≤ 3.20

COIL FORMER DATA

Coil former material: polycarbonate (PC), glass reinforced

Maximum operating temperature: 130 °C

Flammability: in accordance with UL94V-1



Dimensions in mm

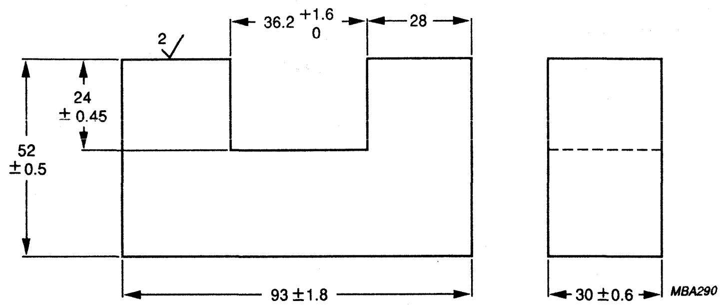
Fig.2 U30/25/16 coil former.

WINDING DATA

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	WINDING LENGTH (mm)	ORDERING CODE
1	10	230	25.9	97	3122 137 5536

U cores and accessories

U93/52/30



Dimensions in mm

Fig.1 U93/52/30 core half.

EFFECTIVE CORE PARAMETERS FOR UU-COMBINATION

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.326	mm^{-1}
V_e	effective volume	200000	mm^3
l_e	effective length	254	mm
A_e	effective area	780	mm^2
	mass of core half	≈ 560	g

CORE HALVES

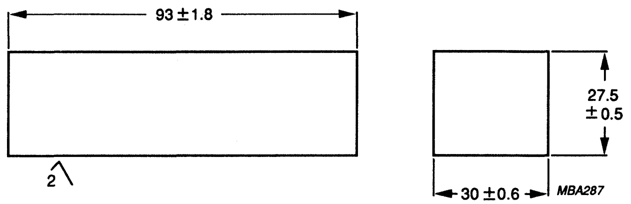
GRADE	A_L*	μ_e	ORDERING CODE
3C80	7200 ± 25%	≈ 1850	4312 020 3358

* measured on a combination of two U-cores.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 22.0	UU93/104/30 combination

I cores and accessories — I93/28/30



Dimensions in mm

Fig.2 I93/28/30 core.

EFFECTIVE CORE PARAMETERS IN COMBINATION WITH U93/52/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.262	mm^{-1}
V_e	effective volume	158000	mm^3
l_e	effective length	204	mm
A_e	effective area	780	mm^2
	mass of core	≈ 370	g

CORE HALVES

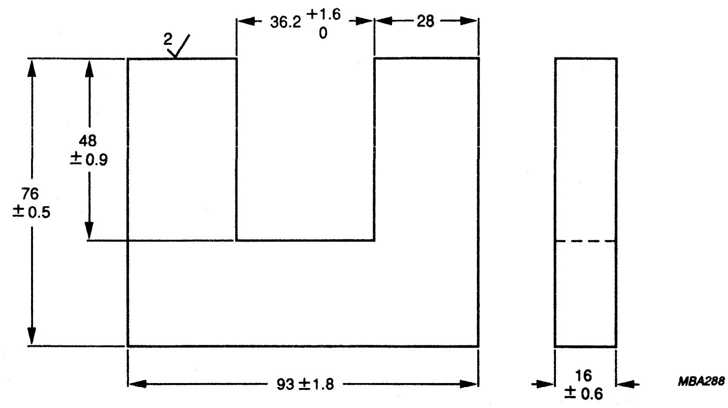
GRADE	A_L*	μ_e	ORDERING CODE
3C80	8900 ± 25%	≈ 1850	4312 020 3359

* measured in combination with U93/52/30.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 17.4	UI93/80/30 combination

U cores and accessories U93/76/16



Dimensions in mm

Fig.1 U93/76/16 core half.

EFFECTIVE CORE PARAMETERS FOR UU-COMBINATION

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.778	mm^{-1}
V_e	effective volume	158000	mm^3
l_e	effective length	354	mm
A_e	effective area	450	mm^2
	mass of core half	≈ 400	g

CORE HALVES

GRADE	A_L*	μ_e	ORDERING CODE
3C80	3100 ± 25%	≈ 1900	4312 020 3355

* measured on a combination of two U-cores.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 16.2	UU93/152/16 combination

I cores and accessories I93/28/16

Dimensions in mm

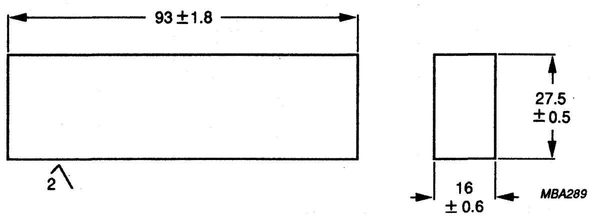


Fig.2 I93/28/16 core.

EFFECTIVE CORE PARAMETERS IN-COMBINATION WITH U93/76/16

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.580	mm^{-1}
V_e	effective volume	107000	mm^3
l_e	effective length	254	mm
A_e	effective area	440	mm^2
	mass of core	≈ 200	g

CORE HALVES

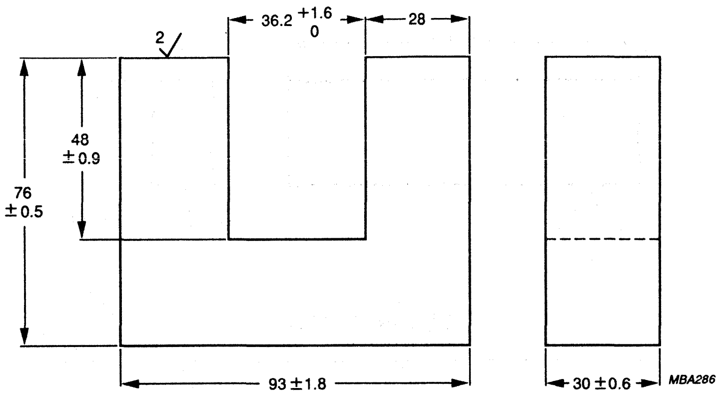
GRADE	A_L*	μ_e	ORDERING CODE
3C80	4000 ± 25%	≈ 1900	4312 020 3356

* measured on an UI-combination.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 11.8	UI93/104/16 combination

U cores and accessories U93/76/30



Dimensions in mm

Fig.1 U93/76/30 core half.

EFFECTIVE CORE PARAMETERS FOR UU-COMBINATION

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.420	mm^{-1}
V_e	effective volume	298000	mm^3
l_e	effective length	354	mm
A_e	effective area	843	mm^2
	mass of core half	≈ 760	g

CORE HALVES

GRADE	A_L*	μ_e	ORDERING CODE
3C80	5200 ± 25%	≈ 1850	4312 020 3357

* measured on a combination of two U93/76/30-cores.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 30	UU93/152/30 combination

I cores and accessories I93/28/30

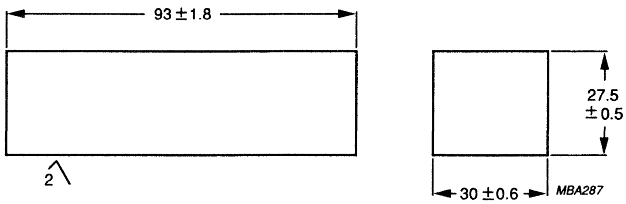


Fig.2 I93/28/30 core.

EFFECTIVE CORE PARAMETERS IN COMBINATION WITH U93/76/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.308	mm^{-1}
V_e	effective volume	215000	mm^3
l_e	effective length	258	mm
A_e	effective area	837	mm^2
	mass of core	≈365	g

CORE HALVES

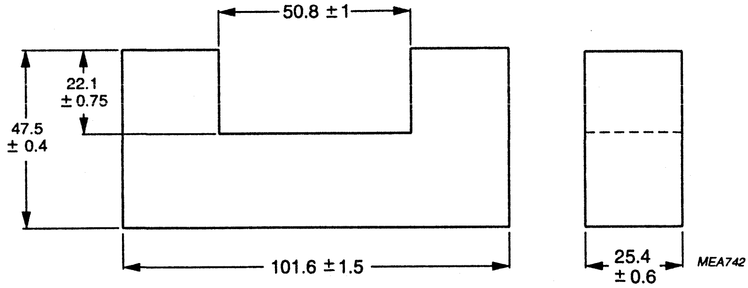
GRADE	A_L*	μ_e	ORDERING CODE
3C80	7200 ± 25%	≈ 1850	4312 020 3359

* measured on an UI-combination.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 22	UI93/104/30 combination

U cores and accessories U100/48/25



Dimensions in mm

Fig.1 U100/48/25 core half.

EFFECTIVE CORE PARAMETERS FOR UU-COMBINATION

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	0.439	mm^{-1}
V_e	effective volume	169000	mm^3
l_e	effective length	272	mm
A_e	effective area	620	mm^2
	mass of core half	≈ 450	g

CORE HALVES

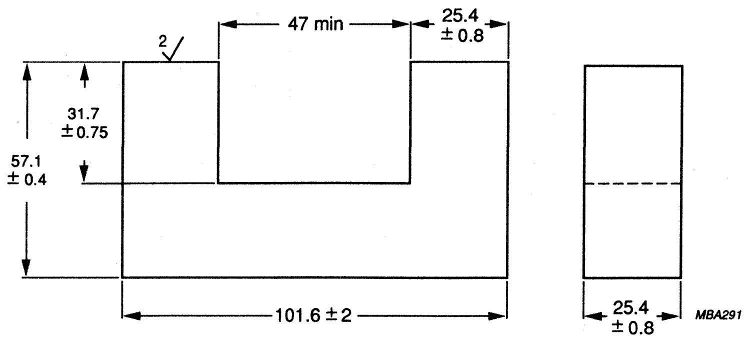
GRADE	A_L*	μ_e	ORDERING CODE
3C80	≈ 5500	≈ 1900	4312 020 4349

* measured on a combination of two U-cores.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 18.6	UU100/96/25 combination

U cores and accessories U100/57/25



Dimensions in mm

Fig.1 U100/57/25 core half.

EFFECTIVE CORE PARAMETERS FOR UU-COMBINATION

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/a)$	core factor (C1)	0.488	mm^{-1}
V_e	effective volume	198000	mm^3
l_e	effective length	315	mm
A_e	effective area	645	mm^2
	mass of core half	≈ 500	g

CORE HALVES

GRADE	A_L*	μ_e	ORDERING CODE
3C80	5250 ± 25%	≈ 1900	4312 020 3360

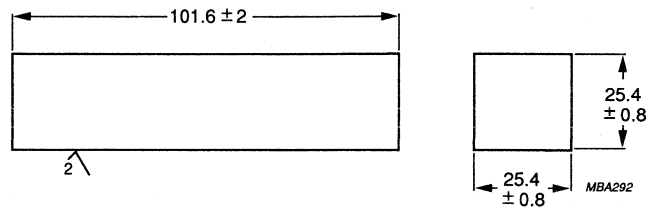
* measured on a combination of two U-cores.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 21	UU100/114/25 combination

I cores and accessories

I100/25/25



Dimensions in mm

Fig.2 I100/25/25 core.

EFFECTIVE CORE PARAMETERS IN COMBINATION WITH U100/57/25

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/a)	core factor (C1)	0.380	mm^{-1}
V_e	effective volume	158000	mm^3
l_e	effective length	245	mm
A_e	effective area	645	mm^2
	mass of core	≈ 300	g

CORE HALVES

GRADE	A_L*	μ_e	ORDERING CODE
3C80	6600 ±25%	≈ 1900	4312 020 3361

* measured on an UI-combination.

PROPERTIES OF CORE SETS UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P_V (W) at f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	REMARKS
3C80	≥ 330	≤ 16.4	UI100/82/25 combination

PRESENT TYPES AND ORDERING CODES.

Our present selection is displayed in Table 1. In principle any core shape can be supplied in all available grades. Other customized shapes can be manufactured on request.

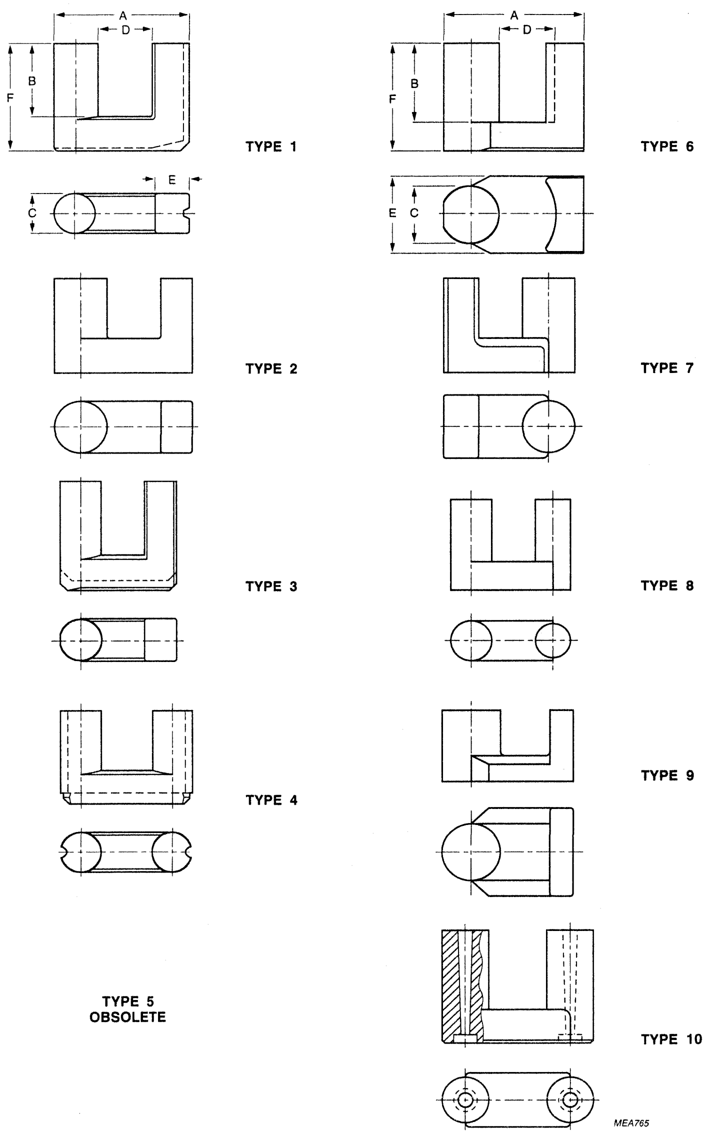


Fig.1 Outlines of U cores for line output transformers.

Table 1 Mechanical data

DESCRIPTION	TYPE	DIMENSIONS (mm)						EFFECTIVE CORE PARAMETER				
		A	B	C	$D_{min.}$	E	F	C1 (mm^{-1})	V_e (mm^3)	l_e (mm)	A_e (mm^2)	MASS (g)
U28/16/20	9	28.5	11.0	12.5	10.2	19.6	16.2	0.833	9000	87	104	25
U28/20/13	7	28.3	13.0	11.2	8.5	13.6	20.4	0.890	9460	87	98	25
U32/20/10	4	32.0	11.1	10.0	12.5	10.0	20.0	1.370	7500	100	73	19
U34/26/9	2	33.5	19.1	9.3	15.1	8.5	26.0	1.886	9240	132	70	24
U35/28/13	3	35.05	18.0	12.7	13.05	9.3	28.3	1.100	15840	132	120	42
U35/34/13	3	35.35	24.0	12.7	13.1	9.3	34.3	1.300	18720	156	120	47
U37/25/18	7	36.9	16.8	14.7	13.9	18.0	25.7	0.847	19050	127	150	51
U37/29/13	1	37.2	18.85	13.0	13.2	10.5	29.35	1.045	18080	138	132	46
U37/29/18	7	36.9	19.9	14.7	13.9	18.0	29.0	0.927	20800	139	150	55
U37/34/13	1	37.2	23.7	13.0	13.2	10.5	34.2	1.197	20850	158	132	51
U39/35/15	2	38.7	24.8	15.0	15.0	9.1	35.2	1.102	23800	162	147	60
U40/32/22	7	38.6	23.9	15.0	14.6	8.0	31.9	0.887	27800	157	177	75
U41/34/13	1	41.3	23.1	13.0	16.3	11.3	34.4	1.206	22900	164	136	60
U42/32/15	1	42.5	19.8	15.2	14.4	12.0	31.8	0.832	26670	149	179	69
U42/35/24	6	42.2	25.0	17.0	16.1	24.0	34.8	0.756	39100	170	225	100
U43/29/16	2	42.1	19.35	15.8	15.7	9.6	29.35	0.867	23900	144	166	63
U43/34/16	2	42.1	24.0	15.8	15.7	9.6	34.0	0.982	27100	163	166	71
U44/31/15	1	43.75	18.9	14.65	16.65	11.8	30.6	0.882	25200	149	169	71
U44/36/15	1	43.75	24.2	14.65	16.65	11.8	35.9	1.006	28700	170	169	71
U44/38/16	3	43.65	25.5	15.9	15.25	12.5	38.0	0.893	34300	175	196	86
U46/33/11	4	46.3	23.55	11.15	24.4	11.5	33.0	1.466	11600	129	88	38
U47/25/18	8	47.4	15.6	14.7	18.5	18.0	24.5	0.914	20900	138	151	53
U47/44/16	1	46.95	31.45	15.95	18.25	12.6	44.0	1.135	39000	210	185	100
U48/39/17	1	48.0	26.4	17.0	17.4	13.0	39.4	0.865	39990	186	215	99
U50/37/16	4	50.25	24.75	15.9	19.15	15.9	36.75	0.973	33300	180	185	84
U57/28/16	4	57.8	15.75	15.5	26.9	15.9	28.2	0.953	27900	163	171	70
U59/36/17	4	59.5	21.5	17.0	25.5	17.0	35.8	0.900	39700	189	210	99
U64/40/20	10	64.0	26.5	20.05	23.55	24.0	40.5	0.724	61000	210	290	160
U64/46/20	10	64.0	32.5	20.0	23.5	24.0	46.5	0.807	67860	234	290	178
U70/33/17	4	69.8	19.05	17.25	35.4	17.25	33.35	0.921	43800	197	214	106

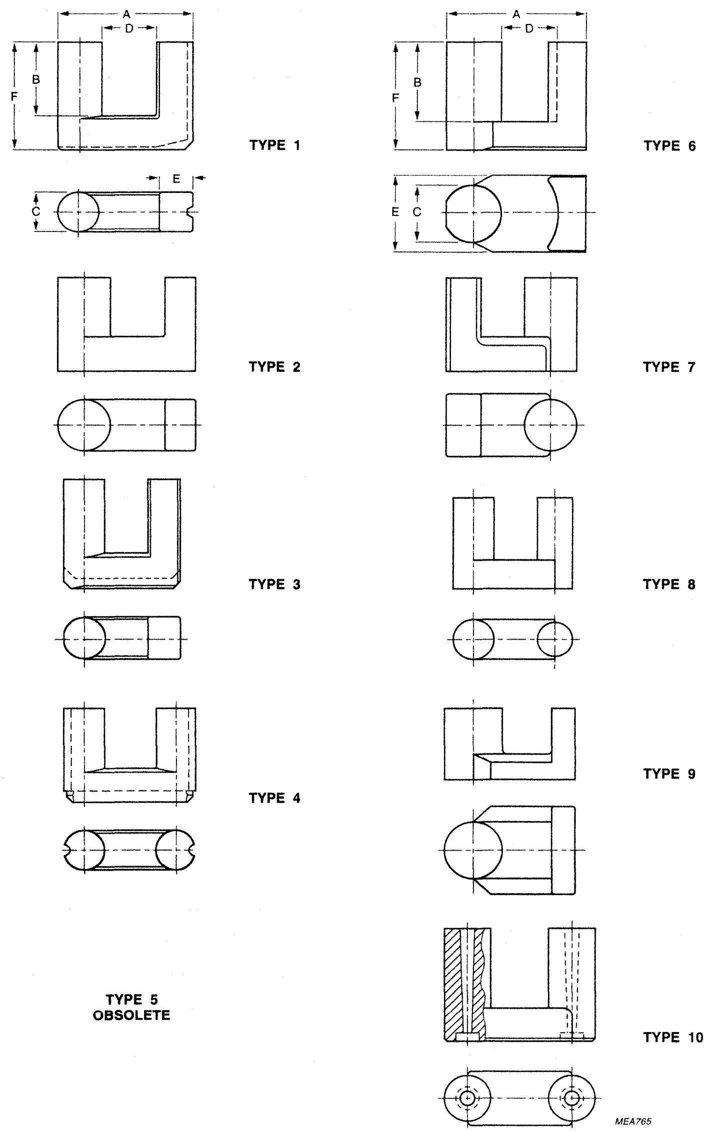


Fig.2 Outlines of U cores for line output transformers.

Table 2 Ordering codes

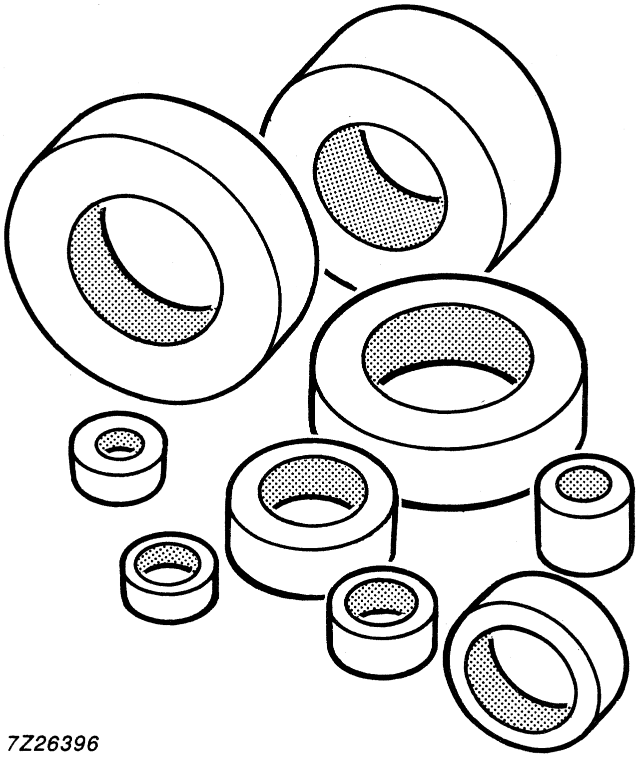
DESCRIPTION	TYPE	ORDERING CODE			
		3C80	3C85	3C10	3C15
U28/16/20	9	4312 020 4310	–	–	–
U28/20/13	7	4312 020 4338	4312 020 4341	–	–
U32/20/10	4	3122 134 9199	–	–	–
U34/26/9	2	3122 134 9332	–	–	–
U35/28/13	3	–	–	4312 020 4360	–
U35/34/13	3	4312 020 3381	–	4312 020 4315	4312 020 4346
U37/25/18	7	4312 020 3374	4312 020 3385	4312 020 4317	–
U37/29/13	1	–	–	4312 020 4321	–
U37/29/18	7	4312 020 3371	–	4312 020 4319	–
U37/34/13	1	–	4312 020 4353	–	–
U39/35/15	2	4312 020 4340	–	–	4312 020 4320
U40/32/22	7	–	–	4312 020 4342	–
U41/34/13	1	–	–	–	4312 020 4361
U42/32/15	1	3122 134 9352	–	–	–
U42/35/24	6	–	–	3122 134 9282	3122 134 9348
U43/29/16	2	4312 020 4306	–	–	–
U43/34/16	2	4312 020 3368	–	–	–
U44/31/15	1	–	–	4312 020 4304	–
U44/36/15	1	–	–	4312 020 4305	4312 020 4334
U44/38/16	3	–	–	4312 020 4339	–
U46/33/11	4	3122 104 9048	–	–	–
U47/25/18	8	4312 020 3352	–	–	–
U47/44/16	1	–	–	–	–
U48/39/17	1	–	–	3122 134 9384	–
U50/37/16	4	4312 020 3376	–	–	–
U57/28/16	4	4312 020 3319	–	–	–
U59/36/17	4	4312 020 3340	–	–	–
U64/40/20	10	3122 134 9139	–	–	–
U64/46/20	10	4312 020 4302	–	–	–
U70/33/17	4	3122 104 9395	–	–	–

FERRITE RING CORES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

RC2.5/1 to RCL58/17.5
Ferrite ring cores



7Z26396

Permeability/A_L

Effective magnetic dimensions are calculated from nominal mechanical dimensions according to IEC 205. Nominal A_L value is calculated with these and the nominal permeability.

For high permeability materials tumbling and coating cause a decrease in permeability. Therefore different nominal permeabilties and tolerances are used to calculate A_L specifications for 3E25 and 3E5 ring cores.

GRADE	PRODUCT TYPE	NOMINAL PERMEABILITY	TOLERANCE	FREQUENCY (kHz)
3E25	uncoated	6000	± 25%	< 100
		6000	± 30%	at 200
3E25	coated (OD ≥ 19 mm)	5500	± 25%	< 200
	coated (OD < 19 mm)	5500	± 30%	< 200
3E5	uncoated	9000	± 30%	< 100
3E5	lacquered	8500	± 30%	< 100

Coating isolation voltage

This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Isolation voltages of nylon coating and lacquer

MATERIAL	OUTSIDE DIAMETER WITHOUT COATING (mm)	ISOLATION VOLTAGE (V) (DC)
Ferrite	4 ≤ OD < 12	1000
	12 ≤ OD ≤ 20	1500
	20 < OD ≤ 36	2000
Iron powder	7.5 ≤ OD ≤ 32.6	1500

Ferrite ring cores

RC2.5/1

Dimensions in mm

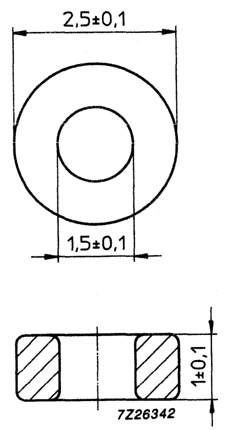


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	12.3	mm^{-1}
V_e	effective volume	2.94	mm^3
l_e	effective length	6.02	mm
A_e	effective area	0.489	mm^2
	mass	≈ 0.015	g

GRADE	A_L (nH)	ORDERING CODE
4C65	13 ± 25%	4330 030 3472
4A11	71 ± 25%	4330 030 3405
3F3	180 ± 25%	4330 030 3513
3E25	610 ± 25%	4330 030 3719
3E5	920 ± 30%	4330 030 3514

Ferrite ring cores RCC4/1.1

Dimensions in mm

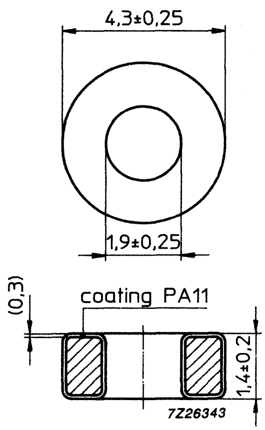


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.55	mm^{-1}
V_e	effective volume	8.82	mm^3
l_e	effective length	9.18	mm
A_e	effective area	0.961	mm^2
	mass	≈ 0.04	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	16 ± 25%	violet	4330 030 3469
4A11	92 ± 25%	pink	4330 030 3436
3F3	240 ± 25%	blue	4330 030 3789
3E25	725 ± 30%	orange	4330 030 3735
3E5*	1120 ± 30%	yellow/white	4330 030 3761

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 4.3 ± 0.3 mm
Inside diameter = 2.1 ± 0.3 mm
Height = 1.25 ± 0.3 mm

Ferrite ring cores

RCC4/1.6

Dimensions in mm

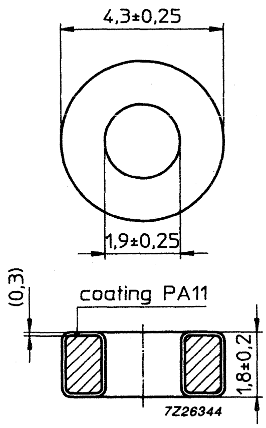


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	6.56	mm^{-1}
V_e	effective volume	12.9	mm^3
l_e	effective length	9.2	mm
A_e	effective area	1.40	mm^2
	mass	≈ 0.10	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	24 ± 25%	violet	4330 030 3470
4A11	134 ± 25%	pink	4330 030 3437
3F3	340 ± 25%	blue	4330 030 3478
3E25	1050 ± 30%	orange	4330 030 3707
3E5*	1630 ± 30%	yellow/white	4330 030 3760

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 4.3 ± 0.3 mm
Inside diameter = 2.1 ± 0.3 mm
Height = 1.75 ± 0.3 mm

Ferrite ring cores

RCC6/2

Dimensions in mm

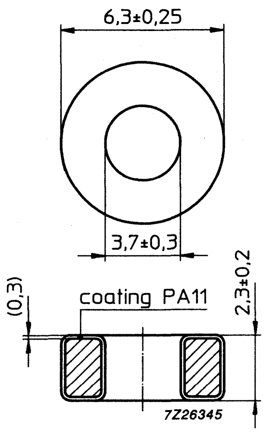


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.75	mm^{-1}
V_e	effective volume	30.2	mm^3
l_e	effective length	15.3	mm
A_e	effective area	1.97	mm^2
	mass	≈ 0.15	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	20 ± 25%	violet	4322 020 9716
4A11	114 ± 25%	pink	4330 030 3438
3F3	290 ± 25%	blue	4330 030 3790
3E25	890 ± 30%	orange	4330 030 3708
3E5*	1380 ± 30%	yellow/white	4330 030 3762

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 6.3 ± 0.3 mm
Inside diameter = 3.75 ± 0.3 mm
Height = 2.25 ± 0.3 mm

Ferrite ring cores RCC6.3/2.5

Dimensions in mm

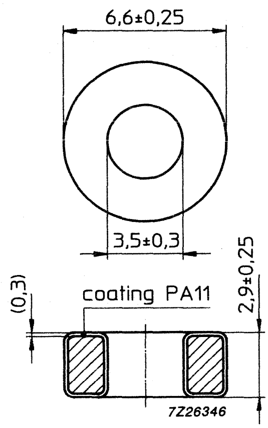


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	46.5	mm^3
l_e	effective length	15.2	mm
A_e	effective area	3.06	mm^2
	mass	≈ 0.23	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	32 ± 25%	violet	4330 030 3479
4A11	177 ± 25%	pink	4330 030 3487
3F3	450 ± 25%	blue	4330 030 3497
3E25	1390 ± 30%	orange	4330 030 3494
3E5*	2150 ± 30%	yellow/white	4330 030 3496

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 6.6 ± 0.3 mm
Inside diameter = 3.55 ± 0.3 mm
Height = 2.75 ± 0.3 mm

Ferrite ring cores

RCC9/3

Dimensions in mm

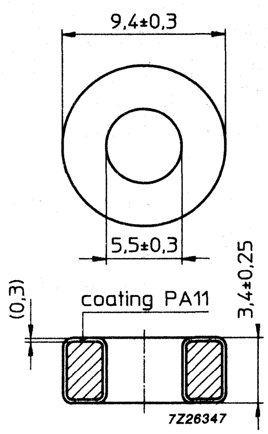


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.17	mm^{-1}
V_e	effective volume	102	mm^3
l_e	effective length	22.9	mm
A_e	effective area	4.44	mm^2
	mass	≈ 0.5	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	30 ± 25%	violet	4322 020 9717
4A11	170 ± 25%	pink	4330 030 3439
3F3	440 ± 25%	blue	4330 030 3791
3E25	1340 ± 30%	orange	4330 030 3709
3E5*	2070 ± 30%	yellow/white	4330 030 3763
3R1	180 ± 25%	black	4330 030 3768
3C85	485 ± 25%	red	4330 030 3580

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 9.3 ± 0.4 mm
Inside diameter = 5.75 ± 0.3 mm
Height = 3.25 ± 0.3 mm

Ferrite ring cores RCC10/4

Dimensions in mm

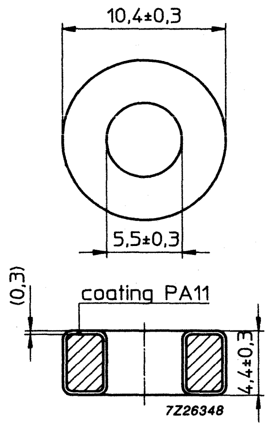


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	3.07	mm^{-1}
V_e	effective volume	188	mm^3
l_e	effective length	24.1	mm
A_e	effective area	7.8	mm^2
	mass	≈ 0.95	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	52 ± 25%	violet	4330 030 3480
4A11	285 ± 25%	pink	4330 030 3488
3F3	740 ± 25%	blue	4330 030 3498
3C85	820 ± 25%	red	4330 030 3446
3C11	1750 ± 25%	white	4330 030 3450
3E25	2250 ± 30%	orange	4330 030 3458
3E5 *	3470 ± 30%	yellow/white	4330 030 3466

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥ 320	–	≤ 0.03	≤ 0.04

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 10.25 ± 0.4 mm
Inside diameter = 5.75 ± 0.3 mm
Height = 4.25 ± 0.3 mm

Ferrite ring cores

RCC12.5/5

Dimensions in mm

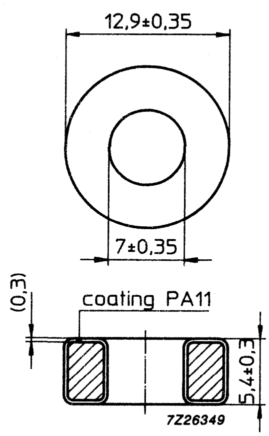


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.46	mm^{-1}
V_e	effective volume	368	mm^3
l_e	effective length	30.1	mm
A_e	effective area	12.2	mm^2
	mass	≈ 1.8	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L	COLOUR CODE	ORDERING CODE
4C65	64 ± 25%	violet	4330 030 3481
4A11	360 ± 25%	pink	4330 030 3440
3F4	380 ± 25%	beige	4330 030 4527
3C85	1000 ± 25%	red	4330 030 3779
3F3	900 ± 25%	blue	4330 030 3792
3C11	2200 ± 25%	white	4330 030 3492
3E25	2810 ± 30%	orange	4330 030 3710
3E5*	4340 ± 30%	yellow/white	4330 030 3764

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.06	≤ 0.07	–
3F3	≥ 320	–	≤ 0.04	≤ 0.07

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 12.75 ± 0.4 mm
Inside diameter = 7.25 ± 0.35 mm
Height = 5.25 ± 0.3 mm

Ferrite ring cores RCC14/5

Dimensions in mm

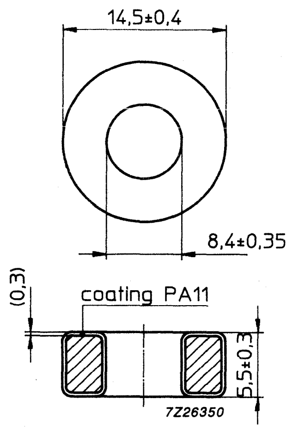


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.84	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	35	mm
A_e	effective area	12.3	mm^2
	mass	≈ 2.1	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	55 ± 25%	violet	4322 020 9718
4A11	310 ± 25%	pink	4330 030 3441
3C85	880 ± 25%	red	4330 030 3745
3F3	790 ± 25%	blue	4330 030 3793
3C11	1900 ± 25%	white	4330 030 3746
3E25	2430 ± 30%	orange	4330 030 3711
3E5*	3760 ± 30%	yellow/white	4330 030 3765
3R1	330 ± 25%	black	4330 030 3769

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.07	≤ 0.08	–
3F3	≥ 320	–	≤ 0.05	≤ 0.08

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 14.25 ± 0.4 mm
Inside diameter = 8.75 ± 0.35 mm
Height = 5.25 ± 0.3 mm

Ferrite ring cores RCC14/9

Dimensions in mm

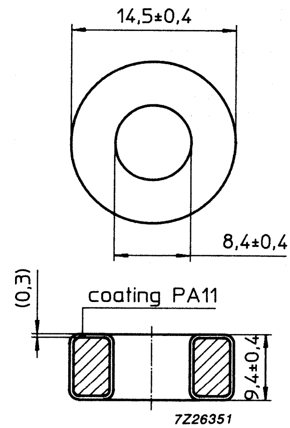


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.58	mm^{-1}
V_e	effective volume	774	mm^3
l_e	effective length	35	mm
A_e	effective area	22.1	mm^2
	mass	≈ 3.8	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4A11	560 ± 25%	pink	4330 030 3442
3C85	1600 ± 25%	red	4330 030 3780
3F3	1430 ± 25%	blue	4330 030 3794
3C11	3400 ± 25%	white	4330 030 3505
3E25	4370 ± 30%	orange	4330 030 3712
3E5 *	6760 ± 30%	yellow/white	4330 030 3766

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.12	≤ 0.14	–
3F3	≥ 320	–	≤ 0.09	≤ 0.15

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 14.25 ± 0.4 mm
Inside diameter = 8.75 ± 0.35 mm
Height = 9.25 ± 0.4 mm

Ferrite ring cores

RCC16/6.3

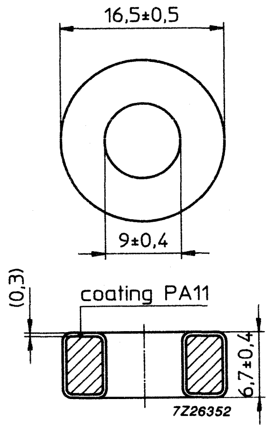


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.95	mm^{-1}
V_e	effective volume	760	mm^3
l_e	effective length	38.5	mm
A_e	effective area	19.7	mm^2
	mass	≈ 3.8	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4A11	450 ± 25%	pink	4330 030 3443
3C85	1300 ± 25%	red	4330 030 3781
3F3	1160 ± 25%	blue	4330 030 3795
3C11	2700 ± 25%	white	4330 030 3718
3E25	3540 ± 30%	orange	4330 030 3713
3E5*	5470 ± 30%	yellow/white	4330 030 3767

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.12	≤ 0.14	–
3F3	≥ 320	–	≤ 0.09	≤ 0.15

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 16.25 ± 0.5 mm
Inside diameter = 9.35 ± 0.4 mm
Height = 6.55 ± 0.4 mm

Ferrite ring cores RCC19/10

Dimensions in mm

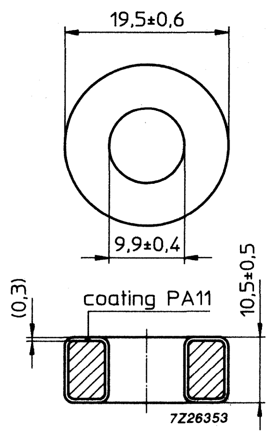


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	1795	mm^3
l_e	effective length	44.0	mm
A_e	effective area	40.8	mm^2
	mass	≈ 9.2	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2330 ± 25%	red	4330 030 3491
3C11	5000 ± 25%	white	4330 030 3747
3E25	6420 ± 25%	orange	4330 030 3734

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.28	≤ 0.32	–

Ferrite ring cores RCC19/15

Dimensions in mm

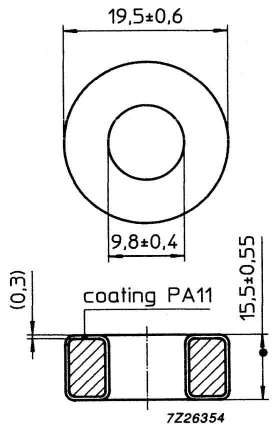


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.718	mm^{-1}
V_e	effective volume	2692	mm^3
l_e	effective length	44.0	mm
A_e	effective area	61.2	mm^2
	mass	≈ 13.8	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	3500 ± 25%	red	4330 030 3748
3C11	7500 ± 25%	white	4330 030 3749
3E25	9630 ± 25%	orange	4330 030 3714

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.42	≤ 0.49	–

Ferrite ring cores RCC20/7

Dimensions in mm

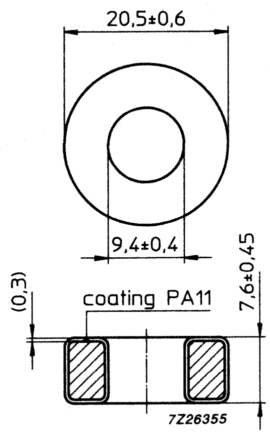


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.30	mm^{-1}
V_e	effective volume	1465	mm^3
l_e	effective length	43.6	mm
A_e	effective area	33.6	mm^2
	mass	≈ 7.7	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	121 ± 25%	violet	4330 030 3482
3C85	1950 ± 25%	red	4330 030 3447
3C11	4150 ± 25%	white	4330 030 3451
3E25	5340 ± 25%	orange	4330 030 3459
3E5 *	8250 ± 30%	yellow/white	4330 030 3525

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.23	≤ 0.27	–

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 20.25 ± 0.6 mm
Inside diameter = 9.75 ± 0.4 mm
Height = 7.25 ± 0.45 mm

Ferrite ring cores RCC23/7

Dimensions in mm

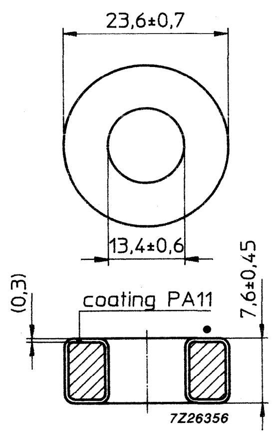


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.81	mm^{-1}
V_e	effective volume	1722	mm^3
l_e	effective length	55.8	mm
A_e	effective area	30.9	mm^2
	mass	≈ 8.4	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	87 ± 25%	violet	4322 020 9719
4A11	485 ± 25%	pink	4330 030 3444
3C85	1400 ± 25%	red	4330 030 3750
3F3	1250 ± 25%	blue	4330 030 3499
3C11	3000 ± 25%	white	4330 030 3751
3E25	3820 ± 25%	orange	4330 030 3716
3R1	**520 ± 25%**	black	4330 030 3770

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.27	≤ 0.31	–
3F3	≥ 320	–	≤ 0.19	≤ 0.33

Ferrite ring cores RCC25/10

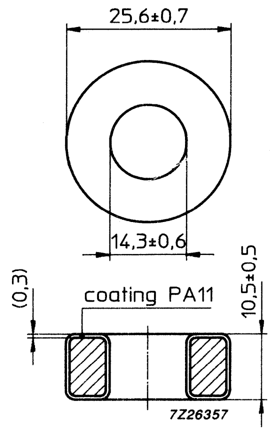


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	2944	mm^3
l_e	effective length	60.2	mm
A_e	effective area	48.9	mm^2
	mass	≈ 15	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2050 ± 25%	red	4330 030 3448
3F3	1840 ± 25%	blue	4330 030 3500
3C11	4400 ± 25%	white	4330 030 3452
3E25	5620 ± 25%	orange	4330 030 3460
3E5*	8680 ± 30%	yellow/white	4330 030 3526

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.46	≤ 0.53	–
3F3	≥ 320	–	≤ 0.33	≤ 0.56

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 25.25 ± 0.7 mm
Inside diameter = 14.75 ± 0.6 mm
Height = 10.25 ± 0.5 mm

Ferrite ring cores RCC26/10

Dimensions in mm

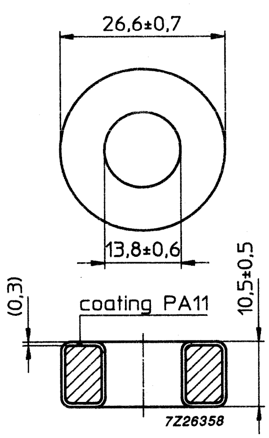


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	3361	mm^3
l_e	effective length	60.1	mm
A_e	effective area	55.9	mm^2
	mass	≈ 17	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2300 ± 25%	red	4330 030 3783
3C11	5000 ± 25%	white	4330 030 3752
3E25	6420 ± 25%	orange	4330 030 3717

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.52	≤ 0.60	–

Ferrite ring cores RCC26/20

Dimensions in mm

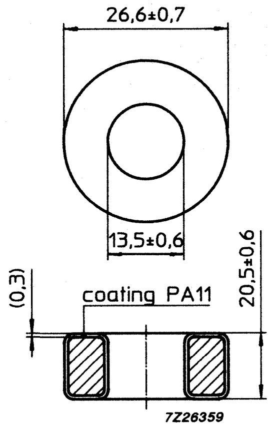


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.538	mm^{-1}
V_e	effective volume	6723	mm^3
l_e	effective length	60.1	mm
A_e	effective area	112	mm^2
	mass	≈ 34	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	4700 ± 25%	red	4330 030 3784
3C11	10000 ± 25%	white	4330 030 3753
3E25	12800 ± 25%	orange	4330 030 3754

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 1.1	≤ 1.2	–

Ferrite ring cores RCC29/7.5

Dimensions in mm

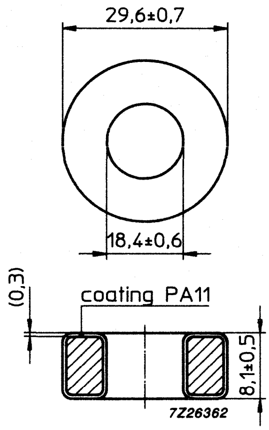


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.98	mm^{-1}
V_e	effective volume	2704	mm^3
l_e	effective length	73.2	mm
A_e	effective area	36.9	mm^2
	mass	≈ 13.5	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	1300 ± 25%	red	4330 030 3785
3C11	2700 ± 25%	white	4330 030 3758
3E25	3550 ± 25%	orange	4330 030 3423

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.42	≤ 0.49	–

Ferrite ring cores RCC31.5/12.5

Dimensions in mm

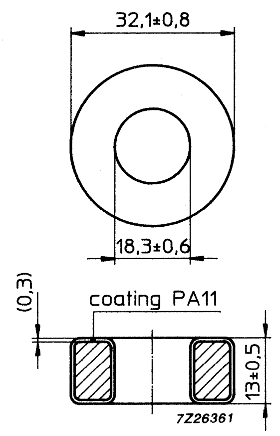


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.99	mm^{-1}
V_e	effective volume	5816	mm^3
l_e	effective length	76	mm
A_e	effective area	76.5	mm^2
	mass	≈ 29	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2530 ± 25%	red	4330 030 3449
3F3	2270 ± 25%	blue	4330 030 3501
3C11	5450 ± 25%	white	4330 030 3453
3E25	6950 ± 25%	orange	4330 030 3461
3E5*	10700 ± 30%	yellow/white	4330 030 3527

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.90	≤ 1.1	–
3F3	≥ 320	–	≤ 0.64	≤ 1.1

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 31.75 ± 0.8 mm
Inside diameter = 18.75 ± 0.7 mm
Height = 12.75 ± 0.5 mm

Ferrite ring cores RCC36/10

Dimensions in mm

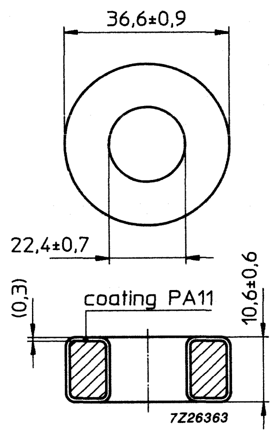


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.40	mm^{-1}
V_e	effective volume	5731	mm^3
l_e	effective length	89.6	mm
A_e	effective area	63.9	mm^2
	mass	≈ 28	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	112 ± 25%	violet	4330 030 3471
3C85	1800 ± 25%	red	4330 030 3786
3C11	3900 ± 25%	white	4330 030 3755

PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; B̂ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; B̂ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 0.89	≤ 1.1	–

Ferrite ring cores

RCC36/15

Dimensions in mm

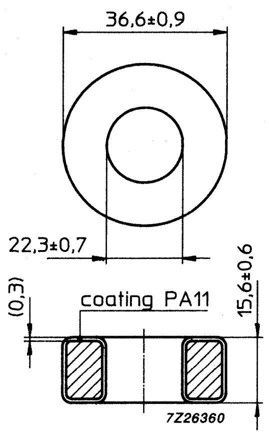


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	0.935	mm^{-1}
V_e	effective volume	8596	mm^3
l_e	effective length	89.6	mm
A_e	effective area	95.9	mm^2
	mass	≈ 42	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
4C65	170 ± 25%	violet	4322 020 9720
4A11	940 ± 25%	pink	4330 030 3445
3C85	2700 ± 25%	red	4330 030 3787
3F3	2420 ± 25%	blue	4330 030 3502
3C11	5800 ± 25%	white	4330 030 3756
3E25	7390 ± 25%	orange	4330 030 3422
3R1	1000 ± 25%	black	4330 030 3431
3E5*	11400 ± 30%	yellow/white	4330 030 3528

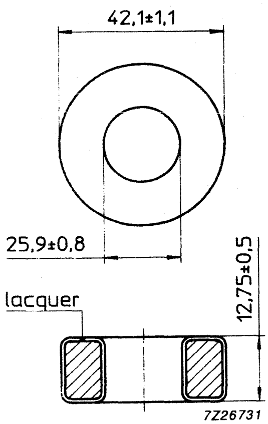
PROPERTIES OF CORES UNDER POWER CONDITIONS

GRADE	B (mT) at H = 250 A/m; f = 25 kHz; T = 100 °C	P (W) at f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	P (W) at f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	P (W) at f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥ 320	≤ 1.4	≤ 1.6	–
3F3	≥ 320	–	≤ 0.95	≤ 1.7

* Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions.

Outside diameter = 36.25 ± 0.9 mm
Inside diameter = 22.75 ± 0.7 mm
Height = 15.25 ± 0.6 mm

Ferrite ring cores RCL42/12.5



Dimensions in mm

Fig.1 RCL42/12.5

EFFECTIVE CORE PARAMETERS

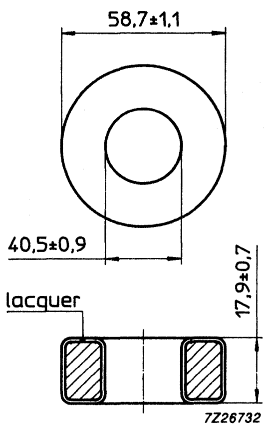
SYMBOL	PARAMETER	VALUE	UNIT
Σ (l/A)	core factor (C1)	1.076	mm^{-1}
V_e	effective volume	9864	mm^3
l_e	effective length	103	mm
A_e	effective area	95.8	mm^2
	mass	≈ 53	g

Coating: Polyurethane lacquer

NON-COATED CORES ARE AVAILABLE ON REQUEST

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2335 ± 25%	red/white	4330 030 3552
3C11	5000 ± 25%	white	4330 030 3592

Ferrite ring cores RCL58/17.5



Dimensions in mm

Fig.1 RCL58/17.5

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ (I/A)	core factor (C1)	1.0	mm^{-1}
V_e	effective volume	23220	mm^3
l_e	effective length	152.4	mm
A_e	effective area	152.4	mm^2
	mass	≈ 110	g

Coating: Polyurethane lacquer

NON-COATED CORES ARE AVAILABLE ON REQUEST

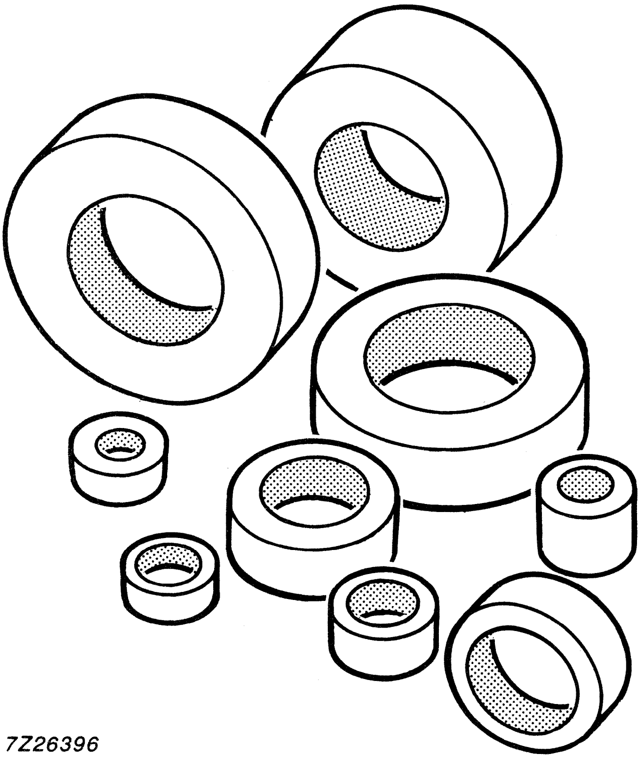
GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
3C85	2575 ± 25%	red/white	4330 030 3553
3C11	5400 ± 25%	white	4330 030 3520
3E25	6900 ± 25%	orange/white	4330 030 4515

IRON POWDER RING CORES

Philips Components

Data sheet	
status	Product specification
date of issue	December 1992

RCC7.5/3 to RCC32.6/10
Iron powder ring cores



7Z26396

Iron powder ring cores RCC7.5/3

Dimensions in mm

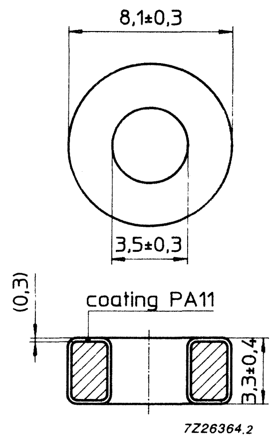


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	3.58	mm^{-1}
V_e	effective volume	83	mm^3
l_e	effective length	17.3	mm
A_e	effective area	4.81	mm^2
	mass	≈ 0.6	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	14 ± 10%	dark yellow	4330 030 6001
2P50	18 ± 10%	dark blue	4330 030 6008
2P65	23 ± 10%	dark red	4330 030 6015
2P80	28 ± 10%	dark green	4330 030 6022
2P90	30 ± 10%	dark brown	4330 030 6029

Iron powder ring cores

RCC12.3/4.4

Dimensions in mm

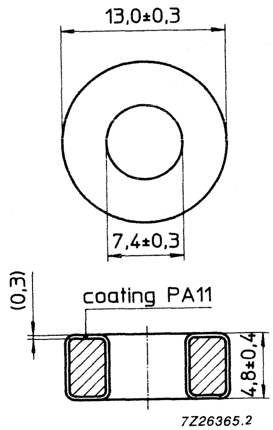


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.30	mm^{-1}
V_e	effective volume	290	mm^3
l_e	effective length	30.9	mm
A_e	effective area	9.37	mm^2
	mass	≈ 2	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	15 ± 10%	dark yellow	4330 030 6002
2P50	19 ± 10%	dark blue	4330 030 6009
2P65	25 ± 10%	dark red	4330 030 6016
2P80	31 ± 10%	dark green	4330 030 6023
2P90	33 ± 10%	dark brown	4330 030 6030

Iron powder ring cores

RCC17.1/4.4

Dimensions in mm

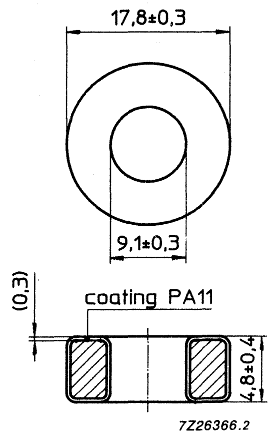


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.55	mm^{-1}
V_e	effective volume	635	mm^3
l_e	effective length	40.2	mm
A_e	effective area	15.8	mm^2
	mass	≈ 5	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	20 ± 10%	dark yellow	4330 030 6003
2P50	25 ± 10%	dark blue	4330 030 6010
2P65	32 ± 10%	dark red	4330 030 6017
2P80	40 ± 10%	dark green	4330 030 6024
2P90	42 ± 10%	dark brown	4330 030 6031

Iron powder ring cores | RCC19.9/6

Dimensions in mm

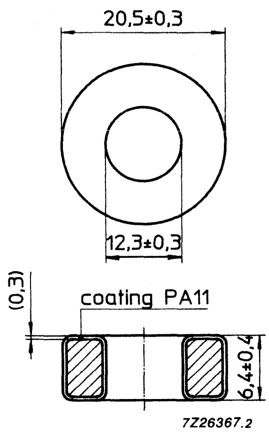


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	2.44	mm^{-1}
V_e	effective volume	1020	mm^3
l_e	effective length	49.9	mm
A_e	effective area	20.4	mm^2
	mass	≈ 7.5	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	21 ± 10%	dark yellow	4330 030 6004
2P50	26 ± 10%	dark blue	4330 030 6011
2P65	34 ± 10%	dark red	4330 030 6018
2P80	41 ± 10%	dark green	4330 030 6025
2P90	44 ± 10%	dark brown	4330 030 6032

Iron powder ring cores RCC23.5/7.5

Dimensions in mm

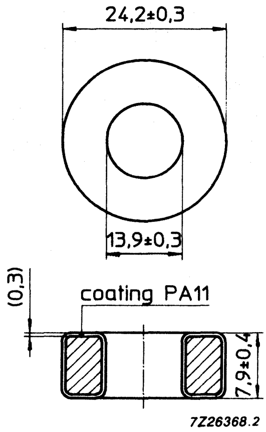


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.76	mm^{-1}
V_e	effective volume	1895	mm^3
l_e	effective length	57.8	mm
A_e	effective area	32.8	mm^2
	mass	≈ 13	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	29 ± 10%	dark yellow	4330 030 6005
2P50	36 ± 10%	dark blue	4330 030 6012
2P65	47 ± 10%	dark red	4330 030 6019
2P80	57 ± 10%	dark green	4330 030 6026
2P90	61 ± 10%	dark brown	4330 030 6033

Iron powder ring cores

RCC26.5/10.7

Dimensions in mm

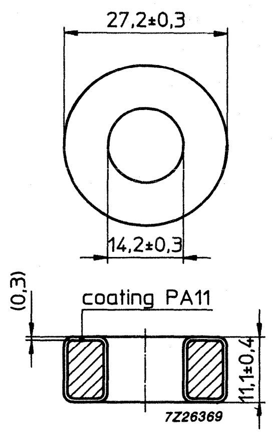


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	3720	mm^3
l_e	effective length	61.6	mm
A_e	effective area	60.4	mm^2
	mass	≈ 25	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	49 ± 10%	dark yellow	4330 030 6006
2P50	62 ± 10%	dark blue	4330 030 6013
2P65	80 ± 10%	dark red	4330 030 6020
2P80	94 ± 10%	dark green	4330 030 6027
2P90	105 ± 10%	dark brown	4330 030 6034

Iron powder ring cores

RCC32.6/10.7

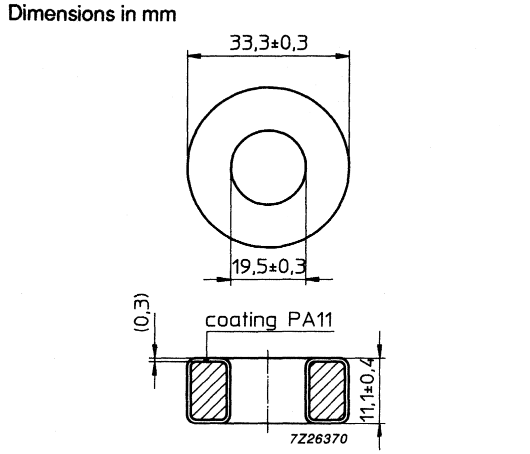


Fig.1 Outline of ring core.

EFFECTIVE CORE PARAMETERS

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	5200	mm^3
l_e	effective length	80.0	mm
A_e	effective area	65.0	mm^2
	mass	≈ 35	g

Coating: Polyamide 11 (PA11), flame retardent in accordance with UL94V-2

GRADE	A_L (nH)	COLOUR CODE	ORDERING CODE
2P40	41 ± 10%	dark yellow	4330 030 6007
2P50	51 ± 10%	dark blue	4330 030 6014
2P65	67 ± 10%	dark red	4330 030 6021
2P80	82 ± 10%	dark green	4330 030 6028
2P90	87 ± 10%	dark brown	4330 030 6035

RODS
IMPEDER CORES
TUBES
EMI-SUPPRESSION BEADS
EMI-SUPPRESSION BEADS ON WIRE
SMD BEADS
MULTI-HOLE CORES
WIDE-BAND CHOKES
CUP AND MUSHROOM CORE
BOBBIN CORES

Soft Ferrites

Rods

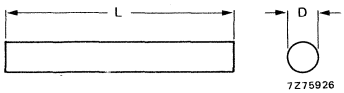


Fig.1 Rod.

STANDARD PROGRAMME

D (mm)	TOLERANCE (mm)	L (mm)	TOLERANCE (mm)	ORDERING CODE	
				4B1	3B1
2	− 0.05	10	− 0.6	4330 030 4021	4330 030 3133
2	− 0.05	15	− 0.8	4330 030 4022	4330 030 3134
2	− 0.05	20	− 0.9	4330 030 4054	4330 030 3145
3	− 0.05	15	− 0.8	4330 030 4023	4330 030 3135
3	− 0.05	20	− 0.9	4330 030 4024	4330 030 3136
3	− 0.05	25	− 1.0	4330 030 4055	4330 030 3147
4	− 0.05	15	− 0.8	4330 030 4025	4330 030 3137
4	− 0.05	20	− 0.9	4330 030 4026	4330 030 3138
4	− 0.05	25	− 1.0	4330 030 4056	4330 030 3149
5	− 0.05	20	− 0.9	4330 030 4027	4330 030 3139
5	− 0.05	25	− 1.0	4330 030 4028	4330 030 3140
5	− 0.05	30	− 1.2	4330 030 4057	4330 030 3151
6	− 0.10	30	− 1.2	4330 030 4029	4330 030 3141
6	− 0.10	40	− 1.6	4330 030 4030	4330 030 3142
6	− 0.10	50	± 1.0	4330 030 4058	4330 030 3153
8	− 0.40	50	± 1.0	4330 030 4031	4330 030 3143
8	− 0.40	150	± 3.0	4330 030 4032	4330 030 3144
8	− 0.40	200	± 4.0	4330 030 4059	4330 030 3155
10	− 0.50	200	± 4.0	4330 030 3071	4330 030 3146

Soft ferrites

Impeder cores

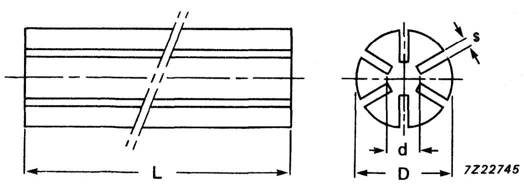


Fig. 1 Impeder.

GRADE	NUMBER OF SLOTS	DIMENSIONS				ORDERING CODE
		D (mm)	d (mm)	L (mm)	s (mm)	
3D3	6	6 ± 0.2	3	200 ± 5	0.6	4330 030 3119
3C85	6	6 ± 0.2	3	200 ± 5	0.6	4330 030 3121
3D3	6	8 + 0/- 0.5	3	125 ± 5	0.6	4330 030 3097
3C85	6	8 ± 0.25	3	200 ± 5	0.6	4330 030 3122
3D3	6	10 + 0/- 0.5	4.5	170 ± 5	0.6	4330 030 3099
3C85	6	10 ± 0.25	4.5	200 ± 5	0.6	4330 030 3123
3D3	8	12 + 0/- 0.7	5.5	170 ± 5	0.7	4330 030 3125
3C85	8	12 ± 0.35	5.5	200 ± 5	0.7	4330 030 3124
3D3	8	14.3 + 0/- 0.8	6.5	170 ± 5	0.8	4330 030 3120
3C85	8	14.3 ± 0.4	6.5	200 ± 5	0.8	4330 030 3126

Soft Ferrites

Tubes

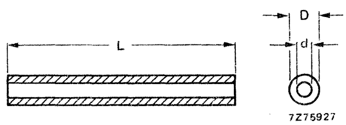


Fig.1 Tube.

STANDARD PROGRAMME

DIMENSIONS						ORDERING CODE		
D (mm)	TOLERANCE (mm)	d (mm)	TOLERANCE (mm)	L (mm)	TOLERANCE (mm)	4B1 4330 030	3B1 4330 030	3C85 4330 030
3.5	− 0.25	1.2	+ 0.15	5	− 0.3	4033	3354	3367
3.5	− 0.25	1.2	+ 0.15	15	− 0.8	4034	3355	3368
4.0	− 0.25	1.6	+ 0.15	15	− 0.8	4035	3356	3369
4.0	− 0.25	1.6	+ 0.15	40	− 1.6	4036	3357	3370
5.0	− 0.30	2.0	+ 0.20	15	− 0.8	4037	3358	3371
5.0	− 0.30	2.0	+ 0.20	50	± 1	4038	3359	3372
6.0	− 0.30	3.0	+ 0.20	20	− 0.9	4039	3360	3373
6.0	− 0.30	3.0	+ 0.20	30	− 1.2	4040	3361	3374
8.0	− 0.40	4.0	+ 0.30	20	− 0.9	4041	3362	3375
8.0	− 0.40	4.0	+ 0.30	40	− 1.6	4042	3363	3376
8.0	− 0.40	4.0	+ 0.30	200	± 4	-	-	3345
10.0	− 0.50	4.2	+ 0.30	20	− 0.9	4043	3364	3377
10.0	− 0.50	4.2	+ 0.30	45	− 1.8	4044	3365	3378
10.0	− 0.50	5.0	+ 0.40	200	± 4	-	-	3346
10.0	− 0.50	6.5	+ 0.40	20	− 0.9	4045	3366	3379

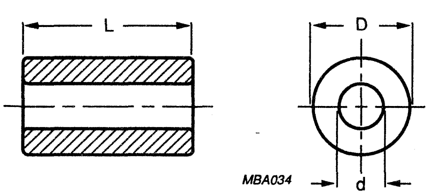


Fig.1 Bead.

TOLERANCES
0.7 + 0.15
1 + 0.15
1.5 + 0.15
2 + 0.2
3 ± 0.2
4 ± 0.2
5 ± 0.2
8 ± 0.2
10 ± 0.3

GRADE	|Z| min. (Ω) * AT FREQUENCY (MHz)						DIMENSIONS			ORDERING CODE
	1	3	10	30	100	300	D (mm)	d (mm)	L (mm)	
3S1	19	38	39	31	26	23	3	0.7	4	4330 030 3210
	27	52	53	42	36	32	5	0.7	4	4330 030 3214
	58	95	97	77	66	58	3	0.7	10	4330 030 3211
	70	125	128	90	70	50	5	0.7	10	4330 030 3215
	14	29	30	24	20	18	3	1	4	4330 030 3212
	33	72	73	58	50	44	3	1	10	4330 030 3213
	15	25	32	26	22	20	5	1.5	4	4330 030 3216
	40	72	80	64	55	48	5	1.5	10	4330 030 3217
	10	18	24	20	17	15	5	2	4	4330 030 3218
	29	51	61	49	42	37	5	2	10	4330 030 3219
4S2	2	8	22	32	50	54	3	0.7	4	4330 030 3311
	5	15	30	44	68	77	5	0.7	4	4330 030 3313
	9	30	55	81	125	135	3	0.7	10	4330 030 3324
	12	40	75	110	170	190	5	0.7	10	4330 030 3326
	3	9	18	25	38	43	3	1	4	4330 030 3312
	7	23	43	61	95	107	3	1	10	4330 030 3321
	3	10	20	27	41	47	5	1.5	4	4330 030 3314
	4	14	27	38	57	65	8	1.5	4	4330 030 3316
	7	25	45	68	104	116	5	1.5	10	4330 030 3322
	10	34	70	93	145	161	8	1.5	10	4330 030 3325
	2	8	15	20	32	36	5	2	4	4330 030 3315
	4	10	20	31	49	55	8	2	4	4330 030 3317
	6	15	30	51	80	89	5	2	10	4330 030 3319
	9	28	55	77	121	134	8	2	10	4330 030 3323
	2	8	15	22	34	38	8	3	4	4330 030 3318
	6	20	40	55	85	95	8	3	10	4330 030 3320

* Typical |Z| values up to 25% higher.

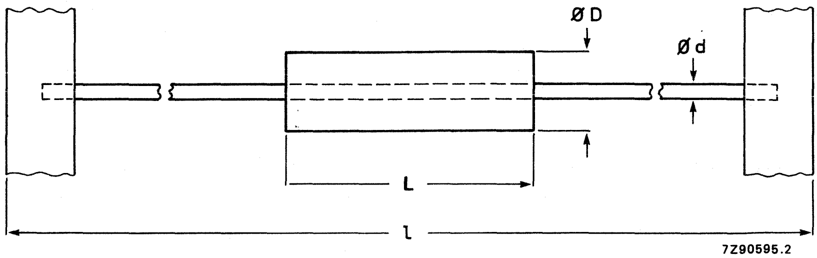


Fig.1 Bead on wire.

Taping standard in accordance with IEC 286, part 1 and EIA-RS-296-D

GRADE	|Z| min. (Ω) AT FREQUENCY (MHz)						DIMENSIONS				ORDERING CODE
	1	3	10	30	100	300	D (mm)	L (mm)	l (mm)	d (mm)	
3S1	70	125	128	90	70	50	4.9	10	64.4	0.64	4330 030 3333
4S2	4	13	26	39	60	70	3.5	4.5	64.4	0.64	4330 030 3873
4S2	5	17	35	53	80	95	3.5	6.0	64.4	0.64	4330 030 3874
4S2	6	20	39	59	88	105	3.5	6.7	64.4	0.64	4330 030 3875
4S2	7	22	44	67	105	120	3.5	7.6	64.4	0.64	4330 030 3876
4S2	8	26	52	78	117	140	3.5	8.9	64.4	0.64	4330 030 3877
4S2	3	10	19	29	46	52	3.5	3.3	64.4	0.64	4330 030 3881

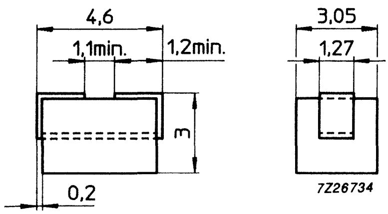


Fig.1 CBD 4.6/3/3

SMD bead type CBD 4.6/3/3

Metal strip: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Mass: ≈ 0.15 g.

Taping method: in accordance with IEC 286-A and EIA 481-A.

GRADE	IZI at f *		ORDERING CODE
	(Ω)	(MHz)	
3S1	35	3	4330 030 3642
	45	10	
	35	25	
4S2	30	25	4330 030 3629
	50	100	
	55	300	

* Typical values. IZI min. is –20%.

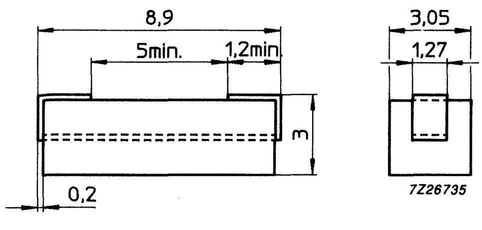


Fig.2 CBD 8.9/3/3

SMD bead type CBD 8.9/3/3

Metal strip: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Mass: ≈ 0.3 g.

Taping method: in accordance with IEC 286-A and EIA 481-A.

GRADE	IZI at f *		ORDERING CODE
	(Ω)	(MHz)	
3S1	55	3	4330 030 3645
	80	10	
	65	25	
4S2	65	25	4330 030 3630
	100	100	
	110	300	

* Typical values. IZI min. is –20%.

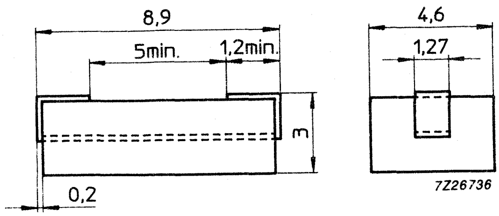


Fig.3 CBD 8.9/4.6/3

SMD bead type CBD 8.9/4.6/3

Metal strip: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Mass: ≈ 0.5 g.

Taping method: in accordance with IEC 286-A and EIA 481-A.

GRADE	IZI at f *		ORDERING CODE
	(Ω)	(MHz)	
4S2	65	25	4330 030 3652
	100	100	
	110	300	

* Typical values. IZI min. is –20%.

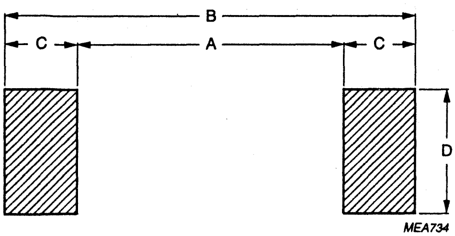


Fig.4 Reflow and vapour phase soldering.

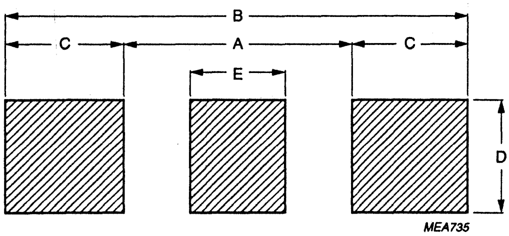


Fig.5 Wave soldering.

RECOMMENDED DIMENSIONS OF SOLDERLANDS

Recommended dimensions of solderlands for reflow and vapour phase soldering

SIZE	A (mm)	B (mm)	C (mm)	D (mm)
CBD 4.6/3/3	2.8	6.4	1.8	3.3
CBD 8.9/3/3	7.0	10.8	1.9	3.3
CBD 8.9/4.6/3	7.0	10.8	1.9	5.0

Recommended dimensions of solderlands for wave soldering

SIZE	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)
CBD 4.6/3/3	2.0	6.4	2.2	3.0	0.8
CBD 8.9/3/3	6.0	12.2	3.1	3.0	2.5
CBD 8.9/4.6/3	6.0	12.2	3.1	4.6	2.5

BLISTER TAPE AND REEL DIMENSIONS

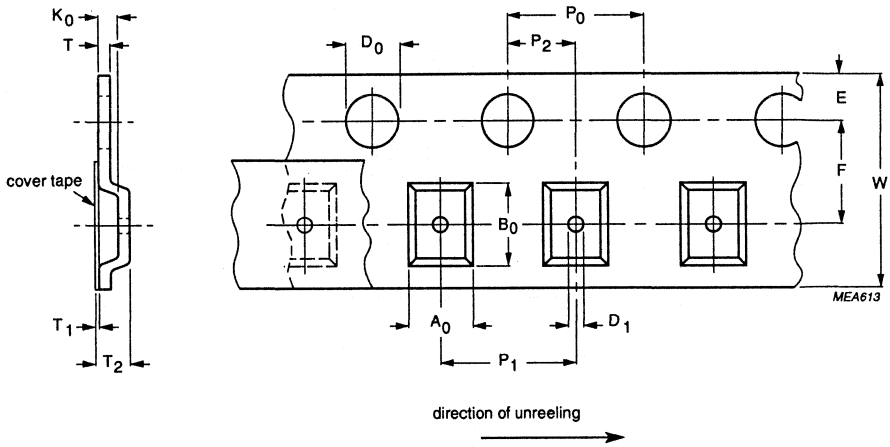


Fig.6 Blister tape.

Physical dimensions of blister tape

DIMENSION	CBD 4.6/3/3 (mm)	CBD 8.9/3/3 (mm)	CBD 8.9/4.6/3 (mm)	TOLERANCE (mm)
A_0	3.45	3.45	5.1	±0.1
B_0	5.1	9.4	9.4	±0.1
T	0.25	0.25	0.3	±10%
W	12.0	16.0	16.0	±0.3
E	1.75	1.75	1.75	±0.1
F	5.5	7.5	7.5	±0.05
D_0	1.5	1.5	1.5	±0.5
D_1	≥1.5	1.5	1.5	–
P_0	4.0	4.0	4.0	±0.1
P_1	8.0	8.0	8.0	±0.1
P_2	2.0	2.0	2.0	±0.05
K_0	3.1	3.1	3.1	±0.1

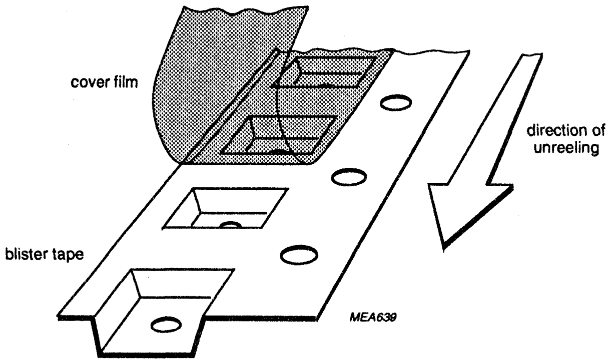
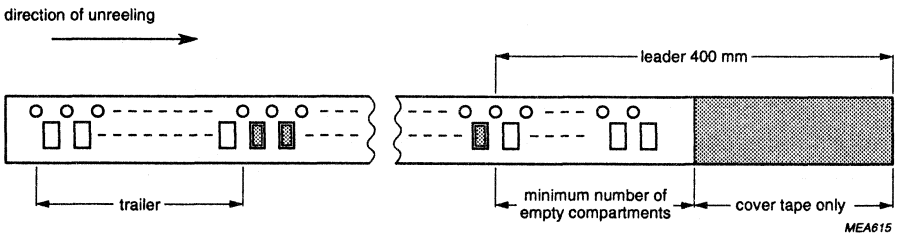


Fig.7 Construction of blister tape.

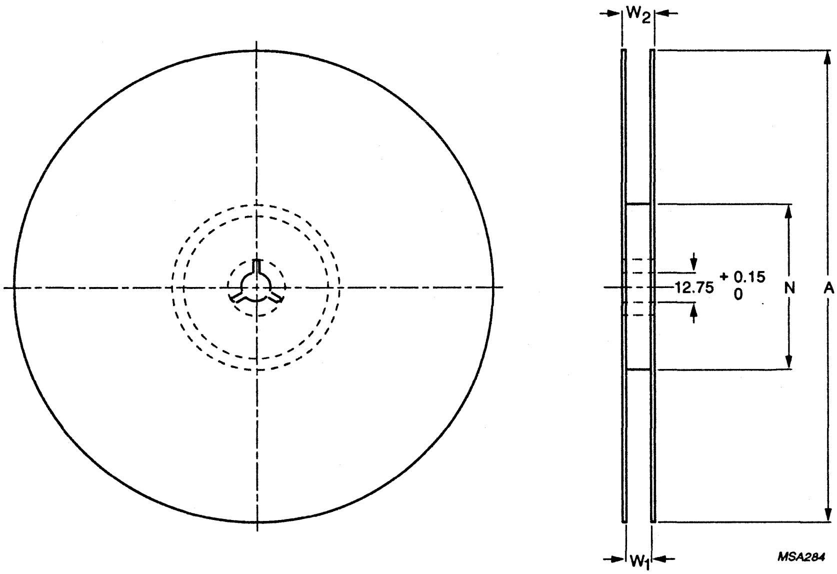


Leader: length of leader tape is 500 mm minimum and covered with cover tape.

Trailer: 75 empty compartments minimum (secured with tape).

Storage temperature range for tape: –25 to +45 °C.

Fig.8 Leader/trailer tape.



Dimensions in mm.

Fig.9 Reel.

Reel dimensions

TAPE WIDTH (mm)	A (mm)	N (mm)	W_1 (mm)	W_2 (mm)
12	330	100 ±5	12.4	< 14.4
16	330	100 ±5	16.4	< 18.4

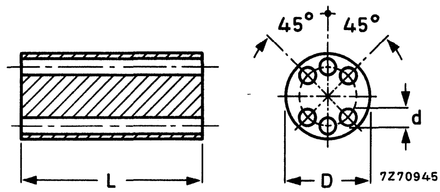


Fig.1 Six hole bead (MHC1).

MULTIHOLE CORES

GRADE	DIMENSIONS D (mm)	DIMENSIONS d (mm)	DIMENSIONS L (mm)	ORDERING CODE
3B1	6 ± 0.3	0.7 + 0.2	10 ± 0.5	4312 020 3150
4B1	6 ± 0.3	0.7 + 0.2	10 ± 0.5	4312 020 3155

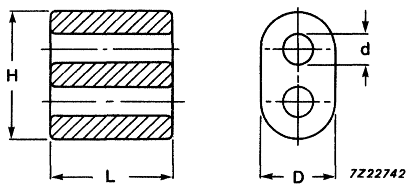


Fig.2 Twin bead (MHC2).

GRADE	DIMENSIONS D (mm)	DIMENSIONS d (mm)	DIMENSIONS L (mm)	DIMENSIONS H (mm)	ORDERING CODE
4B1	8.5 – 0.5	3.5 ± 0.5	8 ± 0.3	14 ± 0.5	4312 020 3157
4B1	8.5 – 0.5	3.5 ± 0.5	14 ± 0.4	14 ± 0.5	4312 020 3152
4B1	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	4313 020 4003*
3C85	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	4313 020 4005*

* Chamfered holes and sides.

Soft Ferrites

Multi-hole cores

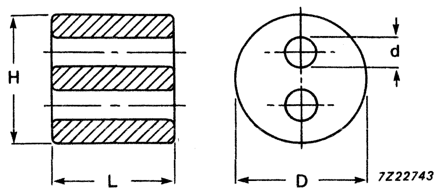


Fig.3 Twin bead (MHC3).

GRADE	DIMENSIONS			ORDERING CODE
	D (mm)	d (mm)	L (mm)	
4B1	5.6 ± 0.15	1.5 ± 0.15	12 ± 0.2	4330 030 3274

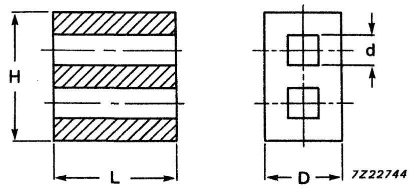


Fig.4 Twin bead (MHC4).

GRADE	DIMENSIONS				ORDERING CODE
	D (mm)	d (mm)	L (mm)	H (mm)	
4A11	5.4 ± 0.3	2.0 ± 0.3	10.9 ± 0.3	10.8 ± 0.3	4313 020 2057
3C85	5.4 ± 0.3	2.0 ± 0.3	10.9 ± 0.3	10.8 ± 0.3	4313 020 2080

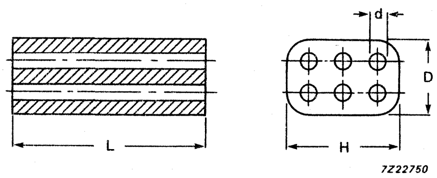


Fig.5 Six hole bead (MHC5).

GRADE	DIMENSIONS				ORDERING CODE
	D (mm)	d (mm)	L (mm)	H (mm)	
3B1	4 ± 0.2	0.7 + 0.3	10 ± 0.5	6.1 ± 0.3	4312 020 3153

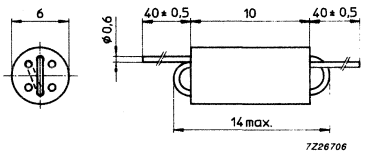


Fig.1 WBC 1.5-A

Wide-band choke type WBC 1.5-A

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	1.5	≥ 300	120	4312 020 3663
4B1	1.5	≥ 350	250	4312 020 3669

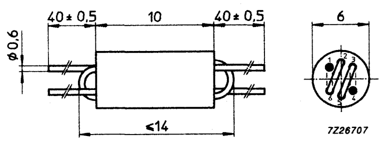


Fig.2 WBC 1.5/1.5-A

Wide-band choke type WBC 1.5/1.5-A

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f *		ORDERING CODE
		(Ω)	(MHz)	
3B1	2 × 1.5	≥ 700	50	4312 020 3665
4B1	2 × 1.5	≥ 800	100	4312 020 3671
4A15	2 × 1.5	1000	50	4330 030 4146
		1000	180	

* IZI measured with both windings connected in series.

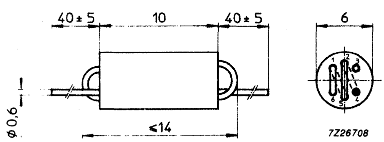


Fig.3 WBC 2.5-A

Wide-band choke type WBC 2.5-A

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4312 020 3664
4B1	2.5	≥ 700	180	4312 020 3670
4A15	2.5	800	50	4330 030 4144
		820	180	

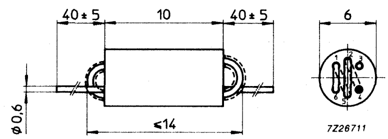


Fig.4 WBC 2.5-SA

Wide-band choke type WBC 2.5-SA

Plastic tubes around wire bends to prevent short-circuits.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4330 030 4152
4B1	2.5	≥ 700	180	4330 030 4153

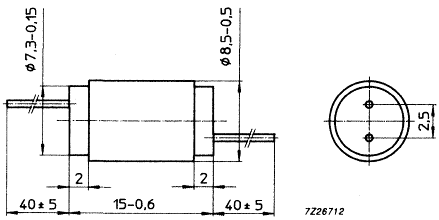


Fig.5 WBC 2.5-EA

Wide-band choke type WBC 2.5-EA

Isolated with polyamide (PA6.6) caps, which are flame retardent in accordance with UL94 V-0.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4330 030 4124
4B1	2.5	≥ 700	180	4330 030 4125

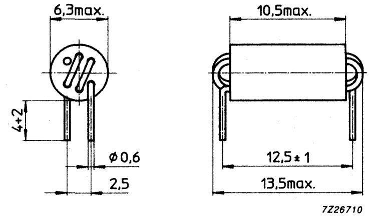


Fig.6 WBC 2.5-R

Wide-band choke type WBC 2.5-R

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4330 030 3808
4B1	2.5	≥ 700	75	4330 030 4118

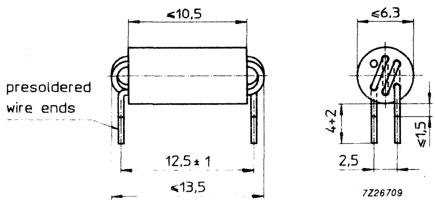


Fig.7 WBC 2.5-IR

Wide-band choke type WBC 2.5-IR

With enamelled wire to prevent short-circuits between wire bends. Leads are pre-soldered.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	|Z| at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4330 030 3896
4B1	2.5	≥ 700	75	4330 030 4107

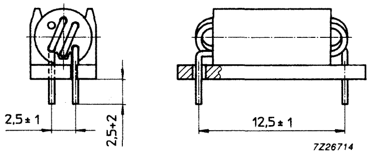


Fig.8 WBC 2.5-SP

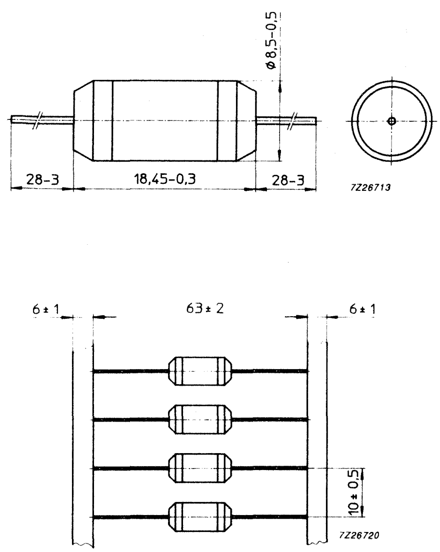
Wide-band choke type WBC 2.5-SP

With polyamide (PA6.6) support plate to allow mounting across circuit tracks. The material is flame retardent in accordance with UL94 V-0.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	|Z| at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	2.5	≥ 600	50	4330 030 4136
4B1	2.5	≥ 700	75	4330 030 4143



Taping method of WBC 2.5-EAT.

Fig.9 WBC 2.5-EAT

Wide-band choke type WBC 2.5-EAT

Isolated with polyamide (PA6.6) caps, which are flame retardent in accordance with UL94 V-0. Taped axially.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Taping method: in accordance with IEC 286 part 1, and EIA-RS-296D.

GRADE	NUMBER OF TURNS	IZI at f (Ω)	IZI at f (MHz)	ORDERING CODE
3B1	2.5	≥ 600	50	4330 030 4122
4B1	2.5	≥ 700	180	4330 030 4123

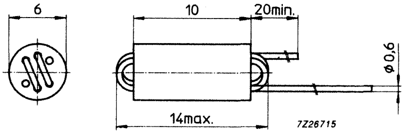


Fig.10 WBC 3-R

Wide-band choke type WBC 3-R

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f (Ω)	IZI at f (MHz)	ORDERING CODE
3B1	3	≥ 650	63	4312 020 3676
4B1	3	≥ 800	110	4330 030 4114
4A15	3	1000	50	4330 030 4145
		1000	180	

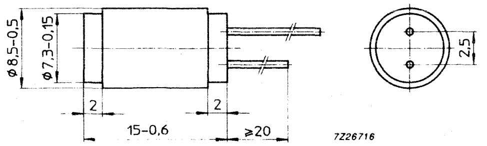


Fig.11 WBC 3-ER

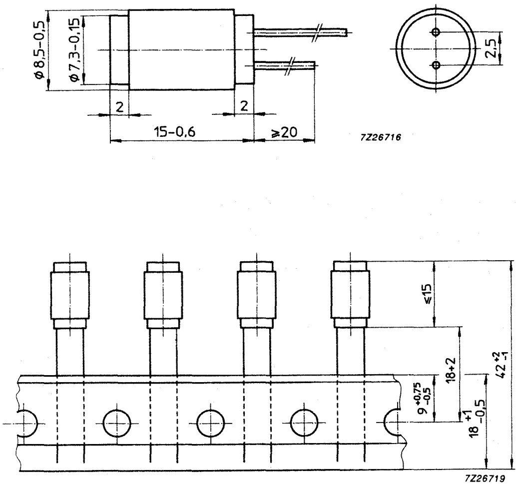
Wide-band choke type WBC 3-ER

Isolated with polyamide (PA6.6) caps, which are flame retardent in accordance with UL94 V-0.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	3	≥ 650	63	4330 030 4126
4B1	3	≥ 800	110	4330 030 4127



Taping method of WBC 3-ERT.

Fig.12 WBC 3-ERT

Wide-band choke type WBC 3-ERT

Isolated with polyamide (PA6.6) caps, which are flame retardent in accordance with UL94 V-0. Taped radially.

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Taping method: in accordance with IEC 286 part 1, and EIA-RS-296D.

GRADE	NUMBER OF TURNS	IZI at f		ORDERING CODE
		(Ω)	(MHz)	
3B1	3	≥ 650	63	4330 030 4141
4B1	3	≥ 800	110	4330 030 4142

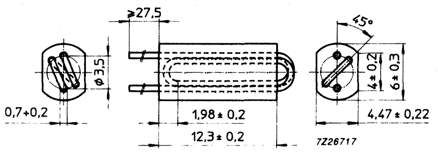


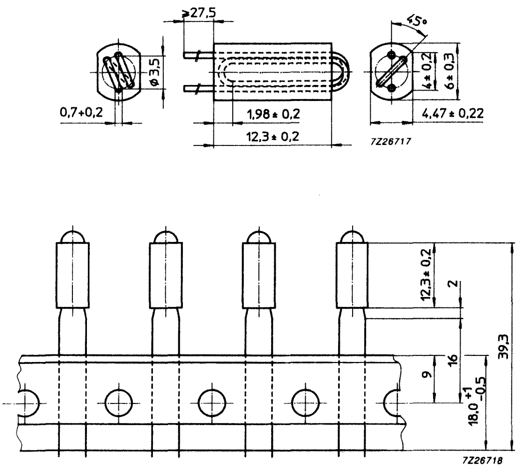
Fig.13 WBC 2-R

Wide-band choke type WBC 2-R

Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

GRADE	NUMBER OF TURNS	IZI typ. at f		ORDERING CODE
		(Ω)	(MHz)	
4A15	2	730	50	4330 030 3618
		750	180	



Taping method of WBC 2-RT.

Fig.14 WBC 2-RT

Wide-band choke type WBC 2-RT

Taped radially.

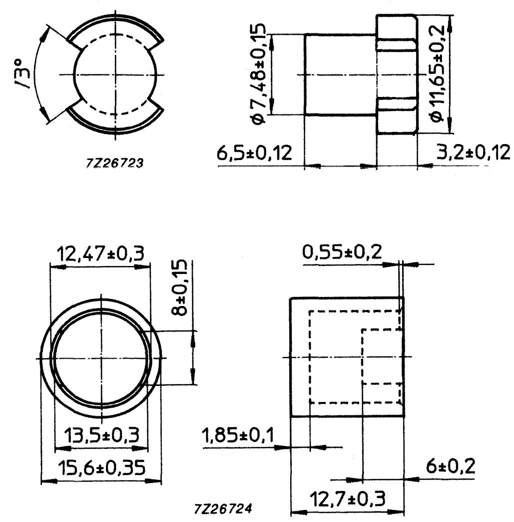
Wire material: Cu, SnPb plated

Solderability: in accordance with IEC 68-2-20 part 2, test TA, method 1.

Taping method: in accordance with IEC 286 part 1, and EIA-RS-296D.

GRADE	NUMBER OF TURNS	IZI typ. at f		ORDERING CODE
		(Ω)	(MHz)	
4A15	2	730	50	4330 030 4105
		750	180	

Soft Ferrites Cup and mushroom core



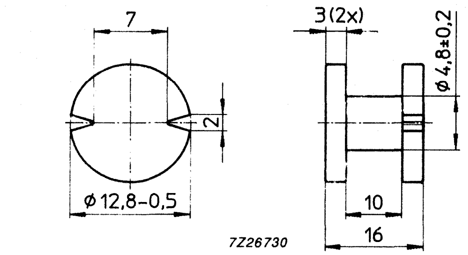
Dimensions in mm

Fig.1 Cup and mushroom core set.

A combination of a cup core and a mushroom core forms a closed magnetic circuit, suitable for general purpose inductor coils.

Material grade

GRADE	CORE	ORDERING CODE FOR SET
4B1	cup	4330 030 3660
3C85	mushroom	

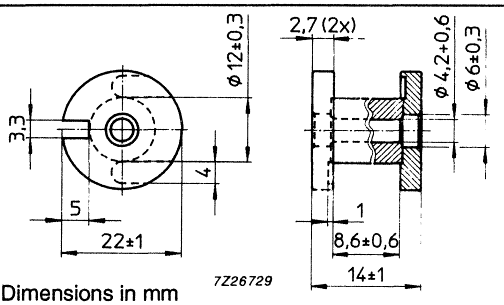


Dimensions in mm

Fig.1 BC 12.8/16

Bobbin core type BC 12.8/16

GRADE	ORDERING CODE
3C80	4330 030 3894

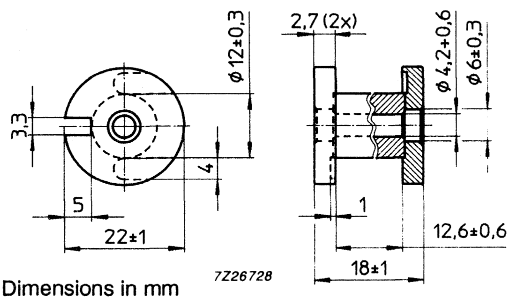


Dimensions in mm

Fig.2 BC 22/14

Bobbin core type BC 22/14

GRADE	ORDERING CODE
3C80	4330 030 3648

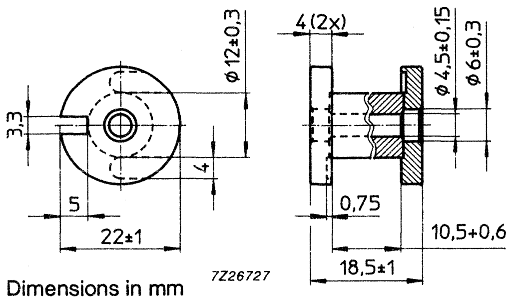


Dimensions in mm

Fig.3 BC 22/18

Bobbin core type BC 22/18

GRADE	ORDERING CODE
3C80	4330 030 3647

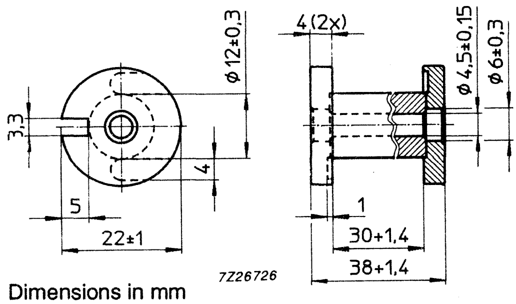


Dimensions in mm

Fig.4 BC 22/18.5

Bobbin core type BC 22/18.5

GRADE	ORDERING CODE
3C80	4330 030 3619

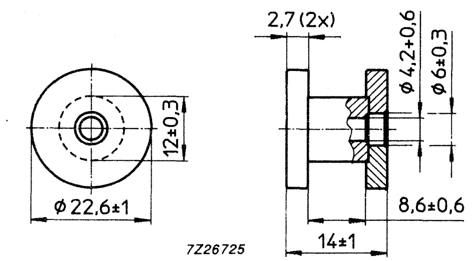


Dimensions in mm

Fig.5 BC 22/38

Bobbin core type BC 22/38

GRADE	ORDERING CODE
3C80	4330 030 3634



Dimensions in mm

Fig.6 BC 22.6/14

Bobbin core type BC 22.6/14

GRADE	ORDERING CODE
3C80	4330 030 3656

YOKE RINGS

FERRITE GRADES FOR YOKE RING APPLICATIONS

Ferrites for yoke rings, grades 2A2, 2B1 and 3C2 have been developed primarily for use in magnetic deflection units in CRT applications, for use over the frequency range 16 to > 64 kHz.

- Grade 2A2 is a magnesium zinc ferrite, characterized by a high resistivity which makes it suitable for direct (toroidal) winding applications. This material is suitable for general use at 16 kHz over a range of flux levels in the region 10 to 100 mT.
- Grade 2B1 is a low loss magnesium zinc ferrite specifically developed for 32 to 64 kHz applications. A high resistivity means that this material can be directly wound, and power losses are minimized at the working temperature of the deflection unit. Although grade 2B1 can be used at all flux levels, it is especially suitable for applications above 40 mT, and it can be used to within 5 °C of its Curie temperature.
- Grade 3C2 is a low loss manganese zinc ferrite which is suitable for indirect winding over the frequency range 16 to 64 kHz. This material shows low power losses over a broad temperature range, and is particularly suitable for applications where flux levels are below 40 mT.

In principle all yoke ring types can be manufactured in any material grade. Normally the winding technology used will fix the choice between high and low resistivity grades.

The magnetic properties for each grade are shown in more detail in the chapter Material grade specifications.

Yoke rings

Minineck range

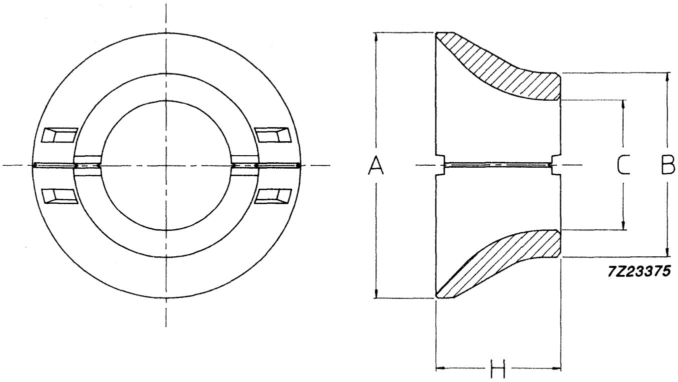


Fig.1 Outline of minineck type.

- Yoke rings are manufactured to specific customer requirements.
- The product range capabilities are indicated in the Table.
- Tolerances are +/– 1% for normal applications.
- Tolerances of <1% can be achieved for special applications.
- Winding technology is direct.
- Material grades 2A2 and 2B1.

Product range capabilities

CORE TYPE	FLARE DIA. A (mm)	NECK DIA. B (mm)	BORE DIA. C (mm)	HEIGHT H (mm)
YR40/33-A	76.0	46.4	40.4	33.0
YR40/33-B	76.0	52.0	40.4	33.0
YR40/35	76.0	52.0	40.4	35.5
YR40/37-A	74.0	52.85	40.8	37.0
YR40/37-B	74.0	52.0	40.0	37.0
YR40/37-C	73.8	51.8	40.0	37.0
YR41/37	74.0	53.0	41.0	37.0

Yoke rings

Hybrid range

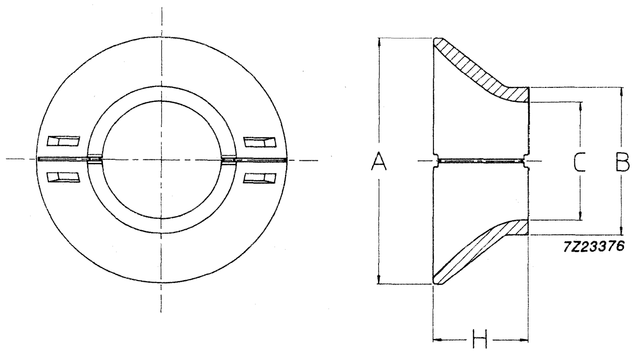


Fig.1 Outline of hybrid type.

- Yoke rings are manufactured to specific customer requirements.
- The product range capabilities are indicated in the Table.
- Tolerances are +/– 1% for normal applications.
- Tolerances of <1% can be achieved for special applications.
- Winding technology is direct.
- Material grades 2A2 and 2B1.

Product range capabilities

CORE TYPE	FLARE DIA. A (mm)	NECK DIA. B (mm)	BORE DIA. C (mm)	HEIGHT H (mm)
YR38/37	78.8	54.0	38.0	37.0
YR45/30	82.55	58.93	45.62	30.48
YR45/35	80.26	58.0	45.52	35.56
YR46/42-A	90.0	52.5	46.5	42.0
YR46/42-B	89.0	60.0	46.5	42.0
YR48/42-A	92.0	60.0	48.0	42.0
YR48/42-B	90.0	54.0	48.0	42.0
YR48/42-C	88.25	62.0	48.0	42.0
YR48/44	100.0	62.0	48.0	44.5
YR48/46	87.24	60.0	48.0	46.0
YR49/35	88.0	62.0	49.9	35.5
YR50/39-A	102.31	66.5	50.52	38.86
YR50/39-B	102.3	64.26	50.52	38.95
YR51/35	108.0	70.0	51.0	35.0
YR51/36-A	88.25	66.0	51.35	36.0
YR51/36-B	92.0	66.0	51.38	36.0
YR51/38	108.0	70.0	51.0	38.0
YR51/42	102.3	64.26	51.5	42.0
YR52/29	95.76	64.77	52.02	29.21
YR52/42	108.85	65.0	52.0	42.0

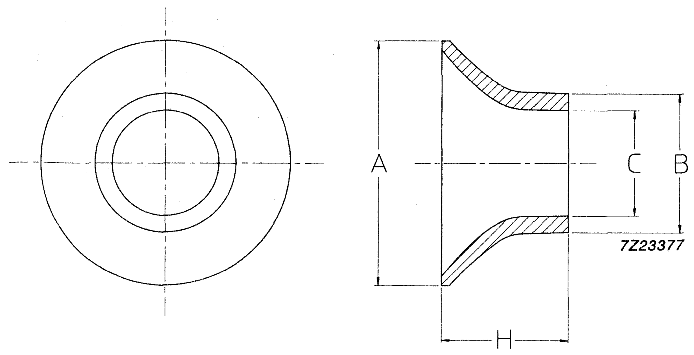


Fig.1 Outline of monitor type.

- Yoke rings are manufactured to specific customer requirements.
- The product range capabilities are indicated in the Table.
- Tolerances are +/– 1% for normal applications.
- Tolerances of <1% can be achieved for special applications.
- Winding technology is indirect.
- Material grades are 3C2, or 2B1.

Product range capabilities

CORE TYPE	FLARE DIA. A (mm)	NECK DIA. B (mm)	BORE DIA. C (mm)	HEIGHT H (mm)
YR46/54-A	94.0	58.0	46.0	54.0
YR46/54-B	92.5	54.0	46.0	54.0
YR46/56	108.0	61.0	46.4	56.0
YR48/46	91.0	64.0	48.0	46.5
YR48/54	92.5	60.0	48.63	54.0
YR51/48	92.0	67.2	51.85	48.0

Yoke rings | Large consumer range

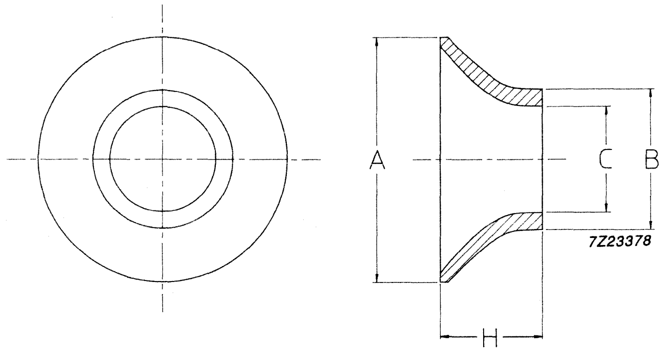


Fig.1 Outline of large consumer type.

- Yoke rings are manufactured to specific customer requirements.
- The product range capabilities are indicated in the Table.
- Tolerances are +/– 1% for normal applications.
- Tolerances of <1% can be achieved for special applications.
- Winding technology is indirect.
- Material grade usually 3C2.

Product range capabilities

CORE TYPE	FLARE DIA. A (mm)	NECK DIA. B (mm)	BORE DIA. C (mm)	HEIGHT H (mm)
YR49/44-A	114.0	57.72	49.5	44.8
YR49/44-B	114.0	65.5	49.5	44.8
YR49/44-C	113.0	57.5	49.75	44.8
YR49/44-D	109.5	65.5	49.5	44.8
YR49/45	112.32	57.72	49.86	45.0
YR50/45	112.32	57.72	50.24	45.0
YR54/51	124.0	69.76	54.2	51.1
YR58/47	135.2	77.6	58.3	47.6
YR59/57	138.0	73.5	59.75	57.6
YR60/46	141.5	79.0	60.46	46.8

STRUCTURE OF TYPE DESCRIPTION

ABBREVATION OF TYPE	DESCRIPTION	EXAMPLE OF TYPE DESCRIPTION
ADJ	adjuster	ADJ-P22/RM8-BLACK
BC	bobbin core	BC22/18.5-3C85
BD	bead	BD3/1/10-4S2
BDW	bead-on-wire	BDW3.5/6-4S2
CBD	SMD-bead	CBD4.6/3/3-4S2
CLA	clasp	CLA-EC70-ST
CLA-....-ST	stud on clasp	CLA-EC70-ST
CLI	clip	CLI-EFD25
CON	container	CON-X22
COV	cover	COV-X30
CP	coil former, thermoplastic	CP-P36/22-2S
CPH	coil former, thermoplastic, horizontal mounting	CPH-ETD34-1S-14P
CPH-.S	number of coil former sections	CPH-ETD34-1S-14P
CPH-..P	number of pins on coil former	CPH-ETD34-1S-14P
CPV	coil former, thermoplastic, vertical mounting	CPV-EC70-1S-15P
CSCI	coil former, thermosetting, coax, inner part	CSCI-ETD34-1S-7P
CSCO	coil former, thermosetting, coax, outer part	CSCO-ETD34-1S-7P
CSH	coil former, thermosetting, horizontal mounting	CSH-EP13-1S-10P
CSV	coil former, thermosetting, vertical mounting	CSV-RM10-1S-11P
CSV-..PD	coil former pins dual-in-line	CPV-RM12-1S-12PD
CUPMSC	cup and mushroom core	CUPMSC15/12-4B1/3C85
E	E-core	E42/21/15-3C85
E...G...	air gap in center pole (micrometer)	E42/21/15-3F3-G500
EC	EC-core	EC35/17-3C80
ECLI	earth-clip	ECLI-ETD34
EFD	EFD-core	EFD25-3C85
EP	EP-core	EP13-3E25-A4400
EP...A...	AL-value of core set (nH)	EP13-3E25-A4400
ETD	ETD-core	ETD44-3F3
FIB	fixing bush for P-cores	FIB
H	H-core	H20-3E25-SET
I	I-core	I100/25/25-3C80
IMP	impeder core	IMP8/3/200-3C85
MHC	multi-hole core	MHC2-6/13-4B1
NUT	fixing nut for P-cores	NUT
P	P-core	P18/11-3H1-A400
PH	potcore half	PH14/7.5-3H1

ABBREVATION OF TYPE	DESCRIPTION	EXAMPLE OF TYPE DESCRIPTION
RC	ring core, uncoated	RC2.5/1-3E25
RCC	ring core, coated	RCC23.5/7.5-2P90
RCL	ring core, lacquered	RCL20/7-3E5
RM	RM-core	RMS-3D3-A63/N
RM./I	core without central hole	RM6S/I-3F3-A1950
RM.../N	core with nut for inductance adjuster	RM5-3D3-A63/N
ROD	rod shaped core	ROD6/40-3B1
SCLI	solder-clip	SCLI
SPR	spring to mount cores	SPR-E20/10/5
TGP	tagplate for P-cores	TGP-P30/19
TUB	tube shaped core	TUB5/2/50-3C85
U	U-core	U30/25/16-3C11
WBC	wide-band choke	WBC2.5-A-3B1
WBC-A	axial wire ends	WBC2.5-A-3B1
WBC-R	radial wire ends	WBC2.5-R-3B1
WBC-IR	insulated (enamelled) wires, radial ends	WBC2.5-IR-3B1
WBC-SA	sleeve around wire bends, axial ends	WBC2.5-SA-3B1
WBC-SP	mounted on support plate	WBC2.5-SP-3B1
WBC-EA	encapsulated, axial wires	WBC2.5-EA-3B1
WBC-ER	encapsulated, radial wires	WBC3-ER-3B1
WBC-RT	radially taped	WBC2-RT-4A15
WBC-EAT	encapsulated, axially taped	WBC2.5-EAT-3B1
WBC-ERT	encapsulated, radially taped	WBC2.5-ERT-3B1
X	X-core	X35-3H1-A630/N
YR	yoke ring	YR49/45-3C2

CODE NUMBER OVERVIEW

Soft Ferrites

Code number overview

ORDERING CODE	TYPE
3112 324 9087	E46/23/30-3C80
3112 324 9088	E46/23/30-3C85
3112 324 9101	E36/21/15-3C85
3112 324 9134	U25/20/13-3E25
3122 104 9048	U46/33/11-3C80
3122 104 9384	U48/39/17-3C10
3122 104 9395	U70/33/17-3C80
3122 134 0259	CPH-U10/I15-1S-4P
3122 134 9139	U64/40/20-3C80
3122 134 9199	U32/20/10-3C80
3122 134 9282	U42/35/24-3C10
3122 134 9332	U34/26/9-3C80
3122 134 9348	U42/35/24-3C15
3122 134 9352	U42/32/15-3C80
3122 137 5536	CPH-U30-1S-10P
3122 137 6191	CPH-U25-1S-9P
3122 137 6414	CPH-U20/I25-1S-4P
4312 020 3057	ROD5/20-4B1
4312 020 3150	MHC1-3B1
4312 020 3152	MHC2-14/14-4B1
4312 020 3153	MHC5-4B1
4312 020 3155	MHC1-4B1
4312 020 3157	MHC2-8/14-4B1
4312 020 3319	U57/28/16-3C80
4312 020 3340	U59/36/17-3C80
4312 020 3351	U20/16/7-3C80
4312 020 3352	U47/25/18-3C80
4312 020 3355	U93/76/16-3C80
4312 020 3356	I93/28/16-3C80
4312 020 3357	U93/76/30-3C80
4312 020 3358	U93/52/30-3C80
4312 020 3359	I93/28/30-3C80
4312 020 3360	U100/57/25-3C80
4312 020 3361	I100/25/25-3C80
4312 020 3368	U43/34/16-3C80
4312 020 3371	U37/29/18-3C80
4312 020 3374	U37/25/18-3C80
4312 020 3376	U50/37/16-3C80
4312 020 3381	U35/34/13-3C80
4312 020 3382	U15/11/6-3E25

ORDERING CODE	TYPE
4312 020 3385	U37/25/18-3C85
4312 020 3389	U20/16/7-3E25
4312 020 3402	E25/13/7-3C80
4312 020 3407	E20/10/5-3C80
4312 020 3410	E55/28/21-3C80
4312 020 3411	E42/21/15-3C80
4312 020 3412	E42/21/20-3C80
4312 020 3419	E42/33/20-3C80
4312 020 3438	E65/32/27-3C80
4312 020 3447	E13/7/4-3C80
4312 020 3455	E30/15/7-3C80
4312 020 3485	ER48-3C80
4312 020 3492	E55/28/21-3C80-G1200
4312 020 3493	E32/16/9-3C11
4312 020 3496	E42/21/15-3C80-G800
4312 020 3504	E20/10/6-3C80
4312 020 3508	E30/15/7-3C11
4312 020 3512	E65/32/27-3C80-G150
4312 020 3515	E65/32/27-3C80-G450
4312 020 3518	E55/28/21-3C80-G150
4312 020 3521	E55/28/21-3C80-G450
4312 020 3523	E42/21/20-3C80-G100
4312 020 3524	E42/21/20-3C80-G200
4312 020 3525	E42/21/20-3C80-G500
4312 020 3526	E42/21/20-3C80-G800
4312 020 3528	E42/21/15-3C80-G500
4312 020 3529	E42/21/15-3C80-G100
4312 020 3530	E42/21/15-3C80-G200
4312 020 3533	E30/15/7-3C80-G100
4312 020 3534	E30/15/7-3C80-G200
4312 020 3535	E30/15/7-3C80-G800
4312 020 3536	E20/10/5-3C80-G50
4312 020 3537	E20/10/5-3C80-G150
4312 020 3540	E32/16/9-3C80
4312 020 3541	E32/16/9-3C80-G100
4312 020 3542	E32/16/9-3C80-G200
4312 020 3543	E32/16/9-3C80-G500
4312 020 3544	E32/16/9-3C80-G800
4312 020 3545	E25/13/7-3C80-G50
4312 020 3546	E25/13/7-3C80-G150

ORDERING CODE	TYPE
4312 020 3550	E20/10/6-3C80-G50
4312 020 3551	E20/10/6-3C80-G150
4312 020 3555	E16/8/5-3C80
4312 020 3556	E20/10/6-3C11
4312 020 3562	E25/13/7-3C11
4312 020 3564	E42/21/15-3C85
4312 020 3565	E42/21/20-3C85
4312 020 3580	E30/15/7-3C80-G500
4312 020 3581	E42/21/15-3C85-G200
4312 020 3587	E65/32/27-3C80-G1250
4312 020 3591	E55/28/21-3C85
4312 020 3592	E55/28/25-3C85
4312 020 3597	E20/10/5-3C11
4312 020 3598	E42/21/15-3C11
4312 020 3663	WBC1.5-A-3B1
4312 020 3664	WBC2.5-A-3B1
4312 020 3665	WBC1.5/1.5-A-3B1
4312 020 3669	WBC1.5-A-4B1
4312 020 3670	WBC2.5-A-4B1
4312 020 3671	WBC1.5/1.5-A-4B1
4312 020 3676	WBC3-R-3B1
4312 020 3700	ETD34-3C80
4312 020 3701	ETD34-3C80-G100
4312 020 3702	ETD34-3C80-G200
4312 020 3703	ETD34-3C80-G500
4312 020 3705	ETD39-3C80
4312 020 3706	ETD39-3C80-G100
4312 020 3707	ETD39-3C80-G200
4312 020 3708	ETD39-3C80-G500
4312 020 3710	ETD44-3C80
4312 020 3711	ETD44-3C80-G200
4312 020 3712	ETD44-3C80-G500
4312 020 3715	ETD49-3C80
4312 020 3716	ETD49-3C80-G200
4312 020 3717	ETD49-3C80-G500
4312 020 3720	ETD34-3C85
4312 020 3721	ETD34-3C85-G100
4312 020 3722	ETD34-3C85-G200
4312 020 3723	ETD34-3C85-G500
4312 020 3724	ETD34-3C85-G800

ORDERING CODE	TYPE
4312 020 3725	ETD39-3C85
4312 020 3726	ETD39-3C85-G100
4312 020 3727	ETD39-3C85-G200
4312 020 3728	ETD39-3C85-G500
4312 020 3729	ETD39-3C85-G800
4312 020 3730	ETD44-3C85
4312 020 3731	ETD44-3C85-G100
4312 020 3732	ETD44-3C85-G200
4312 020 3733	ETD44-3C85-G500
4312 020 3734	ETD44-3C85-G800
4312 020 3735	ETD49-3C85
4312 020 3736	ETD49-3C85-G100
4312 020 3737	ETD49-3C85-G200
4312 020 3738	ETD49-3C85-G500
4312 020 3739	ETD49-3C85-G800
4312 020 3750	ETD29-3C85
4312 020 3751	ETD29-3C85-G50
4312 020 3752	ETD29-3C85-G150
4312 020 3754	ETD29-3C85-G350
4312 020 3755	ETD49-3C80-G1400
4312 020 3756	ETD49-3C80-G800
4312 020 3759	ETD44-3C80-G100
4312 020 3760	ETD44-3C80-G800
4312 020 3763	ETD39-3C80-G800
4312 020 3766	ETD34-3C80-G800
4312 020 3769	ETD29-3C85-G1000
4312 020 3770	ETD49-3C80-G100
4312 020 3789	ETD29-3C11
4312 020 3790	ETD49-3C85-G1400
4312 020 3792	ETD54-3C85
4312 020 3793	ETD59-3C85
4312 020 3800	ETD29-3F3
4312 020 3801	ETD34-3F3
4312 020 3802	ETD39-3F3
4312 020 3803	ETD44-3F3
4312 020 3804	ETD49-3F3
4312 020 3805	ETD29-3F3-G50
4312 020 3806	ETD29-3F3-G150
4312 020 3807	ETD29-3F3-G350
4312 020 3808	ETD29-3F3-G1000

ORDERING CODE	TYPE
4312 020 3809	ETD34-3F3-G100
4312 020 3810	ETD34-3F3-G200
4312 020 3811	ETD34-3F3-G500
4312 020 3812	ETD34-3F3-G800
4312 020 3813	ETD39-3F3-G100
4312 020 3814	ETD39-3F3-G200
4312 020 3815	ETD39-3F3-G500
4312 020 3816	ETD39-3F3-G800
4312 020 3817	ETD44-3F3-G100
4312 020 3818	ETD44-3F3-G200
4312 020 3819	ETD44-3F3-G500
4312 020 3820	ETD44-3F3-G800
4312 020 3821	ETD49-3F3-G100
4312 020 3822	ETD49-3F3-G200
4312 020 3823	ETD49-3F3-G500
4312 020 3824	ETD49-3F3-G800
4312 020 3825	ETD49-3F3-G1400
4312 020 3826	ETD54-3F3
4312 020 3827	ETD59-3F3
4312 020 4100	EFD15-3F3-A700
4312 020 4101	EFD15-3F3-A100
4312 020 4102	EFD15-3F3-A160
4312 020 4103	EFD15-3F3-A250
4312 020 4108	EFD20-3F3-A1150
4312 020 4109	EFD20-3F3-A100
4312 020 4110	EFD20-3F3-A160
4312 020 4111	EFD20-3F3-A250
4312 020 4116	EFD25-3F3-A1800
4312 020 4117	EFD25-3F3-A160
4312 020 4118	EFD25-3F3-A250
4312 020 4119	EFD25-3F3-A315
4312 020 4120	EFD25-3C85-A2100
4312 020 4121	EFD25-3C85-A160
4312 020 4122	EFD25-3C85-A250
4312 020 4123	EFD25-3C85-A315
4312 020 4124	EFD30-3F3-A2000
4312 020 4125	EFD30-3F3-A160
4312 020 4126	EFD30-3F3-A250
4312 020 4127	EFD30-3F3-A315
4312 020 4128	EFD30-3C85-A1900

ORDERING CODE	TYPE
4312 020 4129	EFD30-3C85-A160
4312 020 4130	EFD30-3C85-A250
4312 020 4131	EFD30-3C85-A315
4312 020 4141	EFD15-3F4
4312 020 4146	EFD20-3F4
4312 020 4302	U64/46/20-3C80
4312 020 4303	U20/16/7-3C85
4312 020 4304	U44/31/15-3C10
4312 020 4305	U44/36/15-3C10
4312 020 4306	U43/29/16-3C80
4312 020 4307	U25/20/13-3C80
4312 020 4310	U28/16/20-3C80
4312 020 4311	U15/11/6-3C11
4312 020 4312	U20/16/7-3C11
4312 020 4313	U25/20/13-3C11
4312 020 4314	U30/25/16-3C11
4312 020 4315	U35/34/13-3C10
4312 020 4317	U37/25/18-3C10
4312 020 4319	U37/29/18-3C10
4312 020 4320	U39/35/15-3C15
4312 020 4321	U37/29/13-3C10
4312 020 4322	U10/8/3-3C80
4312 020 4323	U15/11/6-3C80
4312 020 4324	U30/25/16-3C80
4312 020 4325	I15/3/3-3C80
4312 020 4326	I20/6/5-3C80
4312 020 4327	I25/7/7-3C80
4312 020 4328	U10/8/3-3C85
4312 020 4329	U15/11/6-3C85
4312 020 4330	U25/20/13-3C85
4312 020 4331	U30/25/16-3C85
4312 020 4334	U44/36/15-3C15
4312 020 4338	U28/20/13-3C80
4312 020 4339	U44/38/16-3C10
4312 020 4340	U39/35/15-3C80
4312 020 4341	U28/20/13-3C85
4312 020 4342	U40/32/22-3C10
4312 020 4346	U35/34/13-3C15
4312 020 4349	U100/48/25-3C80
4312 020 4353	U37/34/13-3C85

ORDERING CODE	TYPE
4312 020 4360	U35/28/13-3C10
4312 020 4361	U41/34/13-3C15
4312 020 4404	E41/17/12-3C85
4312 020 4406	E25/9/6-3C85
4312 020 4407	E25/16/6-3C85
4312 020 4408	E25/10/6-3C85
4312 020 4409	E25/9/6-3E25
4312 020 4410	E25/16/6-3E25
4312 020 4411	E25/10/6-3E25
4312 020 4412	ER28-3C80
4312 020 4414	E47/20/16-3C85
4312 020 4419	ER28-3C85
4312 020 4501	E25/13/7-3C80-G500
4312 020 4503	E55/28/25-3C80-G2500
4312 020 4504	E55/28/21-3C11
4312 020 4505	E65/32/27-3C11
4312 020 4508	E13/7/4-3C80-G150
4312 020 4509	E13/7/4-3C80-G500
4312 020 4510	E13/7/4-3C85
4312 020 4511	E13/7/4-3C85-G50
4312 020 4512	E13/7/4-3C85-G150
4312 020 4513	E13/7/4-3C85-G500
4312 020 4514	E13/7/4-3C11
4312 020 4515	E55/28/25-3C80
4312 020 4516	E16/8/5-3C80-G50
4312 020 4517	E16/8/5-3C80-G150
4312 020 4518	E16/8/5-3C80-G500
4312 020 4519	E16/8/5-3C85
4312 020 4520	E16/8/5-3C85-G50
4312 020 4521	E16/8/5-3C85-G150
4312 020 4522	E16/8/5-3C85-G500
4312 020 4523	E16/8/5-3C11
4312 020 4524	E20/10/6-3C80-G500
4312 020 4525	E20/10/6-3C85
4312 020 4526	E20/10/6-3C85-G50
4312 020 4527	E20/10/6-3C85-G150
4312 020 4528	E20/10/6-3C85-G500
4312 020 4529	E25/13/7-3C85
4312 020 4530	E25/13/7-3C85-G50
4312 020 4531	E25/13/7-3C85-G150

ORDERING CODE	TYPE
4312 020 4532	E25/13/7-3C85-G500
4312 020 4533	E32/16/9-3C85
4312 020 4534	E32/16/9-3C85-G100
4312 020 4535	E32/16/9-3C85-G200
4312 020 4536	E32/16/9-3C85-G500
4312 020 4537	E32/16/9-3C85-G800
4312 020 4538	E20/10/5-3C80-G500
4312 020 4539	E20/10/5-3C85
4312 020 4540	E20/10/5-3C85-G50
4312 020 4541	E20/10/5-3C85-G150
4312 020 4542	E20/10/5-3C85-G500
4312 020 4543	E30/15/7-3C85
4312 020 4544	E30/15/7-3C85-G100
4312 020 4545	E30/15/7-3C85-G200
4312 020 4546	E30/15/7-3C85-G500
4312 020 4547	E30/15/7-3C85-G800
4312 020 4548	E42/21/15-3C85-G100
4312 020 4549	E42/21/15-3C85-G500
4312 020 4550	E42/21/15-3F3
4312 020 4551	E42/21/20-3F3
4312 020 4552	E20/10/5-3F3
4312 020 4553	E30/15/7-3F3
4312 020 4554	E20/10/6-3F3
4312 020 4555	E25/13/7-3F3
4312 020 4556	E13/7/4-3F3
4312 020 4557	E13/7/4-3F3-G50
4312 020 4558	E13/7/4-3F3-G150
4312 020 4559	E13/7/4-3F3-G500
4312 020 4560	E16/8/5-3F3
4312 020 4561	E16/8/5-3F3-G50
4312 020 4562	E16/8/5-3F3-G150
4312 020 4563	E16/8/5-3F3-G500
4312 020 4564	E30/15/7-3F3-G100
4312 020 4565	E20/10/6-3F3-G50
4312 020 4566	E20/10/6-3F3-G150
4312 020 4567	E20/10/6-3F3-G500
4312 020 4568	E30/15/7-3F3-G200
4312 020 4569	E25/13/7-3F3-G50
4312 020 4570	E25/13/7-3F3-G150
4312 020 4571	E25/13/7-3F3-G500

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ORDERING CODE	TYPE
4312 020 4572	E32/16/9-3F3
4312 020 4573	E32/16/9-3F3-G100
4312 020 4574	E32/16/9-3F3-G200
4312 020 4575	E32/16/9-3F3-G500
4312 020 4576	E32/16/9-3F3-G800
4312 020 4577	E30/15/7-3F3-G500
4312 020 4578	E20/10/5-3F3-G50
4312 020 4579	E20/10/5-3F3-G150
4312 020 4580	E20/10/5-3F3-G500
4312 020 4581	E30/15/7-3F3-G800
4312 020 4582	E42/21/15-3F3-G100
4312 020 4583	E42/21/15-3F3-G200
4312 020 4584	E42/21/15-3F3-G500
4312 020 4585	E42/21/15-3F3-G800
4312 020 4586	E42/21/20-3F3-G100
4312 020 4587	E42/21/20-3F3-G200
4312 020 4588	E42/21/20-3F3-G500
4312 020 4589	E42/21/20-3F3-G800
4312 020 4590	E55/28/21-3F3
4312 020 4591	E55/28/21-3F3-G150
4312 020 4592	E55/28/21-3F3-G450
4312 020 4593	E55/28/21-3F3-G1200
4312 020 4594	E65/32/27-3F3
4312 020 4595	E65/32/27-3F3-G150
4312 020 4596	E65/32/27-3F3-G450
4312 020 4597	E65/32/27-3F3-G1250
4312 020 4599	E55/28/25-3F3
4312 020 4600	E42/21/15-3C85-G800
4312 020 4601	E42/21/20-3C85-G100
4312 020 4602	E42/21/20-3C85-G200
4312 020 4603	E42/21/20-3C85-G500
4312 020 4604	E42/21/20-3C85-G800
4312 020 4605	E55/28/21-3C85-G150
4312 020 4606	E55/28/21-3C85-G450
4312 020 4607	E55/28/21-3C85-G1200
4312 020 4608	E55/28/25-3C80-G500
4312 020 4609	E55/28/25-3C80-G1500
4312 020 4610	E55/28/25-3C85-G500
4312 020 4611	E55/28/25-3C85-G1500
4312 020 4612	E65/32/27-3C85

ORDERING CODE	TYPE
4312 020 4613	E65/32/27-3C85-G150
4312 020 4614	E65/32/27-3C85-G450
4312 020 4615	E65/32/27-3C85-G1250
4312 020 4616	E13/7/4-3C80-G50
4312 020 4638	ER42-3C80
4312 020 4639	ER42-3C85
4312 020 4640	ER35-3C80
4312 020 4641	ER35-3C85
4312 020 4642	ER40-3C80
4312 020 4643	ER40-3C85
4312 020 4662	ER42A-3C80
4312 020 4664	E47/20/16-3C80
4312 020 4666	ER42A-3C85
4312 020 4667	ER54S-3C80
4312 020 4668	ER54S-3C85
4312 020 4669	ER54-3C80
4312 020 4670	ER54-3C85
4312 020 4678	E42/33/20-3C85
4312 020 4686	ER28L-3C80
4312 020 4687	ER28L-3C85
4312 020 4689	E30/15/13-3C85
4312 020 5100	E42/33/20-3F3
4312 021 2601	CLA-EC35
4312 021 2602	CLA-EC41
4312 021 2603	CLA-EC41-ST
4312 021 2604	CLA-EC52
4312 021 2605	CLA-EC52-ST
4312 021 2606	CLA-EC70
4312 021 2607	CLA-EC70-ST
4312 021 2609	CLA-E55/28/21
4312 021 2611	CLA-E65/32/27
4312 021 2612	CLA-E25/13/7
4312 021 2613	SPR-E55/28/21
4312 021 2614	SPR-E65/32/27
4312 021 2615	SPR-EC35
4312 021 2616	SPR-EC41
4312 021 2617	SPR-EC52
4312 021 2618	SPR-EC70
4312 021 2619	SPR-E25/13/7
4312 021 2620	CPH-E13/7/5-1S-6P

ORDERING CODE	TYPE
4312 021 2621	CPH-E20/10/6-1S-8P
4312 021 2622	CPH-E32/16/9-1S-12P
4312 021 2623	CPH-E16/8/5-1S-6P
4312 021 2625	CPV-E25/13/7-1S-6P
4312 021 2626	CPH-E25/13/7-1S-8P
4312 021 2855	CP-E30/15/7-1S
4312 021 2862	CP-E42/21/15-1S
4312 021 2871	CP-E55/28/21-1S
4312 021 2872	CP-E65/32/27-1S
4313 020 1517	TUB4/2/5-3B1
4313 020 2057	MHC4-4A11
4313 020 2080	MHC4-3C85
4313 020 4003	MHC2-6/13-4B1
4313 020 4005	MHC2-6/13-3C85
4322 020 3300	H20-3E25-SET
4322 020 3302	H7-3E25-SET
4322 020 3303	H16-3E25-SET
4322 020 3304	H10-3E25-SET
4322 020 5250	EC35-3C80
4322 020 5251	EC41-3C80
4322 020 5252	EC52-3C80
4322 020 5253	EC70-3C80
4322 020 5264	EFD10-3F3
4322 020 5265	EFD10-3F4
4322 020 5266	EFD12-3F3
4322 020 5267	EFD12-3F4
4322 020 5421	PH5.6/3.6-3D3
4322 020 5451	PH7.4/3.9-3D3
4322 020 5471	PH9.4/4.8-3D3
4322 020 5480	PH14/7.5-3H1
4322 020 5490	PH26/9.2-3H1
4322 020 9716	RCC6/2-4C65
4322 020 9717	RCC9/3-4C65
4322 020 9718	RCC14/5-4C65
4322 020 9719	RCC23/7-4C65
4322 020 9720	RCC36/15-4C65
4322 021 0004	CPHS-EFD15-1S-8P
4322 021 0007	CPHS-EFD20-1S-10P
4322 021 0025	CPH-EFD15-1S-8P
4322 021 0026	CPH-EFD20-1S-10P

ORDERING CODE	TYPE
4322 021 0056	CPHS-EFD10-1S-8P
4322 021 0057	CPHS-EFD12-1S-8P
4322 021 2016	CLA-E20/10/5
4322 021 2017	CLA-E30/15/7
4322 021 2022	SPR-E20/10/5
4322 021 2023	SPR-E30/15/7
4322 021 2024	CSH-E20-1S-8P
4322 021 2025	CSH-E30-1S-10P
4322 021 3004	CON-X22
4322 021 3018	TGP-P11/7
4322 021 3021	SPR-X30
4322 021 3022	SPR-X35
4322 021 3023	COV-X22
4322 021 3024	CP-P11/7-1S
4322 021 3025	CP-P14/8-1S
4322 021 3026	CP-P14/8-2S
4322 021 3027	CP-P18/11-1S
4322 021 3028	CP-P18/11-2S
4322 021 3029	CP-P18/11-3S
4322 021 3030	CP-P22/13-1S
4322 021 3031	CP-P22/13-2S
4322 021 3032	CP-P22/13-3S
4322 021 3033	CP-P26/16-1S
4322 021 3034	CP-P26/16-2S
4322 021 3035	CP-P26/16-3S
4322 021 3036	CP-P30/19-1S
4322 021 3037	CP-P30/19-2S
4322 021 3038	CP-P30/19-3S
4322 021 3039	CP-P36/22-1S
4322 021 3040	CP-P36/22-2S
4322 021 3041	CP-P36/22-3S
4322 021 3042	CP-P42/29-1S
4322 021 3043	CP-P42/29-2S
4322 021 3044	TGP-P14/8
4322 021 3045	TGP-P18/11
4322 021 3046	TGP-P22/13
4322 021 3047	TGP-P26/16
4322 021 3048	TGP-P30/19
4322 021 3049	TGP-P36/22
4322 021 3050	TGP-P42/29

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ORDERING CODE	TYPE
4322 021 3051	CON-P11/7
4322 021 3052	CON-P14/8
4322 021 3053	CON-P18/11
4322 021 3054	CON-P22/13
4322 021 3055	CON-P26/16
4322 021 3056	CON-P30/19
4322 021 3057	CON-P36/22
4322 021 3058	CON-P42/29
4322 021 3062	SPR-P11/7
4322 021 3063	SPR-P14/8
4322 021 3064	SPR-P18/11
4322 021 3065	SPR-P22/13
4322 021 3066	SPR-P26/16
4322 021 3067	SPR-P30/19
4322 021 3068	SPR-P36/22
4322 021 3069	SPR-P42/29
4322 021 3071	NUT
4322 021 3072	FIB
4322 021 3115	COV-X30
4322 021 3116	COV-X35
4322 021 3117	CON-X30/1
4322 021 3118	CON-X35/1
4322 021 3132	CP-P66/56-1S
4322 021 3170	CP-P9/5-1S
4322 021 3178	CLI-RM6
4322 021 3183	CPH-E42/21/15-1S-10P
4322 021 3184	CLI-RM8
4322 021 3190	CLI-RM4/RM5
4322 021 3191	CLA-E42/21/15
4322 021 3192	SPR-E42/21/15
4322 021 3221	CSV-RM4-1S-6P
4322 021 3287	CSV-X22-1S-8P
4322 021 3299	CP-P7.4/4.2-1S
4322 021 3331	CPH-EC35-1S-13P
4322 021 3332	CPH-EC41-1S-9P
4322 021 3333	CPH-EC52-1S-11P
4322 021 3334	CPH-EC70-1S-15P
4322 021 3335	CPV-EC41-1S-9P
4322 021 3336	CPV-EC52-1S-14P
4322 021 3337	CPV-EC70-1S-15P

ORDERING CODE	TYPE
4322 021 3341	CPH-EC35-1S-11P
4322 021 3342	CSV-X30-1S-12P
4322 021 3343	CSV-X35-1S-16P
4322 021 3348	CPH-EC41-1S-12P
4322 021 3350	CPH-EC52-1S-14PH
4322 021 3352	CSV-RM14-1S-10P
4322 021 3353	CSV-RM14-1S-12P
4322 021 3362	CON-X30/2
4322 021 3363	CON-X35/2
4322 021 3370	CP-PH26/9.2-1S
4322 021 3385	CPH-ETD34-1S-14P
4322 021 3386	CPH-ETD39-1S-16P
4322 021 3387	CPH-ETD44-1S-18P
4322 021 3388	CPH-ETD49-1S-20P
4322 021 3389	CLI-ETD34
4322 021 3390	CLI-ETD39
4322 021 3391	CLI-ETD44
4322 021 3392	CLI-ETD49
4322 021 3394	ECLI-ETD34
4322 021 3395	ECLI-ETD39
4322 021 3396	ECLI-ETD44
4322 021 3397	ECLI-ETD49
4322 021 3404	CPV-RM6S/I-1S-8PD
4322 021 3405	CPV-RM8/I-1S-12PD
4322 021 3406	CPV-RM10/I-1S-12PD
4322 021 3407	CPV-RM14/I-1S-12PD
4322 021 3411	CPV-RM12/I-1S-12PD
4322 021 3423	CSCI-ETD34-1S-7P
4322 021 3424	CSCO-ETD34-1S-7P
4322 021 3429	CLI-RM4/I/RM5/I
4322 021 3430	CLI-RM6/I
4322 021 3431	CLI-RM8/I
4322 021 3432	CLI-RM10/I
4322 021 3437	CLI-ETD29
4322 021 3438	CPH-ETD29-1S-13P
4322 021 3445	CSV-RM5-1S-4P
4322 021 3446	CSV-RM5-1S-5P
4322 021 3447	CSV-RM5-1S-6P
4322 021 3448	CSV-RM5-2S-4P
4322 021 3449	CSV-RM5-2S-5P

ORDERING CODE	TYPE
4322 021 3450	CSV-RM5-2S-6P
4322 021 3451	CSV-RM6S/R-1S-4P
4322 021 3452	CSV-RM6S/R-2S-4P
4322 021 3453	CSV-RM6R-1S-5P
4322 021 3454	CSV-RM6R-1S-6P
4322 021 3455	CSV-RM6R-2S-5P
4322 021 3456	CSV-RM6R-2S-6P
4322 021 3457	CSV-RM6S-1S-5P
4322 021 3458	CSV-RM6S-1S-6P
4322 021 3459	CSV-RM6S-2S-5P
4322 021 3460	CSV-RM6S-2S-6P
4322 021 3461	CSV-RM7/I-1S-4P
4322 021 3462	CSV-RM7/I-1S-5P
4322 021 3463	CSV-RM7/I-1S-8P
4322 021 3464	CSV-RM7/I-2S-5P
4322 021 3465	CSV-RM7/I-2S-8P
4322 021 3466	CSV-RM8-1S-5P
4322 021 3467	CSV-RM8-1S-8P
4322 021 3468	CSV-RM8-1S-12P
4322 021 3469	CSV-RM8-2S-5P
4322 021 3470	CSV-RM8-2S-8P
4322 021 3471	CSV-RM8-2S-12P
4322 021 3472	CSV-RM10-1S-5P
4322 021 3473	CSV-RM10-1S-8P
4322 021 3474	CSV-RM10-1S-10P
4322 021 3475	CSV-RM10-1S-11P
4322 021 3476	CSV-RM10-1S-12P
4322 021 3477	CSV-RM10-2S-5P
4322 021 3478	CSV-RM10-2S-8P
4322 021 3479	CSV-RM10-2S-10P
4322 021 3480	CSV-RM10-2S-11P
4322 021 3481	CSV-RM10-2S-12P
4322 021 3486	CSV-RM8-1S-4P
4322 021 3491	CLI-RM12/I
4322 021 3492	CLI-RM14/I
4322 021 3493	CLI-RM7
4322 021 3503	CSH-EP13-1S-10P
4322 021 3507	CPH-U15/I20-1S-4P
4322 021 3508	CPH-U15/I20-2S-4P
4322 021 3514	CLI-EFD15

ORDERING CODE	TYPE
4322 021 3515	CLI-EFD20
4322 021 3516	CLI-EFD25
4322 021 3517	CLI-EFD30
4322 021 3520	CSH-EFD15/5-1S-8P
4322 021 3522	CSH-EFD20/7-1S-10P
4322 021 3524	CSH-EFD25/9-1S-10P
4322 021 3525	CSH-EFD30/9-1S-10P
4322 021 3832	ADJ-P30/RM10-RED
4322 021 3834	ADJ-P30/RM10-YELLOW
4322 021 3838	ADJ-P30/RM10-WHITE
4322 021 3839	ADJ-P30/RM10-GREY
4322 021 3840	ADJ-P22/RM8-BLACK
4322 021 3841	ADJ-P22/RM8-BROWN
4322 021 3842	ADJ-P22/RM8-RED
4322 021 3843	ADJ-P22/RM8-ORANGE
4322 021 3844	ADJ-P22/RM8-YELLOW
4322 021 3845	ADJ-P22/RM8-GREEN
4322 021 3848	ADJ-P22/RM8-WHITE
4322 021 3849	ADJ-P22/RM8-GREY
4322 021 3860	ADJ-RM6-BLACK
4322 021 3861	ADJ-RM6-BROWN
4322 021 3862	ADJ-RM6-RED
4322 021 3864	ADJ-RM6-YELLOW
4322 021 3865	ADJ-RM6-GREEN
4322 021 3867	ADJ-RM6-VIOLET
4322 021 3868	ADJ-RM6-WHITE
4322 021 3869	ADJ-RM6-GREY
4322 021 3870	ADJ-RM4/RM5-BLACK
4322 021 3871	ADJ-RM4/RM5-BROWN
4322 021 3872	ADJ-RM4/RM5-RED
4322 021 3875	ADJ-RM4/RM5-GREEN
4322 021 3878	ADJ-RM4/RM5-WHITE
4322 021 3879	ADJ-RM4/RM5-GREY
4322 021 3924	ADJ-P36/P42-YELLOW
4322 021 3928	ADJ-P36/P42-WHITE
4322 021 3929	ADJ-P36/P42-GREY
4322 021 3941	ADJ-P26-BROWN
4322 021 3942	ADJ-P26-RED
4322 021 3945	ADJ-P26-GREEN
4322 021 3948	ADJ-P26-WHITE

ORDERING CODE	TYPE
4322 021 3949	ADJ-P26-GREY
4322 021 3960	ADJ-P18-BLACK
4322 021 3961	ADJ-P18-BROWN
4322 021 3962	ADJ-P18-RED
4322 021 3963	ADJ-P18-ORANGE
4322 021 3964	ADJ-P18-YELLOW
4322 021 3965	ADJ-P18-GREEN
4322 021 3967	ADJ-P18-VIOLET
4322 021 3968	ADJ-P18-WHITE
4322 021 3970	ADJ-P14-BLACK
4322 021 3971	ADJ-P14-BROWN
4322 021 3972	ADJ-P14-RED
4322 021 3973	ADJ-P14-ORANGE
4322 021 3974	ADJ-P14-YELLOW
4322 021 3975	ADJ-P14-GREEN
4322 021 3978	ADJ-P14-WHITE
4322 021 3979	ADJ-P14-GREY
4322 021 3981	ADJ-P9/P11-BROWN
4322 021 3984	ADJ-P9/P11-YELLOW
4322 021 3985	ADJ-P9/P11-GREEN
4322 021 3989	ADJ-P9/P11-GREY
4322 022 0120	P11/7-3H1-A1800
4322 022 0125	P11/7-3H1-A160
4322 022 0126	P11/7-3H1-A250
4322 022 0139	P11/7-3D3-A800
4322 022 0143	P11/7-3D3-A63
4322 022 0144	P11/7-3D3-A100
4322 022 0150	P11/7-3H3-A1650
4322 022 0155	P11/7-3H3-A160
4322 022 0156	P11/7-3H3-A250
4322 022 0164	P11/7-3E4-A4100
4322 022 0166	P11/7-3E1-A2800
4322 022 0169	P11/7-3F3-A1550
4322 022 0171	P11/7-3F3-A100
4322 022 0172	P11/7-3F3-A160
4322 022 0173	P11/7-3F3-A250
4322 022 0179	P11/7-4C6-A130
4322 022 0181	P11/7-4C6-A25
4322 022 0182	P11/7-4C6-A40
4322 022 0188	P11/7-3B8-A1800

ORDERING CODE	TYPE
4322 022 0190	P11/7-3B8-A100
4322 022 0191	P11/7-3B8-A160
4322 022 0192	P11/7-3B8-A250
4322 022 0321	P14/8-3H1-A2350
4322 022 0325	P14/8-3H1-A160
4322 022 0326	P14/8-3H1-A250
4322 022 0327	P14/8-3H1-A315
4322 022 0328	P14/8-3H1-A400
4322 022 0340	P14/8-3D3-A1000
4322 022 0343	P14/8-3D3-A63
4322 022 0344	P14/8-3D3-A100
4322 022 0355	P14/8-3H3-A160
4322 022 0356	P14/8-3H3-A250
4322 022 0357	P14/8-3H3-A315
4322 022 0358	P14/8-3H3-A400
4322 022 0360	P14/8-3H3-A2150
4322 022 0366	P14/8-3C85-A2150
4322 022 0367	P14/8-3C85-A160
4322 022 0368	P14/8-3C85-A250
4322 022 0369	P14/8-3C85-A315
4322 022 0370	P14/8-3C85-A400
4322 022 0377	P14/8-3E4-A5300
4322 022 0379	P14/8-3E1-A3700
4322 022 0380	P14/8-4C6-A160
4322 022 0381	P14/8-4C6-A25
4322 022 0382	P14/8-4C6-A40
4322 022 0383	P14/8-4C6-A63
4322 022 0385	P14/8-3B8-A160
4322 022 0386	P14/8-3B8-A250
4322 022 0387	P14/8-3B8-A315
4322 022 0388	P14/8-3B8-A400
4322 022 0392	P14/8-3F3-A2000
4322 022 0393	P14/8-3F3-A160
4322 022 0394	P14/8-3F3-A250
4322 022 0395	P14/8-3F3-A315
4322 022 0396	P14/8-3F3-A400
4322 022 0397	P14/8-3B8-A2350
4322 022 0521	P18/11-3H1-A3400
4322 022 0525	P18/11-3H1-A160
4322 022 0526	P18/11-3H1-A250

ORDERING CODE	TYPE
4322 022 0527	P18/11-3H1-A315
4322 022 0528	P18/11-3H1-A400
4322 022 0540	P18/11-3D3-A1400
4322 022 0543	P18/11-3D3-A63
4322 022 0544	P18/11-3D3-A100
4322 022 0545	P18/11-3D3-A160
4322 022 0550	P18/11-3H3-A3100
4322 022 0555	P18/11-3H3-A160
4322 022 0556	P18/11-3H3-A250
4322 022 0557	P18/11-3H3-A315
4322 022 0558	P18/11-3H3-A400
4322 022 0566	P18/11-3F3-A2850
4322 022 0568	P18/11-3F3-A160
4322 022 0569	P18/11-3F3-A250
4322 022 0570	P18/11-3F3-A315
4322 022 0571	P18/11-3F3-A400
4322 022 0577	P18/11-3B8-A3400
4322 022 0578	P18/11-3C85-A3100
4322 022 0580	P18/11-4C6-A210
4322 022 0581	P18/11-4C6-A25
4322 022 0582	P18/11-4C6-A40
4322 022 0583	P18/11-4C6-A63
4322 022 0586	P18/11-3C85-A160
4322 022 0587	P18/11-3C85-A250
4322 022 0588	P18/11-3C85-A315
4322 022 0589	P18/11-3C85-A400
4322 022 0590	P18/11-3B8-A315
4322 022 0591	P18/11-3B8-A160
4322 022 0592	P18/11-3B8-A250
4322 022 0594	P18/11-3B8-A400
4322 022 0720	P22/13-3H1-A4300
4322 022 0725	P22/13-3H1-A160
4322 022 0726	P22/13-3H1-A250
4322 022 0727	P22/13-3H1-A315
4322 022 0728	P22/13-3H1-A400
4322 022 0730	P22/13-3H1-A630
4322 022 0740	P22/13-3D3-A1700
4322 022 0744	P22/13-3D3-A100
4322 022 0745	P22/13-3D3-A160
4322 022 0755	P22/13-3H3-A160

ORDERING CODE	TYPE
4322 022 0756	P22/13-3H3-A250
4322 022 0757	P22/13-3H3-A315
4322 022 0758	P22/13-3H3-A400
4322 022 0759	P22/13-3H3-A3900
4322 022 0760	P22/13-3H3-A630
4322 022 0764	P22/13-3F3-A3550
4322 022 0765	P22/13-3F3-A160
4322 022 0766	P22/13-3F3-A250
4322 022 0767	P22/13-3F3-A315
4322 022 0768	P22/13-3F3-A400
4322 022 0769	P22/13-3F3-A630
4322 022 0777	P22/13-3C85-A3900
4322 022 0779	P22/13-4C6-A250
4322 022 0781	P22/13-4C6-A25
4322 022 0782	P22/13-4C6-A40
4322 022 0783	P22/13-4C6-A63
4322 022 0785	P22/13-3C85-A160
4322 022 0786	P22/13-3C85-A250
4322 022 0787	P22/13-3C85-A315
4322 022 0788	P22/13-3C85-A400
4322 022 0789	P22/13-3C85-A630
4322 022 0791	P22/13-3B8-A160
4322 022 0792	P22/13-3B8-A250
4322 022 0793	P22/13-3B8-A315
4322 022 0794	P22/13-3B8-A400
4322 022 0795	P22/13-3B8-A630
4322 022 0797	P22/13-3B8-A4300
4322 022 0925	P26/16-3H1-A160
4322 022 0926	P26/16-3H1-A250
4322 022 0927	P26/16-3H1-A315
4322 022 0928	P26/16-3H1-A400
4322 022 0930	P26/16-3H1-A630
4322 022 0944	P26/16-3D3-A100
4322 022 0945	P26/16-3D3-A160
4322 022 0946	P26/16-3D3-A250
4322 022 0949	P26/16-3D3-A2150
4322 022 0950	P26/16-3F3-A4600
4322 022 0951	P26/16-3H3-A5000
4322 022 0955	P26/16-3H3-A160
4322 022 0956	P26/16-3H3-A250

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4322 022 0957	P26/16-3H3-A315
4322 022 0958	P26/16-3H3-A400
4322 022 0960	P26/16-3H3-A630
4322 022 0972	P26/16-3H1-A5550
4322 022 0973	P26/16-3C85-A5000
4322 022 0980	P26/16-4C6-A310
4322 022 0983	P26/16-4C6-A63
4322 022 0984	P26/16-4C6-A100
4322 022 0985	P26/16-3B8-A5550
4322 022 0986	P26/16-3B8-A250
4322 022 0987	P26/16-3B8-A315
4322 022 0988	P26/16-3B8-A400
4322 022 0989	P26/16-3B8-A630
4322 022 1120	P30/19-3H1-A7050
4322 022 1126	P30/19-3H1-A250
4322 022 1127	P30/19-3H1-A315
4322 022 1128	P30/19-3H1-A400
4322 022 1130	P30/19-3H1-A630
4322 022 1131	P30/19-3H1-A1000
4322 022 1132	P30/19-3H1-A1600
4322 022 1148	P30/19-3F3-A5750
4322 022 1151	P30/19-3F3-A250
4322 022 1152	P30/19-3F3-A315
4322 022 1153	P30/19-3F3-A400
4322 022 1154	P30/19-3F3-A630
4322 022 1160	P30/19-3C85-A6300
4322 022 1164	P30/19-3C85-A250
4322 022 1165	P30/19-3C85-A315
4322 022 1166	P30/19-3C85-A400
4322 022 1167	P30/19-3C85-A630
4322 022 1182	P30/19-3B8-A7050
4322 022 1184	P30/19-3B8-A250
4322 022 1185	P30/19-3B8-A315
4322 022 1186	P30/19-3B8-A400
4322 022 1187	P30/19-3B8-A630
4322 022 1320	P36/22-3H1-A9000
4322 022 1328	P36/22-3H1-A400
4322 022 1330	P36/22-3H1-A630
4322 022 1331	P36/22-3H1-A1000
4322 022 1332	P36/22-3H1-A1600

ORDERING CODE	TYPE
4322 022 1350	P36/22-3F3-A7350
4322 022 1351	P36/22-3F3-A250
4322 022 1352	P36/22-3F3-A315
4322 022 1353	P36/22-3F3-A400
4322 022 1354	P36/22-3F3-A630
4322 022 1360	P36/22-3C85-A8000
4322 022 1364	P36/22-3C85-A250
4322 022 1365	P36/22-3C85-A315
4322 022 1366	P36/22-3C85-A400
4322 022 1367	P36/22-3C85-A630
4322 022 1378	P36/22-3B8-A9000
4322 022 1381	P36/22-3B8-A250
4322 022 1382	P36/22-3B8-A315
4322 022 1383	P36/22-3B8-A400
4322 022 1384	P36/22-3B8-A630
4322 022 1520	P42/29-3H1-A9500
4322 022 1527	P42/29-3H1-A315
4322 022 1528	P42/29-3H1-A400
4322 022 1530	P42/29-3H1-A630
4322 022 1531	P42/29-3H1-A1000
4322 022 1532	P42/29-3H1-A1600
4322 022 1580	P42/29-3F3-A7700
4322 022 1583	P42/29-3F3-A315
4322 022 1584	P42/29-3F3-A400
4322 022 1585	P42/29-3F3-A630
4322 022 1590	P42/29-3C85-A8500
4322 022 1593	P42/29-3C85-A315
4322 022 1594	P42/29-3C85-A400
4322 022 1595	P42/29-3C85-A630
4322 022 1700	P66/56-3E1-A14000
4322 022 1928	X30-3H1-A400
4322 022 1930	X30-3H1-A630
4322 022 1931	X30-3H1-A1000
4322 022 1932	X30-3H1-A1600
4322 022 2125	P11/7-3H1-A160/N
4322 022 2126	P11/7-3H1-A250/N
4322 022 2143	P11/7-3D3-A63/N
4322 022 2144	P11/7-3D3-A100/N
4322 022 2155	P11/7-3H3-A160/N
4322 022 2156	P11/7-3H3-A250/N

ORDERING CODE	TYPE
4322 022 2181	P11/7-4C6-A25/N
4322 022 2182	P11/7-4C6-A40/N
4322 022 2325	P14/8-3H1-A160/N
4322 022 2326	P14/8-3H1-A250/N
4322 022 2327	P14/8-3H1-A315/N
4322 022 2328	P14/8-3H1-A400/N
4322 022 2343	P14/8-3D3-A63/N
4322 022 2344	P14/8-3D3-A100/N
4322 022 2355	P14/8-3H3-A160/N
4322 022 2356	P14/8-3H3-A250/N
4322 022 2357	P14/8-3H3-A315/N
4322 022 2358	P14/8-3H3-A400/N
4322 022 2381	P14/8-4C6-A25/N
4322 022 2382	P14/8-4C6-A40/N
4322 022 2383	P14/8-4C6-A63/N
4322 022 2525	P18/11-3H1-A160/N
4322 022 2526	P18/11-3H1-A250/N
4322 022 2527	P18/11-3H1-A315/N
4322 022 2528	P18/11-3H1-A400/N
4322 022 2543	P18/11-3D3-A63/N
4322 022 2544	P18/11-3D3-A100/N
4322 022 2545	P18/11-3D3-A160/N
4322 022 2555	P18/11-3H3-A160/N
4322 022 2556	P18/11-3H3-A250/N
4322 022 2557	P18/11-3H3-A315/N
4322 022 2558	P18/11-3H3-A400/N
4322 022 2581	P18/11-4C6-A25/N
4322 022 2582	P18/11-4C6-A40/N
4322 022 2583	P18/11-4C6-A63/N
4322 022 2725	P22/13-3H1-A160/N
4322 022 2726	P22/13-3H1-A250/N
4322 022 2727	P22/13-3H1-A315/N
4322 022 2728	P22/13-3H1-A400/N
4322 022 2730	P22/13-3H1-A630/N
4322 022 2744	P22/13-3D3-A100/N
4322 022 2745	P22/13-3D3-A160/N
4322 022 2755	P22/13-3H3-A160/N
4322 022 2756	P22/13-3H3-A250/N
4322 022 2757	P22/13-3H3-A315/N
4322 022 2758	P22/13-3H3-A400/N

ORDERING CODE	TYPE
4322 022 2760	P22/13-3H3-A630/N
4322 022 2781	P22/13-4C6-A25/N
4322 022 2782	P22/13-4C6-A40/N
4322 022 2783	P22/13-4C6-A63/N
4322 022 2925	P26/16-3H1-A160/N
4322 022 2926	P26/16-3H1-A250/N
4322 022 2927	P26/16-3H1-A315/N
4322 022 2928	P26/16-3H1-A400/N
4322 022 2930	P26/16-3H1-A630/N
4322 022 2944	P26/16-3D3-A100/N
4322 022 2945	P26/16-3D3-A160/N
4322 022 2946	P26/16-3D3-A250/N
4322 022 2955	P26/16-3H3-A160/N
4322 022 2956	P26/16-3H3-A250/N
4322 022 2957	P26/16-3H3-A315/N
4322 022 2958	P26/16-3H3-A400/N
4322 022 2960	P26/16-3H3-A630/N
4322 022 2983	P26/16-4C6-A63/N
4322 022 2984	P26/16-4C6-A100/N
4322 022 3126	P30/19-3H1-A250/N
4322 022 3127	P30/19-3H1-A315/N
4322 022 3128	P30/19-3H1-A400/N
4322 022 3130	P30/19-3H1-A630/N
4322 022 3131	P30/19-3H1-A1000/N
4322 022 3328	P36/22-3H1-A400/N
4322 022 3330	P36/22-3H1-A630/N
4322 022 3331	P36/22-3H1-A1000/N
4322 022 3332	P36/22-3H1-A1600/N
4322 022 3527	P42/29-3H1-A315/N
4322 022 3528	P42/29-3H1-A400/N
4322 022 3530	P42/29-3H1-A630/N
4322 022 3531	P42/29-3H1-A1000/N
4322 022 3532	P42/29-3H1-A1600/N
4322 022 3928	X30-3H1-A400/N
4322 022 3930	X30-3H1-A630/N
4322 022 3931	X30-3H1-A1000/N
4322 022 3932	X30-3H1-A1600/N
4322 022 4120	P9/5-3H1-A1260
4322 022 4123	P9/5-3H1-A63
4322 022 4124	P9/5-3H1-A100

ORDERING CODE	TYPE
4322 022 4125	P9/5-3H1-A160
4322 022 4140	P9/5-3D3-A630
4322 022 4142	P9/5-3D3-A40
4322 022 4143	P9/5-3D3-A63
4322 022 4179	P9/5-4C6-A100
4322 022 4180	P9/5-4C6-A16
4322 022 4181	P9/5-4C6-A25
4322 022 4182	P9/5-4C6-A40
4322 022 4520	X22-3H1-A4200
4322 022 4528	X22-3H1-A400
4322 022 4530	X22-3H1-A630
4322 022 4531	X22-3H1-A1000
4322 022 4540	X22-3D3-A1600
4322 022 4560	X22-3B8-A4200
4322 022 4580	X22-4C6-A220
4322 022 4721	RM6S-3H1-A2300
4322 022 4725	RM6S-3H1-A160
4322 022 4726	RM6S-3H1-A250
4322 022 4727	RM6S-3H1-A315
4322 022 4728	RM6S-3H1-A400
4322 022 4740	RM6S-3D3-A950
4322 022 4743	RM6S-3D3-A63
4322 022 4744	RM6S-3D3-A100
4322 022 4745	RM6S-3D3-A160
4322 022 4750	RM6S-3H3-A2100
4322 022 4755	RM6S-3H3-A160
4322 022 4756	RM6S-3H3-A250
4322 022 4757	RM6S-3H3-A315
4322 022 4758	RM6S-3H3-A400
4322 022 4768	RM6S-3H3-A200
4322 022 4772	RM6S/I-3B8-A63
4322 022 4773	RM6S/I-3B8-A160
4322 022 4774	RM6S/I-3B8-A100
4322 022 4778	RM6S-4C6-A140
4322 022 4781	RM6S-4C6-A25
4322 022 4782	RM6S-4C6-A40
4322 022 4783	RM6S-4C6-A63
4322 022 4784	RM6S/I-3E6-A12500
4322 022 4785	RM6S/I-3B8-A2600
4322 022 4786	RM6S/I-3E1-A4100

ORDERING CODE	TYPE
4322 022 4787	RM6S/I-3E5-A8600
4322 022 4788	RM6S/I-3B8-A250
4322 022 4793	RM6S/I-3E4-A5750
4322 022 5020	RM10-3H1-A4250
4322 022 5026	RM10-3H1-A250
4322 022 5027	RM10-3H1-A315
4322 022 5028	RM10-3H1-A400
4322 022 5030	RM10-3H1-A630
4322 022 5040	RM10/I-3B8-A4950
4322 022 5046	RM10/I-3B8-A160
4322 022 5048	RM10/I-3B8-A250
4322 022 5049	RM10/I-3B8-A315
4322 022 5050	RM10/I-3B8-A400
4322 022 5052	RM10/I-3B8-A630
4322 022 5060	RM10/I-3C85-A4400
4322 022 5086	RM10/I-3C85-A250
4322 022 5087	RM10/I-3C85-A315
4322 022 5088	RM10/I-3C85-A400
4322 022 5089	RM10/I-3C85-A630
4322 022 5090	RM10/I-3E1-A8000
4322 022 5093	RM10/I-3E4-A11000
4322 022 5094	RM10/I-3E5-A16000
4322 022 5099	RM10/I-3C85-A160
4322 022 5120	RM8-3H1-A3150
4322 022 5126	RM8-3H1-A250
4322 022 5127	RM8-3H1-A315
4322 022 5128	RM8-3H1-A400
4322 022 5130	RM8-3H1-A630
4322 022 5140	RM8-3D3-A1240
4322 022 5144	RM8-3D3-A100
4322 022 5145	RM8-3D3-A160
4322 022 5146	RM8/I-3B8-A3600
4322 022 5147	RM8/I-3B8-A160
4322 022 5148	RM8/I-3B8-A250
4322 022 5149	RM8/I-3B8-A315
4322 022 5150	RM8/I-3B8-A400
4322 022 5156	RM8-3H3-A250
4322 022 5157	RM8-3H3-A315
4322 022 5158	RM8-3H3-A400
4322 022 5160	RM8-3H3-A630

ORDERING CODE	TYPE
4322 022 5170	RM8-3H3-A2850
4322 022 5181	RM8-4C6-A180
4322 022 5182	RM8-4C6-A40
4322 022 5183	RM8-4C6-A63
4322 022 5186	RM8/I-3E1-A5800
4322 022 5187	RM8/I-3E4-A8000
4322 022 5198	RM8/I-3E5-A12500
4322 022 5300	X35-3B8-A6000
4322 022 5320	X35-3H1-A6000
4322 022 5328	X35-3H1-A400
4322 022 5330	X35-3H1-A630
4322 022 5331	X35-3H1-A1000
4322 022 5332	X35-3H1-A1600
4322 022 5520	RM6R-3H1-A2450
4322 022 5525	RM6R-3H1-A160
4322 022 5526	RM6R-3H1-A250
4322 022 5527	RM6R-3H1-A315
4322 022 5528	RM6R-3H1-A400
4322 022 5540	RM6R-3D3-A1000
4322 022 5543	RM6R-3D3-A63
4322 022 5544	RM6R-3D3-A100
4322 022 5545	RM6R-3D3-A160
4322 022 5555	RM6R-3H3-A160
4322 022 5556	RM6R-3H3-A250
4322 022 5557	RM6R-3H3-A315
4322 022 5558	RM6R-3H3-A400
4322 022 5562	RM6R-3H3-A2200
4322 022 5566	RM6R-4C6-A150
4322 022 5568	RM6R-3H3-A200
4322 022 5581	RM6R-4C6-A25
4322 022 5582	RM6R-4C6-A40
4322 022 5583	RM6R-4C6-A63
4322 022 5710	RM4/I-3F3-A950
4322 022 5714	RM4/I-3F3-A100
4322 022 5715	RM4/I-3F3-A160
4322 022 5716	RM4/I-3F3-A250
4322 022 5720	RM4-3H1-A950
4322 022 5723	RM4-3H1-A63
4322 022 5724	RM4-3H1-A100
4322 022 5725	RM4-3H1-A160

ORDERING CODE	TYPE
4322 022 5739	RM4-3D3-A400
4322 022 5742	RM4-3D3-A40
4322 022 5743	RM4-3D3-A63
4322 022 5750	RM4-3H3-A900
4322 022 5753	RM4-3H3-A63
4322 022 5754	RM4-3H3-A100
4322 022 5755	RM4-3H3-A160
4322 022 5770	RM4/I-3E1-A1800
4322 022 5775	RM4/I-3E5-A3500
4322 022 5779	RM4-4C6-A65
4322 022 5780	RM4-4C6-A16
4322 022 5781	RM4-4C6-A25
4322 022 5791	RM4/I-3E4-A2500
4322 022 5916	RM5/I-3E6-A9500
4322 022 5920	RM5-3H1-A1800
4322 022 5925	RM5-3H1-A160
4322 022 5926	RM5-3H1-A250
4322 022 5927	RM5-3H1-A315
4322 022 5940	RM5-3D3-A800
4322 022 5943	RM5-3D3-A63
4322 022 5944	RM5-3D3-A100
4322 022 5946	RM5/I-3B8-A2000
4322 022 5948	RM5/I-3B8-A160
4322 022 5949	RM5/I-3B8-A250
4322 022 5950	RM5/I-3B8-A315
4322 022 5955	RM5-3H3-A160
4322 022 5956	RM5-3H3-A250
4322 022 5957	RM5-3H3-A315
4322 022 5981	RM5-4C6-A25
4322 022 5982	RM5-4C6-A40
4322 022 5984	RM5-4C6-A120
4322 022 5990	RM5/I-3E1-A3150
4322 022 5991	RM5/I-3E4-A4500
4322 022 5992	RM5/I-3E5-A6700
4322 022 6123	P9/5-3H1-A63/N
4322 022 6124	P9/5-3H1-A100/N
4322 022 6125	P9/5-3H1-A160/N
4322 022 6142	P9/5-3D3-A40/N
4322 022 6143	P9/5-3D3-A63/N
4322 022 6180	P9/5-4C6-A16/N

ORDERING CODE	TYPE
4322 022 6181	P9/5-4C6-A25/N
4322 022 6182	P9/5-4C6-A40/N
4322 022 6528	X22-3H1-A400/N
4322 022 6530	X22-3H1-A630/N
4322 022 6531	X22-3H1-A1000/N
4322 022 6725	RM6S-3H1-A160/N
4322 022 6726	RM6S-3H1-A250/N
4322 022 6727	RM6S-3H1-A315/N
4322 022 6728	RM6S-3H1-A400/N
4322 022 6743	RM6S-3D3-A63/N
4322 022 6744	RM6S-3D3-A100/N
4322 022 6745	RM6S-3D3-A160/N
4322 022 6755	RM6S-3H3-A160/N
4322 022 6756	RM6S-3H3-A250/N
4322 022 6757	RM6S-3H3-A315/N
4322 022 6758	RM6S-3H3-A400/N
4322 022 6768	RM6S-3H3-A200/N
4322 022 6781	RM6S-4C6-A25/N
4322 022 6782	RM6S-4C6-A40/N
4322 022 6783	RM6S-4C6-A63/N
4322 022 7026	RM10-3H1-A250/N
4322 022 7027	RM10-3H1-A315/N
4322 022 7028	RM10-3H1-A400/N
4322 022 7030	RM10-3H1-A630/N
4322 022 7126	RM8-3H1-A250/N
4322 022 7127	RM8-3H1-A315/N
4322 022 7128	RM8-3H1-A400/N
4322 022 7130	RM8-3H1-A630/N
4322 022 7144	RM8-3D3-A100/N
4322 022 7145	RM8-3D3-A160/N
4322 022 7156	RM8-3H3-A250/N
4322 022 7157	RM8-3H3-A315/N
4322 022 7158	RM8-3H3-A400/N
4322 022 7160	RM8-3H3-A630/N
4322 022 7182	RM8-4C6-A40/N
4322 022 7183	RM8-4C6-A63/N
4322 022 7328	X35-3H1-A400/N
4322 022 7330	X35-3H1-A630/N
4322 022 7331	X35-3H1-A1000/N
4322 022 7332	X35-3H1-A1600/N

ORDERING CODE	TYPE
4322 022 7525	RM6R-3H1-A160/N
4322 022 7526	RM6R-3H1-A250/N
4322 022 7527	RM6R-3H1-A315/N
4322 022 7528	RM6R-3H1-A400/N
4322 022 7543	RM6R-3D3-A63/N
4322 022 7544	RM6R-3D3-A100/N
4322 022 7545	RM6R-3D3-A160/N
4322 022 7555	RM6R-3H3-A160/N
4322 022 7556	RM6R-3H3-A250/N
4322 022 7557	RM6R-3H3-A315/N
4322 022 7558	RM6R-3H3-A400/N
4322 022 7568	RM6R-3H3-A200/N
4322 022 7581	RM6R-4C6-A25/N
4322 022 7582	RM6R-4C6-A40/N
4322 022 7583	RM6R-4C6-A63/N
4322 022 7723	RM4-3H1-A63/N
4322 022 7724	RM4-3H1-A100/N
4322 022 7725	RM4-3H1-A160/N
4322 022 7742	RM4-3D3-A40/N
4322 022 7743	RM4-3D3-A63/N
4322 022 7753	RM4-3H3-A63/N
4322 022 7754	RM4-3H3-A100/N
4322 022 7755	RM4-3H3-A160/N
4322 022 7780	RM4-4C6-A16/N
4322 022 7781	RM4-4C6-A25/N
4322 022 7925	RM5-3H1-A160/N
4322 022 7926	RM5-3H1-A250/N
4322 022 7927	RM5-3H1-A315/N
4322 022 7943	RM5-3D3-A63/N
4322 022 7944	RM5-3D3-A100/N
4322 022 7955	RM5-3H3-A160/N
4322 022 7956	RM5-3H3-A250/N
4322 022 7957	RM5-3H3-A315/N
4322 022 7970	RM5-3H3-A1650
4322 022 7981	RM5-4C6-A25/N
4322 022 7982	RM5-4C6-A40/N
4322 025 0040	RM7/I-3C85-A2700
4322 025 0045	RM7/I-3C85-A160
4322 025 0046	RM7/I-3C85-A250
4322 025 0060	RM7/I-3B8-A3000

ORDERING CODE	TYPE
4322 025 0065	RM7/I-3B8-A160
4322 025 0066	RM7/I-3B8-A250
4322 025 0080	RM7/I-3F3-A2500
4322 025 0085	RM7/I-3F3-A160
4322 025 0086	RM7/I-3F3-A250
4322 025 0090	RM7/I-3E4-A6600
4322 025 0095	RM7/I-3E5-A10000
4322 025 0099	RM7/I-3E1-A4750
4322 025 0120	RM8/I-3C85-A3250
4322 025 0145	RM8/I-3C85-A160
4322 025 0146	RM8/I-3C85-A250
4322 025 0147	RM8/I-3C85-A315
4322 025 0148	RM8/I-3C85-A400
4322 025 0160	RM8/I-3F3-A3000
4322 025 0165	RM8/I-3F3-A160
4322 025 0166	RM8/I-3F3-A250
4322 025 0167	RM8/I-3F3-A315
4322 025 0168	RM8/I-3F3-A400
4322 025 0191	RM8/I-3E6-A18000
4322 025 0260	RM10/I-3F3-A4050
4322 025 0265	RM10/I-3F3-A160
4322 025 0266	RM10/I-3F3-A250
4322 025 0267	RM10/I-3F3-A315
4322 025 0268	RM10/I-3F3-A400
4322 025 0269	RM10/I-3F3-A630
4322 025 0300	RM14/I-3C85-A6250
4322 025 0316	RM14/I-3C85-A250
4322 025 0317	RM14/I-3C85-A315
4322 025 0318	RM14/I-3C85-A400
4322 025 0320	RM14/I-3C85-A630
4322 025 0321	RM14/I-3C85-A1000
4322 025 0360	RM14/I-3F3-A5700
4322 025 0366	RM14/I-3F3-A250
4322 025 0367	RM14/I-3F3-A315
4322 025 0368	RM14/I-3F3-A400
4322 025 0370	RM14/I-3F3-A630
4322 025 0371	RM14/I-3F3-A1000
4322 025 0380	RM14/I-3B8-A7100
4322 025 0386	RM14/I-3B8-A250
4322 025 0387	RM14/I-3B8-A315

ORDERING CODE	TYPE
4322 025 0388	RM14/I-3B8-A400
4322 025 0390	RM14/I-3B8-A630
4322 025 0391	RM14/I-3B8-A1000
4322 025 0400	RM5/I-3C85-A1800
4322 025 0404	RM5/I-3C85-A160
4322 025 0405	RM5/I-3C85-A250
4322 025 0406	RM5/I-3C85-A315
4322 025 0410	RM5/I-3F3-A1700
4322 025 0414	RM5/I-3F3-A160
4322 025 0415	RM5/I-3F3-A250
4322 025 0416	RM5/I-3F3-A315
4322 025 0500	RM6S/I-3C85-A2350
4322 025 0503	RM6S/I-3C85-A63
4322 025 0504	RM6S/I-3C85-A100
4322 025 0505	RM6S/I-3C85-A160
4322 025 0506	RM6S/I-3C85-A250
4322 025 0511	RM6S/I-3F3-A1950
4322 025 0513	RM6S/I-3F3-A63
4322 025 0514	RM6S/I-3F3-A100
4322 025 0515	RM6S/I-3F3-A160
4322 025 0516	RM6S/I-3F3-A250
4322 025 0600	RM12/I-3C85-A5500
4322 025 0605	RM12/I-3C85-A160
4322 025 0606	RM12/I-3C85-A250
4322 025 0607	RM12/I-3C85-A315
4322 025 0608	RM12/I-3C85-A400
4322 025 0620	RM12/I-3F3-A5050
4322 025 0625	RM12/I-3F3-A160
4322 025 0626	RM12/I-3F3-A250
4322 025 0627	RM12/I-3F3-A315
4322 025 0628	RM12/I-3F3-A400
4322 025 0640	RM12/I-3B8-A6200
4322 025 0645	RM12/I-3B8-A160
4322 025 0646	RM12/I-3B8-A250
4322 025 0647	RM12/I-3B8-A315
4322 025 0648	RM12/I-3B8-A400
4322 025 0660	RM12/I-3E4-A13300
4322 025 0670	RM12/I-3E1-A9200
4322 025 0700	P7.4/4.2-3H1-A970
4322 025 0703	P7.4/4.2-3H1-A63

ORDERING CODE	TYPE
4322 025 0704	P7.4/4.2-3H1-A100
4322 025 0820	EP7-3E5-A5200
4322 025 0840	EP7-3F3-A1000
4322 025 0860	EP7-3E1-A2100
4322 025 1003	EP13-3C85-A100
4322 025 1004	EP13-3C85-A160
4322 025 1006	EP13-3C85-A250
4322 025 1007	EP13-3C85-A315
4322 025 1014	EP13-3C85-A1475
4322 025 1020	EP13-3E6-A10000
4322 025 1033	EP13-3E1-A2600
4322 025 1077	EP13-3E5-A7000
4322 025 1080	EP13-3E25-A4400
4322 025 1090	EP13-3F3-A1325
4322 025 1094	EP13-3F3-A160
4322 025 1096	EP13-3F3-A250
4322 025 1097	EP13-3F3-A315
4322 025 1300	X30-3H1-A5000
4322 025 1320	X30-3B8-A5000
4322 025 3026	P26/16-3C85-A250
4322 025 3027	P26/16-3C85-A315
4322 025 3028	P26/16-3C85-A400
4322 025 3030	P26/16-3C85-A630
4322 025 3046	P26/16-3F3-A250
4322 025 3047	P26/16-3F3-A315
4322 025 3048	P26/16-3F3-A400
4322 025 3050	P26/16-3F3-A630
4322 025 3300	P14/8-3F4-A1000
4322 025 3400	P18/11-3F4-A1400
4322 025 3500	P22/13-3F4-A1700
4330 030 3008	ROD5/25-4B1
4330 030 3071	ROD10/200-4B1
4330 030 3097	IMP8/3/125-3D3
4330 030 3099	IMP10/4.5/170-3D3
4330 030 3119	IMP6/3/200-3D3
4330 030 3120	IMP14.3/6.5/170-3D3
4330 030 3121	IMP6/3/200-3C85
4330 030 3122	IMP8/3/200-3C85
4330 030 3123	IMP10/4.5/200-3C85
4330 030 3124	IMP12/5.5/200-3C85

ORDERING CODE	TYPE
4330 030 3125	IMP12/5.5/170-3D3
4330 030 3126	IMP14.3/6.5/200-3C85
4330 030 3133	ROD2/10-3B1
4330 030 3134	ROD2/15-3B1
4330 030 3135	ROD3/15-3B1
4330 030 3136	ROD3/20-3B1
4330 030 3137	ROD4/15-3B1
4330 030 3138	ROD4/20-3B1
4330 030 3139	ROD5/20-3B1
4330 030 3140	ROD5/25-3B1
4330 030 3141	ROD6/30-3B1
4330 030 3142	ROD6/40-3B1
4330 030 3143	ROD8/50-3B1
4330 030 3144	ROD8/150-3B1
4330 030 3145	ROD2/20-3B1
4330 030 3146	ROD10/200-3B1
4330 030 3147	ROD3/25-3B1
4330 030 3149	ROD4/25-3B1
4330 030 3151	ROD5/30-3B1
4330 030 3153	ROD6/50-3B1
4330 030 3155	ROD8/200-3B1
4330 030 3210	BD3/0.7/4-3S1
4330 030 3211	BD3/0.7/10-3S1
4330 030 3212	BD3/1/4-3S1
4330 030 3213	BD3/1/10-3S1
4330 030 3214	BD5/0.7/4-3S1
4330 030 3215	BD5/0.7/10-3S1
4330 030 3216	BD5/1.5/4-3S1
4330 030 3217	BD5/1.5/10-3S1
4330 030 3218	BD5/2/4-3S1
4330 030 3219	BD5/2/10-3S1
4330 030 3274	MHC3-4B1
4330 030 3311	BD3/0.7/4-4S2
4330 030 3312	BD3/1/4-4S2
4330 030 3313	BD5/0.7/4-4S2
4330 030 3314	BD5/1.5/4-4S2
4330 030 3315	BD5/2/4-4S2
4330 030 3316	BD8/1.5/4-4S2
4330 030 3317	BD8/2/4-4S2
4330 030 3318	BD8/3/4-4S2

ORDERING CODE	TYPE
4330 030 3319	BD5/2/10-4S2
4330 030 3320	BD8/3/10-4S2
4330 030 3321	BD3/1/10-4S2
4330 030 3322	BD5/1.5/10-4S2
4330 030 3323	BD8/2/10-4S2
4330 030 3324	BD3/0.7/10-4S2
4330 030 3325	BD8/1.5/10-4S2
4330 030 3326	BD5/0.7/10-4S2
4330 030 3333	BDW4.9/10-3S1
4330 030 3345	TUB8/4/200-3C85
4330 030 3346	TUB10/5/200-3C85
4330 030 3354	TUB3.5/1.2/5-3B1
4330 030 3355	TUB3.5/1.2/15-3B1
4330 030 3356	TUB4/1.6/15-3B1
4330 030 3357	TUB4/1.6/40-3B1
4330 030 3358	TUB5/2/15-3B1
4330 030 3359	TUB5/2/50-3B1
4330 030 3360	TUB6/3/20-3B1
4330 030 3361	TUB6/3/30-3B1
4330 030 3362	TUB8/4/20-3B1
4330 030 3363	TUB8/4/40-3B1
4330 030 3364	TUB10/4.2/20-3B1
4330 030 3365	TUB10/4.2/45-3B1
4330 030 3366	TUB10/6.5/20-3B1
4330 030 3367	TUB3.5/1.2/5-3C85
4330 030 3368	TUB3.5/1.2/15-3C85
4330 030 3369	TUB4/1.6/15-3C85
4330 030 3370	TUB4/1.6/40-3C85
4330 030 3371	TUB5/2/15-3C85
4330 030 3372	TUB5/2/50-3C85
4330 030 3373	TUB6/3/20-3C85
4330 030 3374	TUB6/3/30-3C85
4330 030 3375	TUB8/4/20-3C85
4330 030 3376	TUB8/4/40-3C85
4330 030 3377	TUB10/4.2/20-3C85
4330 030 3378	TUB10/4.2/45-3C85
4330 030 3379	TUB10/6.5/20-3C85
4330 030 3405	RC2.5/1-4A11
4330 030 3407	RCC4/1.6-3E25
4330 030 3422	RCC36/15-3E25

ORDERING CODE	TYPE
4330 030 3423	RCC29/7.5-3E25
4330 030 3431	RCC36/15-3R1
4330 030 3436	RCC4/1.1-4A11
4330 030 3437	RCC4/1.6-4A11
4330 030 3438	RCC6/2-4A11
4330 030 3439	RCC9/3-4A11
4330 030 3440	RCC12.5/5-4A11
4330 030 3441	RCC14/5-4A11
4330 030 3442	RCC14/9-4A11
4330 030 3443	RCC16/6.3-4A11
4330 030 3444	RCC23/7-4A11
4330 030 3445	RCC36/15-4A11
4330 030 3446	RCC10/4-3C85
4330 030 3447	RCC20/7-3C85
4330 030 3448	RCC25/10-3C85
4330 030 3449	RCC31.5/12.5-3C85
4330 030 3450	RCC10/4-3C11
4330 030 3451	RCC20/7-3C11
4330 030 3452	RCC25/10-3C11
4330 030 3453	RCC31.5/12.5-3C11
4330 030 3458	RCC10/4-3E25
4330 030 3459	RCC20/7-3E25
4330 030 3460	RCC25/10-3E25
4330 030 3461	RCC31.5/12.5-3E25
4330 030 3466	RCL10/4-3E5
4330 030 3469	RCC4/1.1-4C65
4330 030 3470	RCC4/1.6-4C65
4330 030 3471	RCC36/10-4C65
4330 030 3472	RC2.5/1-4C65
4330 030 3478	RCC4/1.6-3F3
4330 030 3479	RCC6.3/2.5-4C65
4330 030 3480	RCC10/4-4C65
4330 030 3481	RCC12.5/5-4C65
4330 030 3482	RCC20/7-4C65
4330 030 3487	RCC6.3/2.5-4A11
4330 030 3488	RCC10/4-4A11
4330 030 3491	RCC19/10-3C85
4330 030 3492	RCC12.5/5-3C11
4330 030 3494	RCC6.3/2.5-3E25
4330 030 3496	RCL6.3/2.5-3E5

ORDERING CODE	TYPE
4330 030 3497	RCC6.3/2.5-3F3
4330 030 3498	RCC10/4-3F3
4330 030 3499	RCC23/7-3F3
4330 030 3500	RCC25/10-3F3
4330 030 3501	RCC31.5/12.5-3F3
4330 030 3502	RCC36/15-3F3
4330 030 3505	RCC14/9-3C11
4330 030 3513	RC2.5/1-3F3
4330 030 3514	RC2.5/1-3E5
4330 030 3520	RCL58/17.5-3C11
4330 030 3525	RCL20/7-3E5
4330 030 3526	RCL25/10-3E5
4330 030 3527	RCL31.5/12.5-3E5
4330 030 3528	RCL36/15-3E5
4330 030 3552	RCL42/12.5-3C85
4330 030 3553	RCL58/17.5-3C85
4330 030 3555	RCL42/12.5-3F3
4330 030 3580	RCC9/3-3C85
4330 030 3592	RCL42/12.5-3C11
4330 030 3618	WBC2-R-4A15
4330 030 3619	BC22/18.5-3C80
4330 030 3629	CBD4.6/3/3-4S1
4330 030 3630	CBD8.9/3/3-4S1
4330 030 3634	BC22/38-3C80
4330 030 3642	CBD4.6/3/3-3S1
4330 030 3645	CBD8.9/3/3-3S1
4330 030 3647	BC22/18-3C80
4330 030 3648	BC22/14-3C80
4330 030 3652	CBD8.9/4.6/3-3S1
4330 030 3656	BC22.6/14-3C80
4330 030 3660	CUPMSC15/12-4B1/3C85
4330 030 3708	RCC6/2-3E25
4330 030 3709	RCC9/3-3E25
4330 030 3710	RCC12.5/5-3E25
4330 030 3711	RCC14/5-3E25
4330 030 3712	RCC14/9-3E25
4330 030 3713	RCC16/6.3-3E25
4330 030 3714	RCC19/15-3E25
4330 030 3716	RCC23/7-3E25
4330 030 3717	RCC26/10-3E25

ORDERING CODE	TYPE
4330 030 3718	RCC16/6.3-3C11
4330 030 3719	RC2.5/1-3E25
4330 030 3734	RCC19/10-3E25
4330 030 3735	RCC4/1.1-3E25
4330 030 3745	RCC14/5-3C85
4330 030 3746	RCC14/5-3C11
4330 030 3747	RCC19/10-3C11
4330 030 3748	RCC19/15-3C85
4330 030 3749	RCC19/15-3C11
4330 030 3750	RCC23/7-3C85
4330 030 3751	RCC23/7-3C11
4330 030 3752	RCC26/10-3C11
4330 030 3753	RCC26/20-3C11
4330 030 3754	RCC26/20-3E25
4330 030 3755	RCC36/10-3C11
4330 030 3756	RCC36/15-3C11
4330 030 3758	RCC29/7.5-3C11
4330 030 3760	RCL4/1.6-3E5
4330 030 3761	RCL4/1.1-3E5
4330 030 3762	RCL6/2-3E5
4330 030 3763	RCL9/3-3E5
4330 030 3764	RCL12.5/5-3E5
4330 030 3765	RCL14/5-3E5
4330 030 3766	RCL14/9-3E5
4330 030 3767	RCL16/6.3-3E5
4330 030 3768	RCC9/3-3R1
4330 030 3769	RCC14/5-3R1
4330 030 3770	RCC23/7-3R1
4330 030 3779	RCC12.5/5-3C85
4330 030 3780	RCC14/9-3C85
4330 030 3781	RCC16/6.3-3C85
4330 030 3783	RCC26/10-3C85
4330 030 3784	RCC26/20-3C85
4330 030 3785	RCC29/7.5-3C85
4330 030 3786	RCC36/10-3C85
4330 030 3787	RCC36/15-3C85
4330 030 3789	RCC4/1.1-3F3
4330 030 3790	RCC6/2-3F3
4330 030 3791	RCC9/3-3F3
4330 030 3792	RCC12.5/5-3F3

ORDERING CODE	TYPE
4330 030 3793	RCC14/5-3F3
4330 030 3794	RCC14/9-3F3
4330 030 3795	RCC16/6.3-3F3
4330 030 3808	WBC2.5-R-3B1
4330 030 3810	BDW3.5/6-3S2
4330 030 3873	BDW3.5/4.5-4S2
4330 030 3874	BDW3.5/6-4S2
4330 030 3875	BDW3.5/6.7-4S2
4330 030 3876	BDW3.5/7.6-4S2
4330 030 3877	BDW3.5/8.9-4S2
4330 030 3881	BDW3.5/3.2-4S2
4330 030 3894	BC12.8/16-3C80
4330 030 3896	WBC2.5-IR-3B1
4330 030 4021	ROD2/10-4B1
4330 030 4022	ROD2/15-4B1
4330 030 4023	ROD3/15-4B1
4330 030 4024	ROD3/20-4B1
4330 030 4025	ROD4/15-4B1
4330 030 4026	ROD4/20-4B1
4330 030 4027	ROD5/20-4B1
4330 030 4028	ROD5/25-4B1
4330 030 4029	ROD6/30-4B1
4330 030 4030	ROD6/40-4B1
4330 030 4031	ROD8/50-4B1
4330 030 4032	ROD8/150-4B1
4330 030 4033	TUB3.5/1.2/5-4B1
4330 030 4034	TUB3.5/1.2/15-4B1
4330 030 4035	TUB4/1.6/15-4B1
4330 030 4036	TUB4/1.6/40-4B1
4330 030 4037	TUB5/2/15-4B1
4330 030 4038	TUB5/2/20-4B1
4330 030 4039	TUB6/3/20-4B1
4330 030 4040	TUB6/3/30-4B1
4330 030 4041	TUB8/4/20-4B1
4330 030 4042	TUB8/4/40-4B1
4330 030 4043	TUB10/4.2/20-4B1
4330 030 4044	TUB10/4.2/45-4B1
4330 030 4045	TUB10/6.5/20-4B1
4330 030 4054	ROD2/20-4B1
4330 030 4055	ROD3/25-4B1

ORDERING CODE	TYPE
4330 030 4056	ROD4/25-4B1
4330 030 4057	ROD5/30-4B1
4330 030 4058	ROD6/50-4B1
4330 030 4059	ROD8/200-4B1
4330 030 4105	WBC2-RT-4A15
4330 030 4107	WBC2.5-IR-4B1
4330 030 4114	WBC3-R-4B1
4330 030 4118	WBC2.5-R-4B1
4330 030 4122	WBC2.5-EAT-3B1
4330 030 4123	WBC2.5-EAT-4B1
4330 030 4124	WBC2.5-EA-3B1
4330 030 4125	WBC2.5-EA-4B1
4330 030 4126	WBC3-ER-3B1
4330 030 4127	WBC3-ER-4B1
4330 030 4136	WBC2.5-SP-3B1
4330 030 4141	WBC3-ERT-3B1
4330 030 4142	WBC3-ERT-4B1
4330 030 4143	WBC2.5-SP-4B1
4330 030 4144	WBC2.5-A-4A15
4330 030 4145	WBC3-R-4A15
4330 030 4146	WBC1.5/1.5-A-4A15
4330 030 4152	WBC2.5-SA-3B1
4330 030 4153	WBC2.5-SA-4B1
4330 030 4515	RCL58/17.5-3E25
4330 030 4527	RCC12.5/5-3F4
4330 030 6001	RCC7.5/3-2P40
4330 030 6002	RCC12.3/4.4-2P40
4330 030 6003	RCC17.1/4.4-2P40
4330 030 6004	RCC19.9/6-2P40
4330 030 6005	RCC23.5/7.5-2P40
4330 030 6006	RCC26.5/10.7-2P40
4330 030 6007	RC32.3/10.7-2P40
4330 030 6008	RCC7.5/3-2P50
4330 030 6009	RCC12.3/4.4-2P50
4330 030 6010	RCC17.1/4.4-2P50
4330 030 6011	RCC19.9/6-2P50
4330 030 6012	RCC23.5/7.5-2P50
4330 030 6013	RCC26.5/10.7-2P50
4330 030 6014	RCC32.3/10.7-2P50
4330 030 6015	RCC7.5/3-2P65

Soft Ferrites

Code number overview

ORDERING CODE	TYPE
4330 030 6016	RCC12.3/4.4-2P65
4330 030 6017	RCC17.1/4.4-2P65
4330 030 6018	RCC19.9/6-2P65
4330 030 6019	RCC23.5/7.5-2P65
4330 030 6020	RCC26.5/10.7-2P65
4330 030 6021	RCC32.3/10.7-2P65
4330 030 6022	RCC7.5/3-2P80
4330 030 6023	RCC12.3/4.4-2P80
4330 030 6024	RCC17.1/4.4-2P80
4330 030 6025	RCC19.9/6-2P80
4330 030 6026	RCC23.5/7.5-2P80
4330 030 6027	RCC26.5/10.7-2P80
4330 030 6028	RCC32.3/10.7-2P80
4330 030 6029	RCC7.5/3-2P90
4330 030 6030	RCC12.3/4.4-2P90
4330 030 6031	RCC17.1/4.4-2P90
4330 030 6032	RCC19.9/6-2P90
4330 030 6033	RCC23.5/7.5-2P90
4330 030 6034	RCC26.5/10.7-2P90
4330 030 6053	U15/11/6-2P90
4330 030 6058	U20/16/7-2P90

EFD cores and accessories EFD15

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3514	clamping force ≈ **12.5 N** each

Dimensions in mm

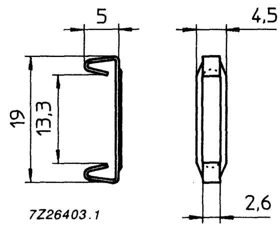

Fig.3 Mounting clip.

EFD cores and accessories EFD20

MOUNTING PARTS

ITEM	FIG. NO.	ORDERING CODE	REMARKS
mounting clip	3	4322 021 3515	clamping force ≈ 20 N each

Dimensions in mm

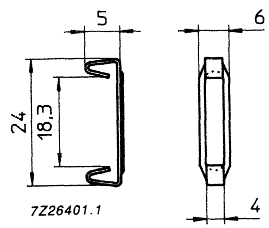

Fig.3 Mounting clip.

NOTES

DATA HANDBOOK SYSTEM

PHILIPS COMPONENTS

DATA HANDBOOK SYSTEM

Philips Components data handbooks contain all pertinent data available at the time of publication and each is revised and reissued regularly.

Loose data sheets are sent to subscribers to keep them up-to-date on additions or alterations made during the lifetime of a data handbook.

Catalogues are available for selected product ranges (some catalogues are also on floppy discs).

Our data handbook titles are listed here.

Display components

Book	*Title*
DC01	Colour Display Components Colour TV Picture Tubes and Assemblies Colour Monitor Tube Assemblies
DC02	Monochrome Monitor Tubes and Deflection Units
DC03	Television Tuners, Coaxial Aerial Input Assemblies
DC05	Flyback Transformers, Mains Transformers and General-purpose FXC Assemblies

Liquid crystal displays

LCD01	Liquid Crystal Displays and Driver ICs for LCDs

Magnetic products

MA01	Soft Ferrites
MA03	Piezoelectric Ceramics and Specialty Ferrites

Passive components

Book	*Title*
PA01	Electrolytic Capacitors
PA02	Varistors, Thermistors and Sensors
PA03	Potentiometers and Switches
PA04	Variable Capacitors
PA05	Film Capacitors
PA06	Ceramic Capacitors
PA07	Quartz Crystals for Special and Industrial Applications
PA08	Fixed Resistors
PA10	Quartz Crystals for Automotive and Standard Applications
PA11	Quartz Oscillators

Professional components

PC04	Photo Multipliers
PC05	Plumbicon Camera Tubes and Accessories
PC07	Vidicon and Newvicon Camera Tubes and Deflection Units
PC08	Image Intensifiers
PC09	Dry-reed Switches
PC12	Electron Multipliers

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PHILIPS SEMICONDUCTORS

OVERVIEW OF DATA HANDBOOKS

Our sister product division, Philips Semiconductors, also has a comprehensive data handbook system to support their products. Their data handbook titles are listed here.

Discrete semiconductors

Book	*Title*
SC01	Diodes
SC02	Power Diodes
SC03	Thyristors and Triacs
SC04	Small Signal Transistors
SC05	Low-frequency Power Transistors and Hybrid IC Power Modules
SC06	High-voltage and Switching Power Transistors
SC07	Small-signal Field-effect Transistors
SC08a	RF Power Bipolar Transistors
SC08b	RF Power MOS Transistors
SC09	RF Power Modules
SC10	Surface Mounted Semiconductors
SC13	PowerMOS Transistors
SC14	RF Wideband Transistors, Video Transistors and Modules
SC15	Microwave Transistors
SC16	Wideband Hybrid IC Modules
SC17	Semiconductor Sensors

Integrated circuits

IC01	Semiconductors for Radio and Audio Systems
IC02	Semiconductors for Television and Video Systems
IC03	Semiconductors for Telecom Systems
IC04	CMOS HE4000B Logic Family
IC05	Advanced Low-power Schottky (ALS) Logic Series
IC06	High-speed CMOS Logic Family
IC08	ECL 100K ECL Logic Family
IC10	Memories
IC11	General Purpose/Linear ICs
IC12	Display Drivers and Microcontroller Peripherals (planned)
IC13	Programmable Logic Devices (PLD)
IC14	8048-based 8-bit Microcontrollers
IC15	FAST TTL Logic Series
IC16	ICs for Clocks and Watches
IC18	Semiconductors for In-Car Electronics and General Industrial Applications (planned)
IC19	Semiconductors for Datacom: LANs, UARTs, Multi-Protocol Controllers and Fibre Optics
IC20	8051-based 8-bit Microcontrollers

Integrated circuits (continued)

IC21	68000-based 16-bit Microcontrollers
IC22	ICs for Multi-Media Systems
IC23	QUBIC Advanced BiCMOS Interface Logic ABT, MULTIBYTE™
IC24	Low Voltage CMOS Logic

High frequency power tubes

PC01	High-power Klystrons and Accessories
PC06	Circulators and Isolators

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Austria: WIEN, Tel. (0222)60 101-0, Fax. (0222)60 101-1975
Belgium: BRUXELLES, Tel. (02)525 6111, Fax. (02)525 7246
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Hong Kong: KWAI CHUNG, Tel. (0)4245 121, Fax. (0)4806 960
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