FERROXCUBE

Soft Ferrites and Accessories

2000
Data Handbook

PHILIPS

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Our quality system focuses on the continuing high quality of our components and the best possible service for our customers. We have a three-sided quality strategy: we apply a system of total quality control and assurance; we operate customer-oriented dynamic improvement programmes; and we promote a partnering relationship with our customers and suppliers.

PRODUCT SAFETY

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.

Soft Ferrites and Accessories

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DATA SHEET STATUS DEFINITIONS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS
Preliminary specification	Development	This data sheet contains preliminary data. Philips Components reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Components reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

DISCLAIMER

Life support applications — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Components customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Components for any damages resulting from such application.

PRODUCT STATUS DEFINITIONS

STATUS	INDICATION	DEFINITION
Prototype	prot	These are products that have been made as development samples for the purposes of technical evaluation only. The data for these types is provisional and is subject to change.
Design-in	des	These products are recommended for new designs.
Preferred		These products are recommended for use in current designs and are available via our sales channels.
Support	sup	These products are **not** recommended for new designs and may not be available through all of our sales channels. Customers are advised to check for availability.

THE NATURE OF SOFT FERRITES

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 most suitable for frequencies over 1 MHz, however, MnZn ferrites exhibit higher permeability (μ_i) and saturation induction levels (B_s) and are suitable up to 3 MHz.

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

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'.

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.

PROPORTIONS OF THE COMPOSITION

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

MIXING

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

PRE-SINTERING

The mixed oxides are calcined at approximately 1 000 °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.

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.

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 final 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.

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 require a very stringent control in conditions.

FINISHING

After sintering, the ferrite core has the required magnetic properties. It can easily be magnetized by an external field (see Fig.2), exhibiting the well-known hysteresis effect (see Fig.1). Dimensions are typically within 2% of nominal due to 10- 20% 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, lapped, mating surfaces are required. If an air-gap is required in the application, it may be provided by centre pole grinding.

Magnetism in ferrites

A sintered ferrite consists of small crystals, typically 10 to 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.2.

During this magnetization process energy barriers have to be overcome. Therefore the magnetization will always lag behind the field. A so-called hysteresis loop (see Fig.1) 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. The shape of the hysteresis loop also has a marked influence on other properties, for example power losses.

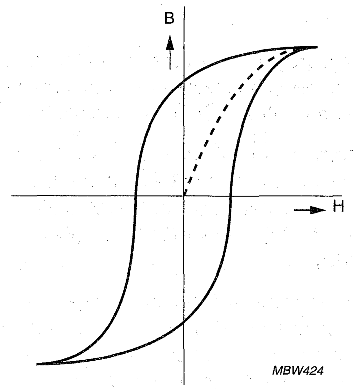


Fig.1 Hysteresis loop.

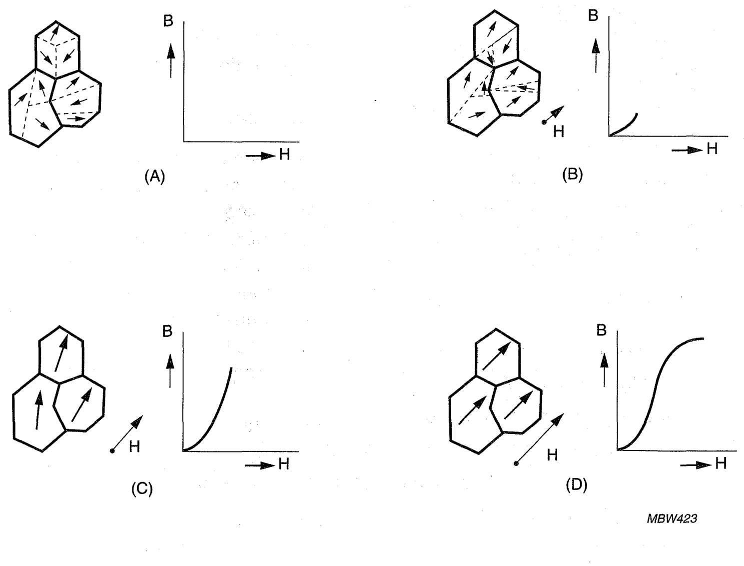


Fig.2 Alignment of domains.

EXPLANATION OF TERMS AND FORMULAE

Symbols and units

SYMBOL	DESCRIPTION	UNIT
A_e	effective cross-sectional area of a core	mm^2
A_{min}	minimum cross-sectional area of a core	mm^2
A_L	inductance factor	nH
B	magnetic flux density	T
B_r	remanence	T
B_s	saturation flux density	T
$\hat{B}$	peak flux density	T
C	capacitance	F
D_F	disaccomodation factor	–
f	frequency	Hz
G	gap length	μm
H	magnetic field strength	A/m
H_c	coercivity	A/m
$\hat{H}$	peak magnetic field strength	A/m
I	current	A
l_e	effective magnetic path length	mm
L	inductance	H
N	number of turns	–
P_v	specific power loss of core material	kW/m^3
Q	quality factor	–
T_c	Curie temperature	°C
V_e	effective volume of core	mm^3
α_F	temperature factor of permeability	K^{-1}
$\frac{\tan\delta}{\mu_i}$	loss factor	–
η_B	hysteresis material constant	T^{-1}
μ	absolute permeability	–
μ_o	magnetic constant ($4\pi \times 10^{-7}$)	Hm^{-1}
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	resistivity	Ωm
$\Sigma(l/A)$	core factor (C1)	mm^{-1}

Definition of terms

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.

$$B = \mu_0 H + J \quad \text{or} \quad B = \mu_0 (H + M) \qquad (1)$$

where $\mu_0 = 4\pi.10^{-7}$ H/m, J is the magnetic polarization and M is the magnetization.

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

$$\frac{B}{H} = \mu_0\left(1 + \frac{M}{H}\right) = \mu_{absolute} \qquad (2)$$

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

$$\frac{B}{H} = \mu_0 \mu_r \qquad (3)$$

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.

INITIAL PERMEABILITY

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

$$\mu_i = \frac{1}{\mu_0} \times \frac{\Delta B}{\Delta H}_{(\Delta H \to 0)} \qquad (4)$$

Initial permeability is dependent on temperature and frequency.

EFFECTIVE PERMEABILITY

If the air-gap 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 of the soft magnetic material and the dimensions of air-gap and circuit.

$$\mu_e = \frac{\mu_i}{1 + \frac{G \times \mu_i}{l_e}} \qquad (5)$$

where G is the gap length and l_e is the effective length of magnetic circuit. This simple formula is a good approximation only for small air-gaps. For longer air-gaps some flux will cross the gap outside its normal area (stray flux) causing an increase of the effective permeability.

AMPLITUDE PERMEABILITY

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

$$\mu_a = \frac{1}{\mu_0} \times \frac{\hat{B}}{\hat{H}} \qquad (6)$$

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

INCREMENTAL PERMEABILITY

The permeability observed when an alternating magnetic field is superimposed on a static bias field, is called the incremental permeability.

$$\mu_\Delta = \frac{1}{\mu_0}\left[\frac{\Delta B}{\Delta H}\right]_{H_{DC}} \qquad (7)$$

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

COMPLEX PERMEABILITY

A coil consisting of windings on a soft magnetic core will never be an ideal inductance with a phase angle of 90°. There will always be losses of some kind, causing a phase shift, which can be represented by a series or parallel resistance as shown in Figs 3 and 4.

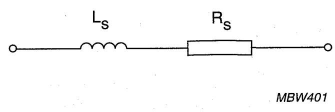


Fig.3 Series representation.

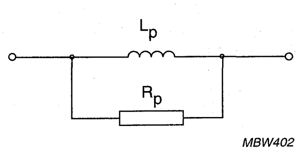


Fig.4 Parallel representation.

For series representation

$$\bar{Z} = j\omega L_s + R_s \quad (8)$$

and for parallel representation,

$$\bar{Z} = \frac{1}{1/(j\omega L_p) + 1/R_p} \quad (9)$$

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

$$\mu = \mu_s' - j\mu_s'' \quad \text{or} \quad \frac{1}{\bar{\mu}} = \frac{1}{\mu'_p} - \frac{1}{\mu''_p} \quad (10)$$

The phase shift caused by magnetic losses is given by:

$$\tan\delta_m = \frac{R_s}{\omega L_s} = \frac{\mu''_s}{\mu'_s} \quad \text{or} \quad \frac{\omega L_p}{R_p} = \frac{\mu'_p}{\mu''_p} \quad (11)$$

For calculations on inductors and also to characterize ferrites, the series representations 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:

$$\mu'_p = \mu'_s(1 + \tan\delta^2) \quad \text{and} \quad \mu''_p = \mu''_s\left(1 + \frac{1}{\tan\delta^2}\right) \quad (12)$$

LOSS FACTOR

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

1. Hysteresis losses
2. Eddy current losses
3. Residual losses.

This gives the formula:

$$\tan\delta_m = \tan\delta_h + \tan\delta_f + \tan\delta_r \quad (13)$$

Figure 5 shows the magnetic losses as a function of frequency.

Hysteresis losses vanish at very low field strengths. 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:

$$\frac{(\tan\delta_m)_{gapped}}{\mu_e - 1} = \frac{\tan\delta_m}{\mu_i - 1} \quad (14)$$

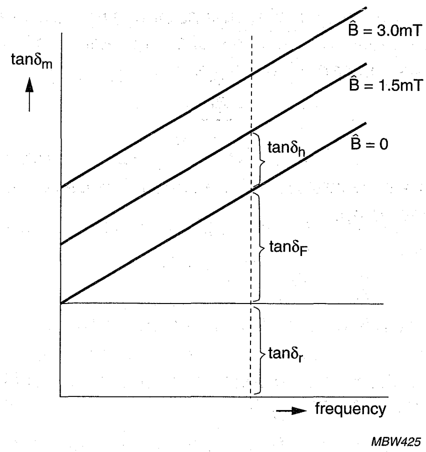


Fig.5 Magnetic losses ($\tan\delta_m$) as a function of frequency.

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

$$\frac{(\tan\delta_m)_{gapped}}{\mu_e} = \frac{\tan\delta_m}{\mu_i} \quad (15)$$

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

$$(\tan\delta_m)_{gapped} = \frac{\tan\delta_m}{\mu_i} \times \mu_e \quad (16)$$

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

$$(\tan\delta)_{gapped} = \frac{\tan\delta}{\mu_i} \times \mu_e \quad (17)$$

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:

$$Q = \frac{1}{\tan\delta} = \frac{\omega L}{R_{tot}} = \frac{\text{reactance}}{\text{total resistance}} \quad (18)$$

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

HYSTERESIS MATERIAL CONSTANT

When 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:

$$\eta_B = \frac{\Delta \tan \delta_m}{\mu_e \times \Delta \hat{B}} \tag{19}$$

The hysteresis loss factor for a certain flux density can be calculated using:

$$\frac{\tan \delta_h}{\mu_e} = \eta_B \times \hat{B} \tag{20}$$

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

EFFECTIVE CORE DIMENSIONS

To facilitate calculations on a non-uniform soft magnetic cores, a set of effective dimensions is given on each data sheet. These dimensions, 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 reluctance of the ideal ring core would be:

$$\frac{l_e}{\mu \times A_e} \tag{21}$$

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

$$\frac{1}{\mu_e} \times \Sigma \frac{l}{A} \tag{22}$$

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

$$L = \frac{\mu_0 \times N^2}{\frac{1}{\mu_e} \times \Sigma \frac{l}{A}} = \frac{1.257 \times 10^{-9} \times N^2}{\frac{1}{\mu_e} \times \Sigma \frac{l}{A}} (\text{in H}) \tag{23}$$

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

for sine wave:

$$\hat{B} = \frac{U\sqrt{2} \times 10^9}{\omega A_e N} = \frac{2.25U \times 10^8}{fNA_e} (\text{in mT}) \tag{24}$$

for square wave:

$$\hat{B} = \frac{0.25\hat{U} \times 10^9}{fNA_e} (\text{in mT}) \tag{25}$$

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 the effective length (l_e):

$$\hat{H} = \frac{IN\sqrt{2}}{l_e} (\text{A/m}) \tag{26}$$

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.

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 (in nano Henry). The inductance of the core is defined as:

$$L = N^2 \times A_L \ (\text{nH}) \tag{27}$$

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

$$A_L = \frac{\mu_0 \mu_e \times 10^6}{\Sigma(l/A)} = \frac{1.257 \mu_e}{\Sigma(l/A)} (\text{nH}) \tag{28}$$

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 strengths, 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 the remanent flux density (B_r).

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

These points are clearly shown in Fig.6.

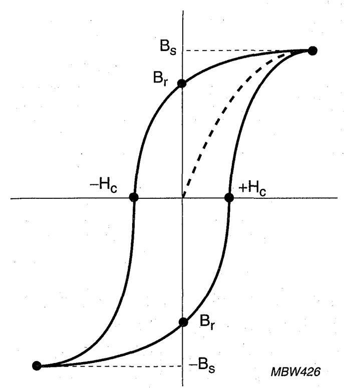


Fig.6 Typical BH curve showing points B_S, B_r and H_c.

TEMPERATURE DEPENDENCE OF THE PERMEABILITY

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 an LC filter with excellent temperature stability.

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

$$TC = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)_{T1}} \times \frac{1}{T_2 - T_1} \tag{29}$$

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

$$TC_{gap} = \frac{\mu_e}{(\mu_i)_{T1}} \times \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)^2_{T1}} \times \frac{1}{T_2 - T_1} \tag{30}$$

$$= \mu_e \times \alpha_F$$

So α_F is defined as:

$$\alpha_F = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)^2_{T1}} \times \frac{1}{T_2 - T_1} \tag{31}$$

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

$$\alpha_F = \frac{(\mu_i)_{T2} - (\mu_i)_{T1}}{(\mu_i)_{T1} \times (\mu_i)_{T2}} \times \frac{1}{T_2 - T_1} \tag{32}$$

The temperature factors 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.

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:

$$D = \frac{\mu_1 - \mu_2}{\mu_1} \tag{33}$$

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

$$d = \frac{\mu_1 - \mu_2}{\mu_1 \times \log(t_2/t_1)} \tag{34}$$

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:

$$D_F = \frac{d}{\mu_i} = \frac{\mu_1 - \mu_2}{\mu_1^2 \times \log(t_2/t_1)} \tag{35}$$

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

$$\frac{L_1 - L_2}{L_1} = \mu_e \times D_F \tag{36}$$

RESISTIVITY

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 to 10 Ωm for MnZn ferrites and 10^4 to 10^6 Ωm for NiZn and MgZn ferrites.

This resistivity depends on temperature and measuring frequency, which is clearly demonstrated in Tables 1 and 2 which show resistivity as a function of temperature for different materials.

Table 1 Resistivity as a function of temperature of a MnZn-ferrite (3C80)

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

Table 2 Resistivity as a function of temperature of a NiZn-ferrite (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 heir capacitance and the measured resistivity decreases, as shown in Tables 3 and 4.

Table 3 Resistivity as function of frequency for MnZn ferrites

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

Table 4 Resistivity as function of frequency for NiZn ferrites

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

PERMITTIVITY

The basic permittivity of all ferrites is of the order of 10. This is valid for MnZn and NiZn materials. The isolating material on the grain boundaries also 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 dependence.

Tables 5 and 6 show the relationship between permittivity and frequency for both MnZn and NiZn ferrites.

Table 5 Permittivity as a function of frequency for MnZn ferrites

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

Table 6 Permittivity as a function of frequency for NiZn ferrites

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

QUALITY

Quality standards

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 ISO9001 and our process control is based on SPC techniques.

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 rejects levels. If an unfavourable trend is observed in the results from a production stage, corrective and preventive actions are 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 material
- Production of process
- Finished products.

All our production centres are complying with the ISO 9000 quality system.

Aspects of quality

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

- Delivery quality
- Fitness for use
- Reliability.

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 IEC 60367. A sampling system, in accordance with IEC 60410 is used, and the Acceptable Quality levels (AQL's) are set for different classes of defects, 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.

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 30 PPM have already been realized.

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 60068-2-6 (test Fc)

- No failures
- Less than 0.1% drift of inductance value.

Bump test, IEC 60068-2-29 (test Eb)

- No failures
- Less than 0.03% drift of inductance value.

Classification 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 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.

Classification of defects per product line

CORE TYPE	CLASSIFICATION OF FAILURES	
	MAJOR	MINOR
RM; P; X; EP; H; PH; RM/I; P/I; PQ; PT; PTS	A_L; critical dimensions	power loss; secondary dimensions
E; planar E; EFD; ETD/ER; EC; U; I	A_L; critical dimensions	power loss; secondary dimensions
ring cores rods tubes beads wideband chokes bobbin cores cup and mushroom cores	A_L; critical dimensions; Z_{min}	A_{Lmax}; power loss; dielectrical strength of coating; secondary dimensions

Classification of defects per product line

Tighter AQL levels can be agreed upon for customized products. Also ppm agreements with customers are encouraged.

CORE TYPE	APPLICATION AREA	FAULT TYPE	CLASSIFICATION OF FAULT			
			MAJOR		MINOR	
			AQL	LEVEL	AQL	LEVEL
P; RM; X	filters	electrical	1%	(I)	2.5%	(S3)
		mechanical	0.65%	(I)	4%	(S3)
P; RM; X; EP; H	general purpose transformers	electrical	1.5%	(S4)	4%	(S3)
		mechanical	0.65%	(I)	4%	(S3)
E; EFD; ETD/ER; EC; U;I	power transformers	electrical	1%	(I)	4%	(S3)
		mechanical	1%	(I)	4%	(S3)
ring cores rods, tubes beads chokes	EMI-suppression	electrical	0.25%	(II)	2.5%	(II)
		mechanical	0.25%	(II)	2.5%	(II)

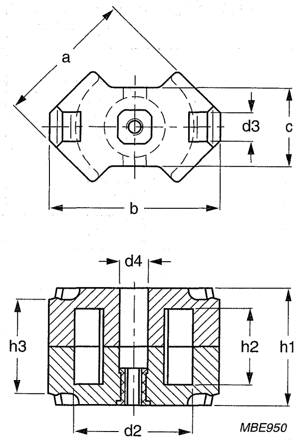


Fig.1 RM core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
RM	1	$h_2$min	a
		h_3	b
		$d_2$min	c
		$d_3$max	h_1
		d4	$h_2$max
			$d_2$max
			$d_3$min

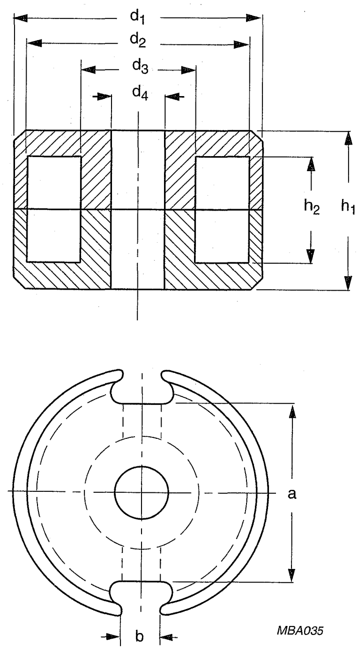


Fig.2 P core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
P; P/I; PT; PTS;	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

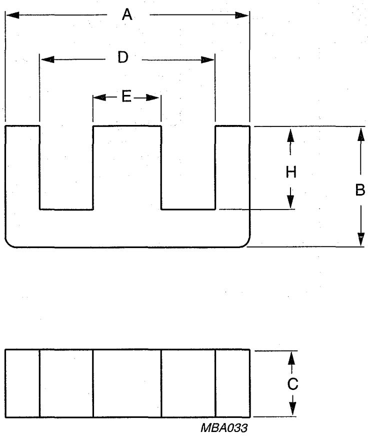


Fig.3 E core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
E; Planar E	3	Amax	Amin
		Bmax	Bmin
		Cmax	Cmin
		Dmin	Dmax
		Emax	Emin
		Hmin	Hmax

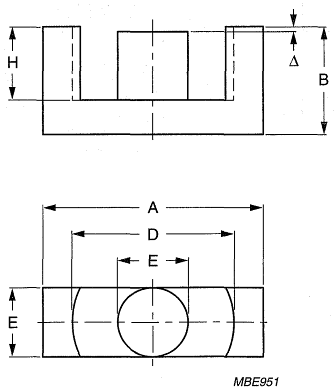


Fig.4 ETD core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
ETD/ER EFD	4	Amax	Amin
		Bmax	Bmin
		Cmax	Cmin
		Dmin	Dmax
		Emax	Emin
		Hmin	Hmax

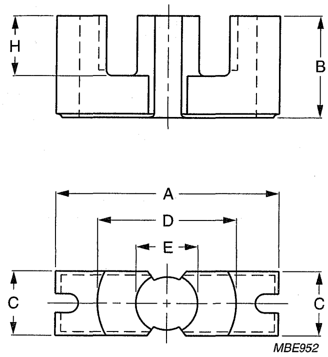


Fig.5 EC core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
EC	5	Amax	Amin
		Bmax	Bmin
		Cmax	Cmin
		Dmin	Dmax
		Emax	Emin
		Hmin	Hmax

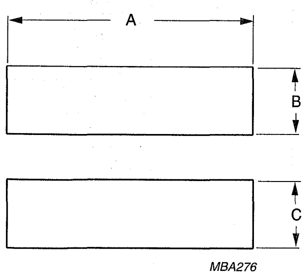


Fig.6 I core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
I	6		A
		Bmax	Bmin
		Cmax	Cmin

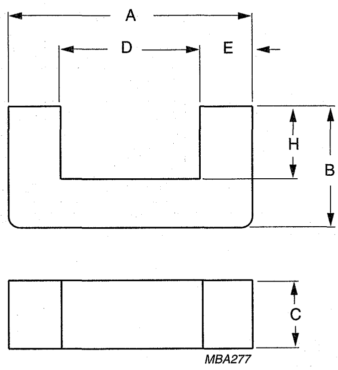


Fig.7 U core.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
U	7		A
			B
		Cmax	Cmin
		Dmin	
		Emax	Emin
		Hmin	

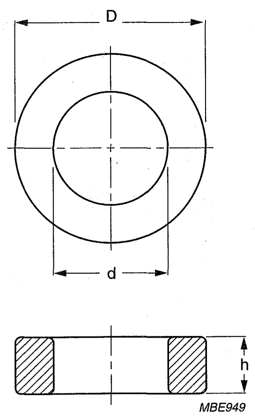


Fig.8 Ring cores (toroids).

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
ring cores (toroids)	8	hmax	hmin
		Dmax	Dmin
		dmin	dmax

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
rods; tubes; beads; multi-hole tubes	9	Dmax	Dmin
		dmin	dmax
			L
			H

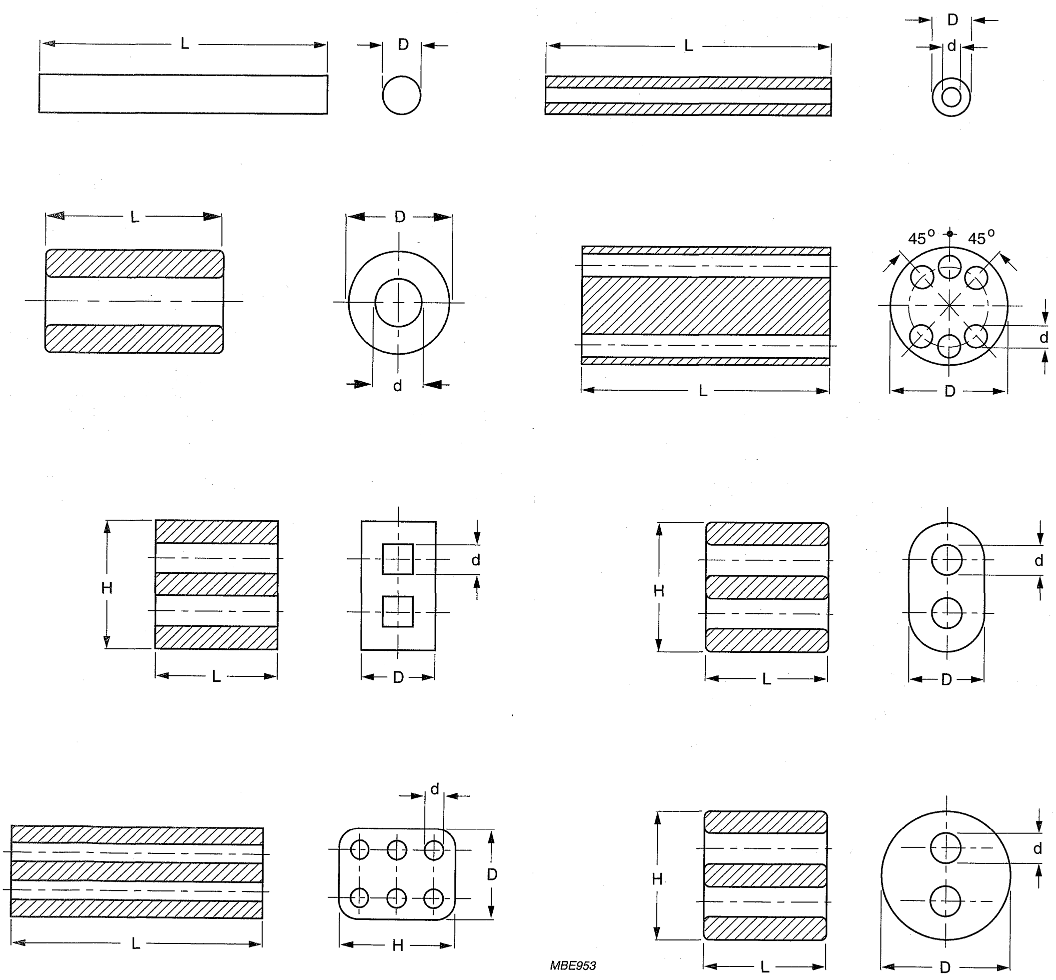


Fig.9 Rods, tubes, beads, multi-hole tubes.

ENVIRONMENTAL ASPECTS OF SOFT FERRITES

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

To be more specific, all materials starting with digit 3 are manganese zinc ferrites based on the MnZn composition.

Their general chemical formula is:

$Mn_{\delta}\,Zn_{(1-\delta)}\,Fe_2\,O_4$

Materials starting with digit 4 are nickel zinc ferrites based on the NiZn composition. Their general chemical formula is:

$Ni_{\delta}\,Zn_{(1-\delta)}\,Fe_2\,O_4$

Materials starting with digit 2 are magnesium zinc ferrites based on the MgZn composition. Their general chemical formula is:

$Mg_{\delta}\,Zn_{(1-\delta)}\,Fe_2\,O_4$

General warning rules

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

ORDERING INFORMATION

The products in this handbook are identified by type numbers. All physical and technical properties of the product are expressed by these numbers. They are therefore recommended for both ordering and use on technical drawings and equipment parts lists.

The 11-digit code, used in former editions of this data handbook, also appears on packaging material.

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

- Technical information:
  - type number
  - 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 packaging labels, provides full logistic information as well.

During all stages of the production process, data are collected and documented with reference to a unique batch number, which is printed on the packaging label. With this batch number it is always possible to trace the results of process steps afterwards and in the event of customer complaints, this number should always be quoted.

Products are available troughout their lifecycle. A short definition of product status is given in the table “Product status definitions”.

Product status definitions

STATUS	INDICATION	DEFINITION
Prototype	prot	These are products that have been made as development samples for the purposes of technical evaluation only. The data for these types is provisional and is subject to change.
Design-in	des	These products are recommended for new designs.
Preferred		These products are recommended for use in current designs and are available via our sales channels.
Support	sup	These products are **not** recommended for new designs and may not be available through all of our sales channels. Customers are advised to check for availability.

APPLICATIONS

Introduction

Soft ferrite cores 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 today's 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 and good temperature stability.

Material requirements:

- Low losses
- Defined temperature factor to compensate temperature drift of capacitor
- Very stable with time.

Preferred materials: 3D3, 3H3.

INTERFERENCE SUPPRESSION

Unwanted high frequency signals are blocked, wanted signals can pass. With the increasing use of electronic equipment it is of vital importance to suppress interfering signals.

Material requirements:

- High impedance in covered frequency range.

Preferred materials: 3S1, 4S2, 3S3, 3S4, 4C65, 4A11, 4A15, 3B1, 4B1, 3C11, 3E25, 3E5.

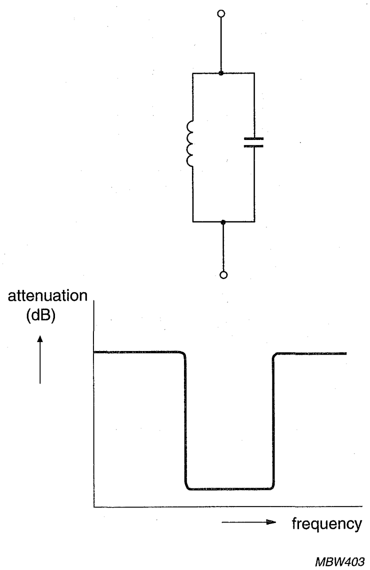


Fig.1 Filter application.

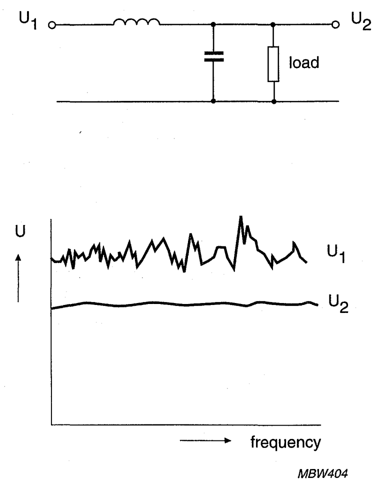


Fig.2 Suppression application.

DELAYING PULSES

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

Material requirements:

- High permeability (μ_i).

Preferred materials: 3E25, 3E5, 3E6, 3E7, 3E8.

STORAGE OF ENERGY

An 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 (B_s).

Preferred materials: 3C15, 3C30, 3C34, 3C90, 3C94, 3C96 2P-iron powder.

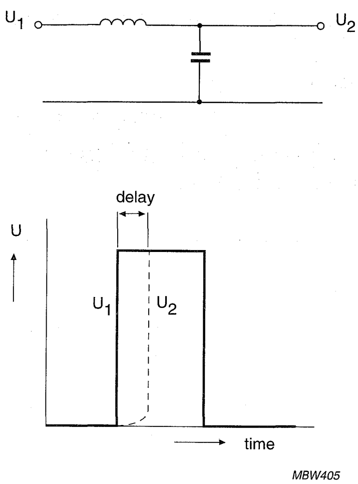


Fig.3 Pulse delay application.

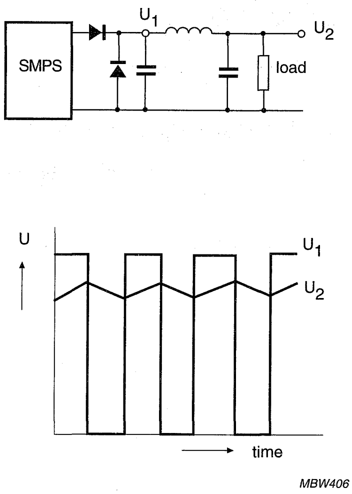


Fig.4 Smoothing/storage application.

PULSE TRANSFORMERS/GENERAL PURPOSE TRANSFORMERS

Pulse or AC signals are transmitted and if required transformed to a higher or lower voltage level. Also galvanic separation to fulfil safety requirements and impedance matching are provided.

Material requirements:

- High permeability
- Low hysteresis factor for low signal distortion
- Low DC sensitivity.

Preferred materials: 3C81, 3H3, 3E1, 3E4, 3E25, 3E27, 3E28, 3E5, 3E6, 3E7, 3E8.

POWER TRANSFORMERS

A power transformer transmits energy, transforms voltage to the required level and provides galvanic separation (safety).

Material requirements:

- Low power losses
- High saturation (B_s).

Preferred materials: 3C15, 3C30, 3C34, 3C81, 3C90, 3C94, 3C96, 3F3, 3F35, 3F4, 4F1.

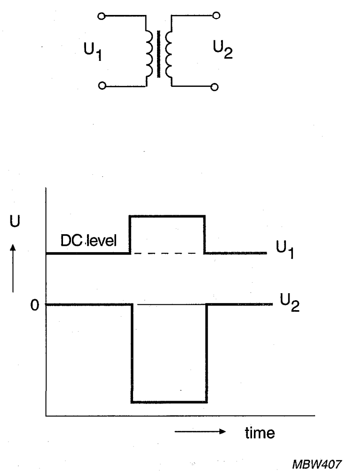


Fig.5 Pulse and general purpose transformer.

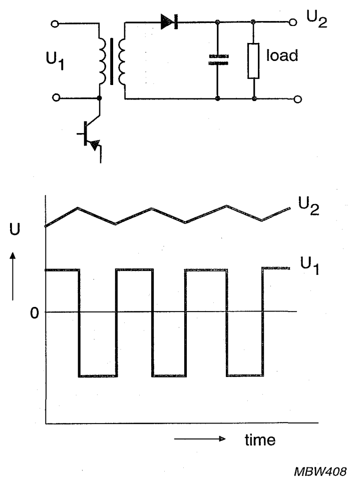


Fig.6 Power transformer application.

TUNING

LC filers are often used to tune circuits in audio, video and measuring equipment. A very narrow bandwidth is often not wanted.

Material requirements:

- Moderate losses up to high frequency
- Reasonable temperature stability.

Preferred materials: 3D3, 4A11, 4B1, 4D2, 4E1.

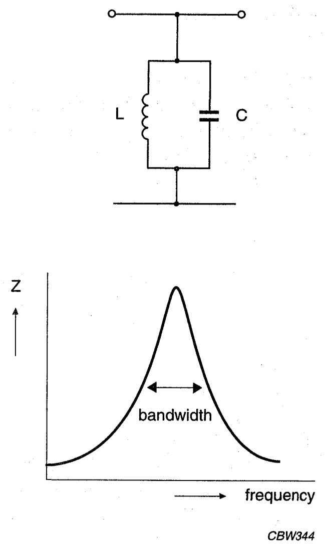


Fig.7 Tuning application.

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 market for ferrite cores.

Most important applications are in:

- Filter inductors
- Pulse and matching transformers.

FILTER COILS

P cores and RM 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.

For filter coils, the following design parameters are important:

- Precise inductance value
- Low losses, high Q value
- High stability over periods of time
- Fixed temperature dependence.

Q VALUE

The quality factor (Q) of a filter coil should generally be as high as possible. For this reason filter materials such as 3H3 and 3D3 have low magnetic losses in their frequency ranges.

Losses in a coil can be divided into:

- Winding losses, due to the DC resistance of the wire eddy-current losses in the wire, electric 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:

$$\frac{R_0}{L} = \frac{1}{\mu_e} \times \frac{1}{f_{Cu}} \times \text{constant} \ (\Omega/H)$$

The space (copper) factor f_{Cu} depends on wire diameter, the amount of insulation and the method of winding.

Eddy-current losses in the winding

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 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:

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

INDUCTOR DESIGN

The specification of an inductor usually includes:

- The inductance
- Minimum Q at the operating frequency
- Applied voltage
- Maximum size
- Maximum and minimum temperature coefficient
- Range of inductance adjustment.

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.

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 of 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 3H3. Maximum Q will not necessarily be obtained from the large-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 3D3 material. Bunched conductors of maximum strand diameter 0.04 mm are recommended.

SIGNAL LEVEL

In most applications, the signal voltage is low. It is good practice to keep wherever possible 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 following expression for third harmonic voltage U_3 may be used as a guide to the amount of distortion:

$$\frac{U_3}{U_1} = 0.6 \tan\delta_h$$

For low distortion, materials with small hysteresis loss factors should be used (e.g. 3H3).

DC POLARIZATION

The effect of a steady, superimposed magnetic field due to an external field or a DC component of the winding current is to reduce the inductance value of an inductor. As with other characteristics, the amount of the decrease depends on the value of the effective permeability. The effect can be reduced by using a gapped core or by choosing a lower permeability material.

A_L VALUE

Since the air gap in ferrite 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 air gap, this air gap is ground in the upper half. This half is marked with the ferrite grade and A_L value.

For very low A_L values (e.g. 16 to 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.

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 and adjuster.

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

$$L = N^2 \times A_L \text{ (nH)}$$

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

PULSE AND SIGNAL TRANSFORMERS

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

They provide impedance matching and DC isolation or transform signal amplitudes. Signal power levels are usually low. In order to transmit analog 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.8.

The elements of the circuit depicted in Fig.8 may be defined as follows:

- E_s = source voltage
- R_s = source resistance
- R_w = total winding resistance = R1 + R2, where R1 is the primary winding resistance and R2 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
- N1, N2 = the primary and referred secondary self or stray capacitance respectively
- R_b = load resistance referred to the primary 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 compared to this main inductance.

Ring cores are very suitable since they have no air gap and make full use of the high permeability of the ferrite.

The frequency response of a practical transformer is shown in Fig.9.

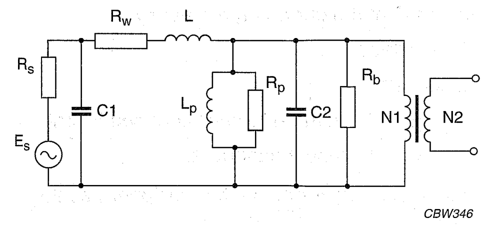


Fig.8 Simplified equivalent circuit of a transformer.

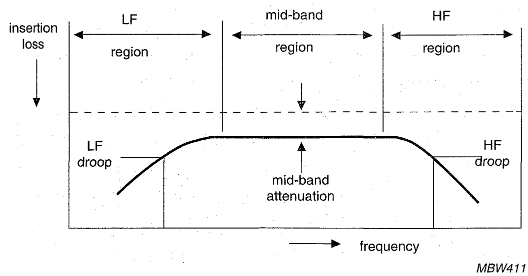


Fig.9 Transmission characteristic of a wideband transformer.

The corresponding distortion of a rectangular pulse by the same circuit is shown in Fig.10.

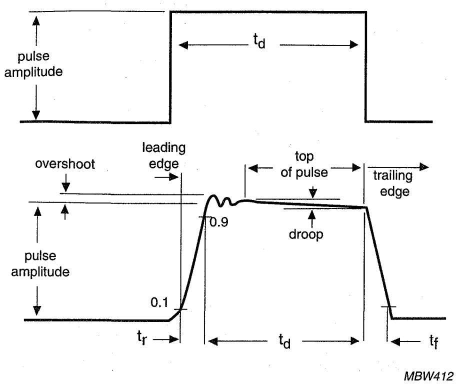


Fig.10 An ideal rectangular pulse and the main pulse distortions that may be introduced by a transformer.

The shunt inductance (L_p) is responsible for the low frequency droop in the analog 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 analog 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 analog transformer may be due to either the increasing series reactance of the leakage inductance 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 combine to slow down, or otherwise distort the leading and trailing edge responses.

Suitable core types for this application in the materials 3E1, 3E4, 3E27, 3E28, 3E5, 3E55, 3E6, 3E7 and 3E8 are:

- P cores
- RM cores
- EP cores
- Ring cores
- Small ER cores
- Small E cores.

If the signal is superimposed on a DC current, core saturation my become a problem. In that case the special DC-bias material 3E28 or a lower permeability material such as 3H3, 3C81 or 3C90 is recommended.

Gapping also decreases the effect of bias currents.

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 at elevated temperatures.

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

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

Switched Mode Power Supply Circuits

The basic arrangement of a Switched Mode Power Supply (SMPS) is shown in Fig.11.

In this configuration, the power input is rectified 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.

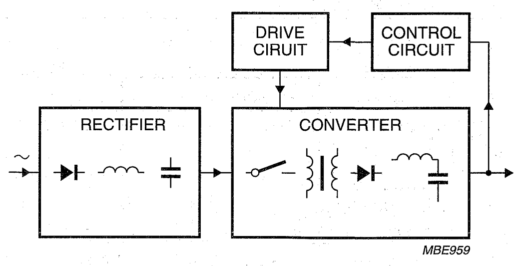


Fig.11 Block diagram of a Switched Mode Power Supply.

Numerous circuit designs can be used to convert DC input voltage to the required DC output voltage. The requirements for the transformer or inductor depend largely on the choice of this circuit technology.

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

These are:

- Flyback converters
- Forward converters, and
- Push-pull converters.

FLYBACK CONVERTER

Figure 12 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.13).

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.14).

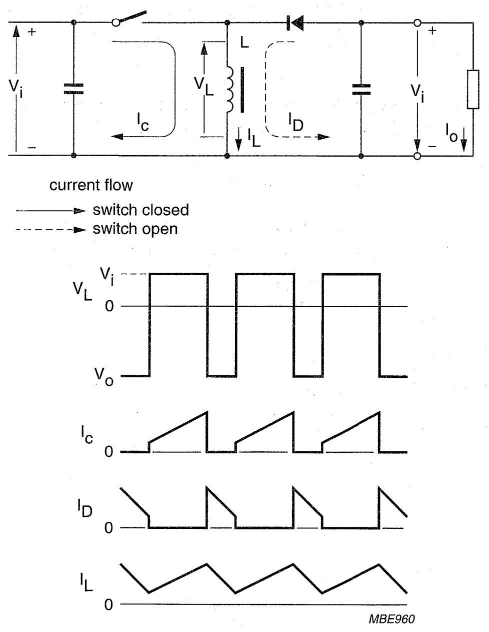


Fig.12 Basic circuit of a DC to DC flyback converter with associated waveforms.

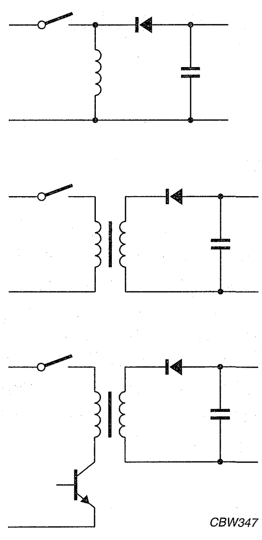


Fig.13 Practical flyback converter circuits.

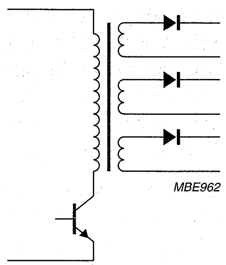


Fig.14 Multiple output flyback converter circuit.

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.

FORWARD CONVERTER

The basic circuit of the forward converter, together with its associated voltage and current waveforms is shown in Fig.15.

When the switch is closed (transistor conducts), the current rises linearly and flows through the inductor into the capacitor and the load. During the 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.16.

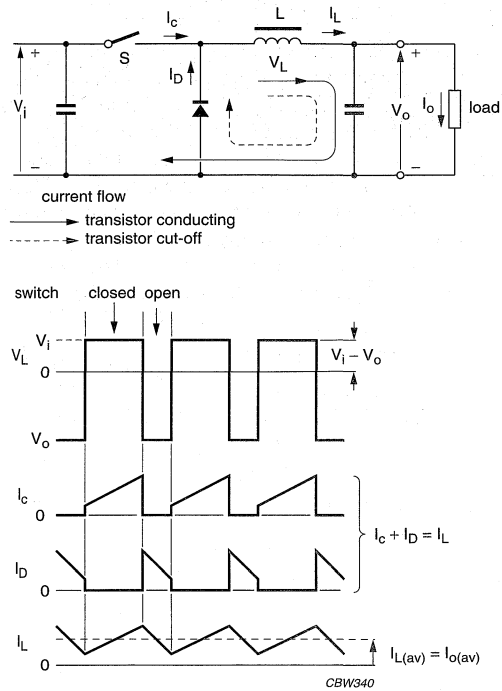


Fig.15 Basic circuit of a DC to DC forward converter with associated waveforms.

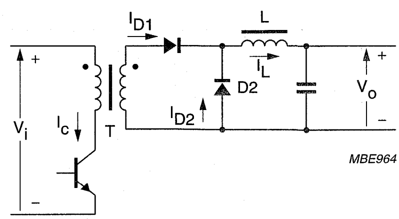


Fig.16 Forward converter with line isolation.

PUSH-PULL CONVERTER

The basic circuit of the push-pull converter, with voltage and current waveforms is shown in Fig.17.

The push-pull converter is an arrangement of two forward converters operating in antiphase (push-pull action). With switch S1 closed (Fig.17a) diode D2 conducts and energy is simultaneously stored in the inductor and supplied to the load. With S1 and S2 open (Fig.17b), 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.17c), diode D1 continues to conduct, diode D2 stops conducting and the process repeats itself.

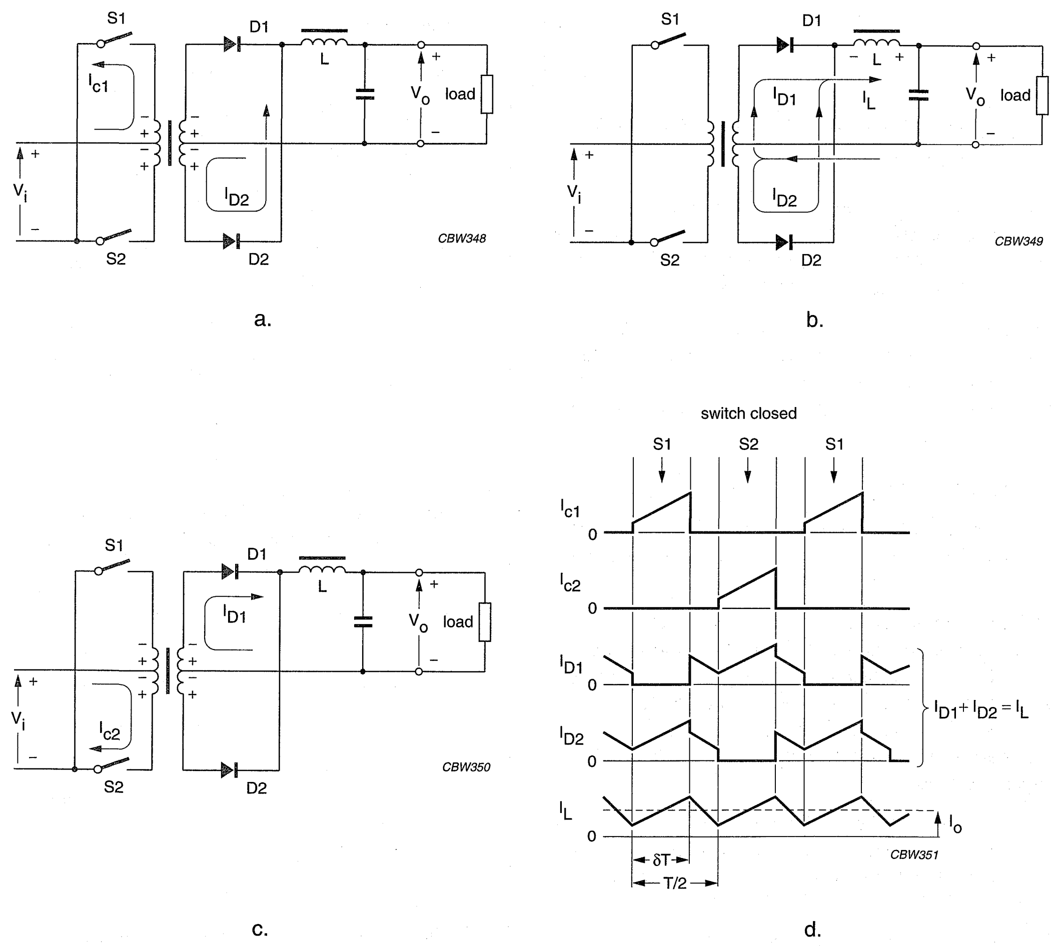


Fig.17 Basic circuit of a DC to DC push-pull converter with associated waveforms.

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.

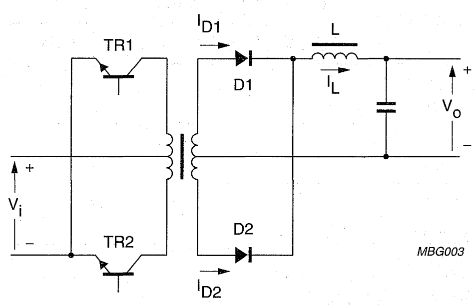


Fig.18 Conventional push-pull converter circuit.

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.19).

Depending upon how the transformer primary is driven, it is possible to differentiate between single-ended (see Fig.19a), push-pull (see Fig.19b) and full-bridge circuits (see Fig.19c). Decisions on circuit details are determined by the transistor capabilities.

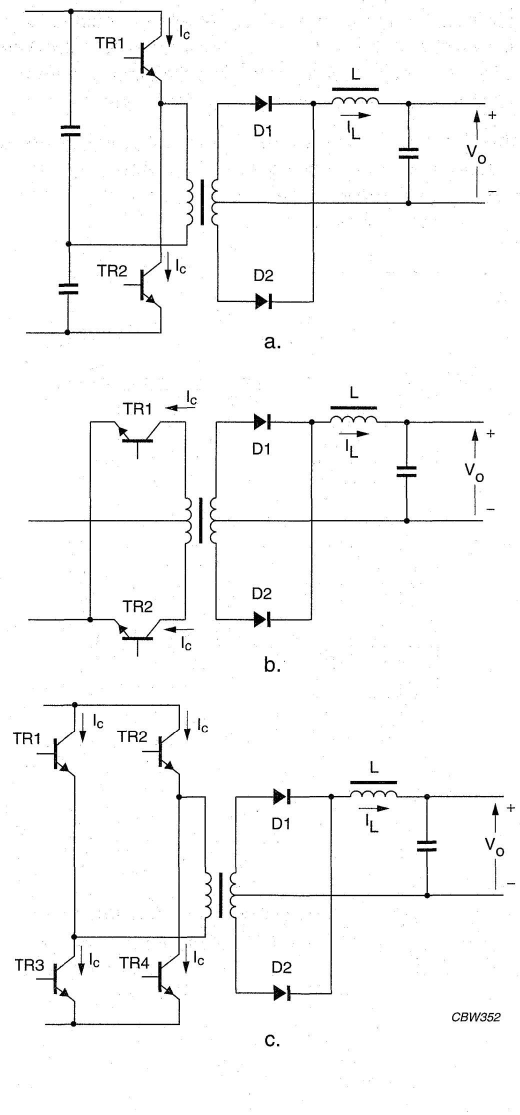


Fig.19 Several push-pull converter circuits.

For a practical 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.20 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.

Table 1 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.

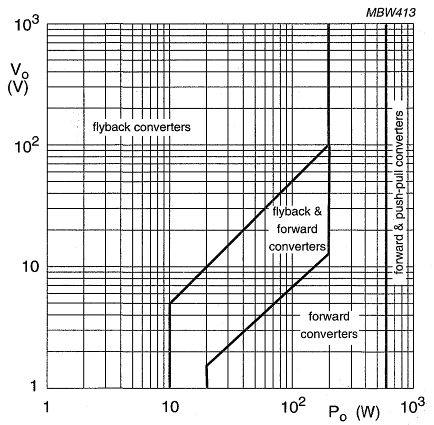


Fig.20 Converter circuit selection as a function of output voltage and throughput power.

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 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.

Table 1 Converter design selection chart (I)

FUNCTION	TYPE OF CONVERTER CIRCUIT(1)		
	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

Note

1. '+' = favourable; '0' = average; '–' = unfavourable.

CORE SELECTION

Table 2 shows which core type could be considered suitable for the different types of converter design.

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

Table 2 Converter design selection chart (II)

FUNCTION	TYPE OF CONVERTER CIRCUIT(1)		
	FLYBACK	FORWARD	PUSH-PULL
E cores	+	+	0
Planar E cores	–	+	0
EFD cores	–	+	+
ETD cores	0	+	+
ER cores	0	+	+
U cores	+	0	0
RM cores	0	+	0
EP cores	–	+	0
P cores	–	+	0
Ring cores	–	+	+

Note

1. '+' = favourable; '0' = average; '–' = unfavourable.

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 power ferrites the practical upper limit has shifted to well over 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 for most applications.

SELECTING THE CORRECT CORE TYPE

The choice of a core type for a specific design depends on the design considerations and also on the personal preference of the designer. Table 3 gives an overview of core types as a function of power throughput and this may be useful to the designer for an initial selection.

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.

Table 3 Power throughput for different core types at 100 kHz switching frequency

POWER RANGE (W)	CORE TYPE
<5	RM4; P11/7; T14; EF13; U10
5 to 10	RM5; P14/8
10 to 20	RM6; E20; P18/11; T23; U15; EFD15
20 to 50	RM8; P22/13; U20; RM10; ETD29; E25; T26/10; EFD20
50 to 100	ETD29; ETD34; EC35; EC41; RM12; P30/19; T26/20; EFD25
100 to 200	ETD34; ETD39; ETD44; EC41; EC52; RM14; P36/22; E30; T56; U25; U30; E42; EFD30
200 to 500	ETD44; ETD49; E55; EC52; E42; P42/29; U37
<500	E65; EC70; U93; U100

Choice of ferrite for power transformers

A complete range of power ferrites is available for any application.

3C15

Low frequency (<100 kHz) material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers.

3C30

Medium frequency (<200 kHz) material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers.

3C34

Medium frequency (<300 kHz) material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers.

3C81

Low frequency (<100 kHz) material with loss minimum around 50 °C.

3C90

Medium frequency (<200 kHz) material for industrial use.

3C91

Medium frequency (<200 kHz) material with loss minimum around 50 °C.

3C94

Medium frequency material (<400 kHz).
Low losses, especially at high flux densities.

3C96

Medium frequency (<400 kHz) material. Very low losses, especially at high flux densities.

3F3

High frequency material (up to 700 kHz).

3F35

High frequency material (up to 1 MHz).
Very low losses, around 500 kHz.

3F4

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

4F1

High frequency material (up to 10 MHz).
Specially recommended for resonant supplies.

Performance factor of power ferrites

The performance factor ($f \times B_{max}$) is a measure of the power throughput that a ferrite core can handle at a certain loss level . From the graph it is clear that for low frequencies there is not much difference between the materials, because the cores are saturation limited. At higher frequencies, the differences increase. There is an optimum operating frequency for each material. It is evident that in order to increase power throughput or power density a high operating frequency and a better ferrite should be chosen.

OUTPUT CHOKES

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

In a closed ferrite circuit, this can easily lead to saturation. Power ferrites such as 3C90 or 3F3 start saturating at field strengths of about 50 A/m. Permeability drops sharply, as can be seen in the graphs of the material data section. The choke loses its effectiveness.

There are two remedies against this effect:

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

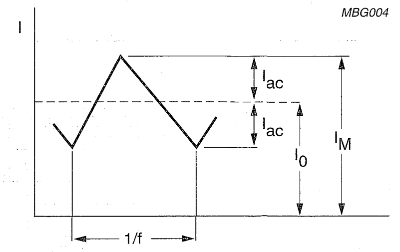


Fig.21 Choke waveform.

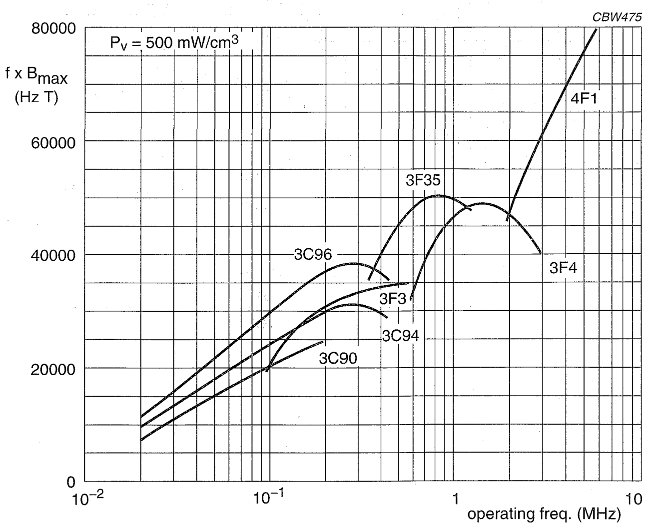


Fig.22 Performance factor ($f \times B_{max}$) at PV = 500 mW/cm^3 as a function of frequency for power ferrite materials.

GAPPED CORE SETS

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

For each operating condition an optimum air gap length can be found. In a design, the maximum output current (I) and the value of inductance (L) necessary to smooth 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 on the following pages for most core types, the proper core and air gap can be selected quickly at a glance.

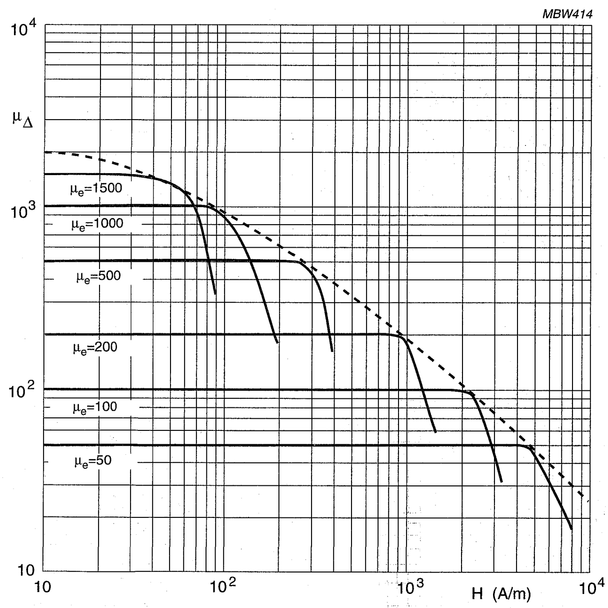


Fig.23 Effect of increased gap length.

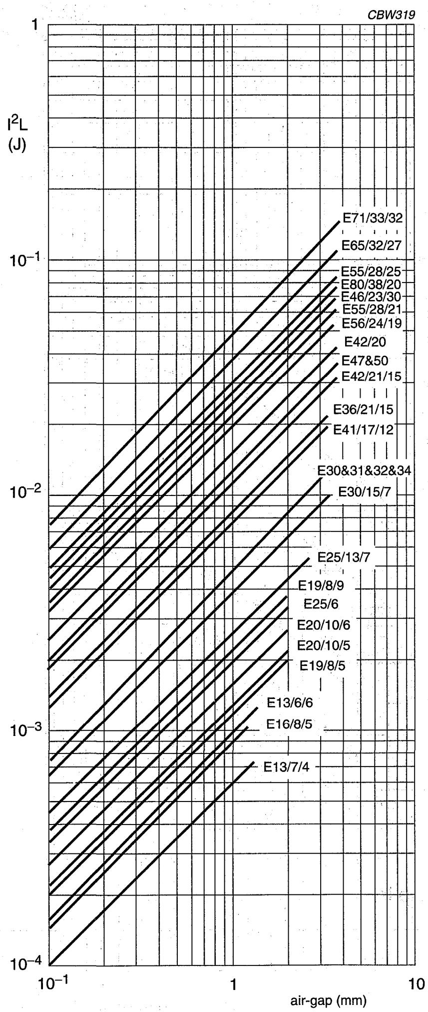


Fig.24 I^2L graph for E cores.

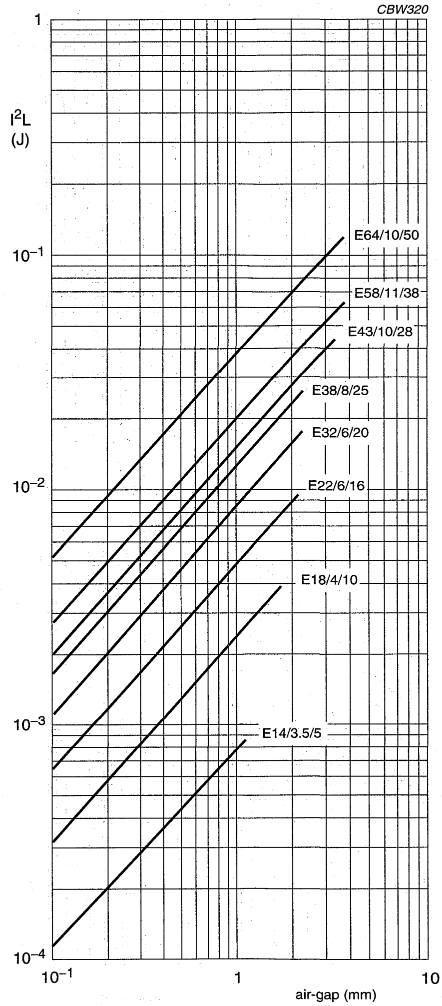


Fig.25 I^2L graph for planar E cores (valid for E + E and E + PLT combinations).

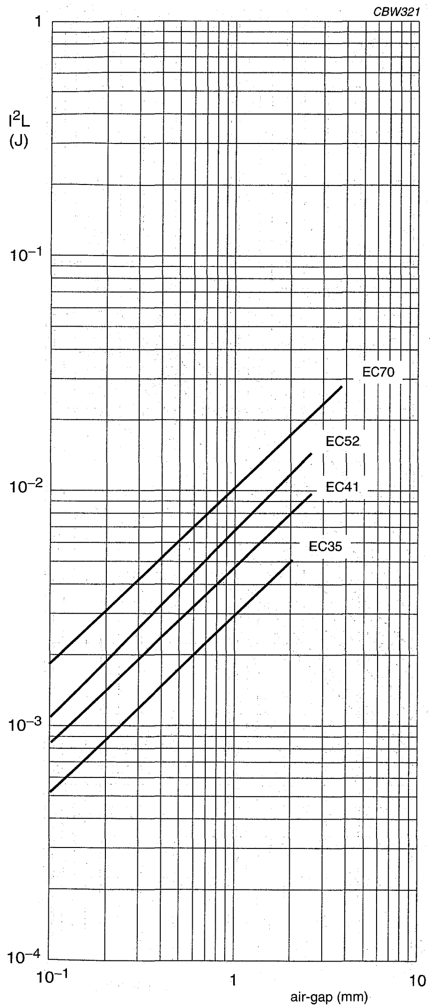


Fig.26 I^2L graph for EC cores.

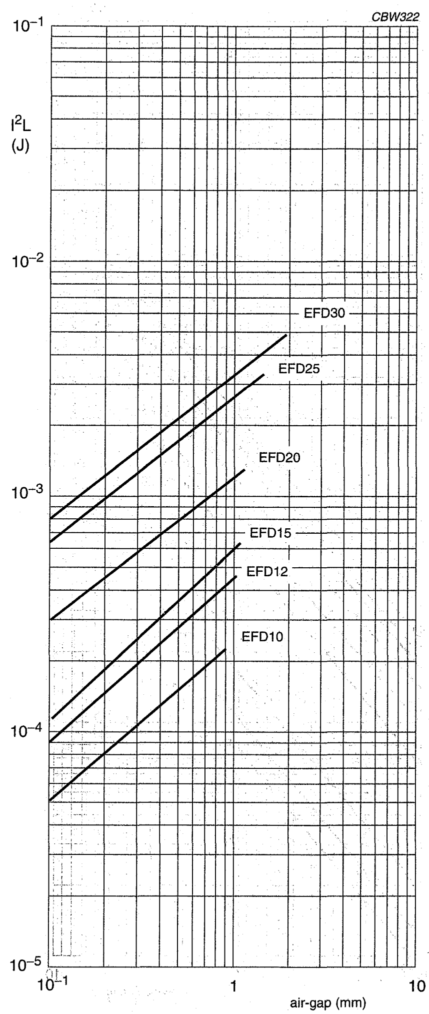


Fig.27 I^2L graph for EFD cores.

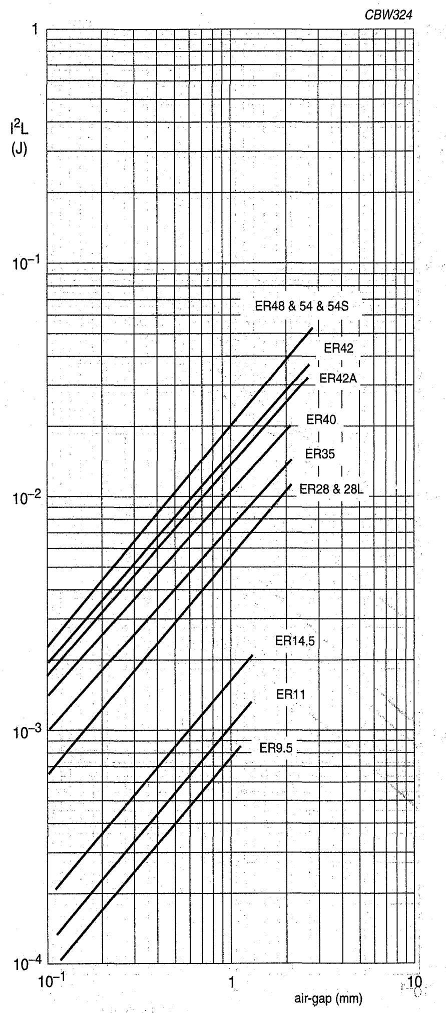


Fig.28 I^2L graph for ER cores.

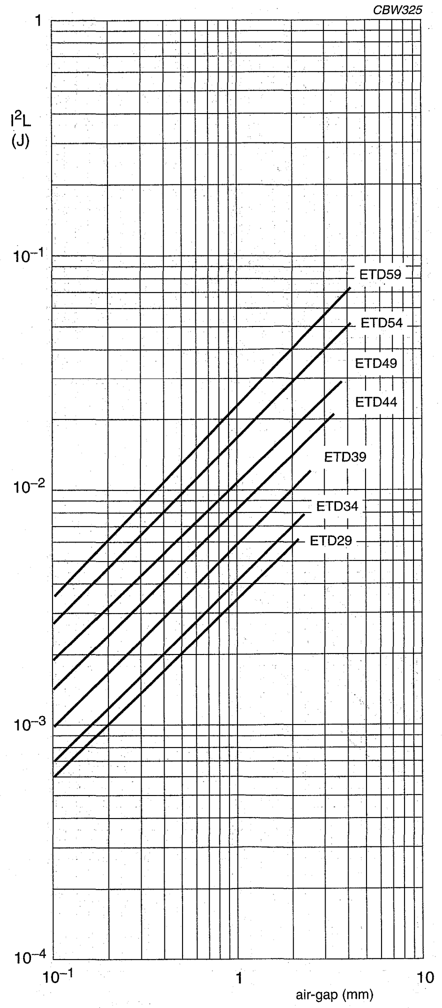


Fig.29 I^2L graph for ETD cores.

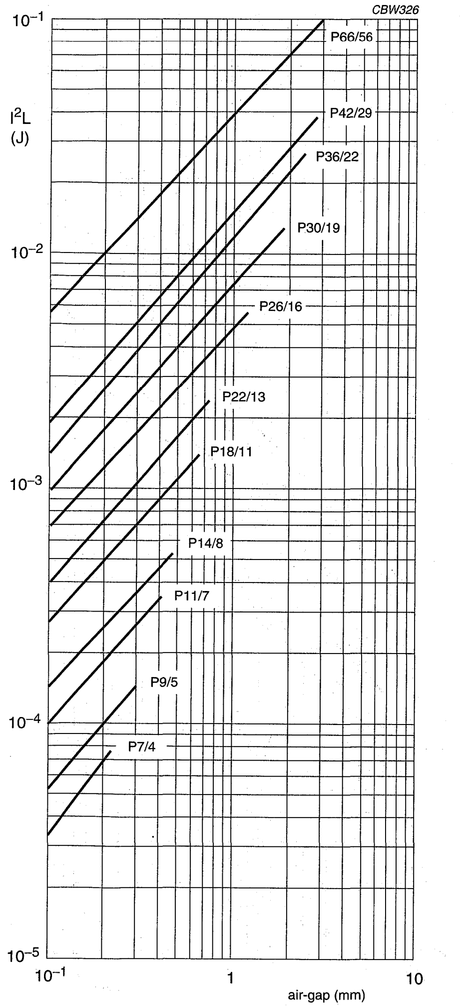


Fig.30 I^2L graph for P cores.

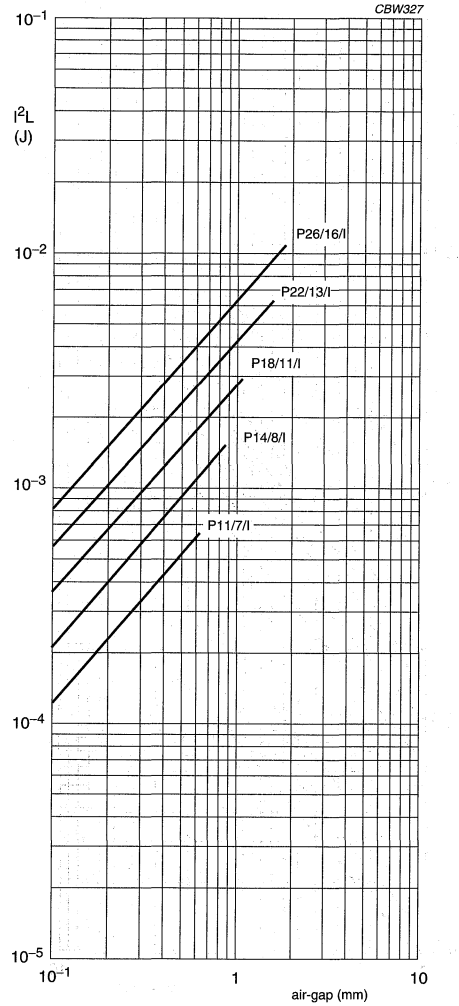


Fig.31 I^2L graph for P/I cores.

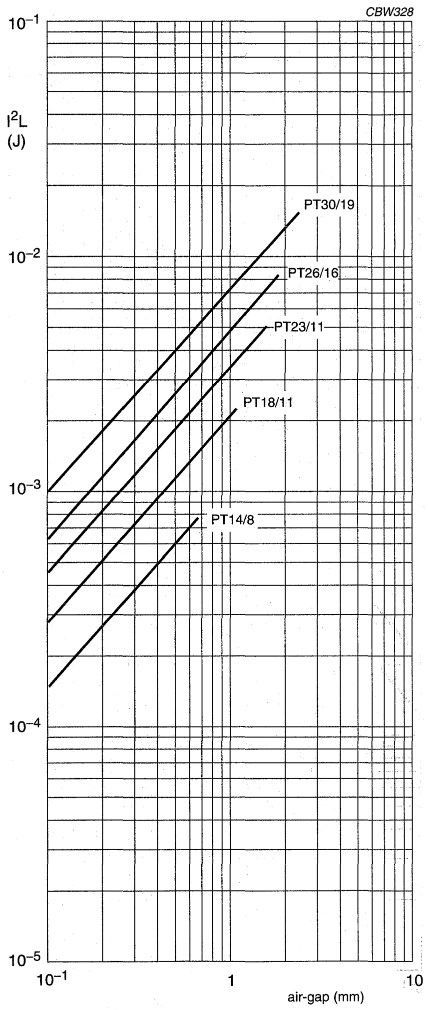


Fig.32 I^2L graph for PT cores.

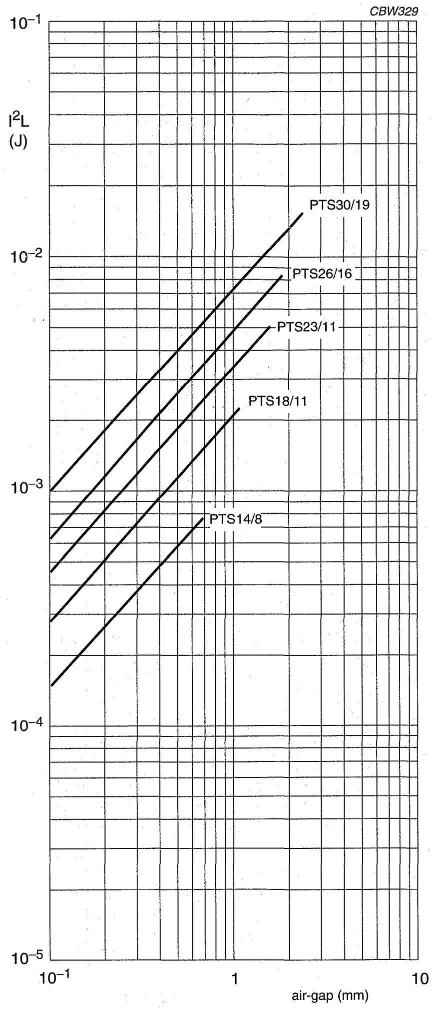


Fig.33 I^2L graph for PTS cores.

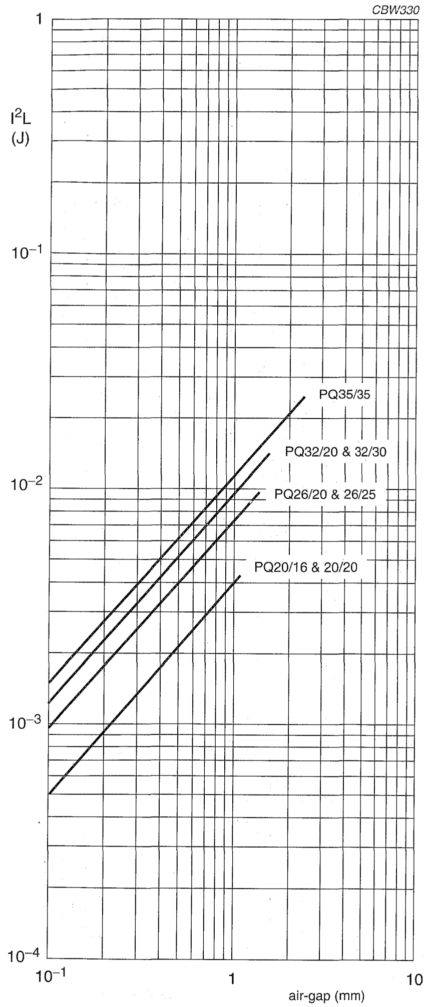


Fig.34 I^2L graph for PQ cores.

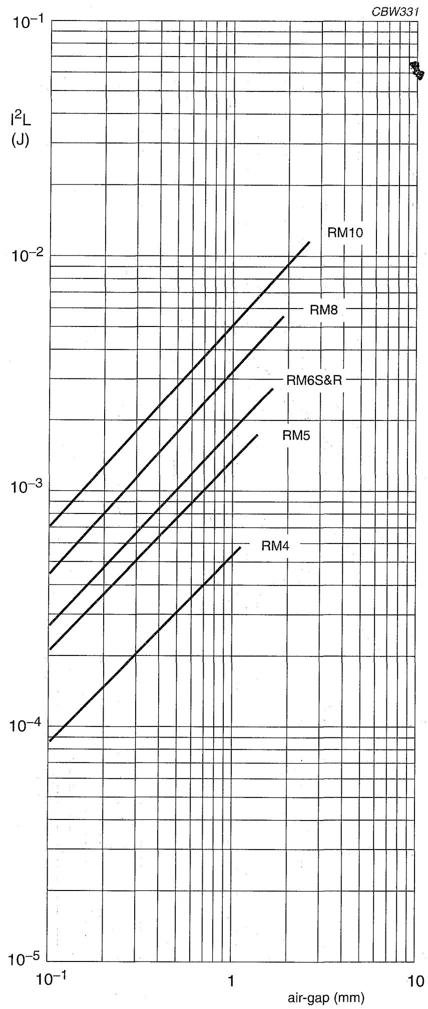


Fig.35 I^2L graph for RM cores.

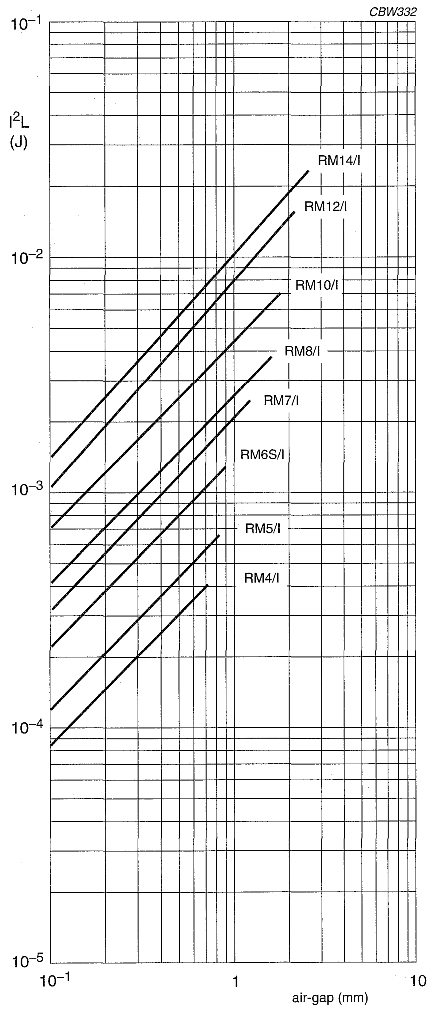


Fig.36 I^2L graph for RM/I cores.

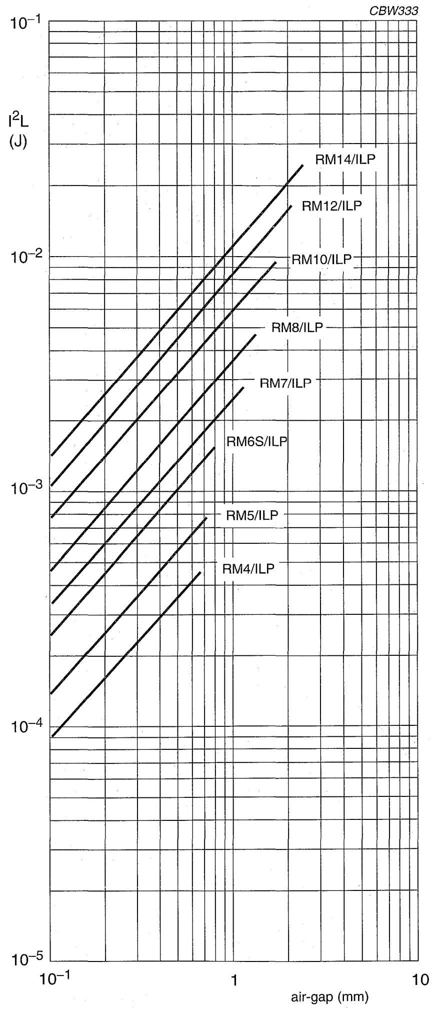


Fig.37 I^2L graph for RM/ILP cores.

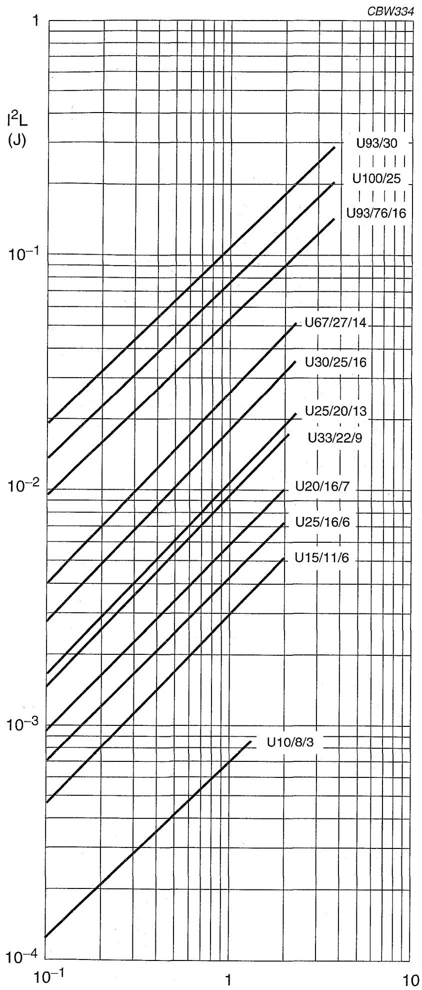


Fig.38 I^2L graph for U cores.

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 acts as a so called distributed air gap. Therefore, our 2P ring core range can operate under bias fields of up to 2000 A/m.

INPUT FILTERS (COMMON MODE CHOKES)

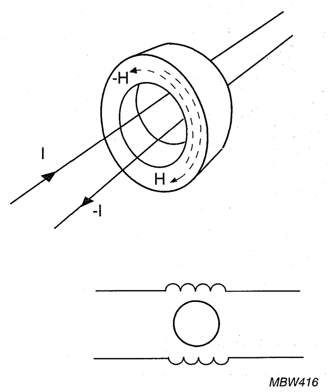


Fig.39 Common mode choke.

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.

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 materials will saturate. In that case one of the power materials 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.40.

These materials only perform well as an inductor 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 an thus, also the impedance. A better result could have been obtained with a grade having a lower permeability. Figure 41 provides a quick method of choosing the right ferrite for the job.

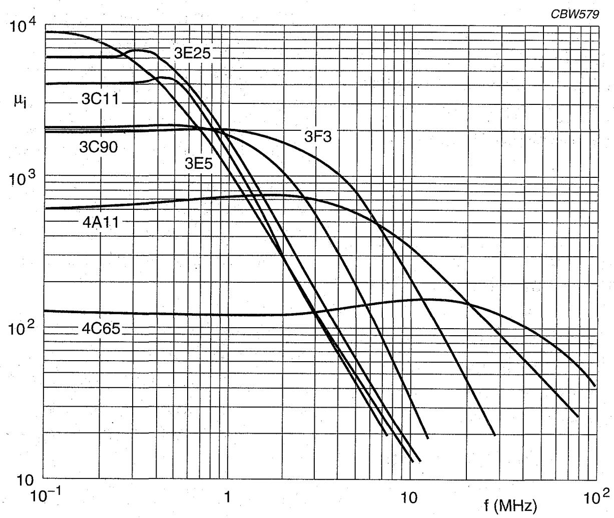


Fig.40 Permeability as a function of frequency of different materials.

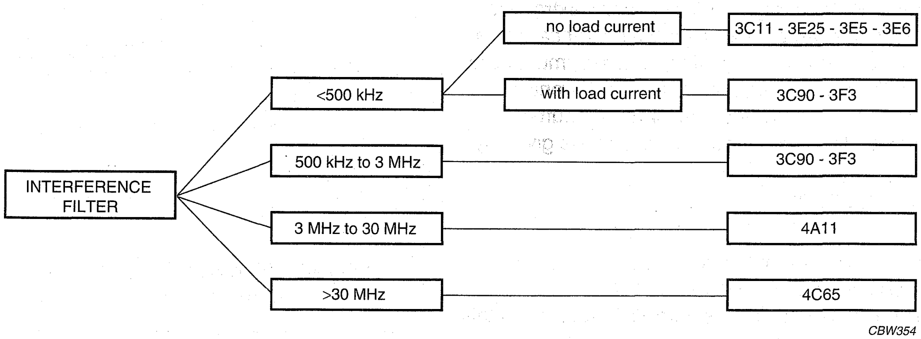


Fig.41 Selection chart for materials used in input filters.

3R1 Toroids in Magnetic regulators

Saturable inductors can be used to regulate several independent outputs of an SMPS by blocking varying amounts of energy from the secondary of the transformer. The rectangular BH loop of our 3R1 ferrite toroids makes them ideal for magnetic regulators with reset control. The circuits required are both simple and economic and can be easily integrated.

Operating principles

When the main switch is ON (t_{on}) the output current (I_{out}) flows through the winding of the saturable inductor to the output inductor and from there to the load.
During OFF time this current falls to zero and so does the magnetic field H. Because the saturable inductor has a rectangular B-H loop, the flux remains at the high level B_r even when the driving field H has fallen to zero.

When no reset current is applied, the flux in the toroid remains at the level of B_r until the next ON time starts. There is only a short delay (t_d) because the flux rises from B_r to B_s. After that, the current rises sharply to its maximum value, limited only by the load impedance. The output voltage has its maximum value, given by:

$$V_{out} = V_t \times \frac{t_{on} - t_d}{T}$$

When V_{out} is higher than V_{ref} a reset current flows during OFF time, regulated by the transistor. This current can only flow through the winding of the saturable inductor. Because this current causes a magnetic field in reverse direction it will move the ferrite away from saturation. Resetting to $-H_c$, for instance, causes some extra delay (t_b) because of the larger flux swing. Full reset causes a flux swing of almost $2 \times B_s$, resulting in a maximum delay ($t_d + t_b$) and the blocking of a major part of the energy flowing from the transformer to the load. The output voltage is regulated to the required level and is given by:

$$V_{out} = V_t \times \frac{t_{on} - t_d - t_b}{T}$$

In this way a reset current in the order of 100 mA can regulate load currents in the order of 10 A or more, depending on the layout of the saturable inductor. For this reason the described circuit is called a magnetic regulator or magnetic amplifier.

The performance of the material 3R1 is comparable to that of amorphous metal making it an excellent choice for application in magnetic regulators. However, since the value of H_c is higher for the ferrite than for most amorphous metal compositions, a simple replacement will often fail to deliver the expected results. A dedicated design or a slight redesign of the regulating circuit is then required, for which we will be glad to give you advice.

Behaviour of the ferrite material in a saturable inductor is shown in Fig.42.

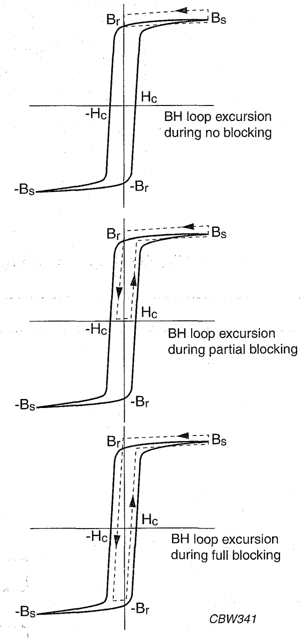


Fig.42 Behaviour of the ferrite material in a saturable inductor.

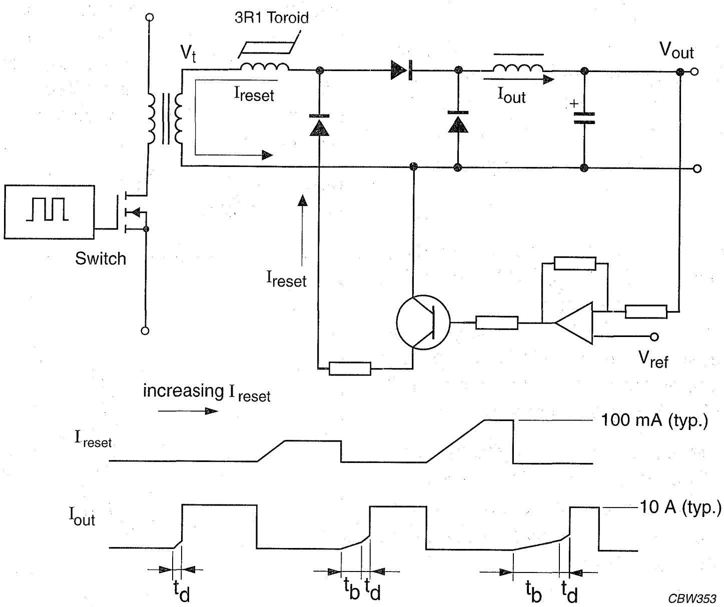


Fig.43 Schematic of a saturable inductor and associated waveforms (with regulation).

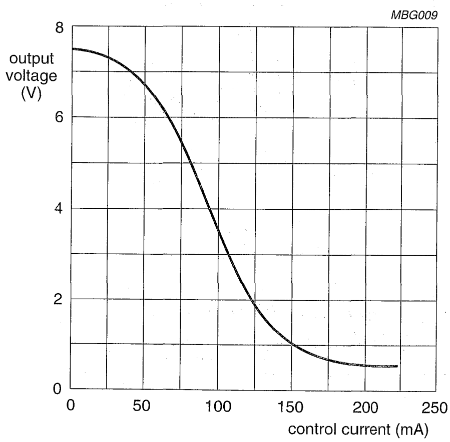


Fig.44 Typical control curve for a 3R1 ring core (size 14 × 9 × 5 mm, with 15 turns).

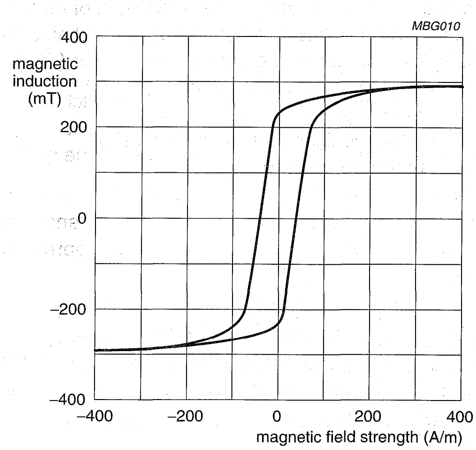


Fig.45 Properties of 3R1 ferrite material; f = 100 kHz, T = 25 °C.

Ferrites for Interference Suppression and Electromagnetic Compatibility (EMC)

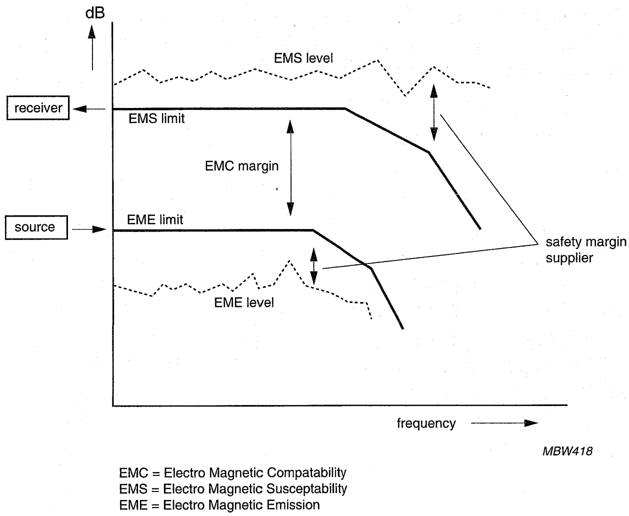


Fig.46 Principles of Electromagnetic Compatibility (EMC).

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 (EME) and also the sensitivity of equipment to incoming interference (EMS).

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.47.

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.

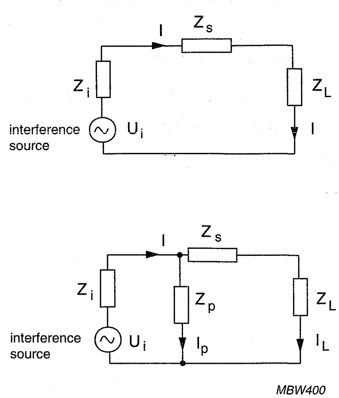


Fig.47 Basic suppression circuits.

Suppressors 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 ring cores, beads, multilayer beads, beads on wire, SMD beads, wideband chokes and cable shields to suit every application. Rods and tubes are also often used for this application after they have been coiled by the user.

New in the program are the Integrated Inductive Components (IIC).

SAMPLE BOXES

As the design process in these areas is often based on trial and error, we have assembled 6 different **designers' sample boxes**. Each box is filled with a selection from our standard ranges, which aims at a specific application area. The boxes also contain a booklet with full information about the products and their applications. These sample boxes are:

- Sample box 9: SMD beads and chokes
- Sample box 10: Cable shielding
- Sample box 11: EMI suppression products
- Sample box 12: Multilayer suppressors.

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
- 3S4 for frequencies from 30 to 1000 MHz
- 4S2 for frequencies from 30 to 1000 MHz.

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

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 Figs 48, 49 and 50).

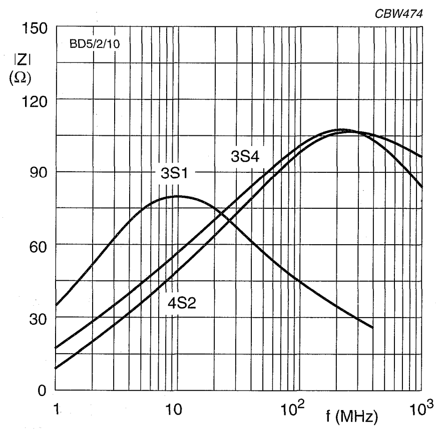


Fig.48 Impedance as a function of frequency for material grades 3S1, 3S4 and 4S2; bead size 5 × 2 × 10 mm.

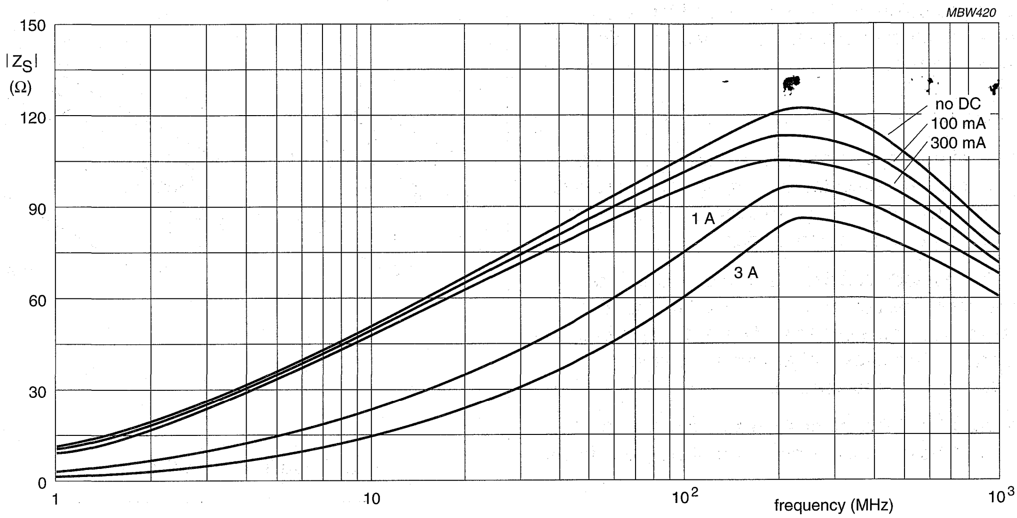


Fig.49 Impedance as a function of frequency at different DC levels for material grade 4S2.

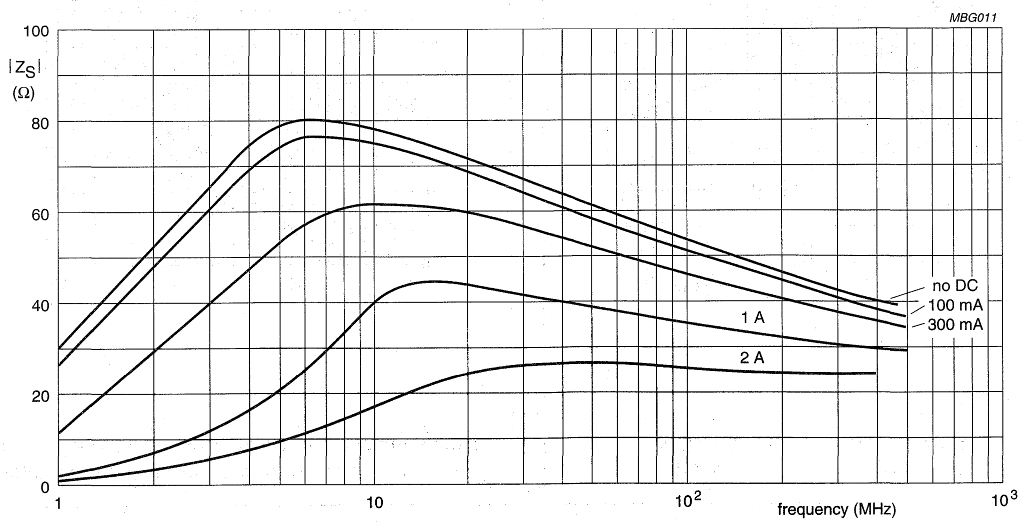


Fig.50 Impedance as a function of frequency at different DC levels for material grade 3S1.

BEADS ON WIRE

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

SMD FERRITE BEADS

In response to market demands for smaller, lighter and more integrated electronic devices a series of SMD beads was added to our range. They are available in different sizes and 2 suppression ferrite grades.

Basically these beads consist of a ferrite tube with a rectangular cross-section and a flat tinned copper wire which is bent around the edges and forms the terminals of the component. This design offers many superior mechanical and electrical features.

Some examples of their impedance as a function of frequency and the influence of bias current are given in the graphs.

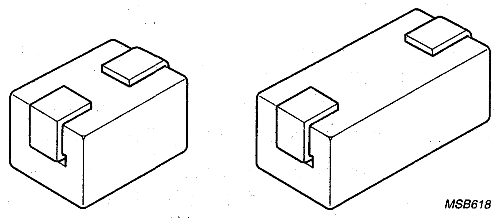


Fig.51 Outline of SMD beads.

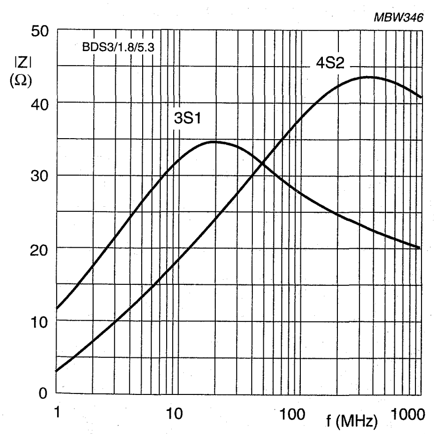


Fig.52 Impedance as a function of frequency for SMD beads.

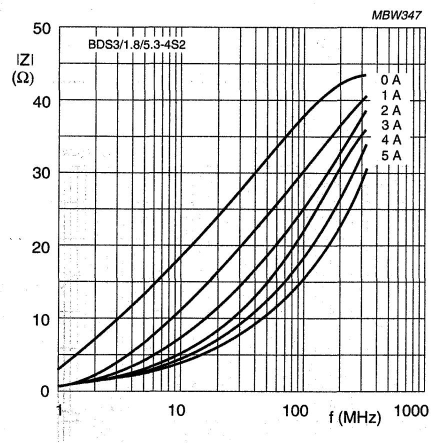


Fig.53 Impedance as a function of frequency for an SMD bead with bias current as a parameter.

SMD FERRITE BEADS FOR COMMON-MODE INTERFERENCE SUPPRESSION

Philips Components has introduced a new range of soft ferrite SMD beads for common-mode interference suppression.

With standard suppression methods in a signal path, the wanted signal is often suppressed along with the interference, and in many modern applications (EDP for instance) this leads to unacceptable loss of signal.

In Philips' new interference suppression beads, a pair of conductors within a single soft ferrite block are connected along their lengths by an air gap.

Common-mode signals (interference signals passing in the same direction along the input and output channels of a device, an IC for instance) serve to reinforce the magnetic flux around both conductors and are therefore attenuated.

In contrast, the wanted signal passing along the input and output channels serves to cancel the flux around the conductors and therefore passes unattenuated.

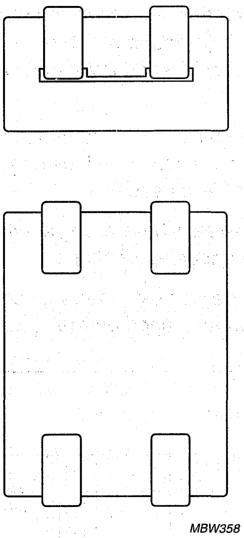


Fig.54 Outline of an SMD common-mode choke.

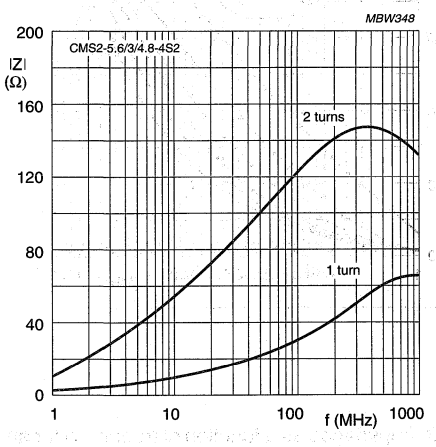


Fig.55 Impedance as a function of frequency of an SMD common mode bead with two conductors.

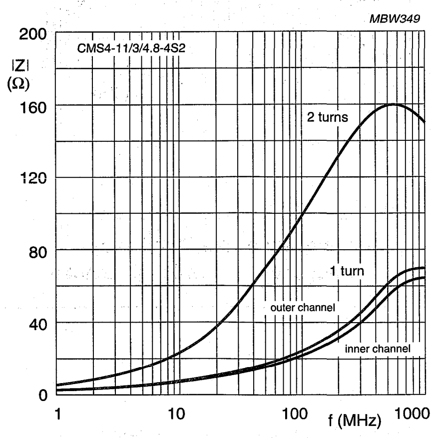


Fig.56 Impedance as a function of frequency of an SMD common mode bead with four conductors.

WIDEBAND CHOKES

Wideband chokes are wired multi-hole beads. Since they have up to 2½ turns of wire their impedance values are rather high over a broad frequency range, hence their name.

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.

These products already have a long service record and are still popular for various applications.

Recently the range was extended with several new types, e.g. with isolation and taped on reel.

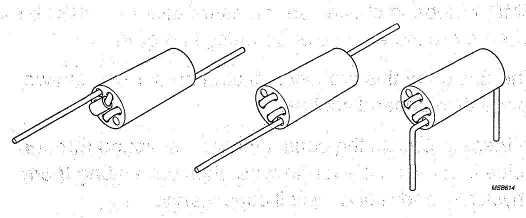


Fig.57 Outline of wideband chokes.

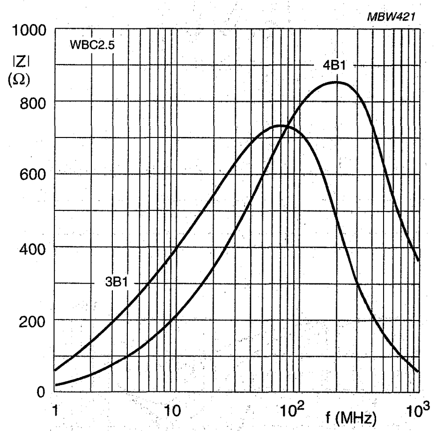


Fig.58 Impedance as a function of frequency for a wideband choke.

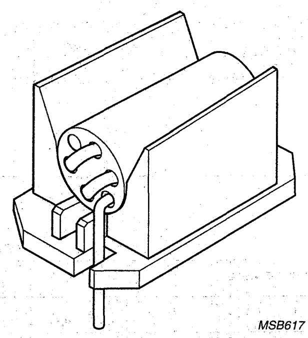


Fig.59 Outline of a wideband choke with support plate.

SMD WIDEBAND CHOKES

SMD wideband chokes are an alternative to a SMD bead when more impedance or damping is required.

The design of this product is based on our well known range of wideband chokes.

In these products the conductor wire is wound through holes in a multi-hole ferrite core, thus separating them physically and reducing coil capacitance.

The result is a high impedance over a wide frequency range, a welcome feature for many interference problems.

The present SMD design preserves the excellent properties and reliability of the original wideband chokes by keeping the number of electrical interfaces to an absolute minimum.

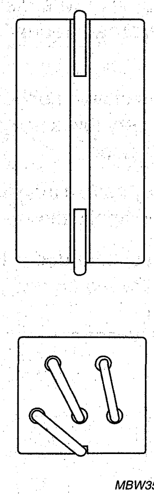


Fig.60 Outline of an SMD wideband choke.

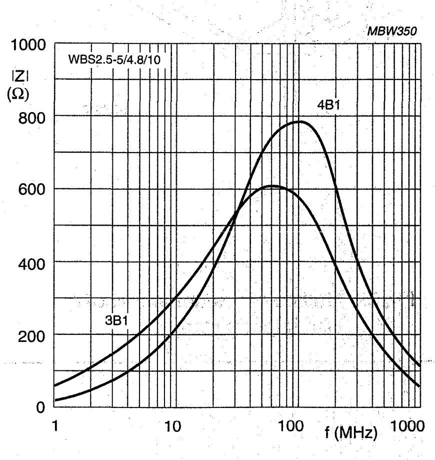


Fig.61 Impedance as a function of frequency for SMD wideband chokes.

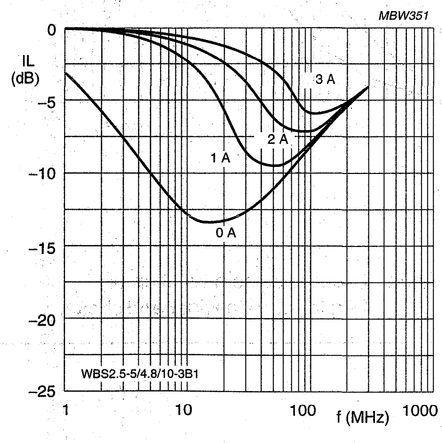


Fig.62 Insertion loss of a 3B1 SMD wideband choke as a function of frequency (50 Ω circuit).

CABLE SHIELDS

New in our range are so-called cable shields. These products are an effective remedy against common-mode interference on coaxial or flat cables. They come in several shapes: round tubes, rectangular sleeves and split sleeves to mount on existing cable connections.

Our new suppression material 3S4 is very suitable for this application. It combines a high permeability (1700) for high impedance in the lower frequency range with an excellent high frequency behaviour for true wideband suppression.

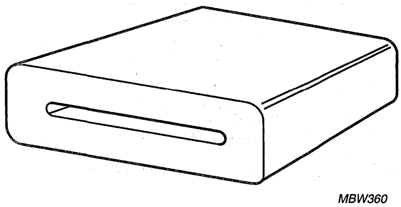


Fig.63 Outline of a cable shield.

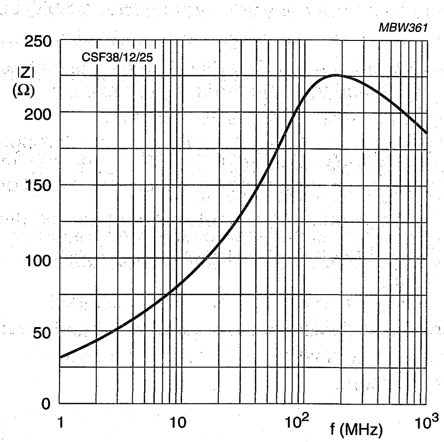


Fig.64 Impedance of a cable shield as a function of frequency.

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.65) unless the rod is very slender.

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.

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

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

where:

N = number of turns

A = cross sectional area of rod

l = length of coil.

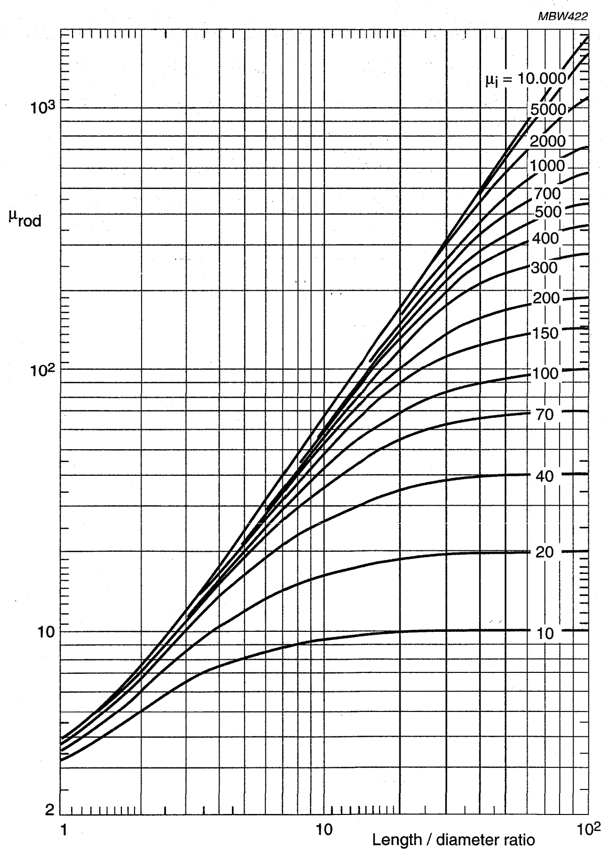


Fig.65 Rod permeability (μ_{rod}) as a function of length to diameter ratio with material permeability as a parameter.

Literature and reference materials

PHILIPS COMPONENTS APPLICATION LITERATURE

For the latest application literature, refer to the website at: **www.acm.components.philips.com**

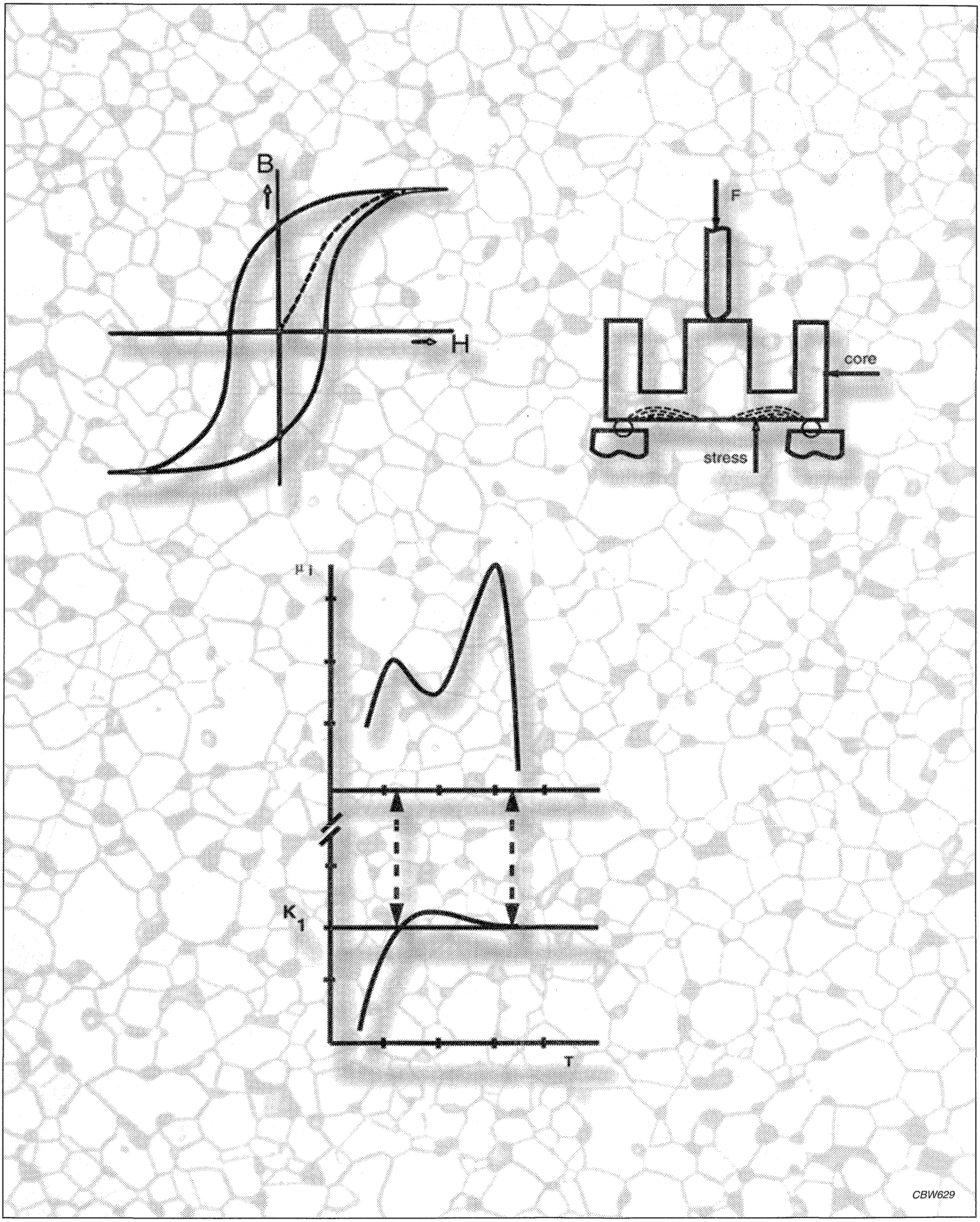
IEC STANDARDS ON SOFT FERRITES

133 (1985)	Dimensions for pot cores made of magnetic oxides and associated parts
205 (1966)	Calculation of the effective parameters of magnetic piece parts
205A (1968)	First supplement
205B (1974)	Second supplement
226 (1967)	Dimensions of cross cores (X cores) made of ferromagnetic oxides and associated parts
367	Cores for inductors and transformers for telecommunications
367-1 (1982)	Part 1: Measuring methods
367-2 (1974)	Part 2: Guides for the drafting of performance specifications
367-2A (1976)	First supplement
424 (1973)	Guide to the specification of limits for physical imperfections of parts made from magnetic oxides
431 (1983)	Dimensions of square cores (RM cores) made of magnetic oxides and associated parts
525 (1976)	Dimensions of toroids made of magnetic oxides or iron powder
647 (1979)	Dimensions for magnetic oxide cores intended for use in power supplies (EC cores)
1185 (1992)	Magnetic oxide cores (ETD cores) intended for use in power supply applications - Dimensions
1246 (1994)	Magnetic oxide cores (E cores) of rectangular cross-section and associated parts - Dimensions

Literature and reference materials

REFERENCE BOOKS ON MAGNETIC COMPONENT DESIGN

1.	Soft Ferrites, Properties and Applications	2nd Edition, E.C. Snelling, Butterworths Publishing, 80 Montvale Ave., Stoneham, MA 02180 Tel: (617) 928-2500
2.	Ferrites for Inductors and Transformers	C. Snelling & A. Giles, Research Studies Press, distributed by J. Wiley & Sons, 605 Third Ave., New York, NY 10016
3.	Transformer and Inductor Design Handbook	C. McLyman, Marcel Deckker, 207 Madison Ave., New York, NY10016
4.	Magnetic Core Selection for Transformers and Inductors	C. McLyman, Marcel Deckker, 207 Madison Ave., New York, Ny10016
5.	Handbook of Transformer Applications	W. Flanigan, McGraw Hill Publishing Co., 1221 Ave. of Americas, New York, NY 10020
6.	Transformers for Electronic Circuits	N. Grossner, McGraw Hill Publishing Co., 1221 Ave. of Americas, New York NY 10020
7.	Magnetic Components-Design and Applications	S. Smith Van Nostrand Reinhold Co., 135 West 50th St., New York, NY 10020
8.	Design Shortcuts and Procedures for Electronic Power Transformers and Inductors	Ordean Kiltie, O. Kiltie & Co. 2445 Fairfield, Ft. Wayne, IN 46807
9.	Switching and Linear Power Supply, Power Converter Design	A. Pressman, Hayden Book Co. Inc., 50 Essex St., Rochelle Park., NY 07662
10.	High Frequency Switching Power Supplies	G. Chrysiss, McGraw Hill Publishing Co, 1221 Ave. of Americas, NY
11.	Design of Solid State Power Supplies	3rd Edition, E. Hnatek, Van Nostrand Reinhold Co., New York, NW 10020
12.	Power Devices and Their Applications	Edited by: Dr. F. Lee & Dr. D. Chen, VPEC, Vol. III, 1990. Tel: (703) 231-4536
13.	Application of Magnetism	J.K. Watson, John Wiley & Sons, Inc. 605 Third Ave., New York, NY 10016
14.	Applied Electromagnetics	M.A. Plonus, McGraw Hill Publishing Co., 1221 Ave. of Americas, New York, NY 10020
15.	Transmission Line Transformers	J. Sevick, American Radio Relay League, 225 Main Street, Newington, CT 06111


B
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Soft Ferrites

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 ∅25 × ∅15 × 10 mm which are not subjected to external stresses.

Products generally comply with the material specification. However, deviations may occur due to shape size and grinding operations etc.

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

MATERIAL GRADE SURVEY

Ferrite material grade survey

FERRITE MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	T_C (°C)	ρ (Ωm)	FERRITE TYPE	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
3D3	750	≈400	≥200	≈2	MnZn	telecom filters signal transformers pulse transformers delay lines	RM, P, PT, PTS, EP, E, ER, RM/I, RM/ILP, toroids
3B7	2300	≈450	≥170	≈1	MnZn		
3H3	2000	≈400	≥160	≈2	MnZn		
3E1	3800	≈400	≥125	≈1	MnZn		
3E4	4700	≈400	≥125	≈1	MnZn		
3E5	10000	≈400	≥125	≈0.5	MnZn		
3E55	10000	≈350	≥100	≈0.1	MnZn		
3E6	12000	≈400	≥130	≈0.1	MnZn		
3E7	15000	≈400	≥130	≈0.1	MnZn		
3E8	18000	≈350	≥100	≈0.1	MnZn		
3E25	6000	≈400	≥125	≈0.5	MnZn		
3E27	6000	≈400	≥150	≈0.5	MnZn		
3E28	4000	≈400	≥145	≈1	MnZn		
3C15	1800	≈500	≥190	≈1	MnZn	power conversion general purpose transformers	E, Planar E, EC, EFD, EP, ETD, ER, U, UR, I, RM/I, RM/ILP, P, P/I, PT, PTS, PQ, toroids
3C30	2100	≈500	≥240	≈2	MnZn		
3C34	2100	≈500	≥240	≈5	MnZn		
3C81	2700	≈450	≥210	≈1	MnZn		
3C91	3000	≈450	≥220	≈5	MnZn		
3C90	2300	≈450	≥220	≈5	MnZn		
3C94	2300	≈450	≥220	≈5	MnZn		
3C96	2000	≈500	≥240	≈5	MnZn		
3F3	2000	≈450	≥200	≈2	MnZn		
3F4	900	≈450	≥220	≈10	MnZn		
3F35	1400	≈500	≥240	≈10	MnZn		
4F1	80	≈350	≥260	≈10^5	NiZn		
3S1	4000	≈400	≥125	≈1	MnZn	EMI-suppression	EMI beads, beads on wire, SMD beads, Multilayer suppressors, common-mode chokes, cable shields, rods, ring cores (toroids), wideband chokes, U cores
3S3	350	≈350	≥225	≈10^4	MnZn		
3S4	1700	≈350	≥110	≈10^3	MnZn		
4S2	700	≈350	≥125	≈10^5	NiZn		
4S4	250	≈300	≥130	≈10^5	NiZn		
4S7	200	≈300	≥140	≈10^5	NiZn		
4C65	125	≈400	≥350	≈10^5	NiZn		
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		
3E26	7000	≈450	≥155	≈0.5	MnZn		

FERRITE MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	T_C (°C)	ρ (Ωm)	FERRITE TYPE	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
4E1	15	≈200	≥500	$\approx 10^5$	NiZn	tuning suppression	rods, tubes, wideband chokes
4D2	60	≈240	≥400	$\approx 10^5$	NiZn		
4B1	250	≈350	≥250	$\approx 10^5$	NiZn		
3B1	900	≈400	≥150	≈0.2	MnZn		
3R1	800	≈450	≥230	$\approx 10^3$	MnZn	magnetic regulators	toroids
4B3	300	≈400	≥250	$\approx 10^5$	NiZn	scientific particle accelerators	large toroids
4E2	25	≈350	≥400	$\approx 10^5$	NiZn		
4M2	140	≈350	≥200	$\approx 10^5$	NiZn		
8C11	900	≈350	≥125	$\approx 10^5$	NiZn		
8C12	1200	≈300	≥125	$\approx 10^5$	NiZn		

Iron powder material grade survey

IRON POWDER MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	MAXIMUM OPERATING TEMPERATURE (°C)	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
2P40	40	950	140	suppression	toroids
2P50	50	1000	140		
2P65	65	1150	140		
2P80	80	1400	140		
2P90	90	1600	140		

Typical mechanical and thermal properties

PROPERTY	MnZn FERRITE	NiZn FERRITE	UNIT
Young's modules	$(90 \text{ to } 150) \times 10^3$	$(80 \text{ to } 150) \times 10^3$	N/mm^2
Ultimate compressive strength	200 to 600	200 to 700	N/mm^2
Ultimate tensile strength	20 to 65	30 to 60	N/mm^2
Vickers hardness	600 to 700	800 to 900	N/mm^2
Linear expansion coefficient	$(10 \text{ to } 12) \times 10^{-6}$	$(7 \text{ to } 8) \times 10^{-6}$	K^{-1}
Specific heat	700 to 800	750	$Jkg^{-1} \times K^{-1}$
Heat conductivity	$(3.5 \text{ to } 5.0) \times 10^{-3}$	$(3.5 \text{ to } 5.0) \times 10^{-3}$	$Jmm^{-1}s^{-1} \times K^{-1}$

Material grade specification 2P..

2P.. SPECIFICATIONS

Material grade specification - 2P40

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	40 ±10%	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 1500 \times 10^{-6}$	
B_r	from 25×10^3 A/m	≈250	mT
H_C	from 25×10^3 A/m	≈2000	A/m
B	$H = 25 \times 10^3$ A/m	≈950	mT
α_F	25 to 55 °C	$\approx 10 \times 10^{-6}$	K^{-1}
T_{max}		160	°C

Material grade specification - 2P50

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	50 ±10%	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\approx 1500 \times 10^{-6}$	
B_r	from 25×10^3 A/m	≈300	mT
H_C	from 25×10^3 A/m	≈1800	A/m
B	$H = 25 \times 10^3$ A/m	≈1000	mT
α_F	25 to 55 °C	$\approx 20 \times 10^{-6}$	K^{-1}
T_{max}		140	°C

Material grade specification - 2P65

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	65 ±10%	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\approx 1000 \times 10^{-6}$	
B_r	from 25×10^3 A/m	≈350	mT
H_C	from 25×10^3 A/m	≈1500	A/m
B	$H = 25 \times 10^3$ A/m	≈1150	mT
α_F	25 to 55 °C	$\approx 15 \times 10^{-6}$	K^{-1}
T_{max}		140	°C

Material grade specification - 2P80

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	80 ±10%	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\approx 1000 \times 10^{-6}$	
B_r	from 25×10^3 A/m	≈400	mT
H_C	from 25×10^3 A/m	≈1200	A/m
B	$H = 25 \times 10^3$ A/m	≈1400	mT
α_F	25 to 55 °C	$\approx 15 \times 10^{-6}$	K^{-1}
T_{max}		140	°C

Material grade specification - 2P90

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	90 ±10%	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\approx 1000 \times 10^{-6}$	
B_r	from 25×10^3 A/m	≈450	mT
H_C	from 25×10^3 A/m	≈900	A/m
B	$H = 25 \times 10^3$ A/m	≈1600	mT
α_F	25 to 55 °C	$\approx 15 \times 10^{-6}$	K^{-1}
T_{max}		140	°C

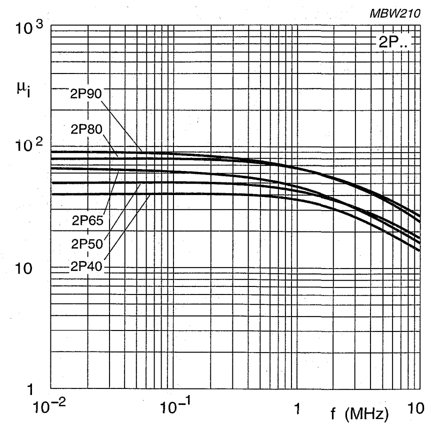


Fig.1 Initial permeability as a function of frequency.

Material grade specification 2P..

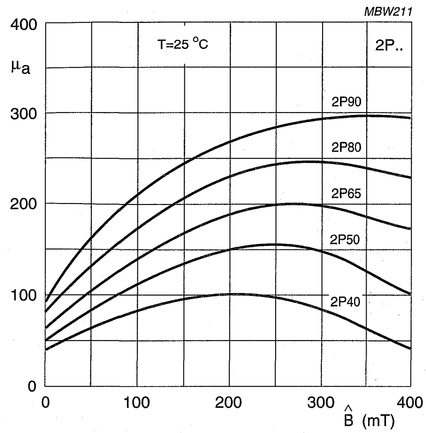


Fig.2 Amplitude permeability as a function of peak flux density.

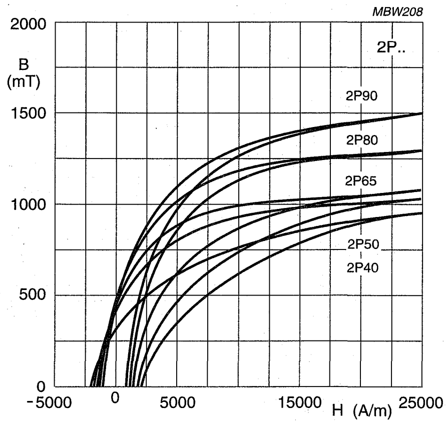


Fig.3 Typical B-H loops.

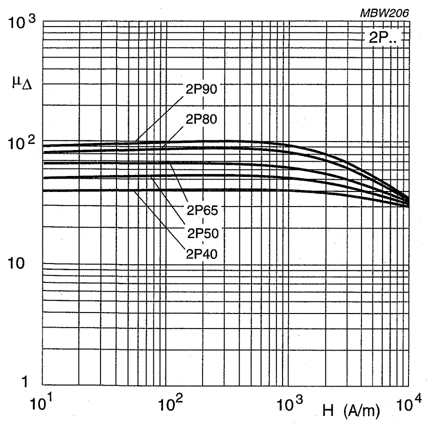


Fig.4 Incremental permeability as a function of magnetic field strength.

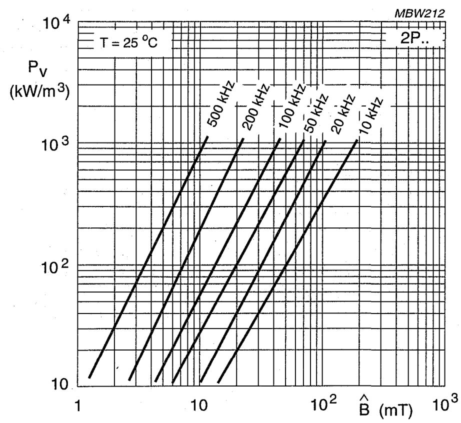


Fig.5 Specific power loss as a function of peak flux density with frequency as a parameter.

Material grade specification 3B1

3B1 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	900 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈330	mT
	100 °C; 10 kHz; 250 A/m	≈200	
$\tan\delta/\mu_i$	25 °C; 450 kHz; 0.1 mT	$\leq 50 \times 10^{-6}$	
ρ	DC; 25 °C	≈0.2	Ωm
T_C		≥150	°C
density		≈4800	kg/m^3

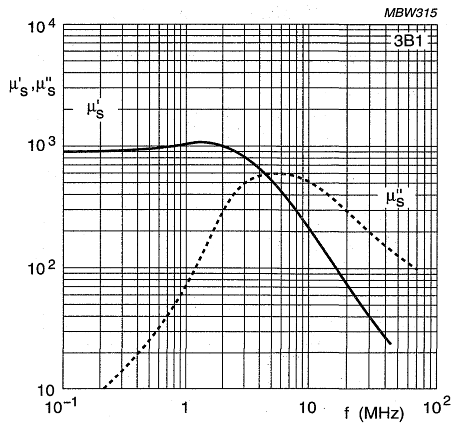


Fig.1 Complex permeability as a function of frequency.

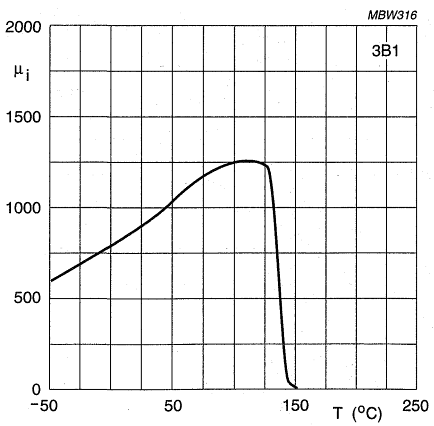


Fig.2 Initial permeability as a function of temperature.

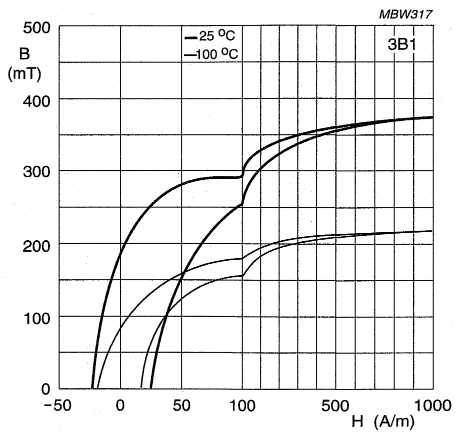


Fig.3 Typical B-H loops.

3B7 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈410	mT
	100 °C; 10 kHz; 250 A/m	≈300	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 5 \times 10^{-6}$	
	25 °C; 500 kHz; 0.1 mT	$\approx 25 \times 10^{-6}$	
	25 °C; 1 MHz; 0.1 mT	$\approx 120 \times 10^{-6}$	
D_F	25 °C; 10 kHz; 0.1 mT	$\leq 4.5 \times 10^{-6}$	
α_F	+20 to 70 °C; ≤10 kHz; 0.1 mT	$(0 \pm 0.6) \times 10^{-6}$	K^{-1}
ρ	DC, 25 °C	≈1	Ωm
T_C		≥170	°C
density		≈4800	kg/m^3

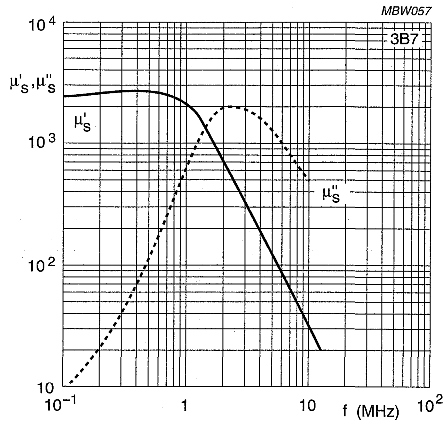


Fig.1 Complex permeability as a function of frequency.

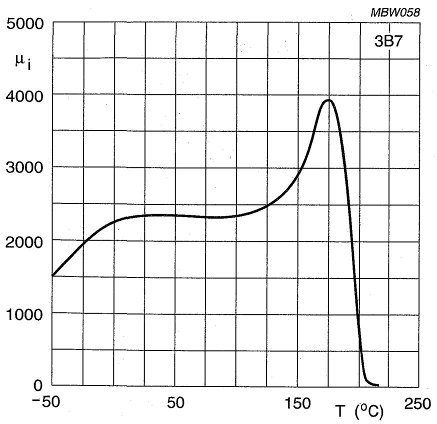


Fig.2 Initial permeability as a function of temperature.

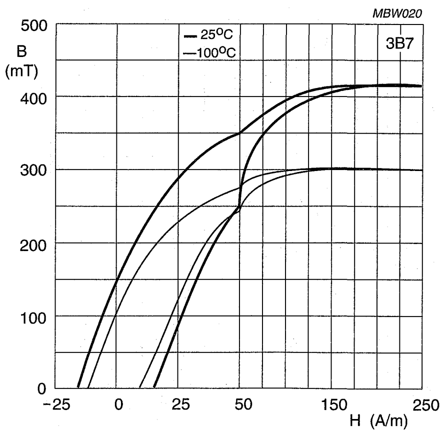


Fig.3 Typical B-H loops.

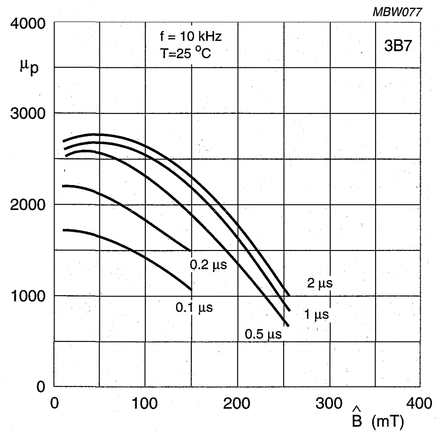


Fig.4 Pulse characteristics (unipolar pulses).

3C11 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	4300 ±20%	
B	25 °C; 10 kHz; 250 A/m	≥350	mT
	100 °C; 10 kHz; 250 A/m	≥180	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 20 \times 10^{-6}$	
	25 °C; 300 kHz; 0.1 mT	$\leq 200 \times 10^{-6}$	
ρ	DC; 25 °C	≈1	Ωm
T_C		≥125	°C
density		≈4900	kg/m³

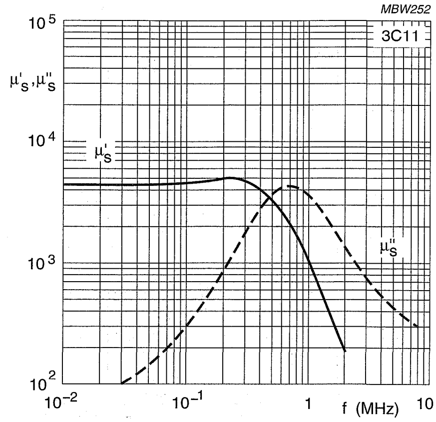


Fig.1 Complex permeability as a function of frequency.

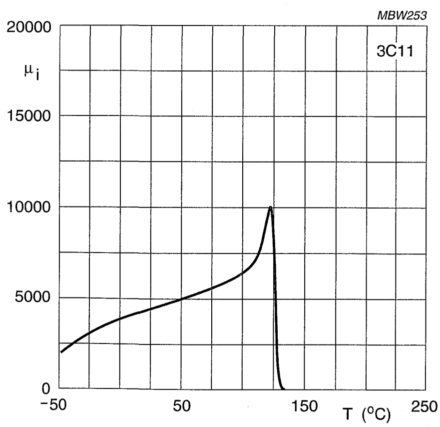


Fig.2 Initial permeability as a function of temperature.

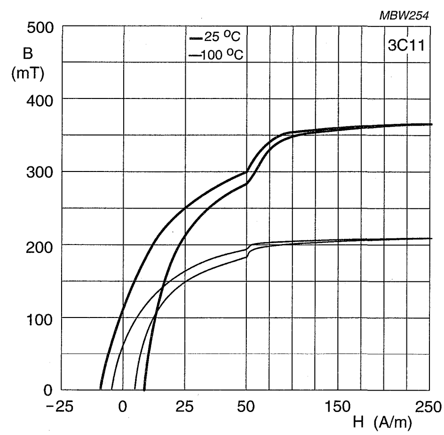


Fig.3 Typical B-H loops.

Material grade specification 3C11

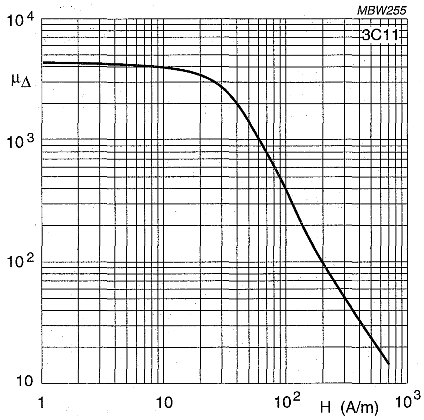


Fig.4 Incremental permeability as a function of magnetic field strength.

3C15 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1800 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	100 °C; 10 kHz; 250 A/m	≥350	mT
P_V	100 °C; 25 kHz; 200 mT 100 °C; 100 kHz; 100 mT	≤140 ≤165	kW/m^3
ρ	DC; 25 °C	≈1	Ωm
T_C		≥190	°C
density		≈4800	kg/m^3

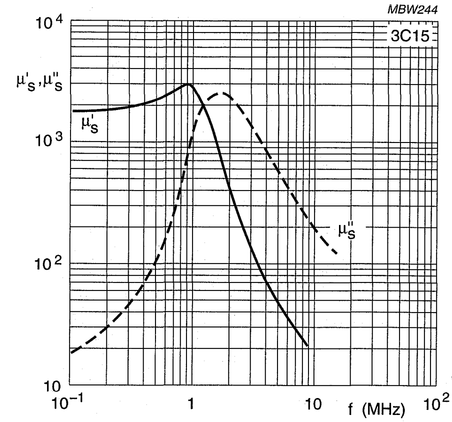


Fig.1 Complex permeability as a function of frequency.

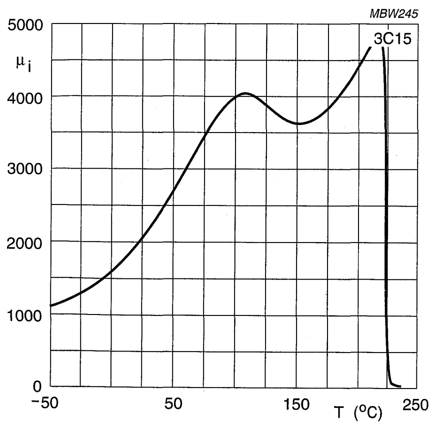


Fig.2 Initial permeability as a function of temperature.

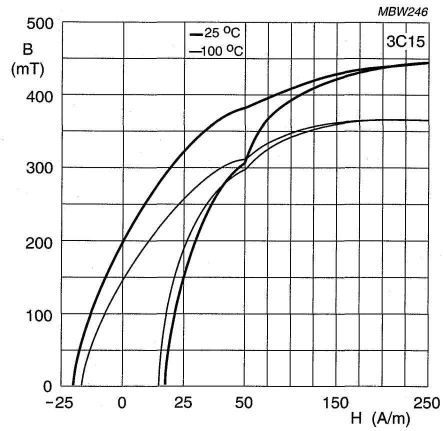


Fig.3 Typical B-H loops.

Material grade specification 3C15

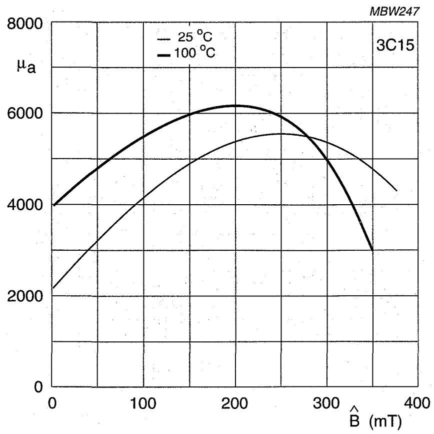


Fig.4 Amplitude permeability as a function of peak flux density.

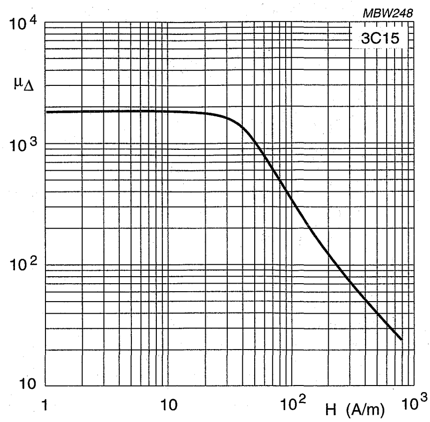


Fig.5 Incremental permeability as a function of magnetic field strength.

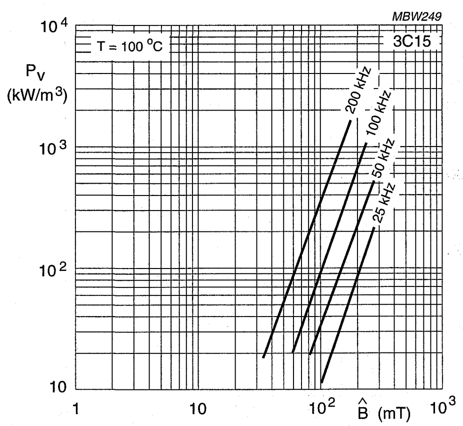


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

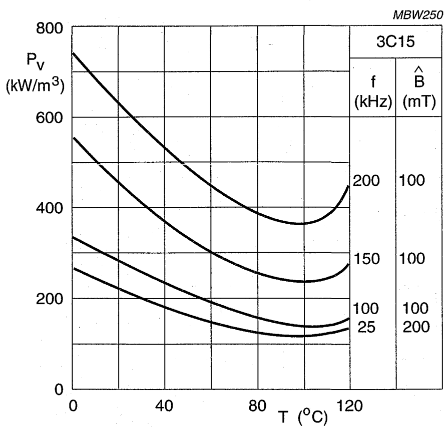


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C30

3C30 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2100 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5000 ±25%	
B	100 °C; 10 kHz; 250 A/m	≥370	mT
P_V	100 °C; 25 kHz; 200 mT	≤80	kW/m³
	100 °C; 100 kHz; 100 mT	≤80	
	100 °C; 100 kHz; 200 mT	≈450	
ρ	DC; 25 °C	≈2	Ωm
T_C		≥240	°C
density		≈4800	kg/m³

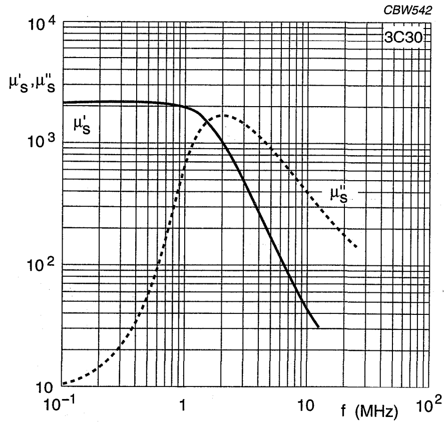


Fig.1 Complex permeability as a function of frequency.

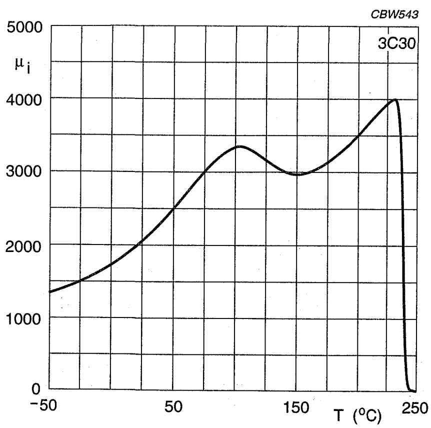


Fig.2 Initial permeability as a function of temperature.

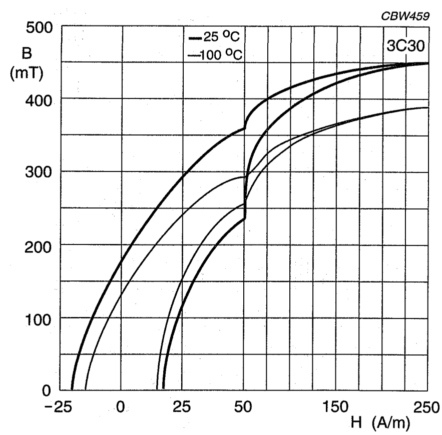


Fig.3 Typical B-H loops.

Material grade specification 3C30

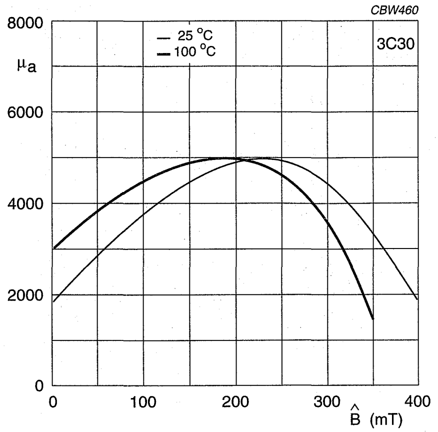


Fig.4 Amplitude permeability as a function of peak flux density.

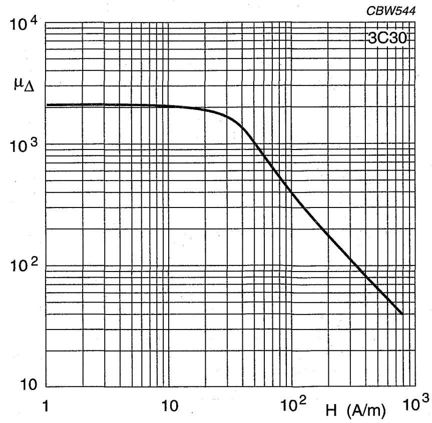


Fig.5 Incremental permeability as a function of magnetic field strength.

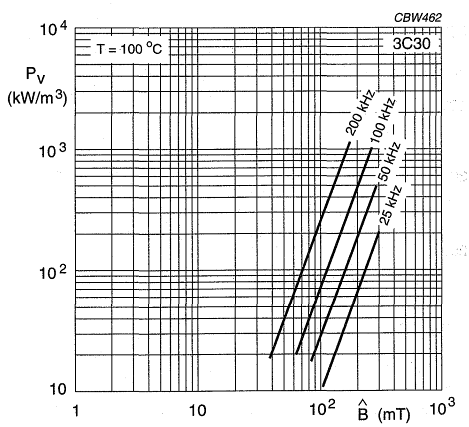


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

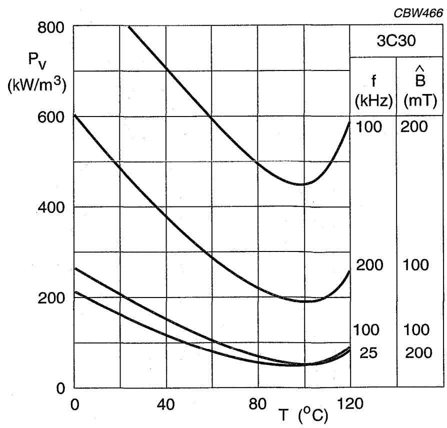


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C34 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2100 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	6500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥430	mT
	100 °C; 10 kHz; 250 A/m	≥370	mT
P_V	100 °C; 100 kHz; 100 mT	≤60	kW/m³
	100 °C; 100 kHz; 200 mT	≤400	
ρ	DC; 25 °C	≈5	Ωm
T_C		≥240	°C
density		≈4800	kg/m³

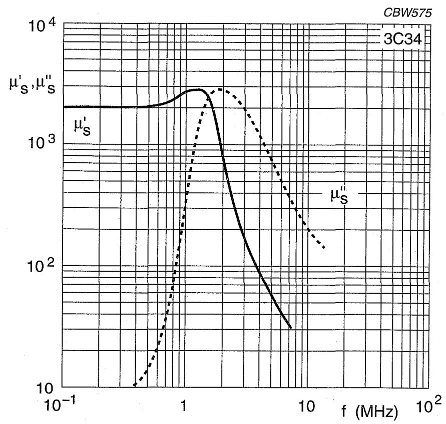


Fig.1 Complex permeability as a function of frequency.

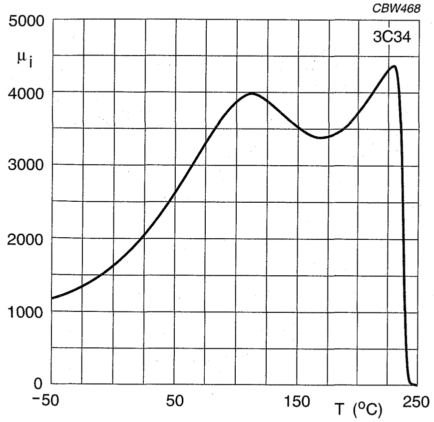


Fig.2 Initial permeability as a function of temperature.

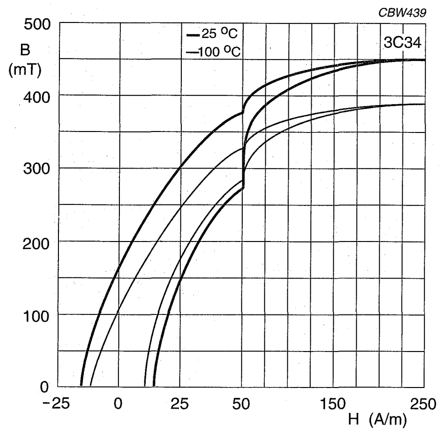


Fig.3 Typical B-H loops.

Preliminary material grade specification 3C34

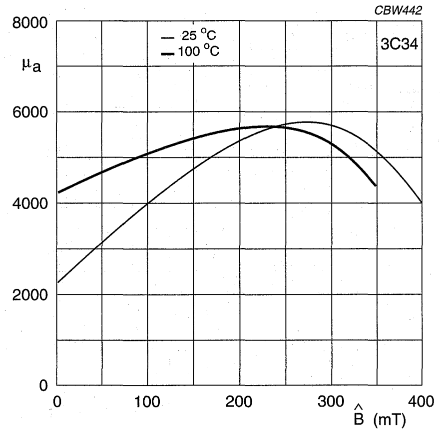


Fig.4 Amplitude permeability as a function of peak flux density.

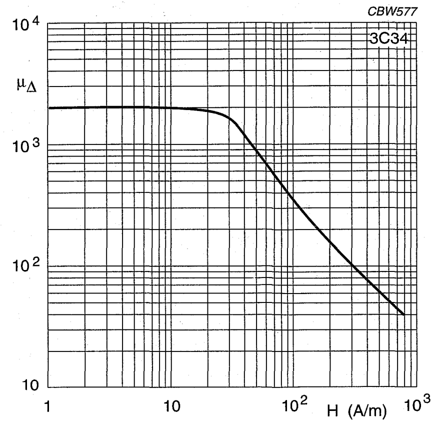


Fig.5 Incremental permeability as a function of magnetic field strength.

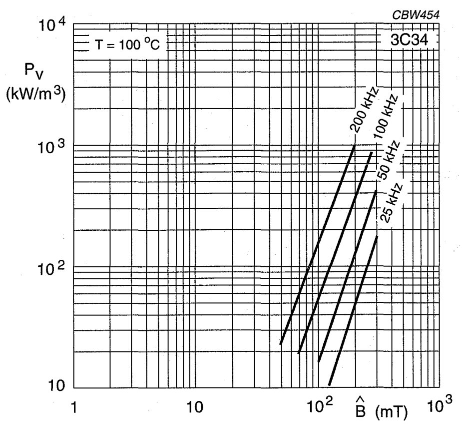


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

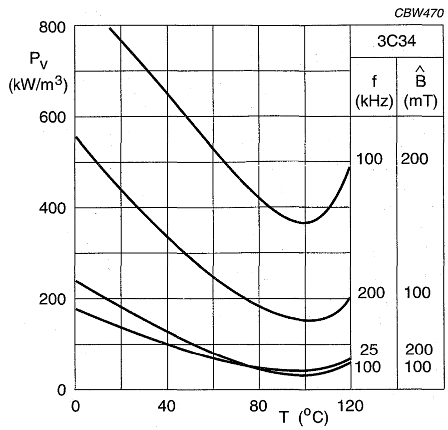


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C81

3C81 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2700 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈420	mT
	100 °C; 10 kHz; 250 A/m	≈330	
P_V	100 °C; 25 kHz; 200 mT	≤185	kW/m^3
ρ	DC; 25 °C	≈1	Ωm
T_C		≥210	°C
density		≈4800	kg/m^3

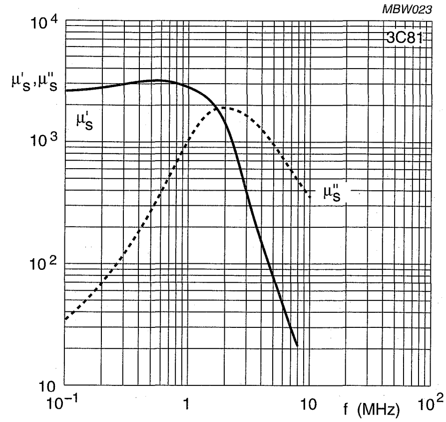


Fig.1 Complex permeability as a function of frequency.

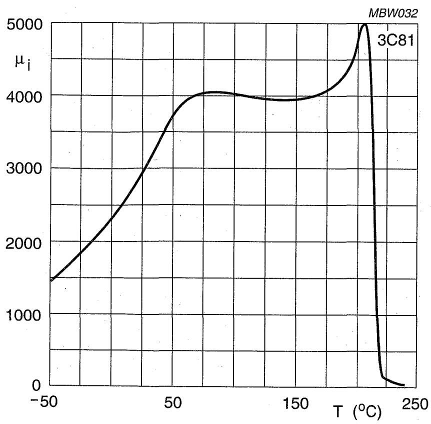


Fig.2 Initial permeability as a function of temperature.

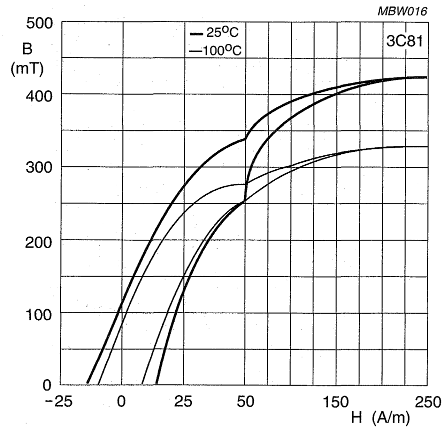


Fig.3 Typical B-H loops.

Material grade specification 3C81

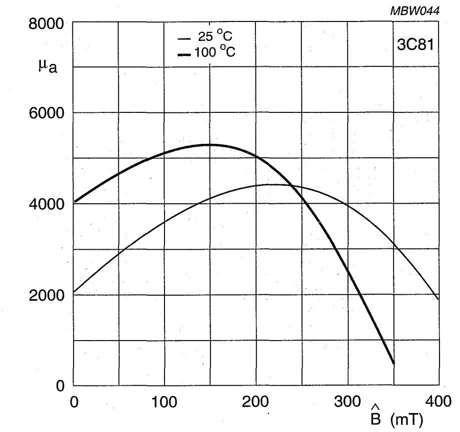


Fig.4 Amplitude permeability as a function of peak flux density.

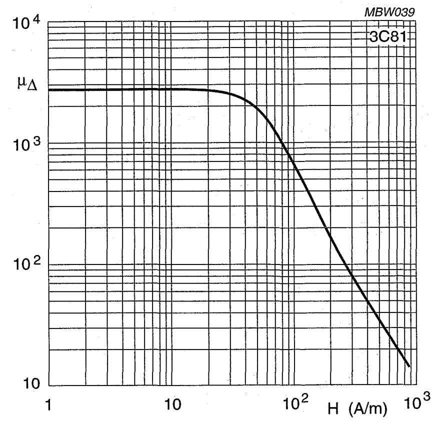


Fig.5 Incremental permeability as a function of magnetic field strength.

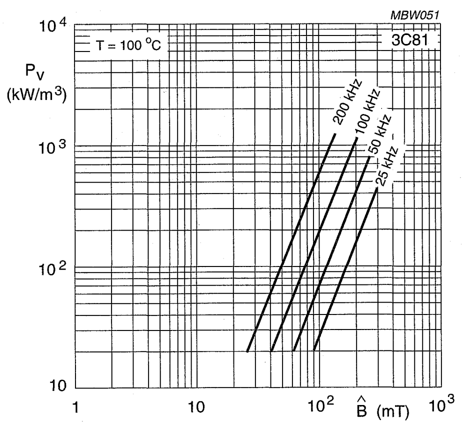


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

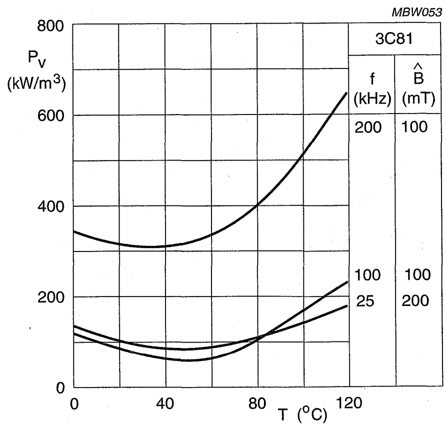


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C90

.3C90 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥430	mT
	100 °C; 10 kHz; 250 A/m	≥340	mT
P_V	100 °C; 25 kHz; 200 mT	≤80	kW/m³
	100 °C; 100 kHz; 100 mT	≤80	
	100 °C; 100 kHz; 200 mT	≈450	
ρ	DC, 25 °C	≈5	Ωm
T_C		≥220	°C
density		≈4800	kg/m³

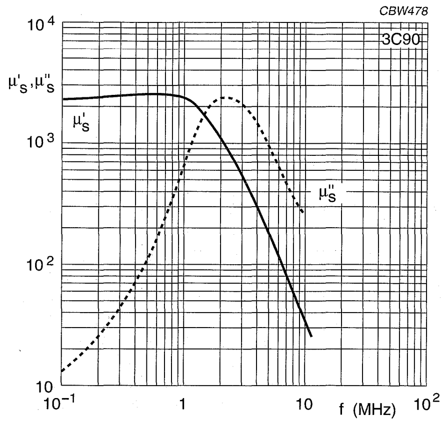


Fig.1 Complex permeability as a function of frequency.

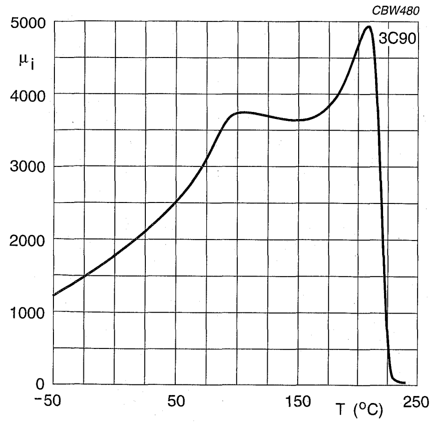


Fig.2 Initial permeability as a function of temperature.

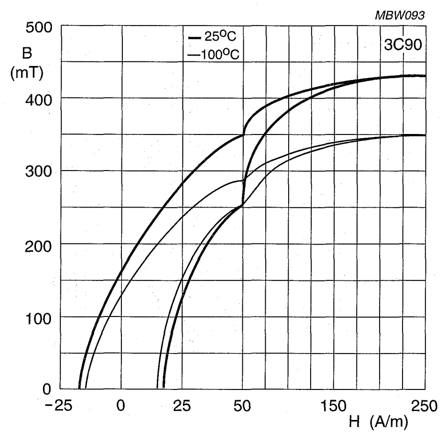


Fig.3 Typical B-H loops.

Material grade specification

3C90

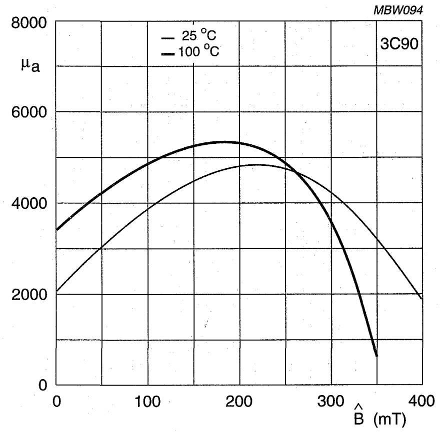


Fig.4 Amplitude permeability as a function of peak flux density.

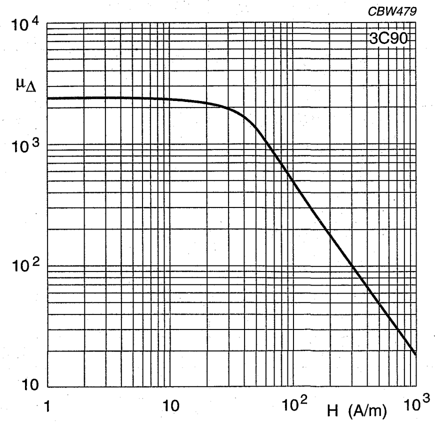


Fig.5 Incremental permeability as a function of magnetic field strength.

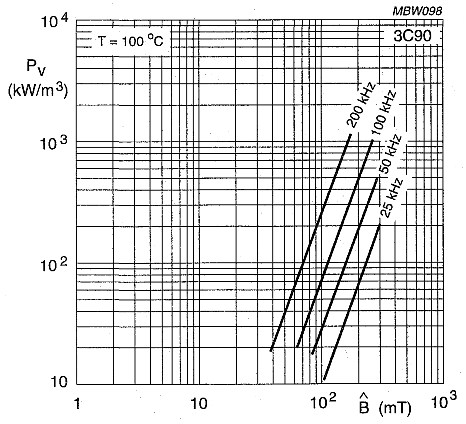


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

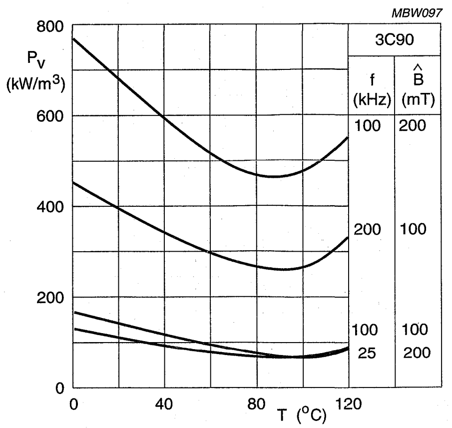


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Preliminary material grade specification 3C91

3C91 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	3000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥430	mT
	100 °C; 10 kHz; 250 A/m	≥330	mT
P_V	60 °C; 100 kHz; 100 mT	≤40	kW/m^3
	60 °C; 100 kHz; 200 mT	≈300	
ρ	DC, 25 °C	≈5	Ωm
T_C		≥220	°C
density		≈4800	kg/m^3

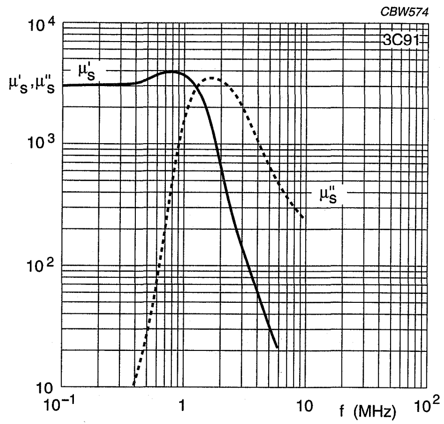


Fig.1 Complex permeability as a function of frequency.

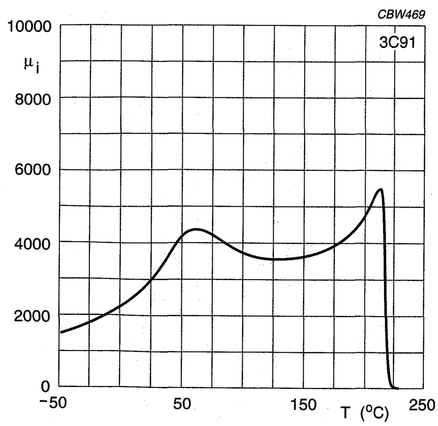


Fig.2 Initial permeability as a function of temperature.

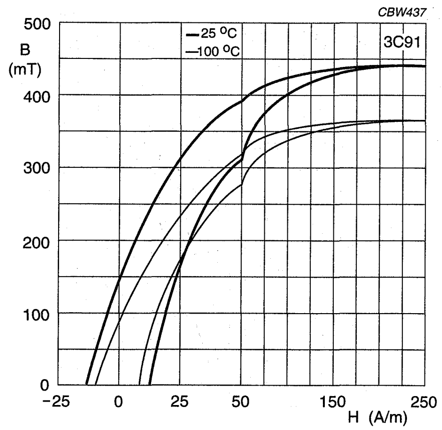


Fig.3 Typical B-H loops.

Preliminary material grade specification 3C91

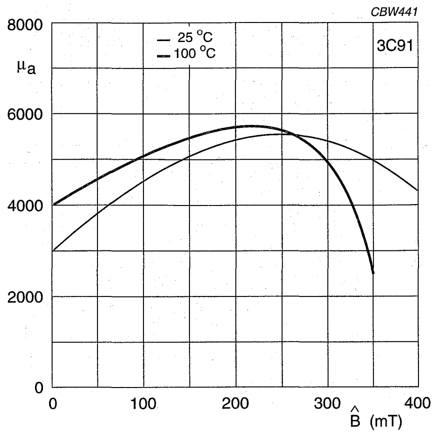


Fig.4 Amplitude permeability as a function of peak flux density.

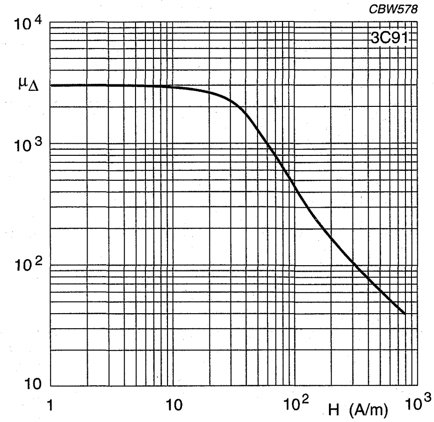


Fig.5 Incremental permeability as a function of magnetic field strength.

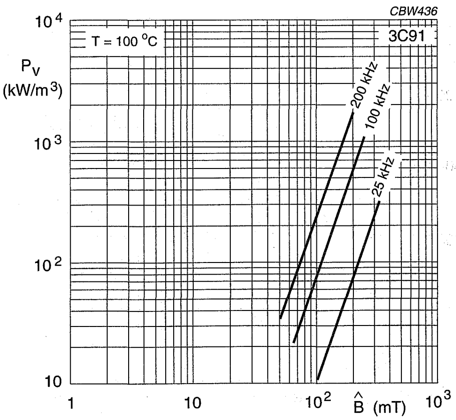


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

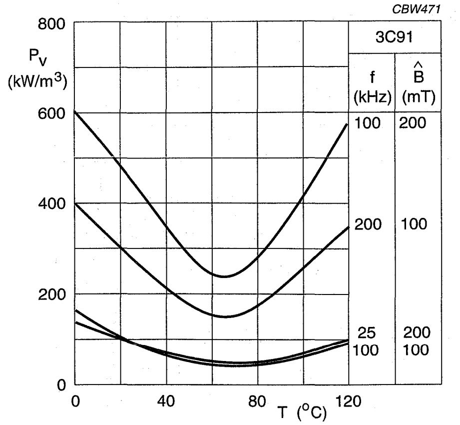


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C94

3C94 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥430	mT
	100 °C; 10 kHz; 250 A/m	≥340	
P_V	100 °C; 100 kHz; 100 mT	≤60	kW/m³
	100 °C; 100 kHz; 200 mT	≤400	
ρ	DC, 25 °C	≈5	Ωm
T_C		≥220	°C
density		≈4800	kg/m³

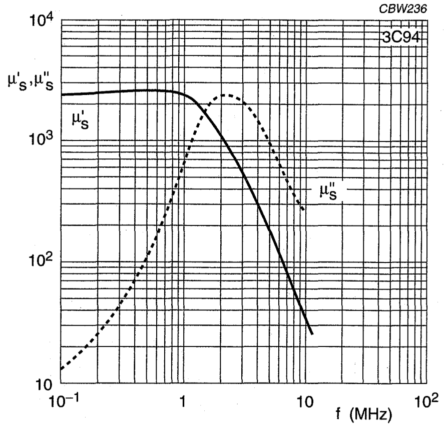


Fig.1 Complex permeability as a function of frequency.

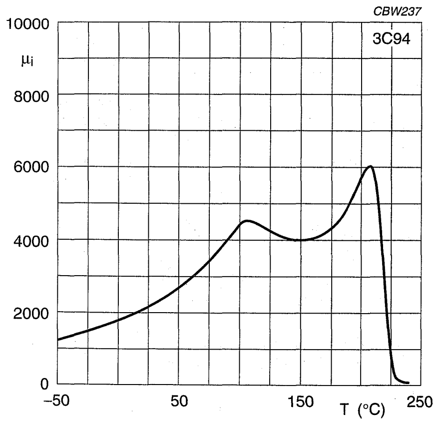


Fig.2 Initial permeability as a function of temperature.

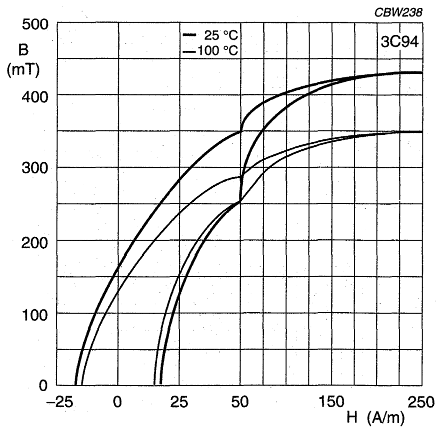


Fig.3 Typical B-H loops.

Material grade specification 3C94

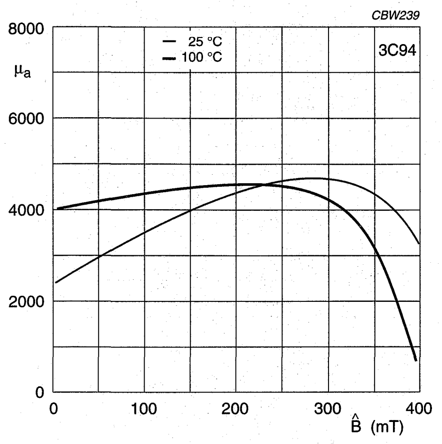


Fig.4 Amplitude permeability as a function of peak flux density.

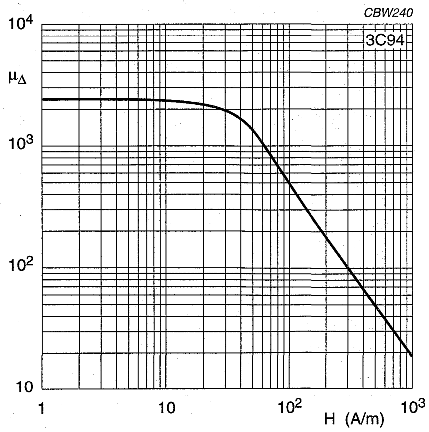


Fig.5 Incremental permeability as a function of magnetic field strength.

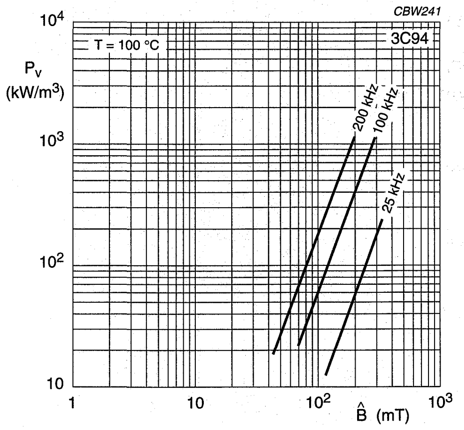


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

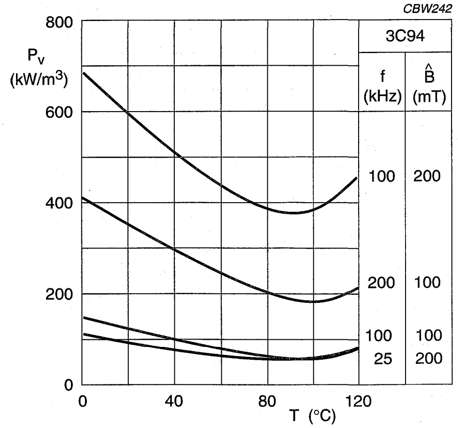


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Preliminary material grade specification 3C96

3C96 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈5500	
B	25 °C; 10 kHz; 250 A/m	≥430	mT
	100 °C; 10 kHz; 250 A/m	≥370	
P_V	100 °C; 100 kHz; 100 mT	≤45	kW/m³
	100 °C; 100 kHz; 200 mT	≤330	
	100 °C; 400 kHz; 50 mT	≤140	
ρ	DC; 25 °C	≈5	Ωm
T_C		≥240	°C
density		≈4800	kg/m³

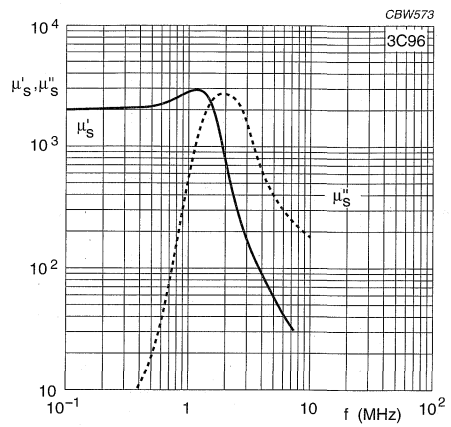


Fig.1 Complex permeability as a function of frequency.

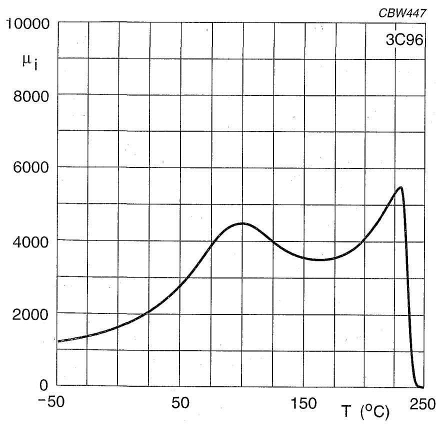


Fig.2 Initial permeability as a function of temperature.

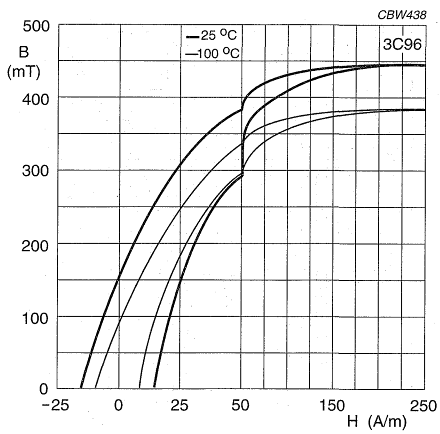


Fig.3 Typical B-H loops.

Preliminary material grade specification 3C96

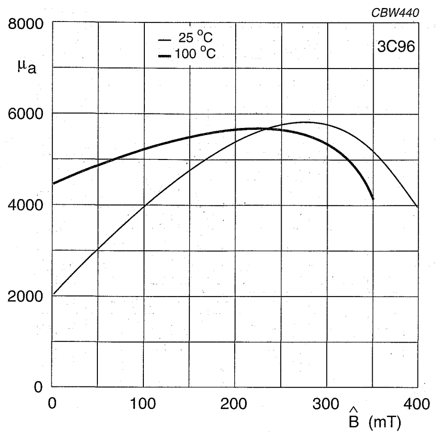


Fig.4 Amplitude permeability as a function of peak flux density.

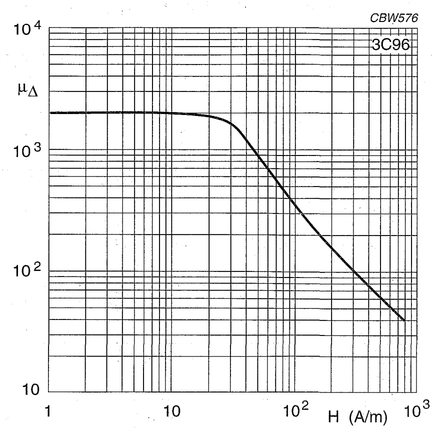


Fig.5 Incremental permeability as a function of magnetic field strength.

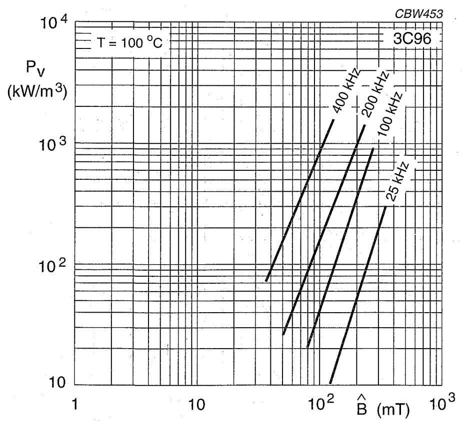


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

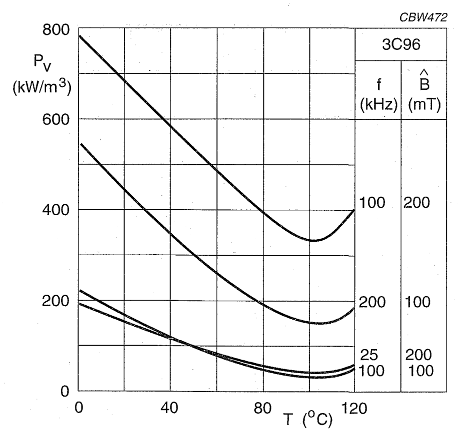


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3D3

3D3 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	750 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈320	mT
	100 °C; 10 kHz; 250 A/m	≈260	
$\tan\delta/\mu_i$	25 °C; 300 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
	25 °C; 1 MHz; 0.1 mT	$\leq 30 \times 10^{-6}$	
η_B	25 °C; 100 kHz; 1.5 to 3 mT	$\leq 1.8 \times 10^{-3}$	T^{-1}
D_F	25 °C; 10 kHz; 0.1 mT	$\leq 12 \times 10^{-6}$	
α_F	25 to 70 °C; ≤10 kHz; 0.1 mT	$(1.5 \pm 1) \times 10^{-6}$	K^{-1}
ρ	DC; 25 °C	≈2	Ωm
T_C		≥200	°C
density		≈4700	kg/m³

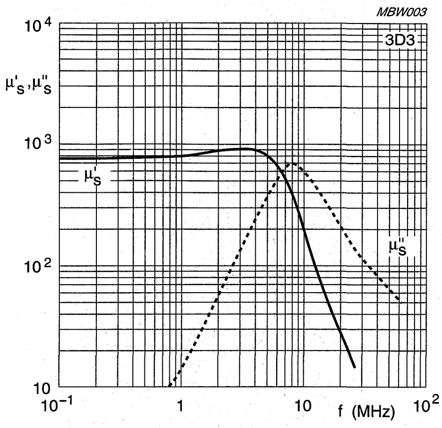


Fig.1 Complex permeability as a function of frequency.

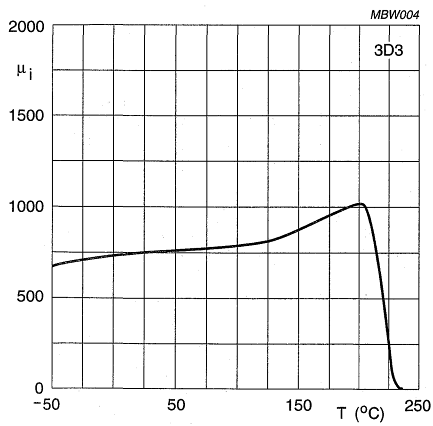


Fig.2 Initial permeability as a function of temperature.

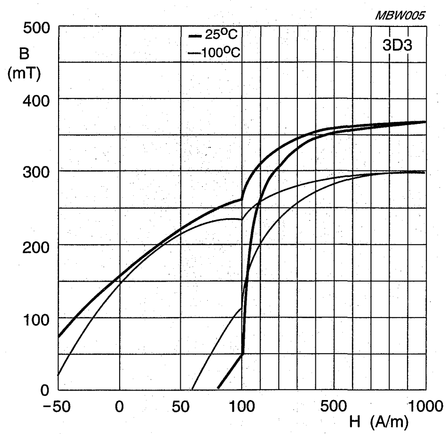


Fig.3 Typical B-H loops.

Material grade specification 3D3

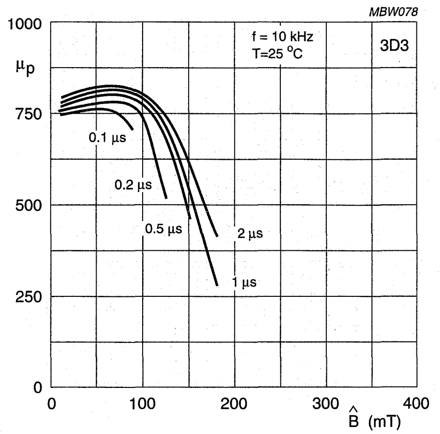


Fig.4 Pulse characteristics (unipolar pulses).

3E1 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	3800 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈350	mT
	100 °C; 10 kHz; 250 A/m	≈200	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 20 \times 10^{-6}$	
	25 °C; 300 kHz; 0.1 mT	$\leq 150 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1.2 \times 10^{-3}$	T^{-1}
D_F	25 °C; 10 kHz; 0.1 mT	$\leq 5 \times 10^{-6}$	
ρ	DC; 25 °C	≈1	Ωm
T_C		≥125	°C
density		≈4800	kg/m³

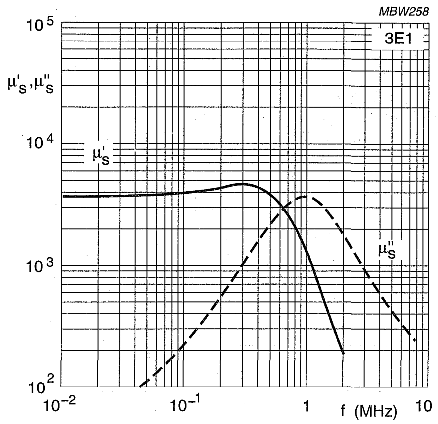


Fig.1 Complex permeability as a function of frequency.

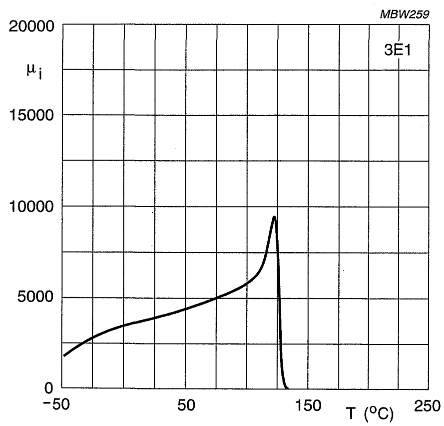


Fig.2 Initial permeability as a function of temperature.

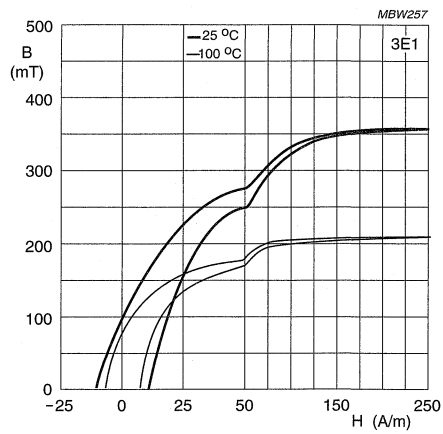


Fig.3 Typical B-H loops.

Material grade specification 3E1

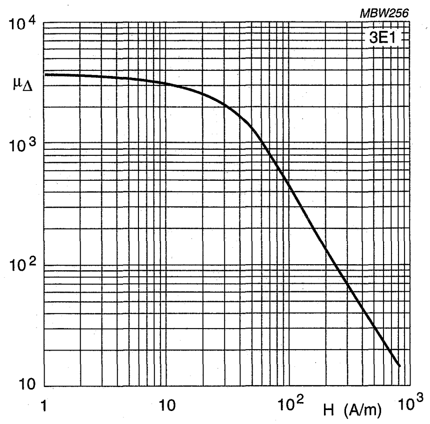


Fig.4 Incremental permeability as a function of magnetic field strength.

3E25 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	6000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈350	mT
	100 °C; 10 kHz; 250 A/m	≈180	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 25 \times 10^{-6}$	
	25 °C; 300 kHz; 0.1 mT	$\leq 200 \times 10^{-6}$	
ρ	DC; 25 °C	≈0.5	Ωm
T_C		≥125	°C
density		≈4900	kg/m^3

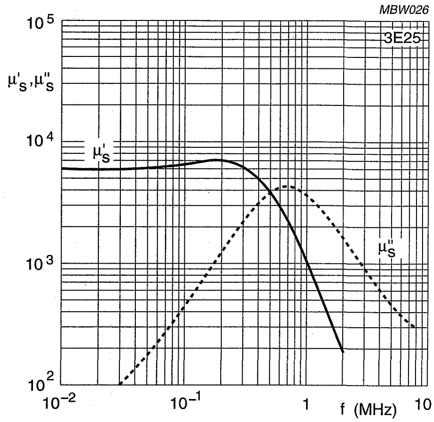


Fig.1 Complex permeability as a function of frequency.

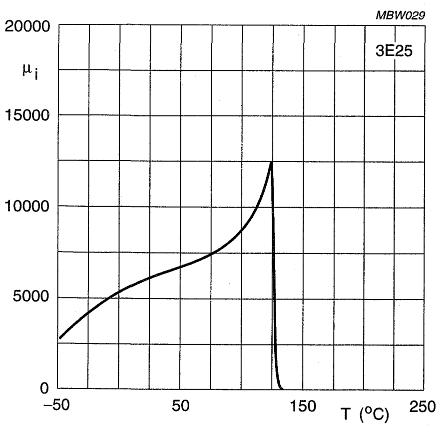


Fig.2 Initial permeability as a function of temperature.

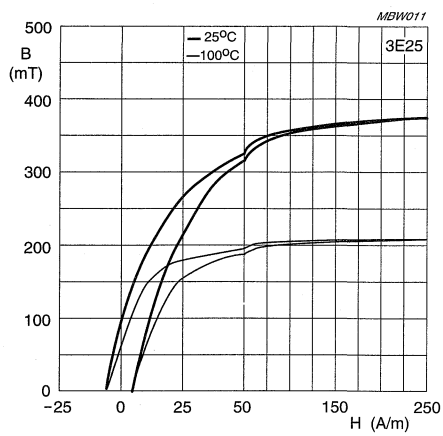


Fig.3 Typical B-H loops.

Material grade specification

3E25

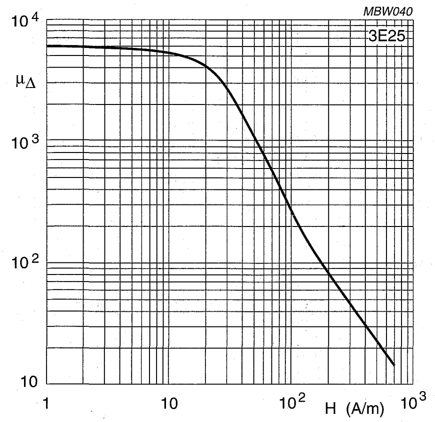


Fig.4 Incremental permeability as a function of magnetic field strength.

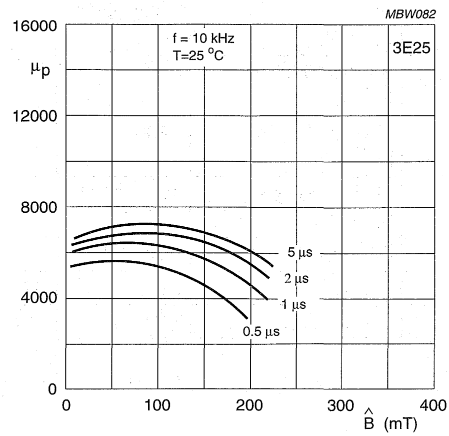


Fig.5 Pulse characteristics (unipolar pulses).

3E26 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	7000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈400	mT
	100 °C; 10 kHz; 250 A/m	≈290	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 20 \times 10^{-6}$	
ρ	DC; 25 °C	≈0.5	Ωm
T_C		≥155	°C
density		≈4900	kg/m^3

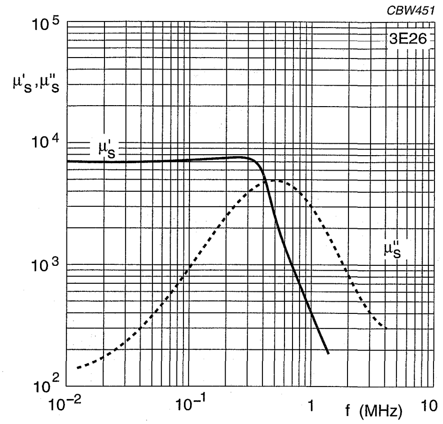


Fig.1 Complex permeability as a function of frequency.

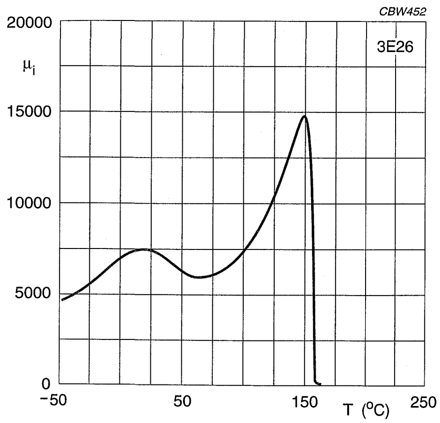


Fig.2 Initial permeability as a function of temperature.

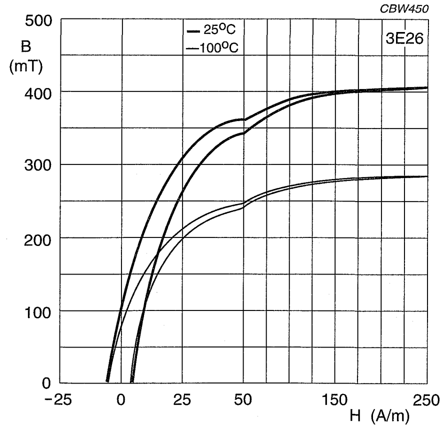


Fig.3 Typical B-H loops.

Material grade specification 3E26

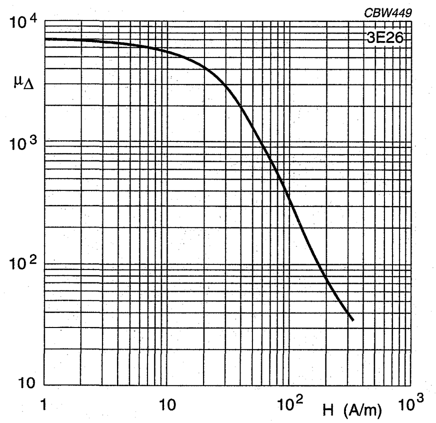


Fig.4 Incremental permeability as a function of magnetic field strength.

3E27 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	6000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈400	mT
	100 °C; 10 kHz; 250 A/m	≈250	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 15 \times 10^{-6}$	
ρ	DC; 25 °C	≈0.5	Ωm
T_C		≥150	°C
density		≈4800	kg/m³

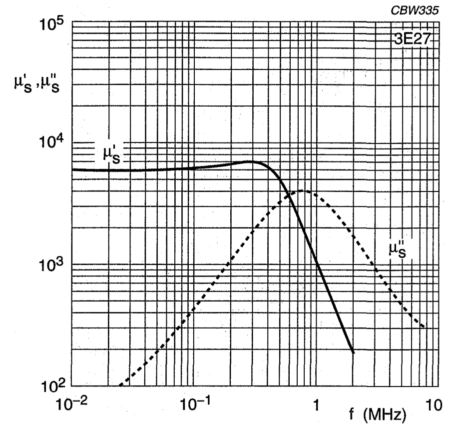


Fig.1 Complex permeability as a function of frequency.

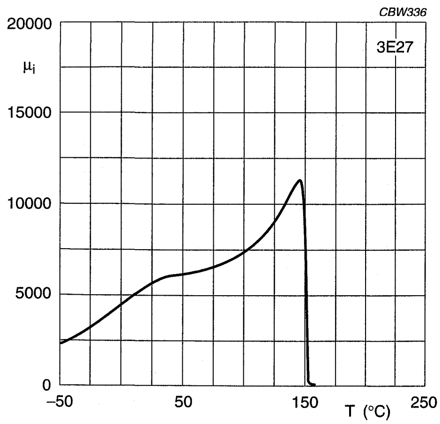


Fig.2 Initial permeability as a function of temperature.

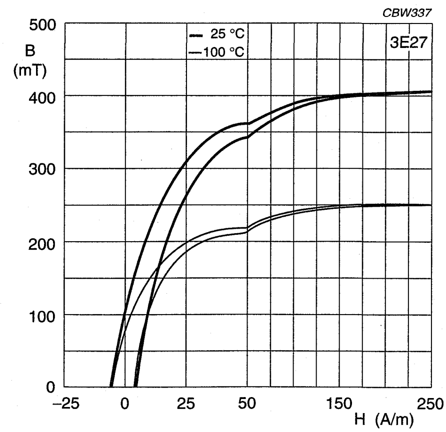


Fig.3 Typical B-H loops.

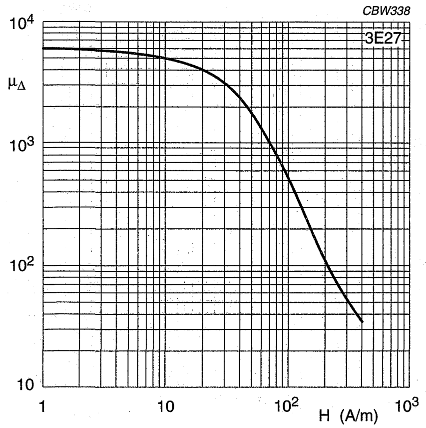


Fig.4 Incremental permeability as a function of magnetic field strength.

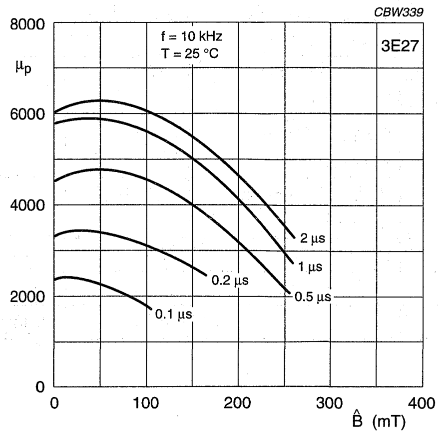


Fig.5 Pulse characteristics (unipolar pulses).

Material grade specification 3E28

3E28 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	4000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈400	mT
	100 °C; 10 kHz; 250 A/m	≈260	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 5 \times 10^{-6}$	
ρ	DC; 25 °C	≈1	Ωm
T_C		≥145	°C
density		≈4800	kg/m^3

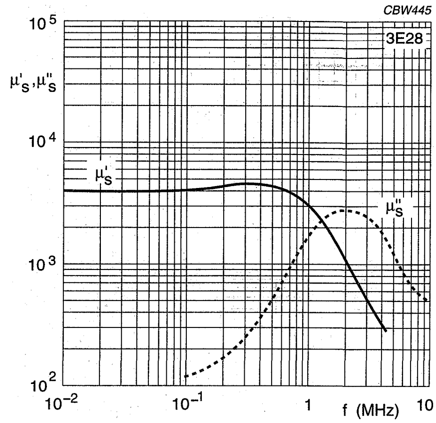


Fig.1 Complex permeability as a function of frequency.

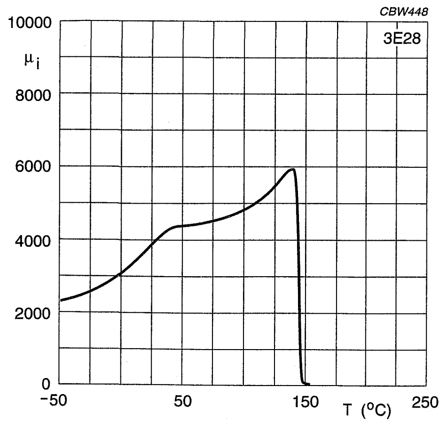


Fig.2 Initial permeability as a function of temperature.

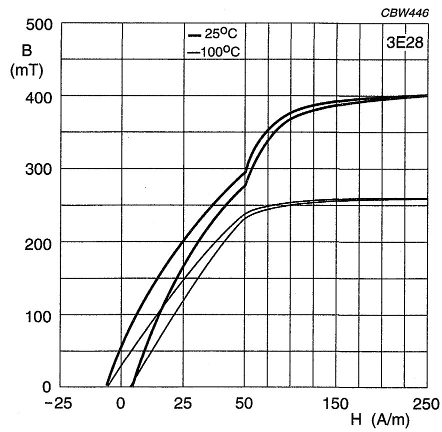


Fig.3 Typical B-H loops.

Material grade specification 3E28

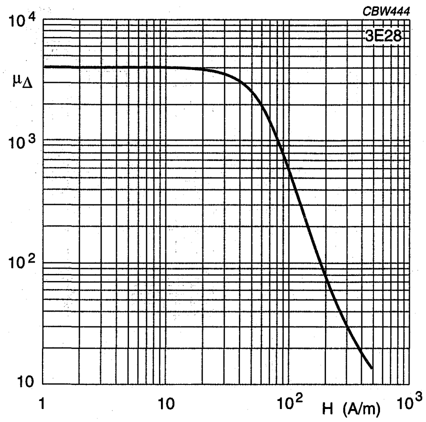


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3E4

3E4 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	4700 ±20%	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈360 ≈210	mT
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT 25 °C; 300 kHz; 0.1 mT	$\leq 20 \times 10^{-6}$ $\leq 150 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
D_F	25 °C; 10 kHz; 0.1 mT	$\leq 5 \times 10^{-6}$	
ρ	DC; 25 °C	≈1	Ωm
T_C		≥125	°C
density		≈4800	kg/m^3

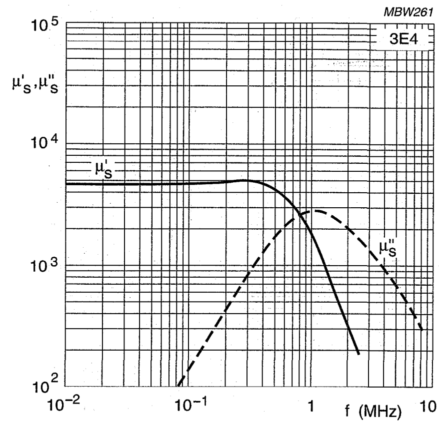


Fig.1 Complex permeability as a function of frequency.

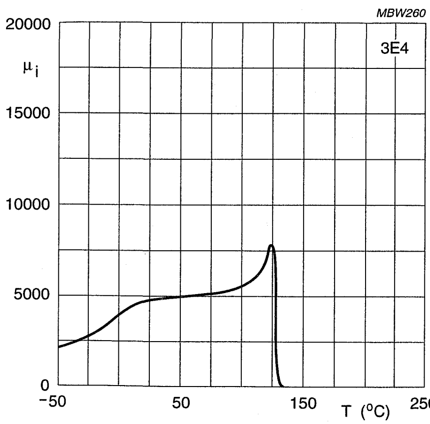


Fig.2 Initial permeability as a function of temperature.

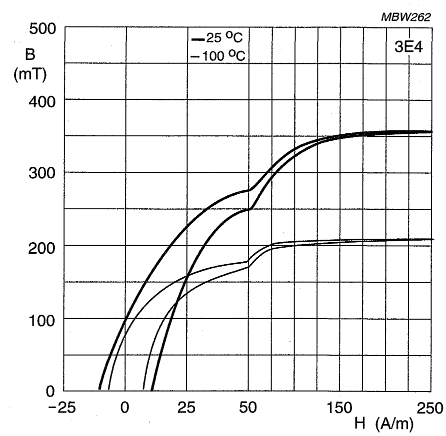


Fig.3 Typical B-H loops.

Material grade specification 3E4

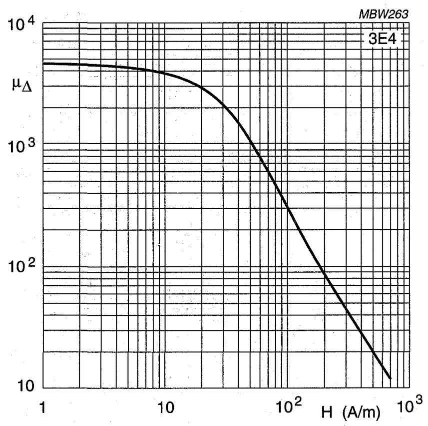


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3E5

3E5 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	10000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈380	mT
	100 °C; 10 kHz; 250 A/m	≈210	
$\tan\delta/\mu_i$	25 °C; 30 kHz; 0.1 mT	$\leq 25 \times 10^{-6}$	
	25 °C; 100 kHz; 0.1 mT	$\leq 75 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈0.5	Ωm
T_C		≥125	°C
density		≈4900	kg/m^3

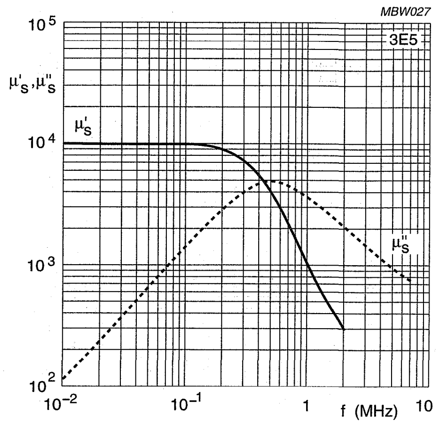


Fig.1 Complex permeability as a function of frequency.

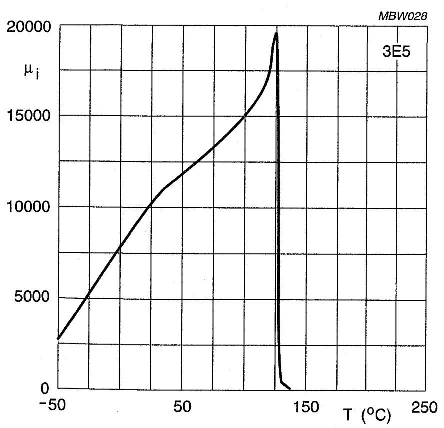


Fig.2 Initial permeability as a function of temperature.

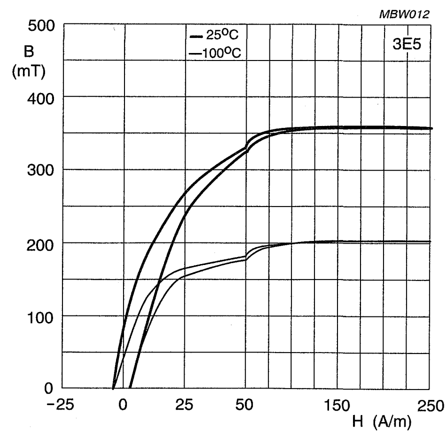


Fig.3 Typical B-H loops.

Material grade specification 3E5

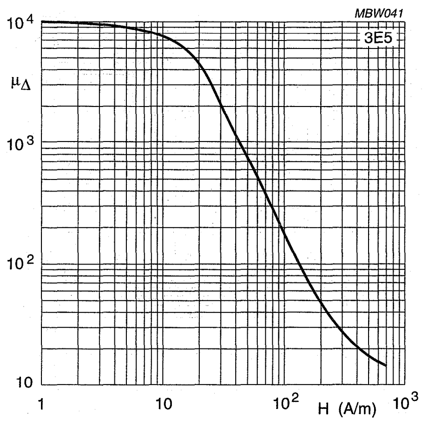


Fig.4 Incremental permeability as a function of magnetic field strength.

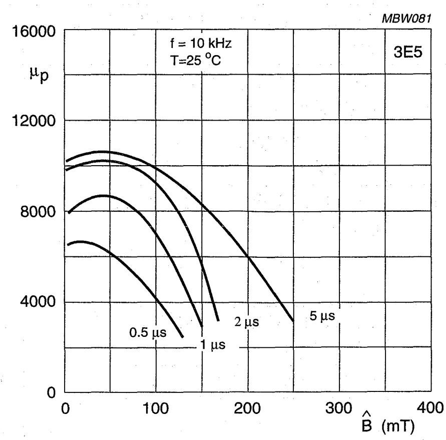


Fig.5 Pulse characteristics (unipolar pulses).

Preliminary material grade specification 3E55

3E55 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	10000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈350	mT
	100 °C; 10 kHz; 250 A/m	≈200	
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
	25 °C; 30 kHz; 0.1 mT	$\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 0.2 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈0.1	Ωm
T_C		≥100	°C
density		≈5000	kg/m^3

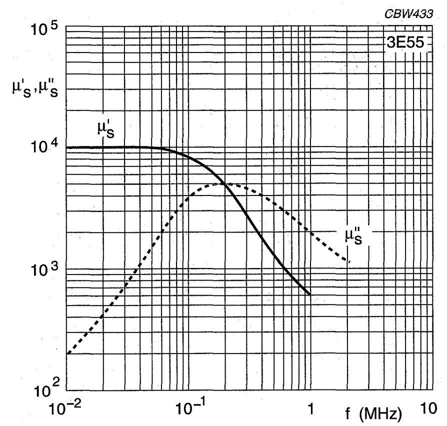


Fig.1 Complex permeability as a function of frequency.

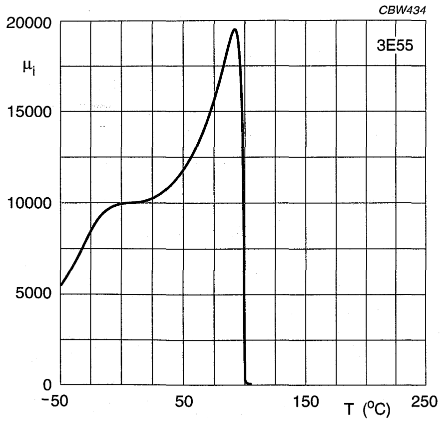


Fig.2 Initial permeability as a function of temperature.

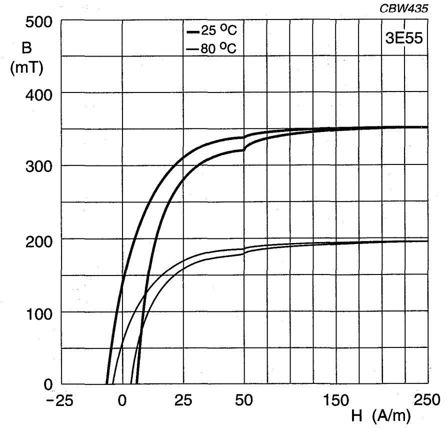


Fig.3 Typical B-H loops.

Material grade specification — 3E6

3E6 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE(1)	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	12000 ±20%	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈380 ≈210	mT
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT 25 °C; 30 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈0.1	Ωm
T_C		≥130	°C
density		≈4900	kg/m^3

Note

1. Measured on sintered, non-ground ring cores of dimensions Ø14 × Ø9 × 5 which are not subjected to external stresses.

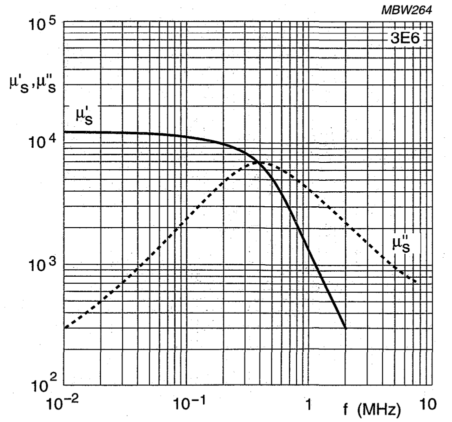


Fig.1 Complex permeability as a function of frequency.

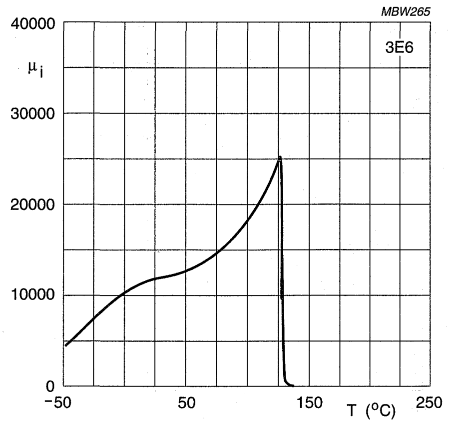


Fig.2 Initial permeability as a function of temperature.

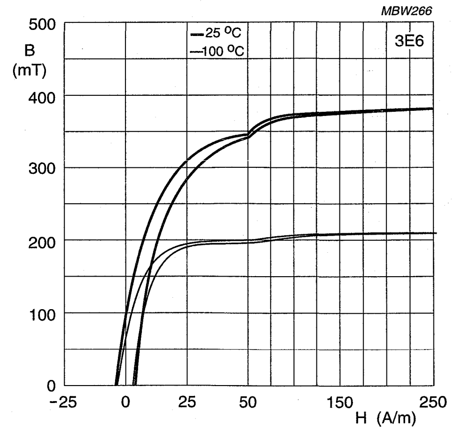


Fig.3 Typical B-H loops.

Material grade specification 3E6

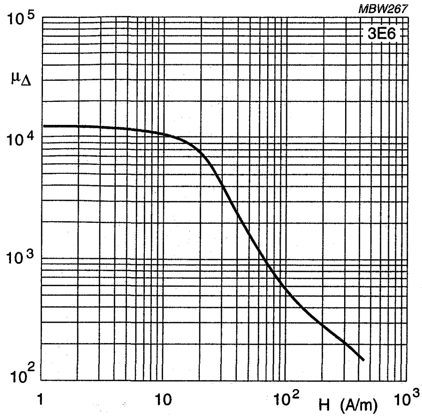


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3E7

3E7 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE(1)	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	15000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈380	mT
	100 °C; 10 kHz; 250 A/m	≈210	
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
	25 °C; 30 kHz; 0.1 mT	$\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈0.1	Ωm
T_C		≥130	°C
density		≈4900	kg/m^3

Note

1. Measured on sintered, non-ground ring cores of dimensions Ø14 × Ø9 × 5 which are not subjected to external stresses.

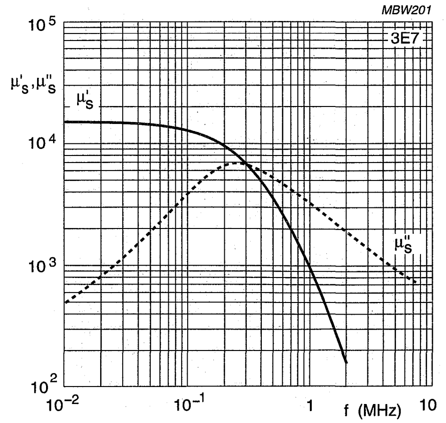


Fig.1 Complex permeability as a function of frequency.

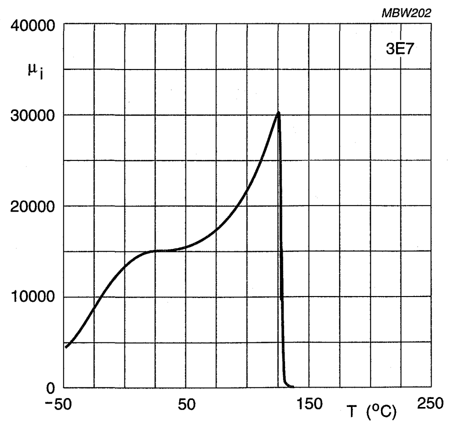


Fig.2 Initial permeability as a function of temperature.

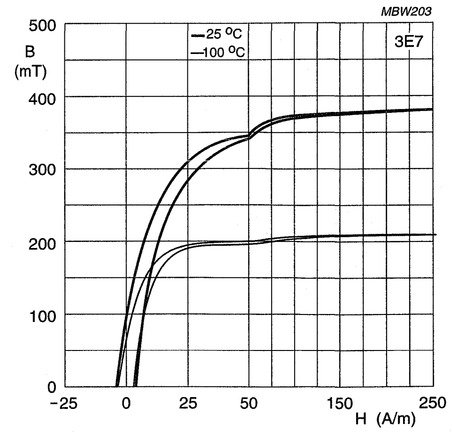


Fig.3 Typical B-H loops.

Material grade specification 3E7

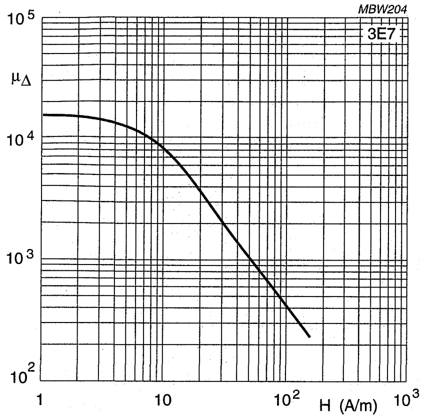


Fig.4 Incremental permeability as a function of magnetic field strength.

Preliminary material grade specification 3E8

3E8 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE[1]	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	18000 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈350	mT
	100 °C; 10 kHz; 250 A/m	≈150	
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
	25 °C; 30 kHz; 0.1 mT	$\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈0.1	Ωm
T_C		≥100	°C
density		≈5000	kg/m^3

Note

1. Measured on sintered, non-ground ring cores of dimensions Ø14 × Ø9 × 5 which are not subjected to external stresses.

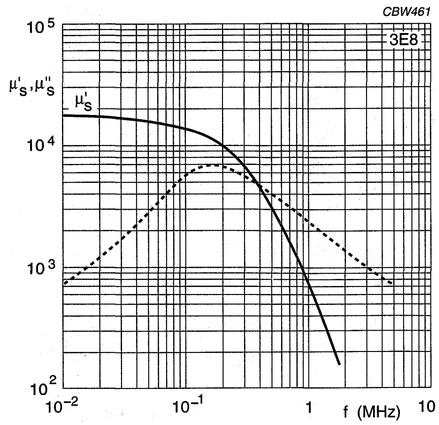


Fig.1 Complex permeability as a function of frequency.

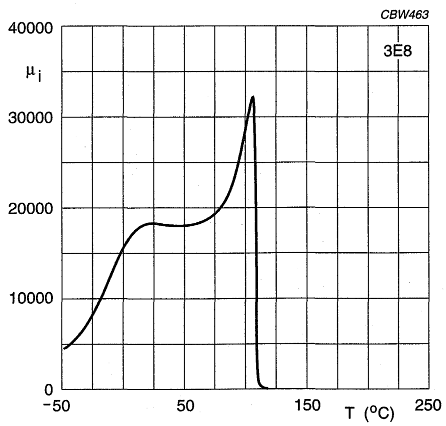


Fig.2 Initial permeability as a function of temperature.

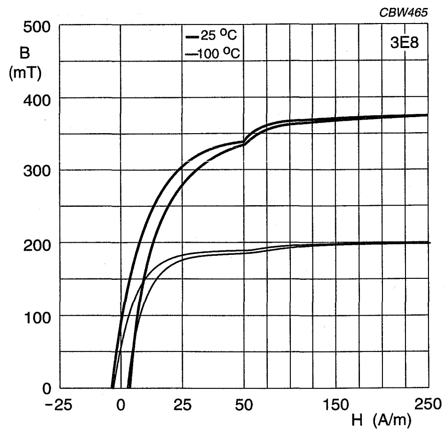


Fig.3 Typical B-H loops.

Preliminary material grade specification 3E8

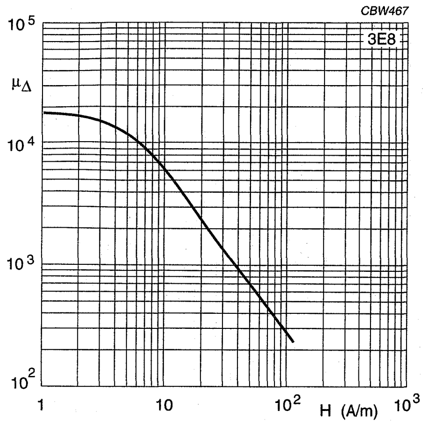


Fig.4 Incremental permeability as a function of magnetic field strength.

Material grade specification 3F3

3F3 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈4000	
B	25 °C; 10 kHz; 250 A/m	≥400	mT
	100 °C; 10 kHz; 250 A/m	≥330	
P_V	100 °C; 100 kHz; 100 mT	≤80	kW/m³
	100 °C; 400 kHz; 50 mT	≤150	
ρ	DC; 25 °C	≈2	Ωm
T_C		≥200	°C
density		≈4750	kg/m³

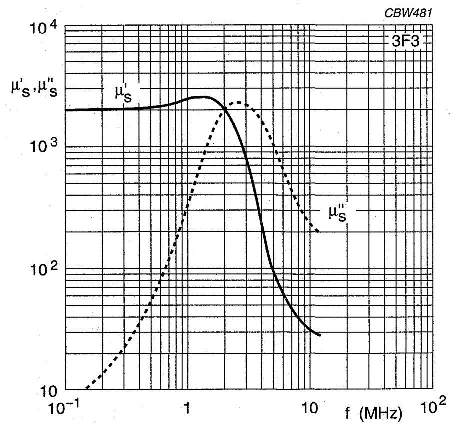


Fig.1 Complex permeability as a function of frequency.

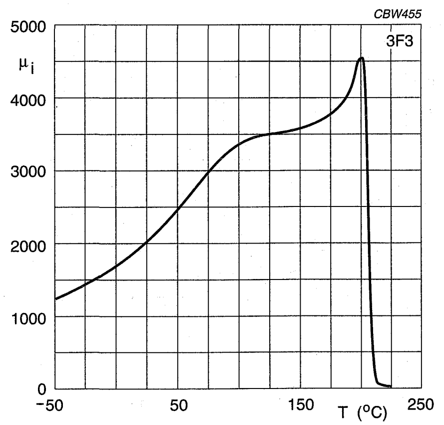


Fig.2 Initial permeability as a function of temperature.

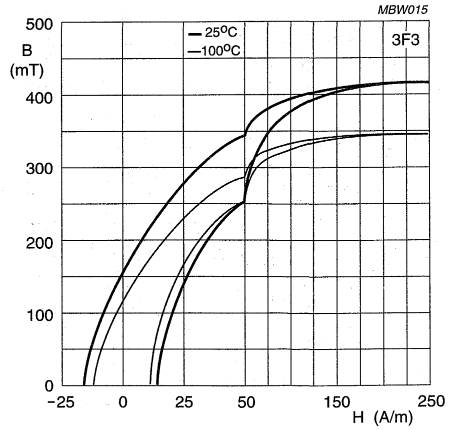


Fig.3 Typical B-H loops.

Material grade specification 3F3

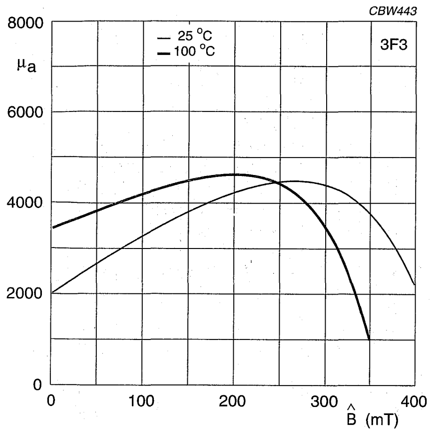


Fig.4 Amplitude permeability as function of peak flux density.

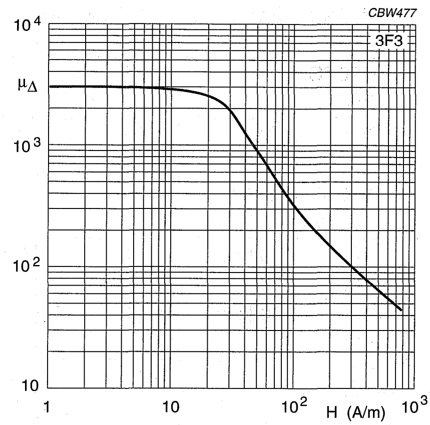


Fig.5 Incremental permeability as a function of magnetic field strength.

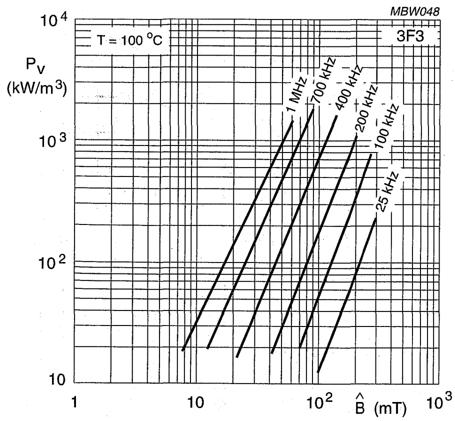


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

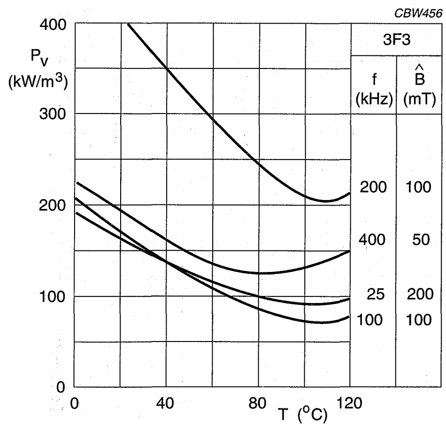


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3F35

3F35 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1400 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈2500	
B	25 °C; 10 kHz; 250 A/m	≥400	mT
	100 °C; 10 kHz; 250 A/m	≥330	
P	100 °C; 400 kHz; 50 mT	≤80	kW/m^3
	100 °C; 500 kHz; 50 mT	≤120	
	100 °C; 500 kHz; 100 mT	≈800	
ρ	DC; 25 °C	≈10	Ωm
T_C		≥240	°C
density		≈4750	kg/m^3

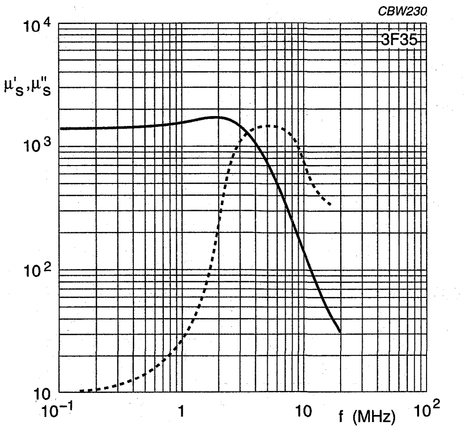


Fig.1 Complex permeability as a function of frequency.

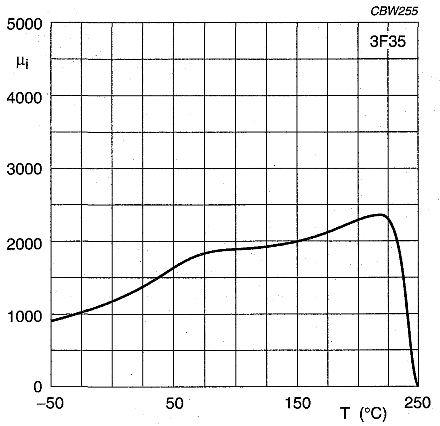


Fig.2 Initial permeability as a function of temperature.

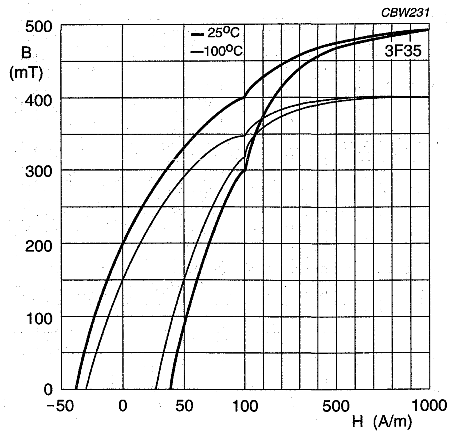


Fig.3 Typical B-H loops.

Material grade specification 3F35

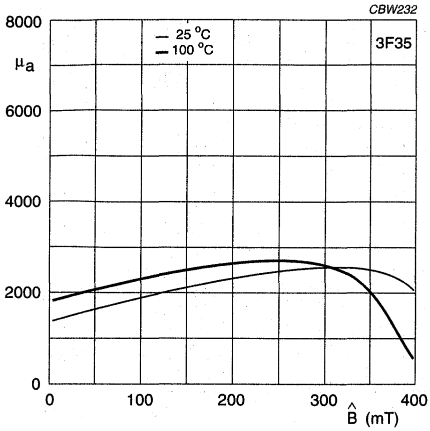


Fig.4 Amplitude permeability as function of peak flux density.

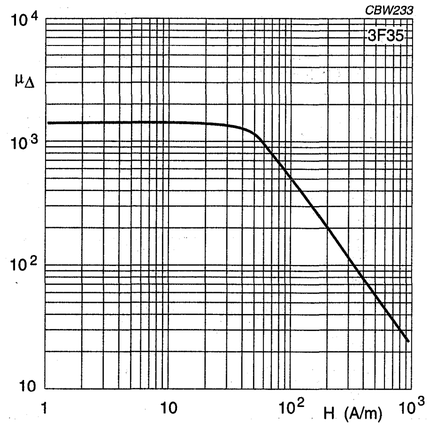


Fig.5 Incremental permeability as a function of magnetic field strength.

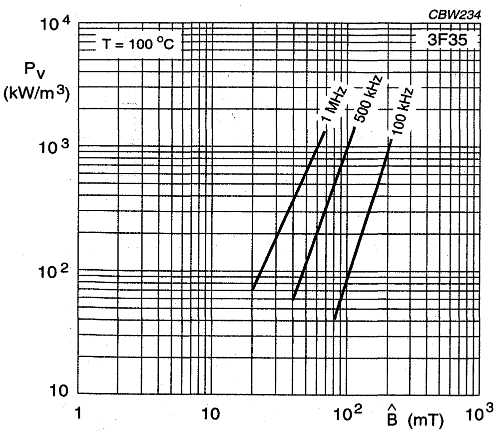


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

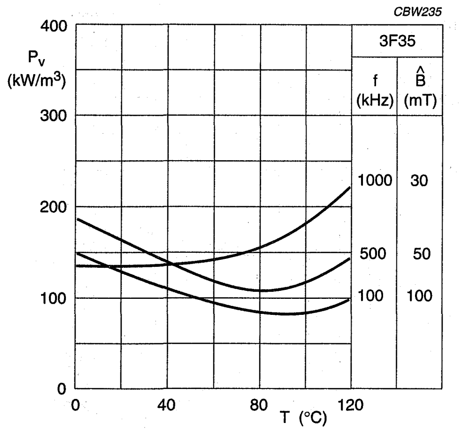


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3F4

3F4 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	900 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈1700	
B	25 °C; 10 kHz; 250 A/m	≥350	mT
	100 °C; 10 kHz; 250 A/m	≥300	
P_V	100 °C; 1 MHz; 30 mT	≤200	kW/m³
	100 °C; 3 MHz; 10 mT	≤320	
ρ	DC; 25 °C	≈10	Ωm
T_C		≥220	°C
density		≈4700	kg/m³

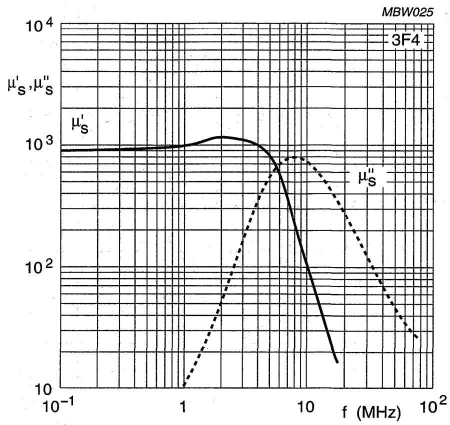


Fig.1 Complex permeability as a function of frequency.

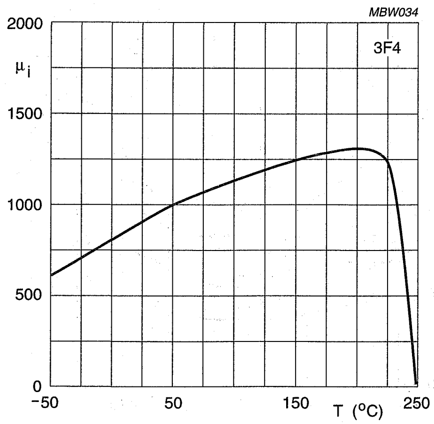


Fig.2 Initial permeability as a function of temperature.

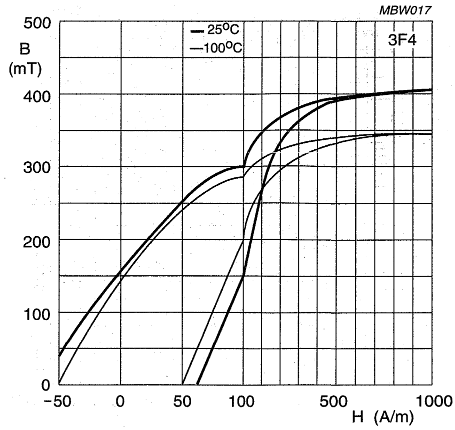


Fig.3 Typical B-H loops.

Material grade specification 3F4

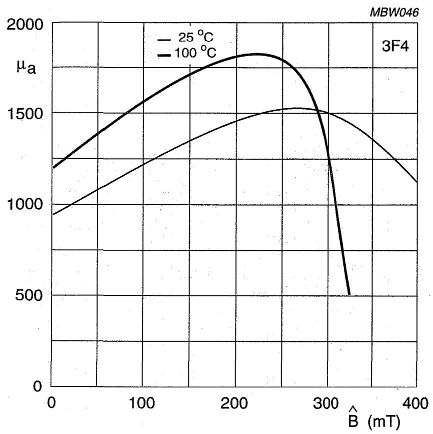


Fig.4 Amplitude permeability as function of peak flux density.

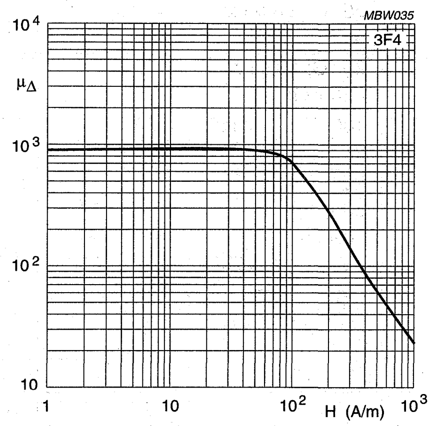


Fig.5 Incremental permeability as a function of magnetic field strength.

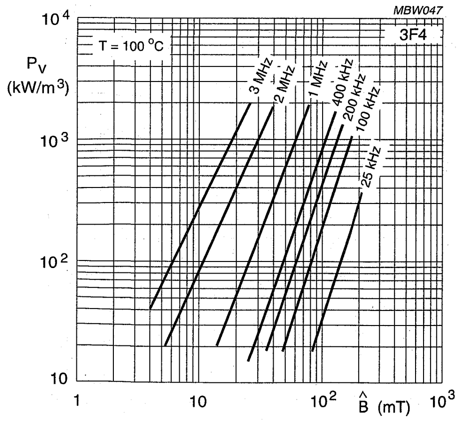


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

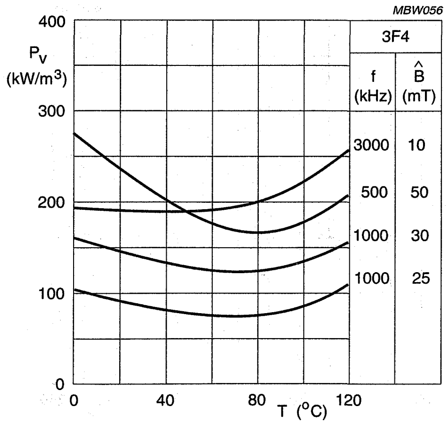


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3H3

3H3 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
B	25 °C; 10 kHz; 250 A/ m 100 °C; 10 kHz; 250 A/ m	≈330 ≈250	mT
$\tan\delta/\mu_i$	25 °C; 0.1 mT: 30 kHz 100 kHz	 $\leq 1.6 \times 10^{-6}$ $\leq 2.5 \times 10^{-6}$	
η_B	25 °C; 100 kHz; 1.5 to 3 mT	$\leq 0.6 \times 10^{-3}$	T^{-1}
D_F	0.1 mT; 10 kHz: 25 °C 40 °C	 $\leq 3 \times 10^{-6}$ $\leq 3 \times 10^{-6}$	
α_F	≤10 kHz; 0.1 mT: 5 to 25 °C 25 to 55 °C 25 to 70 °C	 $(0.7 \pm 0.3) \times 10^{-6}$ $(0.7 \pm 0.3) \times 10^{-6}$ $(0.7 \pm 0.3) \times 10^{-6}$	K^{-1}
ρ	DC; 25 °C	≈2	Ωm
T_C		≥160	°C
density		≈4700	kg/m^3

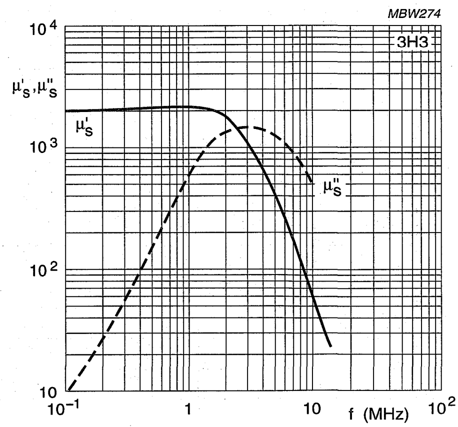


Fig.1 Complex permeability as a function of frequency.

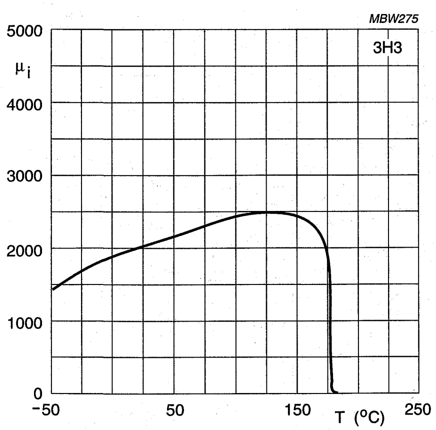


Fig.2 Initial permeability as a function of temperature.

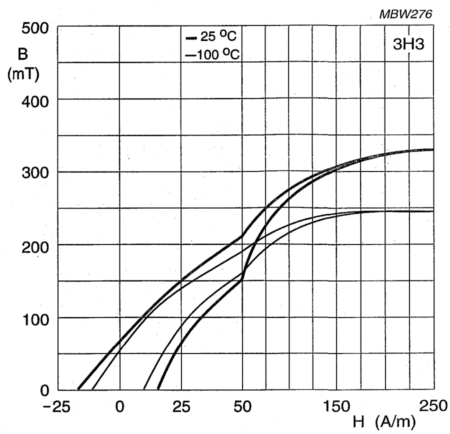


Fig.3 Typical B-H loops.

Material grade specification 3R1

3R1 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	800 ±20%	
B	25 °C; 10 kHz; 250 A/ m	≥360	mT
	100 °C; 10 kHz; 250 A/ m	≥285	
B_r	from 1 kA/m; 25 °C	≥310	mT
	from 1 kA/m; 100 °C	≥220	
H_c	from 1 kA/m; 25 °C	≤52	A/m
	from 1 kA/m; 100 °C	≤23	
ρ	DC; 25 °C	≈10^3	Ωm
T_C		≥230	°C
density		≈4700	kg/m^3

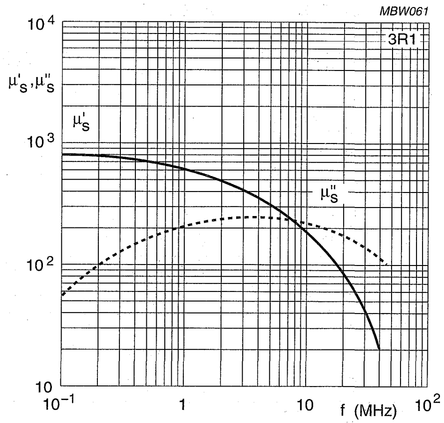


Fig.1 Complex permeability as a function of frequency.

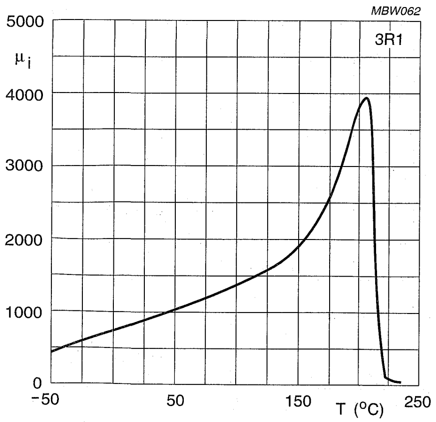


Fig.2 Initial permeability as a function of temperature.

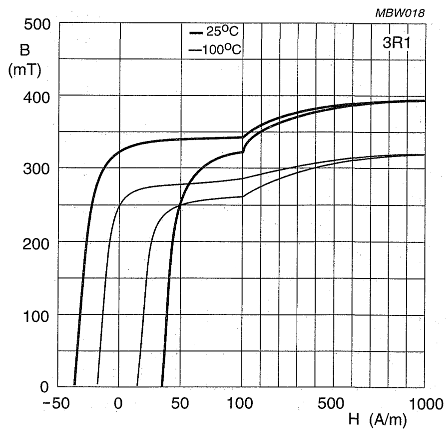


Fig.3 Typical B-H loops.

Material grade specification 3R1

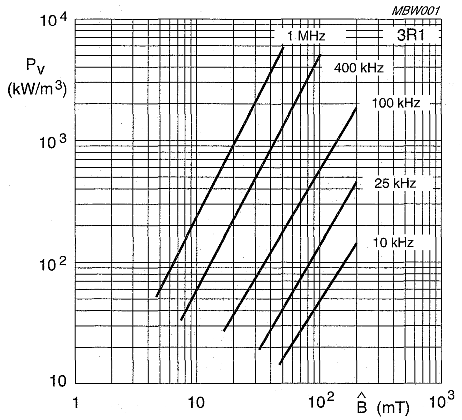


Fig.4 Specific power loss as a function of peak flux density with frequency as a parameter.

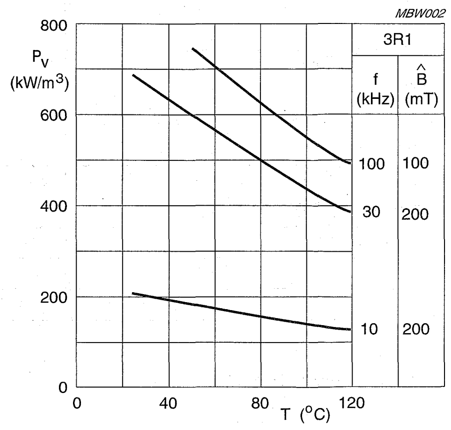


Fig.5 Specific power loss for several frequency/flux density combinations as a function of temperature.

Remark:

When 3R1 ring cores are driven exactly at their natural mechanical resonant frequencies a magneto-elastic resonance will occur. With large flux excursions and no mechanical damping, amplitudes can become so high that the maximum tensile stress of the ferrite is exceeded. Cracks or even breakage of the ring core could be the result. It is advised not to drive the toroidal cores at their radial resonant frequencies or even subharmonics (e.g. half this resonant frequency).

Resonant frequencies can be calculated for any ring core with the following simple formula:

$$f_r = \frac{5700}{\pi\left(\frac{D_o + D_i}{2}\right)} \text{ kHz}$$

where:

f = radial resonant frequency (kHz)

D_o = outside diameter (mm)

D_i = inside diameter (mm).

Material grade specification 3S1

3S1 SPECIFICATIONS

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

Note

1. Measured on a bead ∅5 × ∅2 × 10 mm.

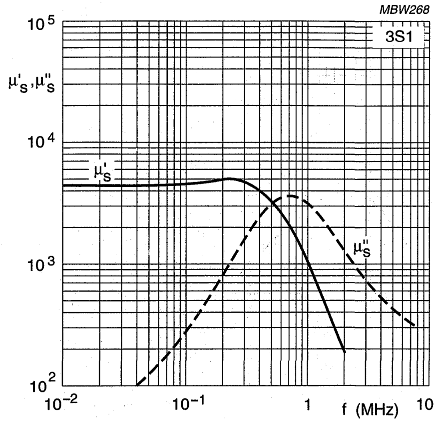


Fig.1 Complex permeability as a function of frequency.

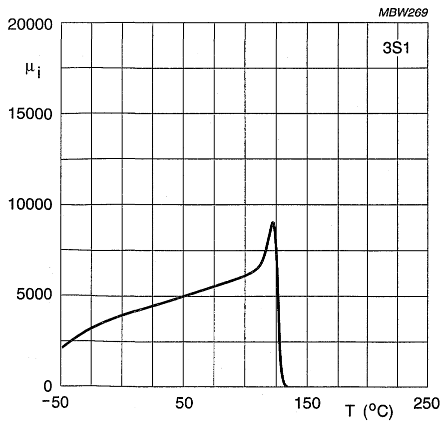


Fig.2 Initial permeability as a function of temperature.

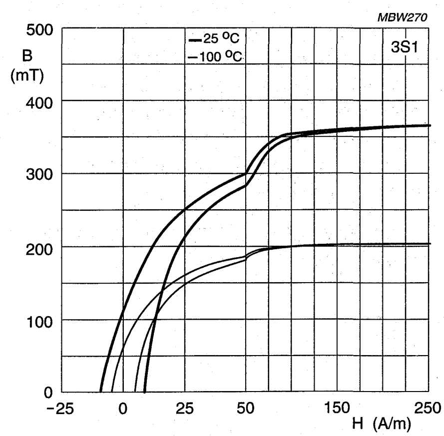


Fig.3 Typical B-H loops.

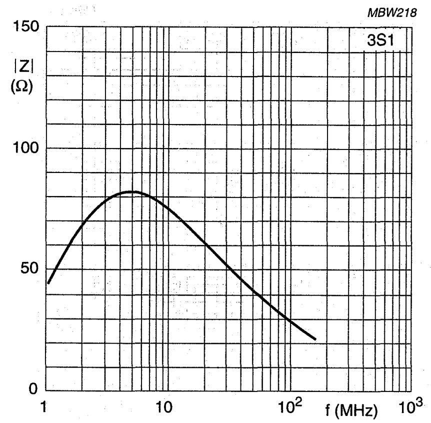


Fig.3 Impedance as a function of frequency.

Material grade specification 3S3

3S3 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈350	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈250	
|Z| (1)	25 °C; 30 MHz	≥25	Ω
	25 °C; 100 MHz	≥60	
	25 °C; 300 MHz	≥100	
ρ	DC; 25 °C	$\approx 10^4$	Ωm
T_C		≥225	°C
density		≈4800	kg/m^3

Note

1. Measured on a bead ∅5 × ∅2 × 10 mm.

Remark: This wideband EMI-suppression material is optimized for applications with high bias currents at elevated temperatures (e.g. rods for chokes in commutation motors).

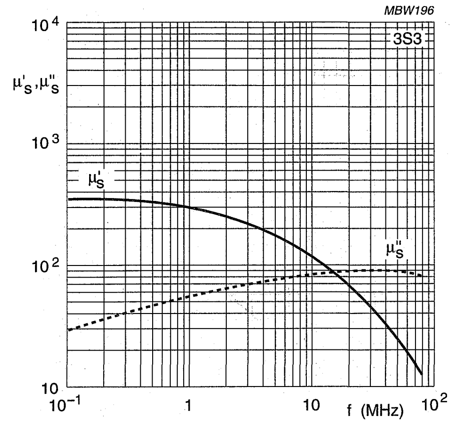


Fig.1 Complex permeability as a function of frequency.

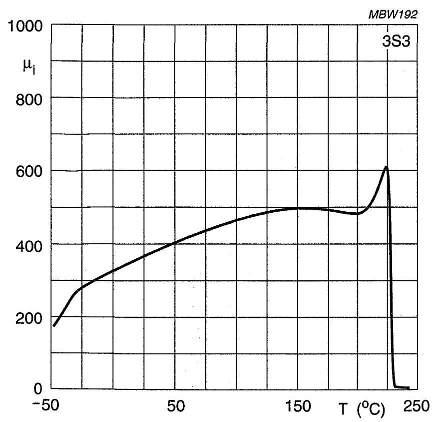


Fig.2 Initial permeability as a function of temperature.

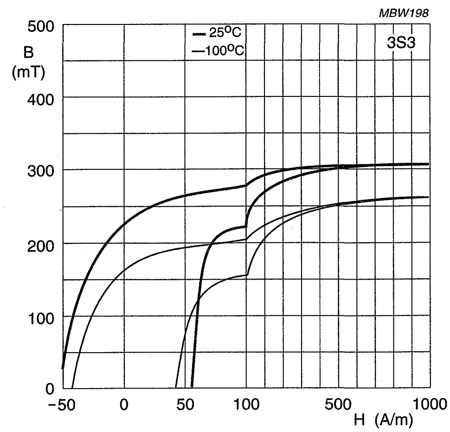


Fig.3 Typical B-H loops.

Material grade specification 3S3

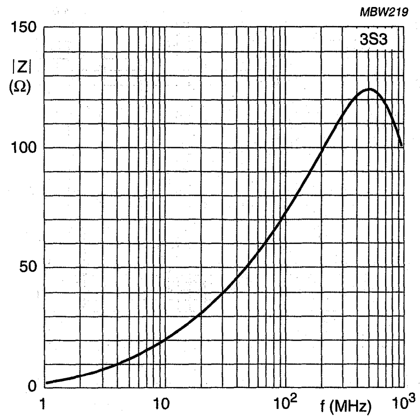


Fig.4 Impedance as a function of frequency.

Material grade specification 3S4

3S4 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈1700	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈140	
|Z|(1)	25 °C; 3 MHz	≥25	Ω
	25 °C; 30 MHz	≥60	
	25 °C; 100 MHz	≥80	
	25 °C; 300 MHz	≥90	
ρ	DC; 25 °C	$\approx 10^3$	Ωm
T_C		≥110	°C
density		≈4800	kg/m^3

Note

1. Measured on a bead ∅5× ∅2 × 10 mm.

Remark: This wideband EMI-suppression material is optimized for applications without bias currents at moderate temperatures (e.g. common-mode chokes).

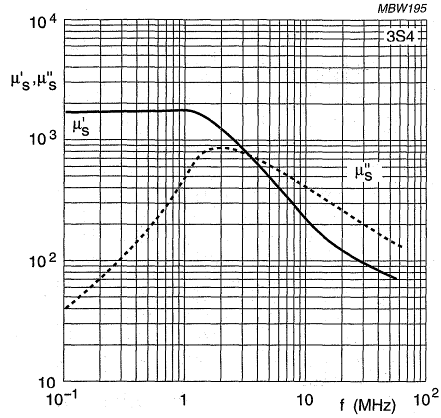


Fig.1 Complex permeability as a function of frequency.

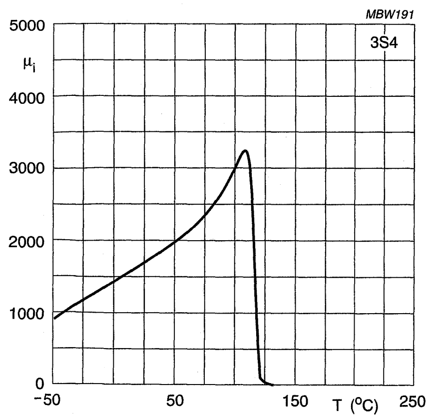


Fig.2 Initial permeability as a function of temperature.

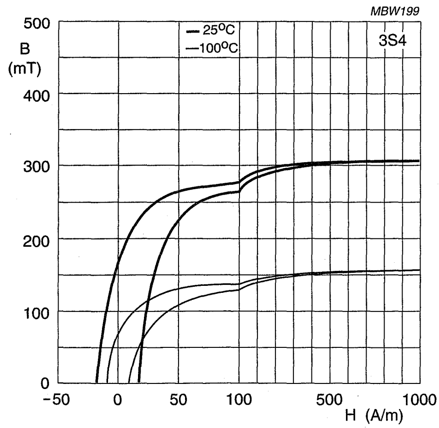


Fig.3 Typical B-H loops.

Material grade specification 3S4

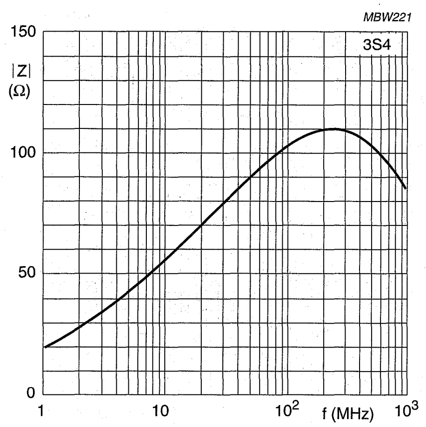


Fig.4 Impedance as a function of frequency.

Material grade specification 4A11

4A11 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	700 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈270	mT
	100 °C; 10 kHz; 250 A/m	≈180	
$\tan\delta/\mu_i$	25 °C; 1 MHz; 0.1 mT	$\leq 100 \times 10^{-6}$	
	25 °C; 3 MHz; 0.1 mT	$\leq 1000 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥125	°C
density		≈5100	kg/m^3

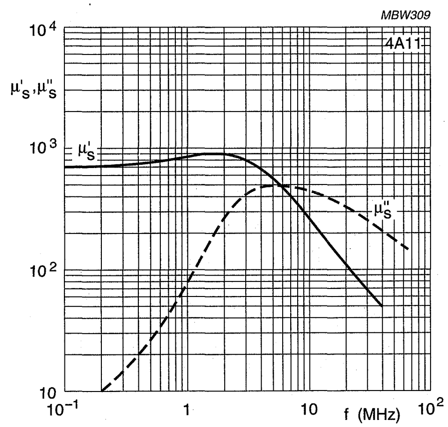


Fig.1 Complex permeability as a function of frequency.

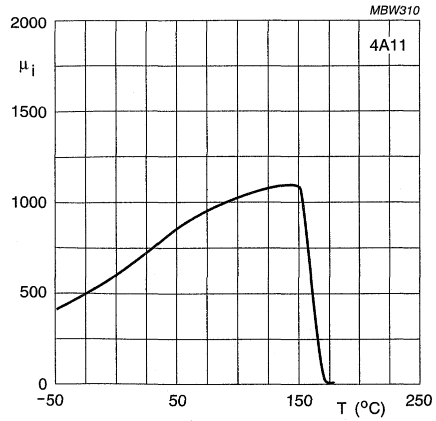


Fig.2 Initial permeability as a function of temperature.

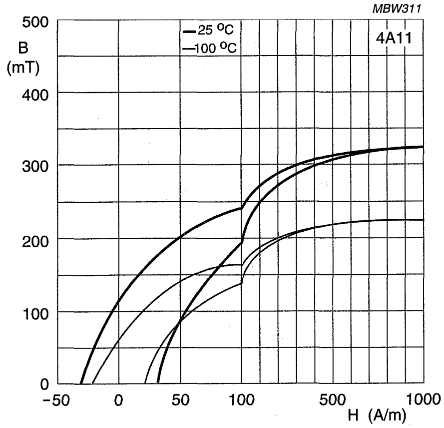


Fig.3 Typical B-H loops.

4A15 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1200 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈180	
$\tan\delta/\mu_i$	25 °C; 1 MHz; 0.1 mT	$\leq 300 \times 10^{-6}$	
	25 °C; 3 MHz; 0.1 mT	$\leq 1500 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥125	°C
density		≈5100	kg/m^3

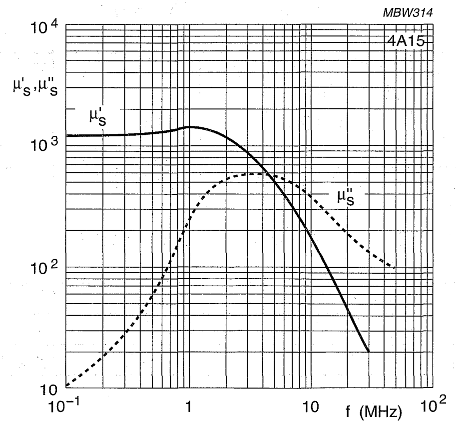


Fig.1 Complex permeability as a function of frequency.

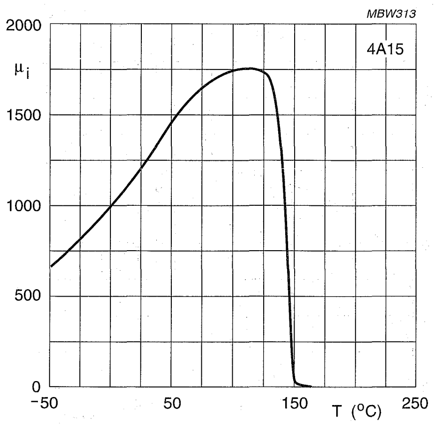


Fig.2 Initial permeability as a function of temperature.

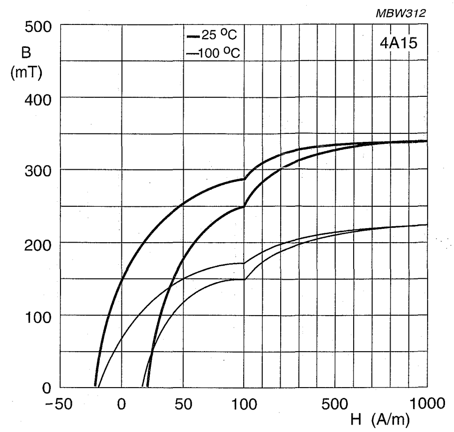


Fig.3 Typical B-H loops.

Material grade specification 4B1

4B1 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	250 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈310	mT
	100 °C; 10 kHz; 250 A/m	≈260	
$\tan\delta/\mu_i$	25 °C; 1 MHz; 0.1 mT	$\leq 90 \times 10^{-6}$	
	25 °C; 3 MHz; 0.1 mT	$\leq 300 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥250	°C
density		≈4600	kg/m³

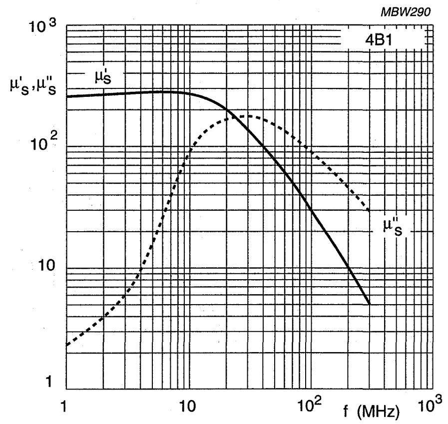


Fig.1 Complex permeability as a function of frequency.

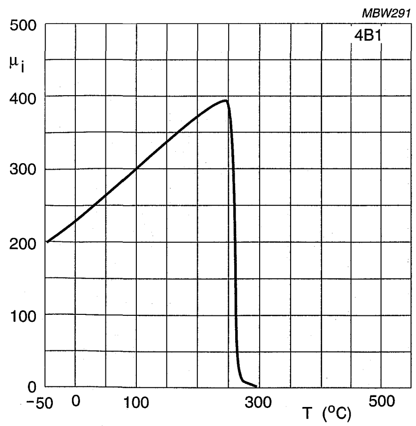


Fig.2 Initial permeability as a function of temperature.

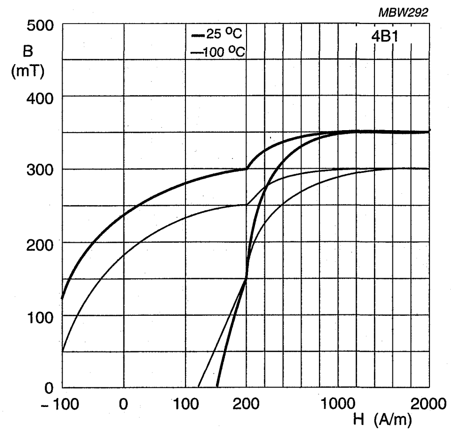


Fig.3 Typical B-H loops.

Material grade specification 4B3

4B3 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	300 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈250	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥250	°C
density		≈5000	kg/m^3

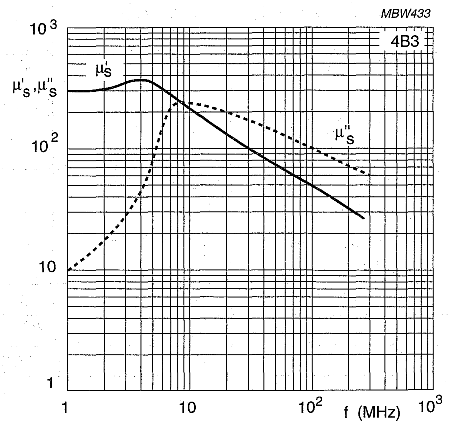


Fig.1 Complex permeability as a function of frequency.

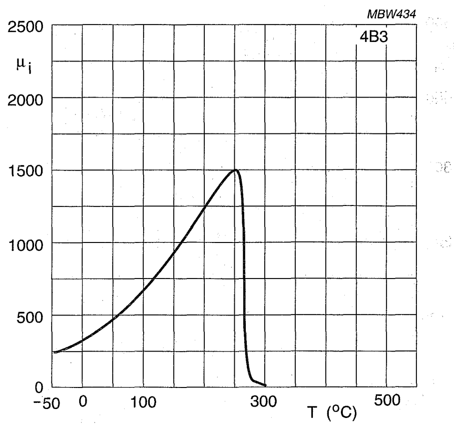


Fig.2 Initial permeability as a function of temperature.

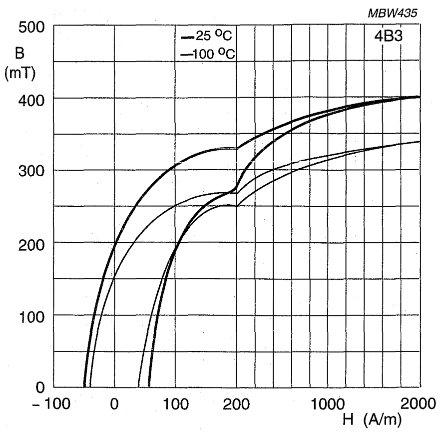


Fig.3 Typical B-H loops.

Material grade specification 4C65

4C65 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	125 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈250	
$\tan\delta/\mu_i$	25 °C; 3 MHz; 0.1 mT	$\leq 80 \times 10^{-6}$	
	25 °C; 10 MHz; 0.1 mT	$\leq 130 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥350	°C
density		≈4500	kg/m^3

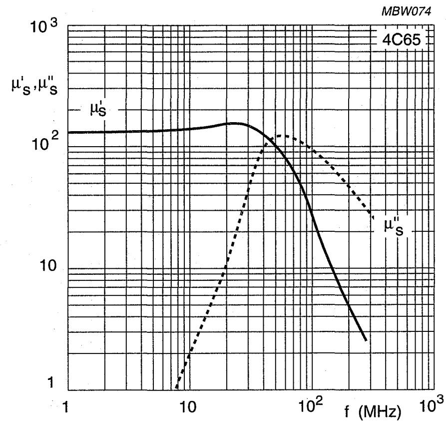


Fig.1 Complex permeability as a function of frequency.

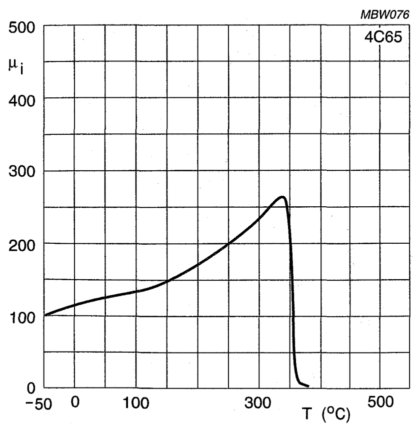


Fig.2 Initial permeability as a function of temperature.

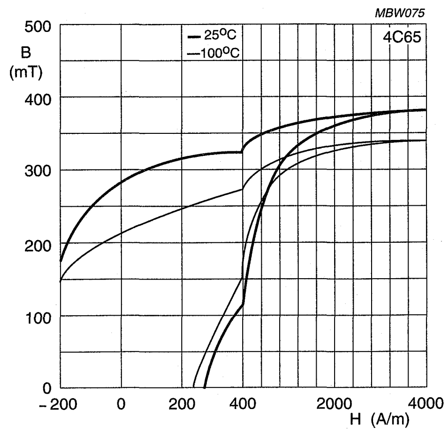


Fig.3 Typical B-H loops.

Material grade specification 4C65

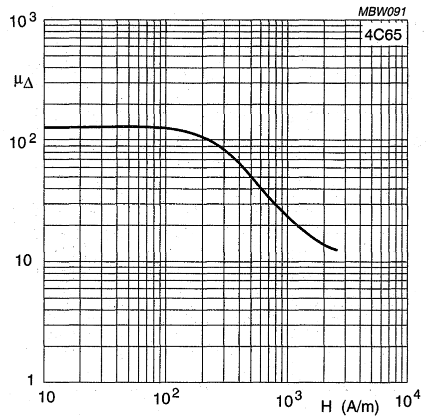


Fig.4 Incremental permeability as a function of magnetic field strength.

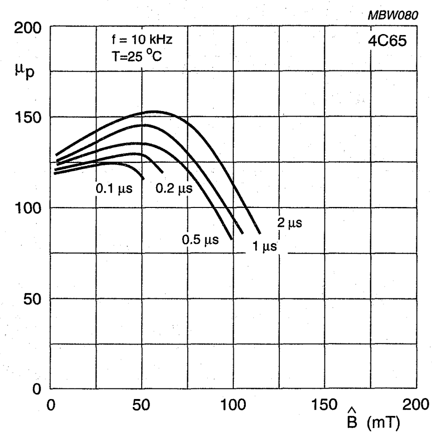


Fig.5 Pulse characteristics (unipolar pulses).

4D2 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	60 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈200	mT
	100 °C; 10 kHz; 250 A/m	≈180	
$\tan\delta/\mu_i$	25 °C; 10 MHz; 0.1 mT	$\leq 100 \times 10^{-6}$	
	25 °C; 30 MHz; 0.1 mT	$\leq 600 \times 10^{-6}$	
ρ	DC, 25 °C	$\approx 10^5$	Ωm
T_C		≥400	°C
density		≈4200	kg/m^3

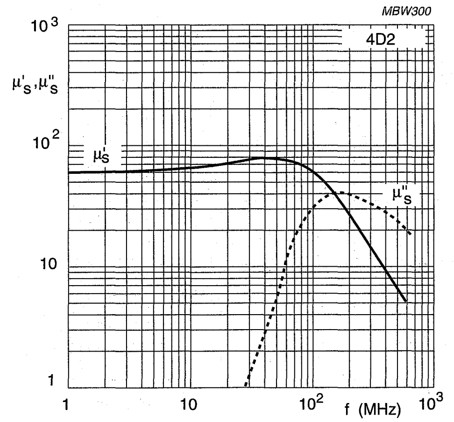


Fig.1 Complex permeability as a function of frequency.

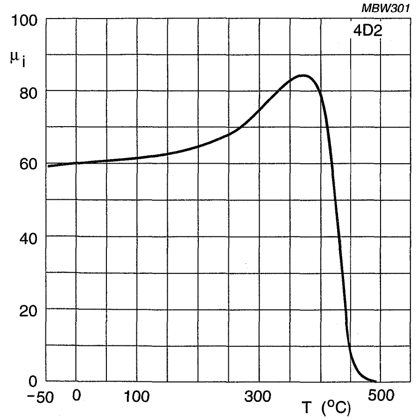


Fig.2 Initial permeability as a function of temperature.

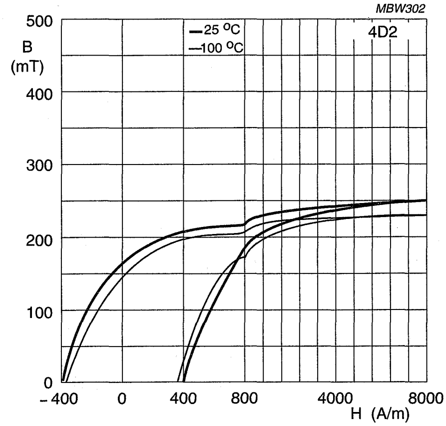


Fig.3 Typical B-H loops.

Material grade specification 4E1

4E1 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	15 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈80	mT
	100 °C; 10 kHz; 250 A/m	≈75	
$\tan\delta/\mu_i$	25 °C; 10 MHz; 0.1 mT	$\leq 300 \times 10^{-6}$	
	25 °C; 30 MHz; 0.1 mT	$\leq 350 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥500	°C
density		≈3700	kg/m^3

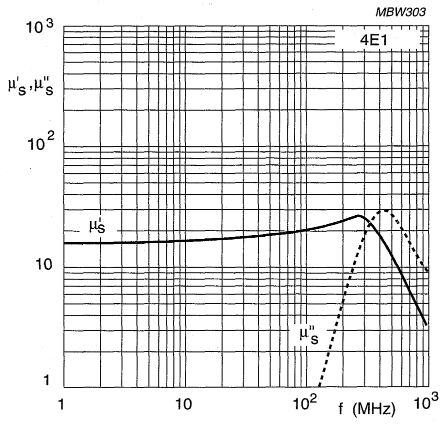


Fig.1 Complex permeability as a function of frequency.

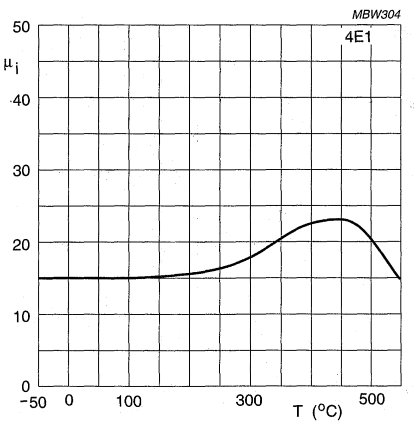


Fig.2 Initial permeability as a function of temperature.

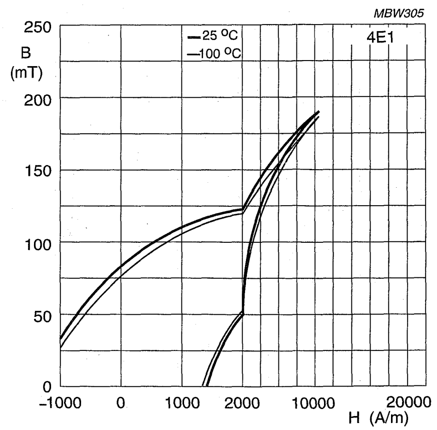


Fig.3 Typical B-H loops.

Material grade specification 4E2

4E2 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	25 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈150	mT
	100 °C; 10 kHz; 250 A/m	≈150	
ρ	DC, 25 °C	≈10^5	Ωm
T_C		≥400	°C
density		≈4000	kg/m^3

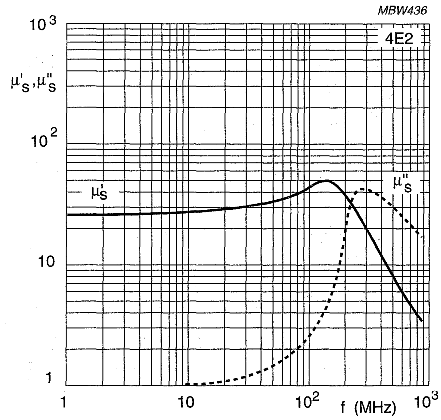


Fig.1 Complex permeability as a function of frequency.

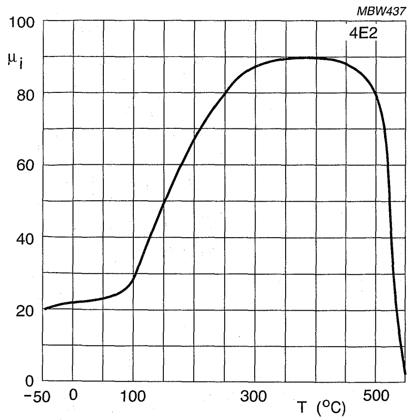


Fig.2 Initial permeability as a function of temperature.

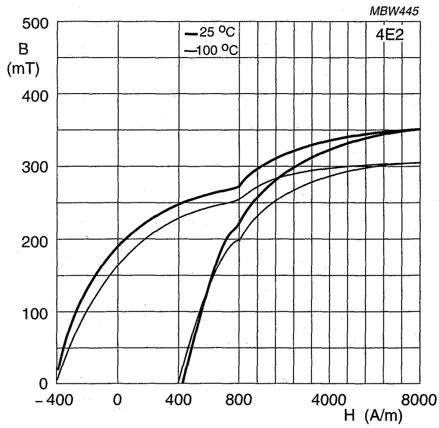


Fig.3 Typical B-H loops.

Material grade specification 4F1

4F1 SPECIFICATIONS

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

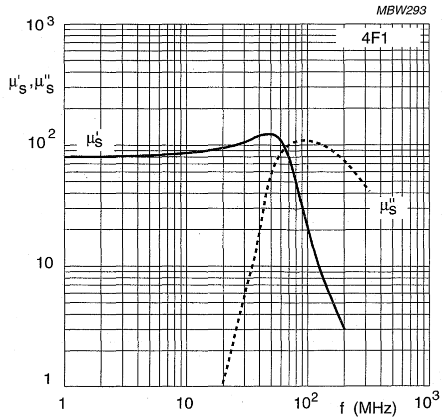


Fig.1 Complex permeability as a function of frequency.

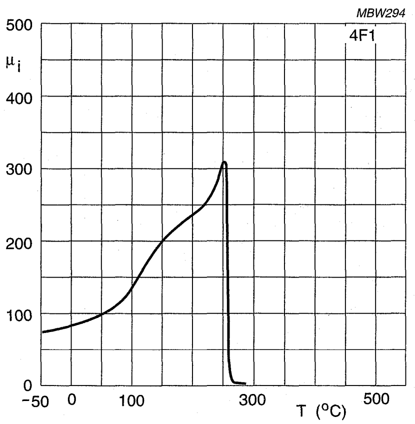


Fig.2 Initial permeability as a function of temperature.

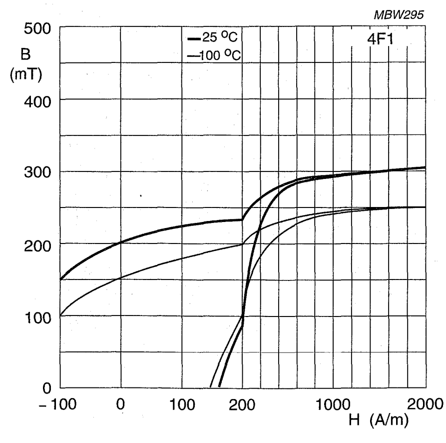


Fig.3 Typical B-H loops.

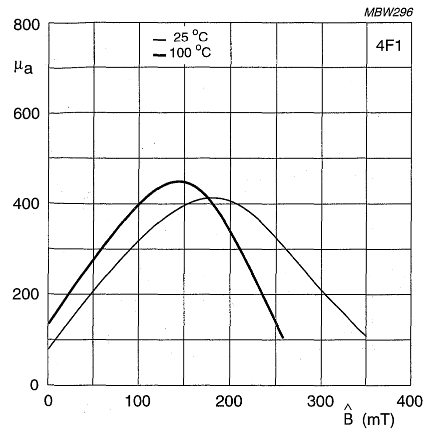


Fig.4 Amplitude permeability as function of peak flux density.

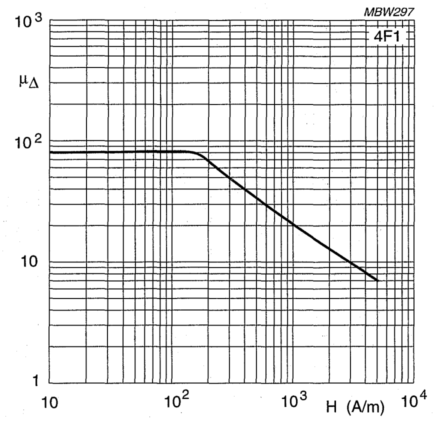


Fig.5 Incremental permeability as a function of magnetic field strength.

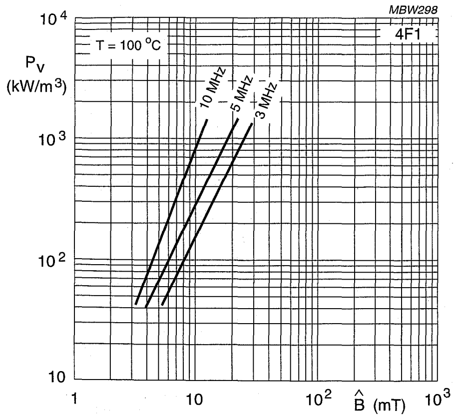


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

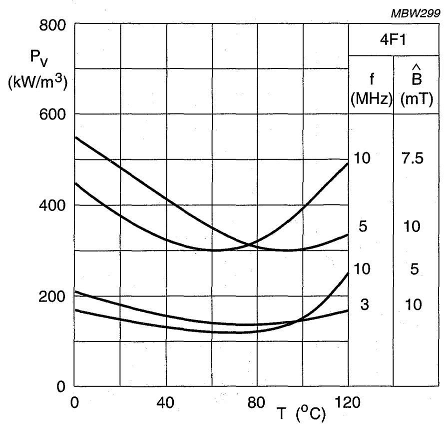


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 4M2

4M2 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	140 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈250	mT
	100 °C; 10 kHz; 250 A/m	≈150	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥200	°C
density		≈5000	kg/m^3

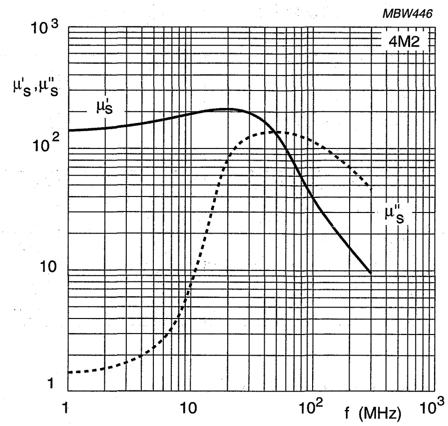


Fig.1 Complex permeability as a function of frequency.

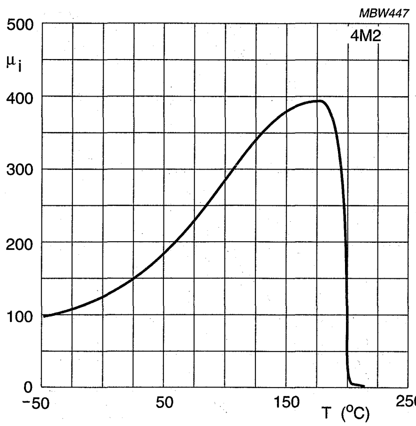


Fig.2 Initial permeability as a function of temperature.

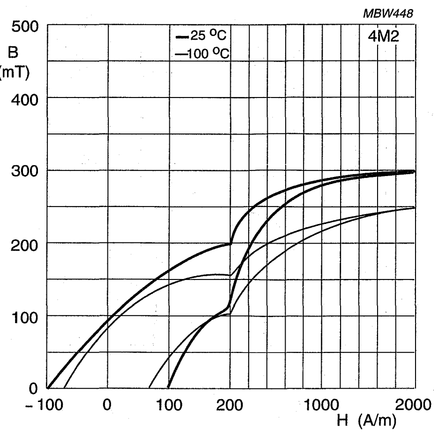


Fig.3 Typical B-H loops.

Material grade specification

4S2 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈700	
B	25 °C; 10 kHz; 250 A/m	≈270	mT
	100 °C; 10 kHz; 250 A/m	≈180	
$\lvert Z \rvert$ (1)	25 °C; 30 MHz	≥50	Ω
	25 °C; 300 MHz	≥90	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥125	°C
density		≈5000	kg/m^3

Note

1. Measured on a bead Ø5 × Ø2 × 10 mm.

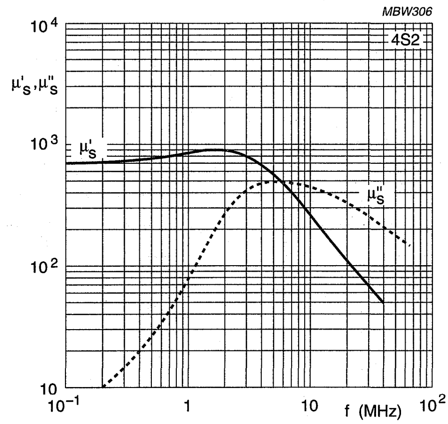


Fig.1 Complex permeability as a function of frequency.

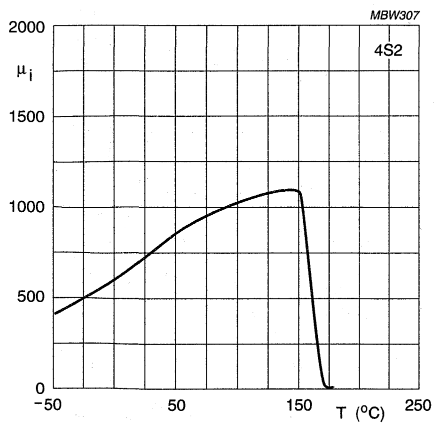


Fig.2 Initial permeability as a function of temperature.

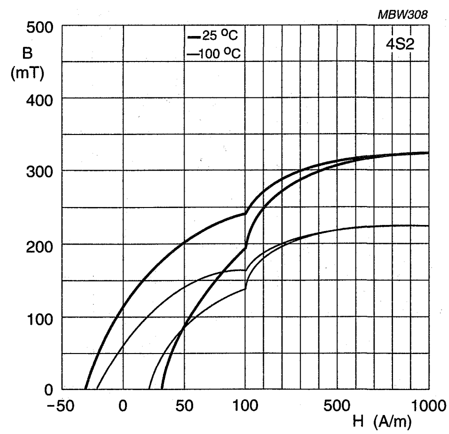


Fig.3 Typical B-H loops.

Material grade specification 4S2

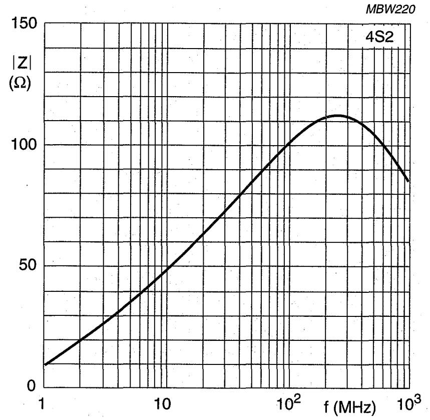


Fig.4 Impedance as a function of frequency.

Material grade specification 4S4

4S4 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈250	
B	25 °C; 10 kHz; 250 A/m	≈200	mT
	100 °C; 10 kHz; 250 A/m	≈130	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥130	°C
density		≈5000	kg/m^3

Remark: This material is used for multilayer suppressors only.

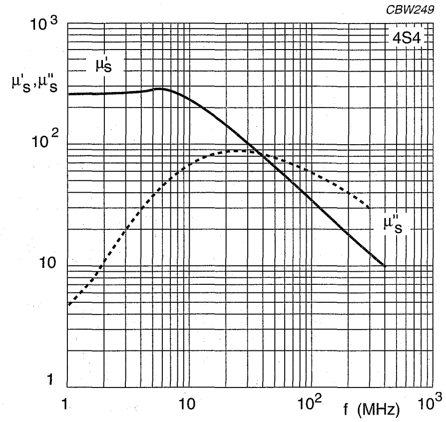


Fig.1 Complex permeability as a function of frequency.

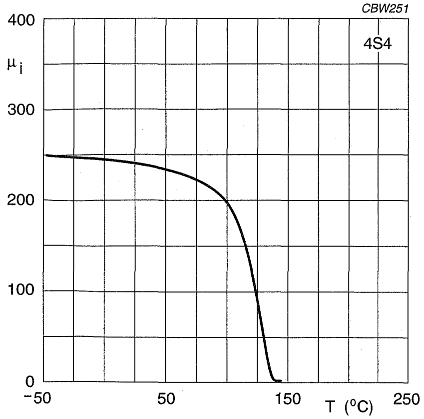


Fig.2 Initial permeability as a function of temperature.

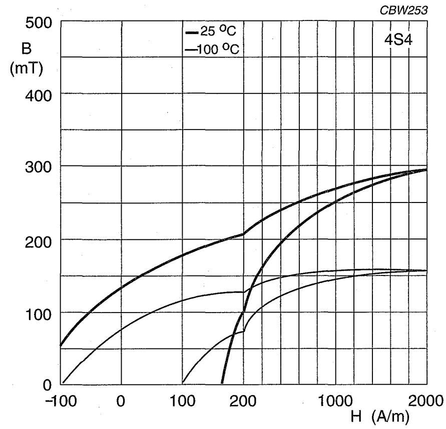


Fig.3 Typical B-H loops.

Material grade specification 4S7

4S7 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈200	
B	25 °C; 10 kHz; 250 A/m	≈200	mT
	100 °C; 10 kHz; 250 A/m	≈120	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥140	°C
density		≈5000	kg/m^3

Remark: This material is used for multilayer suppressors only.

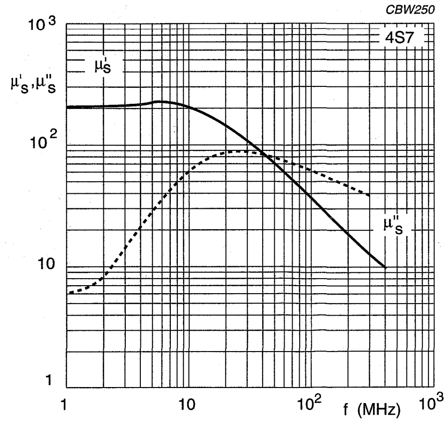


Fig.1 Complex permeability as a function of frequency.

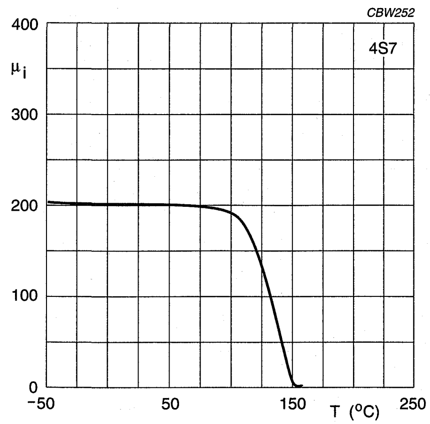


Fig.2 Initial permeability as a function of temperature.

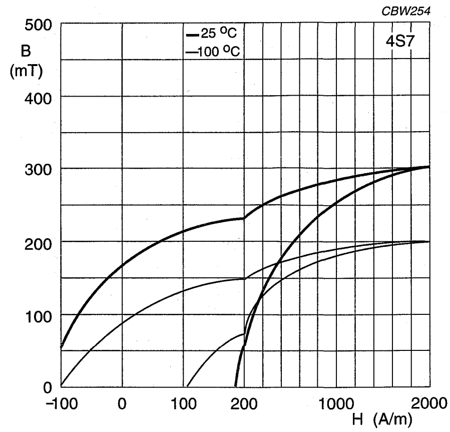


Fig.3 Typical B-H loops.

Material grade specification 8C11

8C11 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1200 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈300	mT
	100 °C; 10 kHz; 250 A/m	≈200	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥125	°C
density		≈5100	kg/m^3

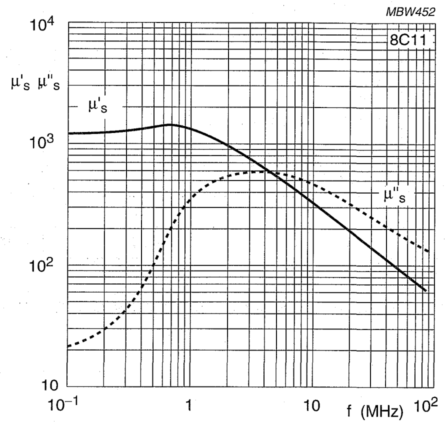


Fig.1 Complex permeability as a function of frequency.

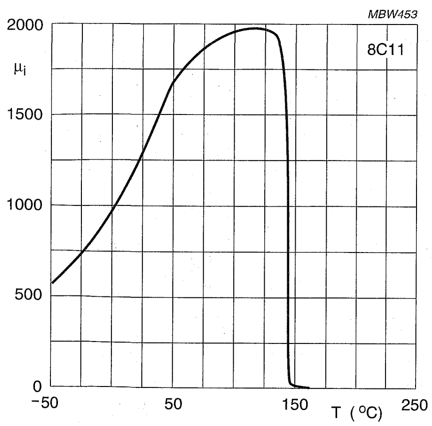


Fig.2 Initial permeability as a function of temperature.

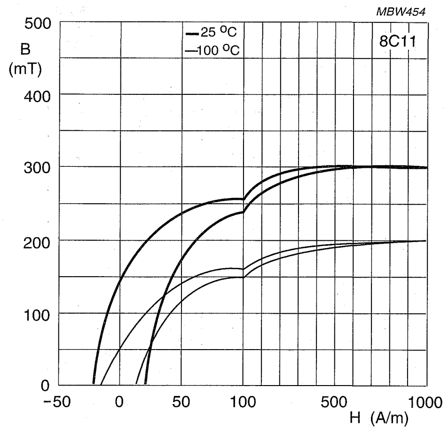


Fig.3 Typical B-H loops.

Material grade specification 8C12

8C12 SPECIFICATIONS

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	900 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈230	mT
	100 °C; 10 kHz; 250 A/m	≈150	
ρ	DC; 25 °C	≈10^5	Ωm
T_C		≥125	°C
density		≈5100	kg/m^3

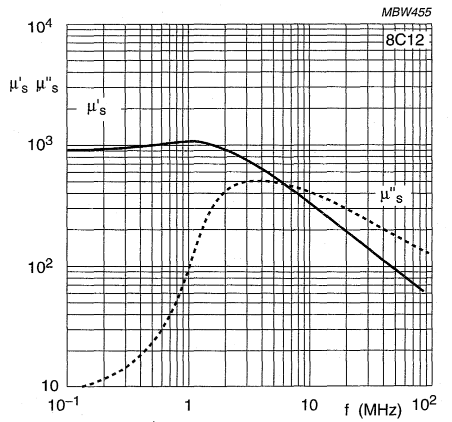


Fig.1 Complex permeability as a function of frequency.

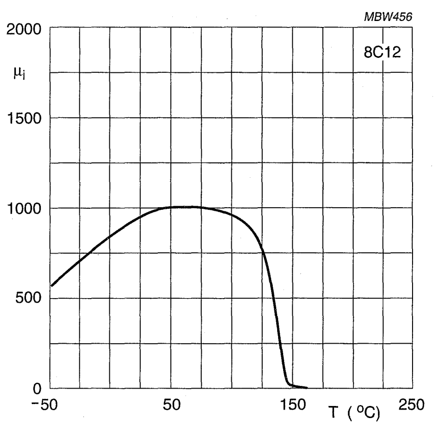


Fig.2 Initial permeability as a function of temperature.

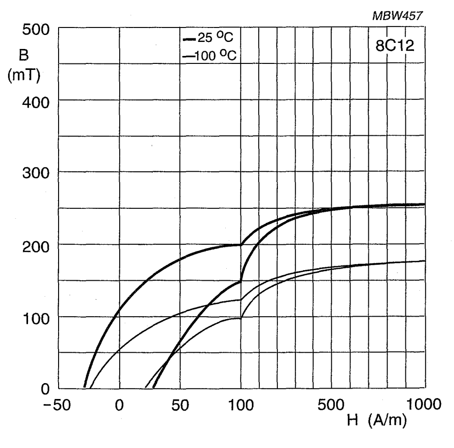
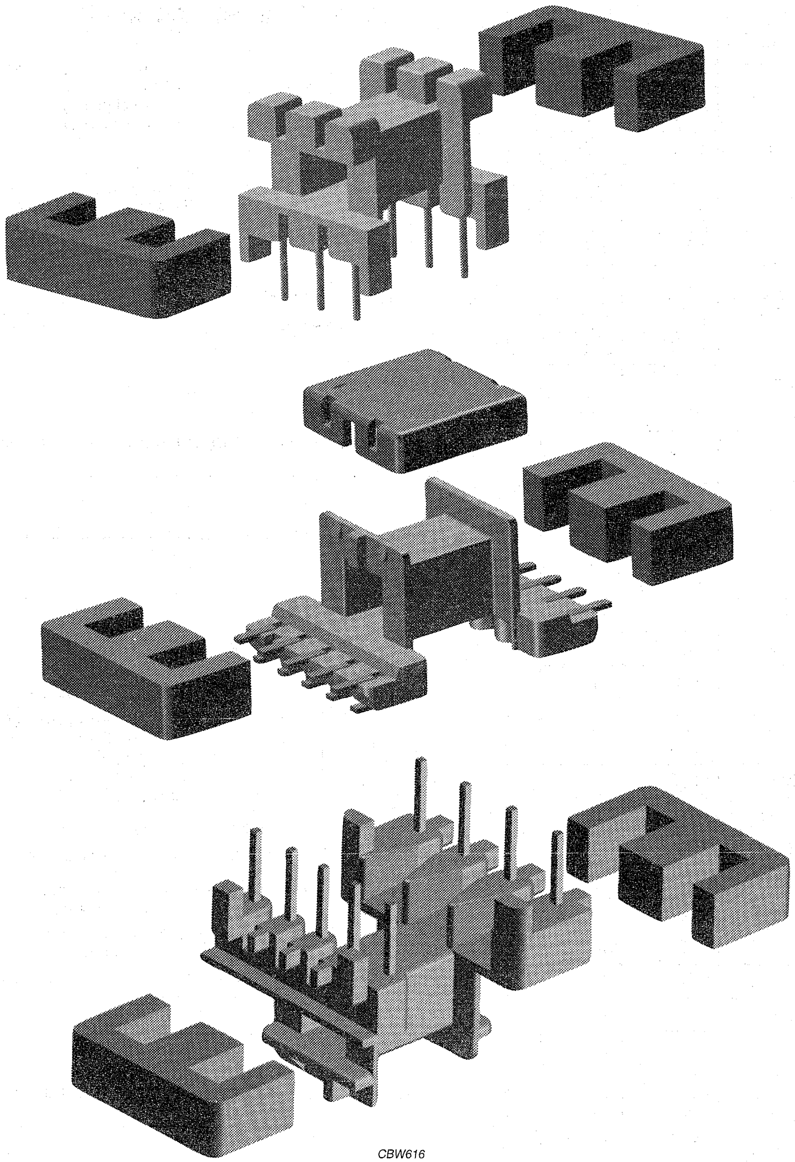


Fig.3 Typical B-H loops.



CBW616

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview E cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
E5.3/2.7/2	31.4	2.50	0.08
E6.3/2.9/2	40.6	3.30	0.12
E8.8/4.1/2	78.0	5.00	0.25
E13/6/3	281	10.1	0.7
E13/6/6	559	20.2	1.4
E13/7/4	369	12.4	0.9
E16/8/5	750	20.1	2.0
E16/12/5	1070	19.4	2.6
E19/8/5	900	22.6	2.3
E19/8/9	1650	41.3	4.0
E20/10/5	1340	31.2	4.0
E20/10/6	1490	32.0	3.7
E20/14/5	1513	24.4	4.2
E22/16/10	5143	86.0	14
E25/9/6	1860	38.4	4.8
E25/10/6	1930	37.0	4.8
E25/13/7	2990	52.0	8.0
E25/13/11	4500	78.4	11
E30/15/7	4000	60.0	11
E31/13/9	5150	83.2	13
E32/16/9	6180	83.0	16
E34/14/9	5590	80.7	14
E35/18/10	8070	100	15
E36/21/12	12160	126	31
E41/17/12	11500	149	30
E42/21/15	17300	178	44
E42/21/20	22700	233	56
E42/33/20	34200	236	82
E47/20/16	20800	234	53
E50/27/15	26900	225	68
E55/28/21	44000	353	108
E55/28/25	52000	420	130
E56/24/19	36000	337	90
E65/32/27	79000	540	205
E71/33/32	102000	683	260
E80/38/20	72300	392	180

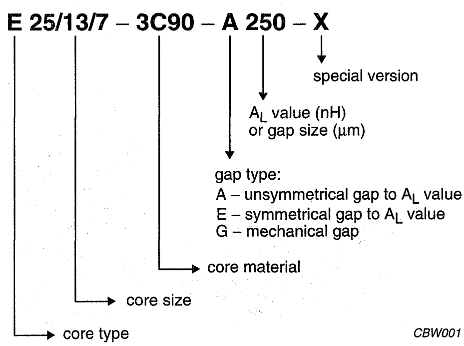


Fig.1 Type number structure for cores.

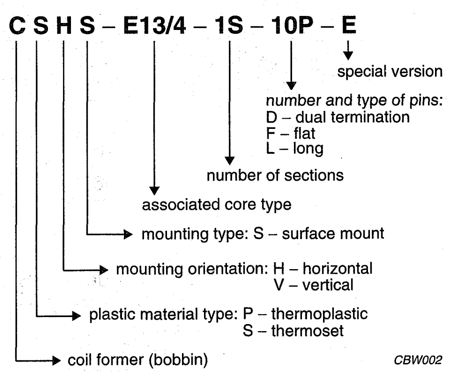


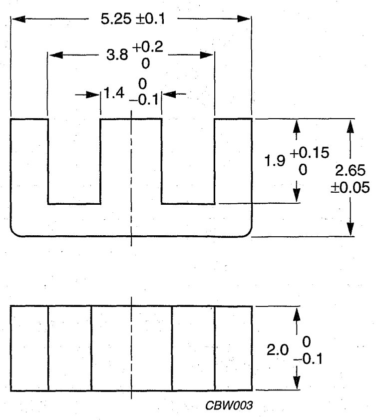
Fig.2 Type number structure for coil formers.

E cores and accessories E5.3/2.7/2

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	4.70	mm^{-1}
V_e	effective volume	33.3	mm^3
l_e	effective length	12.5	mm
A_e	effective area	2.66	mm^2
A_{min}	minimum area	2.63	mm^2
m	mass of core half	≈0.08	g



Dimensions in mm.

Fig.1 E5.3/2.7/2 core half.

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 5 ±2 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	300 ±25%	≈1 120	≈0	E5.3/2.7/2-3C94
3C96 prot	275 ±25%	≈1 030	≈0	E5.3/2.7/2-3C96
3F3	265 ±25%	≈990	≈0	E5.3/2.7/2-3F3
3F35 prot	225 ±25%	≈840	≈0	E5.3/2.7/2-3F35
3F4 des	165 ±25%	≈615	≈0	E5.3/2.7/2-3F4

Core halves of high permeability grades

Clamping force for A_L measurements, 5 ±2 N, flux density $\hat{B} \leq 0.1$ mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	1 400 +40/−30%	≈5240	≈0	E5.3/2.7/2-3E5
3E6	1 600 +40/−30%	≈5980	≈0	E5.3/2.7/2-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.003	≈0.015	≈0.007
3C96	≥320	≤0.002	≈0.011	≈0.005
3F3	≥300	≤0.005	–	≤0.008
3F35	≥300	–	–	≈0.004
3F4	≥250	–	–	–

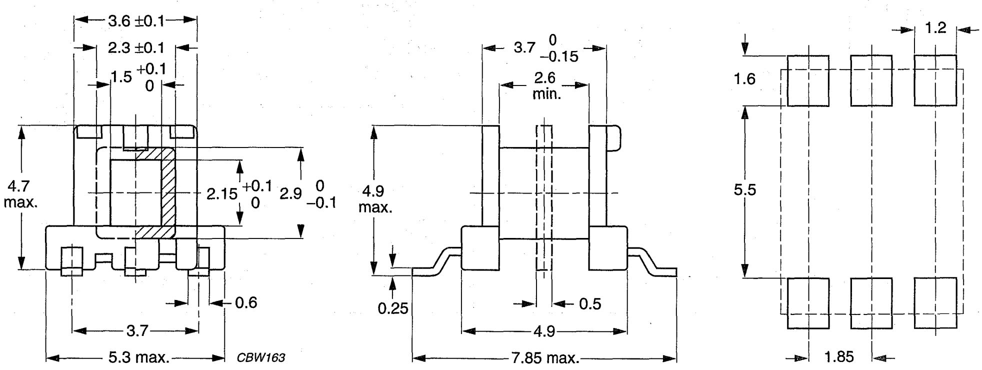
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.006	≈0.04	–	–
3F4	≥250	–	–	≤0.006	≤0.010

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 E5.3/2.7/2 coil former (SMD); 6-solder pads.

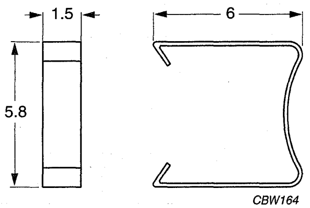
Winding data for E5.3/2.7/2 coil former (SMD) with 6 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.5	2.6	12.6	CPHS-E5.3/2-1S-4P
1	1.5	2.6	12.6	CPHS-E5.3/2-1S-6P
2	2 × 0.6	2 × 1.0	12.6	CPHS-E5.3/2-2S-6P

MOUNTING PARTS

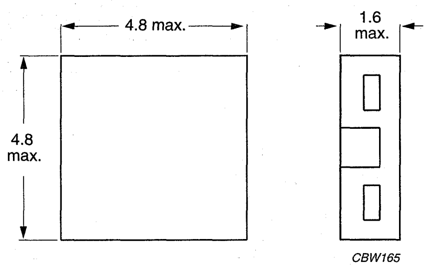
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈5 N	3	CLM-E5.3/2
Cover	liquid crystal polymer (LCP)	4	COV-E5.3/2



Dimensions in mm.

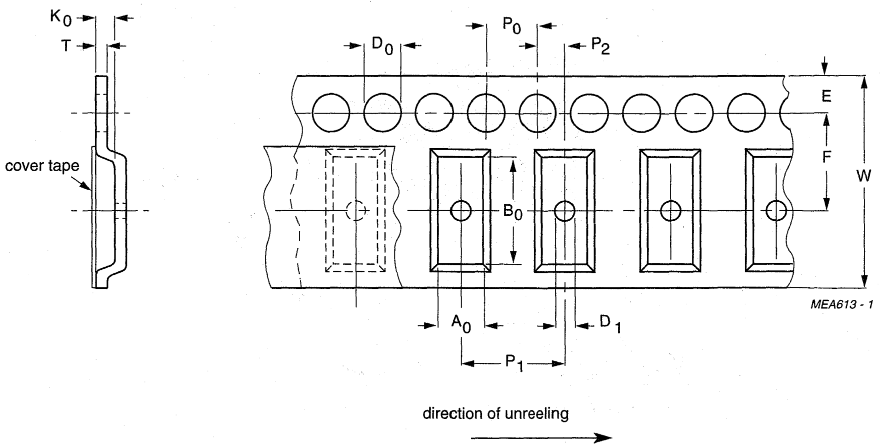
Fig.3 E5.3/2.7/2 clamp.



Dimensions in mm.

Fig.4 E5.3/2.7/2 cover.

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 1.

Fig.5 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.5

SIZE	DIMENSIONS (mm)
A_0	3.0 ±0.1
B_0	5.7 ±0.1
K_0	2.2 ±0.1
T	0.25 ±0.05
W	12.0 ±0.3
E	1.75 ±0.1
F	5.5 ±0.05
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

E cores and accessories E5.3/2.7/2

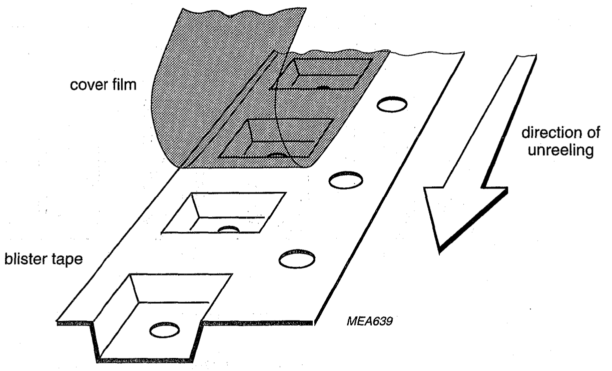
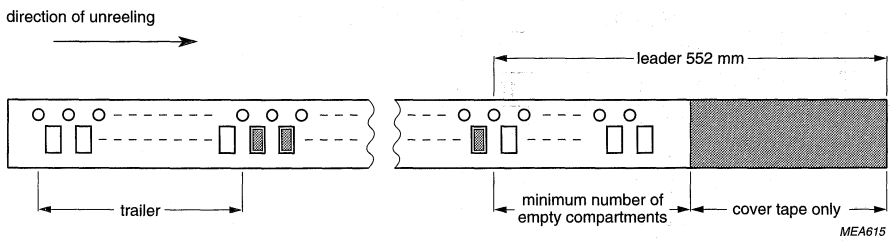
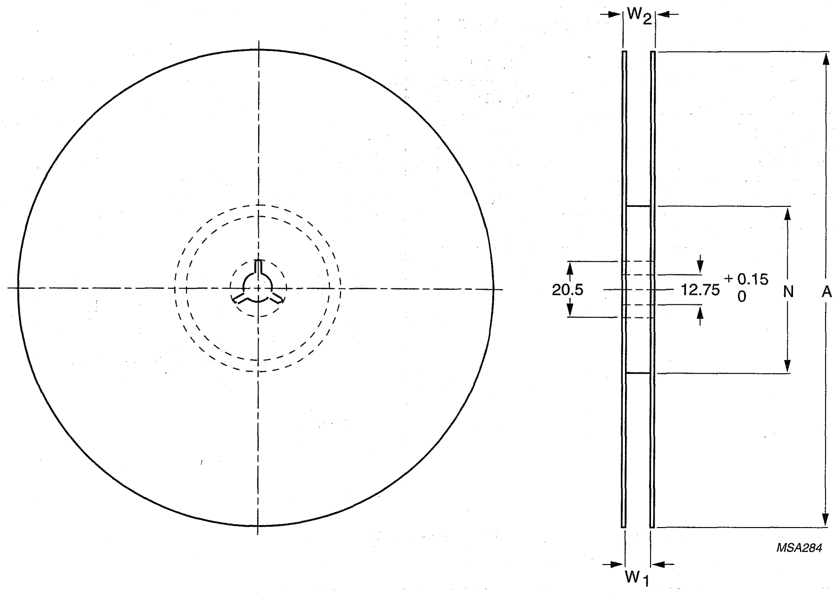


Fig.6 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: –25 to +45 °C.

Fig.7 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

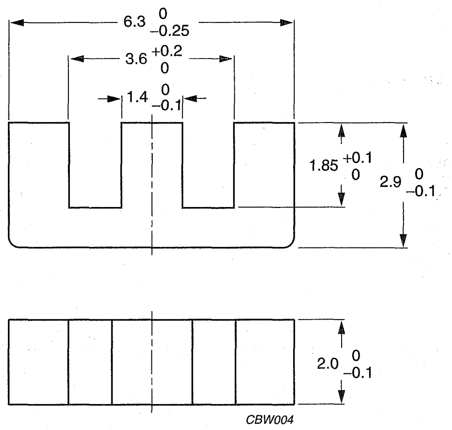
Table 2 Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	3.67	mm^{-1}
V_e	effective volume	40.6	mm^3
l_e	effective length	12.2	mm
A_e	effective area	3.3	mm^2
A_{min}	minimum area	2.6	mm^2
m	mass of core half	≈0.12	g



Dimensions in mm.

Fig.1 E6.3/2.9/2 core half.

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 5 ±2 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	400 ±25%	≈1170	≈0	E6.3/2.9/2-3C94
3C96 prot	380 ±25%	≈1110	≈0	E6.3/2.9/2-3C96
3F3	360 ±25%	≈1050	≈0	E6.3/2.9/2-3F3
3F35 prot	300 ±25%	≈875	≈0	E6.3/2.9/2-3F35
3F4 des	225 ±25%	≈660	≈0	E6.3/2.9/2-3F4

Core halves of high permeability grades

Clamping force for A_L measurements, 5 ±2 N, flux density $\hat{B}$ ≤ 0.1 mT

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E1 sup	700 ±25%	≈2060	≈0	E6.3/2.9/2-3E1
3E5	1700 +40/−30%	≈5000	≈0	E6.3/2.9/2-3E5
3E6	2100 +40/−30%	≈6180	≈0	E6.3/2.9/2-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.004	≈0.017	≈0.008
3C96	≥320	≈0.003	≈0.012	≈0.006
3F3	≥300	≤0.007	–	≤0.010
3F35	≥300	–	–	≈0.004
3F4	≥250	–	–	–

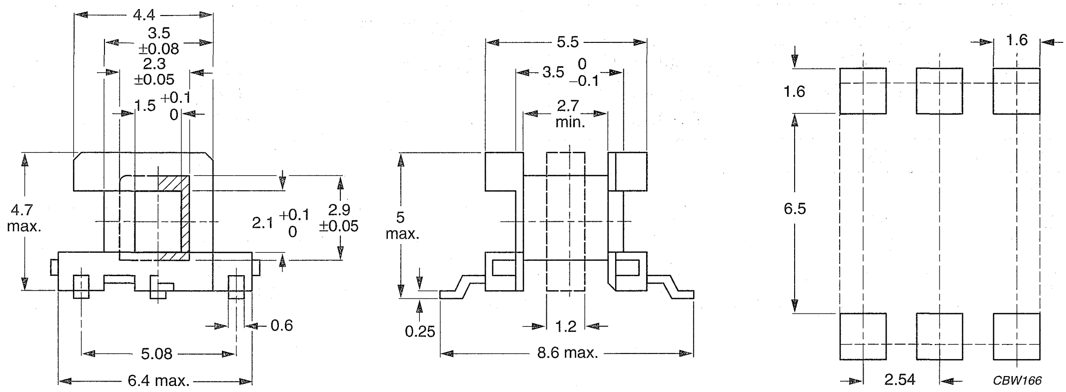
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.007	≈0.05	–	–
3F4	≥250	–	–	≤0.008	≤0.013

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 E6.3/2.9/2 coil former (SMD); 6-solder pads.

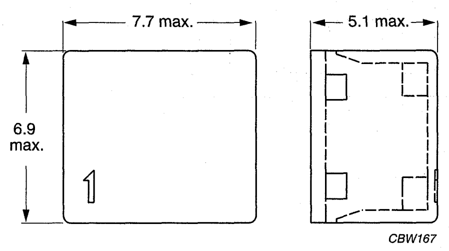
Winding data for E6.3/2.9/2 coil former (SMD) with 6 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.62	2.7	12.8	CPHS-E6.3/2-1S-4P
1	1.62	2.7	12.8	CPHS-E6.3/2-1S-6P
2	2 × 0.45	2 × 0.75	12.8	CPHS-E6.3/2-2S-6P

MOUNTING PARTS

General data for mounting parts

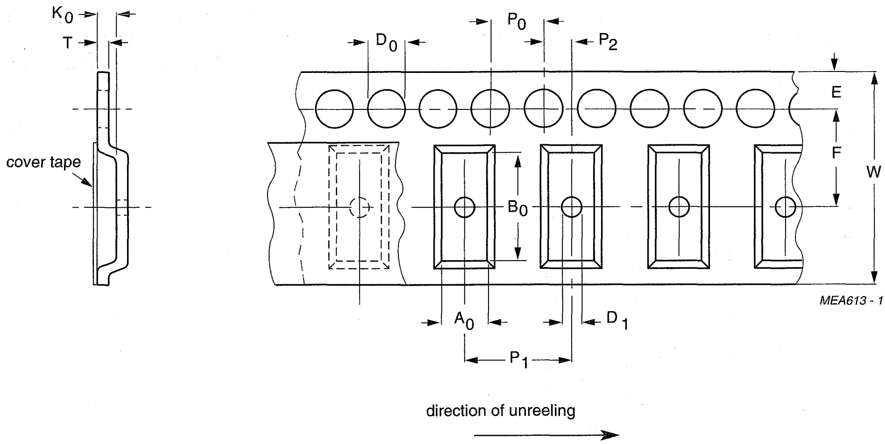
ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	liquid crystal polymer (LCP)	3	COV-E6.3/2



Dimensions in mm.

Fig.3 E6.3/2.9/2 cover.

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 1.

Fig.4 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.4

SIZE	DIMENSIONS (mm)
A_0	3.2 ±0.1
B_0	6.6 ±0.1
K_0	2.1 ±0.1
T	0.25 ±0.05
W	12.0 ±0.3
E	1.75 ±0.1
F	5.5 ±0.05
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

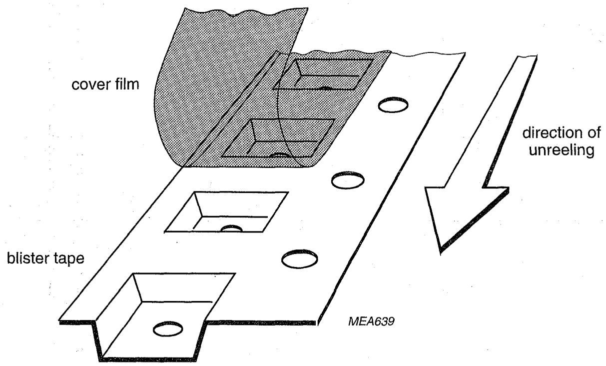
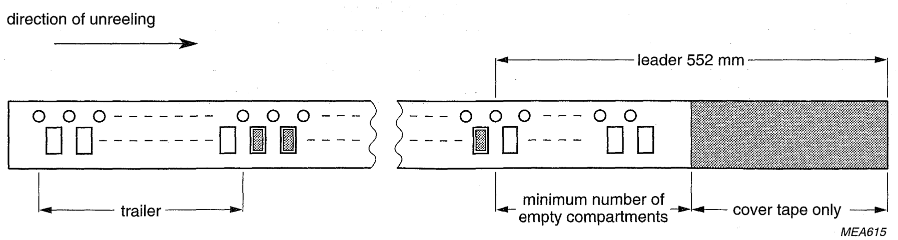
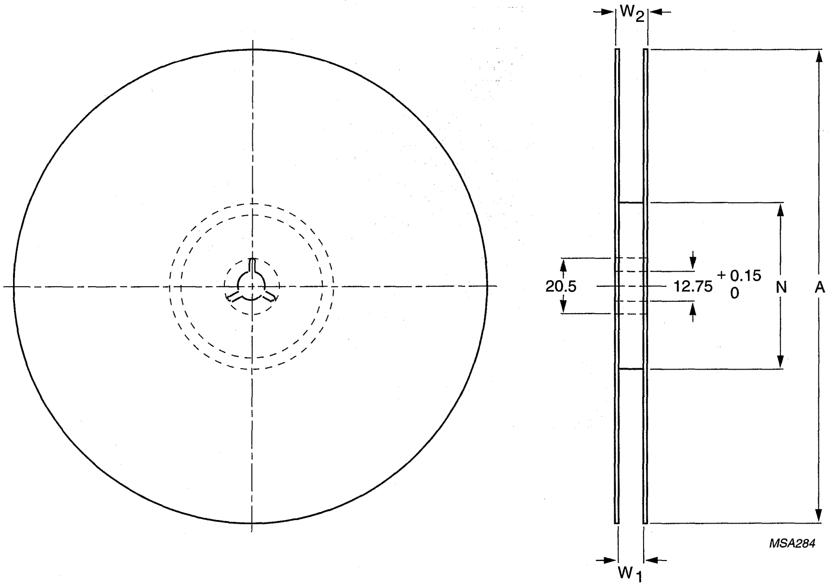


Fig.5 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: –25 to +45 °C.

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

Table 2 Reel dimensions; see Fig.7

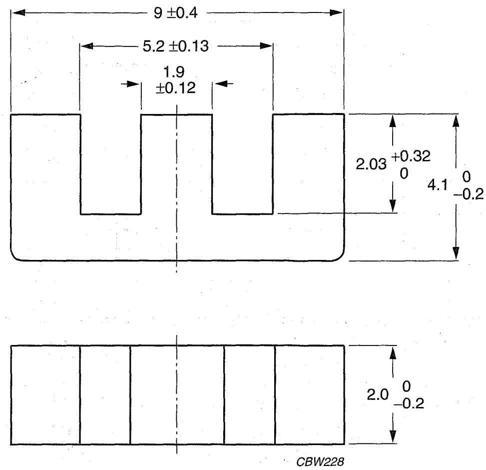
SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4

E cores and accessories E8.8/4.1/2

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	3.13	mm^{-1}
V_e	effective volume	78	mm^3
l_e	effective length	15.6	mm
A_e	effective area	5.0	mm^2
A_{min}	minimum area	3.6	mm^2
m	mass of core half	≈0.25	g



Dimensions in mm.

Fig.1 E8.8/4.1/2 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 5 ±2 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 prot	530 ±25%	≈1310	≈0	E8.8/4.1/2-3C94
3C96 prot	480 ±25%	≈1190	≈0	E8.8/4.1/2-3C96
3F3 prot	460 ±25%	≈1140	≈0	E8.8/4.1/2-3F3
3F35 prot	380 ±25%	≈940	≈0	E8.8/4.1/2-3F35
3F4 prot	280 ±25%	≈695	≈0	E8.8/4.1/2-3F4

Core halves of high permeability grades

A_L measured in combination with an non-gapped core half, clamping force for A_L measurements, 15 ±5 N, flux density $\hat{B}$ ≤ 0.1 mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E6 prot	2500 +40/−30%	≈6210	≈0	E8.8/4.1/2-3E6

E cores and accessories E8.8/4.1/2

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.007	≈0.035	≈0.016
3C96	≥320	≈0.005	≈0.025	≈0.012
3F3	≥300	≤0.01	–	≤0.014
3F35	≥300	–	–	≈0.008
3F4	≥250	–	–	–

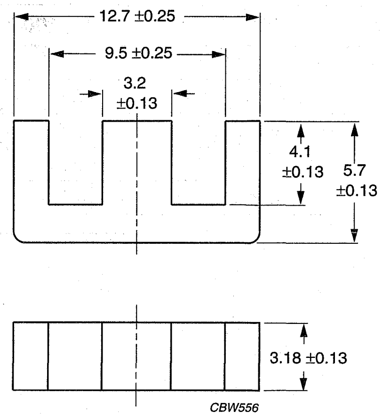
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 500 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.012	≈0.095	–	–
3F4	≥250	–	–	≤0.016	≤0.025

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.74	mm^{-1}
V_e	effective volume	281	mm^3
l_e	effective length	27.8	mm
A_e	effective area	10.1	mm^2
A_{min}	minimum area	10.1	mm^2
m	mass of core half	≈0.7	g



Dimensions in mm.

Fig.1 E13/6/3 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 8 ±4 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	730 ±25%	≈1590	≈0	E13/6/3-3C90

Core halves of high permeability grades

A_L measured in combination with an non-gapped core half, clamping force for A_L measurements, 8 ±4 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	1300 ±25%	≈2830	≈0	E13/6/3-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.03	≤0.03

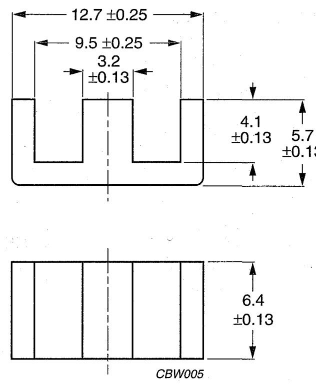
E cores and accessories

E13/6/6 (814E250)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.37	mm^{-1}
V_e	effective volume	559	mm^3
l_e	effective length	27.7	mm
A_e	effective area	20.2	mm^2
m	mass of core half	≈1.4	g



Dimensions in mm.

Fig.1 E13/6/6 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈70	≈520	E13/6/6-3C81-A63
	100 ±3%	≈110	≈300	E13/6/6-3C81-A100
	160 ±3%	≈175	≈170	E13/6/6-3C81-A160
	250 ±5%	≈275	≈100	E13/6/6-3C81-A250
	315 ±10%	≈340	≈75	E13/6/6-3C81-A315
	1950 ±25%	≈2130	≈0	E13/6/6-3C81
3C90	63 ±3%	≈70	≈520	E13/6/6-3C90-A63
	100 ±3%	≈110	≈300	E13/6/6-3C90-A100
	160 ±3%	≈175	≈170	E13/6/6-3C90-A160
	250 ±5%	≈275	≈100	E13/6/6-3C90-A250
	315 ±10%	≈340	≈75	E13/6/6-3C90-A315
	1470 ±25%	≈1605	≈0	E13/6/6-3C90
3C94 des	1470 ±25%	≈1605	≈0	E13/6/6-3C94
3F3	63 ±3%	≈70	≈520	E13/6/6-3F3-A63
	100 ±3%	≈110	≈300	E13/6/6-3F3-A100
	160 ±3%	≈175	≈170	E13/6/6-3F3-A160
	250 ±5%	≈275	≈100	E13/6/6-3F3-A250
	315 ±10%	≈340	≈75	E13/6/6-3F3-A315
	1250 ±25%	≈1370	≈0	E13/6/6-3F3

E cores and accessories

E13/6/6 (814E250)

Core halves of high permeability grades

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 sup	2600 ±25%	≈2840	≈0	E13/6/6-3E25
3E27	2600 ±25%	≈2840	≈0	E13/6/6-3E27
3E5	≥3700	≥4040	≈0	E13/6/6-3E5

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.12	–	–	–
3C90	≥320	≤0.06	≤0.06	–	–
3C94	≥320	–	≤0.05	≈0.24	≈0.11
3F3	≥320	–	≤0.06	–	≤0.11

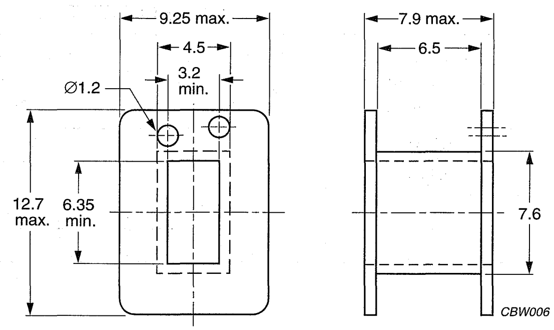
E cores and accessories

E13/6/6
(814E250)

COIL FORMERS

General data for E13/6/6 coil former

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E13/6/6 coil former.

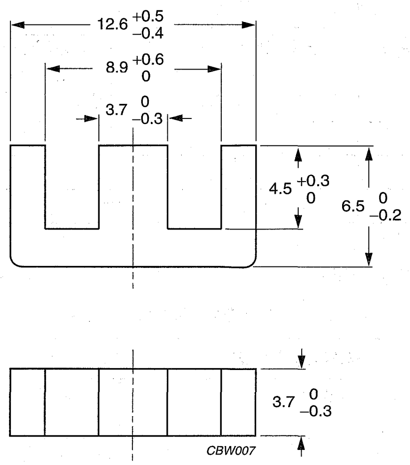
Winding data for E13/6/6 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.4	6.5	32.0	CP-E13/6/6-1S

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.39	mm^{-1}
V_e	effective volume	369	mm^3
I_e	effective length	29.7	mm
A_e	effective area	12.4	mm^2
A_{min}	minimum area	12.2	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 E13/7/4 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 15 ±5 N.
Gapped cores are available on rquest.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	800 ±25%	≈1500	≈0	E13/7/4-3C90
3C94 des	800 ±25%	≈1500	≈0	E13/7/4-3C94
3F3	700 ±25%	≈1300	≈0	E13/7/4-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E1	1200 ±25%	≈2200	≈0	E13/7/4-3E1
3E25 sup	1500 ±25%	≈2800	≈0	E13/7/4-3E25
3E27	1500 ±25%	≈2800	≈0	E13/7/4-3E27

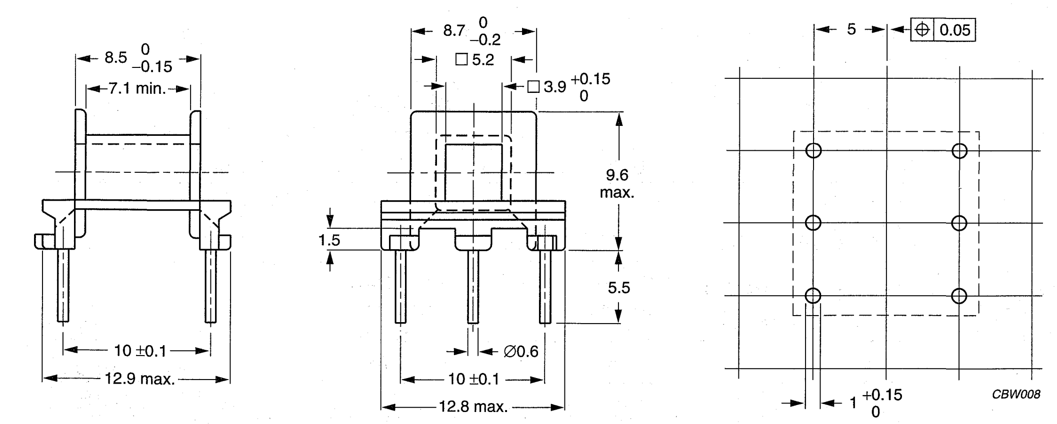
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.05	≤0.05	–	–
3C94	≥320	–	≤0.035	≈0.16	≈0.07
3F3	≥320	–	≤0.05	–	≤0.07

COIL FORMER

General data for 6-pins E13/7/4 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.2 E13/7/4 coil former; 6-pins.

Winding data 6-pins for E13/7/4 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.6	7.1	24	CPH-E13/7/4-1S-6P

COIL FORMER

General data for 10-pads E13/7/4 SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

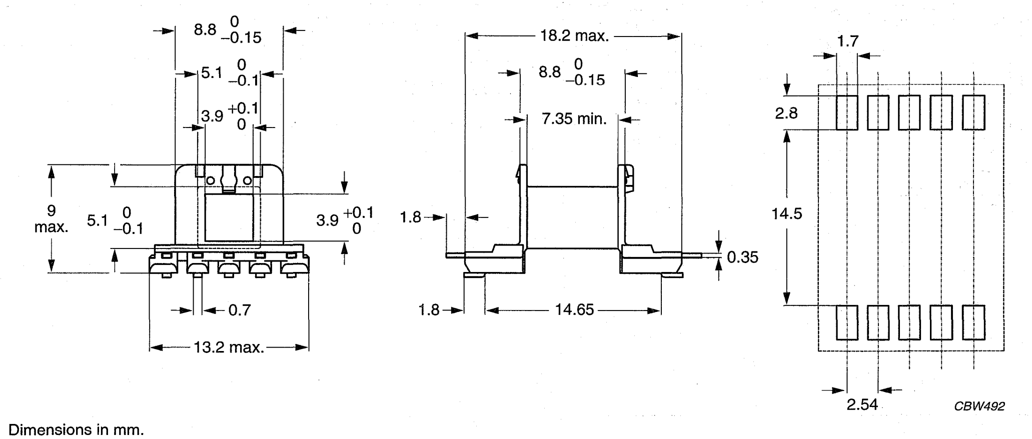


Fig.3 E13/7/4 SMD coil former .

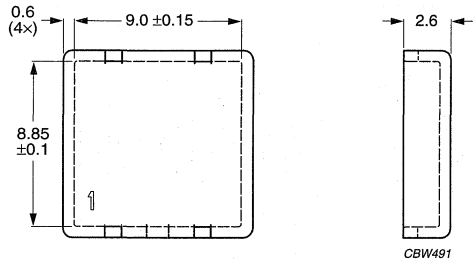
Winding data for E13/7/4 SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	13.0	7.35	27.5	CSHS-E13/7/4-1S-10P

MOUNTING PARTS

General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	polyamide (PA), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E119177(M); maximum operating temperature 130 °C, *"IEC 60085"*, class B	4	COV-E13/7/4



Dimensions in mm.

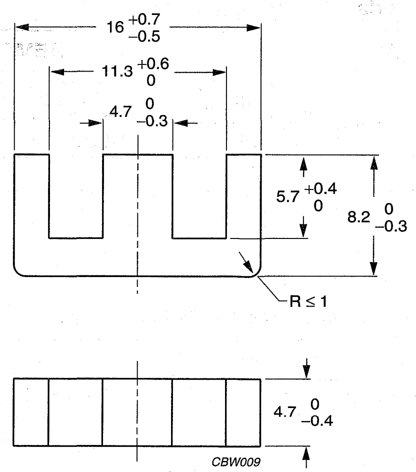
Fig.4 E13/7/4 cover.

E cores and accessories E16/8/5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.87	mm^{-1}
V_e	effective volume	750	mm^3
l_e	effective length	37.6	mm
A_e	effective area	20.1	mm^2
A_{min}	minimum area	19.3	mm^2
m	mass of core half	≈2.0	g



Dimensions in mm.

Fig.1 E16/8/5 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N.
Gapped cores available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	1100 ±25%	≈1640	≈0	E16/8/5-3C90
3C94 des	1100 ±25%	≈1640	≈0	E16/8/5-3C94
3F3	980 ±25%	≈1470	≈0	E16/8/5-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E1	1800 ±25%	≈2700	≈0	E16/8/5-3E1
3E25 sup	2200 ±25%	≈3300	≈0	E16/8/5-3E25
3E27	2200 ±25%	≈3300	≈0	E16/8/5-3E27

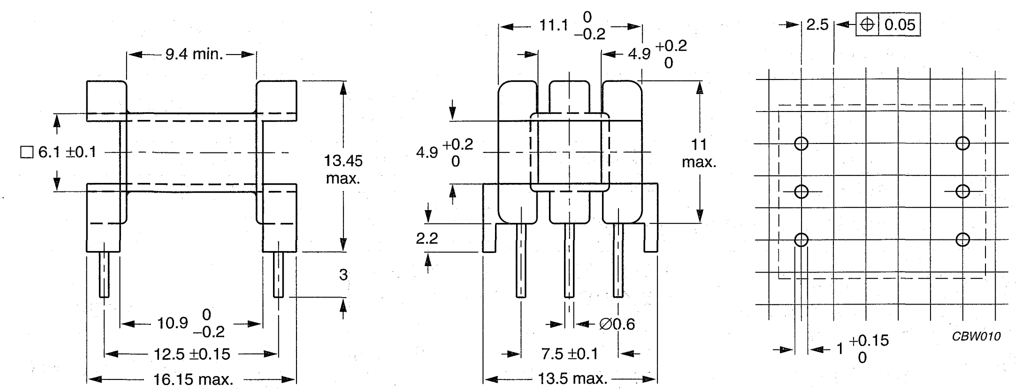
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.10	≤0.10	–	–
3C94	≥320	–	≤0.07	≈0.25	≈0.15
3F3	≥320	–	≤0.10	–	≤0.15

COIL FORMER

General data for 6-pins E16/8/5 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.2 E16/8/5 coil former; 6-pins.

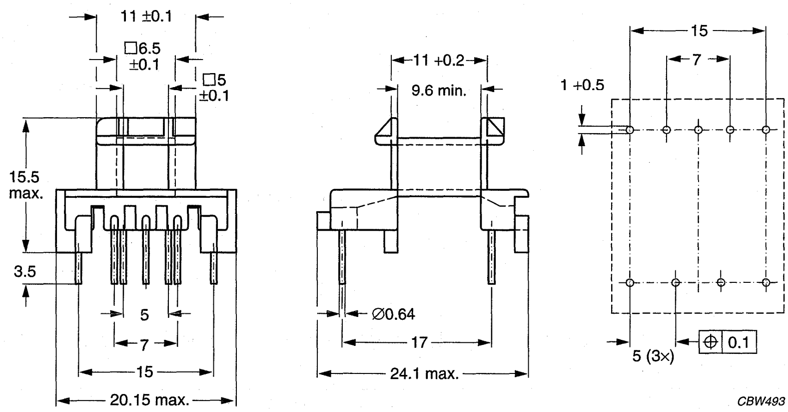
Winding data for 6-pins E16/8/5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	21.6	9.4	33	CPH-E16/8/5-1S-6P

COIL FORMER

General data for 9-pins E16/8/5 coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 E16/8/5 coil former; 9-pins.

Winding data 9-pins for E16/8/5 coil former; note 1

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	20.6	9.6	35	CSH-E16/8/5-1S-9P

Note

1. This coil former is optimized for the use of triple-isolated wire. This wire is approved for safety isolation without the usual creepage distance.

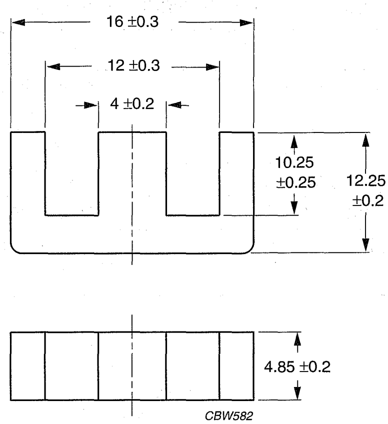
E cores and accessories

E16/12/5 (EL16)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.85	mm^{-1}
V_e	effective volume	1070	mm^3
l_e	effective length	55.3	mm
A_e	effective area	19.4	mm^2
A_{min}	minimum area	19.4	mm^2
m	mass of core half	≈2.6	g



Dimensions in mm.

Fig.1 E16/12/5 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N.
Gapped cores available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	800 ±25%	≈1810	≈0	E16/12/5-3C90

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E26	2000 ±25%	≈4530	≈0	E16/12/5-3E26

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W)at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥315	≤0.13	≤0.14

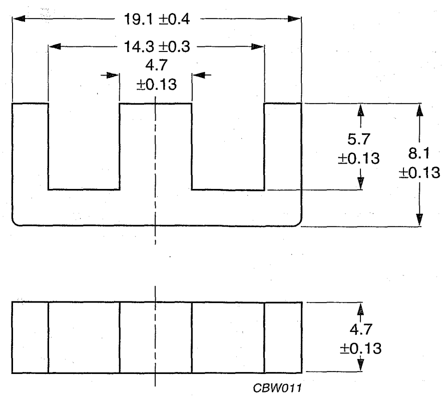
E cores and accessories

E19/8/5 (813E187)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	1.77	mm^{-1}
V_e	effective volume	900	mm^3
l_e	effective length	39.9	mm
A_e	effective area	22.6	mm^2
m	mass of core half	≈2.3	g



Dimensions in mm.

Fig.1 E19/8/5 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈90	≈590	E19/8/5-3C81-A63
	100 ±3%	≈140	≈330	E19/8/5-3C81-A100
	160 ±3%	≈225	≈190	E19/8/5-3C81-A160
	250 ±5%	≈350	≈110	E19/8/5-3C81-A250
	315 ±10%	≈440	≈80	E19/8/5-3C81-A315
	1500 ±25%	≈2110	≈0	E19/8/5-3C81
3C90	63 ±3%	≈90	≈590	E19/8/5-3C90-A63
	100 ±3%	≈140	≈330	E19/8/5-3C90-A100
	160 ±3%	≈225	≈190	E19/8/5-3C90-A160
	250 ±5%	≈350	≈110	E19/8/5-3C90-A250
	315 ±10%	≈440	≈80	E19/8/5-3C90-A315
	1170 ±25%	≈1650	≈0	E19/8/5-3C90
3C94 des	1170 ±25%	≈1650	≈0	E19/8/5-3C94
3F3	63 ±3%	≈90	≈590	E19/8/5-3F3-A63
	100 ±3%	≈140	≈330	E19/8/5-3F3-A100
	160 ±3%	≈225	≈190	E19/8/5-3F3-A160
	250 ±5%	≈350	≈110	E19/8/5-3F3-A250
	315 ±10%	≈440	≈80	E19/8/5-3F3-A315
	995 ±25%	≈1400	≈0	E19/8/5-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 sup	2300 ±25%	≈3230	≈0	E19/8/5-3E25
3E27	2300 ±25%	≈3230	≈0	E19/8/5-3E27
3E5	≥3235	≥4540	≈0	E19/8/5-3E5

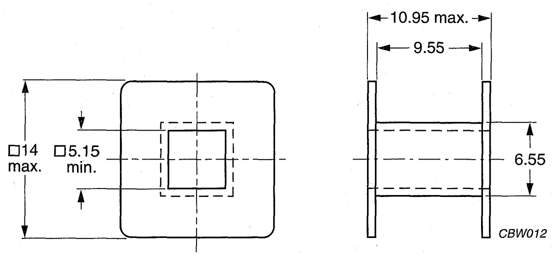
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.20	–	–	–
3C90	≥320	≤0.09	≤0.10	–	–
3C94	≥320	–	≤0.08	≈0.40	≈0.17
3F3	≥320	–	≤0.10	–	≤0.17

COIL FORMERS

General data for E19/8/5 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

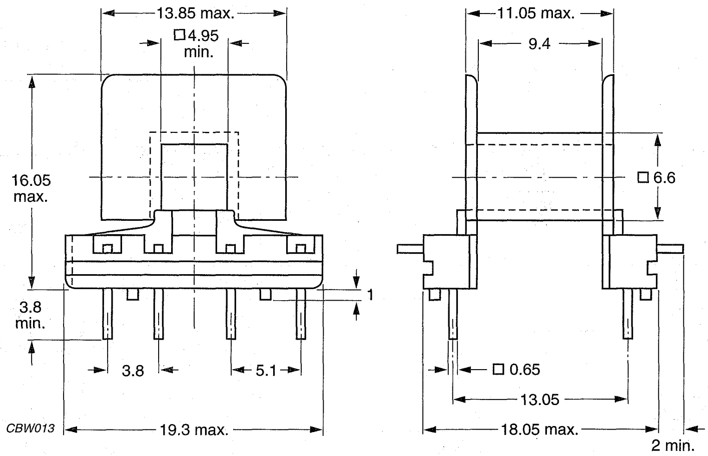
Fig.2 E19/8/5 coil former.

Winding data for E19/8/5 coil forme without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	33.0	9.5	37.9	CP-E19/8/5-1S

General data for 8-pins E19/8/5 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E41938(M)
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 E19/8/5 coil former; 8-pins.

Winding data for 8-pins E19/8/5 coil former

NUMBER OF SECTIONS	MINIMUM WNDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	32.3	9.4	40.9	CPH-E19/8/5-1S-8PD

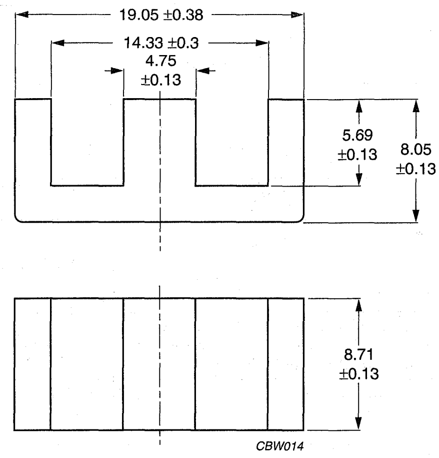
E cores and accessories

E19/8/9 (813E343)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.960	mm^{-1}
V_e	effective volume	1650	mm^3
l_e	effective length	39.9	mm
A_e	effective area	41.3	mm^2
m	mass of core half	≈4	g



Dimensions in mm.

Fig.1 E19/8/9 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N, unless otherwise stated.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%(1)	≈75	≈650	E19/8/9-3C81-E100
	160 ±3%	≈125	≈370	E19/8/9-3C81-A160
	250 ±3%	≈190	≈220	E19/8/9-3C81-A250
	315 ±3%	≈240	≈150	E19/8/9-3C81-A315
	400 ±5%	≈310	≈120	E19/8/9-3C81-A400
	2740 ±25%	≈2680	≈0	E19/8/9-3C81
3C90	100 ±3%(1)	≈75	≈650	E19/8/9-3C90-E100
	160 ±3%	≈125	≈370	E19/8/9-3C90-A160
	250 ±3%	≈190	≈220	E19/8/9-3C90-A250
	315 ±3%	≈240	≈150	E19/8/9-3C90-A315
	400 ±5%	≈310	≈120	E19/8/9-3C90-A400
	2150 ±25%	≈2100	≈0	E19/8/9-3C90
3C94 des	2150 ±25%	≈2100	≈0	E19/8/9-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3F3	100 ±3%(1)	≈75	≈650	E19/8/9-33F3-E100
	160 ±3%	≈125	≈370	E19/8/9-33F3-A160
	250 ±3%	≈190	≈220	E19/8/9-33F3-A250
	315 ±3%	≈240	≈150	E19/8/9-33F3-A315
	400 ±5%	≈310	≈120	E19/8/9-33F3-A400
	1830 ±25%	≈1400	≈0	E19/8/9-33F3

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 20 ±10 N.

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E25 sup	4250 ±25%	≈3270	≈0	E19/8/9-3E25
3E27	4250 ±25%	≈3270	≈0	E19/8/9-3E27
3E5	≥6300	≥4850	≈0	E19/8/9-3E5

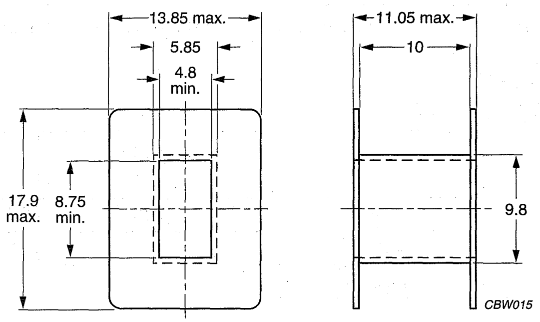
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.17	≤0.18	–	–
3C94	≥320	–	≤0.15	≈0.71	≈0.31
3F3	≥320	–	≤0.18	–	≤0.31

COIL FORMER

General data for E19/8/9 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	105 °C, *"IEC 60085"*, class A



Dimensions in mm.

Fig.2 E19/8/9 coil former.

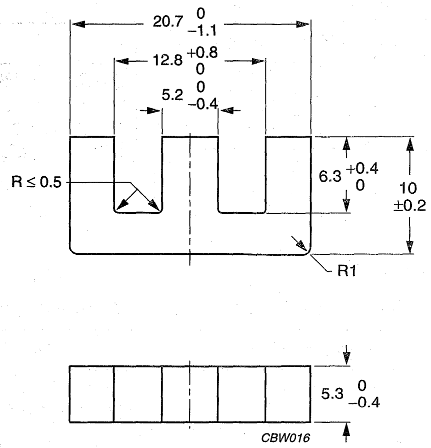
Winding data for E19/8/9 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	39.7	10	45.2	CP-E19/8/9-1S

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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	25.2	mm^2
m	mass of core half	≈4	g



Dimensions in mm.

Fig.1 E20/10/5 core half.

Core halves

Clamping force for A_L measurements, 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	1500 ±25%	≈1700	≈0	E20/10/5-3C90
3C94 des	1500 ±25%	≈1700	≈0	E20/10/5-3C94
3F3	1400 ±25%	≈1600	≈0	E20/10/5-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈2950	≈0	E20/10/5-3C11
3E25	2800 ±25%	≈3100	≈0	E20/10/5-3E25

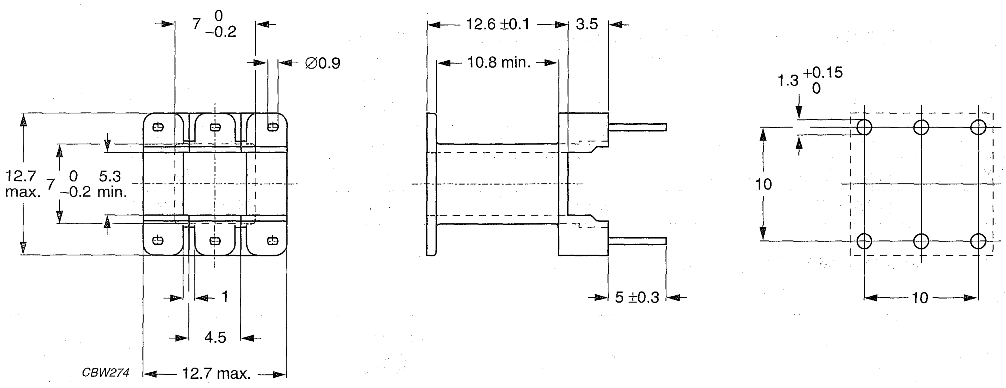
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤0.15	≤0.17	–	–
3C94	≥320	–	≤0.12	≈0.58	≈0.26
3F3	≥320	–	≤0.16	–	≤0.28

COIL FORMER

General data for 6-pins E20/10/5 coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 E20/10/5 coil former; 8-pins.

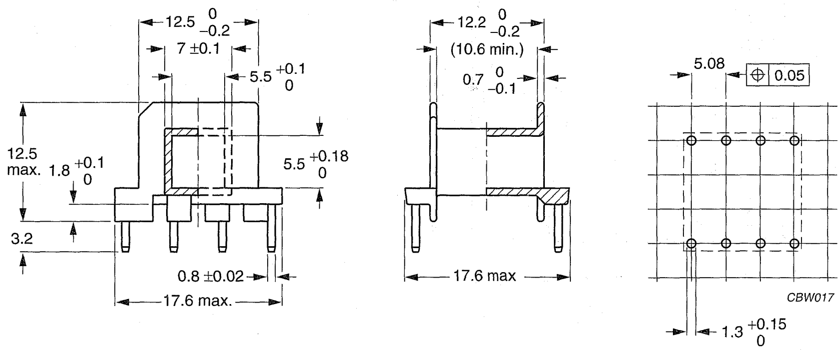
Winding data for 8-pins E20/10/5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	28.6	10.8	38.7	CPV-E20/10/5-1S-6P

COIL FORMER

General data for 8-pins E20/10/5 coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 E20/10/5 coil former; 8-pins.

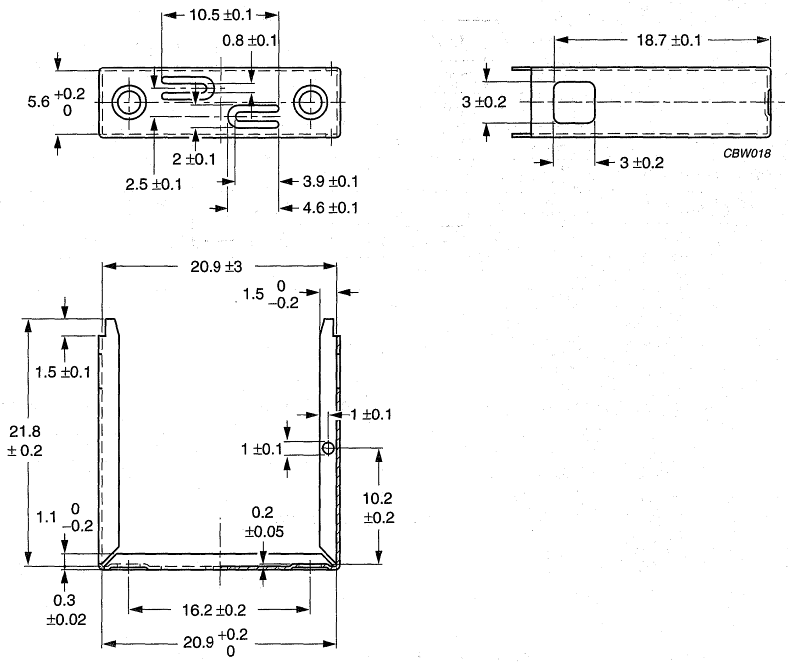
Winding data for 8-pins E20/10/5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27	10.6	38	CSH-E20/10/5-1S-8P

MOUNTING PARTS

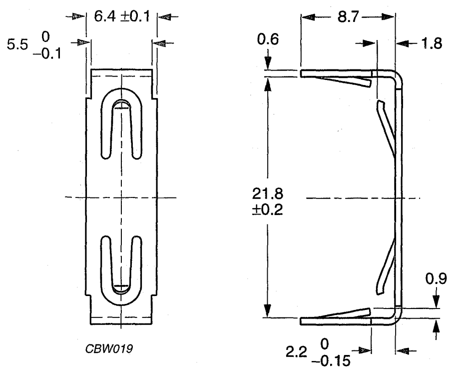
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-zinc alloy (CuSn), nickel (Ni) plated	4	CLA-E20/10/5
Spring	copper-tin alloy (CuSn), nickel (Ni) plated	5	SPR-E20/10/5



Dimensions in mm.

Fig.4 E20/10/5 clasp.



Dimensions in mm.

Fig.5 E20/10/5 spring.

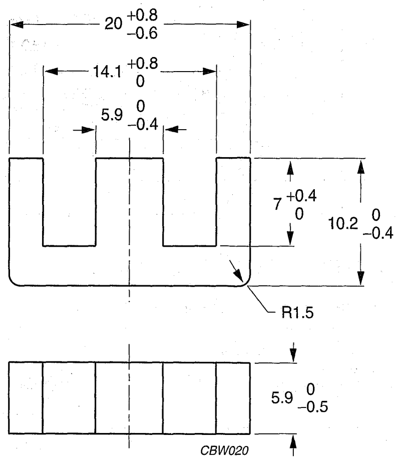
E cores and accessories

E20/10/6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.45	mm^{-1}
V_e	effective volume	1490	mm^3
l_e	effective length	46.0	mm
A_e	effective area	32.0	mm^2
m	mass of core half	≈3.7	g



Dimensions in mm.

Fig.1 E20/10/6 core half.

Core halves

Clamping force for A_L measurements, 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	1450 ±25%	≈1730	≈0	E20/10/6-3C90
3C94 des	1380 ±25%	≈1650	≈0	E20/10/6-3C94
3F3	1350 ±25%	≈1600	≈0	E20/10/6-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C11	2600 ±25%	≈3000	≈0	E20/10/6-3C11
3E25	2700 ±25%	≈3200	≈0	E20/10/6-3E25

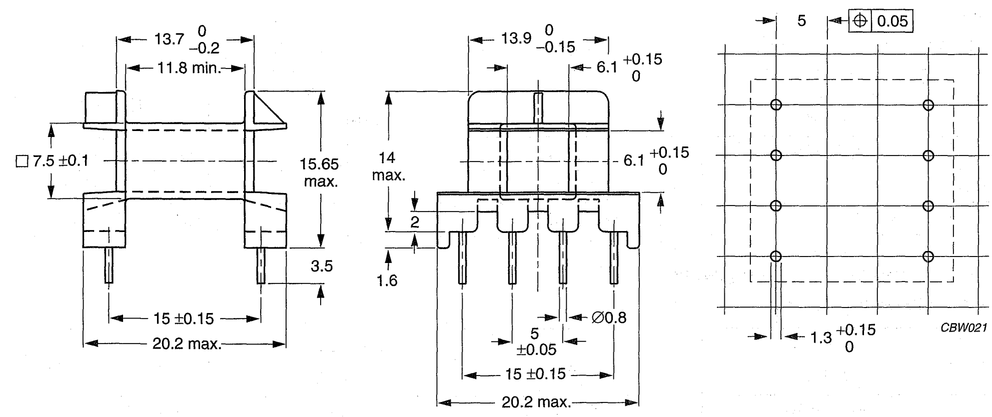
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.16	≤0.18	–	–
3C94	≥320	–	≤0.13	≈0.64	≈0.29
3F3	≥320	–	≤0.20	–	≤0.30

COIL FORMER

General data for 8-pins E20/10/6 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

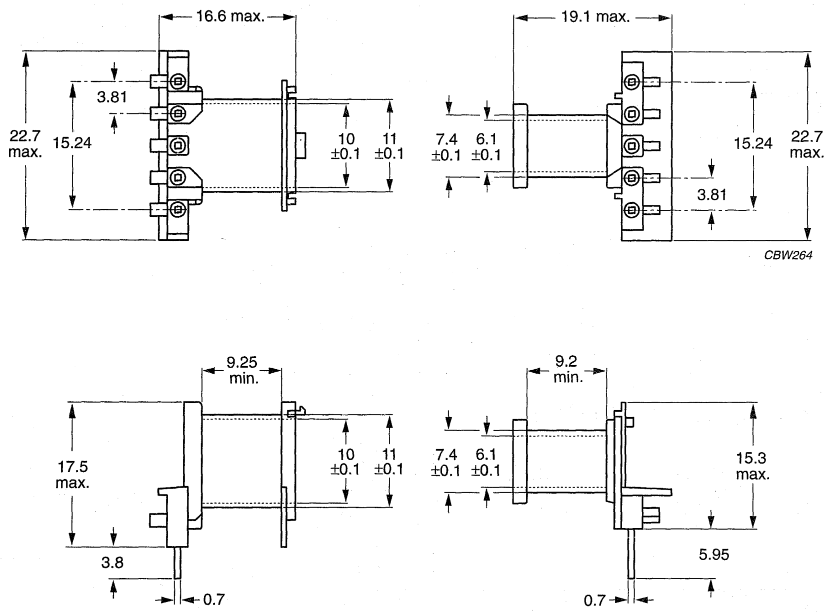
Fig.2 E20/10/6 coil former; 8-pins.

Winding data for 8-pins E20/10/6 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	35	11.8	39	CPH-E20/10/6-1S-8P

General data 10-pins coaxial E20/10/6 coil former

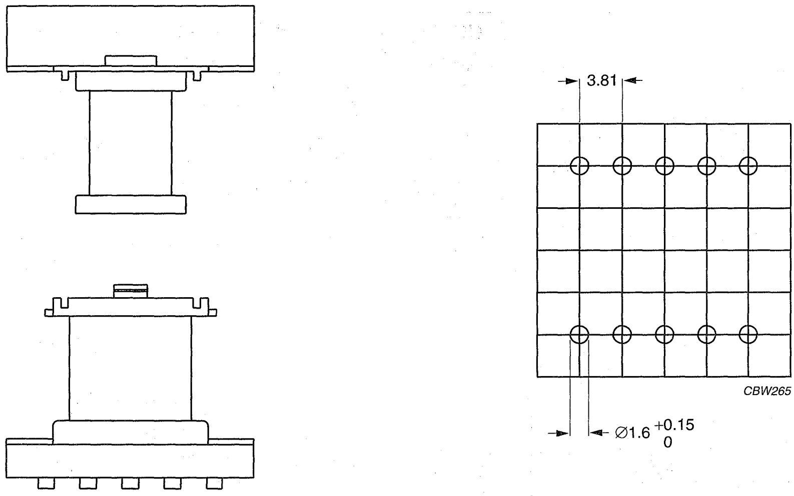
PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

For mounting grid and method of fitting, see Fig.4.

Fig.3 Coaxial E20/10/6 coil former; 10-pins.



Dimensions in mm.

This coil former incorporates 6 mm creepage distance between primary and secondary windings, as well as between primary and all other conductive parts (in accordance with IEC 60380 safety regulations).

Fig.4 Mounting grid and method of fitting.

Winding data for coaxial E20/10/6 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.3	9.2	34.7	CPCI-E20/6-1S-5P-G; see note 1
1	13.1	9.25	50	CPCO-E20/6-1S-5P-G; see note 1

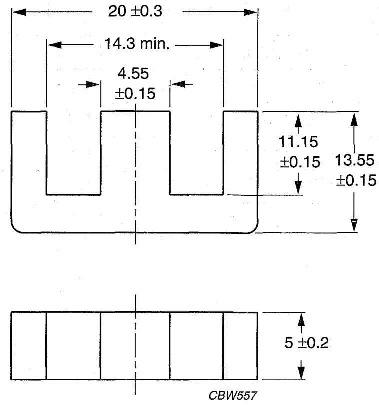
Note

1. Also available with post-inserted pins. Different number of pins available on request for all types.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.54	mm^{-1}
V_e	effective volume	1513	mm^3
l_e	effective length	62.0	mm
A_e	effective area	24.4	mm^2
A_{min}	minimum area	22.8	mm^2
m	mass of core half	≈4.3	g



Dimensions in mm.

Fig.1 E20/14/5 core half.

Core halves

Clamping force for A_L measurements, 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	900 ±25%	≈1820	≈0	E20/14/5-3C90

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E26	2300 ±25%	≈4650	≈0	E20/14/5-3E26

Properties of core sets under power conditions

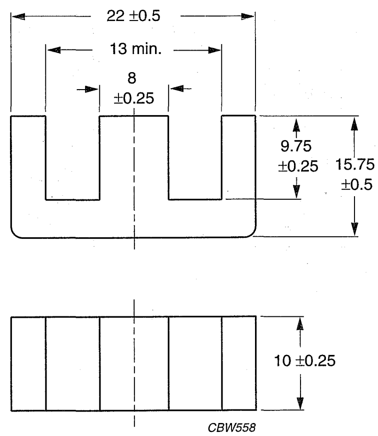
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤0.16	≤0.18

E cores and accessories E22/16/10

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.695	mm^{-1}
V_e	effective volume	5143	mm^3
l_e	effective length	59.8	mm
A_e	effective area	86	mm^2
A_{min}	minimum area	80	mm^2
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 E22/16/10 core half.

Core halves

Clamping force for A_L measurements, 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	3090 ±25%	≈1710	≈0	E22/16/10-3C90

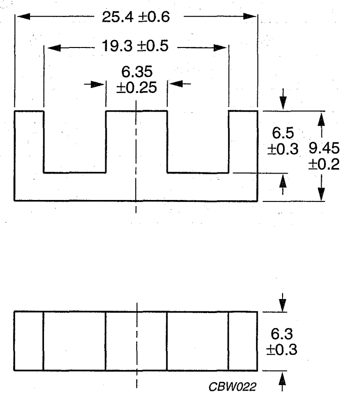
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤0.55	≤0.60

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈4.8	g



Dimensions in mm.

Fig.1 E25/9/6 core half.

Core halves

Clamping force for A_L measurements 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2000 ±25%	≈1950	≈0	E25/9/6-3C90
3C94 des	1600 ±25%	≈1540	≈0	E25/9/6-3C94

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 des	3300 ±25%	≈3200	≈0	E25/9/6-3E25

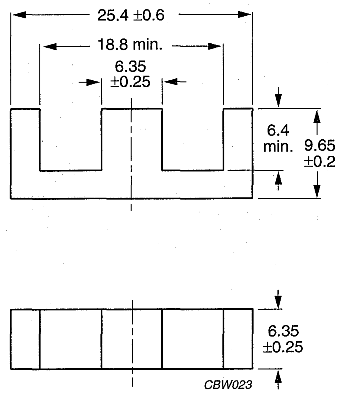
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤0.20	≤0.22	–	–
3C94	≥330	–	≤0.17	≈0.80	≈0.35

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.24	mm^{-1}
V_e	effective volume	1930	mm^3
l_e	effective length	49.0	mm
A_e	effective area	39.5	mm^2
A_{min}	minimum area	37.0	mm^2
m	mass of core half	≈4.8	g



Dimensions in mm.

Fig.1 E25/10/6 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	100 ±3%	≈100	≈600	E25/10/6-3C81-A100
	160 ±3%	≈165	≈340	E25/10/6-3C81-A160
	250 ±3%	≈255	≈200	E25/10/6-3C81-A250
	315 ±3%	≈320	≈150	E25/10/6-3C81-A315
	400 ±5%	≈410	≈110	E25/10/6-3C81-A400
	2340 ±25%	≈2390	≈0	E25/10/6-3C81
3C90	100 ±3%	≈100	≈600	E25/10/6-3C90-A100
	160 ±3%	≈165	≈340	E25/10/6-3C90-A160
	250 ±3%	≈255	≈200	E25/10/6-3C90-A250
	315 ±3%	≈320	≈150	E25/10/6-3C90-A315
	400 ±5%	≈410	≈110	E25/10/6-3C90-A400
	1600 ±25%	≈1600	≈0	E25/10/6-3C90
3C94 des	1600 ±25%	≈1600	≈0	E25/10/6-3C94
3F3	100 ±3%	≈100	≈600	E25/10/6-3F3-A100
	160 ±3%	≈165	≈340	E25/10/6-3F3-A160
	250 ±3%	≈255	≈200	E25/10/6-3F3-A250
	315 ±3%	≈320	≈150	E25/10/6-3F3-A315
	400 ±5%	≈410	≈110	E25/10/6-3F3-A400
	1470 ±25%	≈1500	≈0	E25/10/6-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈2800	≈0	E25/10/6-3C11
3E25 des	3000 ±25%	≈3200	≈0	E25/10/6-3E25
3E27	3200 ±25%	≈3200	≈0	E25/10/6-3E27
3E5	≥5075	≥5075	≈0	E25/10/6-3E5

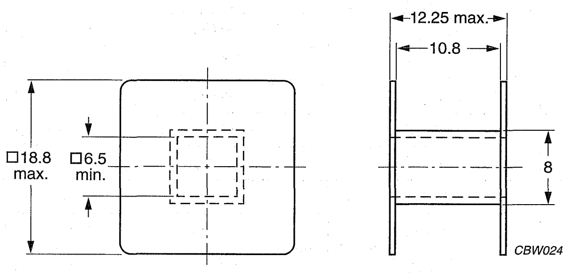
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.4	–	–	–
3C90	≥330	≤0.2	≤0.22	–	–
3C94	≥330	–	≤0.17	≈0.83	≈0.37
3F3	≥320	–	≤0.22	–	≤0.38

COIL FORMERS

General data for E25/10/6 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*
Maximum operating temperature	105 °C, *"IEC 60085"*, class A



Dimensions in mm.

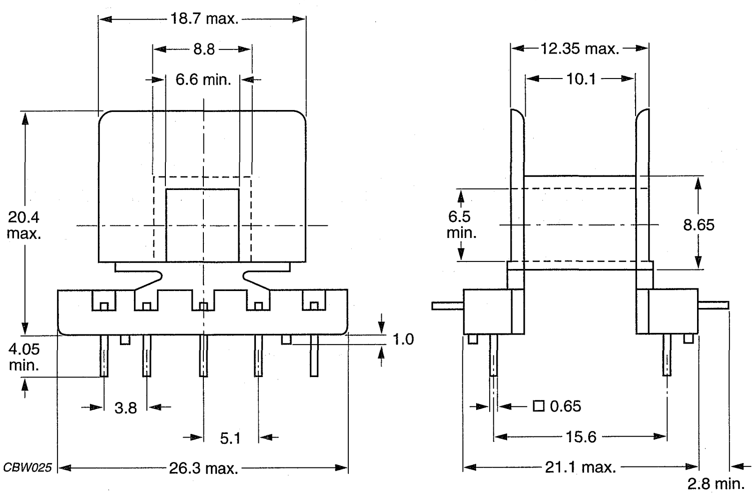
Fig.2 E25/10/6 coil former.

Winding data for E25/10/6 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	56.2	10.8	49.1	CP-E25/10/6-1S

General data for 10-pins E25/10/6 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated



Dimensions in mm.

Fig.3 E25/10/6 coil former; 10-pins.

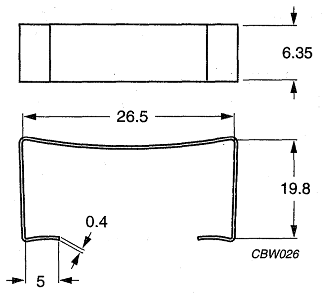
Winding data for 10-pins E25/10/6 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	47.4	10.1	53.1	CPH-E25/10/6-1S-10P

MOUNTING PARTS

General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈30 N	4	CLM-E25/10/6



Dimensions in mm.

Fig.4 E25/10/6 clamp.

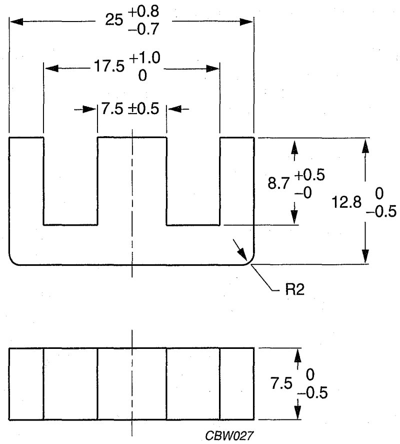
E cores and accessories

E25/13/7 (EF25)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.11	mm^{-1}
V_e	effective volume	2990	mm^3
l_e	effective length	58.0	mm
A_e	effective area	52.0	mm^2
m	mass of core half	≈8	g



Dimensions in mm.

Fig.1 E25/13/7 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 20 ±10 N unless otherwise stated.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈140	≈480	E25/13/7-3C81-A160
	250 ±3%	≈220	≈270	E25/13/7-3C81-A250
	315 ±3%	≈280	≈200	E25/13/7-3C81-A315
	400 ±3%	≈355	≈150	E25/13/7-3C81-A400
	630 ±5%	≈560	≈80	E25/13/7-3C81-A630
	2460 ±25%	≈2170	≈0	E25/13/7-3C81
3C90	160 ±3%	≈140	≈480	E25/13/7-3C90-A160
	250 ±3%	≈220	≈270	E25/13/7-3C90-A250
	315 ±3%	≈280	≈200	E25/13/7-3C90-A315
	400 ±3%	≈355	≈150	E25/13/7-3C90-A400
	630 ±5%	≈560	≈80	E25/13/7-3C90-A630
	1900 ±25%	≈1700	≈0	E25/13/7-3C90
3C94 des	1900 ±25%	≈1700	≈0	E25/13/7-3C94
3F3	160 ±3%	≈140	≈480	E25/13/7-3F3-A160
	250 ±3%	≈220	≈270	E25/13/7-3F3-A250
	315 ±3%	≈280	≈200	E25/13/7-3F3-A315
	400 ±3%	≈355	≈150	E25/13/7-3F3-A400
	630 ±5%	≈560	≈80	E25/13/7-3F3-A630
	1650 ±25%	≈1460	≈0	E25/13/7-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3100 ±25%	≈2800	≈0	E25/13/7-3C11
3E25 sup	4000 ±25%	≈3530	≈0	E25/13/7-3E25
3E27	4000 ±25%	≈3530	≈0	E25/13/7-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.61	–	–	–
3C90	≥330	≤0.35	≤0.38	–	–
3C94	≥330	–	≤0.27	≈1.30	≈0.57
3F3	≥320	–	≤0.38	–	≤0.65

COIL FORMER

General data for 6-pins E25/13/7 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s

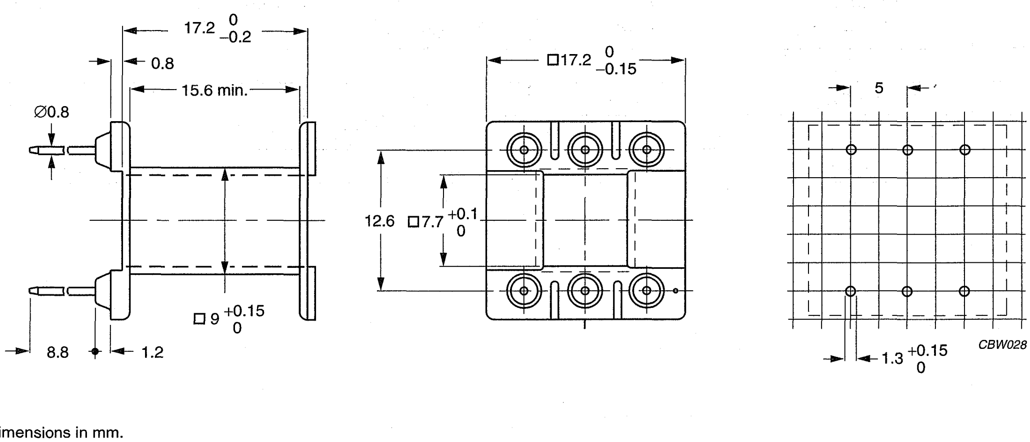


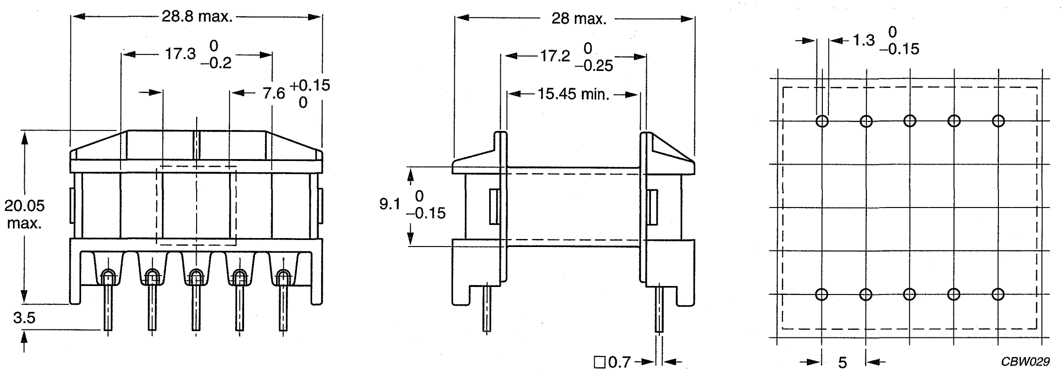
Fig.2 E25/13/7 coil former; 6-pins.

Winding data for 6-pins E25/13/7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	56	15.6	49	CPV-E25/13/7-1S-6P

General data for 10-pins E25/13/7 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 E25/13/7 coil former; 10-pins.

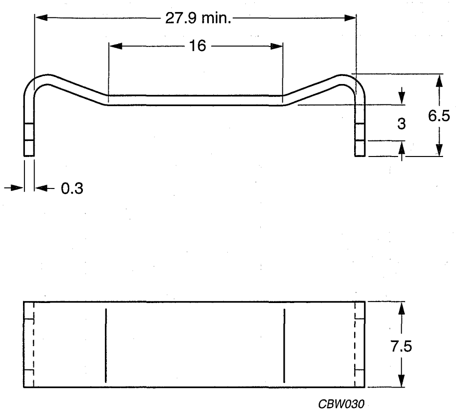
Winding data for 10-pins E25/13/7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	63.3	15.45	52.8	CPH-E25/13/7-1S-10P

MOUNTING PARTS

General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi)	4	CLI-E25/13/7



Dimensions in mm.

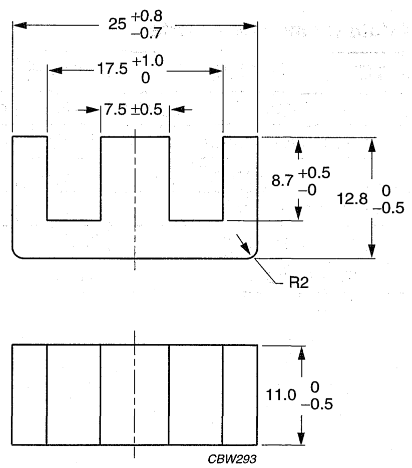
Fig.4 Clip: E25/13/7.

E cores and accessories | E25/13/11

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.733	mm^{-1}
V_e	effective volume	4500	mm^3
l_e	effective length	57.5	mm
A_e	effective area	78.4	mm^2
m	mass of core half	≈11	g



Dimensions in mm.

Fig.1 E25/13/11 core half.

Core halves

Gapped cores are available on request, clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	2800 ±25%	≈1780	≈0	E25/13/11-3C90
3C94 des	2800 ±25%	≈1780	≈0	E25/13/11-3C94
3F3	2700 ±25%	≈1660	≈0	E25/13/11-3F3

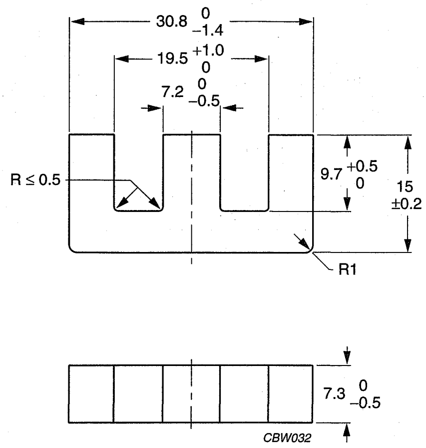
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤0.55	≤0.55	−	−
3C94	≥330	−	≤0.40	≈1.95	≈0.86
3F3	≥320	−	≤0.55	−	≤0.95

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈11	g



Dimensions in mm.

Fig.1 E30/15/7 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 20 ±10 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈145	≈530	E30/15/7-3C81-A160
	250 ±3%	≈225	≈300	E30/15/7-3C81-A250
	315 ±3%	≈285	≈230	E30/15/7-3C81-A315
	400 ±3%	≈365	≈170	E30/15/7-3C81-A400
	630 ±5%	≈580	≈90	E30/15/7-3C81-A630
	2500 ±25%	≈2270	≈0	E30/15/7-3C81
3C90	160 ±3%	≈145	≈530	E30/15/7-3C90-A160
	250 ±3%	≈225	≈300	E30/15/7-3C90-A250
	315 ±3%	≈285	≈230	E30/15/7-3C90-A315
	400 ±3%	≈365	≈170	E30/15/7-3C90-A400
	630 ±5%	≈580	≈90	E30/15/7-3C90-A630
	1900 ±25%	≈1700	≈0	E30/15/7-3C90
3C94 des	2000 ±25%	≈1780	≈0	E30/15/7-3C94

E cores and accessories E30/15/7

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈145	≈530	E30/15/7-3F3-A160
	250 ±3%	≈225	≈300	E30/15/7-3F3-A250
	315 ±3%	≈285	≈230	E30/15/7-3F3-A315
	400 ±3%	≈365	≈170	E30/15/7-3F3-A400
	630 ±5%	≈580	≈90	E30/15/7-3F3-A630
	1600 ±25%	≈1430	≈0	E30/15/7-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3300 ±25%	≈2900	≈0	E30/15/7-3C11
3E25 sup	4100 ±25%	≈3650	≈0	E30/15/7-3E25
3E27	4100 ±25%	≈3650	≈0	E30/15/7-3E27

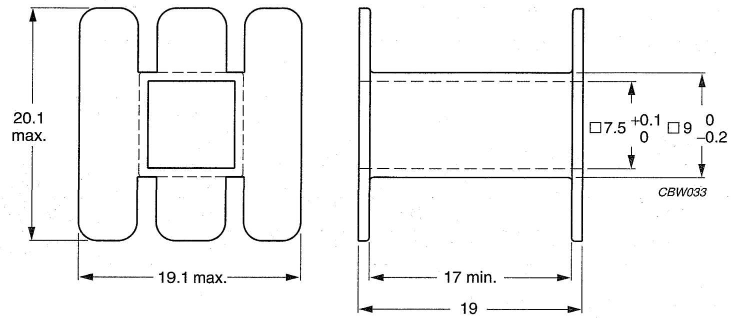
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤082	–	–	–
3C90	≥330	≤0.45	≤0.48	–	–
3C94	≥330	–	≤0.36	≈1.8	≈0.76
3F3	≥320	–	≤0.47	–	≤0.80

COIL FORMERS

GENERAL DATA FOR E30/15/7 COIL FORMER WITHOUT PINS

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41613(M)
Maximum operating temperature	120 °C



Dimensions in mm.

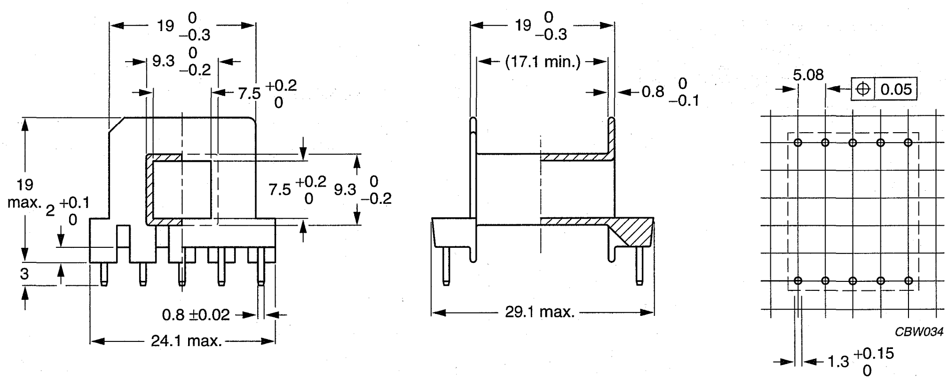
Fig.2 E30/15/7 coil former.

WINDING DATA FOR E30/15/7 COIL FORMER WITHOUT PINS (E)

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80	16.8	56	CP-E30/15/7-1S

GENERAL DATA FOR 10-PINS E30/15/7 COIL FORMER

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E30/15/7 coil former; 10-pins.

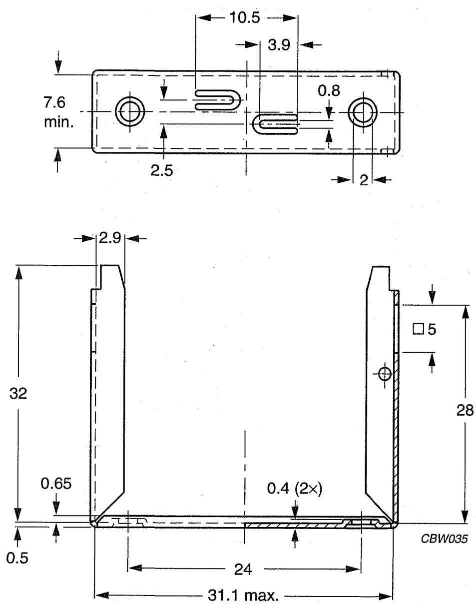
WINDING DATA FOR 10-PINS E30/15/7 COIL FORMER (E)

NUMBER OF NECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80	17.1	56	CSH-E30/7-1S-10P

MOUNTING PARTS

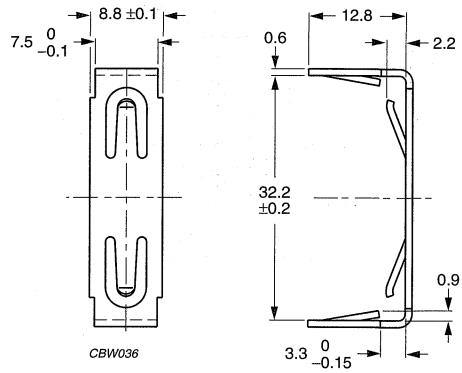
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	CuZn alloy, Ni plated	4	CLA-E30/15/7
Spring	stainless steel (CrNi)	5	SPR-E30/15/7



Dimensions in mm.

Fig.4 E30/15/7 clasp.



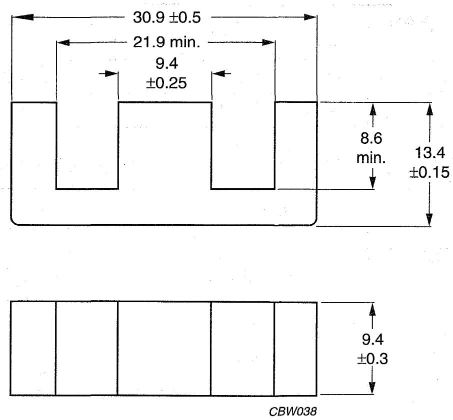
Dimensions in mm.

Fig.5 E30/15/7 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.740	mm^{-1}
V_e	effective volume	5150	mm^3
l_e	effective length	61.9	mm
A_e	effective area	83.2	mm^2
m	mass of core half	≈13	g



Dimensions in mm.

Fig.1 E31/13/9 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈150	≈470	E31/13/9-3C81-A250
	315 ±3%	≈190	≈350	E31/13/9-3C81-A315
	400 ±3%	≈235	≈260	E31/13/9-3C81-A400
	630 ±3%	≈375	≈150	E31/13/9-3C81-A630
	1000 ±5%	≈590	≈80	E31/13/9-3C81-A1000
	3735 ±25%	≈2200	≈0	E31/13/9-3C81
3C90	250 ±3%	≈150	≈470	E31/13/9-3C90-A250
	315 ±3%	≈190	≈350	E31/13/9-3C90-A315
	400 ±3%	≈235	≈260	E31/13/9-3C90-A400
	630 ±3%	≈375	≈150	E31/13/9-3C90-A630
	1000 ±5%	≈590	≈80	E31/13/9-3C90-A1000
	2970 ±25%	≈1750	≈0	E31/13/9-3C90
3C94 des	2970 ±25%	≈1750	≈0	E31/13/9-3C94
3F3	250 ±3%	≈150	≈470	E31/13/9-3F3-A250
	315 ±3%	≈190	≈350	E31/13/9-3F3-A315
	400 ±3%	≈235	≈260	E31/13/9-3F3-A400
	630 ±3%	≈375	≈150	E31/13/9-3F3-A630
	1000 ±5%	≈590	≈80	E31/13/9-3F3-A1000
	2650 ±25%	≈1560	≈0	E31/13/9-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E25 sup	6790 ±25%	≈4000	≈0	E31/13/9-3E25
3E27	6790 ±25%	≈4000	≈0	E31/13/9-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.1	–	–	–
3C90	≥320	≤0.52	≤0.58	–	–
3C94	≥320	–	≤0.46	≈2.2	≈0.98
3F3	≥320	–	≤0.57	–	≤0.98

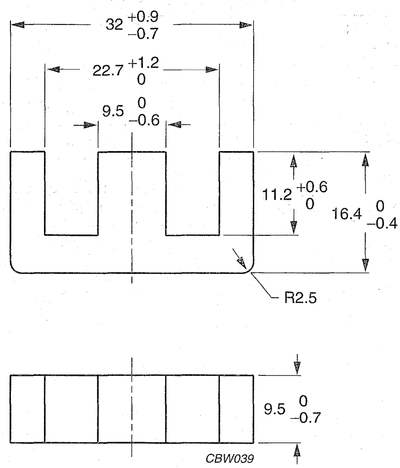
E cores and accessories

E32/16/9 (EF32)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈16	g



Dimensions in mm.

Fig.1 E32/16/9 core half.

Core halves

Clamping force for A_L measurements 20 ±10 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2500 ±25%	≈1850	≈0	E32/16/9-3C90
3C94 des	2500 ±25%	≈1850	≈0	E32/16/9-3C94
3F3	2300 ±25%	≈1700	≈0	E32/16/9-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	4000 ±25%	≈2950	≈0	E32/16/9-3C11
3E25 des	5000 ±25%	≈3700	≈0	E32/16/9-3E25

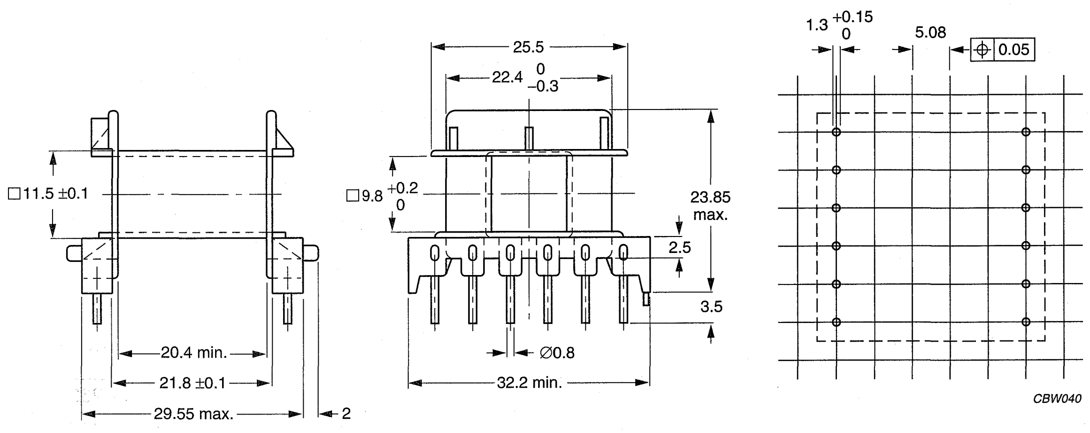
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥330	≤0.65	≤0.70	−	−
3C94	≥330	−	≤0.55	≈2.70	≈1.20
3F3	≥320	−	≤0.75	−	≤1.25

COIL FORMER

General data for 12-pins E32/16/9 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 E32/16/9 coil former; 12-pins.

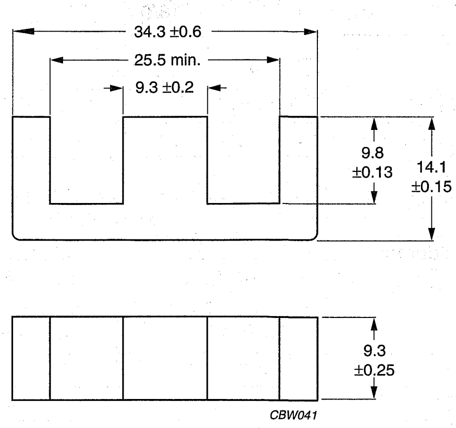
Winding data for 12-pins E32/16/9 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97	20.4	60	CPH-E32/16/9-1S-12P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.850	mm^{-1}
V_e	effective volume	5590	mm^3
l_e	effective length	69.3	mm
A_e	effective area	80.7	mm^2
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 E34/14/9 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	250 ±3%	≈170	≈450	E34/14/9-3C81-A250
	315 ±3%	≈215	≈340	E34/14/9-3C81-A315
	400 ±3%	≈270	≈250	E34/14/9-3C81-A400
	630 ±3%	≈430	≈140	E34/14/9-3C81-A630
	1000 ±5%	≈680	≈70	E34/14/9-3C81-A1000
	3200 ±25%	≈2170	≈0	E34/14/9-3C81
3C90	250 ±3%	≈170	≈450	E34/14/9-3C90-A250
	315 ±3%	≈215	≈340	E34/14/9-3C90-A315
	400 ±3%	≈270	≈250	E34/14/9-3C90-A400
	630 ±3%	≈430	≈140	E34/14/9-3C90-A630
	1000 ±5%	≈680	≈70	E34/14/9-3C90-A1000
	2440 ±25%	≈1660	≈0	E34/14/9-3C90
3C94 des	2440 ±25%	≈1660	≈0	E34/14/9-3C94
3F3	250 ±3%	≈170	≈450	E34/14/9-3F3-A250
	315 ±3%	≈215	≈340	E34/14/9-3F3-A315
	400 ±3%	≈270	≈250	E34/14/9-3F3-A400
	630 ±3%	≈430	≈140	E34/14/9-3F3-A630
	1000 ±5%	≈680	≈70	E34/14/9-3F3-A1000
	2125 ±25%	≈1440	≈0	E34/14/9-3F3

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E25 sup	4695 ±25%	≈3190	≈0	E34/14/9-3E25
3E27	4695 ±25%	≈3190	≈0	E34/14/9-3E27

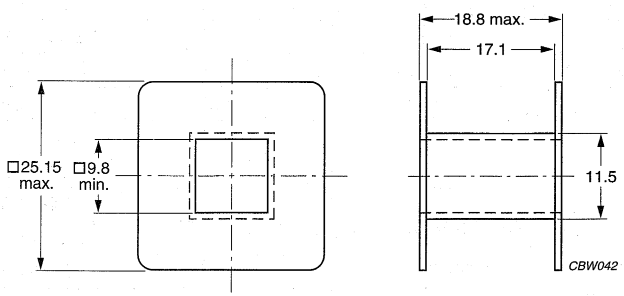
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.20	–	–	–
3C90	≥320	≤0.56	≤0.63	–	–
3C94	≥320	–	≤0.50	≈2.40	≈1.10
3F3	≥320	–	≤0.62	–	≤1.10

COIL FORMERS

General data for E34/14/9 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E34/14/9 coil former.

E cores and accessories

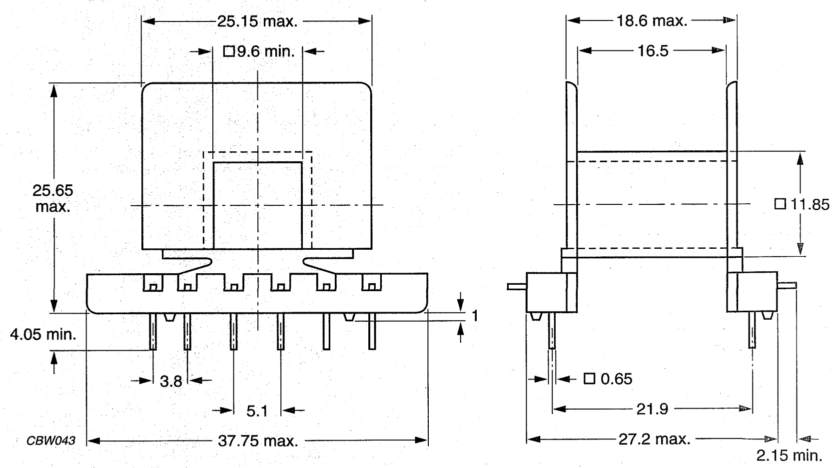
E34/14/9 (E375)

Winding data for E34/14/9 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	111	17.1	67.0	CP-E34/14/9-1S

General data for 12-pins E34/14/9 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZnP), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E34/14/9 coil former: 12-pins.

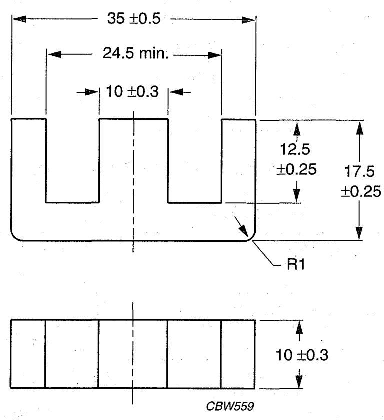
Winding data for 12-pins E34/14/9 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	102	16.5	69.0	CPH-E34/14/9-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.807	mm^{-1}
V_e	effective volume	8070	mm^3
l_e	effective length	80.7	mm
A_e	effective area	100	mm^2
A_{min}	minimum area	100	mm^2
m	mass of core half	≈15	g



Dimensions in mm.

Fig.1 E35/18/10 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 30 ±15 N.
Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	2500 ±3%	≈1600	≈0	E35/18/10-3C90

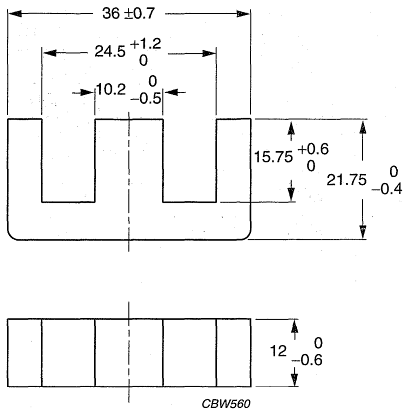
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤0.95	≤1.10

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.762	mm^{-1}
V_e	effective volume	12160	mm^3
l_e	effective length	96	mm
A_e	effective area	126	mm^2
A_{min}	minimum area	121	mm^2
m	mass of core half	≈31	g



Dimensions in mm.

Fig.1 E36/21/12 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 40 ±20 N.
Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2650 ±3%	≈1610	≈0	E36/21/12-3C90

Properties of core sets under power conditions

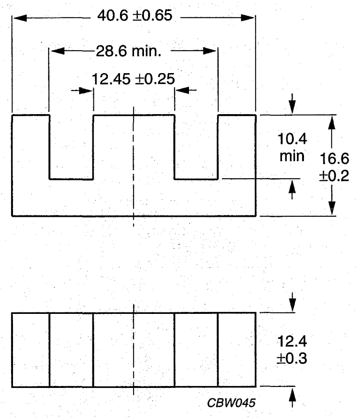
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤1.40	≤1.50

E cores and accessories E41/17/12

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈30	g



Dimensions in mm.

Fig.1 E41/17/12 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%(1)	≈105	≈880	E41/17/12-3C81-E250
	315 ±5%(1)	≈130	≈670	E41/17/12-3C81-E315
	400 ±5%	≈165	≈500	E41/17/12-3C81-A400
	630 ±10%	≈260	≈290	E41/17/12-3C81-A630
	1000 ±10%	≈415	≈160	E41/17/12-3C81-A1000
	5370 ±25%	≈2230	≈0	E41/17/12-3C81
3C90	250 ±3%(1)	≈105	≈880	E41/17/12-3C90-E250
	315 ±5%(1)	≈130	≈670	E41/17/12-3C90-E315
	400 ±5%	≈165	≈500	E41/17/12-3C90-A400
	630 ±10%	≈260	≈290	E41/17/12-3C90-A630
	1000 ±10%	≈415	≈160	E41/17/12-3C90-A1000
	4100 ±25%	≈1800	≈0	E41/17/12-3C90
3C94 des	4100 ±25%	≈1800	≈0	E41/17/12-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%(1)	≈105	≈880	E41/17/12-3F3-E250
	315 ±5%(1)	≈130	≈670	E41/17/12-3F3-E315
	400 ±5%	≈165	≈500	E41/17/12-3F3-A400
	630 ±10%	≈260	≈290	E41/17/12-3F3-A630
	1000 ±10%	≈415	≈160	E41/17/12-3F3-A1000
	3575 ±25%	≈1470	≈0	E41/17/12-3F3

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements 40 ±20 N.

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 sup	9400 ±25%	≈3870	≈0	E41/17/12-3E25
3E27	9400 ±25%	≈3870	≈0	E41/17/12-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤2.40	–	–	–
3C90	≥330	≤1.30	≤1.45	–	–
3C94	≥330	–	≤1.10	≈5.00	≈2.30
3F3	≥320	–	≤1.40	–	≤2.20

E cores and accessories E41/17/12

COIL FORMERS

General data for E41/17/12 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B

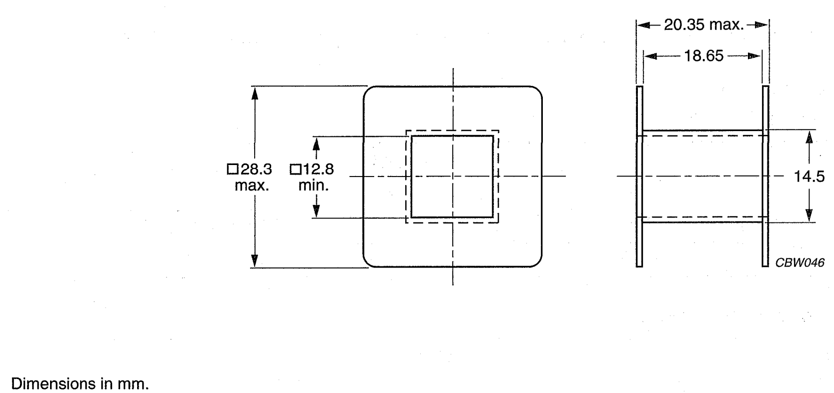


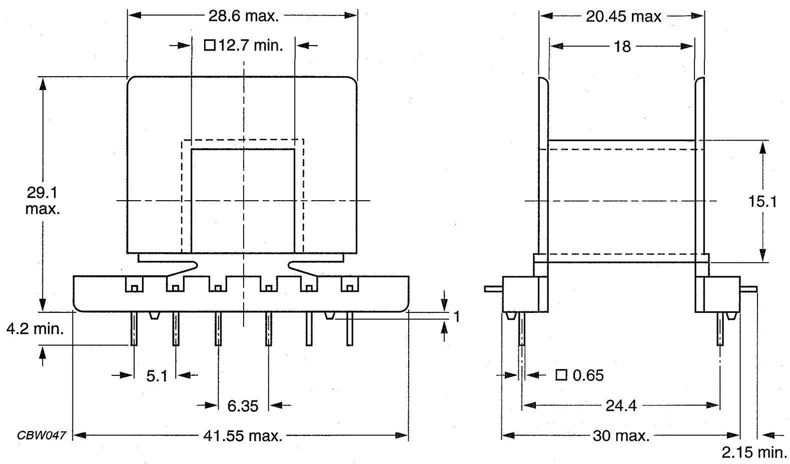
Fig.2 E41/17/12 coil former.

Winding data for E41/17/12 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	120	18.6	79.6	CP-E41/17/12-1S

General data for 12-pins E41/17/12 coil former

PARAMETER	SPECIFICATION
Coil former material	polyethyleneterephtalate (PET), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E41/17/12 coil former; 12-pins.

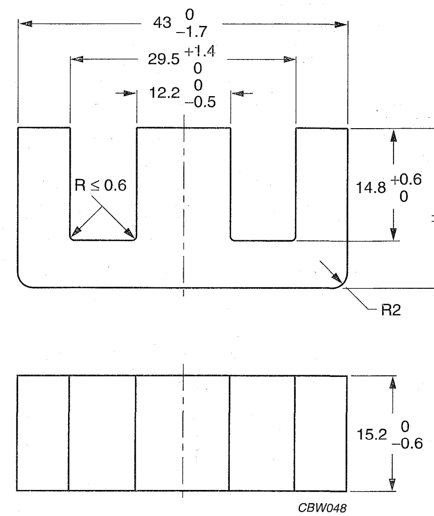
Winding data for 12-pins E41/17/12 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	114	18	81.2	CPH-E41/12-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.548	mm^{-1}
V_e	effective volume	17300	mm^3
l_e	effective length	97.0	mm
A_e	effective area	178	mm^2
A_{min}	minimum area	175	mm^2
m	mass of core half	≈44	g



Dimensions in mm.

Fig.1 E42/21/15 core half.

Core halves

A_L measured in combination with a non gapped core half, clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	250 ±3%(1)	≈110	≈1110	E42/21/15-3C81-E250
	315 ±3%(1)	≈135	≈840	E42/21/15-3C81-E315
	400 ±5%	≈170	≈630	E42/21/15-3C81-A400
	630 ±5%	≈270	≈360	E42/21/15-3C81-A630
	1000 ±10%	≈430	≈200	E42/21/15-3C81-A1000
	5300 ±25%	≈2300	≈0	E42/21/15-3C81
3C90	250 ±3%(1)	≈110	≈1110	E42/21/15-3C90-E250
	315 ±3%(1)	≈135	≈840	E42/21/15-3C90-E315
	400 ±5%	≈170	≈630	E42/21/15-3C90-A400
	630 ±5%	≈270	≈360	E42/21/15-3C90-A630
	1000 ±10%	≈430	≈200	E42/21/15-3C90-A1000
	3900 ±25%	≈1700	≈0	E42/21/15-3C90
3C94 des	4100 ±25%	≈1780	≈0	E42/21/15-3C94

E cores and accessories E42/21/15

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%[1]	≈110	≈1110	E42/21/15-3F3-E250
	315 ±3%[1]	≈135	≈840	E42/21/15-3F3-E315
	400 ±5%	≈170	≈630	E42/21/15-3F3-A400
	630 ±5%	≈270	≈360	E42/21/15-3F3-A630
	1000 ±10%	≈430	≈200	E42/21/15-3F3-A1000
	3600 ±25%	≈1570	≈0	E42/21/15-3F3

Note

1. Measured in combination with an equal core half, clamping force for A_L measurements 40 ±20 N.

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	8000 ±25%	≈3490	≈0	E42/21/15-3C11
3E25 sup	8000 ±25%	≈3490	≈0	E42/21/15-3E25
3E27	8000 ±25%	≈3490	≈0	E42/21/15-3E27

Properties of core sets under power conditions

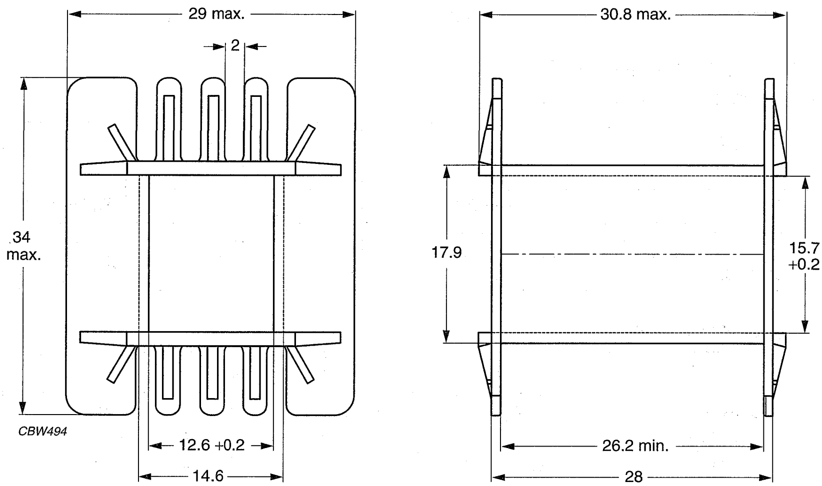
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤3.60	–	–	–
3C90	≥330	≤1.90	≤2.20	–	–
3C94	≥330	–	≤1.80	≈7.40	≈4.00
3F3	≥320	–	≤2.20	–	≤3.80

E cores and accessories E42/21/15

COIL FORMERS

General data for E42/21/15 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

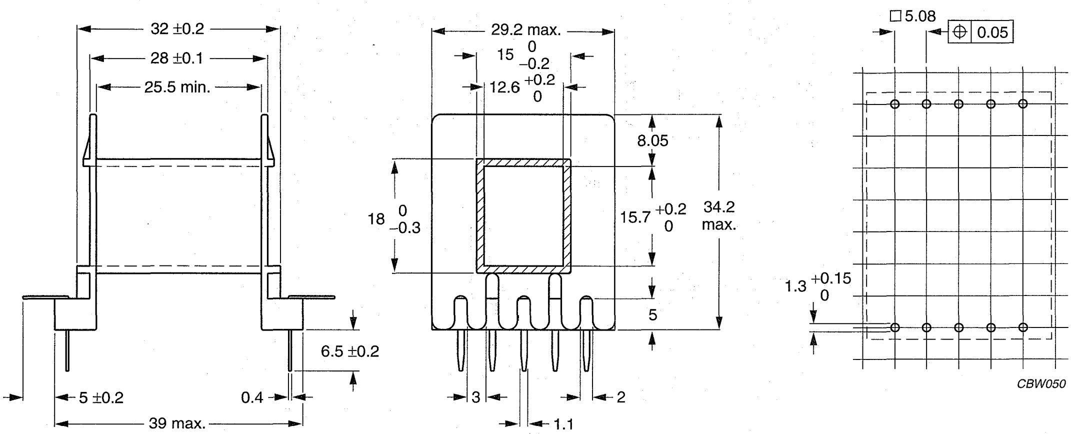
Fig.2 E42/21/15 coil former.

Winding data for E42/21/15 coil former without pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	178	26	93	CP-E42/21/15-1S

General data for 10-pins E42/21/15 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	120 °C, *"IEC 60085"*, class E
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

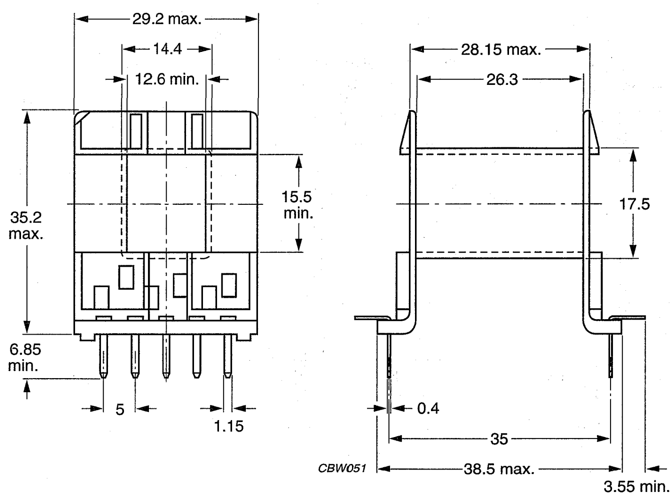
Fig.3 E42/21/15 coil former; 10-pins.

Winding data for 10-pins E42/21/15 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	178	25.5	93	CPH-E42/21/15-1S-10P

General data for 10-pins E42/21/15 coil former (A)

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	105 °C, *"IEC 60085",* class A
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.4 E42/21/15 coil former; 10-pins (A).

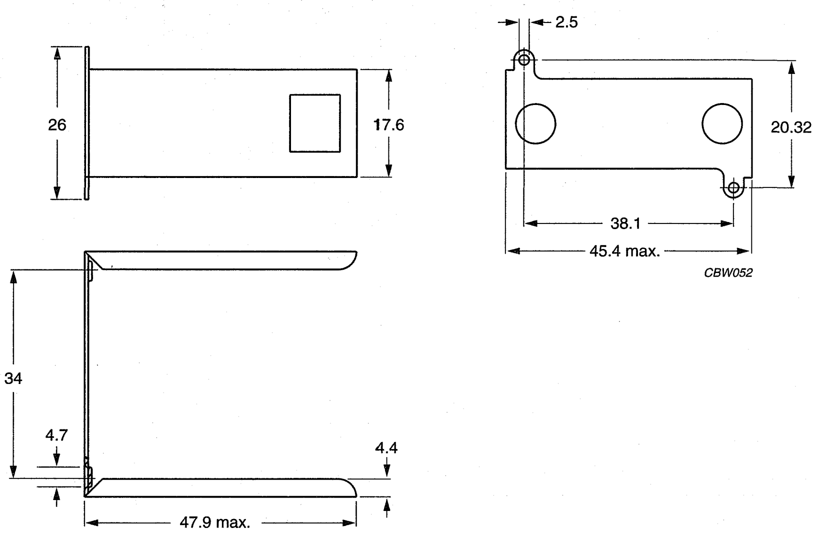
Winding data for 10-pins E42/21/15 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	180	26.3	87	CPH-E42/15-1S-10PD-A

MOUNTING PARTS

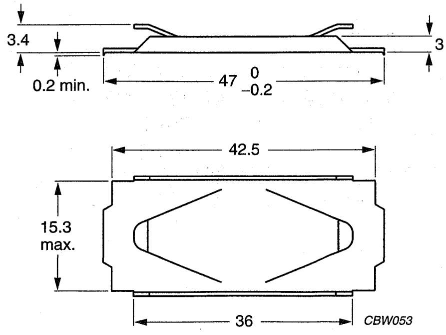
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, zinc (Zn) plated	5	CLA-E42/21/15
Spring	steel, zinc (Zn) plated	6	SPR-E42/21/15



Dimensions in mm.

Fig.5 E42/21/15 clasp.



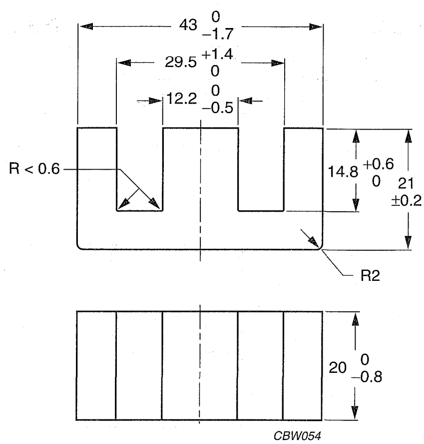
Dimensions in mm.

Fig.6 E42/21/15 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.417	mm^{-1}
V_e	effective volume	22700	mm^3
l_e	effective length	97.0	mm
A_e	effective area	233	mm^2
A_{min}	minimum area	233	mm^2
m	mass of core half	≈56	g



Dimensions in mm.

Fig.1 E42/21/20 core half.

Core halves

Gapped cores are available on request. Clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%(1)	≈84	≈1470	E42/21/20-3C81-E250
	315 ±3%(1)	≈105	≈1110	E42/21/20-3C81-E315
	400 ±3%(1)	≈134	≈830	E42/21/20-3C81-E400
	630 ±5%	≈211	≈480	E42/21/20-3C81-A630
	1000 ±10%	≈334	≈270	E42/21/20-3C81-A1000
	6950 ±25%	≈2300	≈0	E42/21/20-3C81
3C90	250 ±3%	≈84	≈1470	E42/21/20-3C90-E250
	315 ±3%	≈105	≈1110	E42/21/20-3C90-E315
	400 ±3%	≈134	≈830	E42/21/20-3C90-E400
	630 ±5%	≈211	≈480	E42/21/20-3C90-A630
	1000 ±10%	≈334	≈270	E42/21/20-3C90-A1000
	5000 ±25%	≈1660	≈0	E42/21/20-3C90
3C94 des	5200 ±25%	≈1720	≈0	E42/21/20-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%(1)	≈84	≈1470	E42/21/20-3F3-E250
	315 ±3%(1)	≈105	≈1110	E42/21/20-3F3-E315
	400 ±3%(1)	≈134	≈830	E42/21/20-3F3-E400
	630 ±5%	≈211	≈480	E42/21/20-3F3-A630
	1000 ±10%	≈334	≈270	E42/21/20-3F3-A1000
	4600 ±25%	≈1530	≈0	E42/21/20-3F3

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements 40 ±20 N.

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L() (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 sup	10500 ±25%	≈3520	≈0	E42/21/20-3E25
3E27	10500 ±25%	≈3520	≈0	E42/21/20-3E27

Properties of core sets under power conditions

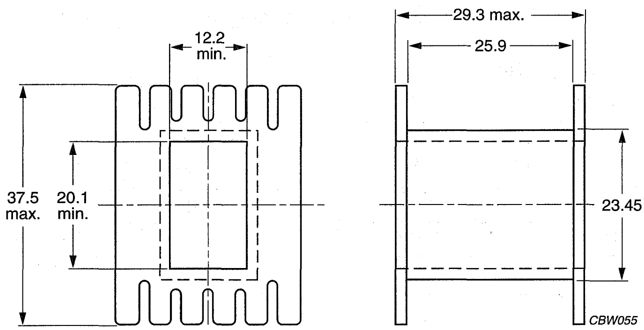
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤4.7	−	−	−
3C90	≥330	≤2.4	≤2.9	−	−
3C94	≥330	−	≤2.5	≈10	≈5.6
3F3	≥320	−	≤2.7	−	≤5.0

E cores and accessories E42/21/20

COIL FORMER

General data for E42/21/20 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	105 °C, *"IEC 60085"*, class A



Dimensions in mm.

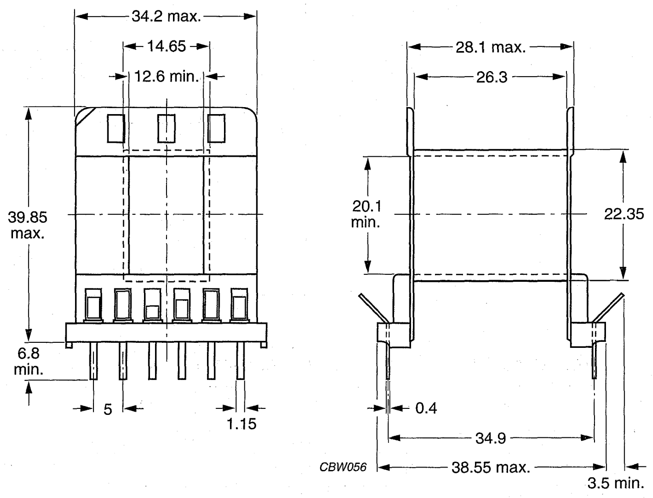
Fig.2 E42/21/20 coil former.

Winding data for E42/21/20 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	173	25.9	100	CP-E42/21/20-1S

General data for 12-pins E42/21/20 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	105 °C, *"IEC 60085"*, class A
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E42/21/20 coil former; 12-pins.

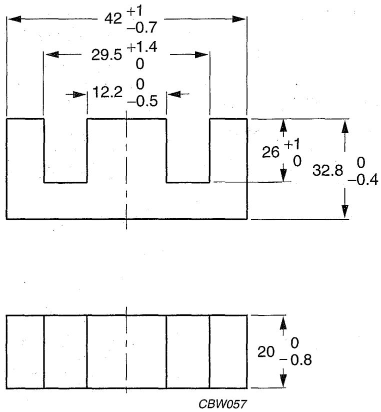
Winding data for 12-pins E42/21/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	255	26.3	78.5	CPH-E42/20-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.614	mm^{-1}
V_e	effective volume	34200	mm^3
l_e	effective length	145	mm
A_e	effective area	236	mm^2
A_{min}	minimum area	234	mm^2
m	mass of core half	≈82	g



Dimensions in mm.

Fig.1 E42/33/20 core half.

Core halves

Clamping force for A_L measurements 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4000 ±25%	≈2000	≈0	E42/33/20-3C90
3C94 des	4000 ±25%	≈2000	≈0	E42/33/20-3C94
3F3	3700 ±25%	≈1850	≈0	E42/33/20-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥330	≤3.6	≤4.2	−	−
3C94	≥330	−	≤3.4	≈15	≈7.5
3F3	≥320	−	≤4.0	−	≤7.3

E cores and accessories — E47/20/16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.380	mm^{-1}
V_e	effective volume	20800	mm^3
l_e	effective length	88.9	mm
A_e	effective area	234	mm^2
A_{min}	minimum area	226	mm^2
m	mass of core half	≈53	g

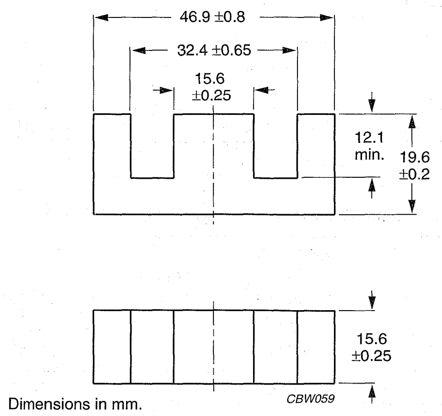


Fig.1 E47/20/16 core half.

Core halves

A_L measured in combination with a non gapped core half, clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	250 ±3%(1)	≈76	≈1460	E47/20/16-3C81-E250
	315 ±3%(1)	≈95	≈1100	E47/20/16-3C81-E315
	400 ±3%(1)	≈121	≈830	E47/20/16-3C81-E400
	630 ±5%	≈191	≈480	E47/20/16-3C81-A630
	1000 ±10%	≈303	≈270	E47/20/16-3C81-A1000
	7540 ±25%	≈2290	≈0	E47/20/16-3C81
3C90	250 ±3%(1)	≈76	≈1460	E47/20/16-3C90-E250
	315 ±3%(1)	≈95	≈1100	E47/20/16-3C90-E315
	400 ±3%(1)	≈121	≈830	E47/20/16-3C90-E400
	630 ±5%	≈191	≈480	E47/20/16-3C90-A630
	1000 ±10%	≈303	≈270	E47/20/16-3C90-A1000
	5500 ±25%	≈1660	≈0	E47/20/16-3C90
3F3	250 ±3%(1)	≈76	≈1458	E47/20/16-3F3-E250
	315 ±3%(1)	≈95	≈1100	E47/20/16-3F3-E315
	400 ±3%(1)	≈121	≈830	E47/20/16-3F3-E400
	630 ±5%	≈191	≈480	E47/20/16-3F3-A630
	1000 ±10%	≈303	≈270	E47/20/16-3F3-A1000
	5100 ±25%	≈1550	≈0	E47/20/16-3F3

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements 40 ±20 N.

Core halves of high permeability grades

Clamping force 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E25 sup	11475 ±25%	≈3480	≈0	E47/20/16-3E25
3E27	11475 ±25%	≈3480	≈0	E47/20/16-3E27

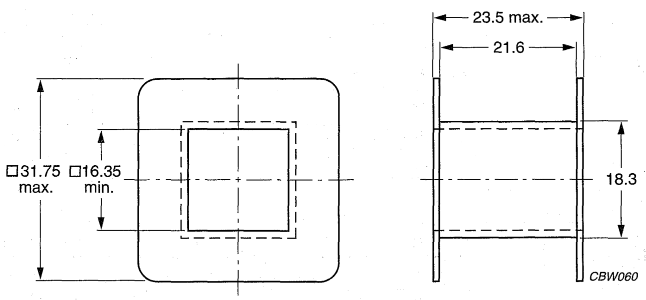
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤4.3	–	–
3C90	≥330	≤2.3	≤2.7	–
3F3	≥320	–	≤2.5	≤4.0

COIL FORMERS

General data for E47/20/16 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E47/20/16 coil former.

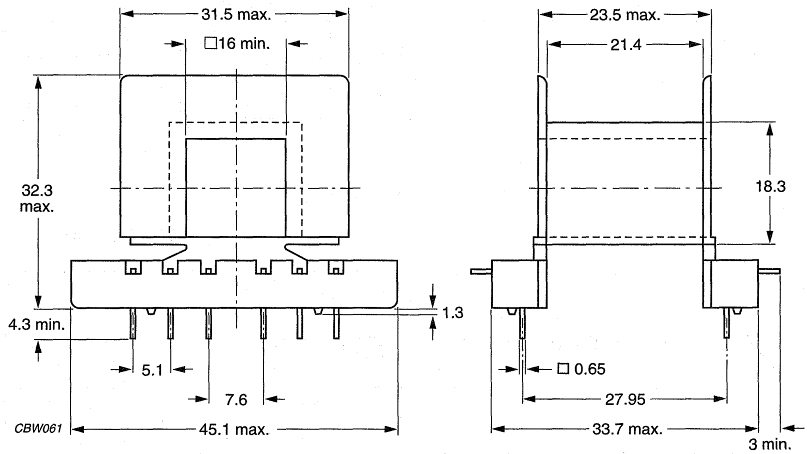
Winding data for E47/20/16 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	130	21.6	93.3	CP-E47/20/16-1S

E cores and accessories | E47/20/16

General data for 12-pins E47/20/16 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E47/20/16 coil former: 12-pins.

Winding data for 12-pins E47/20/16 coil former

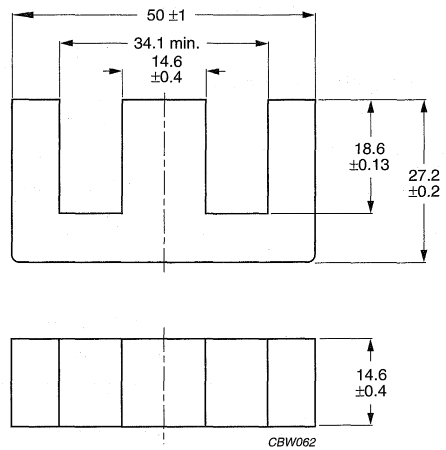
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	131	21.4	94.7	CPH-E47/16-1S-12PD

E cores and accessories E50/27/15

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.530	mm^{-1}
V_e	effective volume	26900	mm^3
l_e	effective length	120	mm
A_e	effective area	225	mm^2
m	mass of core half	≈68	g



Dimensions in mm.

Fig.1 E50/27/15 core half.

Core halves

A_L measured in combination with a non gapped core half, clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%(1)	≈106	≈1410	E50/27/15-3C81-E250
	315 ±3%(1)	≈133	≈1060	E50/27/15-3C81-E315
	400 ±3%(1)	≈169	≈790	E50/27/15-3C81-E400
	630 ±5%	≈267	≈450	E50/27/15-3C81-A630
	1000 ±10%	≈424	≈250	E50/27/15-3C81-A1000
	5500 ±25%	≈2300	≈0	E50/27/15-3C81
3C90	250 ±3%(1)	≈106	≈1410	E50/27/15-3C90-E250
	315 ±3%(1)	≈133	≈1060	E50/27/15-3C90-E315
	400 ±3%(1)	≈169	≈790	E50/27/15-3C90-E400
	630 ±5%	≈267	≈450	E50/27/15-3C90-A630
	1000 ±10%	≈424	≈250	E50/27/15-3C90-A1000
	4355 ±25%	≈1840	≈0	E50/27/15-3C90

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements 40 ±20 N.

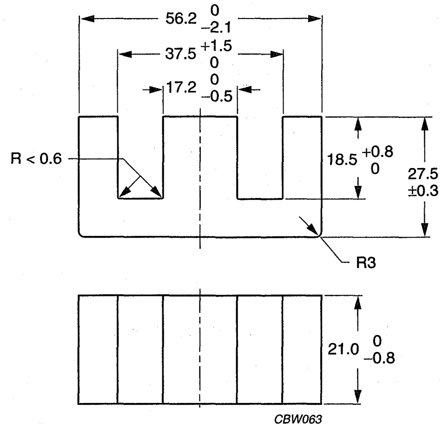
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤5.5	−
3C90	≥320	≤2.7	≤3.4

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.350	mm^{-1}
V_e	effective volume	44000	mm^3
l_e	effective length	124	mm
A_e	effective area	353	mm^2
A_{min}	minimum area	345	mm^2
m	mass of core half	≈108	g



Dimensions in mm.

Fig.1 E55/28/21 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	315 ±3%(1)	≈88	≈1740	E55/28/21-3C81-E315
	400 ±3%(1)	≈112	≈1300	E55/28/21-3C81-E400
	630 ±3%(1)	≈176	≈750	E55/28/21-3C81-E630
	1000 ±5%	≈280	≈430	E55/28/21-3C81-A1000
	1600 ±10%	≈448	≈230	E55/28/21-3C81-A1600
	8625 ±25%	≈2400	≈0	E55/28/21-3C81
3C90	315 ±3%(1)	≈88	≈1740	E55/28/21-3C90-E315
	400 ±3%(1)	≈112	≈1300	E55/28/21-3C90-E400
	630 ±3%(1)	≈176	≈750	E55/28/21-3C90-E630
	1000 ±5%	≈280	≈430	E55/28/21-3C90-A1000
	1600 ±10%	≈448	≈230	E55/28/21-3C90-A1600
	6300 ±25%	≈1750	≈0	E55/28/21-3C90

E cores and accessories E55/28/21

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%(1)	≈88	≈1740	E55/28/21-3F3-E315
	400 ±3%(1)	≈112	≈1300	E55/28/21-3F3-E400
	630 ±3%(1)	≈176	≈750	E55/28/21-3F3-E630
	1000 ±5%	≈280	≈430	E55/28/21-3F3-A1000
	1600 ±10%	≈448	≈230	E55/28/21-3F3-A1600
	5700 ±25%	≈1590	≈0	E55/28/21-3F3

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements 40 ±20 N.

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	12800 ±25%	≈3700	≈0	E55/28/21-3C11
3E25 des	14000 ±25%	≈4000	≈0	E55/28/21-3E25
3E27	15400 ±25%	≈4300	≈0	E55/28/21-3E27

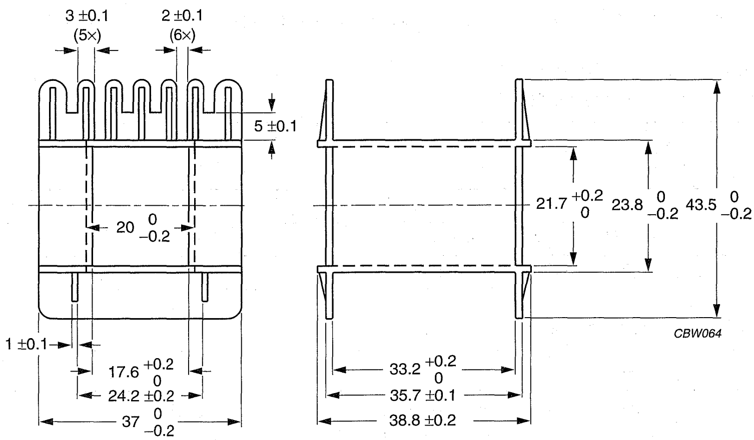
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤9.0	−	−
3C90	≥310	≤4.8	≤5.9	−
3F3	≥310	−	≤5.6	≤10.3

COIL FORMERS

General data for E55/28/21 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41613(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E55/28/21 coil former (E).

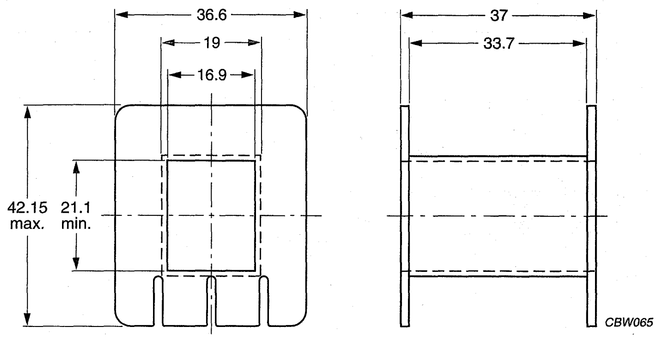
Winding data for E55/28/21 coil former without pins (E)

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	250	33.2	116	CP-E55/28/21-1S

E cores and accessories E55/28/21

General data for E55/28/21 coil former without pins (A)

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

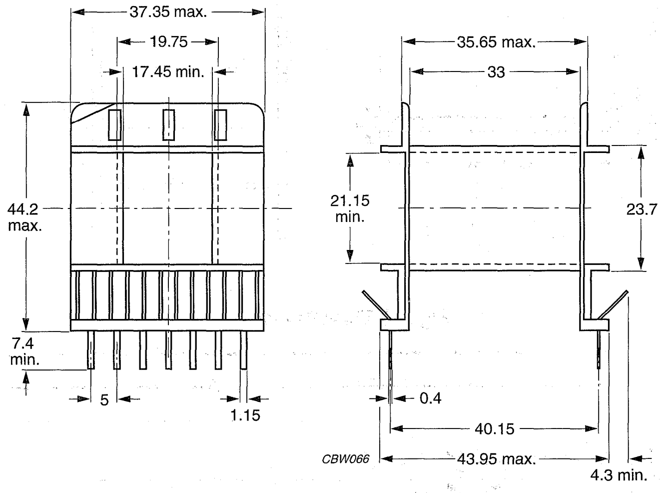
Fig.3 E55/28/21 coil former (A).

Winding data for E55/28/21 coil former without pins (A)

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	277	33.7	113	CP-E55/28/21-1S-A

General data for 14-pins E55/28/21 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	105 °C, *"IEC 60085"*, class A
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.4 E55/28/21 coil former; 14-pins.

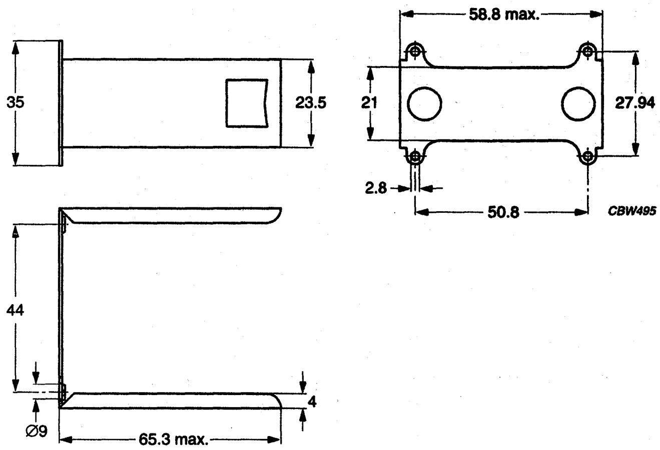
Winding data for 14-pins E55/28/21 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	278	33	119	CPH-E55/28/21-1S-14P

MOUNTING PARTS

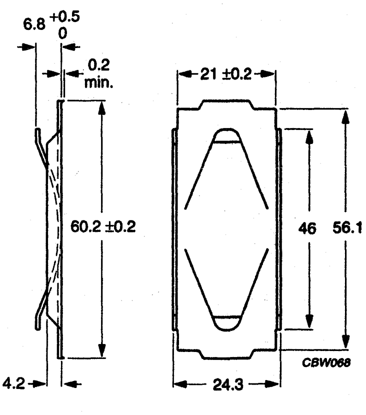
GENERAL DATA FOR MOUNTING PARTS

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, zinc (Zn) plated	5	CLA-E55/28/21
Spring	steel, zinc (Zn) plated	6	SPR-E55/28/21



Dimensions in mm.

Fig.5 E55/28/21 clasp.



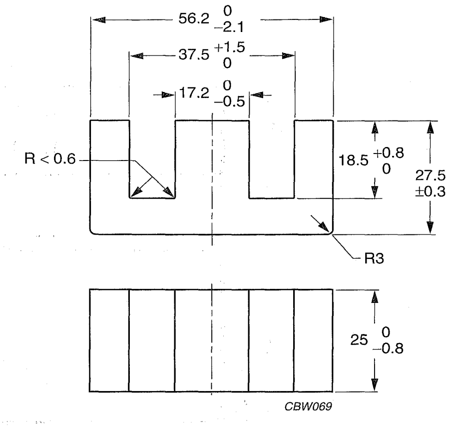
Dimensions in mm.

Fig.6 E55/28/21 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.239	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	411	mm^2
m	mass of core half	≈130	g



Dimensions in mm.

Fig.1 E55/28/25 core half.

Core halves

Clamping force for A_L measurements 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	8000 ±25%	≈1950	≈0	E55/28/25-3C90
3F3	7400 ±25%	≈1800	≈0	E55/28/25-3F3

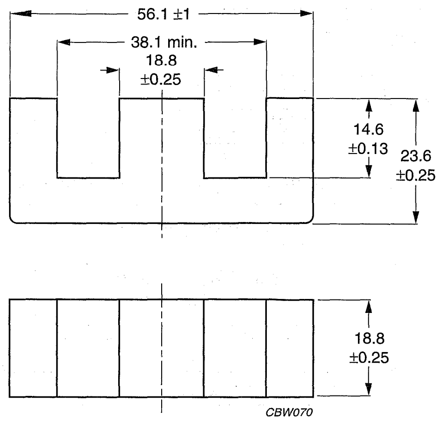
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤5.7	≤7.3	−
3F3	≥310	−	≤6.6	≤12.7

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.320	mm^{-1}
V_e	effective volume	36000	mm^3
l_e	effective length	107	mm
A_e	effective area	337	mm^2
m	mass of core half	≈90	g



Dimensions in mm.

Fig.1 E56/24/19 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 60 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%(1)	≈79	≈1650	E56/24/19-3C81-E315
	400 ±3%(1)	≈101	≈1240	E56/24/19-3C81-E400
	630 ±3%(1)	≈158	≈720	E56/24/19-3C81-E630
	1000 ±5%	≈251	≈410	E56/24/19-3C81-A1000
	1600 ±10%	≈402	≈230	E56/24/19-3C81-A1600
	9500 ±25%	≈2380	≈0	E56/24/19-3C81
3C90	315 ±3%(1)	≈79	≈1650	E56/24/19-3C90-E315
	400 ±3%(1)	≈101	≈1240	E56/24/19-3C90-E400
	630 ±3%(1)	≈158	≈720	E56/24/19-3C90-E630
	1000 ±5%	≈251	≈410	E56/24/19-3C90-A1000
	1600 ±10%	≈402	≈230	E56/24/19-3C90-A1600
	6900 ±25%	≈1730	≈0	E56/24/19-3C90

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 60 ±20 N.

Core halves of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25 sup	14580 ±25%	≈3660	≈0	E56/24/19-3E25
3E27	14580 ±25%	≈3660	≈0	E56/24/19-3E27

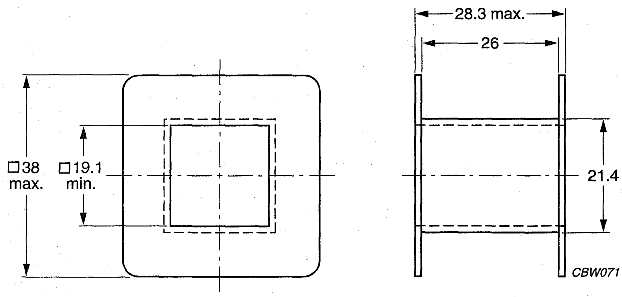
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤7.4	–
3C90	≥320	≤3.6	≤4.8

COIL FORMERS

General data for E56/24/19 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E56/24/19 coil former.

E cores and accessories

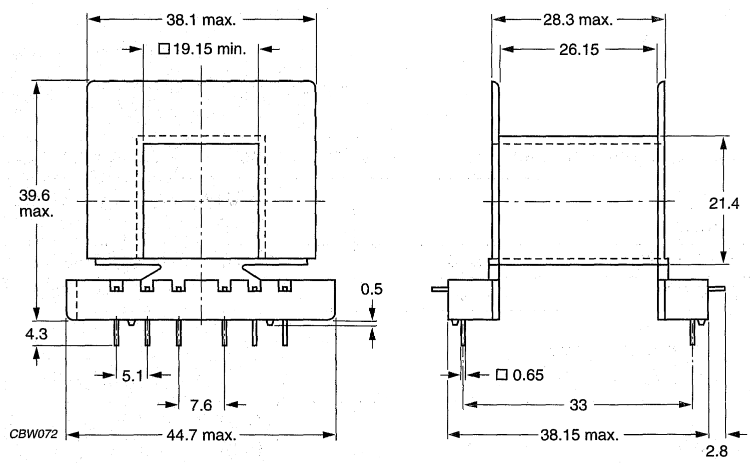
E56/24/19 (E75)

Winding data for E56/24/19 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	222	26.1	112	CP-E56/24/19-1S

General data for 12-pins E56/24/19 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with *"UL 94V-0"*;UL file number E69578(M)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 E56/24/19 coil former; 12-pins.

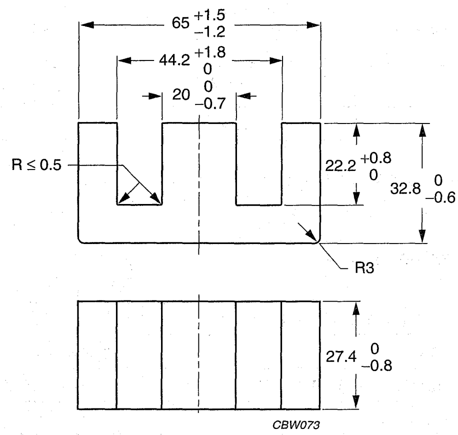
Winding data for 12-pins E56/24/19 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	205	26.2	114	CPH-E56/24/19-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.274	mm^{-1}
V_e	effective volume	79000	mm^3
l_e	effective length	147	mm
A_e	effective area	540	mm^2
A_{min}	minimum area	530	mm^2
m	mass of core half	≈205	g



Dimensions in mm.

Fig.1 E65/32/27 core half.

Core halves

Gapped cores are available on request. Clamping force for A_L measurements, 60 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	8600 ±25%	≈1900	≈0	E65/32/27-3C90
3F3	7300 ±25%	≈1590	≈0	E65/32/27-3F3

Core halves of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	16700 ±25%	≈3800	≈0	E65/32/27-3C11

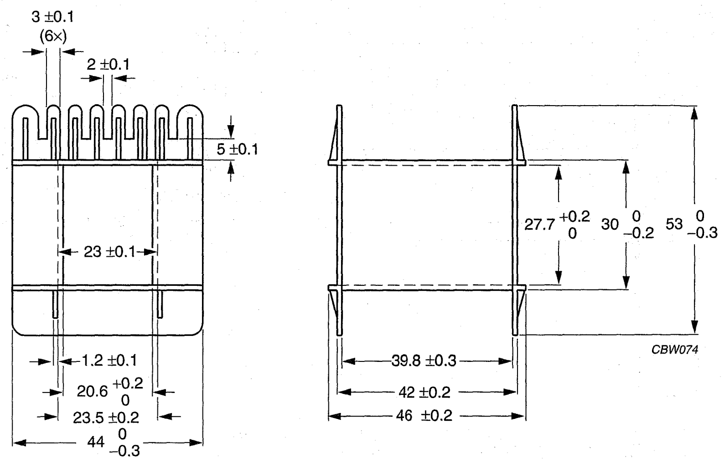
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤9.1	≤12.0	−
3F3	≥310	−	≤10.5	≤21.0

COIL FORMER

General data for E65/32/27 coil former without pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41613(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 E65/32/27 coil former.

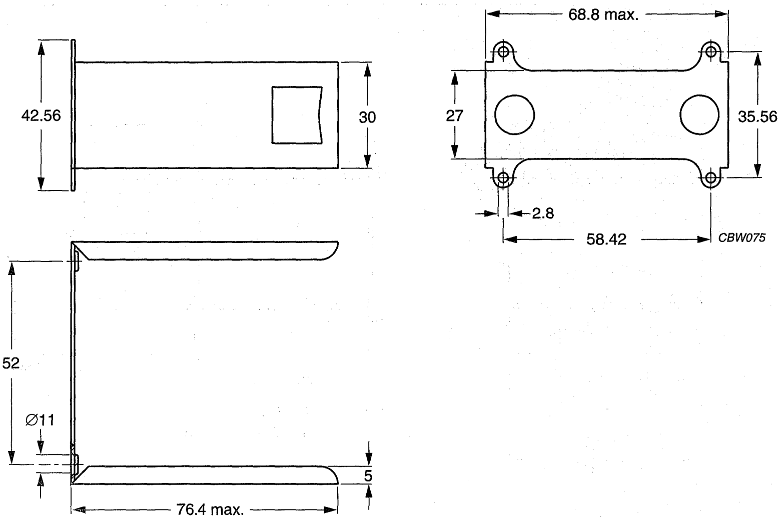
Winding data for E65/32/27 coil former without pins (E)

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	394	39.5	150	CP-E65/32/27-1S

MOUNTING PARTS

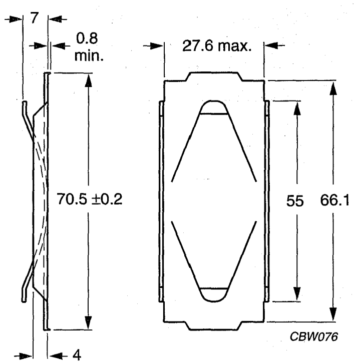
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, zinc (Zn) plated	3	CLA-E65/32/27
Spring	steel, zinc (Zn) plated	4	SPR-E65/32/27



Dimensions in mm.

Fig.3 E65/32/27 clasp.



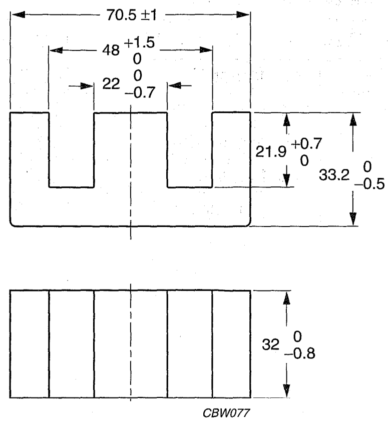
Dimensions in mm.

Fig.4 E65/32/27 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.218	mm^{-1}
V_e	effective volume	102000	mm^3
l_e	effective length	149	mm
A_e	effective area	683	mm^2
A_{min}	minimum area	676	mm^2
m	mass of core half	≈260	g



Dimensions in mm.

Fig.1 E71/33/32 core half.

Core halves

Clamping force for A_L measurements, 60 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	10800 ±25%	≈1950	≈0	E71/33/32-3C90
3F3	10000 ±25%	≈1800	≈0	E71/33/32-3F3

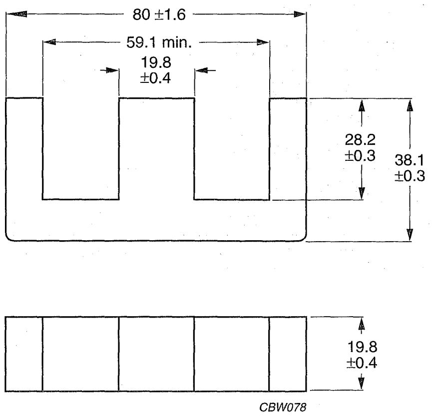
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤12.0	≤16.5	−
3F3	≥310	−	≤14.0	≤29.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.470	mm^{-1}
V_e	effective volume	72300	mm^3
l_e	effective length	184	mm
A_e	effective area	392	mm^2
m	mass of core half	≈180	g



Dimensions in mm.

Fig.1 E80/38/20 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%(1)	≈118	≈1980	E80/38/20-3C81-E315
	400 ±3%(1)	≈150	≈1460	E80/38/20-3C81-E400
	630 ±3%(1)	≈236	≈830	E80/38/20-3C81-E630
	1000 ±5%	≈374	≈460	E80/38/20-3C81-A1000
	1600 ±10%	≈598	≈240	E80/38/20-3C81-A1600
	6730 ±25%	≈2500	≈0	E80/38/20-3C81
3C90	315 ±3%(1)	≈118	≈1980	E80/38/20-3C90-E315
	400 ±3%(1)	≈150	≈1460	E80/38/20-3C90-E400
	630 ±3%(1)	≈236	≈830	E80/38/20-3C90-E630
	1000 ±5%	≈374	≈460	E80/38/20-3C90-A1000
	1600 ±10%	≈598	≈240	E80/38/20-3C90-A1600
	5070 ±25%	≈1900	≈0	E80/38/20-3C90

E cores and accessories E80/38/20

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%(1)	≈118	≈1980	E80/38/20-3F3-E315
	400 ±3%(1)	≈150	≈1460	E80/38/20-3F3-E400
	630 ±3%(1)	≈236	≈830	E80/38/20-3F3-E630
	1000 ±5%	≈374	≈460	E80/38/20-3F3-A1000
	1600 ±10%	≈598	≈240	E80/38/20-3F3-A1600
	4590 ±25%	≈1720	≈0	E80/38/20-3F3

Note

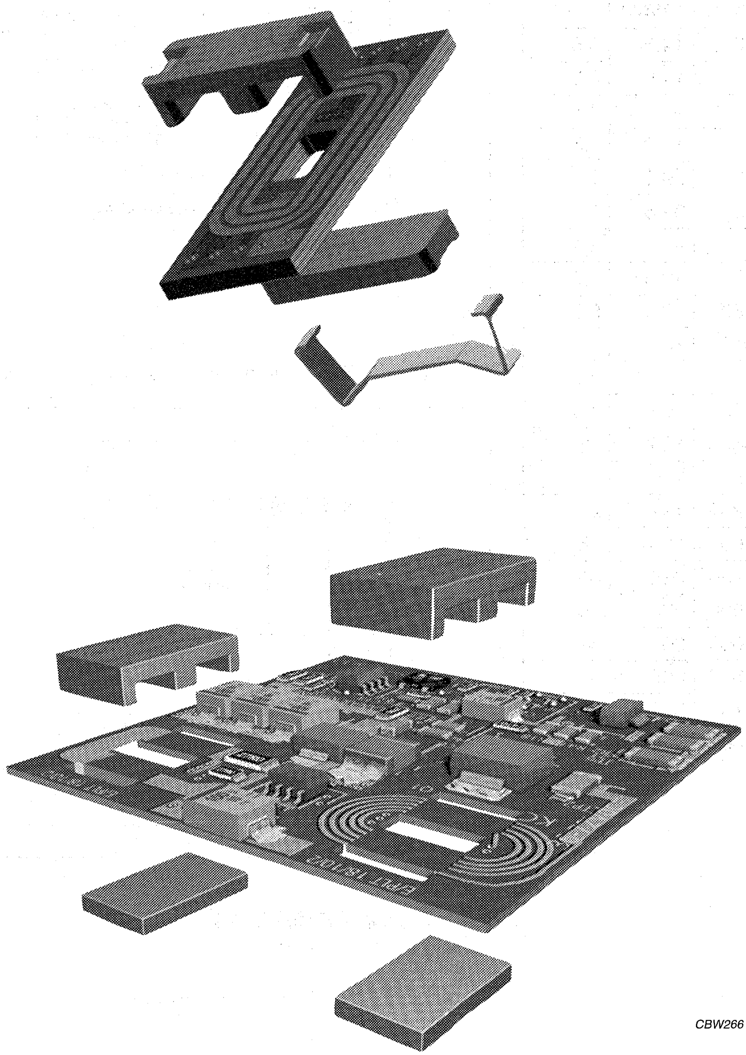
1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 60 ±20 N.

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤14.8	–	–
3C90	≥320	≤7.2	≤10.0	–
3F3	≥320	–	≤8.0	≤13.8

Soft Ferrites

Planar E cores



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Planar E cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
E14/3.5/5	300	14.5	0.6
PLT14/5/1.5	240	14.5	0.5
E14/3.5/5/R	–	–	0.6
PLT14/5/1.5/S	230	14.2	0.5
E18/4/10	960	39.5	2.4
PLT18/10/2	800	39.5	1.7
E18/4/10/R	–	–	2.4
PLT18/10/2/S	830	40.8	1.7
E22/6/16	2550	78.5	6.5
PLT22/16/2.5	2040	78.5	4.0
E22/6/16/R	–	–	6.5
PLT22/16/2.5/S	2100	80.4	4.0
E32/6/20	5380	129	13
PLT32/20/3	4560	129	10
E38/8/25	10200	194	25
PLT38/25/4	8460	194	18
E43/10/28	13900	225	35
PLT43/28/4	11500	225	24
E58/11/38	24600	305	62
PLT58/38/4	20800	305	44
E64/10/50	40700	511	100
PLT64/50/5	35500	511	78

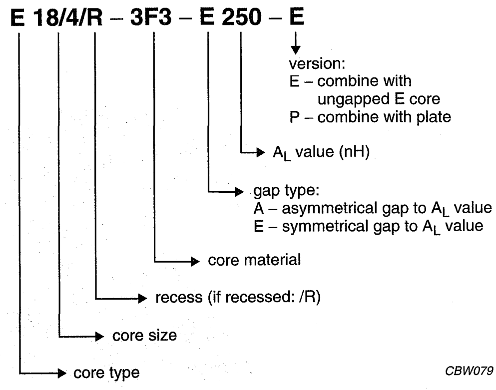


Fig.1 Type number structure for E cores.

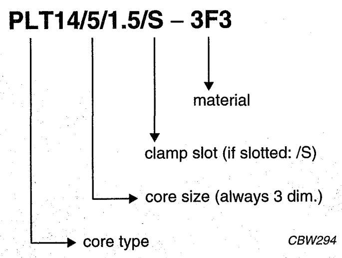


Fig.2 Type number structure for plates.

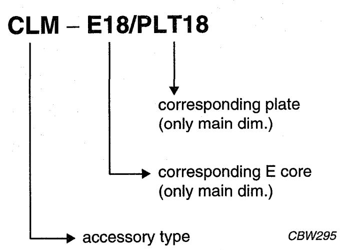


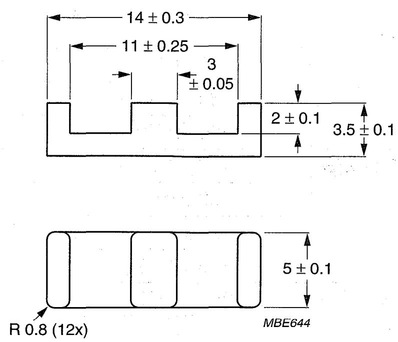
Fig.3 Type number structure for clamps.

Planar E cores and accessories E14/3.5/5

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.43	mm^{-1}
V_e	effective volume	300	mm^3
l_e	effective length	20.7	mm
A_e	effective area	14.5	mm^2
A_{min}	minimum area	14.5	mm^2
m	mass of core half	≈0.6	g



Dimensions in mm.

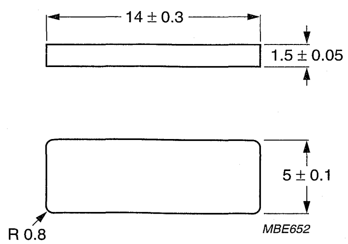
Fig.1 E14/3.5/5 core.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.16	mm^{-1}
V_e	effective volume	240	mm^3
l_e	effective length	16.7	mm
A_e	effective area	14.5	mm^2
A_{min}	minimum area	14.5	mm^2
m	mass of plate	≈0.5	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT14/5/1.5-3C90
3C94 des	PLT14/5/1.5-3C94
3C96 prot	PLT14/5/1.5-3C96
3F3	PLT14/5/1.5-3F3
3F35 prot	PLT14/5/1.5-3F35
3F4 des	PLT14/5/1.5-3F4
3E6	PLT14/5/1.5-3E6



Dimensions in mm.

Fig.2 PLT 14/5/1.5.

Planar E cores and accessories E14/3.5/5

Core halves for use in combination with an ungapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 10 ±5 N, using a PCB coil containing 4 layers of 8 tracks each, total heigth 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈72	≈530	E14/3.5-3C90-A63-E
	100 ±5%	≈114	≈270	E14/3.5-3C90-A100-E
	160 ±8%	≈182	≈130	E14/3.5-3C90-A160-E
	1280 ±25%	≈1450	≈0	E14/3.5/5-3C90
3C94 des	63 ±3%	≈72	≈530	E14/3.5-3C94-A63-E
	100 ±5%	≈114	≈270	E14/3.5-3C94-A100-E
	160 ±8%	≈182	≈130	E14/3.5-3C94-A160-E
	1280 ±25%	≈1450	≈0	E14/3.5/5-3C94
3C96 prot	1200 ±25%	≈1360	≈0	E14/3.5/5-3C96
3F3	63 ±3%	≈72	≈530	E14/3.5-3F3-A63-E
	100 ±5%	≈114	≈270	E14/3.5-3F3-A100-E
	160 ±8%	≈182	≈130	E14/3.5-3F3-A160-E
	1100 ±25%	≈1250	≈0	E14/3.5/5-3F3
3F35 prot	900 ±25%	≈1020	≈0	E14/3.5/5-3F35
3F4 des	63 ±3%	≈72	≈530	E14/3.5-3F4-A63-E
	100 ±5%	≈114	≈270	E14/3.5-3F4-A100-E
	160 ±8%	≈182	≈130	E14/3.5-3F4-A160-E
	650 ±25%	≈740	≈0	E14/3.5/5-3F4
3E6	5600 +40/−30%	≈6360	≈0	E14/3.5/5-3E6

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT) clamping force for A_L measurements, 10 ±5 N, using a PCB coil containing 4 layers of 8 tracks each, total heigth 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈58	≈600	E14/3.5-3C90-A63-P
	100 ±5%	≈92	≈300	E14/3.5-3C90-A100-P
	160 ±8%	≈148	≈150	E14/3.5-3C90-A160-P
	1500 ±25%	≈1400	≈0	E14/3.5/5-3C90
3C94 des	63 ±3%	≈58	≈600	E14/3.5-3C94-A63-P
	100 ±5%	≈92	≈300	E14/3.5-3C94-A100-P
	160 ±8%	≈148	≈150	E14/3.5-3C94-A160-P
	1500 ±25%	≈1400	≈0	E14/3.5/5-3C94
3C96 prot	1350 ±25%	≈1260	≈0	E14/3.5/5-3C96
3F3	63 ±3%	≈58	≈600	E14/3.5-3F3-A63-P
	100 ±5%	≈92	≈300	E14/3.5-3F3-A100-P
	160 ±8%	≈148	≈150	E14/3.5-3F3-A160-P
	1300 ±25%	≈1200	≈0	E14/3.5/5-3F3
3F35 prot	1050 ±25%	≈980	≈0	E14/3.5/5-3F35
3F4 des	63 ±3%	≈58	≈600	E14/3.5-3F4-A63-P
	100 ±5%	≈92	≈300	E14/3.5-3F4-A100-P
	160 ±8%	≈148	≈150	E14/3.5-3F4-A160-P
	780 ±25%	≈720	≈0	E14/3.5/5-3F4
3E6	6400 +40/–30%	≈5900	≈0	E14/3.5/5-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
E+E14-3C90	≥320	≤0.030	–	–
E+PLT14-3C90	≥320	≤0.026	–	–
E+E14-3C94	≥320	≤0.026	≈0.130	≈0.060
E+PLT14-3C94	≥320	≤0.021	≈0.110	≈0.045
E+E14-3C96	≥320	≈0.018	≈0.095	≈0.045
E+PLT14-3C96	≥320	≈0.015	≈0.080	≈0.032
E+E14-3F3	≥300	≤0.033	–	≤0.060
E+PLT14-3F3	≥300	≤0.027	–	≤0.047
E+E14-3F35	≥300	–	–	≈0.030
E+PLT14-3F35	≥300	–	–	≈0.024
E+E14-3F4	≥250	–	–	–
E+PLT14-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
E+E14-3C90	≥320	–	–	–	–
E+PLT14-3C90	≥320	–	–	–	–
E+E14-3C94	≥320	–	–	–	–
E+PLT14-3C94	≥320	–	–	–	–
E+E14-3C96	≥320	–	–	–	–
E+PLT14-3C96	≥320	–	–	–	–
E+E14-3F3	≥300	–	–	–	–
E+PLT14-3F3	≥300	–	–	–	–
E+E14-3F35	≥300	≈0.048	≈0.36	–	–
E+PLT14-3F35	≥300	≈0.038	≈0.29	–	–
E+E14-3F4	≥250	–	–	≤0.060	≤0.096
E+PLT14-3F4	≥250	–	–	≤0.048	≤0.077

MOUNTING INFORMATION

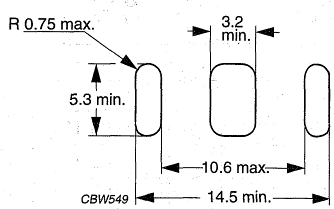
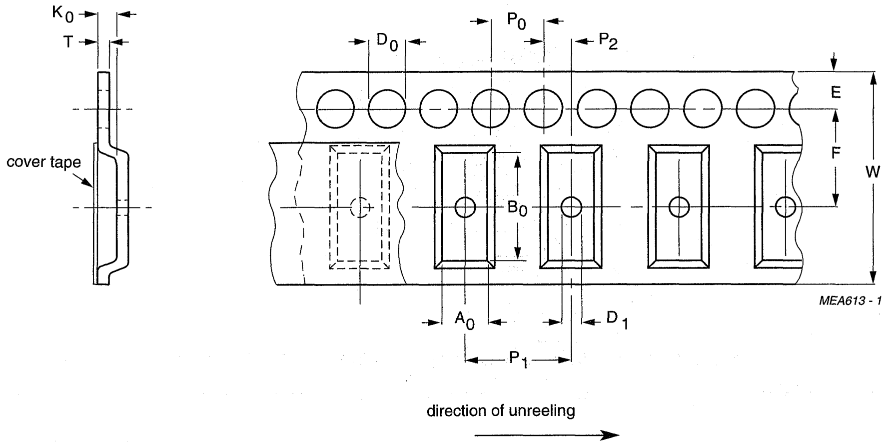


Fig.3 Recommended PCB cut-out for glued planar E14/3.5/5 cores.

Planar E cores and accessories E14/3.5/5

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.4 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.4

SIZE	DIMENSIONS (mm)
A_0	5.4 ±0.2
B_0	14.6 ±0.2
K_0	4.0 ±0.2
T	0.3 ±0.05
W	24.0 ±0.3
E	1.75 ±0.1
F	11.5 ±0.1
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

Planar E cores and accessories E14/3.5/5

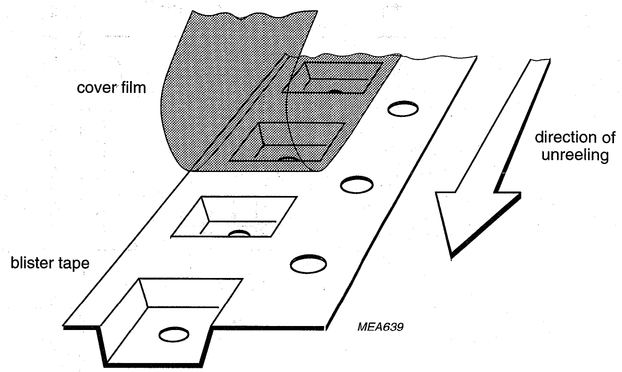
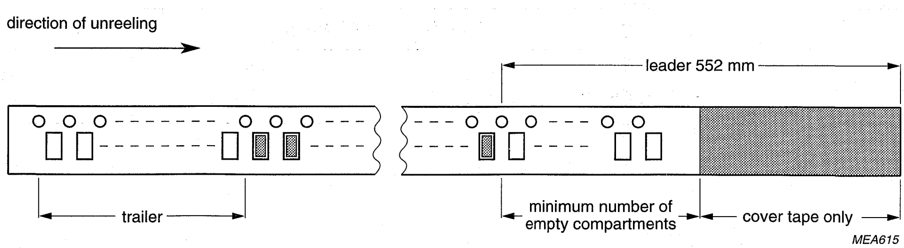
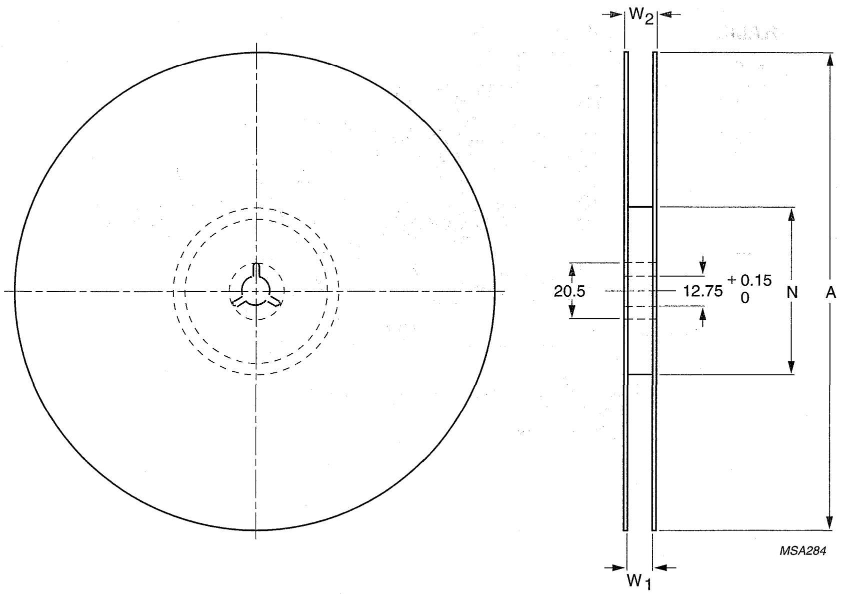


Fig.5 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: –25 to +45 °C.

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

Table 2 Reel dimensions; see Fig.7

SIZE	DIMENSIONS (mm)			
	A	**N**	**W_1**	**W_2**
24	330	100 ±5	24.4	≤28.4

Planar E cores and accessories E14/3.5/5/R

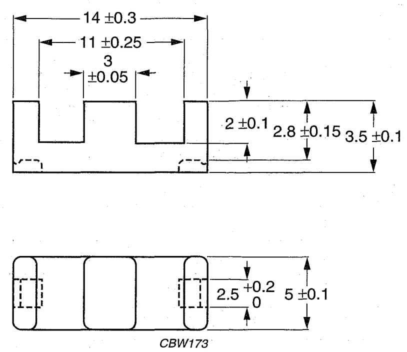
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.15	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	16.4	mm
A_e	effective area	14.2	mm^2
A_{min}	minimum area	10.9	mm^2
m	mass of E core half	≈0.6	g
m	mass of plate	≈0.5	g

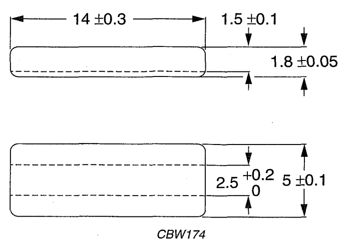
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT14/5/1.5/S-3C90
3C94 des	PLT14/5/1.5/S-3C94
3C96 prot	PLT14/5/1.5/S-3C96
3F3	PLT14/5/1.5/S-3F3
3F35 prot	PLT14/5/1.5/S-3F35
3F4 des	PLT14/5/1.5/S-3F4
3E6	PLT14/5/1.5/S-3E6



Dimensions in mm.

Fig.1 E14/3.5/5/R core.



Dimensions in mm.

Fig.2 PLT14/5/1.5/S.

Planar E cores and accessories E14/3.5/5/R

Core halves for use in combination with a slotted plate (PLT/S)

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements 10 ±5 N; measurement coil as for E14/3.5/5.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈58	≈600	E14/3.5/R-3C90-A63-P
	100 ±5%	≈92	≈300	E14/3.5/R-3C90-A100-P
	160 ±8%	≈148	≈150	E14/3.5/R-3C90-A160-P
	1500 ±25%	≈1380	≈0	E14/3.5/5/R-3C90
3C94 des	63 ±3%	≈58	≈600	E14/3.5/R-3C94-A63-P
	100 ±5%	≈92	≈300	E14/3.5/R-3C94-A100-P
	160 ±8%	≈148	≈150	E14/3.5/R-3C94-A160-P
	1500 ±25%	≈1380	≈0	E14/3.5/5/R-3C94
3C96 prot	1350 ±25%	≈1240	≈0	E14/3.5/5/R-3C96
3F3	63 ±3%	≈58	≈600	E14/3.5/R-3F3-A63-P
	100 ±5%	≈92	≈300	E14/3.5/R-3F3-A100-P
	160 ±8%	≈148	≈150	E14/3.5/R-3F3-A160-P
	1300 ±25%	≈1200	≈0	E14/3.5/5/R-3F3
3F35 prot	1050 ±25%	≈970	≈0	E14/3.5/5/R-3F35
3F4 des	63 ±3%	≈58	≈600	E14/3.5/R-3F4-A63-P
	100 ±5%	≈92	≈300	E14/3.5/R-3F4-A100-P
	160 ±8%	≈148	≈150	E14/3.5/R-3F4-A160-P
	780 ±25%	≈710	≈0	E14/3.5/5/R-3F4
3E6	6400 +40/−30%	≈5900	≈0	E14/3.5/5/R-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	≤0.026	–	–
E14/R+PLT14/S-3C94	≥320	≤0.020	≈0.100	≈0.044
E14/R+PLT14/S-3C96	≥320	≈0.015	≈0.070	≈0.030
E14/R+PLT14/S-3F3	≥300	≤0.027	–	≤0.047
E14/R+PLT14/S-3F35	≥300	≤0.027	–	≈0.023
E14/R+PLT14/S-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

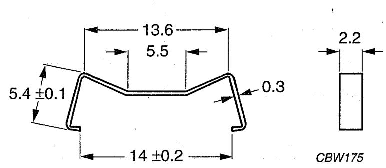
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	–	–	–	–
E14/R+PLT14/S-3C94	≥320	–	–	–	–
E14/R+PLT14/S-3C96	≥320	–	–	–	–
E14/R+PLT14/S-3F3	≥300	–	–	–	–
E14/R+PLT14/S-3F35	≥300	≈0.037	≈0.028	–	–
E14/R+PLT14/S-3F4	≥250	–	–	≤0.048	≤0.077

Planar E cores and accessories | E14/3.5/5/R

MOUNTING PARTS

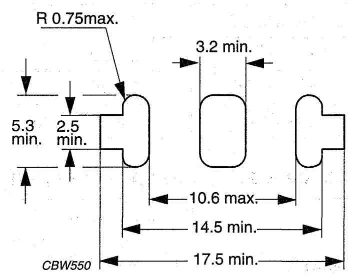
General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E14/PLT14



Dimensions in mm.

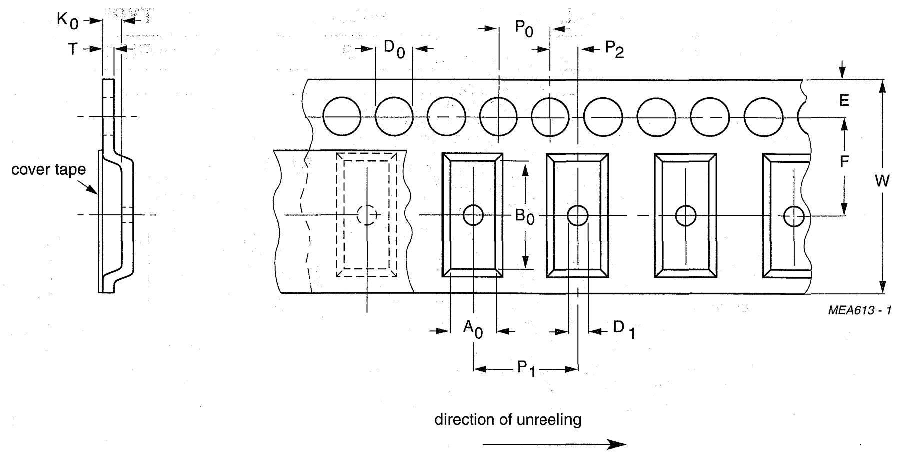
Fig.3 Clamp for E14/R+PLT14/S.



Dimensions in mm.

Fig.4 Recommended PCB cut-out for clamped cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.5 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.5

SIZE	DIMENSIONS (mm)
A_0	5.4 ±0.2
B_0	14.6 ±0.2
K_0	4.0 ±0.2
T	0.3 ±0.05
W	24.0 ±0.3
E	1.75 ±0.1
F	11.5 ±0.1
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

Planar E cores and accessories | E14/3.5/5/R

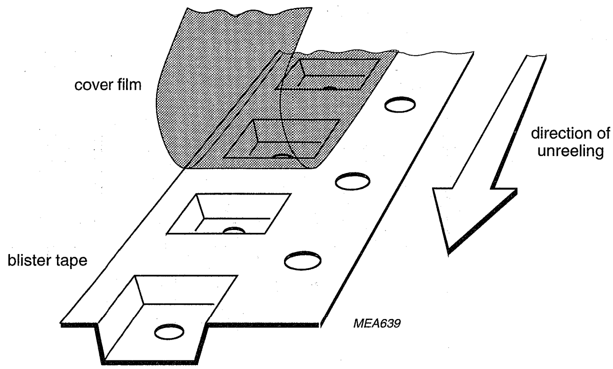
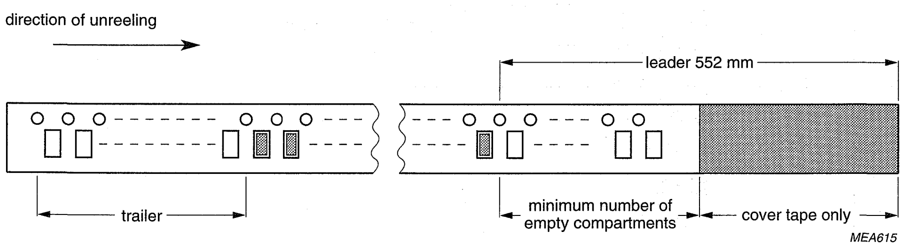


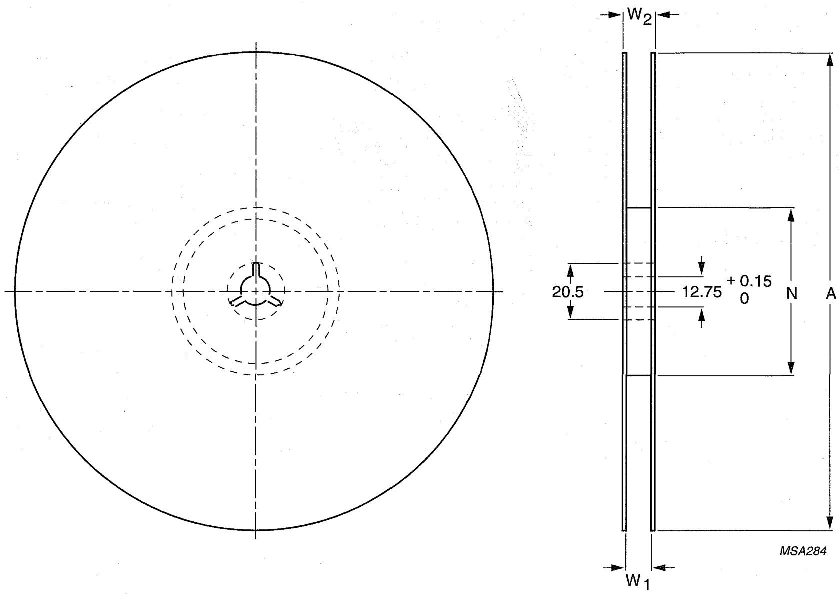
Fig.6 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: −25 to +45 °C.

Fig.7 Leader/trailer tape.

Planar E cores and accessories E14/3.5/5/R



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

Table 2 Reel dimensions; see Fig.8

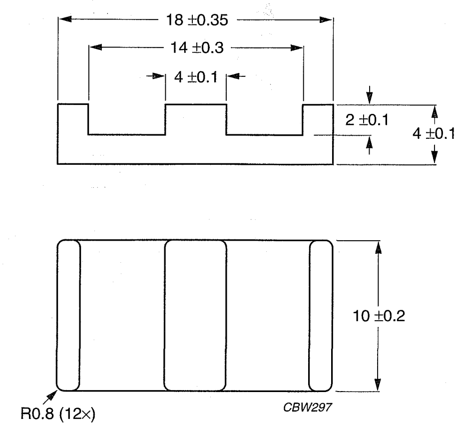
SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
24	330	100 ±5	24.4	≤28.4

Planar E cores and accessories E18/4/10

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.616	mm^{-1}
V_e	effective volume	960	mm^3
l_e	effective length	24.3	mm
A_e	effective area	39.5	mm^2
A_{min}	minimum area	39.5	mm^2
m	mass of core half	≈2.4	g



Dimensions in mm.

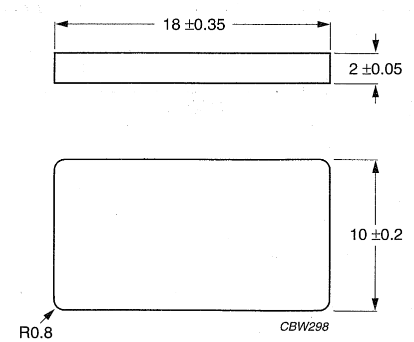
Fig.1 E18/4/10 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.514	mm^{-1}
V_e	effective volume	800	mm^3
l_e	effective length	20.3	mm
A_e	effective area	39.5	mm^2
A_{min}	minimum area	39.5	mm^2
m	mass of plate	≈1.7	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT18/10/2-3C90
3C94 des	PLT18/10/2-3C94
3C96 prot	PLT18/10/2-3C96
3F3	PLT18/10/2-3F3
3F35 prot	PLT18/10/2-3F35
3F4 des	PLT18/10/2-3F4
3E6	PLT18/10/2-3E6



Dimensions in mm.

Fig.2 PLT 18/10/2.

Core halves for use in combination with an non-gapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 4 layers of 8 tracks each, total heigth 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈49	≈800	E18/4-3C90-A100-E
	160 ±3%	≈78	≈420	E18/4-3C90-A160-E
	250 ±5%	≈123	≈220	E18/4-3C90-A250-E
	315 ±8%	≈154	≈170	E18/4-3C90-A315-E
	3200 ±25%	≈1560	≈0	E18/4/10-3C90
3C94 des	100 ±3%	≈49	≈800	E18/4-3C94-A100-E
	160 ±3%	≈78	≈420	E18/4-3C94-A160-E
	250 ±5%	≈123	≈220	E18/4-3C94-A250-E
	315 ±8%	≈154	≈170	E18/4-3C94-A315-E
	3200 ±25%	≈1560	≈0	E18/4/10-3C94
3C96 prot	2900 ±25%	≈1410	≈0	E18/4/10-3C96
3F3	100 ±3%	≈49	≈800	E18/4-3F3-A100-E
	160 ±3%	≈78	≈420	E18/4-3F3-A160-E
	250 ±5%	≈123	≈220	E18/4-3F3-A250-E
	315 ±8%	≈154	≈170	E18/4-3F3-A315-E
	2700 ±25%	≈1320	≈0	E18/4/10-3F3
3F35 prot	2200 ±25%	≈1070	≈0	E18/4/10-3F35
3F4 des	100 ±3%	≈49	≈800	E18/4-3F4-A100-E
	160 ±3%	≈78	≈420	E18/4-3F4-A160-E
	250 ±5%	≈123	≈220	E18/4-3F4-A250-E
	315 ±8%	≈154	≈170	E18/4-3F4-A315-E
	1550 ±25%	≈760	≈0	E18/4/10-3F4
3E6	13500 +40/-30%	≈6600	≈0	E18/4/10-3E6

Planar E cores and accessories E18/4/10

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 4 layers of 8 tracks each, total heigth 1.6 mm.

GRADE	A_L() (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	100 ±3%	≈41	≈870	E18/4-3C90-A100-E
	160 ±3%	≈65	≈470	E18/4-3C90-A160-E
	250 ±5%	≈102	≈240	E18/4-3C90-A250-E
	315 ±8%	≈129	≈170	E18/4-3C90-A315-E
	3680 ±25%	≈1500	≈0	E18/4/10-3C90
3C94 des	100 ±3%	≈41	≈870	E18/4-3C94-A100-E
	160 ±3%	≈65	≈470	E18/4-3C94-A160-E
	250 ±5%	≈102	≈240	E18/4-3C94-A250-E
	315 ±8%	≈129	≈170	E18/4-C94-A315-E
	3680 ±25%	≈1500	≈0	E18/4/10-3C94
3C96 prot	3250 ±25%	≈1320	≈0	E18/4/10-3C96
3F3	100 ±3%	≈41	≈870	E18/4-3F3-A100-P
	160 ±3%	≈65	≈470	E18/4-3F3-A160-P
	250 ±5%	≈102	≈240	E18/4-3F3-A250-P
	315 ±8%	≈129	≈170	E18/4-3F3-A315-P
	3100 ±25%	≈1270	≈0	E18/4/10-3F3
3F35 prot	2500 ±25%	≈1020	≈0	E18/4/10-3F35
3F4 des	100 ±3%	≈41	≈870	E18/4-3F4-A100-P
	160 ±3%	≈65	≈470	E18/4-3F4-A160-P
	250 ±5%	≈102	≈240	E18/4-3F4-A250-P
	315 ±8%	≈129	≈170	E18/4-3F4-A315-P
	1800 ±25%	≈740	≈0	E18/4/10-3F4
3E6	15500 +40/-30%	≈6400	≈0	E18/4/10-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E18-3C90	≥320	≤0.105	–	–
E+PLT18-3C90	≥320	≤0.095	–	–
E+E18-3C94	≥320	≤0.085	≈0.42	≈0.180
E+PLT18-3C94	≥320	≤0.070	≈0.35	≈0.120
E+E18-3C96	≥320	≈0.060	≈0.30	≈0.130
E+PLT18-3C96	≥320	≈0.050	≈0.25	≈0.090
E+E18-3F3	≥300	≤0.110	–	≤0.190
E+PLT18-3F3	≥300	≤0.090	–	≤0.160
E+E18-3F35	≥300	–	–	≈0.10
E+PLT18-3F35	≥300	–	–	≈0.08
E+E18-3F4	≥250	–	–	–
E+PLT18-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E18-3C90	≥320	–	–	–	–
E+PLT18-3C90	≥320	–	–	–	–
E+E18-3C94	≥320	–	–	–	–
E+PLT18-3C94	≥320	–	–	–	–
E+E18-3C96	≥320	–	–	–	–
E+PLT18-3C96	≥320	–	–	–	–
E+E18-3F3	≥300	–	–	–	–
E+PLT18-3F3	≥300	–	–	–	–
E+E18-3F35	≥300	≈0.15	≈1.15		
E+PLT18-3F35	≥300	≈0.13	≈0.96		
E+E18-3F4	≥250	–	–	≤0.19	≤0.31
E+PLT18-3F4	≥250	–	–	≤0.16	≤0.26

MOUNTING INFORMATION

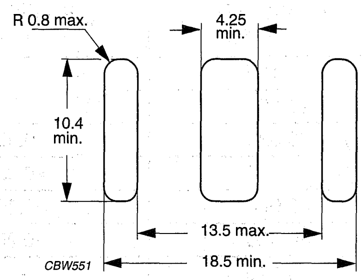
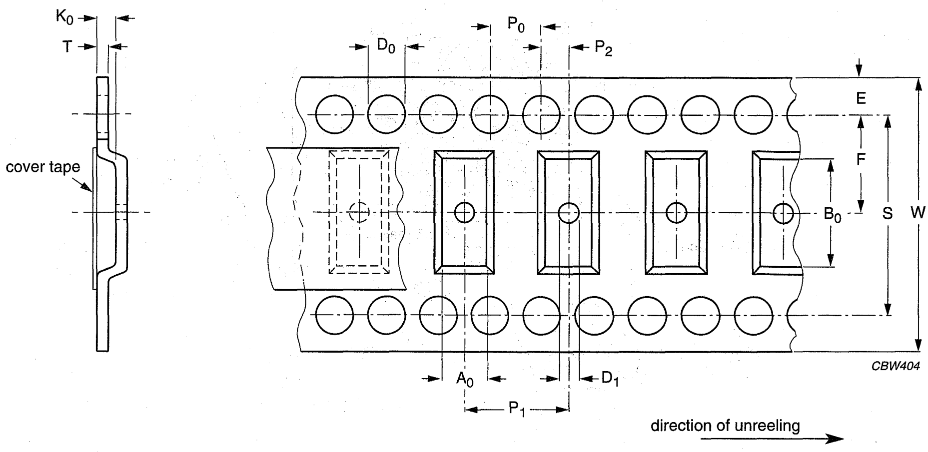


Fig.3 Recommended PCB cut-out for glued planar E18/4/10 cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.4 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.4

SIZE	DIMENSIONS (mm)
A_0	10.5 ±0.2
B_0	18.7 ±0.2
K_0	4.5 ±0.2
T	0.3 ±0.05
W	32.0 ±0.3
E	1.75 ±0.1
F	14.2 ±0.1
D_0	1.5 +0.1
D_1	≥2.0
P_0	4.0 ±0.1
P_1	16.0 ±0.1
P_2	2.0 ±0.1
S	28.4 ±0.1

Planar E cores and accessories E18/4/10

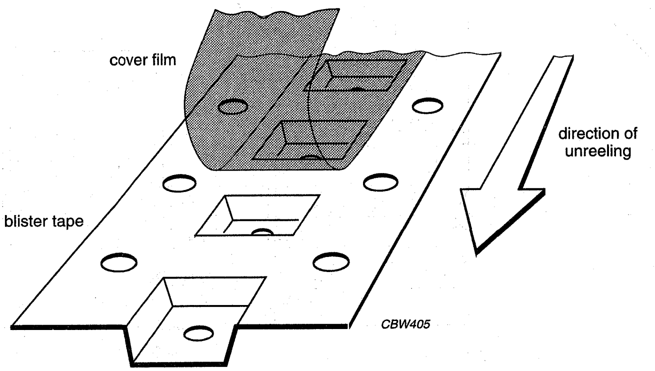
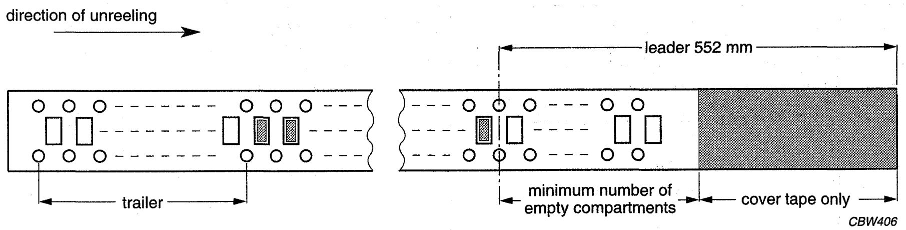
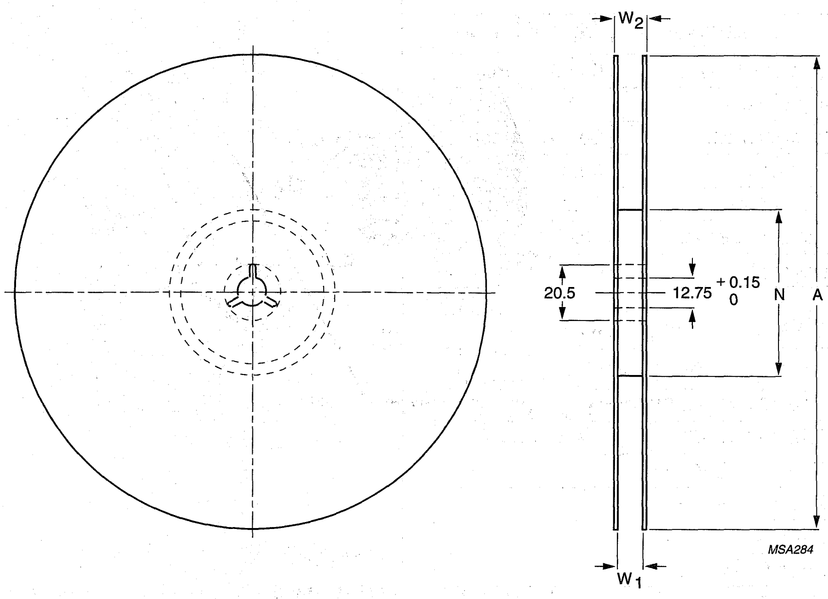


Fig.5 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: −25 to +45 °C.

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

Table 2 Reel dimensions; see Fig.7

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
32	330	100 ±5	32.4	≤36.4

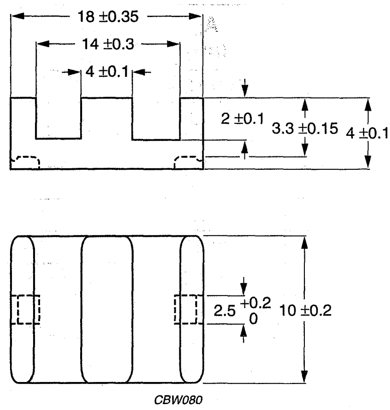
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.498	mm^{-1}
V_e	effective volume	830	mm^3
l_e	effective length	20.3	mm
A_e	effective area	40.8	mm^2
A_{min}	minimum area	35.9	mm^2
m	mass of E core half	≈2.4	g
m	mass of plate	≈1.7	g

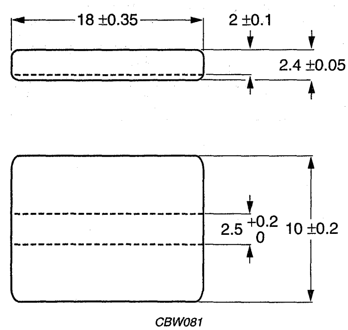
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT18/10/2/S-3C90
3C94 des	PLT18/10/2/S-3C94
3C96 prot	PLT18/10/2/S-3C96
3F3	PLT18/10/2/S-3F3
3F35 prot	PLT18/10/2/S-3F35
3F4 des	PLT18/10/2/S-3F4
3E6	PLT18/10/2/S-3E6



Dimensions in mm.

Fig.1 E18/4/10/R core half.



Dimensions in mm.

Fig.2 PLT 18/10/2.

Planar E cores and accessories E18/4/10/R

Core halves for use in combination with a slotted plate (PLT/S)

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements, 20 ±10 N; measurement coil as for E18/4/10.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈41	≈870	E18/4/R-3C90-A100-P
	160 ±3%	≈65	≈470	E18/4/R-3C90-A160-P
	250 ±5%	≈102	≈240	E18/4/R-3C90-A250-P
	315 ±8%	≈129	≈170	E18/4/R-3C90-A315-P
	3680 ±25%	≈1500	≈0	E18/4/10/R-3C90
3C94 des	100 ±3%	≈41	≈870	E18/4/R-3C94-A100-P
	160 ±3%	≈65	≈470	E18/4/R-3C94-A160-P
	250 ±5%	≈102	≈240	E18/4/R-3C94-A250-P
	315 ±8%	≈129	≈170	E18/4/R-3C94-A315-P
	3680 ±25%	≈1500	≈0	E18/4/10/R-3C94
3C96 prot	3250 ±25%	≈1320	≈0	E18/4/10/R-3C96
3F3	100 ±3%	≈41	≈870	E18/4/R-3F3-A100-P
	160 ±3%	≈65	≈470	E18/4/R-3F3-A160-P
	250 ±5%	≈102	≈240	E18/4/R-3F3-A250-P
	315 ±8%	≈129	≈170	E18/4/R-3F3-A315-P
	3100 ±25%	≈1270	≈0	E18/4/10/R-3F3
3F35 prot	2500 ±25%	≈1020	≈0	E18/4/10/R-3F35
3F4 des	100 ±3%	≈41	≈870	E18/4/R-3F4-A100-P
	160 ±3%	≈65	≈470	E18/4/R-3F4-A160-P
	250 ±5%	≈102	≈240	E18/4/R-3F4-A250-P
	315 ±8%	≈129	≈170	E18/4/R-3F4-A315-P
	1800 ±25%	≈740	≈0	E18/4/10/R-3F4
3E6	15500 +40/−30%	≈6400	≈0	E18/4/10/R-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	≤0.095	–	–
E18/R+PLT18/S-3C94	≥320	≤0.075	≈0.36	≈0.160
E18/R+PLT18/S-3C96	≥320	≈0.53	≈0.25	≈0.12
E18/R+PLT18/S-3F3	≥300	≤0.090	–	≤0.160
E18/R+PLT18/S-3F35	≥300	–	–	≈0.085
E18/R+PLT18/S-3F4	≥250	–	–	–

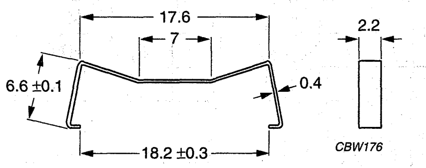
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	–	–	–	–
E18/R+PLT18/S-3C94	≥320	–	–	–	–
E18/R+PLT18/S-3C96	≥320	–	–	–	–
E18/R+PLT18/S-3F3	≥300	–	–	–	–
E18/R+PLT18/S-3F35	≥300	≈0.14	≈1.00	–	–
E18/R+PLT18/S-3F4	≥250	–	–	≤0.16	≤0.26

MOUNTING PARTS

General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E18/PLT18



Dimensions in mm.

Fig.3 Clamp for E18/R+PLT18/S.

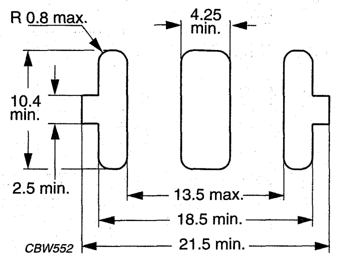
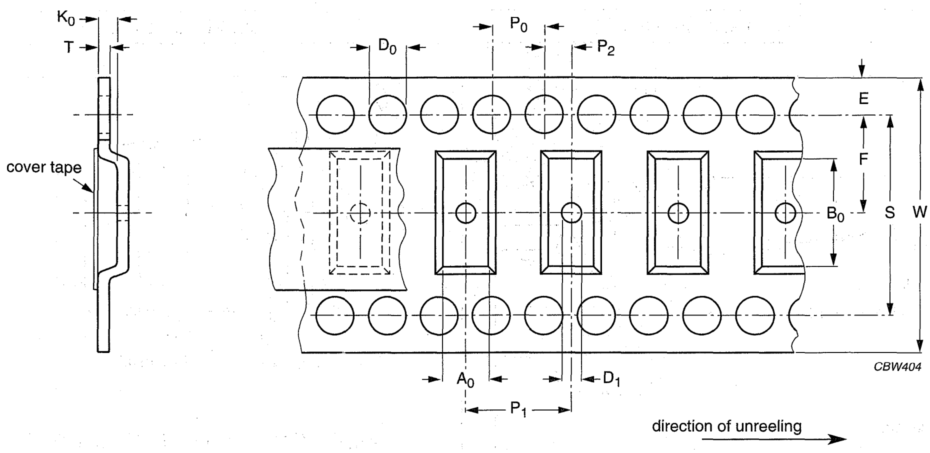


Fig.4 Recommended PCB cut-out for clamped cores.

BLISTER TAPE AND REEL DIMENSIONS (prot)



For dimensions see Table 1.

Fig.5 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.5

SIZE	DIMENSIONS (mm)
A_0	10.5 ±0.2
B_0	18.7 ±0.2
K_0	4.5 ±0.2
T	0.3 ±0.05
W	32.0 ±0.3
E	1.75 ±0.1
F	14.2 ±0.1
D_0	1.5 +0.1
D_1	≥2.0
P_0	4.0 ±0.1
P_1	16.0 ±0.1
P_2	2.0 ±0.1
S	28.4 ±0.1

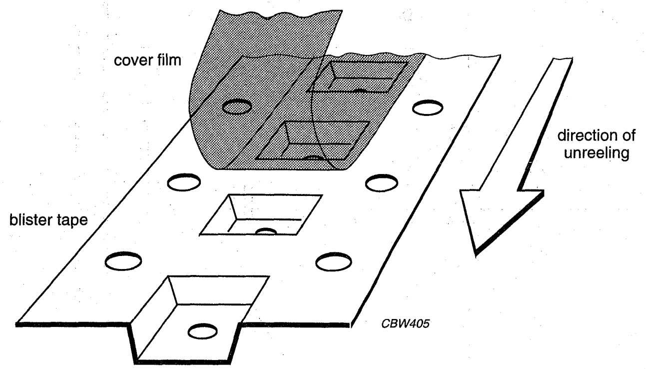
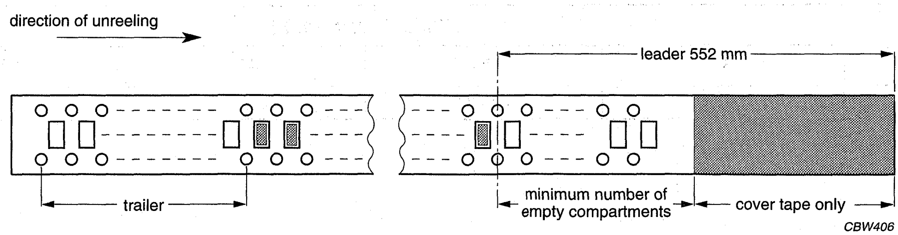
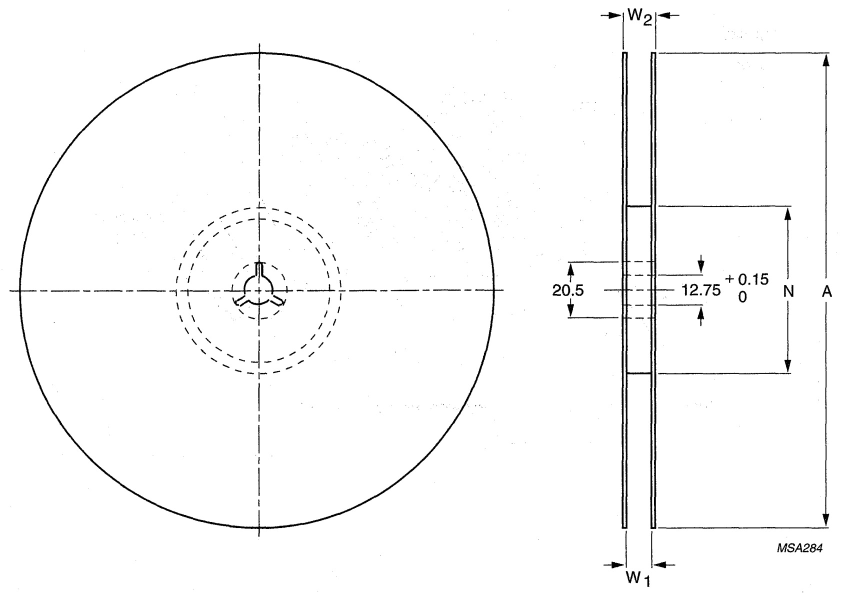


Fig.6 Construction of blister tape.



Leader: length of leader tape is 552 mm minimum covered with cover tape.
Trailer: 160 mm minimum (secured with tape).
Storage temperature range for tape: –25 to +45 °C.

Fig.7 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

Table 2 Reel dimensions; see Fig.8

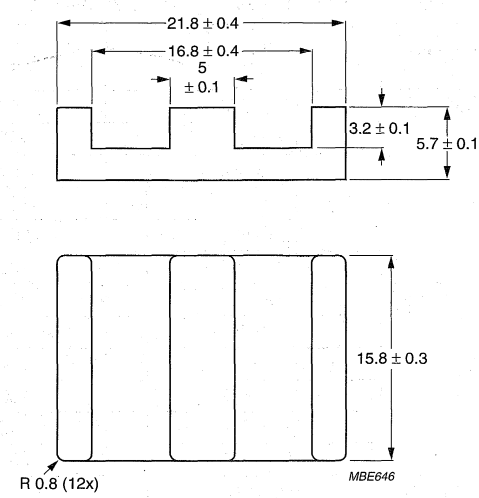
SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
32	330	100 ±5	32.4	≤36.4

Planar E cores and accessories E22/6/16

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.414	mm^{-1}
V_e	effective volume	2550	mm^3
l_e	effective length	32.5	mm
A_e	effective area	78.5	mm^2
A_{min}	minimum area	78.5	mm^2
m	mass of core half	≈6.5	g



Dimensions in mm.

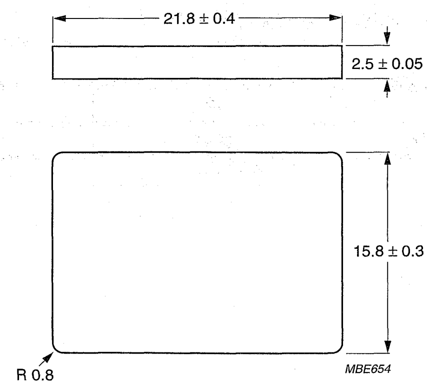
Fig.1 E22/6/16.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.332	mm^{-1}
V_e	effective volume	2040	mm^3
l_e	effective length	26.1	mm
A_e	effective area	78.5	mm^2
A_{min}	minimum area	78.5	mm^2
m	mass of plate	≈4	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT22/16/2.5-3C90
3C94 des	PLT22/16/2.5-3C94
3C96 prot	PLT22/16/2.5-3C96
3F3	PLT22/16/2.5-3F3
3F35 prot	PLT22/16/2.5-3F35
3F4 des	PLT22/16/2.5-3F4
3E6	PLT22/16/2.5-3E6



Dimensions in mm.

Fig.2 PLT22/16/2.5.

Core halves for use in combination with an non-gapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 5 layers of 20 tracks each, total heigth 2.5 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈53	≈900	E22/6-3C90-A160-E
	250 ±3%	≈82	≈490	E22/6-3C90-A250-E
	315 ±3%	≈104	≈360	E22/6-3C90-A315-E
	400 ±5%	≈132	≈280	E22/6-3C90-A400-E
	630 ±8%	≈208	≈160	E22/6-3C90-A630-E
	5150 ±25%	≈1700	≈0	E22/6/16-3C90
3C94 des	160 ±3%	≈53	≈900	E22/6-3C94-A160-E
	250 ±3%	≈82	≈490	E22/6-3C94-A250-E
	315 ±3%	≈104	≈360	E22/6-3C94-A315-E
	400 ±5%	≈132	≈280	E22/6-3C94-A400-E
	630 ±8%	≈208	≈160	E22/6-3C94-A630-E
	5150 ±25%	≈1700	≈0	E22/6/16-3C94
3C96 prot	4600 ±25%	≈1520	≈0	E22/6/16-3C96
3F3	160 ±3%	≈53	≈900	E22/6-3F3-A160-E
	250 ±3%	≈82	≈490	E22/6-3F3-A250-E
	315 ±3%	≈104	≈360	E22/6-3F3-A315-E
	400 ±5%	≈132	≈280	E22/6-3F3-A400-E
	630 ±8%	≈208	≈160	E22/6-3F3-A630-E
	4300 ±25%	≈1420	≈0	E22/6/16-3F3
3F35 prot	3500 ±25%	≈1160	≈0	E22/6/16-3F35
3F4 des	160 ±3%	≈53	≈900	E22/6-3F4-A160-E
	250 ±3%	≈82	≈490	E22/6-3F4-A250-E
	315 ±3%	≈104	≈360	E22/6-3F4-A315-E
	400 ±5%	≈132	≈280	E22/6-3F4-A400-E
	630 ±8%	≈208	≈160	E22/6-3F4-A630-E
	2400 ±25%	≈790	≈0	E22/6/16-3F4
3E6	22000 +40/−30%	≈7250	≈0	E22/6/16-3E6

Planar E cores and accessories E22/6/16

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 5 layers of 20 tracks each, total heigth 2.5 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈42	≈950	E22/6-3C90-A160-P
	250 ±3%	≈66	≈550	E22/6-3C90-A250-P
	315 ±3%	≈83	≈400	E22/6-3C90-A315-P
	400 ±5%	≈106	≈280	E22/6-3C90-A400-P
	630 ±8%	≈166	≈160	E22/6-3C90-A630-P
	6150 ±25%	≈1620	≈0	E22/6/16-3C90
3C94 des	160 ±3%	≈42	≈950	E22/6-3C94-A160-P
	250 ±3%	≈66	≈550	E22/6-3C94-A250-P
	315 ±3%	≈83	≈400	E22/6-3C94-A315-P
	400 ±5%	≈106	≈280	E22/6-3C94-A400-P
	630 ±8%	≈166	≈160	E22/6-3C94-A630-P
	6150 ±25%	≈1620	≈0	E22/6/16-3C94
3C96 prot	5450 ±25%	≈1440	≈0	E22/6/16-3C96
3F3	160 ±3%	≈42	≈950	E22/6-3F3-A160-P
	250 ±3%	≈66	≈550	E22/6-3F3-A250-P
	315 ±3%	≈83	≈400	E22/6-3F3-A315-P
	400 ±5%	≈106	≈280	E22/6-3F3-A400-P
	630 ±8%	≈166	≈160	E22/6-3F3-A630-P
	5000 ±25%	≈1320	≈0	E22/6/16-3F3
3F35 prot	4100 ±25%	≈1080	≈0	E22/6/16-3F35
3F4 des	160 ±3%	≈42	≈950	E22/6-3F4-A160-P
	250 ±3%	≈66	≈550	E22/6-3F4-A250-P
	315 ±3%	≈83	≈400	E22/6-3F4-A315-P
	400 ±5%	≈106	≈280	E22/6-3F4-A400-P
	630 ±8%	≈166	≈160	E22/6-3F4-A630-P
	2900 ±25%	≈770	≈0	E22/6/16-3F4
3E6	26000 +40/−30%	≈6900	≈0	E22/6/16-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E22-3C90	≥320	≤0.280	–	–
E+PLT22-3C90	≥320	≤0.235	–	–
E+E22-3C94	≥320	≤0.225	≈1.10	≈0.49
E+PLT22-3C94	≥320	≤0.180	≈0.88	≈0.39
E+E22-3C96	≥320	≈0.160	≈0.78	≈0.34
E+PLT22-3C96	≥320	≈0.130	≈0.62	≈0.27
E+E22-3F3	≥300	≤0.280	–	≤0.50
E+PLT22-3F3	≥300	≤0.230	–	≤0.40
E+E22-3F35	≥300	–	–	≈0.26
E+PLT22-3F35	≥300	–	–	≈0.20
E+E22-3F4	≥250	–	–	–
E+PLT22-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E22-3C90	≥320	–	–	–	–
E+PLT22-3C90	≥320	–	–	–	–
E+E22-3C94	≥320	–	–	–	–
E+PLT22-3C94	≥320	–	–	–	–
E+E22-3C96	≥320	–	–	–	–
E+PLT22-3C96	≥320	–	–	–	–
E+E22-3F3	≥300	–	–	–	–
E+PLT22-3F3	≥300	–	–	–	–
E+E22-3F35	≥300	≈0.41	≈3.10	–	–
E+PLT22-3F35	≥300	≈0.33	≈2.45	–	–
E+E22-3F4	≥250	–	–	≤0.51	≤0.82
E+PLT22-3F4	≥250	–	–	≤0.41	≤0.66

MOUNTING INFORMATION

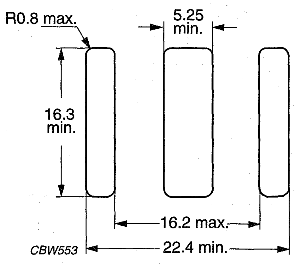


Fig.3 Recommended PCB cut-out for glued cores.

Planar E cores and accessories E22/6/16/R

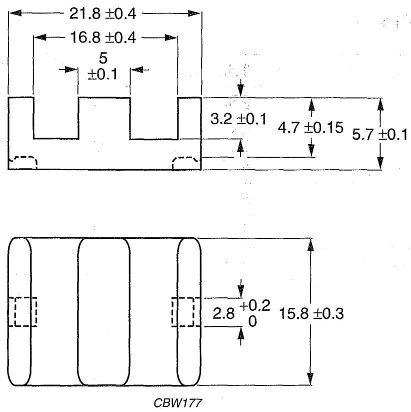
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.324	mm^{-1}
V_e	effective volume	2100	mm^3
l_e	effective length	26.1	mm
A_e	effective area	80.4	mm^2
A_{min}	minimum area	72.6	mm^2
m	mass of E core half	≈6.5	g
m	mass of plate	≈4	g

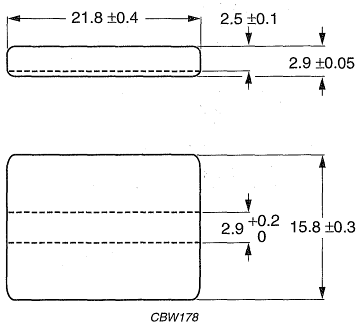
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT22/16/2.5/S-3C90
3C94 des	PLT22/16/2.5/S-3C94
3C96 prot	PLT22/16/2.5/S-3C96
3F3	PLT22/16/2.5/S-3F3
3F35 prot	PLT22/16/2.5/S-3F35
3F4 des	PLT22/16/2.5/S-3F4
3E6	PLT22/16/2.5/S-3E6



Dimensions in mm.

Fig.1 E22/6/16/R.



Dimensions in mm.

Fig.2 PLT22/16/2.5/S.

Core halves for use in combination with a slotted plate (PLT/S)

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements, 20 ±10 N; measurement coil as for E22/6/16.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈42	≈950	E22/6/R-3C90-A160-P
	250 ±3%	≈66	≈550	E22/6/R-3C90-A250-P
	315 ±3%	≈83	≈400	E22/6/R-3C90-A315-P
	400 ±5%	≈106	≈280	E22/6/R-3C90-A400-P
	630 ±8%	≈166	≈160	E22/6/R-3C90-A630-P
	6150 ±25%	≈1620	≈0	E22/6/16/R-3C90
3C94 des	160 ±3%	≈42	≈950	E22/6/R-3C94-A160-P
	250 ±3%	≈66	≈550	E22/6/R-3C94-A250-P
	315 ±3%	≈83	≈400	E22/6/R-3C94-A315-P
	400 ±5%	≈106	≈280	E22/6/R-3C94-A400-P
	630 ±8%	≈166	≈160	E22/6/R-3C94-A630-P
	6150 ±25%	≈1620	≈0	E22/6/16/R-3C94
3C96 prot	5450 ±25%	≈1440	≈0	E22/6/16/R-3C96
3F3	160 ±3%	≈42	≈950	E22/6/R-3F3-A160-P
	250 ±3%	≈66	≈550	E22/6/R-3F3-A250-P
	315 ±3%	≈83	≈400	E22/6/R-3F3-A315-P
	400 ±5%	≈106	≈280	E22/6/R-3F3-A400-P
	630 ±8%	≈166	≈160	E22/6/R-3F3-A630-P
	5000 ±25%	≈1320	≈0	E22/6/16/R-3F3
3F35 prot	4100 ±25%	≈1080	≈0	E22/6/16/R-3F35
3F4 des	160 ±3%	≈42	≈950	E22/6/R-3F4-A160-P
	250 ±3%	≈66	≈550	E22/6/R-3F4-A250-P
	315 ±3%	≈83	≈400	E22/6/R-3F4-A315-P
	400 ±5%	≈106	≈280	E22/6/R-3F4-A400-P
	630 ±8%	≈166	≈160	E22/6/R-3F4-A630-P
	2900 ±25%	≈770	≈0	E22/6/16/R-3F4
3E6	26000 +40/−30%	≈6900	≈0	E22/6/16/R-3E6

Planar E cores and accessories E22/6/16/R

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
E18/R+PLT18/S-3C90	≥320	≤0.235	−	−
E18/R+PLT18/S-3C94	≥320	≤0.180	≈0.88	≈0.39
E18/R+PLT18/S-3C96	≥320	≈0.13	≈0.62	≈0.28
E18/R+PLT18/S-3F3	≥300	≤0.230	−	≤0.40
E18/R+PLT18/S-3F35	≥300	≤0.230	−	≈0.20
E18/R+PLT18/S-3F4	≥250	−	−	−

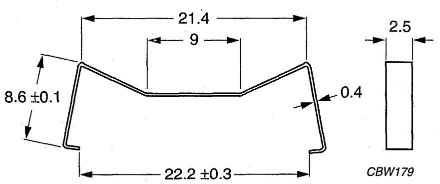
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	**f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C**	**f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C**	**f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C**
E18/R+PLT18/S-3C90	≥320	−	−	−	−
E18/R+PLT18/S-3C94	≥320	−	−	−	−
E18/R+PLT18/S-3C96	≥320	−	−	−	−
E18/R+PLT18/S-3F3	≥300	−	−	−	−
E18/R+PLT18/S-3F35	≥300	≈0.34	≈2.50	−	−
E18/R+PLT18/S-3F4	≥250	−	−	≤0.41	≤0.66

MOUNTING PARTS

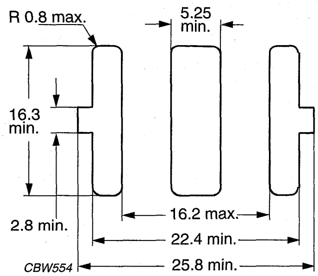
General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E22/PLT22



Dimensions in mm.

Fig.3 Clamp for E22/R+PLT22/S.



Dimensions in mm.

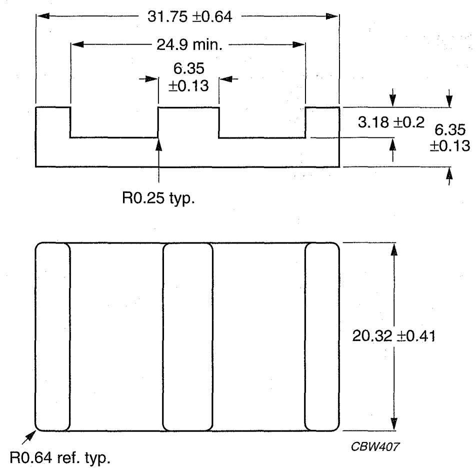
Fig.4 Recommended PCB cut-out for clamped cores.

Planar E cores | E32/6/20

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.323	mm^{-1}
V_e	effective volume	5380	mm^3
l_e	effective length	41.7	mm
A_e	effective area	129	mm^2
m	mass of core half	≈13	g



Dimensions in mm.

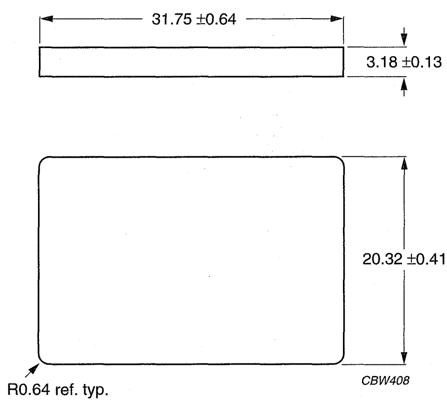
Fig.1 E32/6/20.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.278	mm^{-1}
V_e	effective volume	4560	mm^3
l_e	effective length	35.9	mm
A_e	effective area	129	mm^2
m	mass of plate	≈10	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT32/20/3-3C90
3C94 des	PLT32/20/3-3C94
3C96 prot	PLT32/20/3-3C96
3F3	PLT32/20/3-3F3
3F4 des	PLT32/20/3-3F4



Dimensions in mm.

Fig.2 PLT32/20/3.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 30 ±10 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%(1)	≈41	≈1200	E32/6-3C90-E160-E
	250 ±3%(1)	≈64	≈700	E32/6-3C90-E250-E
	315 ±3%	≈81	≈550	E32/6-3C90-A315-E
	400 ±5%	≈103	≈450	E32/6-3C90-A400-E
	630 ±8%	≈162	≈260	E32/6-3C90-A630-E
	6425 ±25%	≈1650	≈0	E32/6/20-3C90
3C94 des	160 ±3%(1)	≈41	≈1200	E32/6-3C94-E160-E
	250 ±3%(1)	≈64	≈700	E32/6-3C94-E250-E
	315 ±3%	≈81	≈550	E32/6-3C94-E315-E
	400 ±5%	≈103	≈450	E32/6-3C94-E400-E
	630 ±8%	≈162	≈260	E32/6-3C94-E630-E
	6425 ±25%	≈1650	≈0	E32/6/20-3C94
3C96 prot	6425 ±25%	≈1650	≈0	E32/6/20-3C96
3F3	160 ±3%(1)	≈41	≈1200	E32/6-3F3-E160-E
	250 ±3%(1)	≈64	≈700	E32/6-3F3-E250-E
	315 ±3%	≈81	≈550	E32/6-3F3-A315-E
	400 ±5%	≈103	≈450	E32/6-3F3-A400-E
	630 ±8%	≈162	≈260	E32/6-3F3-A630-E
	5900 ±25%	≈1520	≈0	E32/6/20-3F3
3F4 des	160 ±3%(1)	≈41	≈1200	E32/6-3F4-E160-E
	250 ±3%(1)	≈64	≈700	E32/6-3F4-E250-E
	315 ±3%	≈81	≈550	E32/6-3F4-A315-E
	400 ±5%	≈103	≈450	E32/6-3F4-A400-E
	630 ±8%	≈162	≈260	E32/6-3F4-A630-E
	3200 ±25%	≈820	≈0	E32/6/20-3F4

Note

1. Measured in combination with an equal gapped E core half, clamping force for A_L measurements, 30 ±10 N.

Planar E cores E32/6/20

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈35	≈1200	E32/6-3C90-A160-P
	250 ±3%	≈55	≈700	E32/6-3C90-A250-P
	315 ±3%	≈69	≈550	E32/6-3C90-A315-P
	400 ±5%	≈87	≈450	E32/6-3C90-A400-P
	630 ±8%	≈138	≈260	E32/6-3C90-A630-P
	7350 ±25%	≈1610	≈0	E32/6/20-3C90
3C94 des	160 ±3%	≈35	≈1200	E32/6-3C94-A160-P
	250 ±3%	≈55	≈700	E32/6-3C94-A250-P
	315 ±3%	≈69	≈550	E32/6-3C94-A315-P
	400 ±5%	≈87	≈450	E32/6-3C94-A400-P
	630 ±8%	≈138	≈260	E32/6-3C94-A630-P
	7350 ±25%	≈1610	≈0	E32/6/20-3C94
3C96 prot	7350 ±25%	≈1610	≈0	E32/6/20-3C96
3F3	160 ±3%	≈35	≈1200	E32/6-3F3-A160-P
	250 ±3%	≈55	≈700	E32/6-3F3-A250-P
	315 ±3%	≈69	≈550	E32/6-3F3-A315-P
	400 ±5%	≈87	≈450	E32/6-3F3-A400-P
	630 ±8%	≈138	≈260	E32/6-3F3-A630-P
	6780 ±25%	≈1490	≈0	E32/6/20-3F3
3F4 des	160 ±3%	≈35	≈1200	E32/6-3F4-A160-P
	250 ±3%	≈55	≈700	E32/6-3F4-A250-P
	315 ±3%	≈69	≈550	E32/6-3F4-A315-P
	400 ±5%	≈87	≈450	E32/6-3F4-A400-P
	630 ±8%	≈138	≈260	E32/6-3F4-A630-P
	3700 ±25%	≈810	≈0	E32/6/20-3F4

Properties under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
E+E32-3C90	≥320	≤0.65	≤0.65	–
E+PLT32-3C90	≥320	≤0.55	≤0.55	–
E+E32-3C94	≥320	–	≤0.48	≈2.30
E+PLT32-3C94	≥320	–	≤0.41	≈2.00
E+E32-3C96	≥320	–	≈0.35	≈1.60
E+PLT32-3C96	≥320	–	≈0.29	≈1.40
E+E32-3F3	≥320	–	≤0.59	–
E+PLT32-3F3	≥320	–	≤0.50	–
E+E32-3F4	≥250	–	–	–
E+PLT32-3F4	≥250	–	–	–

Properties under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E32-3C90	≥320	–	–	–
E+PLT32-3C90	≥320	–	–	–
E+E32-3C94	≥320	≈1.00	–	–
E+PLT32-3C94	≥320	≈0.87	–	–
E+E32-3C96	≥320	≈0.70	–	–
E+PLT32-3C96	≥320	≈0.60	–	–
E+E32-3F3	≥320	≤1.00	–	–
E+PLT32-3F3	≥320	≤0.85	–	–
E+E32-3F4	≥250	–	≤1.60	≤2.00
E+PLT32-3F4	≥250	–	≤1.36	≤1.70

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.272	mm^{-1}
V_e	effective volume	10200	mm^3
l_e	effective length	52.6	mm
A_e	effective area	194	mm^2
m	mass of core half	≈25	g

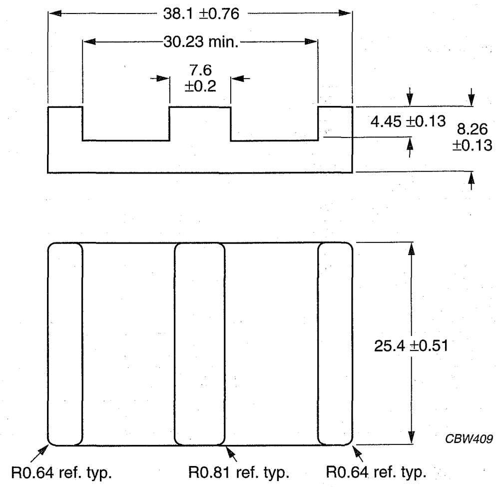


Fig.1 E38/8/25 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.226	mm^{-1}
V_e	effective volume	8460	mm^3
l_e	effective length	43.7	mm
A_e	effective area	194	mm^2
m	mass of plate	≈18	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT38/25/4-3C90
3F3	PLT38/25/4-3F3
3F4 des	PLT38/25/4-3F4

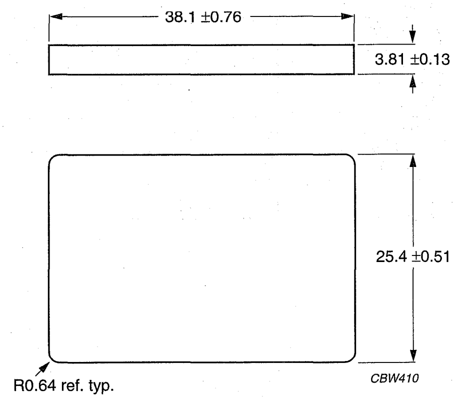


Fig.2 PLT38/25/4.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 40 ±15 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%(1)	≈54	≈1100	E38/8-3C90-E250-E
	315 ±3%(1)	≈68	≈850	E38/8-3C90-E315-E
	400 ±3%(1)	≈86	≈650	E38/8-3C90-E400-E
	630 ±5%	≈136	≈400	E38/8-3C90-A630-E
	1000 ±10%	≈216	≈250	E38/8-3C90-A1000-E
	7940 ±25%	≈1720	≈0	E38/8/25-3C90
3F3	250 ±3%(1)	≈54	≈1100	E38/8-3F3-E250-E
	315 ±3%(1)	≈68	≈850	E38/8-3F3-E315-E
	400 ±3%(1)	≈86	≈650	E38/8-3F3-E400-E
	630 ±5%	≈136	≈400	E38/8-3F3-A630-E
	1000 ±10%	≈216	≈250	E38/8-3F3-A1000-E
	7250 ±25%	≈1570	≈0	E38/8/25-3F3
3F4 des	250 ±3%(1)	≈54	≈1100	E38/8-3F4-E250-E
	315 ±3%(1)	≈68	≈850	E38/8-3F4-E315-E
	400 ±3%(1)	≈86	≈650	E38/8-3F4-E400-E
	630 ±5%	≈136	≈400	E38/8-3F4-A630-E
	1000 ±10%	≈216	≈250	E38/8-3F4-A1000-E
	3880 ±25%	≈840	≈0	E38/8/25-3F4

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 40 ±15 N.

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈45	≈1100	E38/8-3C90-A250-P
	315 ±3%	≈57	≈850	E38/8-3C90-A315-P
	400 ±3%	≈72	≈650	E38/8-3C90-A400-P
	630 ±5%	≈113	≈400	E38/8-3C90-A630-P
	1000 ±10%	≈180	≈250	E38/8-3C90-A1000-P
	9290 ±25%	≈1670	≈0	E38/8/25-3C90
3F3	250 ±3%	≈45	≈1100	E38/8-3F3-A250-P
	315 ±3%	≈57	≈850	E38/8-3F3-A315-P
	400 ±3%	≈72	≈650	E38/8-3F3-A400-P
	630 ±5%	≈113	≈400	E38/8-3F3-A630-P
	1000 ±10%	≈180	≈250	E38/8-3F3-A1000-P
	8500 ±25%	≈1520	≈0	E38/8/25-3F3

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3F4 des	250 ±3%	≈45	≈1100	E38/8-3F4-A250-P
	315 ±3%	≈57	≈850	E38/8-3F4-A315-P
	400 ±3%	≈72	≈650	E38/8-3F4-A400-P
	630 ±5%	≈113	≈400	E38/8-3F4-A630-P
	1000 ±10%	≈180	≈250	E38/8-3F4-A1000-P
	4600 ±25%	≈830	≈0	E38/8/25-3F4

Properties under power conditions

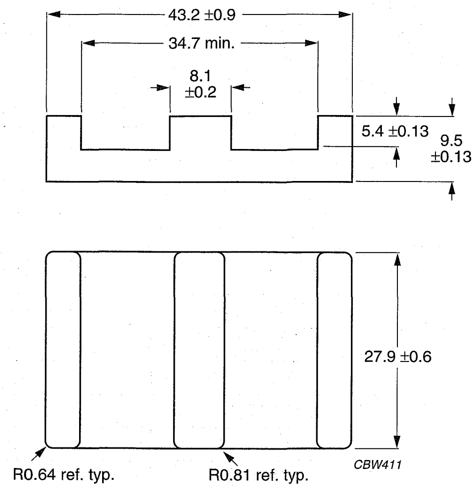
CORE COMBINATION	B (mT)at	CORE LOSS (W)at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E38-3C90	≥320	≤1.25	≤1.25	–	–	–
E+PLT38-3C90	≥320	≤1.05	≤1.05	–	–	–
E+E38-3F3	≥320	–	≤1.20	≤2.00	–	–
E+PLT38-3F3	≥320	–	≤1.00	≤1.65	–	–
E+E38-3F4	≥250	–	–	–	≤3.00	≤3.50
E+PLT38-3F4	≥250	–	–	–	≤2.50	≤2.90

Planar E cores E43/10/28

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.276	mm^{-1}
V_e	effective volume	13900	mm^3
l_e	effective length	61.7	mm
A_e	effective area	225	mm^2
m	mass of core half	≈35	g



Dimensions in mm.

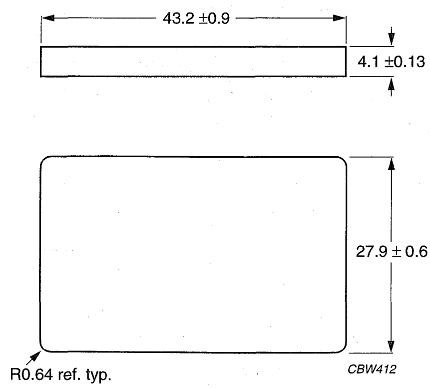
Fig.1 E43/10/28 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.226	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	50.8	mm
A_e	effective area	225	mm^2
m	mass of core half	≈24	g

Ordering information

GRADE	TYPE NUMBER
3C90	PLT43/28/4-3C90
3F3	PLT43/28/4-3F3
3F4 des	PLT43/28/4-3F4



Dimensions in mm.

Fig.2 PLT43/28/4.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 40 ±20 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%(1)	≈55	≈1100	E43/10-3C90-E250-E
	315 ±3%(1)	≈69	≈800	E43/10-3C90-E315-E
	400 ±3%(1)	≈87	≈700	E43/10-3C90-E400-E
	630 ±5%	≈138	≈400	E43/10-3C90-A630-E
	1000 ±10%	≈219	≈250	E43/10-3C90-A1000-E
	8030 ±25%	≈1710	≈0	E43/10/28-3C90
3F3	250 ±3%(1)	≈55	≈1100	E43/10-3F3-E250-E
	315 ±3%(1)	≈69	≈800	E43/10-3F3-E315-E
	400 ±3%(1)	≈87	≈700	E43/10-3F3-E400-E
	630 ±5%	≈138	≈400	E43/10-3F3-A630-E
	1000 ±10%	≈219	≈250	E43/10-3F3-A1000-E
	7310 ±25%	≈1600	≈0	E43/10/28-3F3
3F4 des	250 ±3%(1)	≈55	≈1100	E43/10-3F4-E250-E
	315 ±3%(1)	≈69	≈800	E43/10-3F4-E315-E
	400 ±3%(1)	≈87	≈700	E43/10-3F4-E400-E
	630 ±5%	≈138	≈400	E43/10-3F4-A630-E
	1000 ±10%	≈219	≈250	E43/10-3F4-A1000-E
	3870 ±25%	≈850	≈0	E43/10/28-3F4

Note

1. Measured in combination with an equal gapped E core half, clamping force for A_L measurements, 40 ±20 N.

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈45	≈1100	E43/10-3C90-A250-P
	315 ±3%	≈57	≈800	E43/10-3C90-A315-P
	400 ±3%	≈72	≈700	E43/10-3C90-A400-P
	630 ±5%	≈113	≈400	E43/10-3C90-A630-P
	1000 ±10%	≈180	≈250	E43/10-3C90-A1000-P
	9250 ±25%	≈1710	≈0	E43/10/28-3C90
3F3	250 ±3%	≈45	≈1100	E43/10-3F3-A250-P
	315 ±3%	≈57	≈800	E43/10-3F3-A315-P
	400 ±3%	≈72	≈700	E43/10-3F3-A400-P
	630 ±5%	≈113	≈400	E43/10-3F3-A630-P
	1000 ±10%	≈180	≈250	E43/10-3F3-A1000-P
	8700 ±25%	≈1560	≈0	E43/10/28-3F3

Planar E cores E43/10/28

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4 des	250 ±3%	≈45	≈1100	E43/10-3F4-A250-P
	315 ±3%	≈57	≈800	E43/10-3F4-A315-P
	400 ±3%	≈72	≈700	E43/10-3F4-A400-P
	630 ±5%	≈113	≈400	E43/10-3F4-A630-P
	1000 ±10%	≈180	≈250	E43/10-3F4-A1000-P
	4660 ±25%	≈850	≈0	E43/10/28-3F4

Properties under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E43-3C90	≥320	≤1.70	≤1.80	–	–	–
E+PLT43-3C90	≥320	≤1.40	≤1.50	–	–	–
E+E43-3F3	≥320	–	≤1.60	≤2.70	–	–
E+PLT43-3F3	≥320	–	≤1.35	≤2.25	–	–
E+E43-3F4	≥250	–	–	–	≤4.20	≤5.00
E+PLT43-3F4	≥250	–	–	–	≤3.50	≤4.15

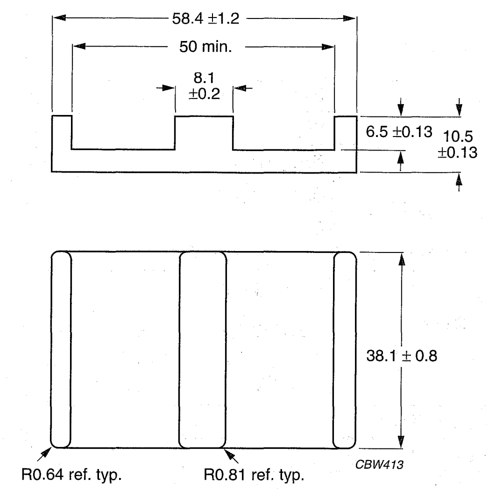
Planar E cores

E58/11/38

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.268	mm^{-1}
V_e	effective volume	24600	mm^3
l_e	effective length	81.2	mm
A_e	effective area	305	mm^2
m	mass of core half	≈62	g



Dimensions in mm.

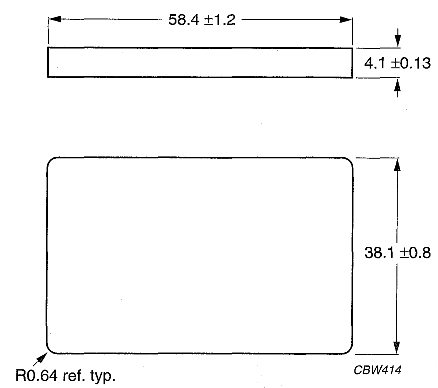
Fig.1 E58/11/38 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.224	mm^{-1}
V_e	effective volume	20800	mm^3
l_e	effective length	68.3	mm
A_e	effective area	305	mm^2
m	mass of core half	≈44	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT58/38/4-3C90
3F3	PLT58/38/4-3F3
3F4 des	PLT58/38/4-3F4



Dimensions in mm.

Fig.2 PLT 58/38/4.

Planar E cores | E58/11/38

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	315 ±3%(1)	≈67	≈1400	E58/11-3C90-E315-E
	400 ±3%(1)	≈85	≈1100	E58/11-3C90-E400-E
	630 ±5%(1)	≈134	≈650	E58/11-3C90-E630-E
	1000 ±5%	≈213	≈400	E58/11-3C90-A1000-E
	1600 ±10%	≈341	≈200	E58/11-3C90-A1600-E
	8480 ±25%	≈1800	≈0	E58/11/38-3C90
3F3	315 ±3%(1)	≈67	≈1400	E58/11-3F3-E315-E
	400 ±3%(1)	≈85	≈1100	E58/11-3F3-E400-E
	630 ±5%(1)	≈134	≈650	E58/11-3F3-E630-E
	1000 ±5%	≈213	≈400	E58/11-3F3-A1000-E
	1600 ±10%	≈341	≈200	E58/11-3F3-A1600-E
	7710 ±25%	≈1640	≈0	E58/11/38-3F3
3F4 des	315 ±3%(1)	≈67	≈1400	E58/11-3F4-E315-E
	400 ±3%(1)	≈85	≈1100	E58/11-3F4-E400-E
	630 ±5%(1)	≈134	≈650	E58/11-3F4-E630-E
	1000 ±5%	≈213	≈400	E58/11-3F4-A1000-E
	1600 ±10%	≈341	≈200	E58/11-3F4-A1600-E
	4030 ±25%	≈860	≈0	E58/11/38-3F4

Note

1. Measured in combination with an equal gapped E core half, clamping force for A_L measurements, 40 ±20 N.

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	315 ±3%	≈56	≈1400	E58/11-3C90-A315-P
	400 ±3%	≈71	≈1100	E58/11-3C90-A400-P
	630 ±5%	≈112	≈650	E58/11-3C90-A630-P
	1000 ±5%	≈178	≈400	E58/11-3C90-A1000-P
	1600 ±10%	≈285	≈200	E58/11-3C90-A1600-P
	9970 ±25%	≈780	≈0	E58/11/38-3C90
3F3	315 ±3%	≈56	≈1400	E58/11-3F3-A315-P
	400 ±3%	≈71	≈1100	E58/11-3F3-A400-P
	630 ±5%	≈112	≈650	E58/11-3F3-A630-P
	1000 ±5%	≈178	≈400	E58/11-3F3-A1000-P
	1600 ±10%	≈285	≈200	E58/11-3F3-A1600-P
	9070 ±25%	≈1620	≈0	E58/11/38-3F3

Planar E cores E58/11/38

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4 des	315 ±3%	≈56	≈1400	E58/11-3F4-A315-P
	400 ±3%	≈71	≈1100	E58/11-3F4-A400-P
	630 ±5%	≈112	≈650	E58/11-3F4-A630-P
	1000 ±5%	≈178	≈400	E58/11-3F4-A1000-P
	1600 ±10%	≈285	≈200	E58/11-3F4-A1600-P
	4780 ±25%	≈850	≈0	E58/11/38-3F4

Properties under power conditions

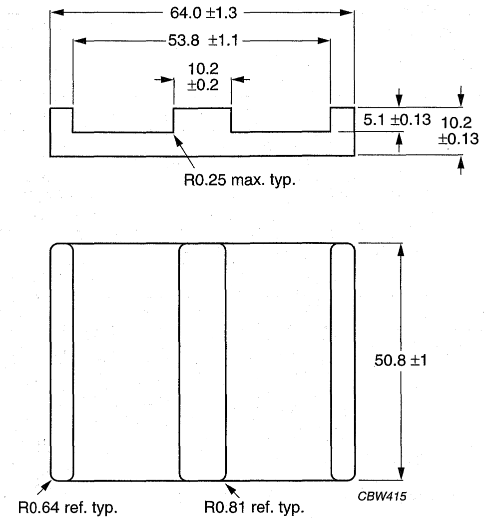
CORE COMBINATION	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
E+E58-3C90	≥320	≤2.95	≤3.10	–	–	–
E+PLT58-3C90	≥320	≤2.50	≤2.65	–	–	–
E+E58-3F3	≥320	–	≤2.70	≤4.70	–	–
E+PLT58-3F3	≥320	–	≤2.30	≤4.00	–	–
E+E58-3F4	≥250	–	–	–	≤7.40	≤8.00
E+PLT58-3F4	≥250	–	–	–	≤6.25	≤6.80

Planar E cores E64/10/50

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.156	mm^{-1}
V_e	effective volume	40700	mm^3
l_e	effective length	79.7	mm
A_e	effective area	511	mm^2
m	mass of core half	≈100	g



Dimensions in mm.

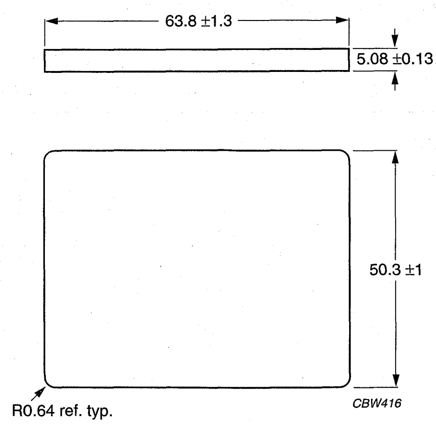
Fig.1 E64/10/50.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.136	mm^{-1}
V_e	effective volume	35500	mm^3
l_e	effective length	69.6	mm
A_e	effective area	511	mm^2
m	mass of plate	≈78	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT64/50/5-3C90
3F3	PLT64/50/5-3F3
3F4 des	PLT64/50/5-3F4



Dimensions in mm.

Fig.2 PLT 64/50/5.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 100 ±30 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	630 ±3%(1)	≈78	≈1100	E64/10-3C90-E630-E
	1000 ±3%(1)	≈124	≈660	E64/10-3C90-E1000-E
	1600 ±5%	≈199	≈385	E64/10-3C90-A1600-E
	2500 ±10%	≈310	≈225	E64/10-3C90-A2500-E
	3150 ±10%	≈391	≈170	E64/10-3C90-A3150-E
	14640 ±25%	≈1820	≈0	E64/10/50-3C90
3F3	630 ±3%(1)	≈78	≈1100	E64/10-3F3-E630-E
	1000 ±3%(1)	≈124	≈660	E64/10-3F3-E1000-E
	1600 ±5%	≈199	≈385	E64/10-3F3-A1600-E
	2500 ±10%	≈310	≈225	E64/10-3F3-A2500-E
	3150 ±10%	≈391	≈170	E64/10-3F3-A3150-E
	13300 ±25%	≈1650	≈0	E64/10/50-3F3
3F4 des	630 ±3%(1)	≈78	≈1100	E64/10-3F4-E630-E
	1000 ±3%(1)	≈124	≈660	E64/10-3F4-E1000-E
	1600 ±5%	≈199	≈385	E64/10-3F4-A1600-E
	2500 ±10%	≈310	≈225	E64/10-3F4-A2500-E
	3150 ±10%	≈391	≈170	E64/10-3F4-A3150-E
	6960 ±25%	≈860	≈0	E64/10/50-3F4

Note

1. Measured in combination with an equa -gapped core half, clamping force for A_L measurements, 100 ±30 N.

Core halves for use in combination with a plate (PLT)

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 100 ±30 N.

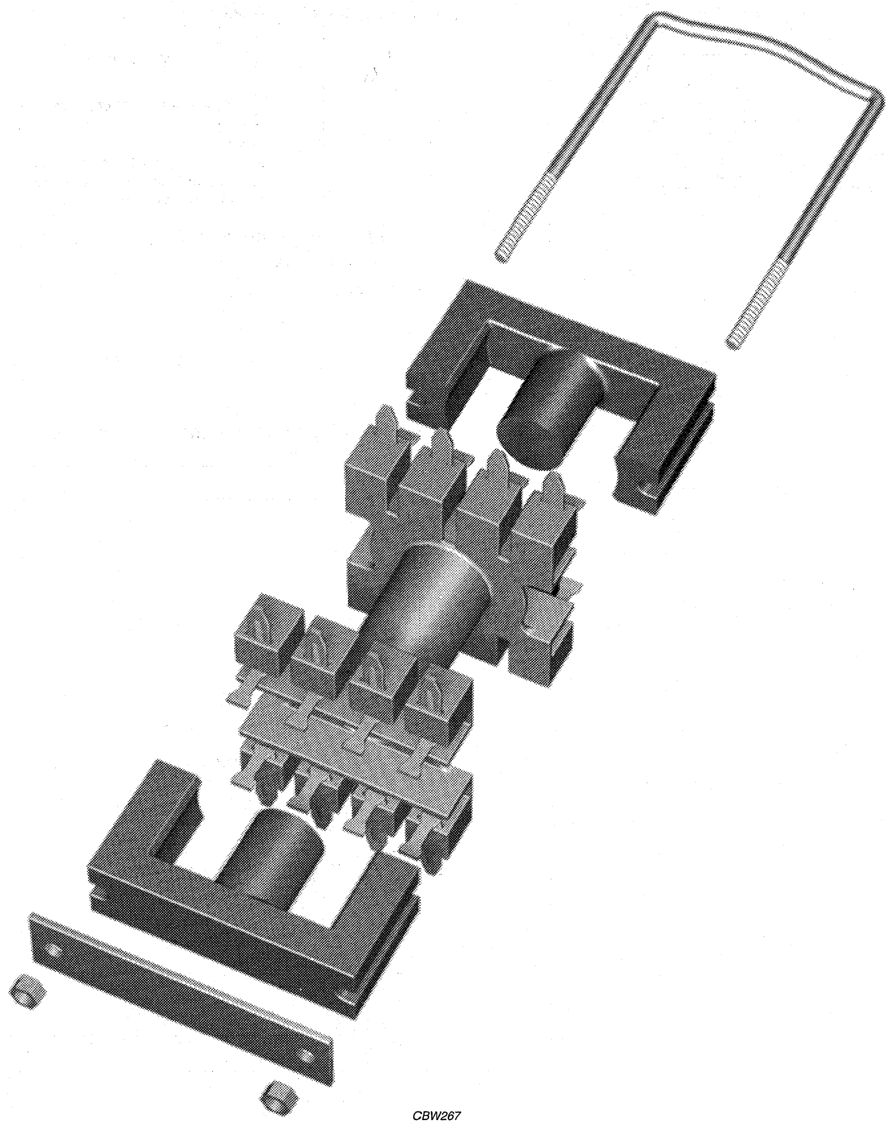
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	630 ±3%	≈78	≈1100	E64/10-3C90-A-630-P
	1000 ±3%	≈124	≈660	E64/10-3C90-A-1000-P
	1600 ±5%	≈199	≈385	E64/10-3C90-A-1600-P
	2500 ±10%	≈310	≈225	E64/10-3C90-A-2500-P
	3150 ±10%	≈391	≈170	E64/10-3C90-A-3150-P
	16540 ±25%	≈1790	≈0	E64/10/50-3C90
3F3	630 ±3%	≈78	≈1100	E64/10-3F3-A-630-P
	1000 ±3%	≈124	≈660	E64/10-3F3-A-1000-P
	1600 ±5%	≈199	≈385	E64/10-3F3-A-1600-P
	2500 ±10%	≈310	≈225	E64/10-3F3-A-2500-P
	3150 ±10%	≈391	≈170	E64/10-3F3-A-3150-P
	15050 ±25%	≈1630	≈0	E64/10/50-3F3

Planar E cores E64/10/50

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4 des	630 ±3%	≈78	≈1100	E64/10-3F4-A-630-P
	1000 ±3%	≈124	≈660	E64/10-3F4-A-1000-P
	1600 ±5%	≈199	≈385	E64/10-3F4-A-1600-P
	2500 ±10%	≈310	≈225	E64/10-3F4-A-2500-P
	3150 ±10%	≈391	≈170	E64/10-3F4-A-3150-P
	7920 ±25%	≈860	≈0	E64/10/50-3F4

Properties under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E64-3C90	≥320	≤4.90	≤5.20	−	−	−
E+PLT64-3C90	≥320	≤4.30	≤4.55	−	−	−
E+E64-3F3	≥320	−	≤4.50	≤7.80	−	−
E+PLT64-3F3	≥320	−	≤3.95	≤6.80	−	−
E+E64-3F4	≥250	−	−	−	≤12.0	≤15.0
E+PLT64-3F4	≥250	−	−	−	≤10.5	≤13.0



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EC cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EC35	6530	84.3	19
EC41	10800	121	30
EC52	18800	180	56
EC70	40100	279	127

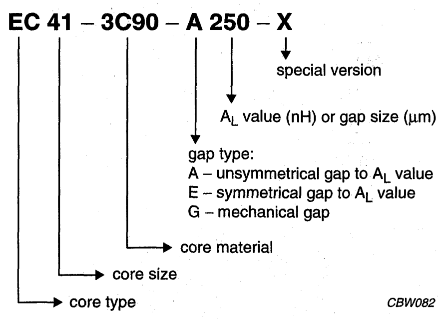


Fig.1 Type number structure for cores.

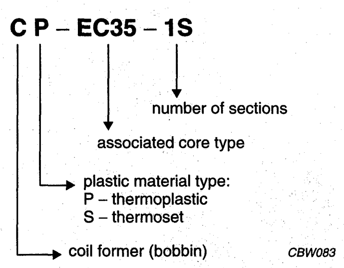
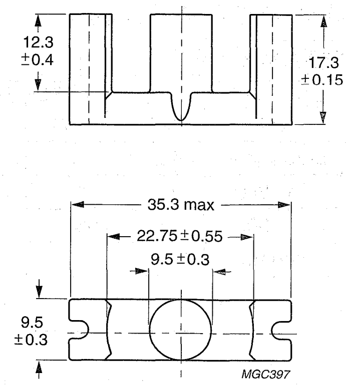


Fig.2 Type number structure for core sets.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈19	g



Dimensions in mm.

Fig.1 EC35 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	100 ±3%(1)	≈73	≈1470	EC35-3C81-E100
	160 ±3%(1)	≈117	≈820	EC35-3C81-E160
	250 ±3%	≈184	≈470	EC35-3C81-A250
	315 ±5%	≈231	≈350	EC35-3C81-A315
	400 ±10%	≈290	≈260	EC35-3C81-A400
	≥2250	≥1640	≈0	EC35-3C81
3C90 sup	100 ±3%(1)	≈73	≈1470	EC35-3C90-E100
	160 ±3%(1)	≈117	≈820	EC35-3C90-E160
	250 ±3%	≈184	≈470	EC35-3C90-A250
	315 ±5%	≈231	≈350	EC35-3C90-A315
	400 ±10%	≈290	≈260	EC35-3C90-A400
	2100 ±25%	≈1530	≈0	EC35-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

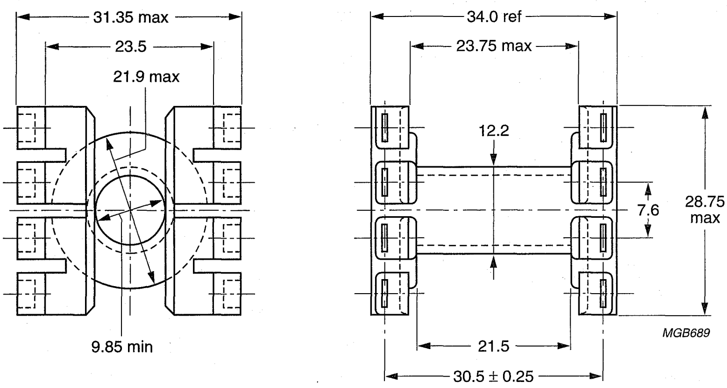
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤1.40	–
3C90	≥320	≤0.79	≤0.83

COIL FORMERS

General data 8-slots EC35 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 EC35 coil former; 8-slots.

Winding data 8-slots EC35 coil former for insertable pins

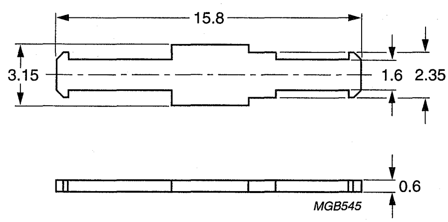
Coil formers with inserted pins are available on request.

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97.1	21.5	53.1	CP-EC35-1S

MOUNTING PARTS

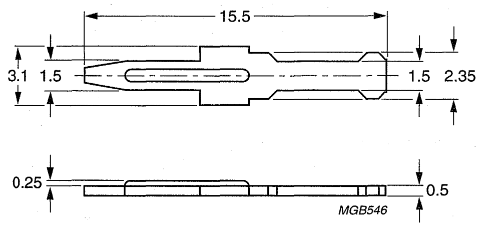
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1; material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
Base plate 2 holes	aluminium		5	BPL2-EC35
Base plate 4 holes	aluminium		6	BPL4-EC35
Clamp	copper-zinc alloy (CuZn)		7	CLM/U-EC35



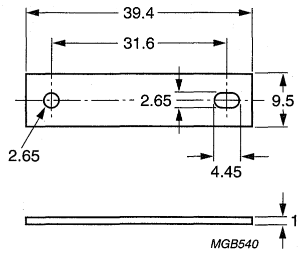
Dimensions in mm.

Fig.3 EC pin; general mount.



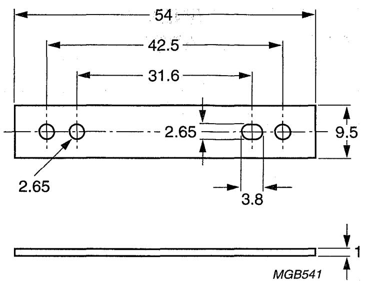
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



Dimensions in mm.

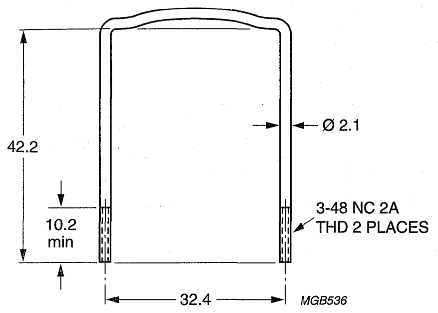
Fig.5 EC35 base plate; 2 holes.



Dimensions in mm.

Fig.6 EC35 base plate; 4 holes.

EC cores and accessories EC35



Dimensions in mm.

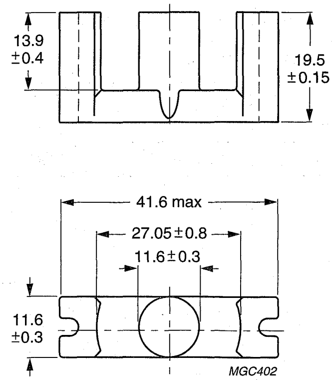
Fig.7 EC35 clamp.

EC cores and accessories | EC41

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈30	g



Dimensions in mm.

Fig.1 EC41 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	100 ±3%(1)	≈59	≈2200	EC41-3C81-E100
	160 ±3%(1)	≈94	≈1220	EC41-3C81-E160
	250 ±3%(1)	≈147	≈705	EC41-3C81-E250
	315 ±5%	≈186	≈530	EC41-3C81-A315
	400 ±5%	≈236	≈390	EC41-3C81-A400
	≥2800	≥1640	≈0	EC41-3C81
3C90 sup	100 ±3%(1)	≈59	≈2200	EC41-3C90-E100
	160 ±3%(1)	≈94	≈1220	EC41-3C90-E160
	250 ±3%(1)	≈147	≈705	EC41-3C90-E250
	315 ±5%	≈186	≈530	EC41-3C90-A315
	400 ±5%	≈186	≈390	EC41-3C90-A400
	2700 ±25%	≈1580	≈0	EC41-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

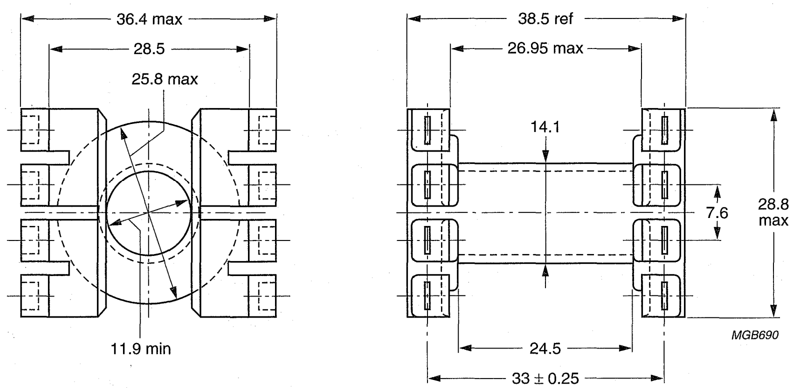
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤2.2	−
3C90	≥320	≤1.3	≤1.4

COIL FORMERS

General data 8-slots EC41 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 EC41 coil former; 8-slots.

Winding data 8-slots EC41 coil former for insertable pins

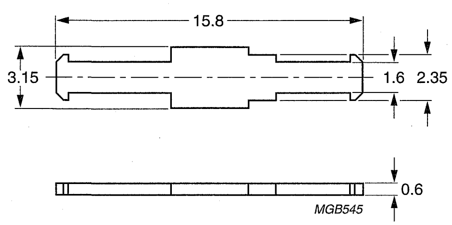
Coil formers with inserted pins are available on request.

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	137.5	24.5	62.4	CP-EC41-1S

MOUNTING PARTS

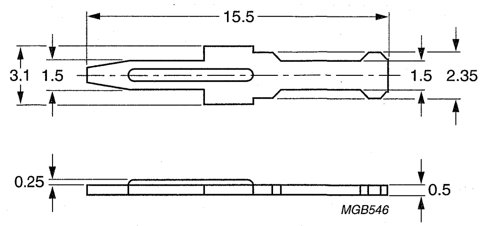
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC41
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC41
Base plate 4 holes	aluminium (Al)		7	BPL4-EC41



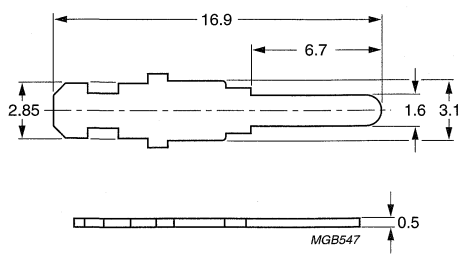
Dimensions in mm.

Fig.3 EC pin; general mount.



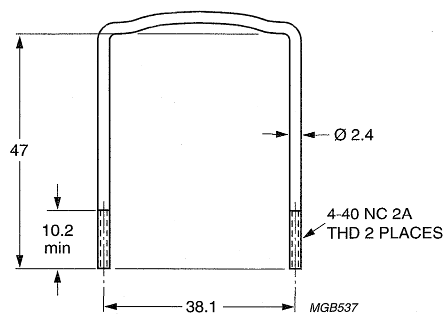
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



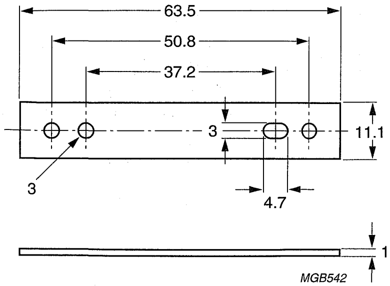
Dimensions in mm.

Fig.5 EC41 pin; vertical mount.



Dimensions in mm.

Fig.6 EC41 clamp.



Dimensions in mm.

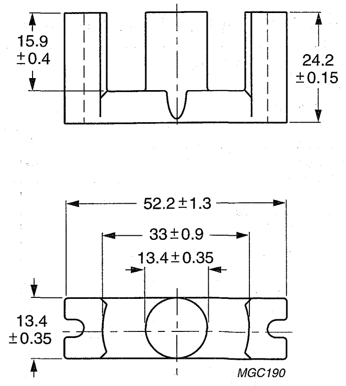
Fig.7 EC41 base plate; 4 holes.

EC cores and accessories | EC52

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈56	g



Dimensions in mm.

Fig.1 EC52 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	160 ±3%[(1)]	≈74	≈1920	EC52-3C81-E160
	250 ±3%[(1)]	≈116	≈1100	EC52-3C81-E250
	315 ±3%[(1)]	≈147	≈830	EC52-3C81-E315
	400 ±3%	≈185	≈620	EC52-3C81-A400
	630 ±5%	≈290	≈350	EC52-3C81-A630
	≥3550	≥1640	≈0	EC52-3C81
3C90 sup	160 ±3%[(1)]	≈74	≈1920	EC52-3C90-E160
	250 ±3%[(1)]	≈116	≈1100	EC52-3C90-E250
	315 ±3%[(1)]	≈147	≈830	EC52-3C90-E315
	400 ±3%	≈185	≈620	EC52-3C90-A400
	630 ±5%	≈290	≈350	EC52-3C90-A630
	3600 ±25%	≈1660	≈0	EC52-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

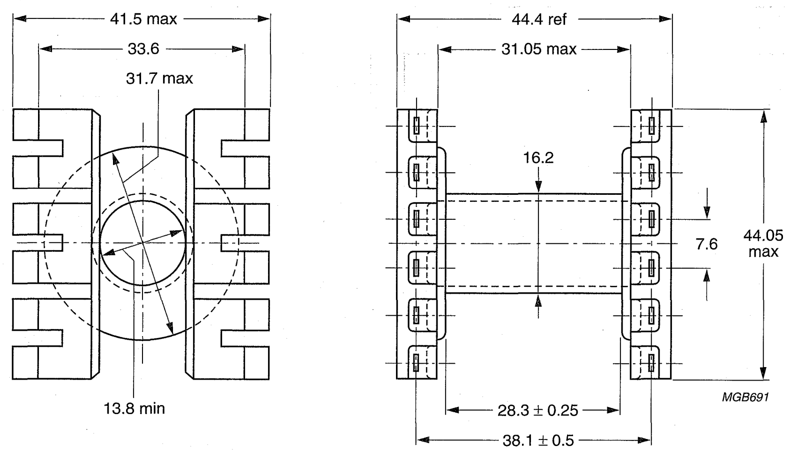
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤3.8	–
3C90	≥320	≤2.3	≤2.4

COIL FORMERS

General data 12-slots EC52 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(R)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 EC52 coil former; 12-slots.

Winding data for 12-slots EC52 coil former for insertable pins

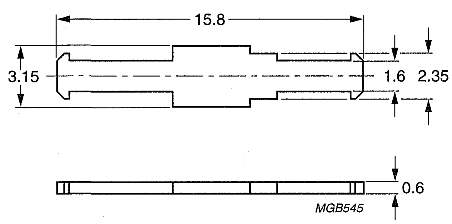
Coil formers with inserted pins are available on request.

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	212	28.3	74.9	CP-EC52-1S

MOUNTING PARTS

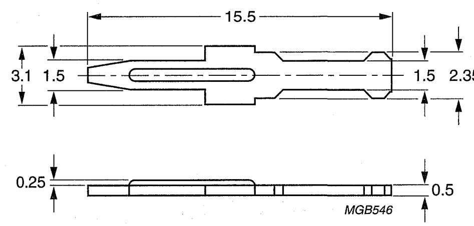
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC52
Clamp	copper-zinc alloy (CuZn)		5	CLM/U-EC52
Base plate 4 holes	aluminium		5	BPL4-EC52



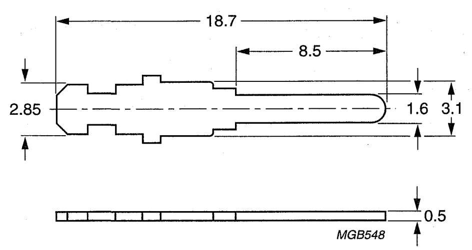
Dimensions in mm.

Fig.3 EC pin; general mount.



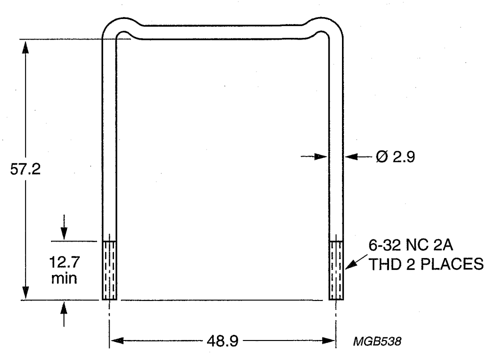
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



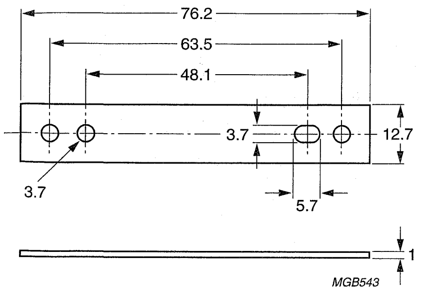
Dimensions in mm.

Fig.5 EC52 pin; vertical mount.



Dimensions in mm.

Fig.6 EC52 clamp.



Dimensions in mm.

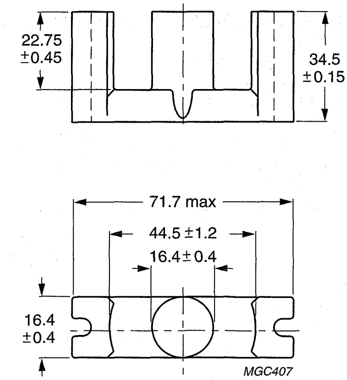
Fig.7 EC52 base plate; 4 holes.

EC cores and accessories EC70

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈127	g



Dimensions in mm.

Fig.1 EC70 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	250 ±3%(1)	≈102	≈1830	EC70-3C81-E250
	315 ±3%(1)	≈130	≈1370	EC70-3C81-E315
	400 ±3%(1)	≈165	≈1020	EC70-3C81-E400
	630 ±5%	≈256	≈580	EC70-3C81-A630
	1000 ±10%	≈406	≈320	EC70-3C81-A1000
	≥4000	≥1620	≈0	EC70-3C81
3C90 sup	250 ±3%(1)	≈102	≈1830	EC70-3C90-E250
	315 ±3%(1)	≈130	≈1370	EC70-3C90-E315
	400 ±3%(1)	≈165	≈1020	EC70-3C90-E400
	630 ±5%	≈256	≈580	EC70-3C90-A630
	1000 ±10%	≈406	≈320	EC70-3C90-A1000
	3900 ±25%	≈1580	≈0	EC70-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

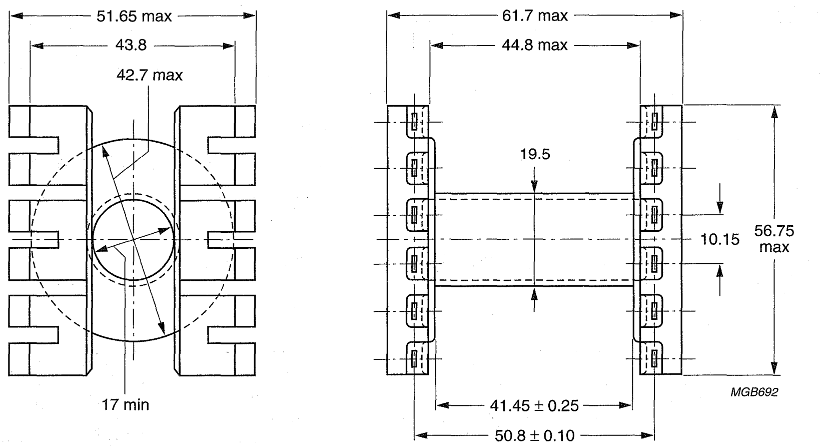
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥330	≤8.2	–
3C90	≥330	≤4.9	≤5.1

COIL FORMERS

General data 8-slots EC70 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B



Dimensions in mm.

Fig.2 EC70 coil former; 8-slots.

Winding data 8-slots EC70 coil former for insertable pins; see note 1

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	465	41.5	97.3	CP-EC70-1S

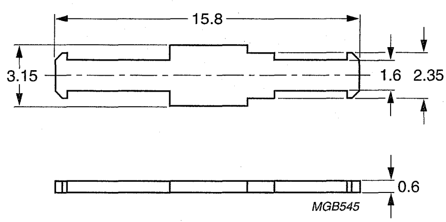
Note

1. Coil formers with inserted pins are available on request.

MOUNTING PARTS

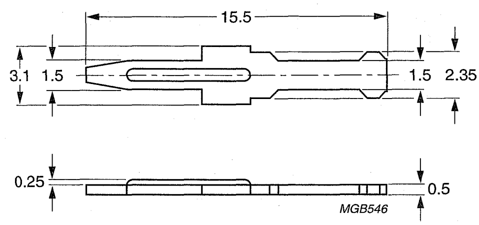
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC70
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC70
Base plate 4 holes	aluminium		7	BPL4-EC70



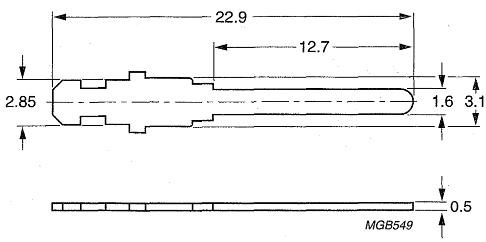
Dimensions in mm.

Fig.3 EC pin; general mount.



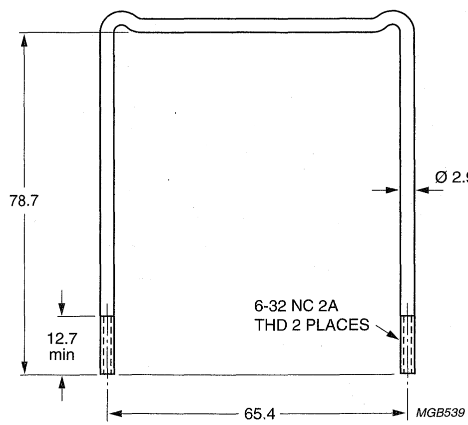
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



Dimensions in mm.

Fig.5 EC70 pin; vertical mount.

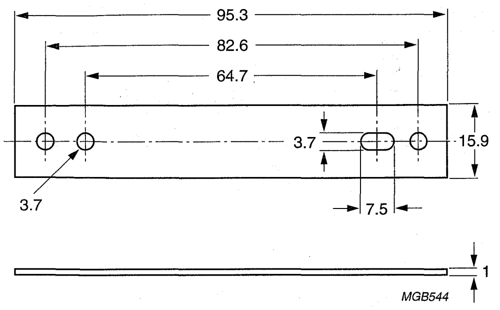


Dimensions in mm.

Fig.6 EC70 clamp.

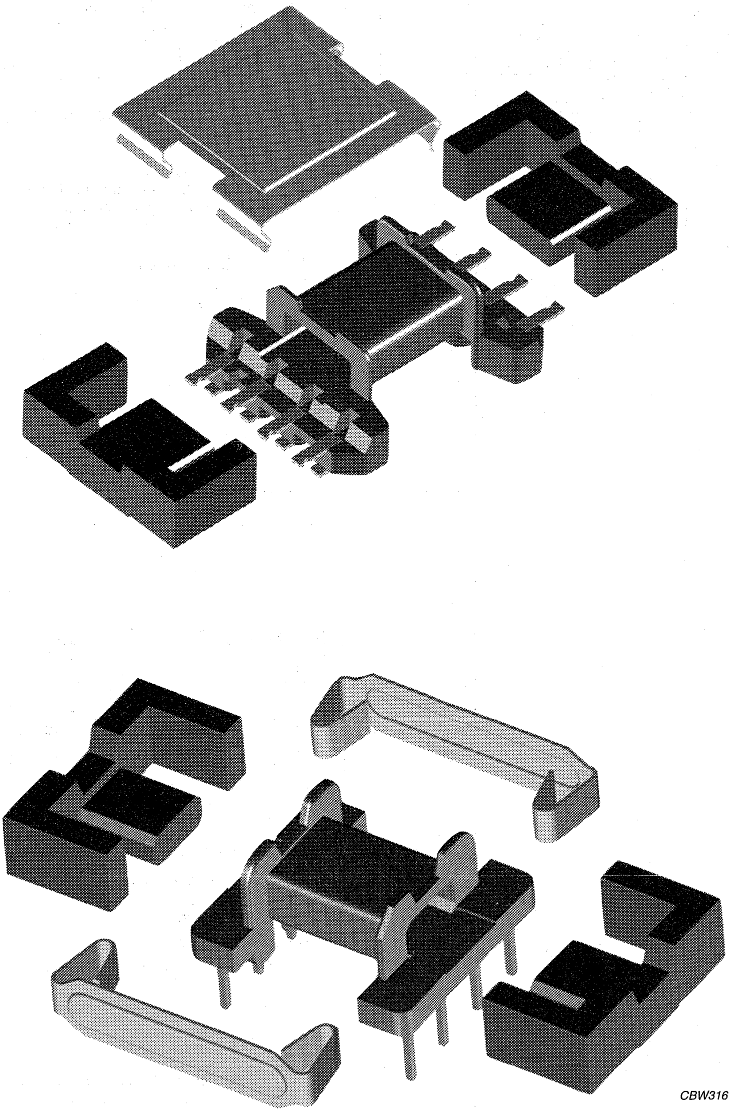
EC cores and accessories

EC70



Dimensions in mm.

Fig.7 EC70 base plate; 4-holes.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EFD cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EFD10	171	7.2	0.45
EFD12	325	11.4	0.9
EFD15	510	15.0	1.4
EFD20	1460	31.0	3.5
EFD25	3300	58.0	8
EFD30	4700	69.0	12

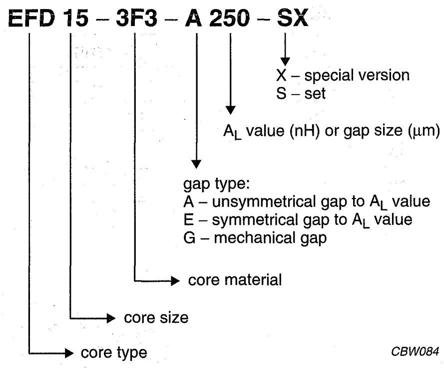


Fig.1 Type number structure for cores.

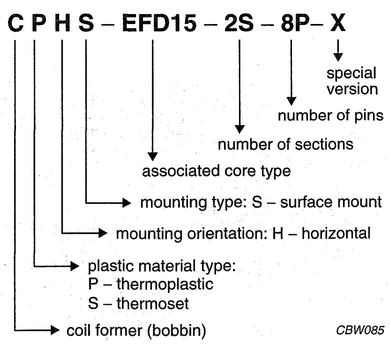


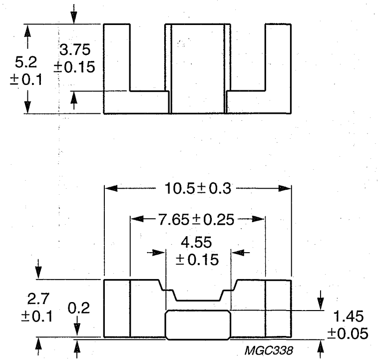
Fig.2 Type number structure for coil formers.

EFD cores and accessories EFD10

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.29	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
m	mass of core half	≈0.45	g



Dimensions in mm.

Fig.1 EFD10 core half.

Core sets

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	25 ±5%	≈66	≈540	EFD10-3C90-A25-S
	40 ±8%	≈105	≈300	EFD10-3C90-A40-S
	63 ±10%	≈165	≈170	EFD10-3C90-A63-S
	585 ±25%	≈1510	≈0	EFD10-3C90-S
3C94 des	25 ±5%	≈66	≈540	EFD10-3C94-A25-S
	40 ±8%	≈105	≈300	EFD10-3C94-A40-S
	63 ±10%	≈165	≈170	EFD10-3C94-A63-S
	585 ±25%	≈1510	≈0	EFD10-3C94-S
3C96 prot	525 ±25%	≈1360	≈0	EFD10-3C96-S
3F3	25 ±5%	≈66	≈540	EFD10-3F3-A25-S
	40 ±8%	≈105	≈300	EFD10-3F3-A40-S
	63 ±10%	≈165	≈170	EFD10-3F3-A63-S
	500 ±25%	≈1290	≈0	EFD10-3F3-S
3F35 prot	400 ±25%	≈1030	≈0	EFD10-3F35-S

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4 des	25 ±5%	≈66	≈520	EFD10-3F4-A25-S
	40 ±8%	≈105	≈280	EFD10-3F4-A40-S
	63 ±10%	≈165	≈150	EFD10-3F4-A63-S
	280 ±25%	≈730	≈0	EFD10-3F4-S
3E4 sup	1400 +40/−30%	≈3670	≈0	EFD10-3E4-S
3E5 des	2000 +40/−30%	≈5240	≈0	EFD10-3E5-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.019	−	−
3C94	≥320	≤0.015	≈0.074	≈0.033
3C96	≥320	≈0.011	≈0.052	≈0.023
3F35	≥300	−	−	≈0.017
3F3	≥315	≤0.020	−	≤0.035
3F4	≥250	−	−	−

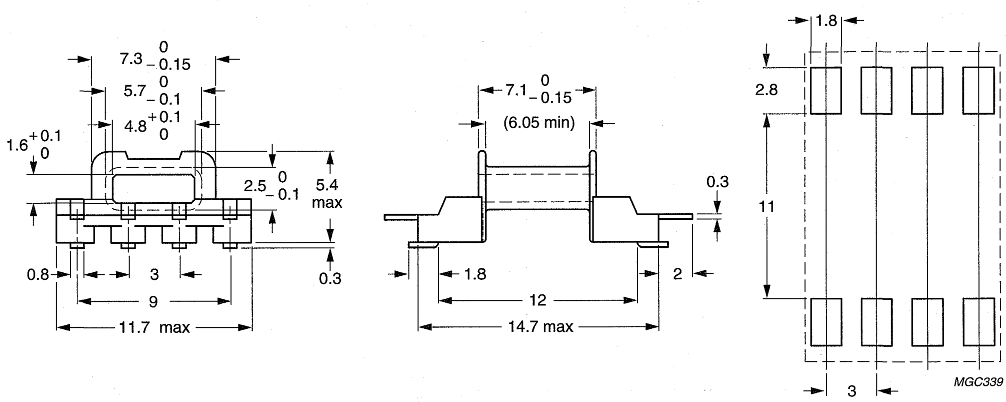
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	−	−	−	−
3C94	≥320	−	−	−	−
3C96	≥320	−	−	−	−
3F35	≥300	≈0.028	≈0.200	−	−
3F3	≥315	−	−	−	−
3F4	≥250	−	−	≤0.034	≤0.055

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD10 coil former (SMD); 8-solder pads.

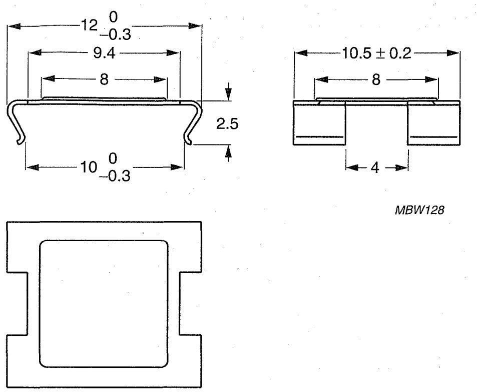
Winding data for EFD10 coil former (SMD) with 8-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	MINIMUM WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	4.2	6.05	14.8	CPHS-EFD10-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈15 N	3	CLM-EFD10



Dimensions in mm.

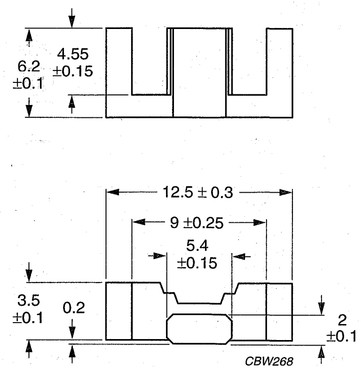
Fig.3 EFD10 mounting clamp.

EFD cores and accessories EFD12

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.50	mm^{-1}
V_e	effective volume	325	mm^3
l_e	effective tlength	28.5	mm
A_e	effective area	11.4	mm^2
A_{min}	minimum area	10.7	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 EFD12 core half.

Core sets

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	40 ±5%	≈80	≈490	EFD12-3C90-A40-S
	63 ±8%	≈125	≈280	EFD12-3C90-A63-S
	100 ±10%	≈200	≈160	EFD12-3C90-A100-S
	825 ±25%	≈1610	≈0	EFD12-3C90-S
3C94 des	40 ±5%	≈80	≈490	EFD12-3C94-A40-S
	63 ±8%	≈125	≈280	EFD12-3C94-A63-S
	100 ±10%	≈200	≈160	EFD12-3C94-A100-S
	825 ±25%	≈1610	≈0	EFD12-3C94-S
3C96 prot	750 ±25%	≈1460	≈0	EFD12-3C96-S
3F3	40 ±5%	≈80	≈490	EFD12-3F3-A40-S
	63 ±8%	≈125	≈280	EFD12-3F3-A63-S
	100 ±10%	≈200	≈160	EFD12-3F3-A100-S
	700 ±25%	≈1370	≈0	EFD12-3F3-S
3F35 prot	550 ±25%	≈1070	≈0	EFD12-3F35-S
3F4 des	40 ±5%	≈80	≈470	EFD12-3F4-A40-S
	63 ±8%	≈125	≈260	EFD12-3F4-A63-S
	100 ±10%	≈200	≈140	EFD12-3F4-A100-S
	280 ±25%	≈730	≈0	EFD12-3F4-S
3E4 sup	1900 +40/–30%	≈3780	≈0	EFD12-3E4-S
3E5 des	2800 +40/–30%	≈5570	≈0	EFD12-3E5-S

EFD cores and accessories EFD12

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥320	≤0.036	–	–
3C94	≥320	≤0.029	≈0.14	≈0.062
3C96	≥320	≈0.021	≈0.10	≈0.043
3F35	≥300	–	–	≈0.033
3F3	≥315	≤0.04	–	≤0.065
3F4	≥250	–	–	–

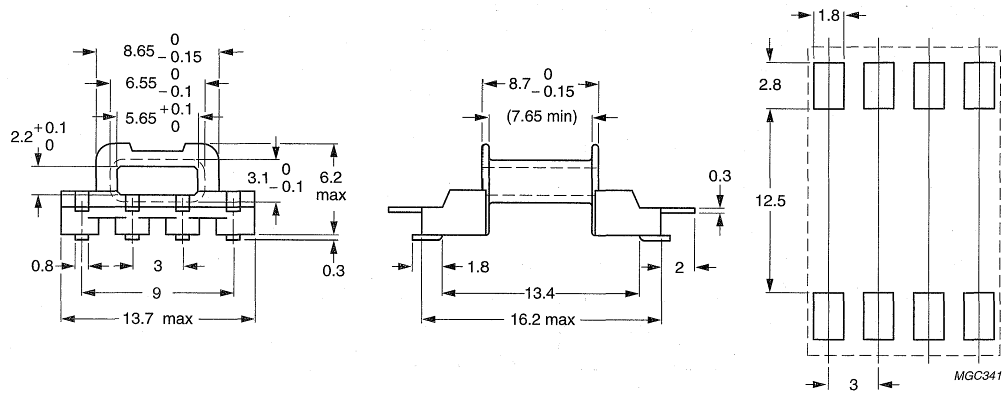
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥300	≈0.052	≈0.39	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤0.065	≤0.11

COIL FORMERS

General data

ITEM	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD12 coil former (SMD); 8-solder pads.

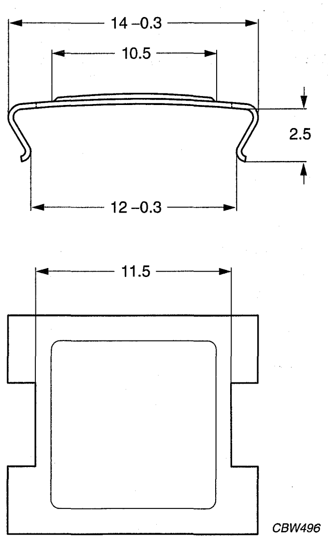
Winding data for EFD12 coil former (SMD) with 8-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	MINIMUM WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.5	7.65	18.6	CPHS-EFD12-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈20 N	3	CLM-EFD12



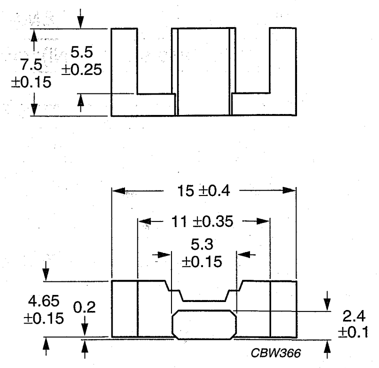
Dimensions in mm.

Fig.3 EFD12 mounting clamp.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈1.4	g



Dimensions in mm.

Fig.1 EFD15 core half.

Core sets

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	63 ±5%	≈115	≈350	EFD15-3C90-A63-S
	100 ±8%	≈180	≈170	EFD15-3C90-A100-S
	160 ±10%	≈290	≈100	EFD15-3C90-A160-S
	950 ±25%	≈1700	≈0	EFD15-3C90-S
3C94 des	63 ±5%	≈115	≈350	EFD15-3C94-A63-S
	100 ±8%	≈180	≈170	EFD15-3C94-A100-S
	160 ±10%	≈290	≈100	EFD15-3C94-A160-S
	950 ±25%	≈1700	≈0	EFD15-3C94-S
3C96 prot	850 ±25%	≈1520	≈0	EFD15-3C96-S
3F3	63 ±5%	≈115	≈350	EFD15-3F3-A63-S
	100 ±8%	≈180	≈170	EFD15-3F3-A100-S
	160 ±10%	≈290	≈100	EFD15-3F3-A160-S
	780 ±25%	≈1400	≈0	EFD15-3F3-S
3F35 prot	630 ±25%	≈1130	≈0	EFD15-3F35-S
3F4 des	63 ±5%	≈115	≈350	EFD15-3F4-A63-S
	100 ±8%	≈180	≈160	EFD15-3F4-A100-S
	160 ±10%	≈290	≈90	EFD15-3F4-A160-S
	400 ±25%	≈720	≈0	EFD15-3F4-S
3E4 sup	2000 +40/−30%	≈3610	≈0	EFD15-3E4-S
3E5	3600 +40/−30%	≈6500	≈0	EFD15-3E5-S

EFD cores and accessories EFD15

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.057	–	–
3C94	≥320	≤0.045	≈0.22	≈0.100
3C96	≥320	≈0.032	≈0.15	≈0.070
3F35	≥300	–	–	≈0.051
3F3	≥315	≤0.06	–	≤0.100
3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

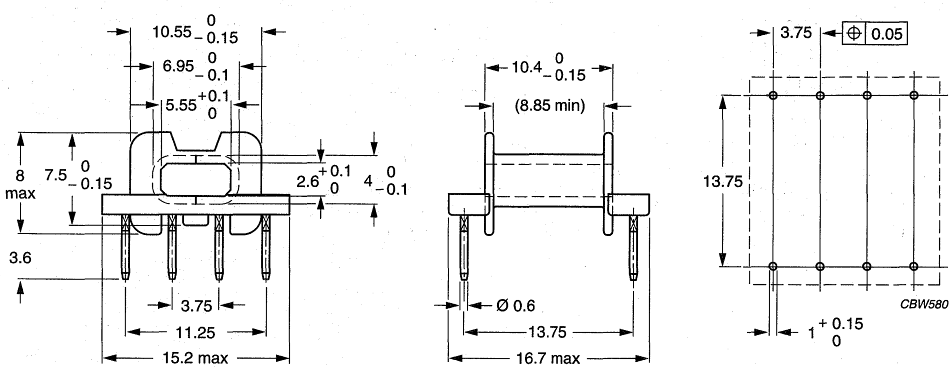
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥300	≈0.082	≈0.61	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤0.10	≤0.16

EFD cores and accessories | EFD15

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD15 coil former; 8-pins.

Winding data for EFD15 coil former with 8-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	14.8	8.85	26.3	CSH-EFD15-1S-8P; see note 1

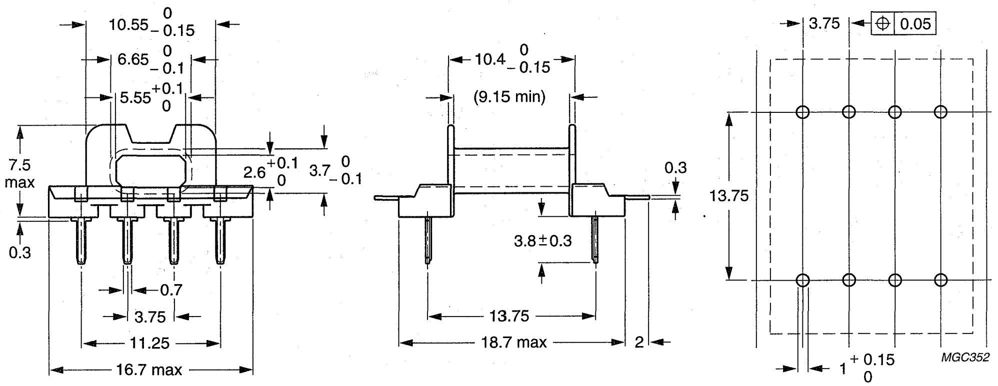
Note

1. Also available with post-inserted pins.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 EFD15 coil former; 8-pins.

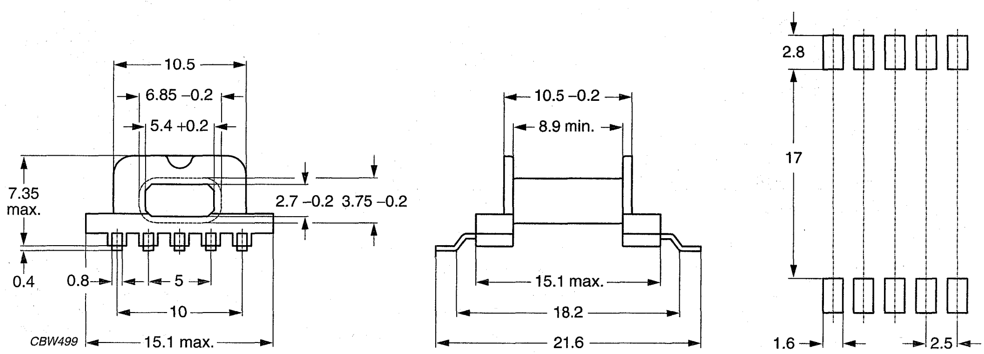
Winding data for EFD15 coil former (PCB) with 8-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.15	25.6	CPH-EFD15-1S-8P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.4 EFD15 coil former (SMD); 10-solder pads.

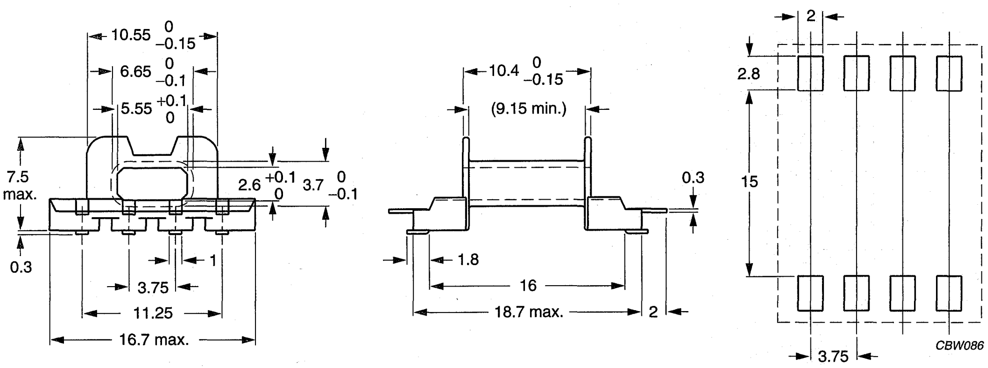
Winding data for EFD15 coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	16	8.9	26	CPHS-EFD15-1S-8P-T
1	10	16	8.9	26	CPHS-EFD15-1S-10P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.5 EFD15 coil former (SMD); 8-solder pads.

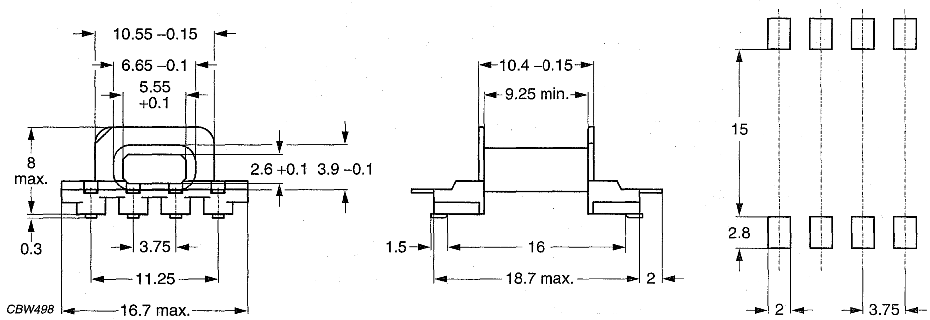
Winding data for EFD15 coil former (SMD) with 8-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	16.7	9.15	25.6	CPHS-EFD15-1S-8P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.6 EFD15 coil former (SMD).

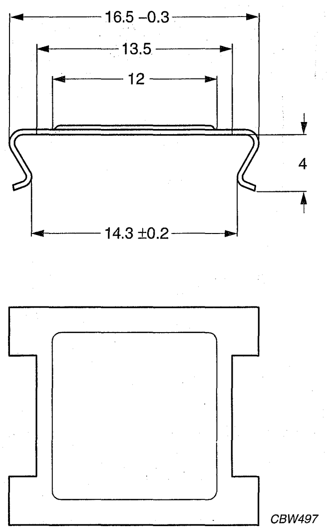
Winding data for EFD15 (SMD) coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.25	24.1	CSHS-EFD15-1S-8P-T

MOUNTING PARTS

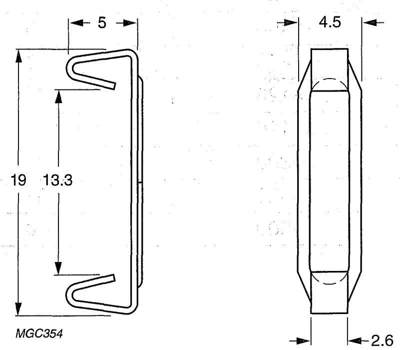
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈25 N	7	CLM-EFD15
Clip	stainless steel (CrNi); clamping force ≈12.5 N	8	CLI-EFD15



Dimensions in mm.

Fig.7 Clamp: CLM-EFD15.



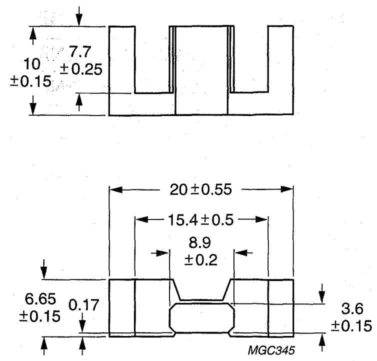
Dimensions in mm.

Fig.8 Clip: CLI-EFD15.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	29	mm^2
m	mass of core half	≈3.5	g



Dimensions in mm.

Fig.1 EFD20 core half.

Core halves and sets

A_L measured as a set or in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	1300 ±25%	≈1540	≈0	EFD20-3C90
3F3	63 ±3%	≈75	≈500	EFD20-3F3-E63-S
	100 ±3%	≈120	≈240	EFD20-3F3-A100-S
	160 ±5%	≈195	≈140	EFD20-3F3-A160-S
	250 ±8%	≈300	≈90	EFD20-3F3-A250-S
	315 ±10%	≈425	≈65	EFD20-3F3-A315-S
	1200 ±25%	≈1450	≈0	EFD20-3F3
3F4 des	63 ±3%	≈75	≈500	EFD20-3F4-E63-S
	100 ±3%	≈120	≈240	EFD20-3F4-A100-S
	160 ±5%	≈195	≈140	EFD20-3F4-A160-S
	250 ±8%	≈300	≈90	EFD20-3F4-A250-S
	315 ±10%	≈425	≈65	EFD20-3F4-A315-S
	650 ±25%	≈800	≈0	EFD20-3F4

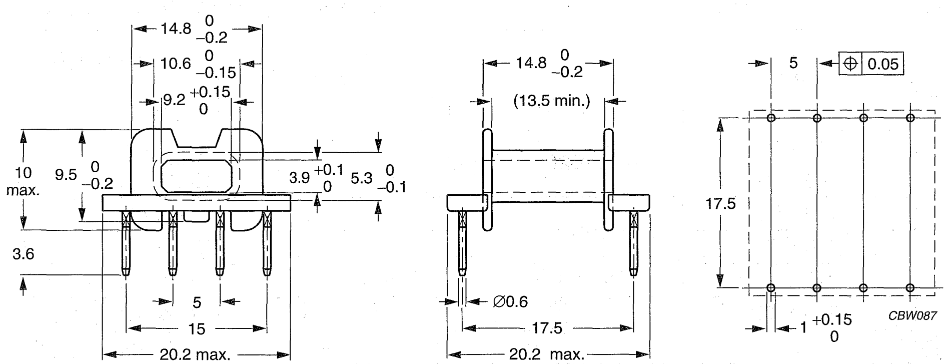
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	≤0.16	≤0.17	–	–	–
3F3	≥315	–	≤0.17	≤0.28	–	–
3F4	≥300	–	–	–	≤0.30	≤0.50

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD20 coil former; 8-pins.

Winding data for EFD20 coil former with 8-pins

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	26.4	13.2	36.5	CSH-EFD20-1S-8P; see note 1

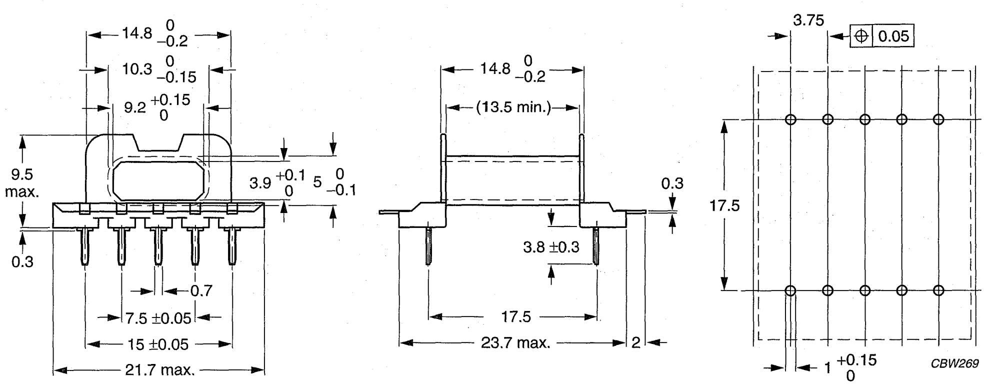
Note

1. Also available with post-inserted pins.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E83005 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 EFD20 coil former (PCB); 10-pins.

Winding data for EFD20 coil former (PCB) with 10-pins

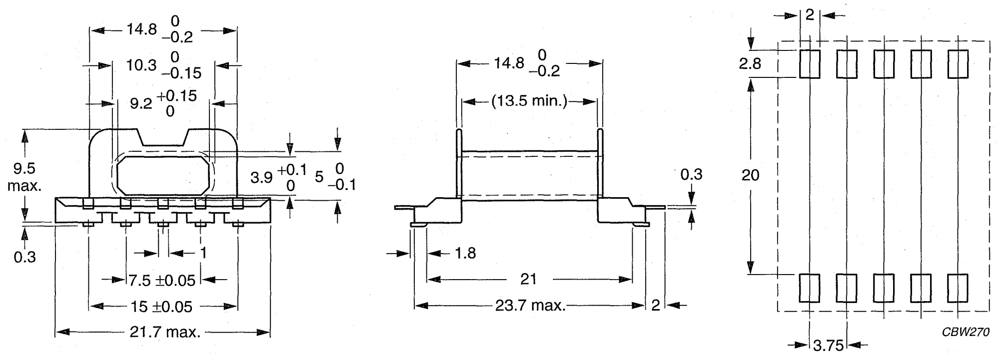
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.7	13.5	34.1	CPH-EFD20-1S-10P

EFD cores and accessories EFD20

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E83005 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.4 EFD20 coil former (SMD); 10-solder pads.

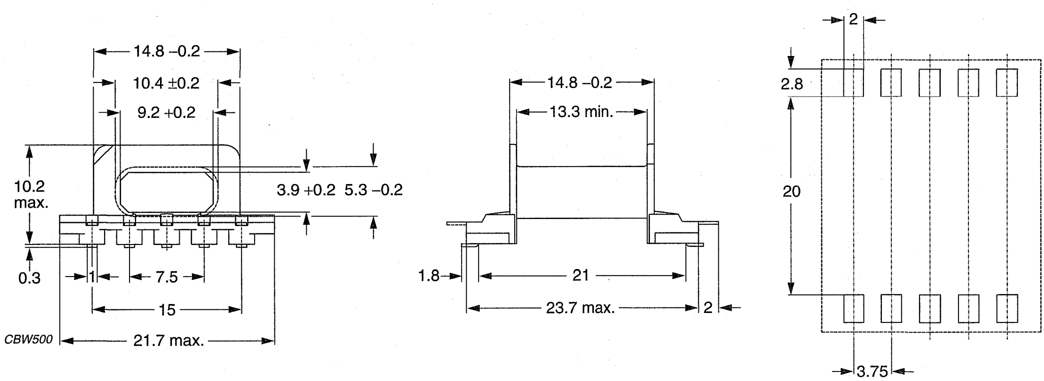
Winding data for EFD20 coil former (SMD) with 10-solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.7	13.5	34.1	CPHS-EFD20-1S-10P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	185 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.5 EFD20 coil former (SMD); 10-solder pads.

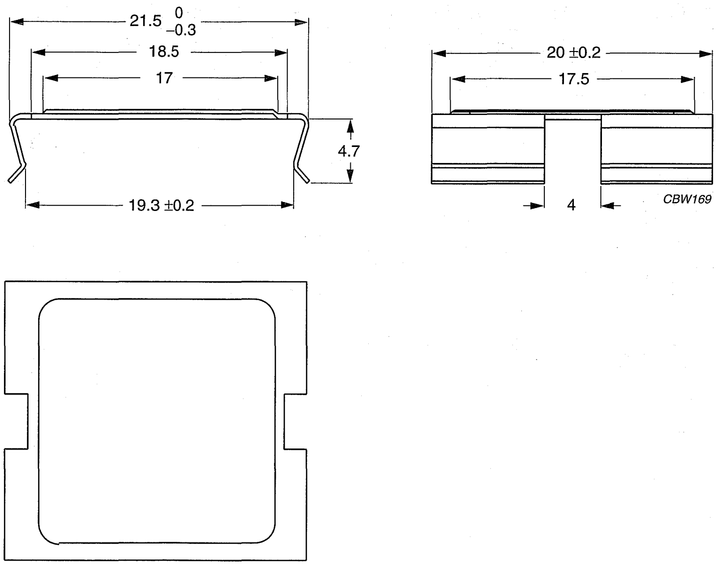
Winding data for EFD20 coil former (SMD) with 10-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	10	27.2	13.3	34.9	CSHS-EFD20-1S-10P-T

MOUNTING PARTS

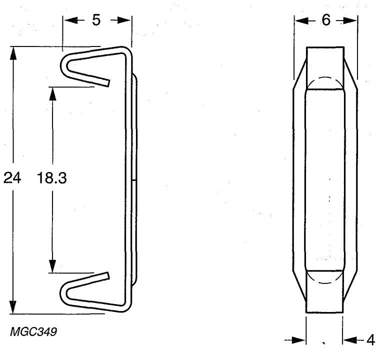
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 30 N	6	CLM-EFD20
Clip	stainless steel (CrNi); clamping force ≈ 20 N	7	CLI-EFD20



Dimensions in mm.

Fig.6 Clamp CLM-EFD20



Dimensions in mm.

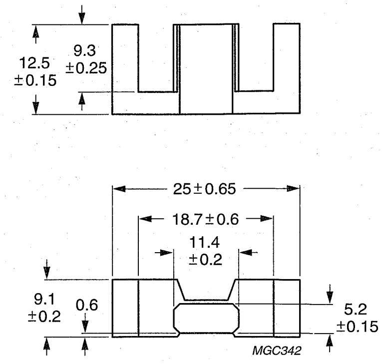
Fig.7 Clip CLI-EFD20.

EFD cores and accessories EFD25

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	55	mm^2
m	mass of core half	≈8	g



Dimensions in mm.

Fig.1 EFD25 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2200 ±25%	≈1780	≈0	EFD25-3C90
3F3	2000 ±25%	≈1600	≈0	EFD25-3F3
3F4 des	1000 ±25%	≈800	≈0	EFD25-3F4

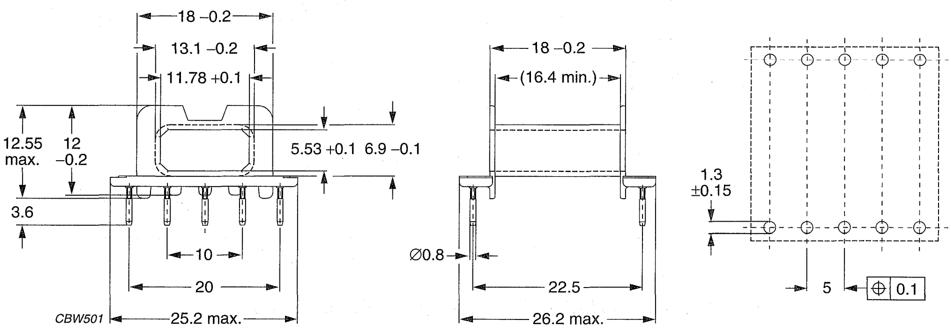
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	≤0.35	≤0.38	–	–	–
3F3	≥315	–	≤0.38	≤0.66	–	–
3F4	≥300	–	–	–	≤0.70	≤1.10

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD25 coil former; 10-pins.

Winding data for EFD25 coil former with 10-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	40.2	16.4	46.4	CSH-EFD25-1S-10P; see note 1

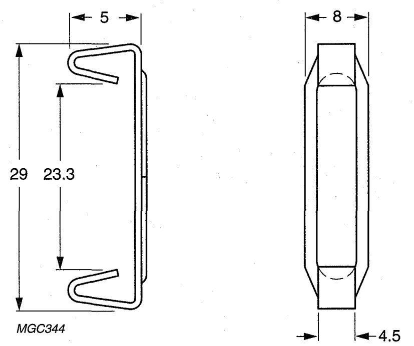
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈30 N	3	CLI-EFD25



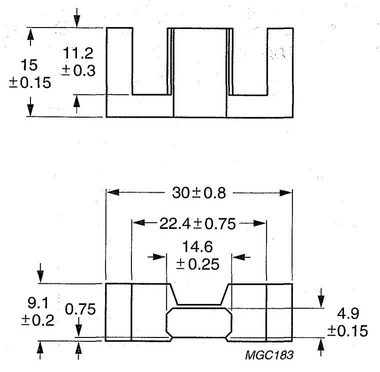
Dimensions in mm.

Fig.3 EFD25 mounting clip.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	66.0	mm^2
m	mass of core half	≈12	g



Dimensions in mm.

Fig.1 EFD30 core half.

Core halves and sets

Clamping force for A_L measurements, 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2100 ±25%	≈1650	≈0	EFD30-3C90
3F3	160 ±3%	≈126	≈500	EFD30-3F3-A160-S
	250 ±3%	≈195	≈350	EFD30-3F3-A250-S
	315 ±5%	≈250	≈250	EFD30-3F3-A315-S
	400 ±5%	≈315	≈200	EFD30-3F3-A400-S
	630 ±10%	≈500	≈120	EFD30-3F3-A630-S
	1900 ±25%	≈1500	≈0	EFD30-3F3
3F4 des	160 ±3%	≈126	≈500	EFD30-3F4-A160-S
	250 ±3%	≈195	≈350	EFD30-3F4-A250-S
	315 ±5%	≈250	≈250	EFD30-3F4-A315-S
	400 ±5%	≈315	≈200	EFD30-3F4-A400-S
	630 ±10%	≈500	≈120	EFD30-3F4-A630-S
	1050 ±25%	≈820	≈0	EFD30-3F4

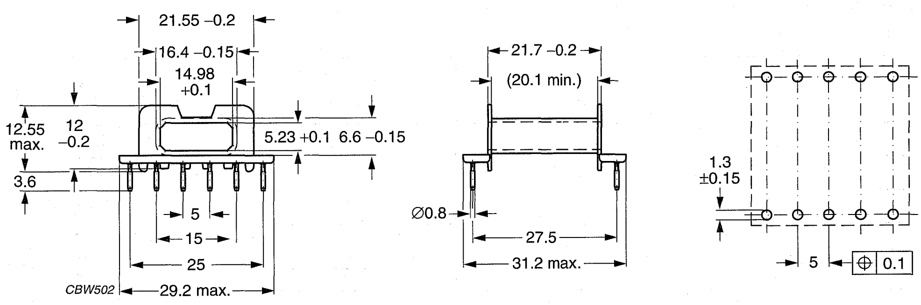
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C	f = 1 Mz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥330	≤0.50	≤0.54	–	–	–
3F3	≥315	–	≤0.54	≤0.91	–	–
3F4	≥300	–	–	–	≤1.00	≤1.60

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD30 coil former; 12-pins.

Winding data for EFD30 coil former with 12-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	52.3	20.1	52.9	CSH-EFD30-1S-12P‘; see note 1

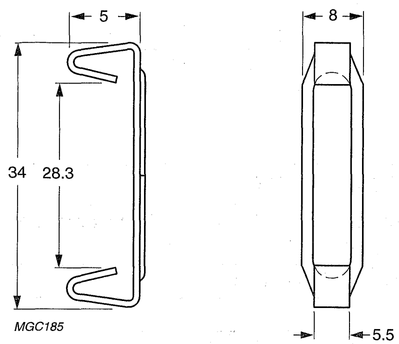
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

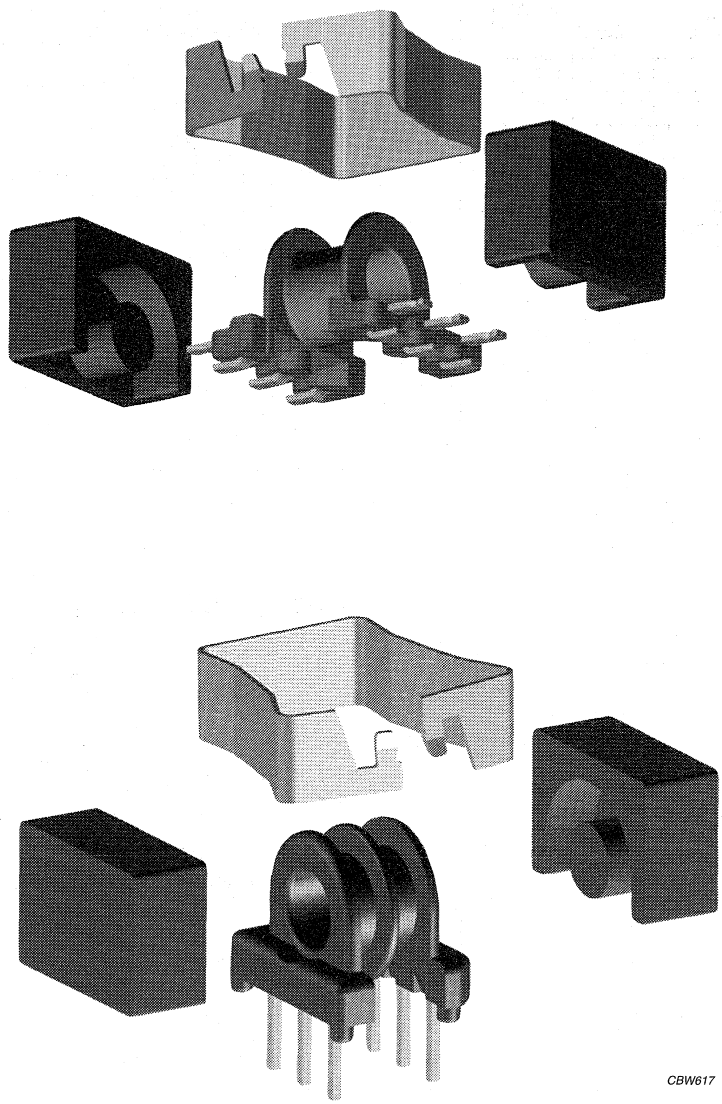
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈35 N	3	CLI-EFD30



Dimensions in mm.

Fig.3 EFD30 mounting clip.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EP cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EP7	165	10.7	1.4
EP10	215	11.3	2.8
EP13	472	19.5	4.7
EP17	999	33.7	12
EP20	3230	78.7	27

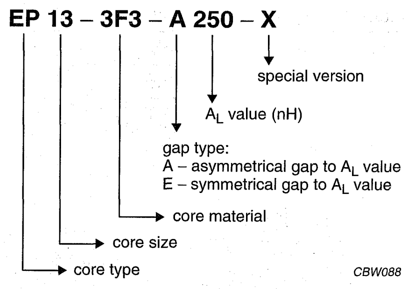


Fig.1 Type number structure for cores.

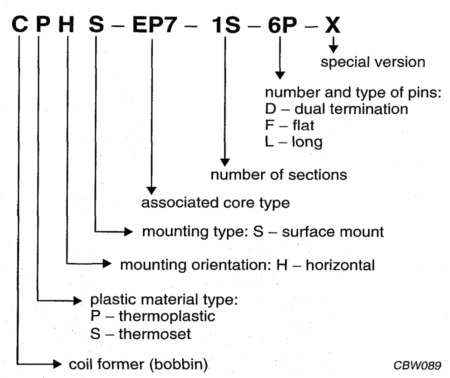
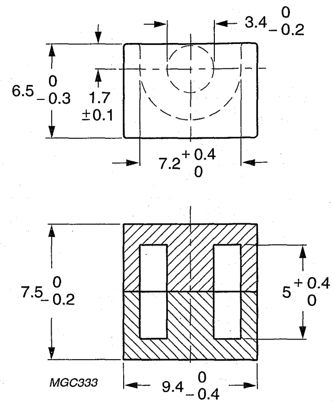


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.45	mm^{-1}
V_e	effective volume	165	mm^3
l_e	effective length	15.5	mm
A_e	effective area	10.7	mm^2
A_{min}	minimum area	8.55	mm^2
m	mass of core set	≈1.4	g



Dimensions in mm.

Fig.1 EP7 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	25 ±3%	≈30	≈790	EP7-3C90-E25
	40 ±3%	≈48	≈440	EP7-3C90-A40
	63 ±3%	≈76	≈260	EP7-3C90-A63
	100 ±3%	≈121	≈150	EP7-3C90-A100
	160 ±5%	≈193	≈85	EP7-3C90-A160
	1200 ±25%	≈1450	≈0	EP7-3C90
3C94 des	25 ±3%	≈30	≈790	EP7-3C94-E25
	40 ±3%	≈48	≈440	EP7-3C94-A40
	63 ±3%	≈76	≈260	EP7-3C94-A63
	100 ±3%	≈121	≈150	EP7-3C94-A100
	160 ±5%	≈193	≈85	EP7-3C94-A160
	1200 ±25%	≈1450	≈0	EP7-3C94
3C96 prot	1120 ±25%	≈1350	≈0	EP7-3C96
3D3	40 ±3%	≈48	≈440	EP7-3D3-A40
	63 ±3%	≈76	≈260	EP7-3D3-A63
	100 ±3%	≈121	≈150	EP7-3D3-A100
	530 ±25%	≈640	≈0	EP7-3D3

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	25 ±3%	≈30	≈790	EP7-3F3-E25
	40 ±3%	≈48	≈440	EP7-3F3-A40
	63 ±3%	≈76	≈260	EP7-3F3-A63
	100 ±3%	≈121	≈150	EP7-3F3-A100
	160 ±5%	≈193	≈85	EP7-3F3-A160
	1000 ±25%	≈1210	≈0	EP7-3F3
3F35 prot	850 ±25%	≈1030	≈0	EP7-3F35
3F4 des	100 ±3%	≈121	≈150	EP7-3F4-A100
	160 ±5%	≈193	≈85	EP7-3F4-A160
	600 ±25%	≈730	≈0	EP7-3F4
3H3	63 ±3%	≈76	≈260	EP7-3H3-A63
	100 ±3%	≈121	≈150	EP7-3H3-A100
	160 ±5%	≈193	≈85	EP7-3H3-A160
	1120 ±25%	≈1350	≈0	EP7-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	2100 ±25%	≈2540	EP7-3E1
3E27	≥2500	≥3020	EP7-3E27
3E5	5200 +40/–30%	≈6290	EP7-3E5
3E6	5800 +40/–30%	≈7000	EP7-3E6

EP cores and accessories EP7

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; B̂ = 200 mT; T = 100 °C**	**f = 100 kHz; B̂ = 100 mT; T = 100 °C**	**f = 100 kHz; B̂ = 200 mT; T = 100 °C**	**f = 400 kHz; B̂ = 50 mT; T = 100 °C**
3C90	≥320	≤0.018	≈0.018	–	–
3C94	≥320	–	≤0.015	≈0.070	≈0.030
3C96	≥320	–	≈0.011	≈0.050	≈0.021
3F35	≥320	–	–	–	≈0.017
3F3	≥315	–	≤0.020	–	≤0.035
3F4	≥250	–	–	–	–

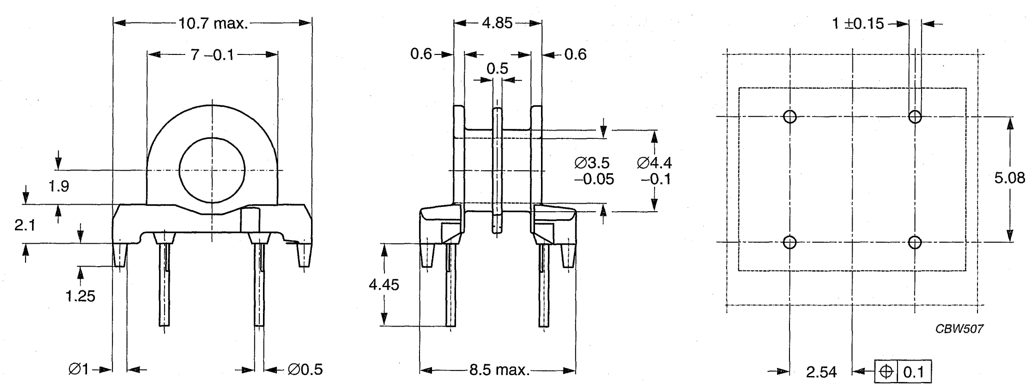
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 500 kHz; B̂ = 50 mT; T = 100 °C**	**f = 500 kHz; B̂ = 100 mT; T = 100 °C**	**f = 1 MHz; B̂ = 30 mT; T = 100 °C**	**f = 3 MHz; B̂ = 10 mT; T = 100 °C**
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥320	≈0.026	≈0.200	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤0.033	≤0.053

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0";* UL file number E46770(M)
Pin material	copper clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

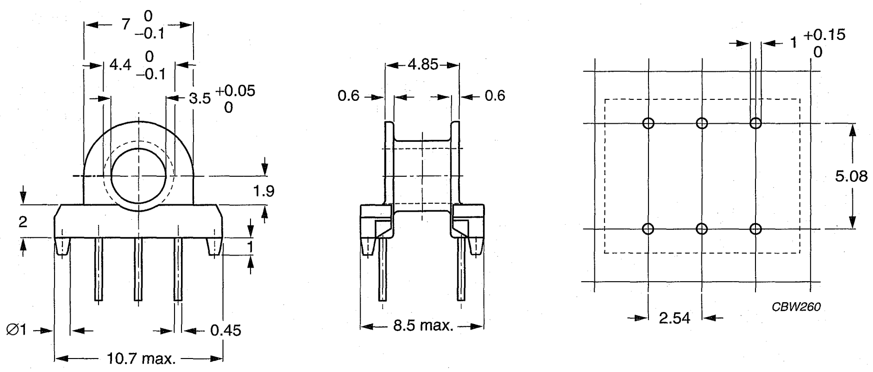
Fig.2 EP7 coil former: 4-pins.

Winding data for 4-pins EP7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 1.75	2 × 1.45	17.9	CSH-EP7-2S-4P-TA
1	4.3	3.4	17.9	CSH-EP7-1S-4P-TA

General data CSH-EP7-1S-6P-B

PARMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429(M)
Pin material	copper clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

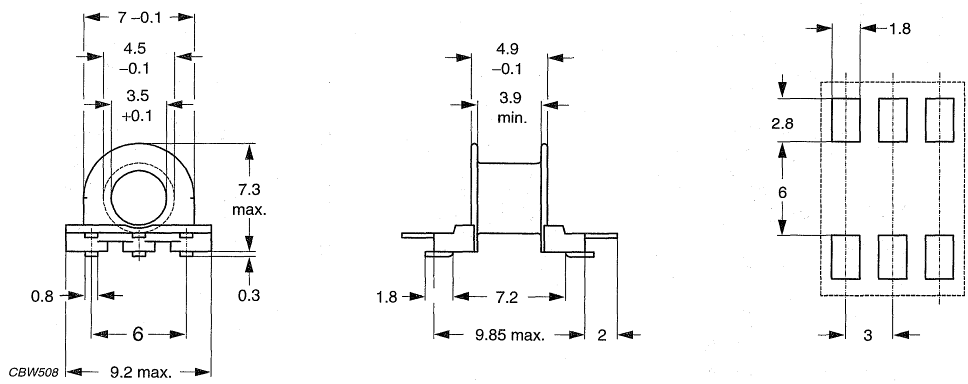
Fig.3 EP7 coil former: 6-pins.

Winding data for 6-pins EP7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.3	3.4	17.7	CSH-EP7-1S-6P-B
1	4.3	3.4	17.7	CSH-EP7-1S-4P-B

General data for 6-pads EP7 SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number: E41429 (M)
Solder pad material	copper-clad steel , tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.4 Coil former CSHS-EP7-1S-6P: 6-pads.

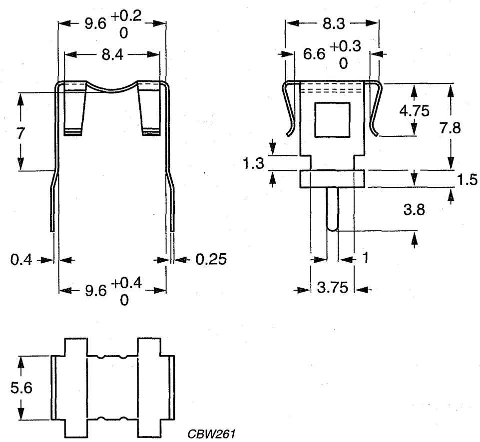
Winding data for 6-pads EP7 SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.7	3.9	17.9	CSHS-EP7-1S-6P

MOUNTING PARTS

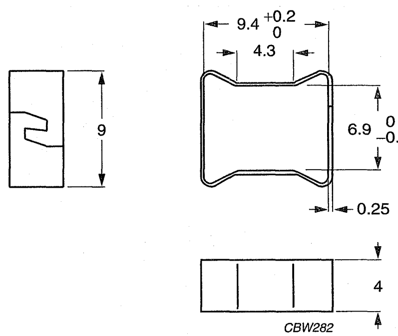
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CSH-EP7-1S-6P-B	5	CLI/P-EP7
Mounting clip	stainless steel (CrNi); clamping force ≈22 N	6	CLI-EP7



Dimensions in mm.

Fig.5 Mounting clip CLI/P-EP7.



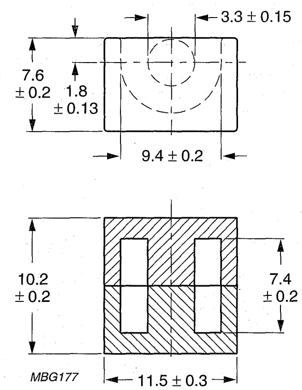
Dimensions in mm.

Fig.6 Mounting clip CLI-EP7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.70	mm^{-1}
V_e	effective volume	215	mm^3
l_e	effective length	19.3	mm
A_e	effective area	11.3	mm^2
A_{min}	minimum area	8.55	mm^2
m	mass of core set	≈2.8‘	g



Dimensions in mm.

Fig.1 EP10 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	25 ±3%	≈34	≈870	EP10-3C81-E25
	40 ±3%	≈54	≈480	EP10-3C81-A40
	63 ±3%	≈85	≈280	EP10-3C81-A63
	100 ±3%	≈135	≈160	EP10-3C81-A100
	160 ±5%	≈216	≈90	EP10-3C81-A160
	≥900	≥1210	≈0	EP10-3C81
3C90	25 ±3%	≈34	≈870	EP10-3C90-E25
	40 ±3%	≈54	≈480	EP10-3C90-A40
	63 ±3%	≈85	≈280	EP10-3C90-A63
	100 ±3%	≈135	≈160	EP10-3C90-A100
	160 ±5%	≈216	≈90	EP10-3C90-A160
	1140 ±25%	≈1530	≈0	EP10-3C90
3C91 prot	≥900	≥1210	≈0	EP10-3C91

EP cores and accessories EP10

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	25 ±3%	≈34	≈870	EP10-3C94-E25
	40 ±3%	≈54	≈480	EP10-3C94-A40
	63 ±3%	≈85	≈280	EP10-3C94-A63
	100 ±3%	≈135	≈160	EP10-3C94-A100
	160 ±5%	≈216	≈90	EP10-3C94-A160
	1140 ±25%	≈1530	≈0	EP10-3C94
3C96 prot	1025 ±25%	≈1380	≈0	EP10-3C96
3D3	40 ±3%	≈54	≈480	EP10-3D3-A40
	63 ±3%	≈85	≈280	EP10-3D3-A63
	100 ±3%	≈135	≈160	EP10-3D3-A100
	470 ±25%	≈635	≈0	EP10-3D3
3F3	25 ±3%	≈34	≈870	EP10-3F3-E25
	40 ±3%	≈54	≈480	EP10-3F3-A40
	63 ±3%	≈85	≈280	EP10-3F3-A63
	100 ±3%	≈135	≈160	EP10-3F3-A100
	160 ±5%	≈216	≈90	EP10-3F3-A160
	1000 ±25%	≈1350	≈0	EP10-3F3
3F35 prot	800 ±25%	≈1080	≈0	EP10-3F35
3F4 des	63 ±3%	≈85	≈280	EP10-3F4-A63
	100 ±3%	≈135	≈160	EP10-3F4-A100
	160 ±5%	≈216	≈90	EP10-3F4-A160
	560 ±25%	≈760	≈0	EP10-3F4
3H3	40 ±3%	≈54	≈480	EP10-3H3-A40
	63 ±3%	≈85	≈280	EP10-3H3-A63
	100 ±3%	≈135	≈160	EP10-3H3-A100
	160 ±5%	≈216	≈90	EP10-3H3-A160
	1025 ±25%	≈1390	≈0	EP10-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E1 sup	2000 +30/−20%	≈2700	≈0	EP10-3E1
3E4 sup	3200 +40/−30%	≈4300	≈0	EP10-3E4
3E27	≥2500	≥3370	≈0	EP10-3E27
3E5	4800 +40/−30%	≈6500	≈0	EP10-3E5
3E6	6900 +40/−30%	≈9340	≈0	EP10-3E6

EP cores and accessories EP10

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.043	–	–	–
3C90	≥320	≤0.024	≈0.024	–	–
3C91	≥315	≈0.022	≈0.022	–	–
3C94	≥320	–	≤0.019	≈0.093	≈0.043
3C96	≥320	–	≈0.014	≈0.065	≈0.030
3F35	≥300	–	–	–	≈0.022
3F3	≥315	–	≤0.025	–	≤0.045
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥300	≈0.035	≈0.26	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤0.043	≤0.069

EP cores and accessories EP10

COIL FORMER

General data CSH-EP10-1S-8P

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429(M)
Pin material	copper clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s

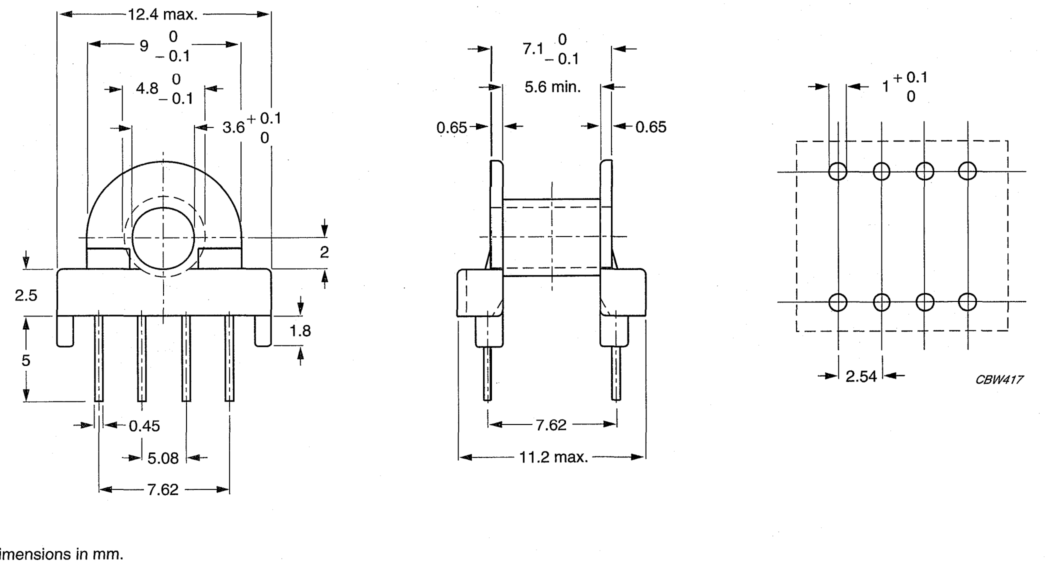


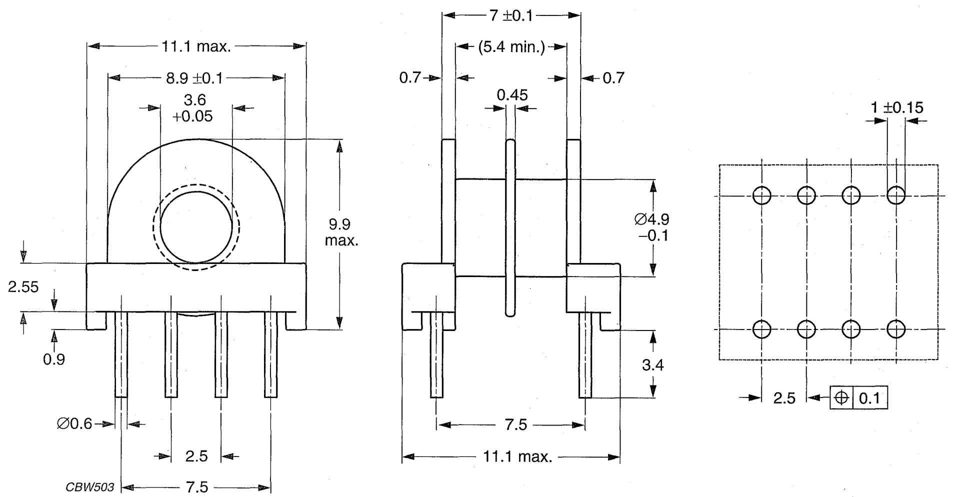
Fig.2 EP10 coil former: 8-pins.

Winding data for 8-pins EP10 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.4	5.6	21.5	CSH-EP10-1S-8P

General data CSH-EP10-2S-8P

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

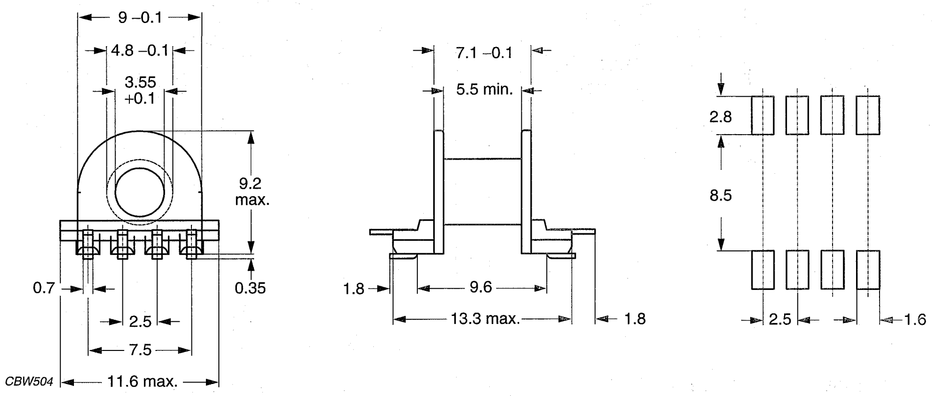
Fig.3 EP10 coil former.

Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 4.8	2 × 2.6	21.6	CSH-EP10-2S-8P

General data CSHS-EP10-1S-8P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.4 EP10 coil former.

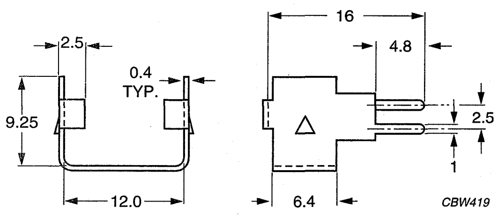
Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.3	5.5	21.5	CSHS-EP10-1S-8P-T

MOUNTING PARTS

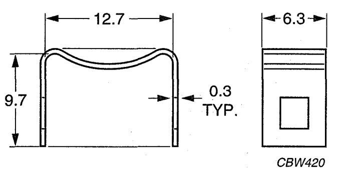
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	5	CLA-EP10
Spring	copper-nickel-zinc alloy (nickel silver)	6	SPR-EP10
Clip	stainless steel (CrNi); clamping force ≈27 N	7	CLI-EP10



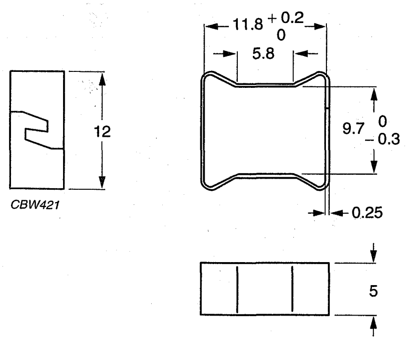
Dimensions in mm.

Fig.5 Mounting clasp CLA-EP10.



Dimensions in mm.

Fig.6 Mounting spring SPR-EP10.



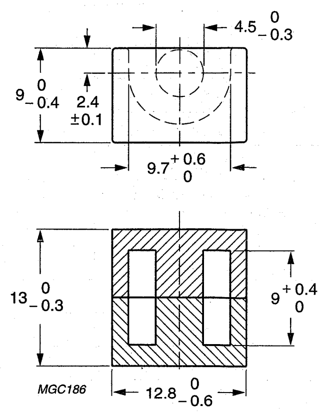
Dimensions in mm.

Fig.7 Mounting clip CLI-EP10.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core set	≈4.7	g



Dimensions in mm.

Fig.1 EP13 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	40 ±3%	≈39	≈880	EP13-3C81-E40
	63 ±3%	≈62	≈500	EP13-3C81-A63
	100 ±3%	≈100	≈250	EP13-3C81-A100
	160 ±3%	≈160	≈150	EP13-3C81-A160
	250 ±5%	≈250	≈85	EP13-3C81-A250
	≥1250	≥1230	≈0	EP13-3C81
3C90	40 ±3%	≈39	≈880	EP13-3C90-E40
	63 ±3%	≈62	≈500	EP13-3C90-A63
	100 ±3%	≈100	≈230	EP13-3C90-A100
	160 ±3%	≈160	≈130	EP13-3C90-A160
	250 ±5%	≈250	≈75	EP13-3C90-A250
	1650 ±25%	≈1630	≈0	EP13-3C90
3C91 prot	≥1250	≥1230	≈0	EP13-3C91

EP cores and accessories EP13

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C94 des	40 ±3%	≈39	≈880	EP13-3C94-E25
	63 ±3%	≈62	≈500	EP13-3C94-A40
	100 ±3%	≈100	≈230	EP13-3C94-A63
	160 ±3%	≈160	≈130	EP13-3C94-A100
	250 ±5%	≈250	≈75	EP13-3C94-A160
	1650 ±25%	≈1630	≈0	EP13-3C94
3C96 prot	1475 ±25%	≈1460	≈0	EP13-3C96
3D3	63 ±3%	≈62	≈500	EP13-3D3-A63
	100 ±3%	≈100	≈250	EP13-3D3-A100
	160 ±3%	≈160	≈150	EP13-3D3-A160
	670 ±25%	≈660	≈0	EP13-3D3
3F3	40 ±3%	≈39	≈880	EP13-3F3-E40
	63 ±3%	≈62	≈500	EP13-3F3-A63
	100 ±3%	≈160	≈250	EP13-3F3-A100
	160 ±3%	≈160	≈150	EP13-3F3-A160
	250 ±5%	≈250	≈85	EP13-3F3-A250
	1325 ±25%	≈1310	≈0	EP13-3F3
3F35 prot	1100 ±25%	≈1090	≈0	EP10-3F35
3F4 des	160 ±5%	≈160	≈150	EP13-3F4-A160
	250 ±8%	≈250	≈85	EP13-3F4-A250
	315 ±12%	≈315	≈50	EP13-3F4-A315
	780 ±25%	≈880	≈0	EP13-3F4
3H3	63 ±3%	≈62	≈500	EP13-3H3-A63
	100 ±3%	≈100	≈250	EP13-3H3-A100
	160 ±3%	≈160	≈150	EP13-3H3-A160
	1475 ±25%	≈1460	≈0	EP13-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E1 sup	2600 ±25%	≈2560	≈0	EP13-3E1
3E27	≥3400	≥3350	≈0	EP13-3E27
3E4 sup	4400 +30/-20%	≈4300	≈0	EP13-3E4
3E5	7000 +40/-30%	≈6900	≈0	EP13-3E5
3E6	10000 +40/-30%	≈9900	≈0	EP13-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.100	–	–	–
3C90	≥320	≤0.052	≈0.052	–	≈
3C91	≥315	≈0.050	≈0.050	≈0.30	–
3C94	≥320	–	≤0.045	≈0.20	≈0.10
3C96	≥320	–	≈0.032	≈0.14	≈0.07
3F35	≥300	–	–	–	≈0.05
3F3	≥315	–	≤0.050	–	≤0.100
3F4	≥250	–	–	–	–

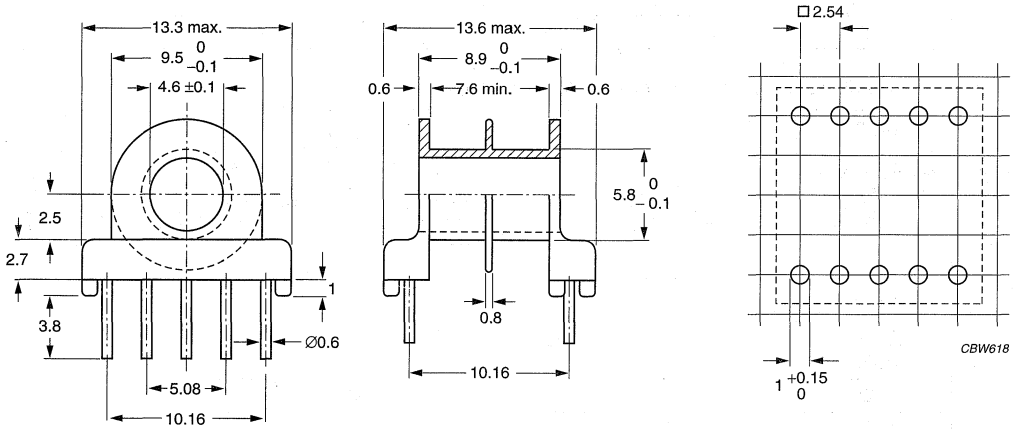
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F35	≥300	≈0.075	≈0.57	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤0.094	≤0.15

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number: E41429(M)
Pin material	copper clad steel tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

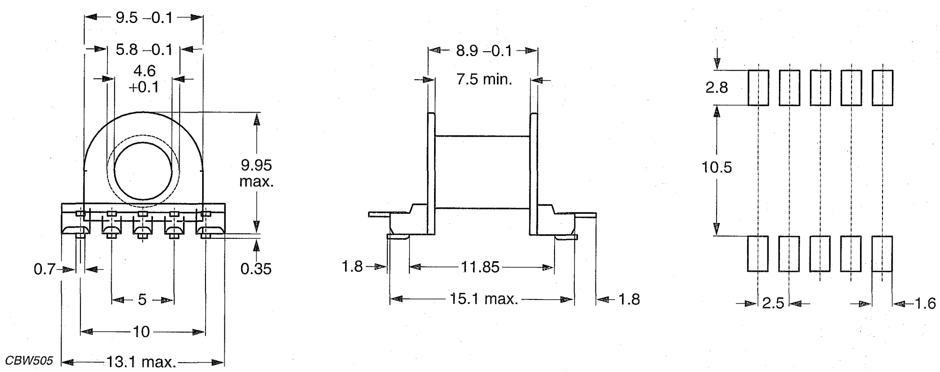
Fig.2 EP13 coil former; 10-pins.

Winding data for 10-pins EP13 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	13.6	7.6	23.8	CSH-EP13-1S-10P
2	2 × 6.1	2 × 3.4	23.8	CSH-EP13-2S-10P

General data CSHS-EP13-1S-10P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 EP13 coil former.

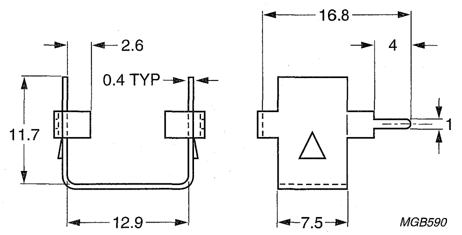
Winding data for EP13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	13.5	7.5	23.8	CSHS-EP13-1S-10P-T

MOUNTING PARTS

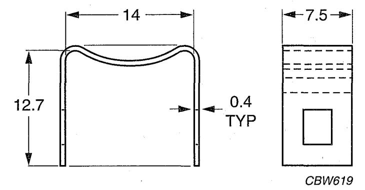
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	4	CLA-EP13
Spring	copper-nickel-zinc alloy (nickel silver)	5	SPR-EP13
Clip	stainless steel (CrNi); clamping force ≈32 N	6	CLI-EP13



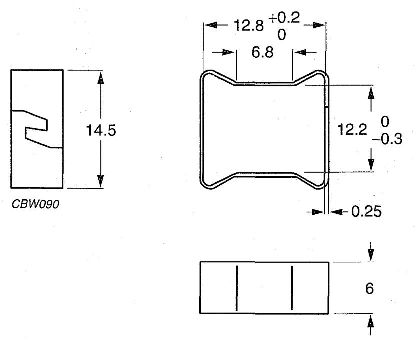
Dimensions in mm.

Fig.4 Mounting clasp CLA-EP13.



Dimensions in mm.

Fig.5 Mounting spring SPR-EP13.



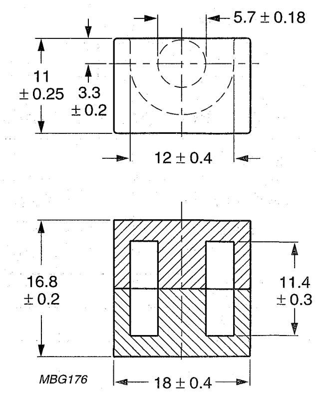
Dimensions in mm.

Fig.6 Mounting clip for CLI-EP13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.870	mm^{-1}
V_e	effective volume	999	mm^3
l_e	effective length	29.5	mm
A_e	effective area	33.7	mm^2
A_{min}	minimum area	25.5	mm^2
m	mass of set	≈12	g



Dimensions in mm.

Fig.1 EP17 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈42	≈930	EP17-3C90-E63
	100 ±3%	≈67	≈530	EP17-3C90-A100
	160 ±3%	≈107	≈300	EP17-3C90-A160
	250 ±3%	≈167	≈180	EP17-3C90-A250
	315 ±5%	≈210	≈135	EP17-3C90-A315
	2485 ±25%	≈1660	≈0	EP17-3C90
3C94 des	63 ±3%	≈42	≈930	EP17-3C94-E63
	100 ±3%	≈67	≈530	EP17-3C94-A100
	160 ±3%	≈107	≈300	EP17-3C94-A160
	250 ±3%	≈167	≈180	EP17-3C94-A250
	315 ±5%	≈210	≈135	EP17-3C94-A315
	2485 ±25%	≈1660	≈0	EP17-3C94

Core sets of high permeability grades

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	≥5300	≥3530	≈0	EP17-3E27

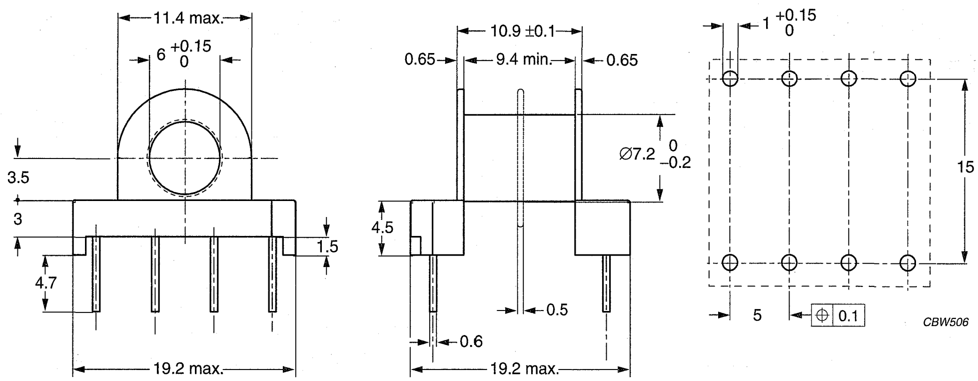
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.12	≤0.13	–	–
3C94	≥320	–	≤0.09	≈0.43	≈0.20

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EP17 coil former: 8-pins.

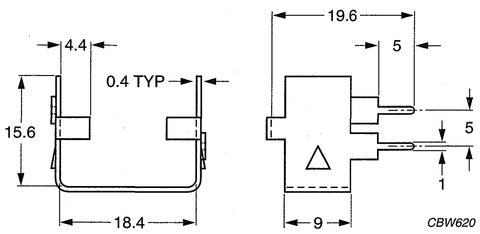
Winding data for 8-pins EP17 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	18.0	9.45	28.9	CSH-EP17-1S-8P
2	2 × 8.3	2 × 4.6	28.9	CSH-EP17-2S-8P

MOUNTING PARTS

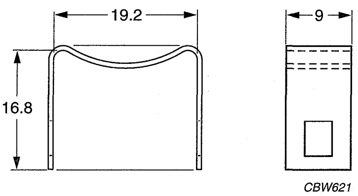
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP17
Spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP17



Dimensions in mm.

Fig.3 Mounting clasp CLA-EP17.



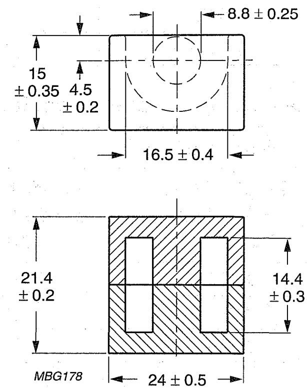
Dimensions in mm.

Fig.4 Mounting spring SPR-EP17.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.520	mm^{-1}
V_e	effective volume	3230	mm^3
l_e	effective length	41.1	mm
A_e	effective area	78.7	mm^2
A_{min}	minimum area	60.8	mm^2
m	mass of set	≈27	g



Dimensions in mm.

Fig.1 EP20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈65	≈740	EP20-3C90-E160
	250 ±3%	≈101	≈440	EP20-3C90-A250
	315 ±3%	≈127	≈340	EP20-3C90-A315
	400 ±3%	≈162	≈250	EP20-3C90-A400
	630 ±5%	≈255	≈150	EP20-3C90-A630
	4435 ±25%	≈1800	≈0	EP20-3C90
3C94 des	160 ±3%	≈65	≈740	EP20-3C94-E160
	250 ±3%	≈101	≈440	EP20-3C94-A250
	315 ±3%	≈127	≈340	EP20-3C94-A315
	400 ±3%	≈162	≈250	EP20-3C94-A400
	630 ±5%	≈255	≈150	EP20-3C94-A630
	4435 ±25%	≈1800	≈0	EP20-3C94
3F3	160 ±3%	≈65	≈740	EP20-3F3-E160
	250 ±3%	≈101	≈440	EP20-3F3-A250
	315 ±3%	≈127	≈340	EP20-3F3-A315
	400 ±3%	≈162	≈250	EP20-3F3-A400
	630 ±5%	≈255	≈150	EP20-3F3-A630
	3550 ±25%	≈1440	≈0	EP20-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E27	≥8700	≥3520	≈0	EP20-3E27

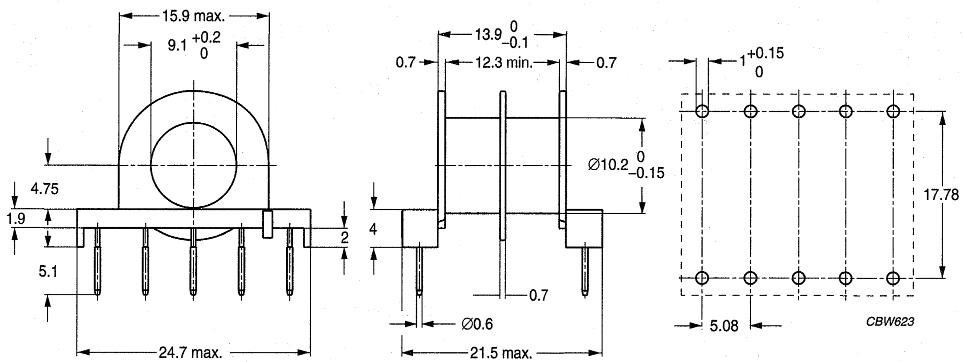
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.39	≤0.41	–	–
3C94	≥320	–	≤0.31	≈1.4	≈0.65
3F3	≥320	–	≤0.36	–	≤0.62

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EP20 coil former: 10-pins.

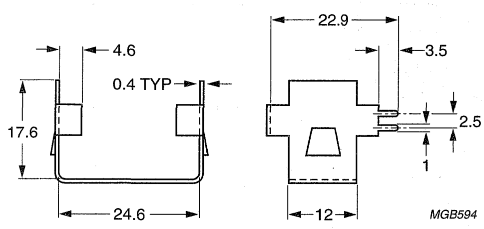
Winding data for 10-pins EP20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	32.6	12.5	41.0	CSH-EP20-1S-10P
2	2 × 15.5	5.85	41.0	CSH-EP20-2S-10P

MOUNTING PARTS

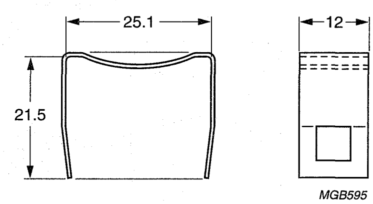
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP20
Spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP20



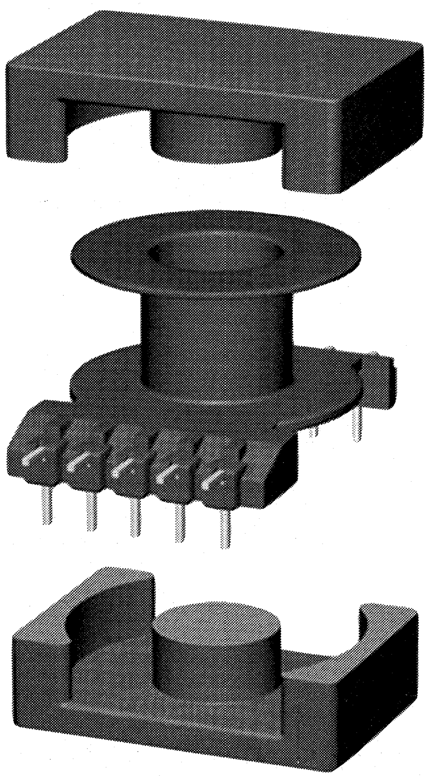
Dimensions in mm.

Fig.3 Mounting clasp CLA-EP20.



Dimensions in mm.

Fig.4 Mounting spring SPR-EP20.



CBW586

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EQ cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EQ13	348	19.9	0.9
EQ30	4970	108	13.5

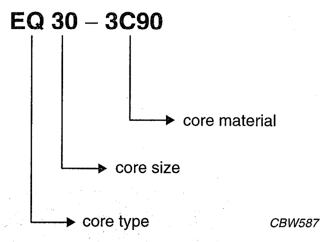


Fig.1 Type number structure for cores.

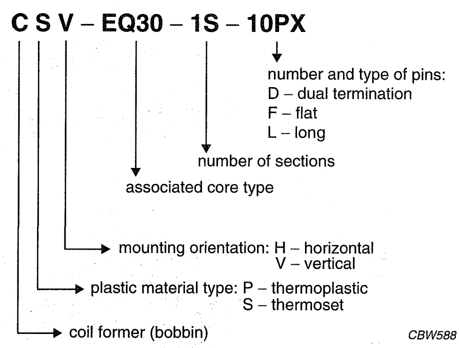


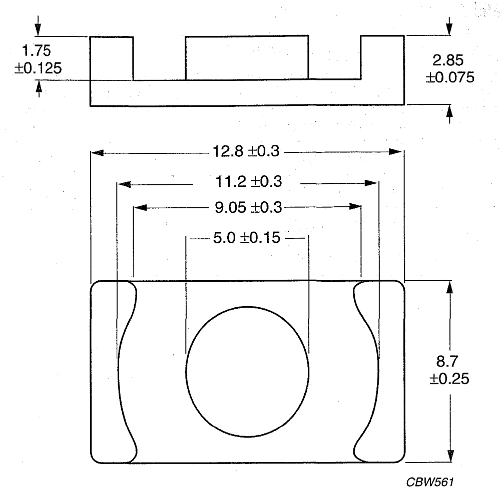
Fig.2 Type number structure for coil formers.

EQ cores and accessories EQ13

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.911	mm^{-1}
V_e	effective volume	348	mm^3
l_e	effective length	17.5	mm
A_e	effective area	19.9	mm^2
A_{min}	minimum area	19.2	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 EQ13 core half.

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	1700 ±3%	≈1230	≈0	EQ13-3C90

Properties of core sets under power conditions

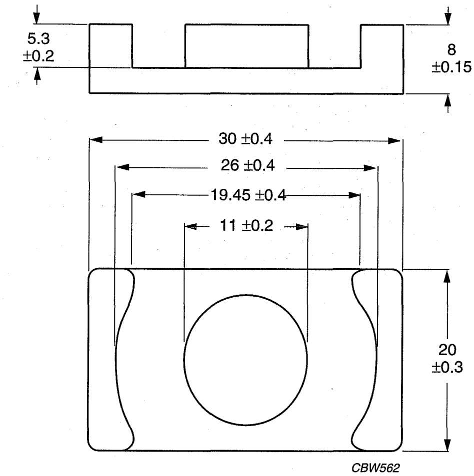
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.035	≈0.035

EQ cores and accessories EQ30

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.426	mm^{-1}
V_e	effective volume	4970	mm^3
l_e	effective length	46	mm
A_e	effective area	108	mm^2
A_{min}	minimum area	95	mm^2
m	mass of core half	≈13.5	g



Dimensions in mm.

Fig.1 EQ30 core half.

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4300 ±25%	≈1460	≈0	EQ30-3C90
3C94 des	4300 ±25%	≈1460	≈0	EQ30-3C94

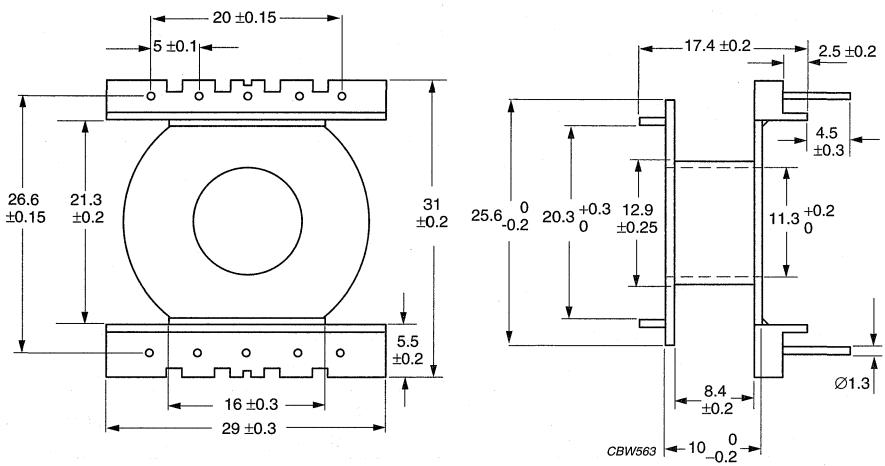
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.60	≤0.60	–	–
3C94	≥320	–	≤0.45	≈2.1	≈1.0

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s

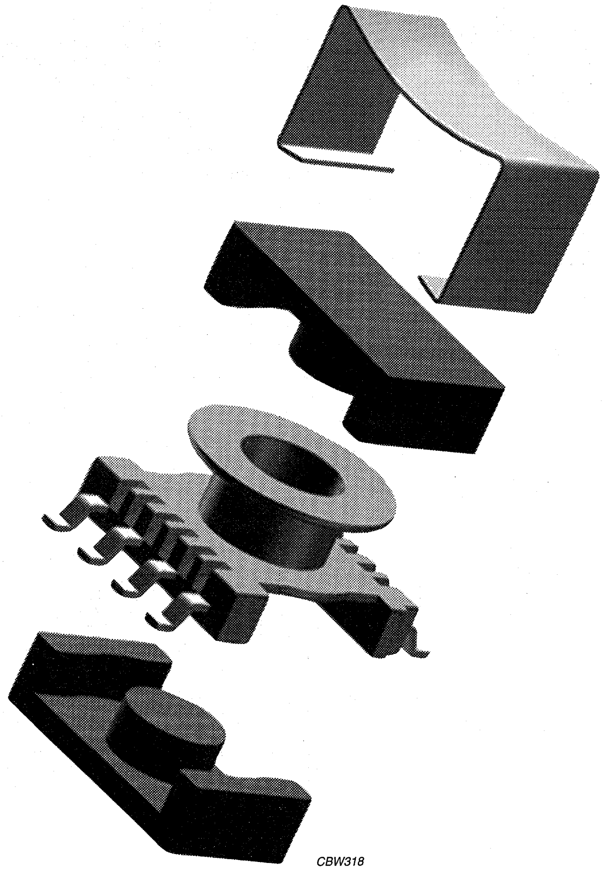


Dimensions in mm.

Fig.2 EQ30 coil former; 10-pins.

Winding data for EQ30 coil former with 10 pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.2	8.2	60	CSV-EQ30-1S-10P



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ER cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
ER9.5	120	8.47	0.35
ER11	174	11.9	0.5
ER14.5	333	17.6	0.9
ER28	5260	81.4	14
ER28L	6140	81.4	16
ER35	9710	107	23
ER40	14600	149	37
ER42	19200	194	48
ER42A	16800	170	45
ER48	25500	255	64
ER54	23000	250	61

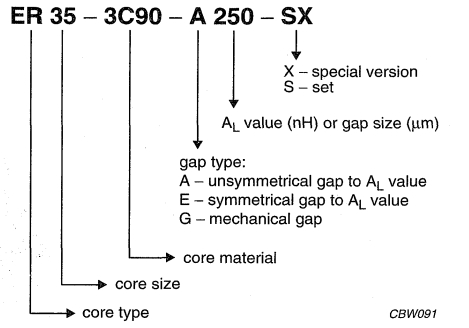


Fig.1 Type number structure for cores.

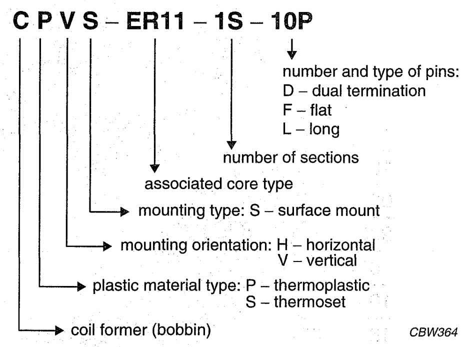


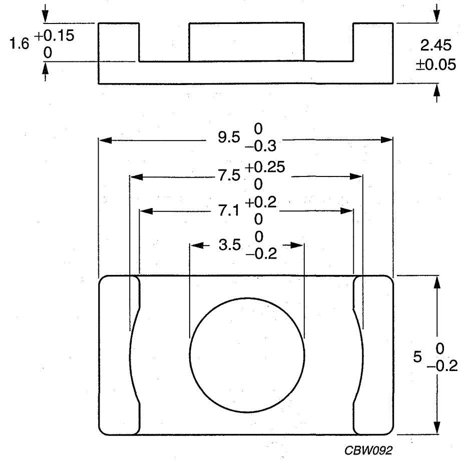
Fig.2 Type number structure for coil formers.

ER cores and accessories ER9.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.67	mm^{-1}
V_e	effective volume	120	mm^3
l_e	effective length	14.2	mm
A_e	effective area	8.47	mm^2
A_{min}	minimum area	7.60	mm^2
m	mass of core half	≈0.35	g



Dimensions in mm.

Fig.1 ER9.5 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	63 ±3%	≈84	≈200	ER9.5-3C94-A63-S
	100 ±3%	≈133	≈100	ER9.5-3C94-A100-S
	160 ±10%	≈213	≈70	ER9.5-3C94-A160-S
	1000 ±25%	≈1330	≈0	ER9.5-3C94-S
3C96 prot	900 ±25%	≈1200	≈0	ER9.5-3C96-S
3F3	63 ±3%	≈84	≈200	ER9.5-3F3-A63-S
	100 ±3%	≈133	≈100	ER9.5-3F3-A100-S
	160 ±10%	≈213	≈70	ER9.5-3F3-A160-S
	850 ±25%	≈1130	≈0	ER9.5-3F3-S
3F35 prot	700 ±25%	≈930	≈0	ER9.5-3F35-S
3F4 des	40 ±3%	≈53	≈300	ER9.5-3F4-A40-S
	63 ±5%	≈84	≈200	ER9.5-3F4-A63-S
	100 ±5%	≈133	≈100	ER9.5-3F4-A100-S
	525 ±25%	≈700	≈0	ER9.5-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N, flux density $\hat{B}$ ≤ 0.1 mT.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E5	3600 +40/−30%	≈4780	≈0	ER9.5-3E5-S
3E6	4800 +40/−30%	≈6380	≈0	ER9.5-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.011	≈0.053	≤0.023
3C96	≥320	≈0.008	≈0.038	≈0.016
3F3	≥300	≤0.015	−	≤0.025
3F35	≥300	−	−	≈0.012
3F4	≥250	−	−	−

Properties of core sets under power conditions (continued)

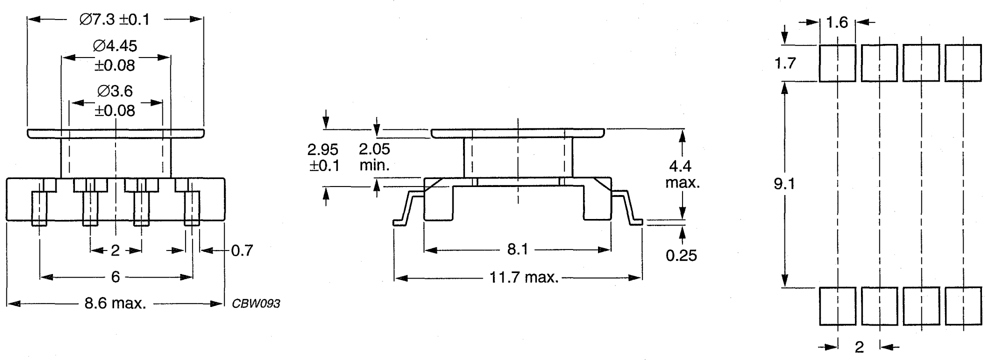
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	−	−	−	−
3C96	≥320	−	−	−	−
3F3	≥300	−	−	−	−
3F35	≥300	≈0.02	≈0.15	−	−
3F4	≥250	−	−	≤0.024	≤0.038

ER cores and accessories ER9.5

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 ER9.5 coil former (SMD); 8-solder pads.

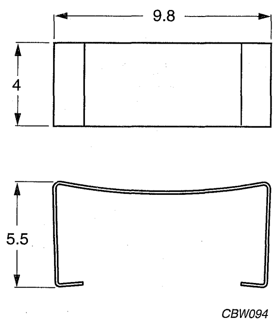
Table 1 Winding data for ER9.5 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	2.05	18.4	CPVS-ER9.5-1S-8P

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈20 N	3	CLM-ER9.5



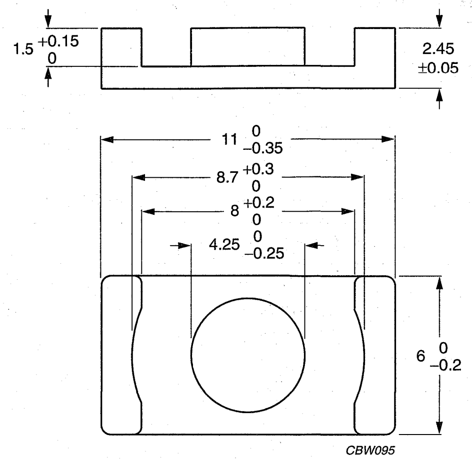
Dimensions in mm.

Fig.3 ER9.5 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	174	mm^3
l_e	effective length	14.7	mm
A_e	effective area	11.9	mm^2
A_{min}	minimum area	10.3	mm^2
m	mass of core half	≈0.5	g



Dimensions in mm.

Fig.1 ER11 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	100 ±3%	≈98	≈200	ER11-3C94-A100-S
	160 ±3%	≈155	≈100	ER11-3C94-A160-S
	250 ±10%	≈245	≈60	ER11-3C94-A250-S
	1400 ±25%	≈1370	≈0	ER11-3C94-S
3C96 prot	1250 ±25%	≈1220	≈0	ER11-3C96-S
3F3	100 ±3%	≈98	≈200	ER11-3F3-A100-S
	160 ±3%	≈155	≈100	ER11-3F3-A160-S
	250 ±10%	≈245	≈60	ER11-3F3-A250-S
	1200 ±25%	≈1170	≈0	ER11-3F3-S
3F35 prot	1000 ±25%	≈980	≈0	ER11-3F35-S
3F4 des	63 ±3%	≈61	≈300	ER11-3F4-A63-S
	100 ±5%	≈98	≈200	ER11-3F4-A100-S
	160 ±8%	≈155	≈100	ER11-3F4-A160-S
	725 ±25%	≈710	≈0	ER11-3F4-S

ER cores and accessories ER11

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N, flux density $\hat{B} \leq 0.1$ mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	5000 +40/–30%	≈4890	≈0	ER11-3E5-S
3E6	6700 +40/–30%	≈6560	≈0	ER11-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.018	≈0.075	≈0.037
3C96	≥320	≈0.013	≈0.055	≈0.025
3F3	≥300	≤0.025	–	≤0.040
3F35	≥300	–	–	≈0.017
3F4	≥250	–	–	–

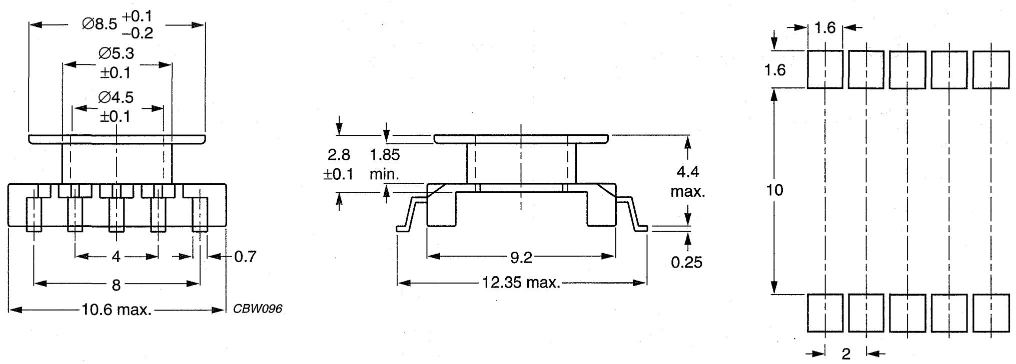
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	≈0.028	≈0.20	–	–
3F35	≥300	–	–	–	–
3F4	≥250	–	–	≤0.035	≤0.056

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 ER11 coil former (SMD); 10-solder pads.

Winding data for ER11 coil former (SMD)

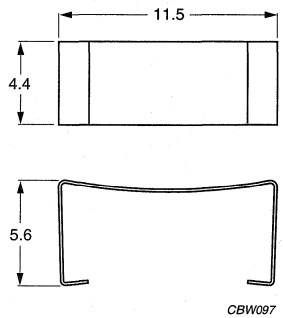
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	1.85	21.6	CPVS-ER11-1S-10P
1	2.8	1.85	21.6	CPVS-ER11-1S-12P

ER cores and accessories ER11

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈25 N	3	CLM-ER11



Dimensions in mm.

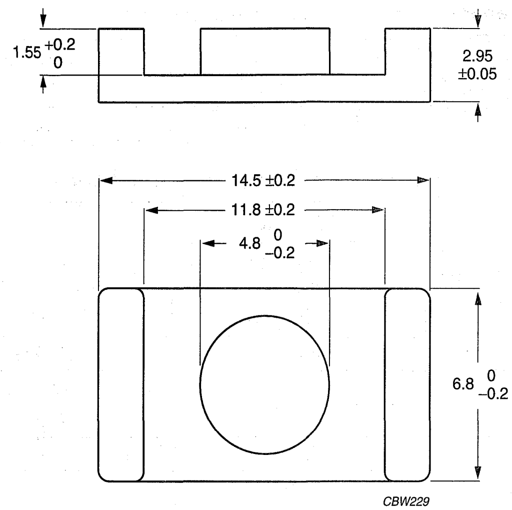
Fig.3 ER11 clamp.

ER cores and accessories ER14.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	333	mm^3
l_e	effective length	19.0	mm
A_e	effective area	17.6	mm^2
A_{min}	minimum area	17.3	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 ER14.5 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	100 ±3%	≈86	≈250	ER14.5-3C94-A100-S
	160 ±3%	≈139	≈150	ER14.5-3C94-A160-S
	250 ±8%	≈215	≈90	ER14.5-3C94-A250-S
	1600 ±25%	≈1370	≈0	ER14.5-3C94-S
3C96 prot	1500 ±25%	≈1290	≈0	ER14.5-3C96-S
3F3	100 ±3%	≈86	≈250	ER14.5-3F3-A100-S
	160 ±3%	≈139	≈150	ER14.5-3F3-A160-S
	250 ±8%	≈215	≈90	ER14.5-3F3-A250-S
	1400 ±25%	≈1200	≈0	ER14.5-3F3-S
3F35 prot	1150 ±25%	≈990	≈0	ER14.5-3F35-S
3F4 des	100 ±3%	≈86	≈240	ER14.5-3F4-A100-S
	160 ±5%	≈139	≈130	ER14.5-3F4-A160-S
	250 ±8%	≈215	≈70	ER14.5-3F4-A250-S
	850 ±25%	≈730	≈0	ER14.5-3F4

ER cores and accessories

ER14.5

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N, flux density $\hat{B}$ ≤ 0.1 mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E6	7900 +40/−30%	≈6800	≈0	ER14.5-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤0.032	≈0.15	≤0.070
3C96	≥320	≈0.022	≈0.11	≈0.005
3F3	≥300	≤0.043	−	≤0.061
3F35	≥300	−	−	≈0.033
3F4	≥250	−	−	−

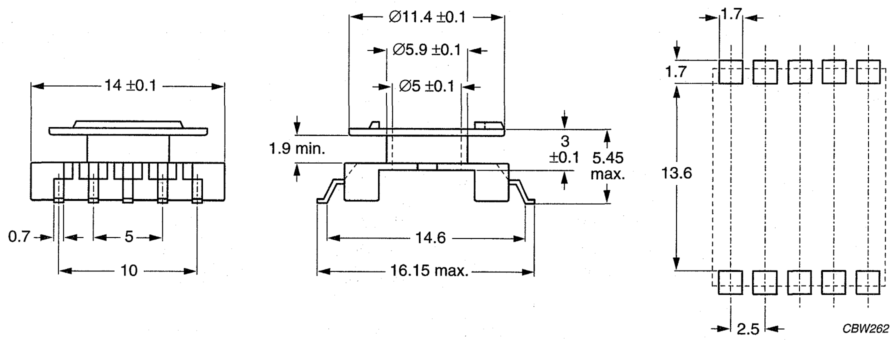
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	−	−	−	−
3C96	≥300	−	−	−	−
3F3	≥300	−	−	−	−
3F35	≥300	≈0.053	≈0.4	−	−
3F4	≥250	−	−	≤0.067	≤0.107

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 ER14.5 coil former (SMD); 10-solder pads.

Winding data for ER14.5 coil former (SMD) with 10 solder pads

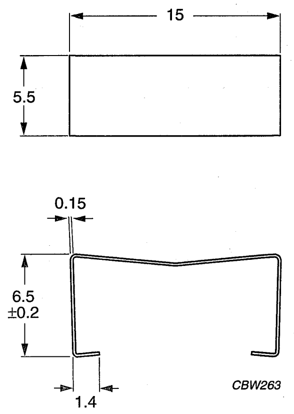
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.1	1.9	27	CPVS-ER14.5-1S-10P

ER cores and accessories ER14.5

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-ER14.5



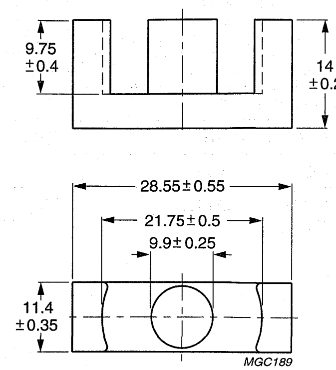
Dimensions in mm.

Fig.3 ER11 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 ER28 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2900 ±25%	≈1800	≈0	ER28-3C90
3C94 des	2900 ±25%	≈1800	≈0	ER28-3C94

Properties of core sets under power conditions

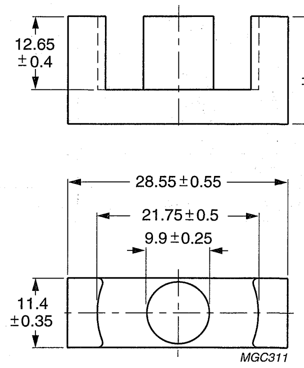
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.63	≤0.67	–	–
3C94	≥320	–	≤0.50	≈2.3	≈1.1

ER cores ER28L

CORE SETS

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
m	mass of core half	≈16	g



Dimensions in mm.

Fig.1 ER28L core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	2500 ±25%	≈1900	≈0	ER28L-3C90
3C94 des	2500 ±25%	≈1900	≈0	ER28L-3C94

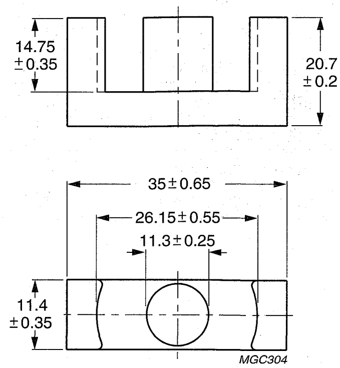
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.74	≤0.77	–	–
3C94	≥320	–	≤0.58	≈2.6	≈1.3

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.849	mm^{-1}
V_e	effective volume	9710	mm^3
I_e	effective length	90.8	mm
A_e	effective area	107	mm^2
A_{min}	minimum area	100	mm^2
m	mass of core half	≈23	g



Dimensions in mm.

Fig.1 ER35 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2800 ±25%	≈1900	≈0	ER35-3C90
3C94 des	2800 ±25%	≈1900	≈0	ER35-3C94

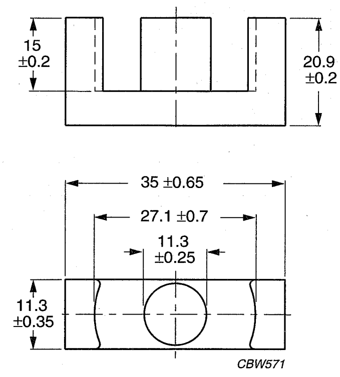
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤1.2	≤1.3	−	−
3C94	≥320	−	≤0.95	≈04.2	≈2.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.900	mm^{-1}
V_e	effective volume	9548	mm^3
l_e	effective length	92.7	mm
A_e	effective area	103	mm^2
A_{min}	minimum area	100	mm^2
m	mass of core half	≈27	g



Dimensions in mm.

Fig.1 ER35W core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	3000 ±25%	≈2150	≈0	ER35W-3C90

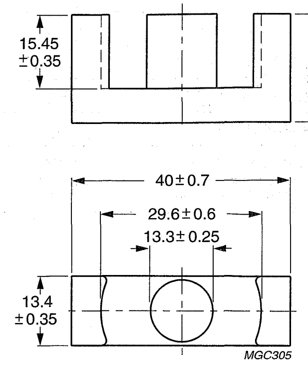
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤1.2	≤1.3

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈37	g



Dimensions in mm.

Fig.1 ER40 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3600 ±25%	≈1900	≈0	ER40-3C90
3C94 des	3600 ±25%	≈1900	≈0	ER40-3C94

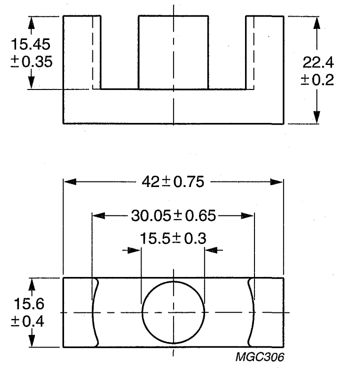
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤1.8	≤1.9	−	−
3C94	≥320	−	≤1.45	≈6.3	≈2.9

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈48	g



Dimensions in mm.

Fig.1 ER42 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4600 ±25%	≈1900	≈0	ER42-3C90
3C94 des	4600 ±25%	≈1900	≈0	ER42-3C94

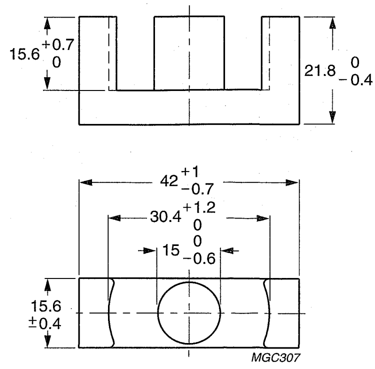
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤2.3	≤2.4	–	–
3C94	≥320	–	≤1.8	≈8.3	≈4.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈45	g



Dimensions in mm.

Fig.1 ER42A core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4000 ±25%	≈1900	≈0	ER42A-3C90
3C94 des	4000 ±25%	≈1900	≈0	ER42A-3C94

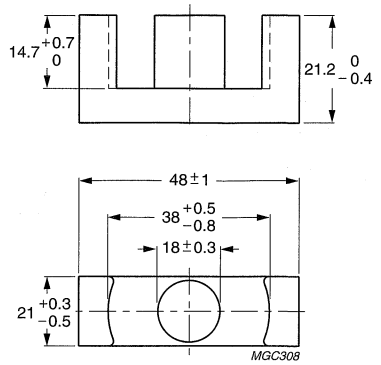
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤2.0	≤2.1	–	–
3C94	≥320	–	≤1.6	≈7.2	≈3.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈64	g



Dimensions in mm.

Fig.1 ER48 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	5700 ±25%	≈1900	≈0	ER48-3C90
3C94 des	5700 ±25%	≈1900	≈0	ER48-3C94

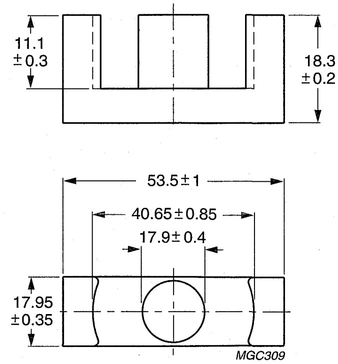
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤3.1	≤3.3	–	–
3C94	≥320	–	≤2.6	≈11	≈5.9

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.370	mm^{-1}
V_e	effective volume	23000	mm^3
l_e	effective length	91.8	mm
A_e	effective area	250	mm^2
A_{min}	minimum area	240	mm^2
m	mass of core half	≈61	g



Dimensions in mm.

Fig.1 ER54 core half.

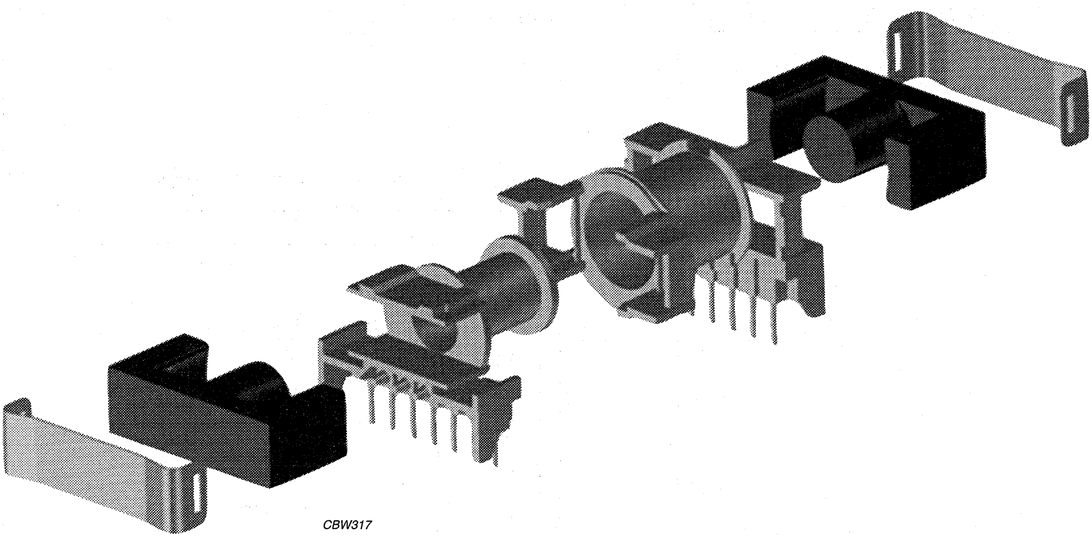
Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	6100 ±25%	≈1800	≈0	ER54-3C90
3C94 des	6100 ±25%	≈1800	≈0	ER54-3C94

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤2.8	≤2.9	−	−
3C94	≥320	−	≤2.3	≈10	≈5.3



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ETD cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
ETD29	5470	76.0	14
ETD34	7640	97.1	20
ETD39	11500	125	30
ETD44	17800	173	47
ETD49	24000	211	62
ETD54	35500	280	90
ETD59	51500	368	130

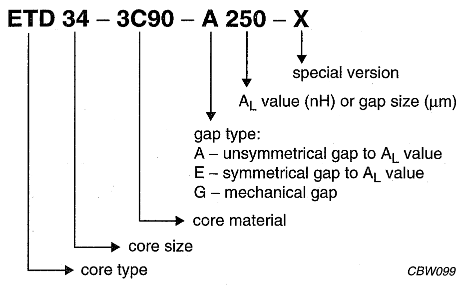


Fig.1 Type number structure for cores.

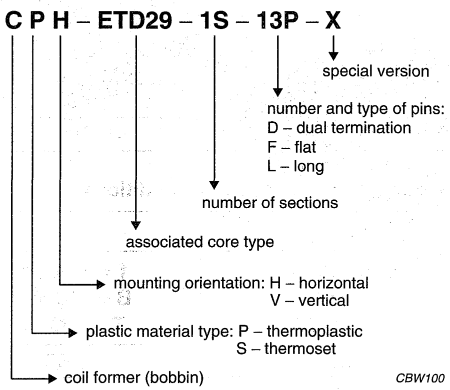


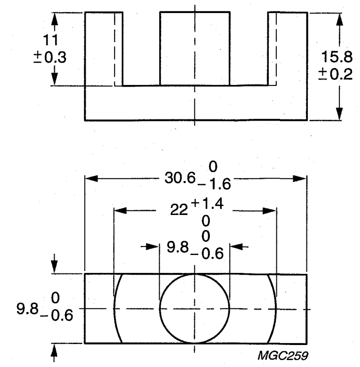
Fig.2 Type number structure for coil formers.

ETD cores and accessories ETD29

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 ETD29 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2350 ±25%	≈1850	≈0	ETD29-3C90
3F3	2200 ±25%	≈1700	≈0	ETD29-3F3

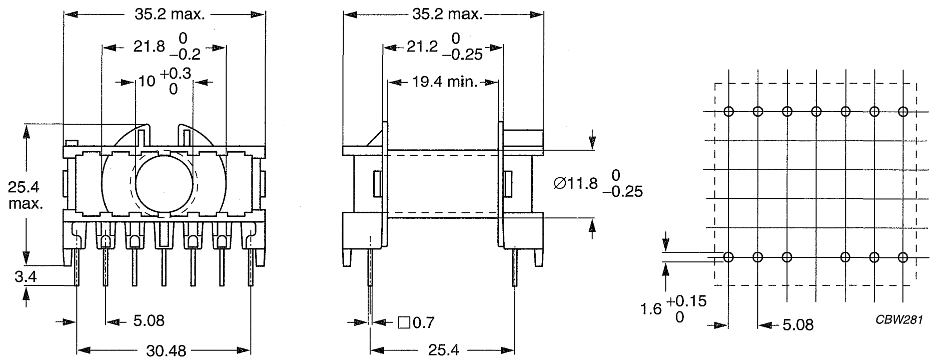
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤0.66	≤0.69	−
3F3	≥320	−	≤0.65	≤1.1

COIL FORMER

General data 13-pins ETD29 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD29 coil former; 13-pins.

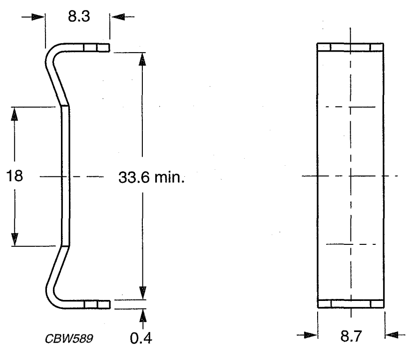
Winding data for 13-pins ETD29 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	90	19.4	53	CPH-ETD29-1S-13P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD29



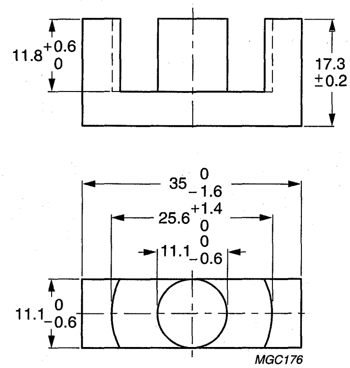
Dimensions in mm.

Fig.3 Mounting clip for ETD29.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core half	≈20	g



Dimensions in mm.

Fig.1 ETD34 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2700 ±25%	≈1870	≈0	ETD34-3C90
3F3	2500 ±25%	≈1750	≈0	ETD34-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥330	≤0.92	≤0.97	−
3F3	≥320	−	≤0.90	≤1.6

COIL FORMERS

General data 14-pins ETD34 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

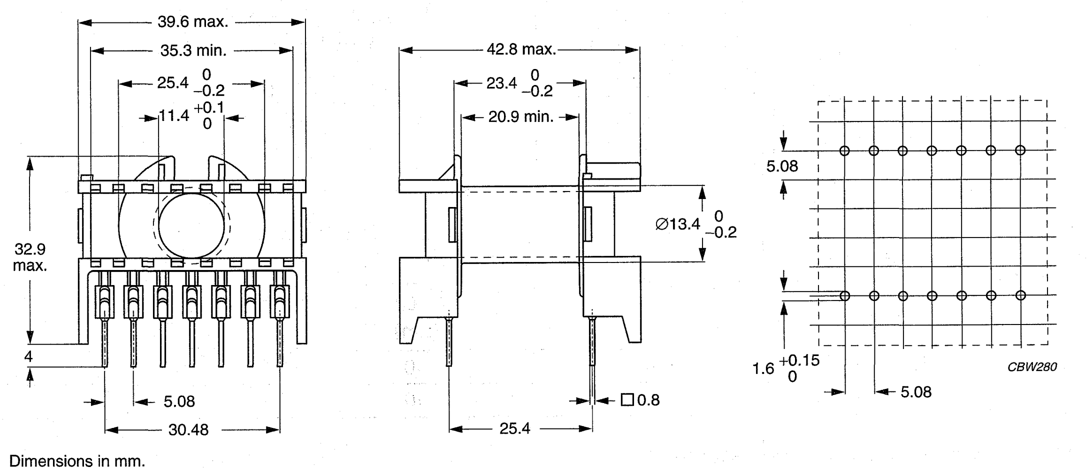


Fig.2 ETD34 coil former; 14-pins.

Winding data for 14-pins ETD34 coil former

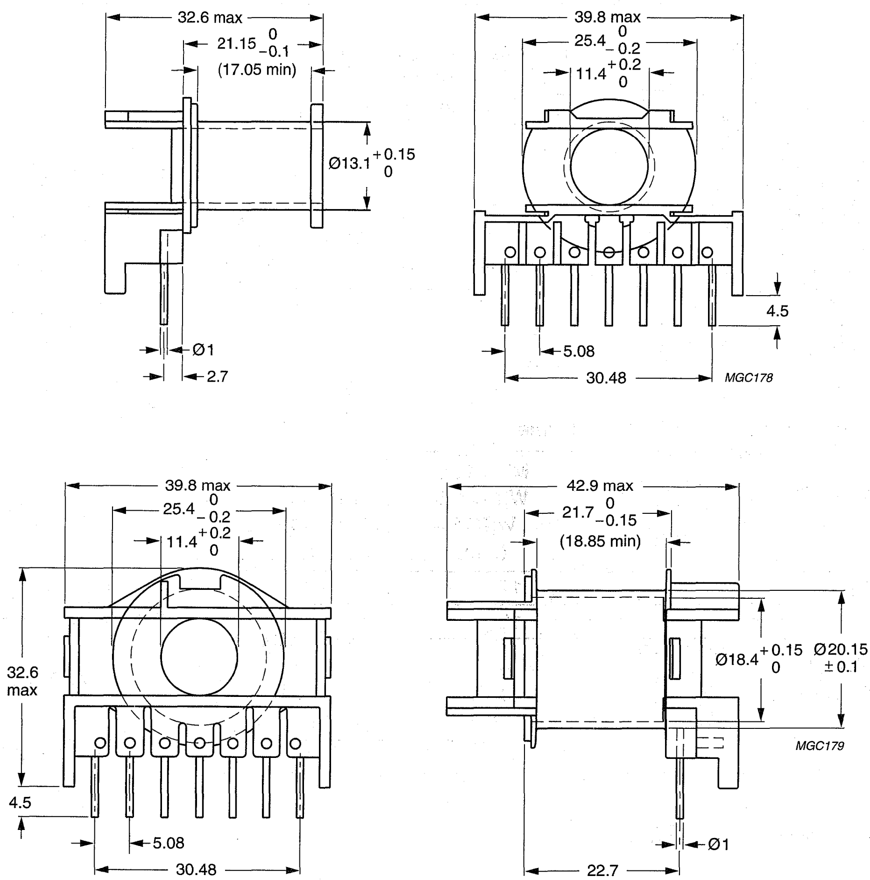
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	123	20.9	60	CPH-ETD34-1S-14P(1)

Note

1. Also available with ∅1.0 mm pins.

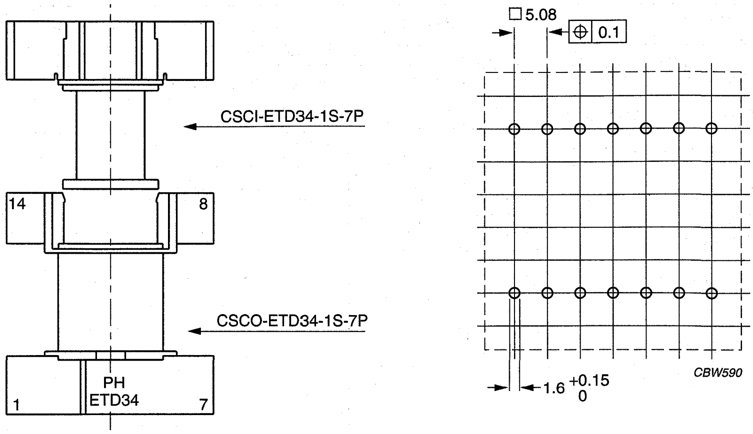
General data 14-pins coaxial ETD34 coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E63312(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.
For mounting grid and method of fitting, see Fig.4.

Fig.3 Coaxial ETD34 coil former; 14-pins.



Dimensions in mm.

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 fitting.

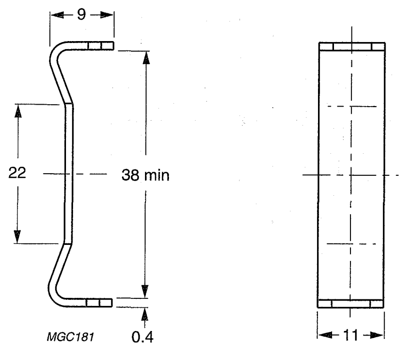
Winding data for coaxial ETD34 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	44.5	17	49.5	CSCI-ETD34-1S-7P
1	49	18.9	71	CSCO-ETD34-1S-7P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	5	CLI-ETD34



Dimensions in mm.

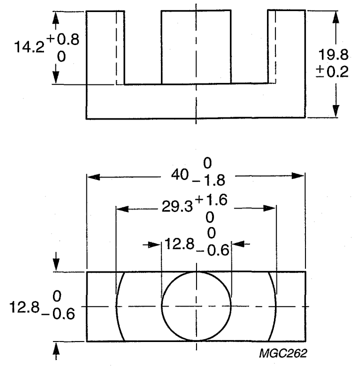
Fig.5 Mounting clip for ETD34.

ETD cores and accessories ETD39

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈30	g



Dimensions in mm.

Fig.1 ETD39 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3000 ±25%	≈1900	≈0	ETD39-3C90
3F3	2800 ±25%	≈1750	≈0	ETD39-3F3

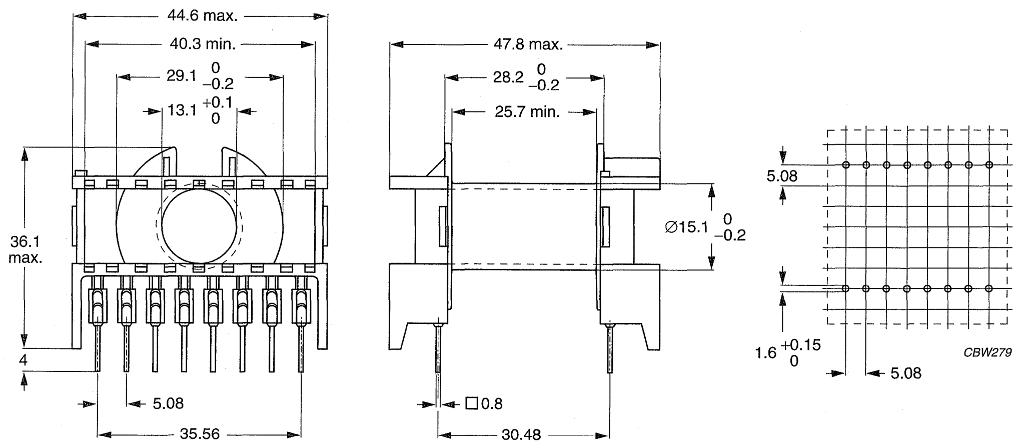
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤1.4	≤1.5	−
3F3	≥320	−	≤1.4	≤2.5

COIL FORMER

General data 16-pins ETD39 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD39 coil former; 16-pins.

Winding data for 16-pins ETD39 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	177	25.7	69	CPH-ETD39-1S-16P(1)

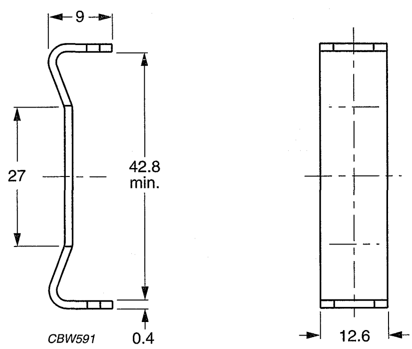
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD39



Dimensions in mm.

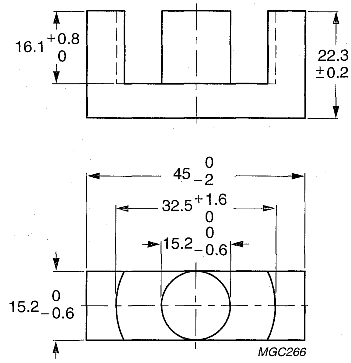
Fig.3 Mounting clip for ETD39.

ETD cores and accessories ETD44

CORE SETS

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
m	mass of core half	≈47	g



Dimensions in mm.

Fig.1 ETD44 core half.

Core halves

Clamping force for A_L measurements, 40 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3800 ±25%	≈1900	≈0	ETD44-3C90
3F3	3500 ±25%	≈1780	≈0	ETD44-3F3

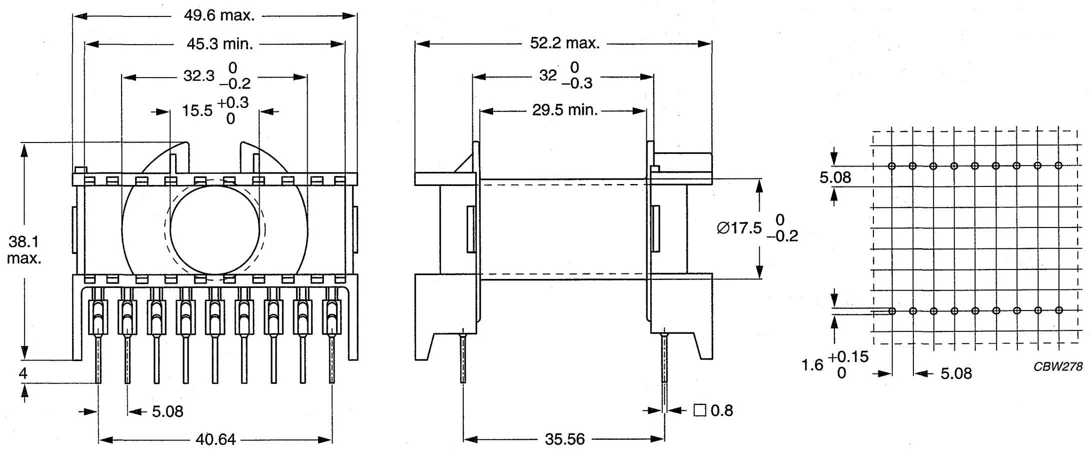
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤2.2	≤2.3	−
3F3	≥320	−	≤2.2	≤3.9

COIL FORMERS

General data 18-pins ETD44 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD44 coil former; 18-pins.

Winding data for 18-pins ETD44 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	214	29.5	77	CPH-ETD44-1S-18P(1)

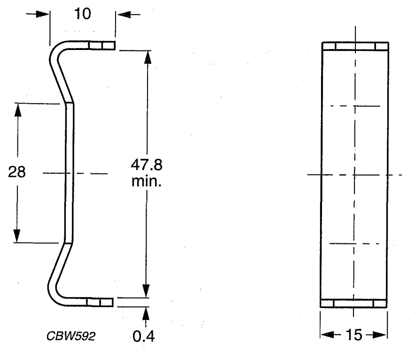
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD44



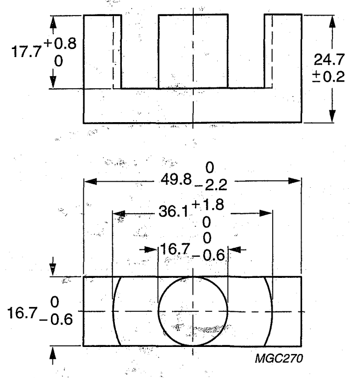
Dimensions in mm.

Fig.3 Mounting clip for ETD44.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈62	g



Dimensions in mm.

Fig.1 ETD49 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4200 ±25%	≈1950	≈0	ETD49-3C90
3F3	3900 ±25%	≈1800	≈0	ETD49-3F3

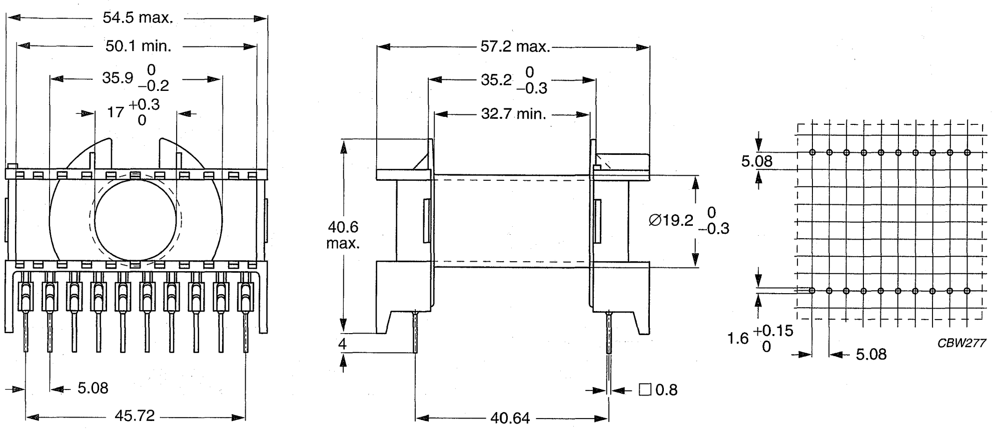
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤2.9	≤3.1	–
3F3	≥320	–	≤3.0	≤5.4

COIL FORMERS

General data 20-pins ETD49 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD49 coil former; 20-pins.

Winding data for 20-pins ETD49 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	273	32.7	85	CPH-ETD49-1S-20P(1)

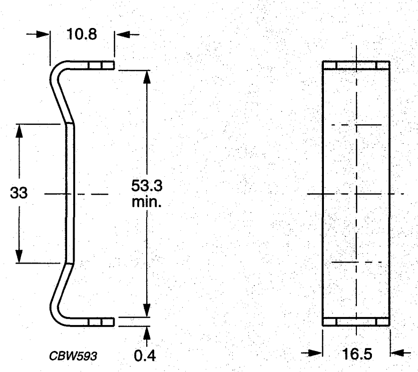
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD49



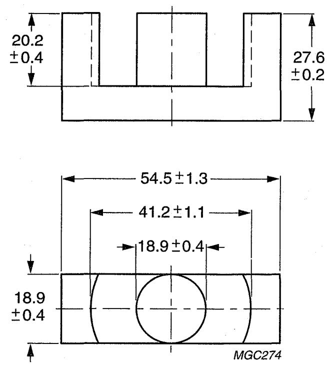
Dimensions in mm.

Fig.3 Mounting clip for ETD49.

CORE SETS

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	270	mm^2
m	mass of core half	≈90	g



Dimensions in mm.

Fig.1 ETD54 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	5000 ±25%	≈1950	≈0	ETD54-3C90
3F3	4600 ±25%	≈1800	≈0	ETD54-3F3

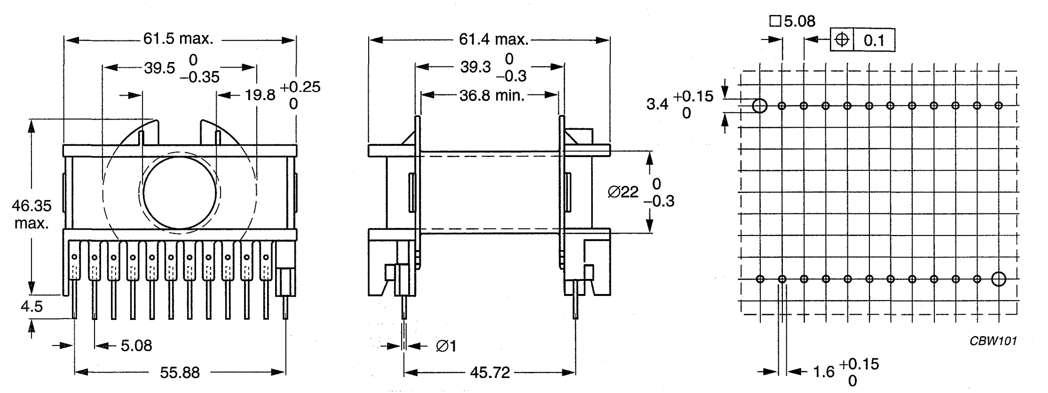
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤4.3	≤4.8	–
3F3	≥320	–	≤4.5	≤8.5

COIL FORMERS

General data 22-pins ETD54 coil former

ITEM	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD54 coil former; 22-pins.

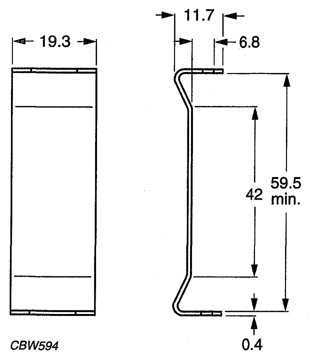
Winding data for 22-pins ETD54 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	316	36.8	96	CPH-ETD54-1S-22P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD54



Dimensions in mm.

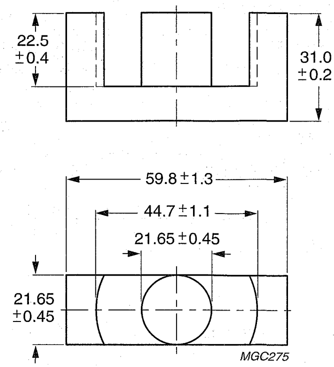
Fig.3 Mounting clip for ETD54.

ETD cores and accessories ETD59

CORE SETS

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	360	mm^2
m	mass of core half	≈130	g



Dimensions in mm.

Fig.1 ETD59 core half.

Core halves

Clamping force for A_L measurements, 70 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	6000 ±25%	≈1950	≈0	ETD59-3C90
3F3	5600 ±25%	≈1800	≈0	ETD59-3F3

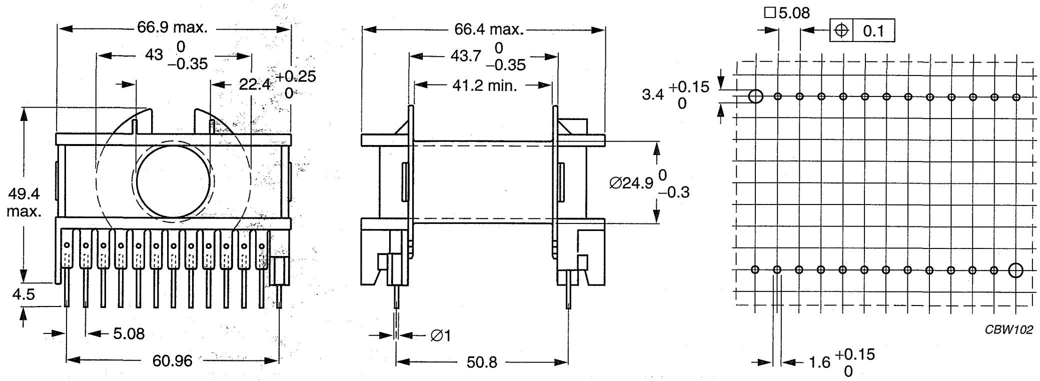
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤6.2	≤7.3	–
3F3	≥320	–	≤6.7	≤12.8

COIL FORMER

General data 24-pins ETD59 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD59 coil former; 24-pins.

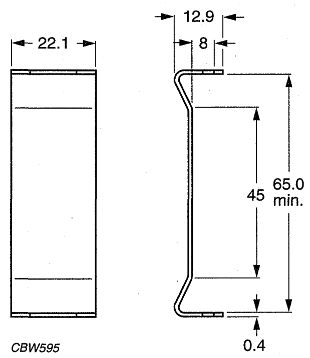
Winding data for 24-pins ETD59 coil former

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	366	41.2	106	CPH-ETD59-1S-24P

MOUNTING PARTS

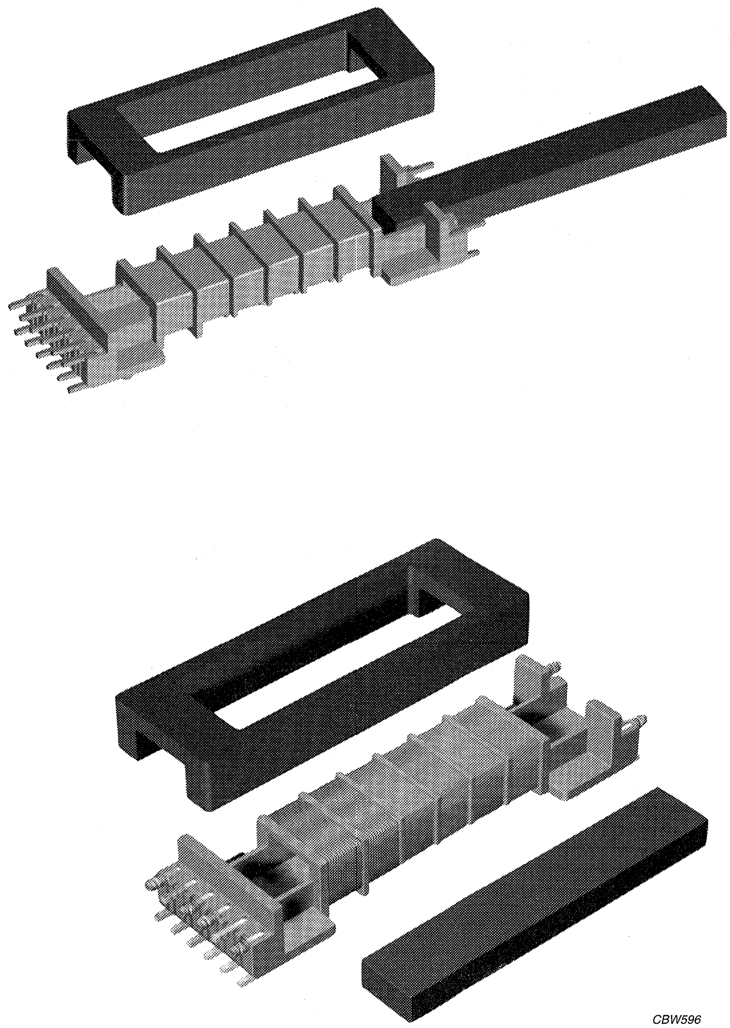
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD59



Dimensions in mm.

Fig.3 Mounting clip for ETD59.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Frame and Bar cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
FRM20/5/15	655	14	2.1
BAR20/3/5.5	655	14	1.5
FRM21/4/12	312	7.9	1.5
BAR22/2/6	312	7.9	1.0
FRM24/3.5/10	348	7.6	1.2
BAR25/2.2/4	370	8.1	1.2
FRM27/3.8/9	504	9.7	1.6
BAR28/3.8/2.3	504	9.7	1.2

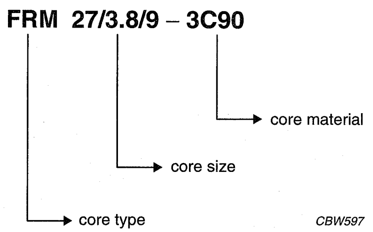


Fig.1 Type number structure for cores.

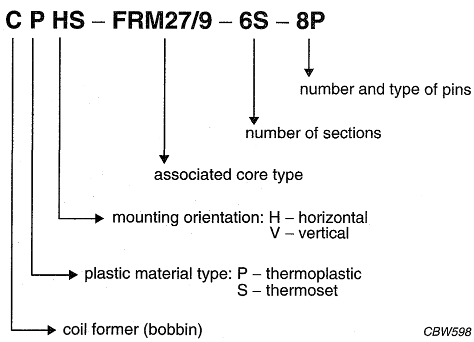
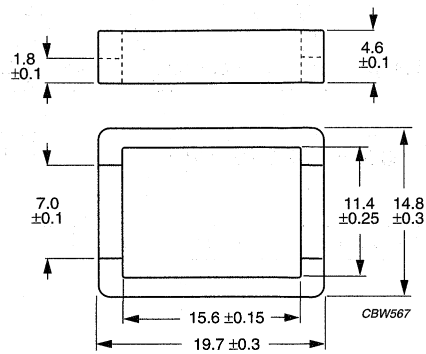


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.29	mm^{-1}
V_e	effective volume	655	mm^3
l_e	effective length	46	mm
A_e	effective area	14	mm^2
A_{min}	minimum area	7.4	mm^2
m	mass of frame	≈2.1	g
m	mass of bar	≈1.5	g

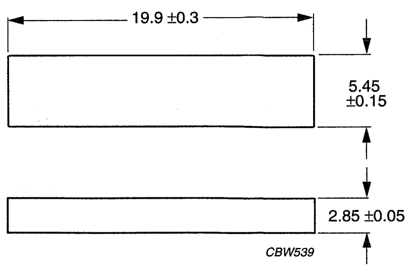


Dimensions in mm.

Fig.1 FRM20/5/15.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR20/3/5.5-3C90



Dimensions in mm.

Fig.2 BAR20/3/5.5.

Frame cores for use in combination with matching bar cores

A_L measured in combination with bar core

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	500 ±25%	≈1310	≈0	FRM20/5/15-3C90

Properties of Frame and Bar combinations under power conditions

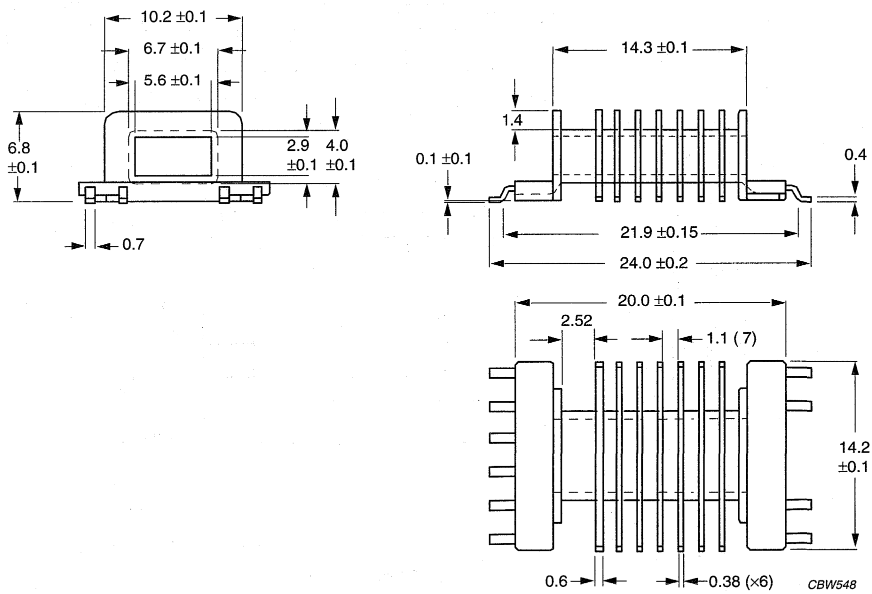
CORE COMBINATION	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
FRM20/5/15-3C90 + BAR20/3/5.5-3C90	≥320	≤0.073	≤0.080

Frame and Bar cores and accessories FRM20/5/15

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 SMD coil former for FRM20/5/15.

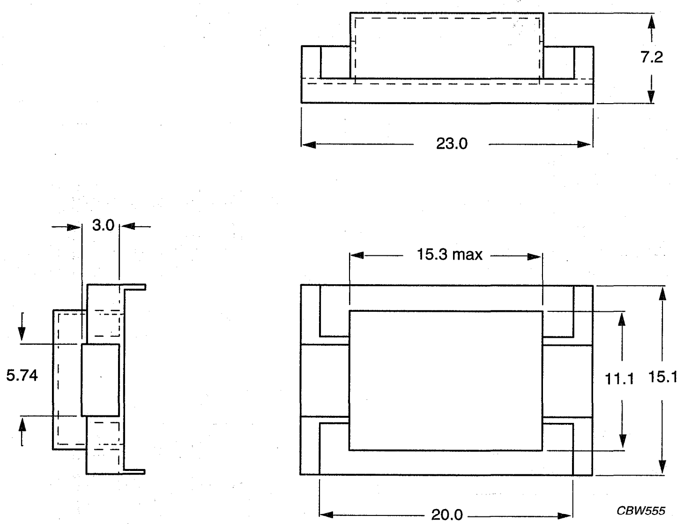
Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDERPADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
8	10	3.5 + 7 × 1.5	2.52 + 8 × 1.1	27	CPHS-FRM20/15-8S-10P

MOUNTING PARTS

General data

PARAMETER	SPECIFICATION
Cover material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



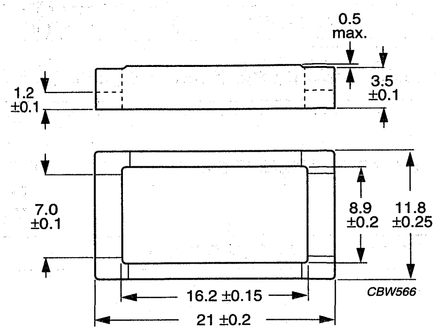
Dimensions in mm.

Fig.4 Cover for FRM20/5/15.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.06	mm^{-1}
V_e	effective volume	312	mm^3
l_e	effective length	40	mm
A_e	effective area	7.9	mm^2
A_{min}	minimum area	5.7	mm^2
m	mass of frame	≈1.5	g
m	mass of bar	≈1.0	g

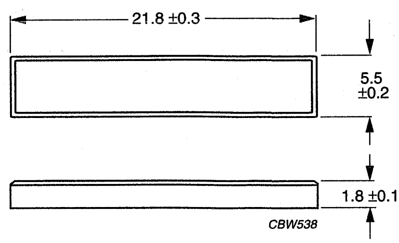


Dimensions in mm.

Fig.1 FRM21/4/12.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR22/2/6-3C90



Dimensions in mm.

Fig.2 BAR22/2/6.

Frame and Bar cores and accessories FRM21/4/12

Frame cores for use in combination with matching bar cores

A_L measured in combination with bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	400 ±25%	≈1610	≈0	FRM21/4/12-3C90

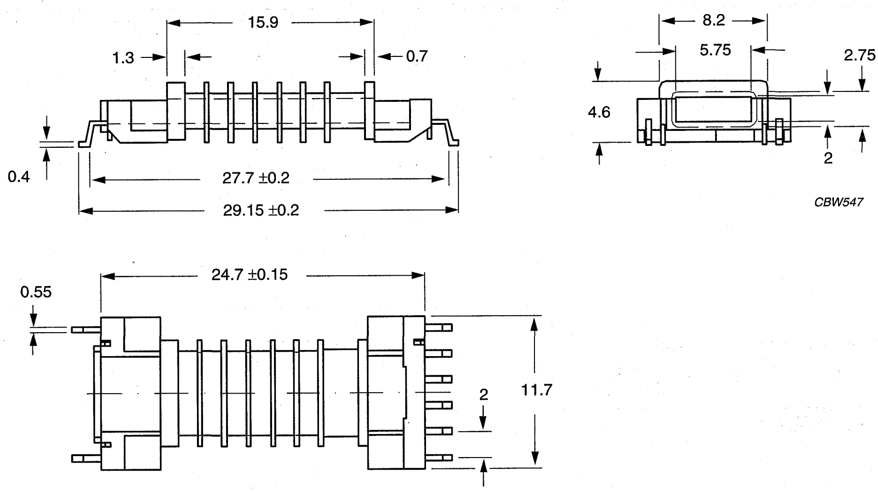
Properties of Frame and Bar combinations under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
FRM21/4/12-3C90 + BAR22/2/6-3C90	≥320	≤0.034	≤0.037

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 SMD coil former for FRM21/4/12.

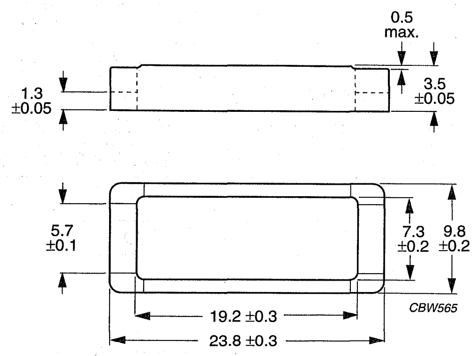
Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDERPADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
7	8	$2.3 + 6 \times 1.35$	$2.6 + 6 \times 1.5$	21	CPHS-FRM21/12-7S-8P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.03	mm^{-1}
V_e	effective volume	348	mm^3
l_e	effective length	45.8	mm
A_e	effective area	7.6	mm^2
A_{min}	minimum area	6.0	mm^2
m	mass of frame	≈1.2	g
m	mass of bar	≈1.2	g

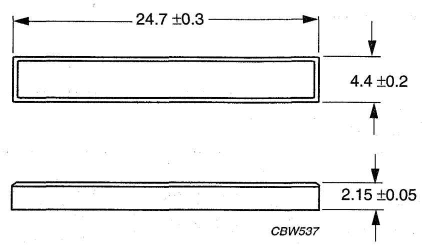


Dimensions in mm.

Fig.1 FRM24/3.5/10 core.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR25/2.2/4-3C90



Dimensions in mm.

Fig.2 BAR 25/2.2/4.

Frame and Bar cores and accessories FRM24/3.5/10

Frame cores for use in combination with matching bar cores

AL measured in combination with bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	370 ±25%	≈1660	≈0	FRM24/3.5/10-3C90

Properties of Frame and Bar combinations under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
FRM24/3.5/10-3C90 + BAR25/2.2/4-3C90	≥320	≤0.041	≤0.044

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s

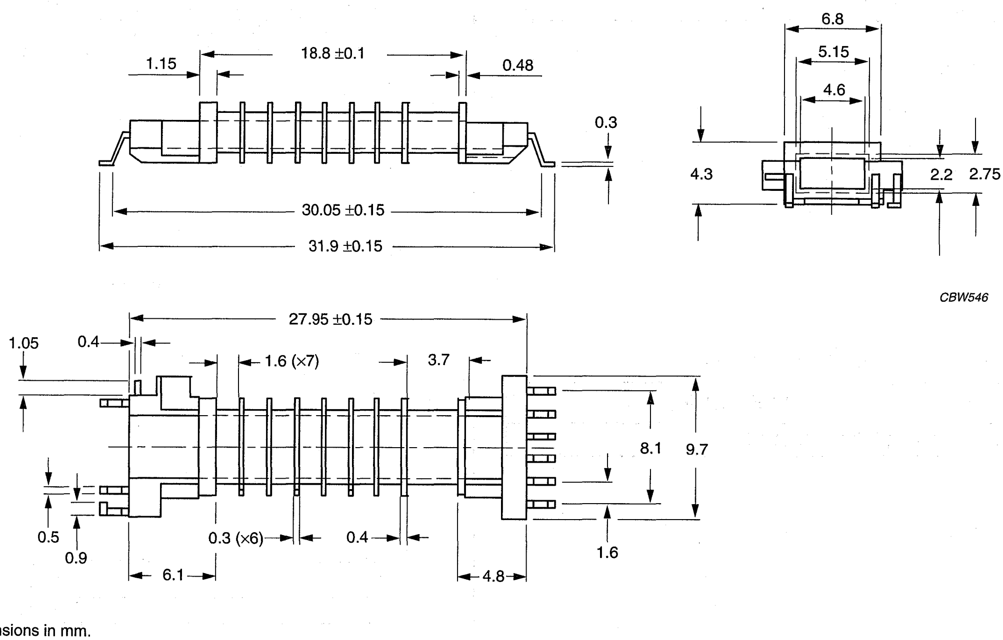


Fig.3 SMD coil former for FRM24/3.5/10.

Winding data

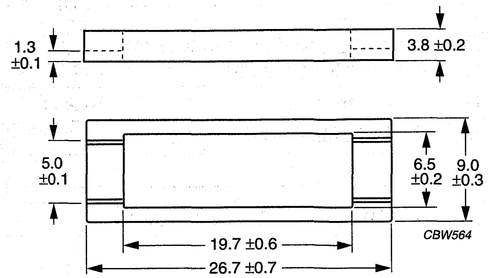
NUMBER OF SECTIONS	NUMBER OF SOLDERPADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
8	9	5.9 + 7 × 1.23	3.7 + 7 × 1.6	17.3	CPHS-FRM24/10-8S-9P

Frame and Bar cores and accessories FRM27/3.8/9

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.56	mm^{-1}
V_e	effective volume	504	mm^3
l_e	effective length	52.1	mm
A_e	effective area	9.7	mm^2
A_{min}	minimum area	8.7	mm^2
m	mass of frame	≈1.6	g
m	mass of bar	≈1.2	g

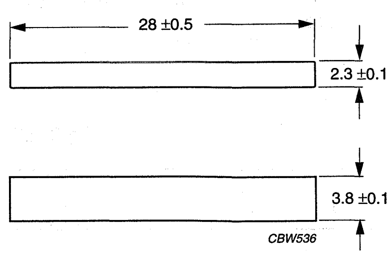


Dimensions in mm.

Fig.1 FRM27/3.8/9 core.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR28/2.3/3.8-3C90



Dimensions in mm.

Fig.2 BAR28/2.3/3.8

Frame and Bar cores and accessories FRM27/3.8/9

Frame cores for use in combination with matching bar cores

A_L measured in combination with a bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	350 ±20%	≈1550	≈0	FRM27/3.8/9-3C90

Properties of Frame and Bar combinations under power conditions

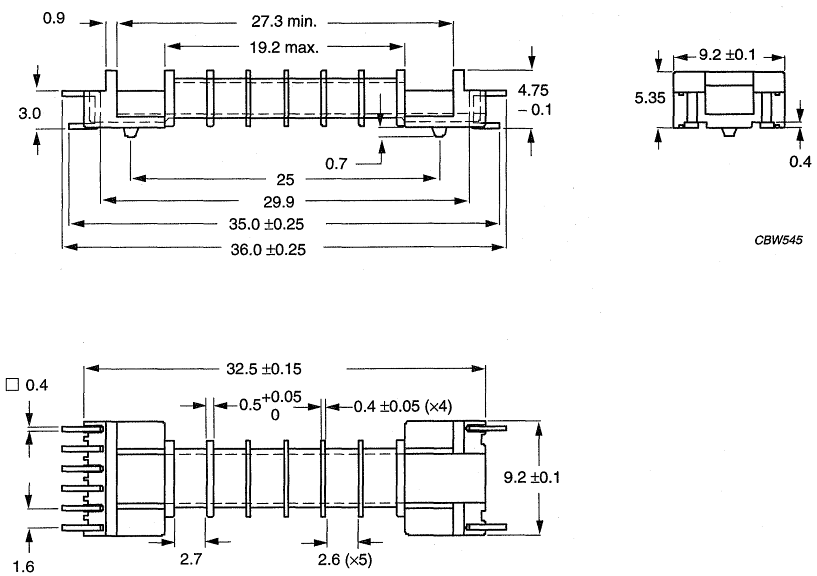
CORE COMBINATION	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
FRM27/3.8/9-3C90 + BAR28/2.3/3.8-3C90	≥320	≤0.056	≤0.060

Frame and Bar cores and accessories FRM27/3.8/9

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s

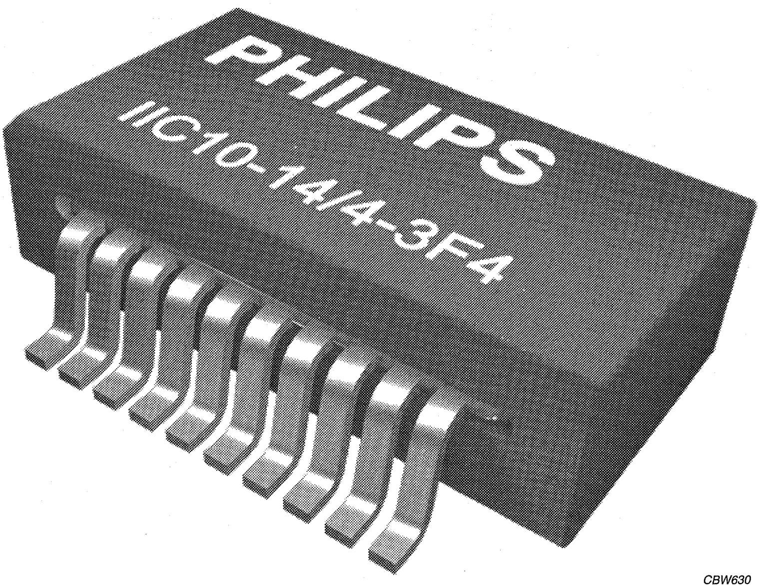


Dimensions in mm.

Fig.3 SMD coil former for FRM27/3.8/9.

Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDERPADS	WINDING AREA (mm²)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
6	8	1.75 + 5 × 1.7	2.7 + 5 × 2.6	18.5	CPHS-FRM27/9-6S-8P



CBW630

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview IIC

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
IIC10-14/4	33.8	11.7	≈1.85
IIC10P-14/4	33.8	11.7	≈1.85

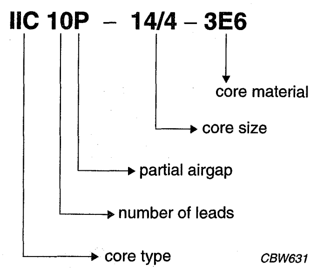


Fig.1 Type number structure.

IIC10P-14/4

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.47	mm^{-1}
V_e	effective volume	338	mm^3
l_e	effective length	28.9	mm
A_e	effective area	11.7	mm^2
m	mass of core half	≈1.85	g

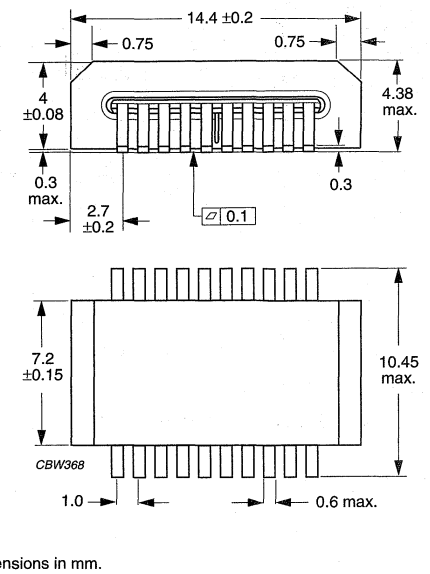


Fig.1 IIC10P-14/4 outline.

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Partial air gap to resist saturation.
- Number of turns can be adpated by track layout.

APPLICATIONS

- Power inductor
- Output choke
- EMI choke with bias current.

IICs with partial air gap for use as power inductors

GRADE	L (μH) FOR 10 TURNS NO BIAS CURRENT			L (μH) FOR 10 TURNS WITH A BIAS CURRENT OF 1 A			TYPE NUMBER
	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	
3C30 des	92 ±25%	–	–	≥5	–	–	IIC10P-14/4-3C30
3F4 des	–	–	45 ±25%	–	–	≥5	IIC10P-14/4-3F4
3F35 des	–	70 ±25%	–	–	≥5	–	IIC10P-14/4-3F35

IICs with partial air gap under power conditions

GRADE	CORE LOSS (mW) at			TYPE NUMBER
	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	
3C30	≤30	–	–	IIC10P-14/4-3C30
3F4	–	–	≤70	IIC10P-14/4-3F4
3F35	–	≤40	–	IIC10P-14/4-3F35

IIC10-14/4

Effective core parameters

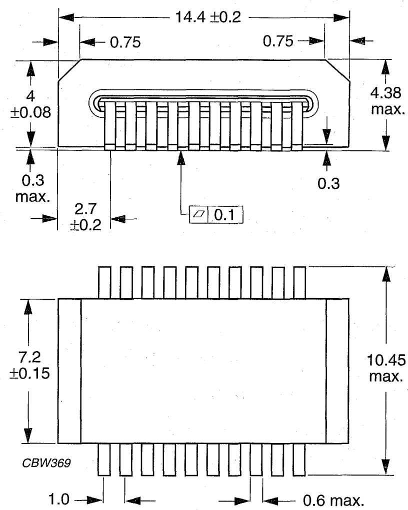
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.47	mm^{-1}
V_e	effective volume	338	mm^3
l_e	effective length	28.9	mm
A_e	effective area	11.7	mm^2
m	mass of core half	≈1.85	g

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Several magnetic functions, depending on track layout.

APPLICATIONS

- Common-mode choke
- Mutli-line choke
- Power transformers
- Signal transformers
- Saturable inductor.



Dimensions in mm.

Fig.2 IIC10-14/4 outline.

IICs for use as transformer or common-mode chokes

GRADE	A_L (nH) at			CORE LOSS (mW) at		TYPE NUMBER
	f = 10 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	
3F4 des	−	−	450 ±25%	−	≤70	IIC10-14/4-3F4
3E6 des	6000 ±30%	−	−	−	−	IIC10-14/4-3E6
3F35 des	−	700 ±25%	−	≤40	−	IIC10-14/4-3F35

IIC for use as a common-mode choke or multi-line choke

GRADE	|Z| Ω for 1 turn at f = 100 MHz; T = 25 °C(1)	TYPE NUMBER
3S4 des	≈35	IIC10-14/4-3S4

Note

1. Minimum value, $|Z|_{min}$ is −20%.

IIC with rectangular hysteresis loop for use in magnetic regulators

GRADE	E.t product (V.μs) at		TYPE NUMBER
	f = 100 kHz; H = 800 A/m; T = 100 °C; I_{reset} = 70 mA; 10 turns	f = 100 kHz; H = 800 A/m; T = 100 °C; I_{reset} = 0 mA; 10 turns	
3R1 des	≥33	≤12	IIC10-14/4-3R1

GENERAL DATA

ITEM	SPECIFICATION
Leadframe material	copper (Cu), tin-lead (SnPb) plated
Moulding material	liquid crystal polymer (LCP), flame retardant in accordance with *"ULV94-0"*
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-3"* and *"EIA 481-1"*

R_{dc}

≈65 mΩ (25 °C) and ≈85 mΩ (100 °C) for 10 turns including 20 solder joints (assuming 70 µm Cu PCB tracks).

Isolation voltage

>500 V (DC) between leads and between leads and ferrite core.

Isolation resistance

>100 MΩ between leads.

Inter winding capacitance

2 windings of 5 turns:

unifilar ≈5 pF

bifilar ≈10 pF.

(depending on track layout; see Figs 1 and 2)

Leakage inductance

2 windings of 5 turns:

unifilar ≈1.8 µH

bifilar ≈0.2 µH.

Maximum continuous current (DC)

4 A (depending on copper track thickness on PCB).

Maximum peak current

10 A.

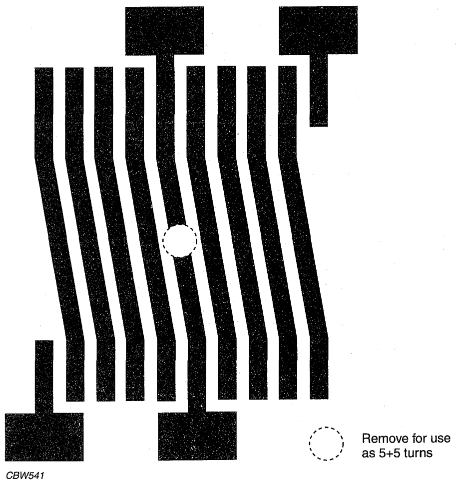


Fig.3 Unifilar track pattern.

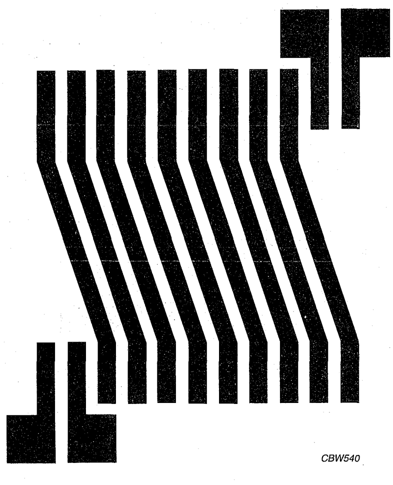


Fig.4 Bifilar track pattern.

MOUNTING

Soldering information

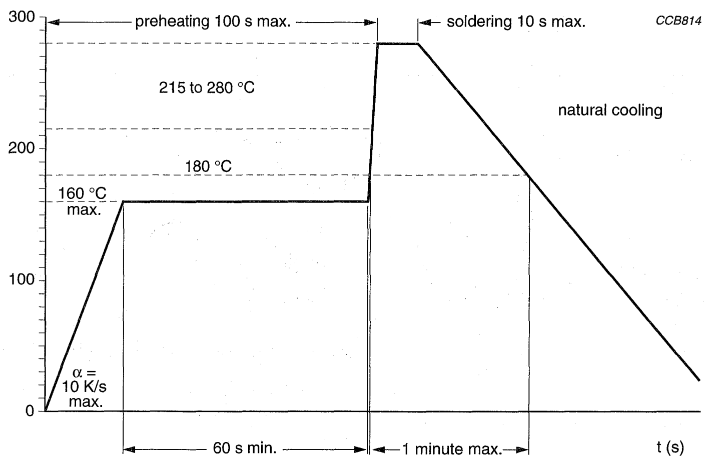


Fig.5 Recommended temperature profile for reflow soldering.

RECOMMENDED SOLDER LANDS

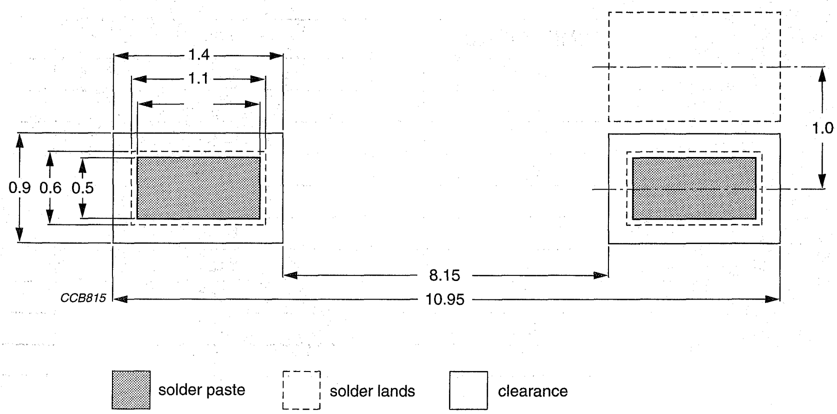


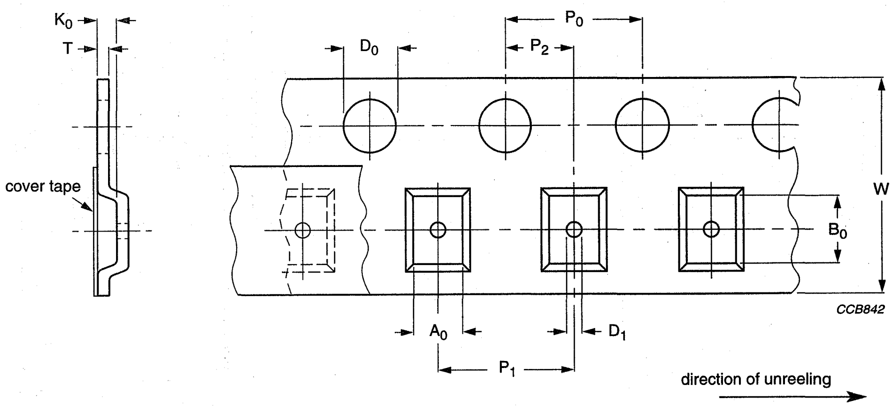
Fig.6 Recommended solder lands

PACKAGING

Tape and reel specifications

All tape and reel specifications are in accordance with the second edition of *"IEC 60286-3"*. Basic dimensions are given in Figs 7 and 8, and Table 1.

Blister tape



K_0: chosen so that the orientation of the component cannot change.
For dimensions see Table 1.

Fig.7 Blister tape.

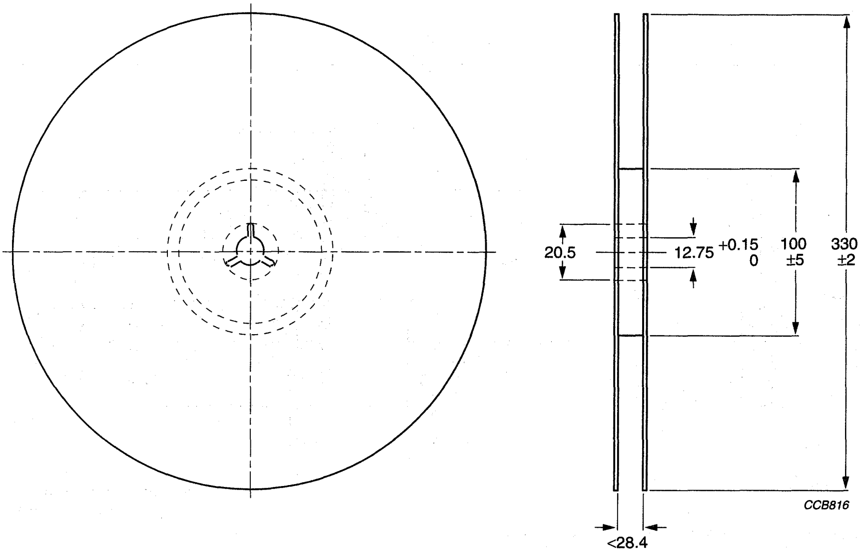
Table 1 Dimensions of blister tape; see Fig.7

SYMBOL	DIMENSIONS	TOL.	UNIT
A_0	10.6	±0.1	mm
B_0	14.75	±0.1	mm
K_0	4.75	±0.1	mm
W	24	±0.3	mm
D_0	1.5	±0.1	mm
D_1	1.5	±0.25	mm
P_0; note 1	4	±0.1	mm
P_1	12	±0.1	mm
P_2	6	±0.1	mm
T	0.3	±0.1	mm

Note

1. P_0 pitch tolerance over any 10 pitches is ±0.2 mm.

Reel specifications



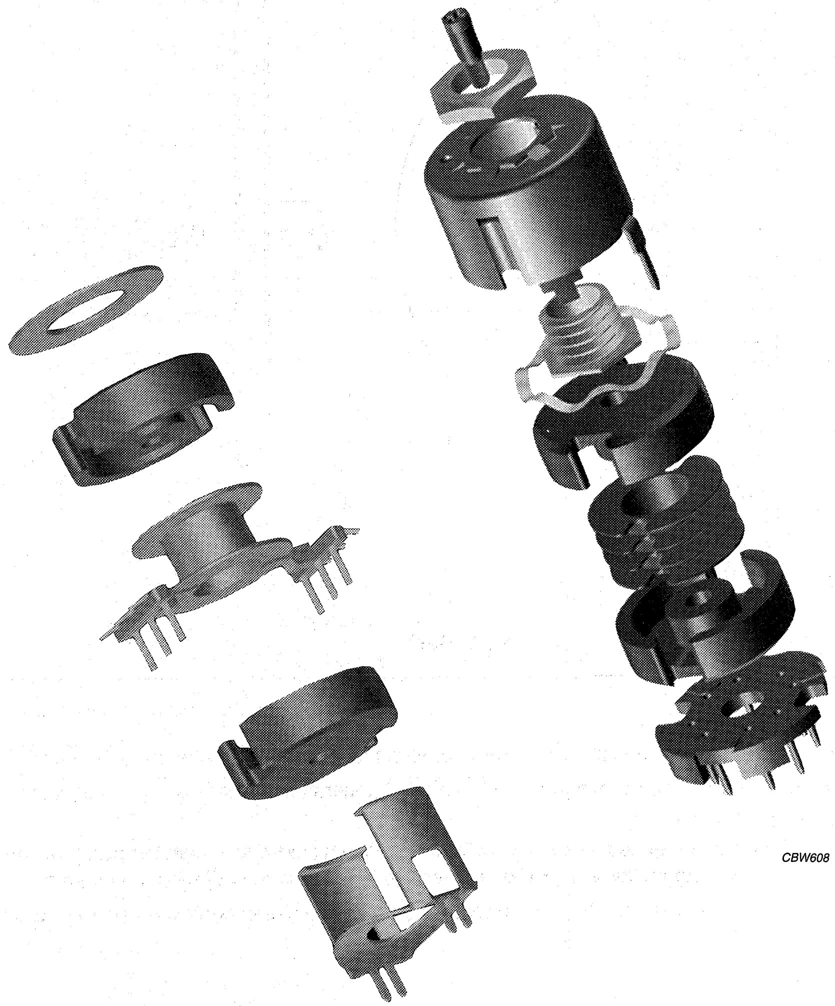
Dimensions in mm.

Fig.8 Reel.

Storage requirements

These storage requirements should be observed in order to ensure the soldering of the exposed electrode:

- Maximum ambient temperature shall not exceed 40 °C. Storage temperature higher than 40 °C could result in the deformation of packaging materials.
- Maximum relative humidity recommended for storage is 70% RH. High humidity with high temperature can accelerate the oxidation of the tin-lead plating on the termination and reduce the solderability of the components.
- Products shall not be stored in environments with the presence of harmful gases containing sulfur or chlorine.



For more information on Product Status Definitions, see page 3.

Soft Ferrites

P, P/I, PT cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview P cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
P9/5	126	10.1	0.8
P11/7	251	16.2	1.8
P11/7/I	309	19.0	1.9
P14/8	495	25.1	3.2
P14/18/I	628	29.9	3.5
PT14/8	492	23.3	2.8
P18/11	1120	43.3	6.0
P18/11/I	1270	47.5	7
PT18/11	1110	40.6	6
P22/13	2000	63.4	12
P22/13/I	2460	73.4	13
PT23/11	1740	61.0	10.5
PT23/18	2590	62.2	14
P26/16	3530	93.9	20
P26/16/I	4370	110	21
P30/19	6190	137	34
P36/22	10700	202	54
P42/29	18200	265	104

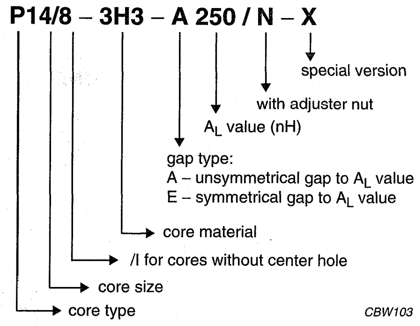


Fig.1 Type number structure for cores.

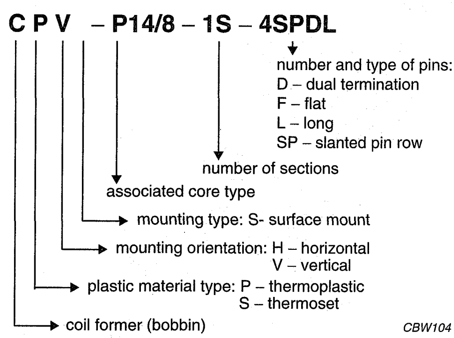


Fig.2 Type number structure for coil formers.

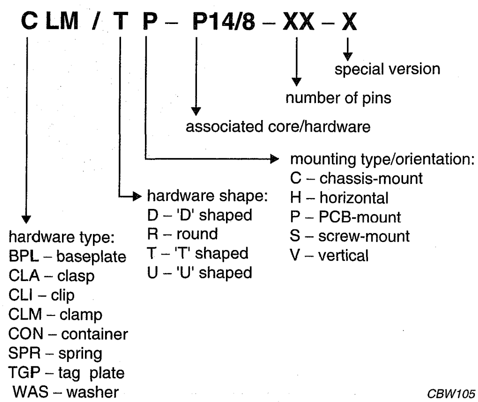
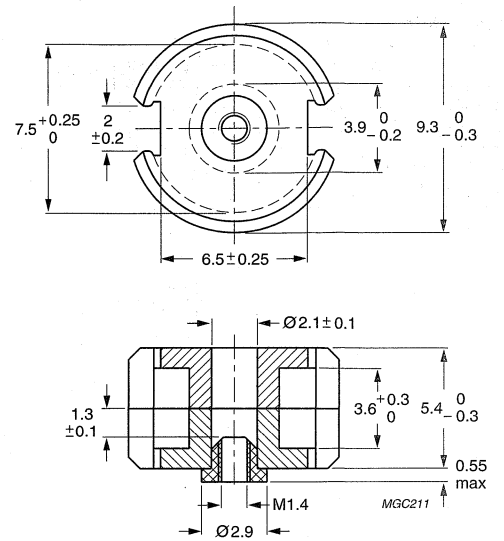


Fig.3 Type number structure for hardware.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈0.8	g



Dimensions in mm.

Fig.1 P9/5 core set.

Core sets for filter applications

Clamping force for A_L measurements, 25 ±5 N.

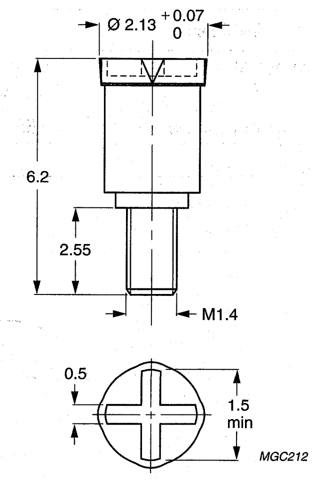
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈40	≈400	P9/5-3D3-E40/N	P9/5-3D3-E40
	63 ±3%	≈63	≈200	P9/5-3D3-A63/N	P9/5-3D3-A63
	630 ±25%	≈630	≈0	−	P9/5-3D3

P cores and accessories P9/5

INDUCTANCE ADJUSTERS

General data

ITEM	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P9/5 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L$(1)	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L$(1)	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L$(1)
3D3	40	–	–	ADJ-P9/P11-YELLOW	11	–	–
	63	–	–	–	18	ADJ-P9/P11-BROWN	31

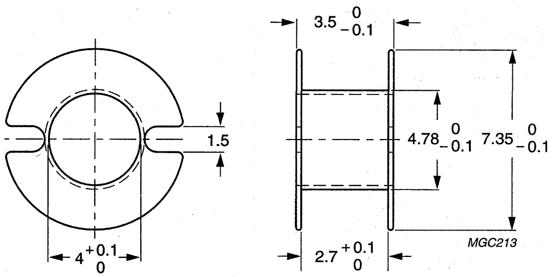
Note

1. Maximum adjustment range.

COIL FORMERS

General data for coil former CP-P9/5-1S

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.3 Coil former: CP-P9/5-1S.

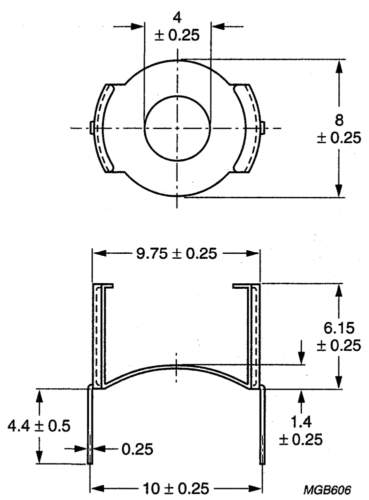
Winding data for coil former CP-P9/5-1S

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.1	2.5	18.9	CP-P9/5-1S

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	spring steel, tin plated	4	CLM/TP-P9/5



Dimensions in mm.

Fig.4 Clamp: CLM/TP-P9/5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈1.8	g

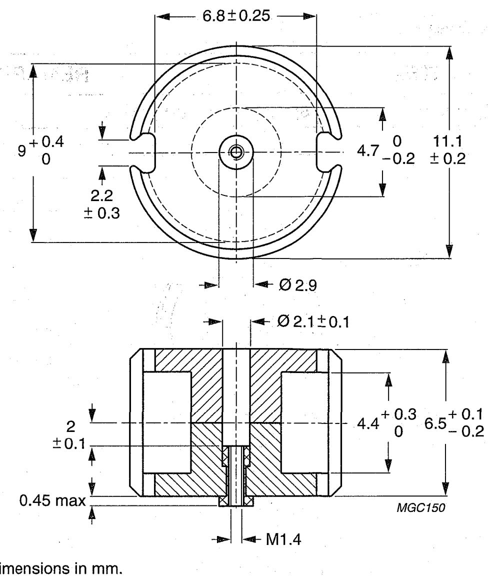


Fig.1 P11/7 core set.

Core sets for filter applications

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	16 ±3%	≈12	≈1500	P11/7-3D3-E16/N	P11/7-3D3-E16
	25 ±3%	≈19	≈900	P11/7-3D3-E25/N	P11/7-3D3-E25
	40 ±3%	≈31	≈600	P11/7-3D3-E40/N	P11/7-3D3-E40
	63 ±3%	≈48	≈350	P11/7-3D3-E63/N	P11/7-3D3-E63
	100 ±3%	≈76	≈200	P11/7-3D3-A100/N	P11/7-3D3-A100
	800 ±25%	≈610	≈0	−	P11/7-3D3
3H3 sup	160 ±3%	≈122	≈110	P11/7-3H3-A160/N	P11/7-3H3-A160
	250 ±3%	≈190	≈70	P11/7-3H3-A250/N	P11/7-3H3-A250
	1650 ±25%	≈1250	≈0	−	P11/7-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	100 ±3%	≈76	≈200	P11/7-3C81-A100
	160 ±3%	≈122	≈110	P11/7-3C81-A160
	250 ±3%	≈190	≈70	P11/7-3C81-A250
	2020 ±25%	≈1540	≈0	P11/7-3C81
3F3 sup	100 ±3%	≈76	≈200	P11/7-3F3-A100
	160 ±3%	≈122	≈110	P11/7-3F3-A160
	250 ±5%	≈190	≈70	P11/7-3F3-A250
	1500 ±25%	≈1150	≈0	P11/7-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E4 sup	4100 +40/–30%	≈3100	≈0	P11/7-3E4

Properties of core sets under power conditions

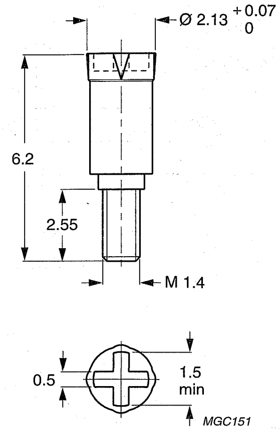
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.05	–	–
3F3	≥315	–	≤0.03	≤0.05

P cores and accessories P11/7

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P11/7 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1)
3H3	100	–	–	ADJ-P9/P11-YELLOW	13	ADJ-P9/P11-BROWN	24
	160	ADJ-P9/P11-YELLOW	8	ADJ-P9/P11-BROWN	15	ADJ-P9/P11-GREY	22
	250	ADJ-P9/P11-BROWN	9	ADJ-P9/P11-GREY	14	–	–
3D3	16	–	–	ADJ-P9/P11-YELLOW	19	–	–
	25	–	–	–	–	ADJ-P9/P11-YELLOW	30
	40	–	–	–	–	ADJ-P9/P11-YELLOW	24
	63	–	–	ADJ-P9/P11-YELLOW	18	–	–
	100	–	–	ADJ-P9/P11-YELLOW	11	–	–

Note

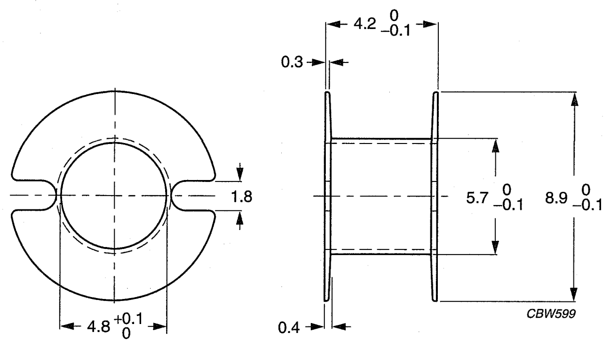
1. Maximum adjustment range.

P cores and accessories P11/7

COIL FORMERS

General data CP-P11/7-1S coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.3 Coil former: CP-P11/7-1S.

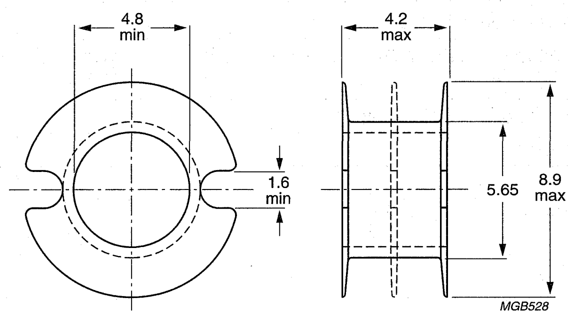
Winding data for CP-P11/7-1S coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.8	3.1	22.6	CP-P11/7-1S

P cores and accessories P11/7

General data for CP-P11/7-A coil former

PARAMETER	SPECIFICATION
Coil former material	acetal (POM), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E66288(R)
Maximum operating temperature	105 °C



Dimensions in mm.

Fig.4 Coil former: CP-P11/7-A.

Winding data for CP-P11/7-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 2.00	2 × 1.52	22.7	CP-P11/7-2S-A
3	3 × 1.16	3 × 0.91	22.7	CP-P11/7-3S-A(1)

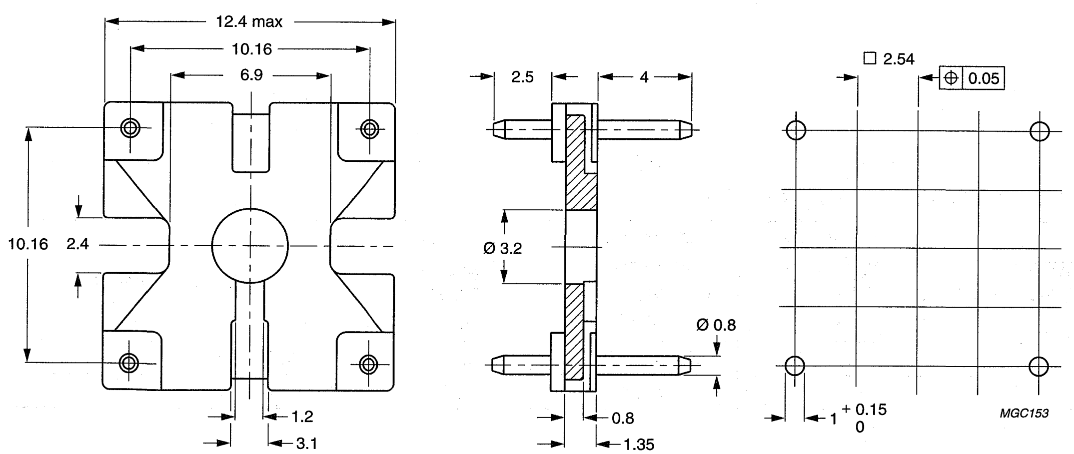
Note

1. UL file number E93370(M).

MOUNTING PARTS

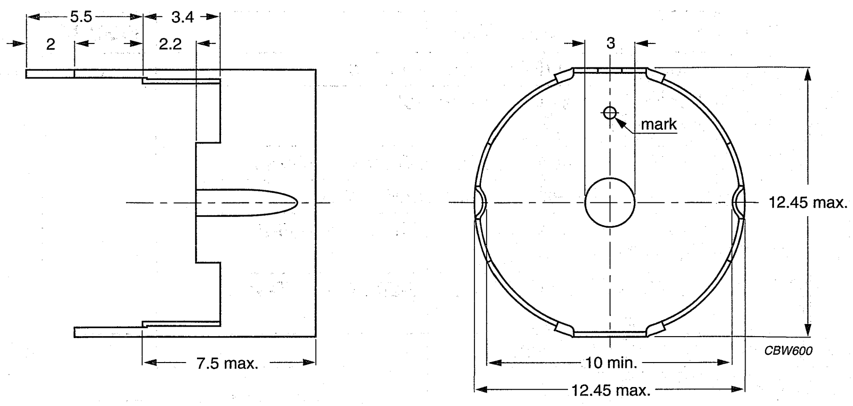
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P11/7-4P
	flame retardant: in accordance with *"UL 94V-0"*; file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P11/7
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P11/7
	spring force: ≈35 N when mounted		
Clamp	spring steel, tin-plated	8	CLM/TP-P11/7



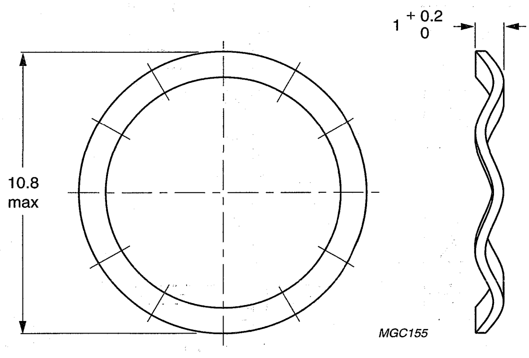
Dimensions in mm.

Fig.5 P11/7 tag plate.



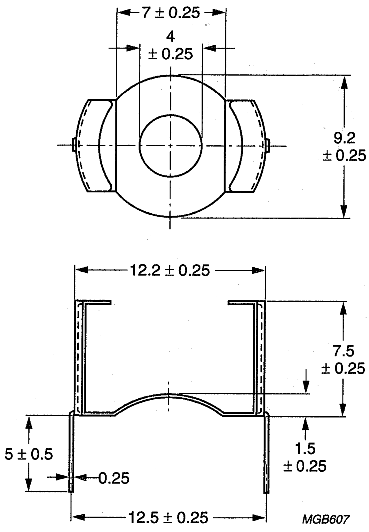
Dimensions in mm.

Fig.6 Container: CON-P11/7.



Dimensions in mm.

Fig.7 Spring: SPR-P11/7.



Dimensions in mm.

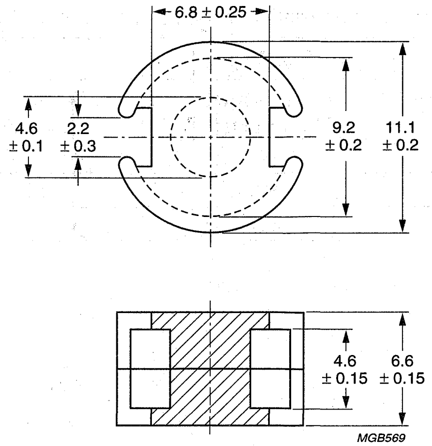
Fig.8 Clamp: CLM/TP-P11/7.

P cores and accessories P11/7/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.860	mm^{-1}
V_e	effective volume	309	mm^3
l_e	effective length	16.3	mm
A_e	effective area	19.0	mm^2
A_{min}	minimum area	13.9	mm^2
m	mass of set	≈1.9	g



Dimensions in mm.

Fig.1 P11/7/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈43	≈475	P11/7/I-3C81-A63
	100 ±3%	≈68	≈277	P11/7/I-3C81-A100
	160 ±3%	≈109	≈160	P11/7/I-3C81-A160
	250 ±5%	≈170	≈97	P11/7/I-3C81-A250
	315 ±5%	≈215	≈74	P11/7/I-3C81-A315
	2100 ±25%	≈1440	≈0	P11/7/I-3C81
3F3	63 ±3%	≈43	≈475	P11/7/I-3F3-A63
	100 ±3%	≈68	≈277	P11/7/I-3F3-A100
	160 ±3%	≈109	≈160	P11/7/I-3F3-A160
	250 ±5%	≈170	≈97	P11/7/I-3F3-A250
	315 ±5%	≈215	≈74	P11/7/I-3F3-A315
	1750 ±25%	≈1211	≈0	P11/7/I-3F3

P cores and accessories P11/7/I

Properties of core sets under power conditions

For coil former and winding data, see data sheet, *"P11/7"*.

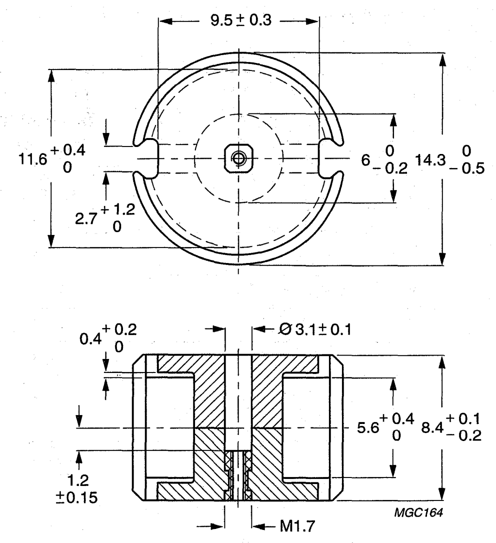
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.07	–	–
3F3	≥320	–	≤0.04	≤0.06

P cores and accessories P14/8

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of set	≈3.2	g



Dimensions in mm.

Fig.1 P14/8 core set.

Core sets for filter applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈25	≈900	P14/8-3D3-E40/N	P14/8-3D3-E40
	63 ±3%	≈40	≈550	P14/8-3D3-E63/N	P14/8-3D3-E63
	100 ±3%	≈63	≈300	P14/8-3D3-E100/N	P14/8-3D3-E100
	1000 ±25%	≈630	≈0	−	P14/8-3D3
3H3 sup	160 ±3%	≈100	≈180	P14/8-3H3-A160/N	P14/8-3H3-A160
	250 ±3%	≈157	≈110	P14/8-3H3-A250/N	P14/8-3H3-A250
	315 ±3%	≈198	≈80	P14/8-3H3-A315/N	P14/8-3H3-A315
	400 ±3%	≈252	≈60	P14/8-3H3-A400/N	P14/8-3H3-A400
	2150 ±25%	≈1350	≈0	−	P14/8-3H3

P cores and accessories P14/8

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈40	≈650	P14/8-3C81-E63
	100 ±3%	≈63	≈380	P14/8-3C81-A100
	160 ±3%	≈100	≈180	P14/8-3C81-A160
	250 ±3%	≈157	≈110	P14/8-3C81-A250
	315 ±3%	≈198	≈80	P14/8-3C81-A315
	2800 ±25%	≈1760	≈0	P14/8-3C81
3F3	63 ±3%	≈40	≈650	P14/8-3F3-E63
	100 ±3%	≈63	≈380	P14/8-3F3-A100
	160 ±3%	≈100	≈180	P14/8-3F3-A160
	250 ±3%	≈157	≈110	P14/8-3F3-A250
	315 ±3%	≈198	≈80	P14/8-3F3-A315
	2000 ±25%	≈1250	≈0	P14/8-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	3700 ±25%	≈2350	P14/8-3E1
3E4 sup	5300 +40/−30%	≈3300	P14/8-3E4
3E27	5750 ±25%	≈3610	P14/8-3E27

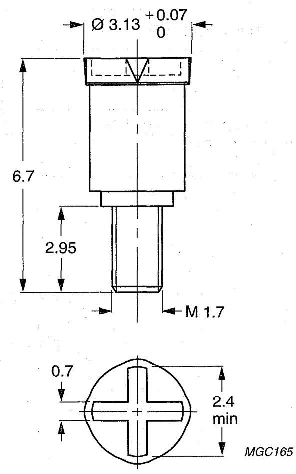
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.10	−	−
3F3	≥315	−	≤0.06	≤0.10

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P14/8 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L$ (1)	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L$ (1)	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L$ (1)
3H3	100	–	–	ADJ-P14-ORANGE	14	–	–
	160	–	–	ADJ-P14-WHITE	17	ADJ-P14-BROWN	24
	250	ADJ-P14-WHITE	10	ADJ-P14-BROWN	15	–	–
	315	ADJ-P14-WHITE	8	–	–	–	–
	400	ADJ-P14-BROWN	9	–	–	–	–
	630	ADJ-P14-BROWN	4	–	–	–	–
3D3	40	–	–	–	–	ADJ-P14-ORANGE	24
	63	–	–	–	–	ADJ-P14-ORANGE	20
	100	ADJ-P14-ORANGE	11	–	–	–	–

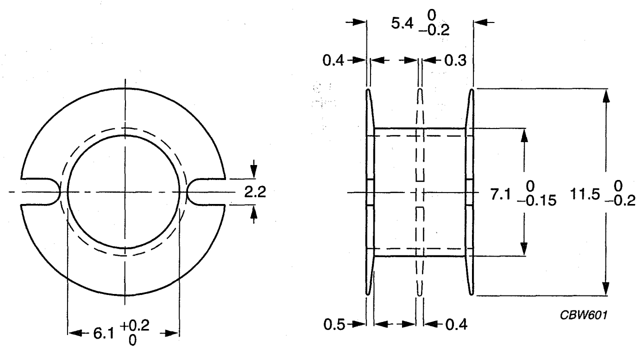
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P14/8 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

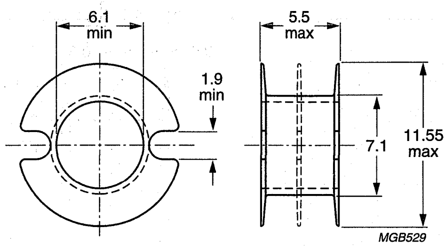
Fig.3 Coil former CP-P14/8.

Winding data for CP-P14/8 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8.8	4.1	28.9	CP-P14/8-1S
2	2 × 4.0	2 × 1.85	28.9	CP-P14/8-2S

General data for CP-P14/8-A coil former

PARAMETER	SPECIFICATION
Coil former material	acetal (POM), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E66288(R)
Maximum operating temperature	105 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.4 Coil former CP-P14/8-A.

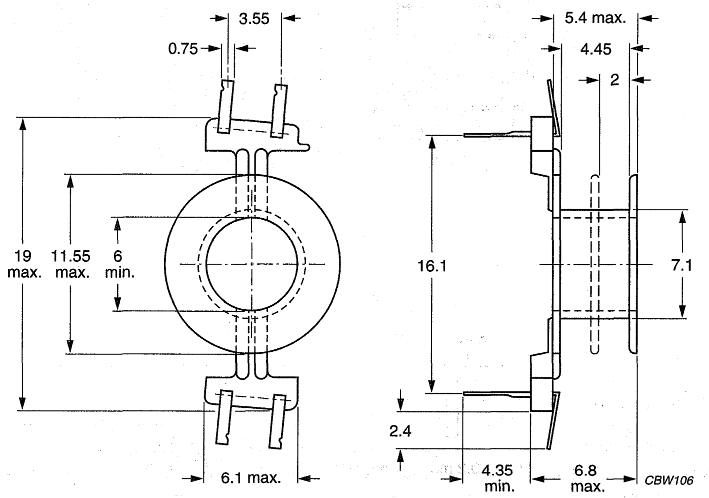
Winding data for CP-P14/8-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
3	3 × 2.19	3 × 1.2	29.3	CP-P14/8-3S-A

P cores and accessories P14/8

General data 4-pins P14/8 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.5 P14/8 coil former for PCB mounting; 4-pins.

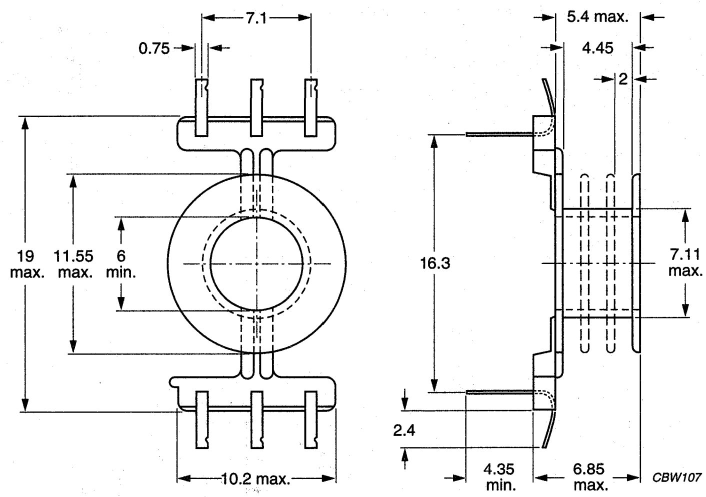
Data for 4-pins P14/8 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	8.65	4.4	29.0	4.4	CPV-P14/8-1S-4SPD
1	8.65	4.4	29.0	6.8	CPV-P14/8-1S-4SPDL
2	2 × 3.87	2 × 2.0	29.0	4.4	CPV-P14/8-2S-4SPD
2	2 × 3.87	2 × 2.0	29.0	6.8	CPV-P14/8-2S-4SPDL

P cores and accessories P14/8

General data 6-pins P14/8 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.6 P14/8 coil former for PCB mounting; 6-pins.

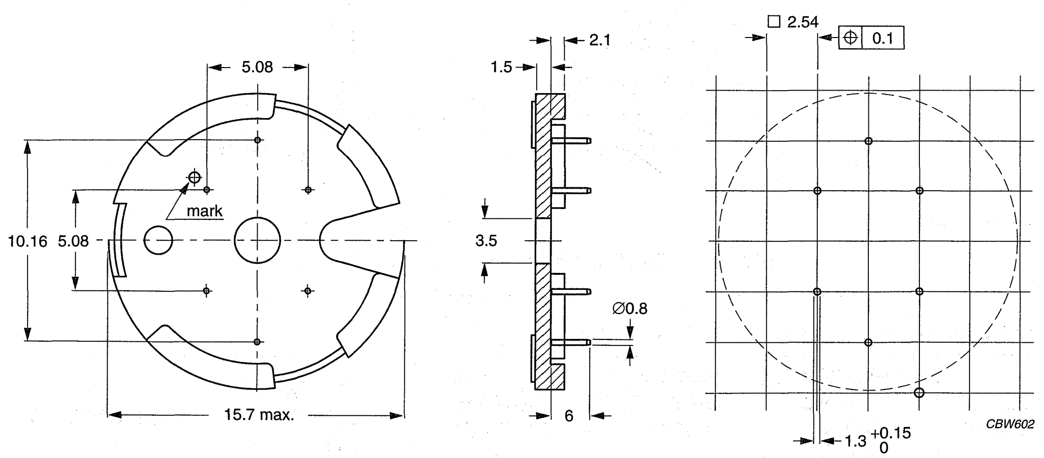
Data for 6-pins P14/8 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	8.65	4.4	29.0	4.4	CPV-P14/8-1S-6PD
1	8.65	4.4	29.0	6.8	CPV-P14/8-1S-6PDL
2	2 × 3.87	2 × 2.0	29.0	4.4	CPV-P14/8-2S-6PD
2	2 × 3.87	2 × 2.0	29.0	6.8	CPV-P14/8-2S-6PDL

MOUNTING PARTS

General data for mounting parts

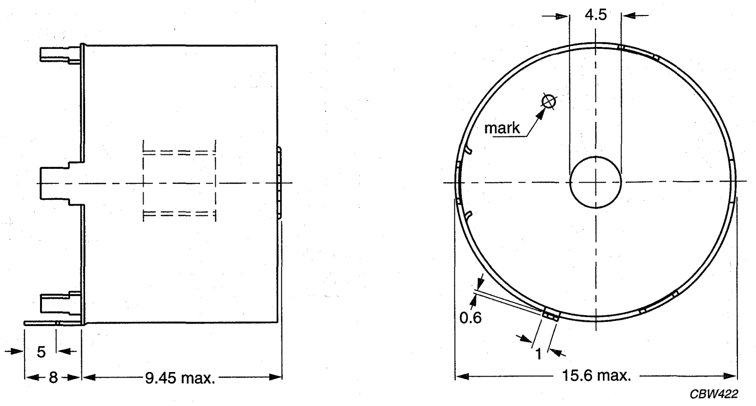
ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	7	TGP-P14/8-6P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	8	CON-P14/8
	earth pins: presoldered		
Spring	CrNi-steel	9	SPR-P14/8
	spring force: ≈60 N when mounted		
Clamp	spring steel, tin-plated	10	CLM/TP-P14/8
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TP-P14/8



Dimensions in mm.

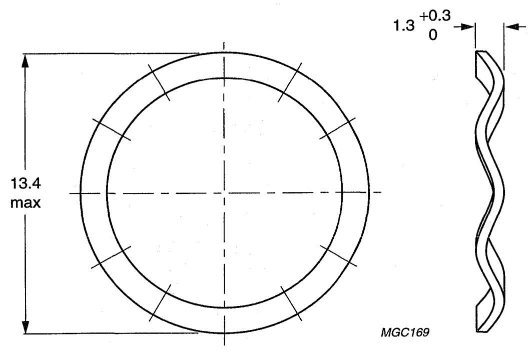
Fig.7 Tag plate: TGP-P14/8.

P cores and accessories P14/8



Dimensions in mm.

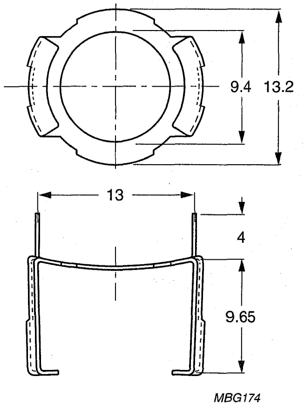
Fig.8 Container: CON-P14/8.



Dimensions in mm.

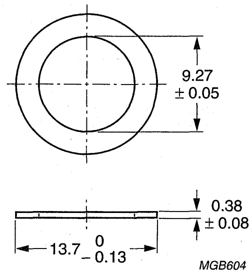
Fig.9 Spring: SPR-P14/8.

P cores and accessories P14/8



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P14/8.



Dimensions in mm.

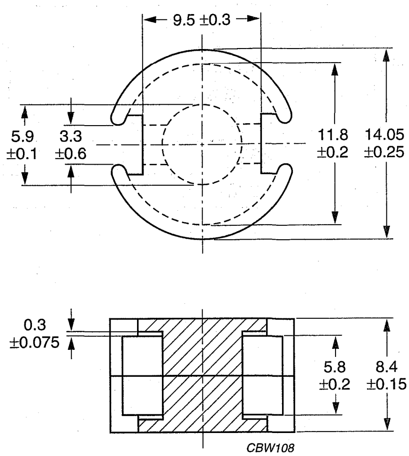
Fig.11 Washer: WAS-CLM/TP-P14/8.

P cores and accessories P14/8/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.700	mm^{-1}
V_e	effective volume	628	mm^3
l_e	effective length	21.0	mm
A_e	effective area	29.9	mm^2
A_{min}	minimum area	21.3	mm^2
m	mass of set	≈3.5	g



Dimensions in mm.

Fig.1 P14/8/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	100 ±3%	≈56	≈455	P14/8/I-3C81-A100
	160 ±3%	≈89	≈264	P14/8/I-3C81-A160
	250 ±3%	≈139	≈157	P14/8/I-3C81-A250
	315 ±5%	≈175	≈119	P14/8/I-3C81-A315
	400 ±5%	≈223	≈92	P14/8/I-3C81-A400
	2900 ±25%	≈1610	≈0	P14/8/I-3C81
3F3	100 ±3%	≈56	≈455	P14/8/I-3F3-A100
	160 ±3%	≈89	≈264	P14/8/I-3F3-A160
	250 ±3%	≈139	≈157	P14/8/I-3F3-A250
	315 ±5%	≈175	≈119	P14/8/I-3F3-A315
	400 ±5%	≈223	≈92	P14/8/I-3F3-A400
	2400 ±25%	≈1330	≈0	P14/8/I-3F3

P cores and accessories P14/8/I

Properties of core sets under power conditions

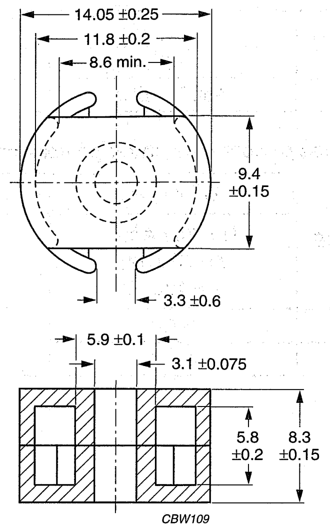
For coil former and winding data, see data sheet, *"P14/8"*.

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤0.15	–	–
3F3	≥320	–	≤0.07	≤0.12

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.910	mm^{-1}
V_e	effective volume	492	mm^3
l_e	effective length	21.1	mm
A_e	effective area	23.3	mm^2
A_{min}	minimum area	19.9	mm^2
m	mass of set	≈2.8	g



Dimensions in mm.

Fig.1 PT14/8 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 15 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈45	≈594	PT14/8-3C81-A63
	100 ±3%	≈72	≈345	PT14/8-3C81-A100
	160 ±3%	≈115	≈201	PT14/8-3C81-A160
	250 ±3%	≈180	≈119	PT14/8-3C81-A250
	315 ±5%	≈227	≈89	PT14/8-3C81-A315
	2400 ±25%	≈1730	≈0	PT14/8-3C81
3F3	63 ±3%	≈45	≈594	PT14/8-3F3-A63
	100 ±3%	≈72	≈345	PT14/8-3F3-A100
	160 ±3%	≈115	≈201	PT14/8-3F3-A160
	250 ±3%	≈180	≈119	PT14/8-3F3-A250
	315 ±5%	≈227	≈89	PT14/8-3F3-A315
	1650 ±25%	≈1190	≈0	PT14/8-3F3

P cores and accessories

PT14/8 (1408TS)

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E27	4500 ±25%	≈3240	≈0	PT14/8-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.11	–	–
3F3	≥320	–	≤0.06	≤0.10

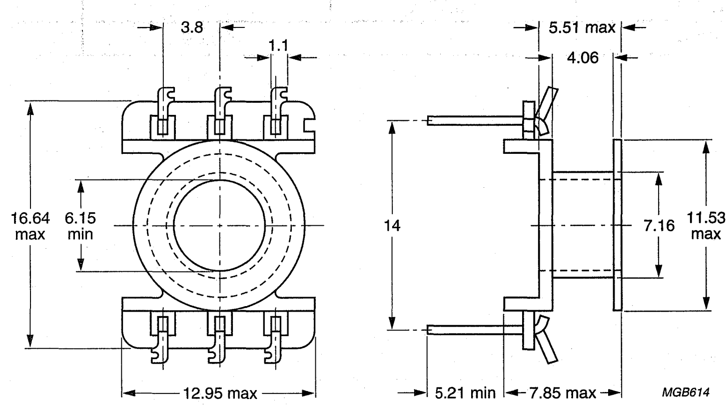
P cores and accessories

PT14/8 (1408TS)

COIL FORMERS

General data 6-pins PT14/8 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"* class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PT14/8 coil former; 6-pins.

Winding data for 6-pins PT14/8 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	7.9	4.1	29.2	CPV-PT14/8-1S-6P

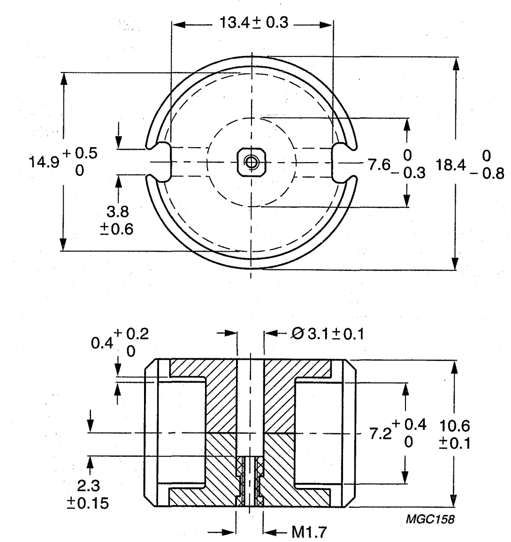
Note

1. For additional coil formers and mounting parts, see data sheet, *"P14/8"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈6.0	g



Dimensions in mm.

Fig.1 P18/11 core set.

Core sets for filter applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	63 ±3%	≈30	≈1100	P18/11-3D3-E63/N	P18/11-3D3-E63
	100 ±3%	≈48	≈550	P18/11-3D3-E100/N	P18/11-3D3-E100
	160 ±3%	≈76	≈300	P18/11-3D3-E160/N	P18/11-3D3-E160
	1400 ±25%	≈670	≈0	–	P18/11-3D3
3H3 sup	160 ±3%	≈76	≈350	P18/11-3H3-E160/N	P18/11-3H3-E160
	250 ±3%	≈119	≈200	P18/11-3H3-A250/N	P18/11-3H3-A250
	315 ±3%	≈149	≈150	P18/11-3H3-A315/N	P18/11-3H3-A315
	400 ±3%	≈190	≈120	P18/11-3H3-A400/N	P18/11-3H3-A400
	630 ±5%	≈300	≈80	P18/11-3H3-A630/N	P18/11-3H3-A630
	3100 ±25%	≈1470	≈0	–	P18/11-3H3

P cores and accessories P18/11

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈46	≈680	P18/11-3C81-E100
	160 ±3%	≈76	≈350	P18/11-3C81-A160
	250 ±3%	≈119	≈200	P18/11-3C81-A250
	315 ±3%	≈149	≈150	P18/11-3C81-A315
	400 ±3%	≈190	≈120	P18/11-3C81-A400
	4000 ±25%	≈1900	≈0	P18/11-3C81
3F3 sup	100 ±3%	≈46	≈680	P18/11-3F3-E100
	160 ±3%	≈76	≈350	P18/11-3F3-A160
	250 ±3%	≈119	≈200	P18/11-3F3-A250
	315 ±3%	≈149	≈150	P18/11-3F3-A315
	400 ±3%	≈190	≈120	P18/11-3F3-A400
	2850 ±25%	≈1350	≈0	P18/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	5400 ±25%	≈2560	P18/11-3E1
3E27	7500 ±25%	≈3560	P18/11-3E27
3E4 sup	7550 +40/-30%	≈3580	P18/11-3E4

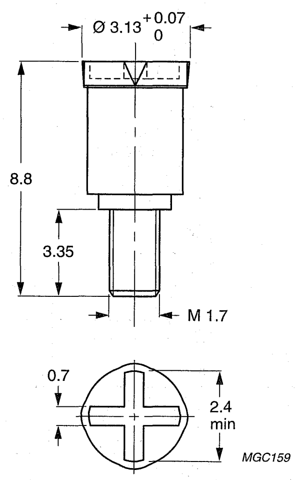
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.26	–	–
3F3	≥315	–	≤0.13	≤0.22

INDUCTANCE ADJUSTERS

General data

ITEM	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P18/11 inductance adjuster.

Inductance adjuster selection chart (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1)	types for medium adjustment	ΔL/L(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1)
3H3	63	–	–	ADJ-P18-YELLOW	16	–	–
	100	–	–	–	–	ADJ-P18-BROWN	42
	160	ADJ-P18-YELLOW	9	ADJ-P18-RED	18	ADJ-P18-BROWN	28
	250	ADJ-P18-RED	11	ADJ-P18-WHITE	14	ADJ-P18-BROWN	18
	315	ADJ-P18-RED	8	ADJ-P18-BROWN	14	ADJ-P18-VIOLET	20
	400	ADJ-P18-WHITE	8	ADJ-P18-VIOLET	16	–	–
	630	ADJ-P18-VIOLET	8	–	–	–	–
	1000	ADJ-P18-VIOLET	5	–	–	–	–
	1250	–	–	–	–	–	–
3D3	40	–	–	–	–	ADJ-P18-YELLOW	19
	63	–	–	ADJ-P18-YELLOW	17	–	–
	100	–	–	–	–	ADJ-P18-RED	26
	160	–	–	ADJ-P18-RED	15	–	–

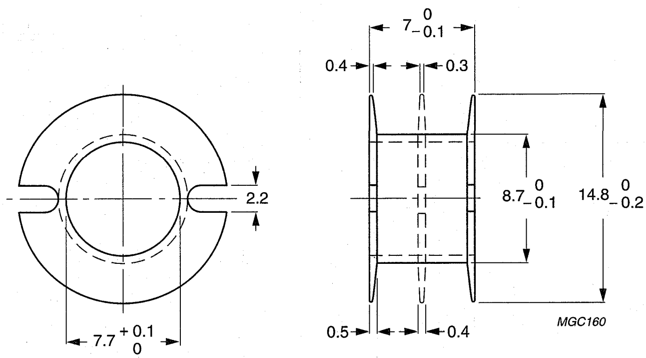
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P18/11

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.3 CP-P18/11 coil former.

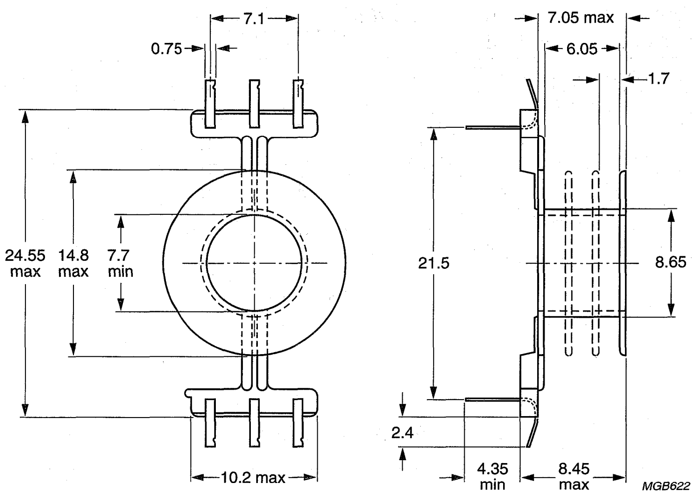
Winding data for CP-P18/11 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	17.1	5.7	36.6	CP-P18/11-1S
2	2 × 7.95	2 × 2.65	36.6	CP-P18/11-2S
3	3 × 4.95	3 × 1.6	36.6	CP-P18/11-3S

P cores and accessories P18/11

General data 6-pins P18/11 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.4 P18/11 coil former for PCB mounting; 6-pins.

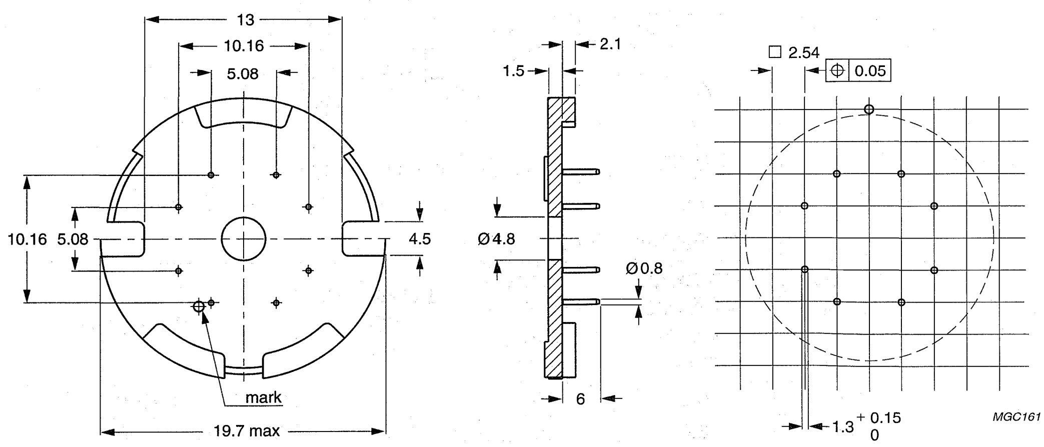
Data for 6-pins P18/11 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	16.8	6.0	36.7	4.4	CPV-P18/11-1S-6PD
1	16.8	6.0	36.7	6.8	CPV-P18/11-1S-6PDL
2	2 × 7.61	2 × 2.8	36.7	4.4	CPV-P18/11-2S-6PD
2	2 × 7.61	2 × 2.8	36.7	6.8	CPV-P18/11-2S-6PDL
3	3 × 4.58	3 × 1.7	36.7	4.4	CPV-P18/11-3S-6PD
3	3 × 4.58	3 × 1.7	36.7	6.8	CPV-P18/11-3S-6PDL

MOUNTING PARTS

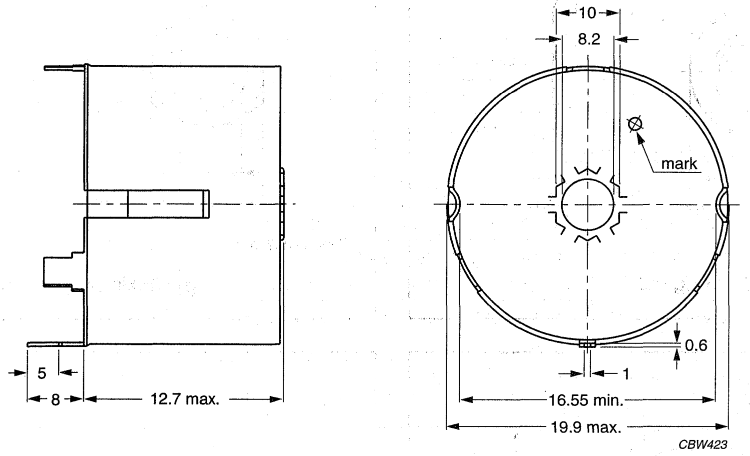
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P18/11-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P18/11
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P18/11
	spring force: ≈100 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	nickel-plated copper-zinc alloy	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TP-P18/11
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TP-P18/11



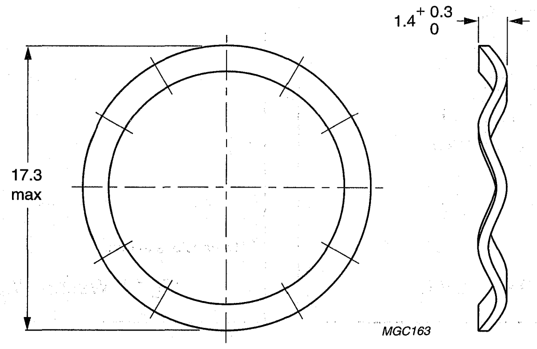
Dimensions in mm.

Fig.5 Tag plate: TGP-P18/11-8P.



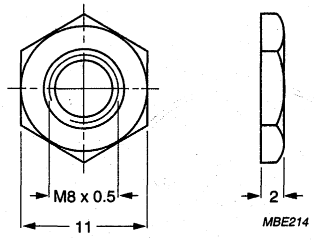
Dimensions in mm.

Fig.6 Container: CON-P18/11.



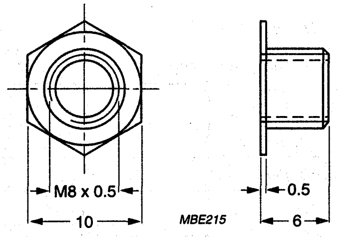
Dimensions in mm.

Fig.7 Spring: SPR-P18/11.



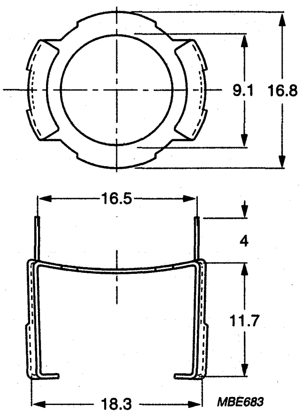
Dimensions in mm.

Fig.8 Fixing nut: NUT.



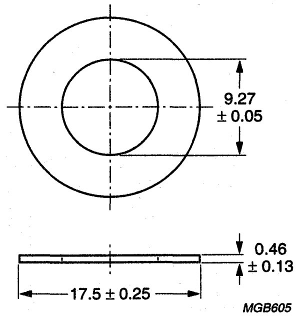
Dimensions in mm.

Fig.9 Fixing bush: FIB.



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P18/11.



Dimensions in mm.

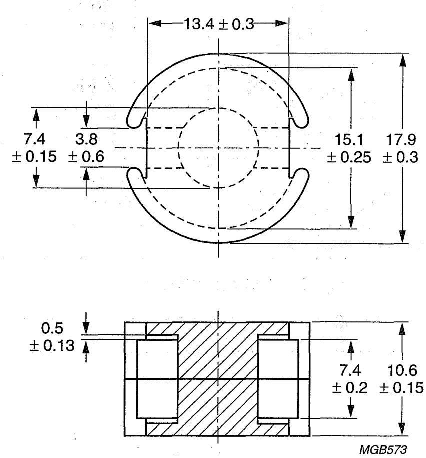
Fig.11 Washer: WAS-CLM/TP-P18/11.

P cores and accessories P18/11/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.560	mm^{-1}
V_e	effective volume	1270	mm^3
l_e	effective length	26.7	mm
A_e	effective area	47.5	mm^2
A_{min}	minimum area	42.9	mm^2
m	mass of set	≈7	g



Dimensions in mm.

Fig.1 P18/11/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	160 ±3%	≈72	≈432	P18/11/I-3C81-A160
	250 ±3%	≈112	≈259	P18/11/I-3C81-A250
	315 ±3%	≈141	≈198	P18/11/I-3C81-A315
	400 ±3%	≈179	≈150	P18/11/I-3C81-A400
	630 ±5%	≈282	≈86	P18/11/I-3C81-A630
	4200 ±25%	≈1870	≈0	P18/11/I-3C81
3C91 prot	4200 ±25%	≈1870	≈0	P18/11/I-3C91
3F3	160 ±3%	≈72	≈432	P18/11/I-3F3-A160
	250 ±3%	≈112	≈259	P18/11/I-3F3-A250
	315 ±3%	≈141	≈198	P18/11/I-3F3-A315
	400 ±3%	≈179	≈150	P18/11/I-3F3-A400
	630 ±5%	≈282	≈86	P18/11/I-3F3-A630
	3110 ±25%	≈1395	≈0	P18/11/I-3F3

P cores and accessories P18/11/I

Properties of core sets under power conditions

For coil former and winding data, see data sheet, *"P18/11"*.

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤0.26	–	–	–
3C91	≥320	–	≈0.12[(1)]	≈0.7[(1)]	–
3F3	≥320	–	≤0.14	–	≤0.24

Note

1. Measured at 60 °C.

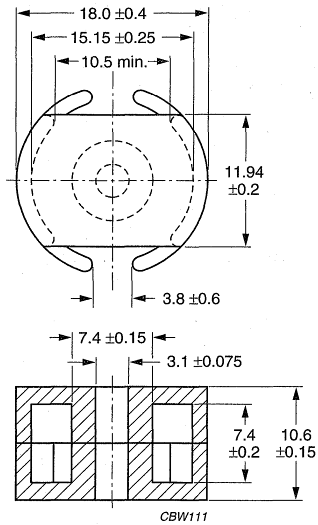
P cores and accessories

PT18/11 (1811TS)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.670	mm^{-1}
V_e	effective volume	1110	mm^3
l_e	effective length	27.2	mm
A_e	effective area	40.6	mm^2
A_{min}	minimum area	32.9	mm^2
m	mass of set	≈6	g



Dimensions in mm.

Fig.1 PT18/11 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈53	≈632	PT18/11-3C81-A100
	160 ±3%	≈85	≈366	PT18/11-3C81-A160
	250 ±3%	≈133	≈216	PT18/11-3C81-A250
	315 ±3%	≈168	≈165	PT18/11-3C81-A315
	400 ±5%	≈213	≈124	PT18/11-3C81-A400
	3130 ±25%	≈1670	≈0	PT18/11-3C81
3F3	100 ±3%	≈53	≈632	PT18/11-3F3-A100
	160 ±3%	≈85	≈366	PT18/11-3F3-A160
	250 ±3%	≈133	≈216	PT18/11-3F3-A250
	315 ±3%	≈168	≈165	PT18/11-3F3-A315
	400 ±5%	≈213	≈124	PT18/11-3F3-A400
	2505 ±25%	≈1340	≈0	PT18/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	5760 ±25%	≈3075	≈0	PT18/11-3E27

Properties of core sets under power conditions

For coil formers and mounting parts, see data sheet, *"P18/11"*.

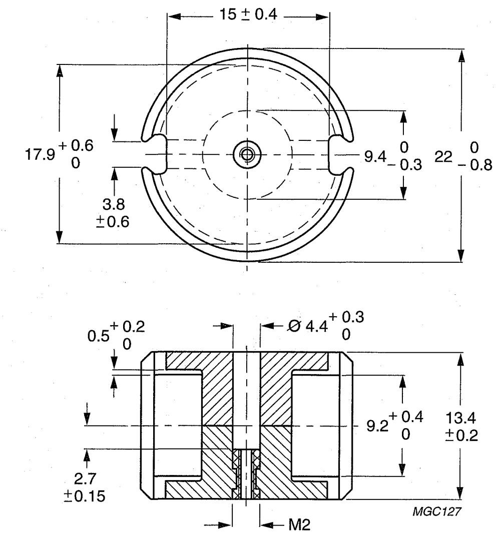
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.23	–	–
3F3	≥320	–	≤0.12	≤0.21

# P cores and accessories	P22/13

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈12	g



Dimensions in mm.

Fig.1 P22/13 core set.

Core sets for filter applications

Clamping force for A_L measurements, 140 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈16	≈3000	P22/13-3D3-E40/N	P22/13-3D3-E40
	63 ±3%	≈25	≈1500	P22/13-3D3-E63/N	P22/13-3D3-E63
	100 ±3%	≈40	≈900	P22/13-3D3-E100/N	P22/13-3D3-E100
	160 ±3%	≈64	≈500	P22/13-3D3-E160/N	P22/13-3D3-E160
	1700 ±25%	≈670	≈0	−	P22/13-3D3
3H3 sup	160 ±3%	≈64	≈500	P22/13-3H3-E160/N	P22/13-3H3-E160
	250 ±3%	≈99	≈300	P22/13-3H3-E250/N	P22/13-3H3-E250
	315 ±3%	≈125	≈250	P22/13-3H3-E315/N	P22/13-3H3-E315
	400 ±3%	≈158	≈170	P22/13-3H3-A400/N	P22/13-3H3-A400
	630 ±3%	≈249	≈100	P22/13-3H3-A630/N	P22/13-3H3-A630
	3900 ±25%	≈1540	≈0	−	P22/13-3H3

P cores and accessories P22/13

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 140 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈64	≈500	P22/13-3C81-A160
	250 ±3%	≈99	≈300	P22/13-3C81-A250
	315 ±3%	≈125	≈250	P22/13-3C81-A315
	400 ±3%	≈158	≈170	P22/13-3C81-A400
	630 ±3%	≈249	≈100	P22/13-3C81-A630
	5200 ±25%	≈2060	≈0	P22/13-3C81
3F3 sup	160 ±3%	≈64	≈500	P22/13-3F3-A160
	250 ±3%	≈99	≈300	P22/13-3F3-A250
	315 ±3%	≈125	≈250	P22/13-3F3-A315
	400 ±3%	≈158	≈170	P22/13-3F3-A400
	630 ±3%	≈249	≈100	P22/13-3F3-A630
	3550 ±25%	≈1410	≈0	P22/13-3F3

P cores and accessories P22/13

Core sets of high permeability grades

Clamping force for A_L measurements, 140 ±30 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	6900 ±25%	≈2730	P22/13-3E1
3E27	9250 ±25%	≈3660	P22/13-3E27
3E4 sup	9450 +40/−30%	≈3740	P22/13-3E4

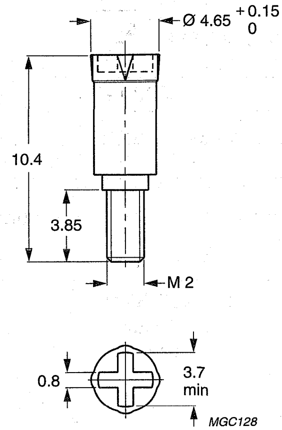
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.46	−	−
3F3	≥315	−	≤0.22	≤0.40

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P22/13 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L (1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L (1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L (1)
3H3	100	–	–	ADJ-P22/RM8-RED	16	ADJ-P22/RM8-ORANGE	21
	160	ADJ-P22/RM8-RED	11	ADJ-P22/RM8-YELLOW	18	ADJ-P22/RM8-WHITE	27
	250	ADJ-P22/RM8-YELLOW	12	ADJ-P22/RM8-WHITE	18	–	–
	315	ADJ-P22/RM8-YELLOW	9	–	–	ADJ-P22/RM8-BROWN	22
	400	ADJ-P22/RM8-WHITE	11	ADJ-P22/RM8-BROWN	17	ADJ-P22/RM8-BLACK	30
	630	ADJ-P22/RM8-BROWN	10	ADJ-P22/RM8-BLACK	18	–	–
	1000	ADJ-P22/RM8-BROWN	6	ADJ-P22/RM8-BLACK	12	–	–
	1250	ADJ-P22/RM8-BROWN	4	ADJ-P22/RM8-BLACK	7	–	–
3D3	40	–	–	–	–	ADJ-P22/RM8-ORANGE	27
	63	–	–	–	–	ADJ-P22/RM8-ORANGE	26
	100	–	–	ADJ-P22/RM8RED	16	ADJ-P22/RM8-YELLOW	27
	160	ADJ-P22/RM8-RED	10	ADJ-P22/RM8-YELLOW	17	–	–
	250	ADJ-P22/RM8-YELLOW	–	–	–	–	–

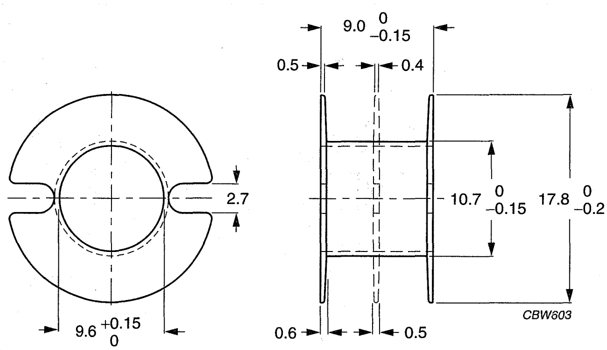
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P22/13 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.3 Coil former: CP-P22/13.

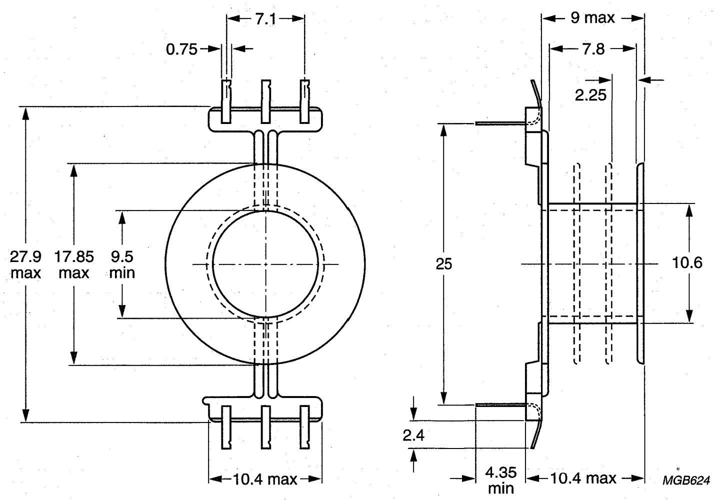
Winding data for CP-P22/13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	26.2	7.5	44.5	CP-P22/13-1S
2	2 × 12.2	2 × 3.45	44.5	CP-P22/13-2S
3	3 × 7.6	3 × 2.1	44.5	CP-P22/13-3S

P cores and accessories P22/13

General data 6-pins P22/13 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.4 P22/13 coil former for PCB mounting; 6-pins.

Data for 6-pins P22/13 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	25.2	7.8	44.5	4.4	CPV-P22/13-1S-6PD
1	25.2	7.8	44.5	6.8	CPV-P22/13-1S-6PDL
2	2 × 11.7	2 × 3.6	44.5	4.4	CPV-P22/13-2S-6PD
2	2 × 11.7	2 × 3.6	44.5	6.8	CPV-P22/13-2S-6PDL
3	3 × 7.03	3 × 2.2	44.5	4.4	CPV-P22/13-3S-6PD(1)
3	3 × 7.03	3 × 2.2	44.5	6.8	CPV-P22/13-3S-6PDL(1)

Note

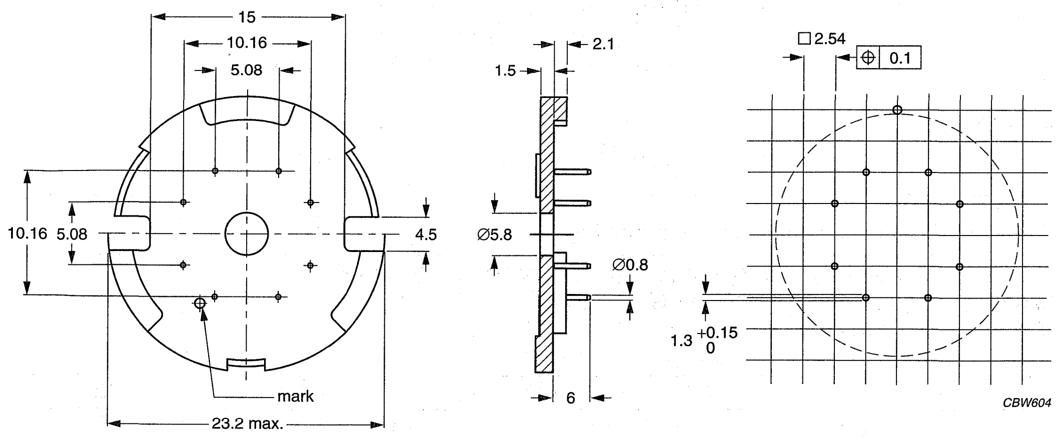
1. In accordance with *"UL 94-HB"*.

P cores and accessories P22/13

MOUNTING PARTS

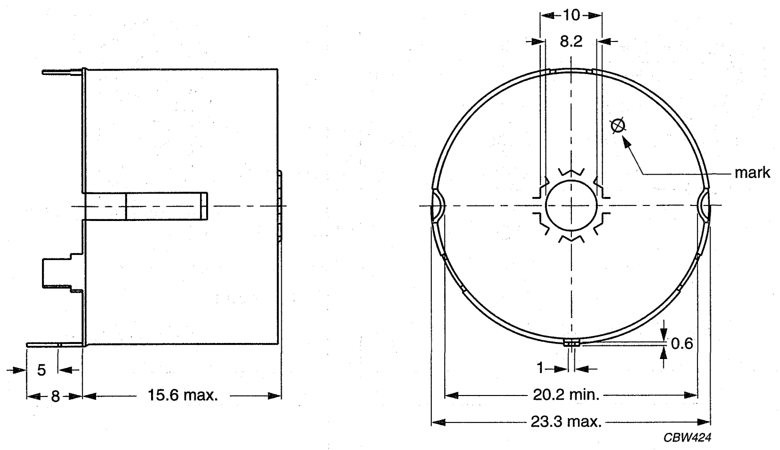
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P22/13-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P22/13
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P22/13
	spring force: ≈140 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TS-P22/13
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TS-P22/13



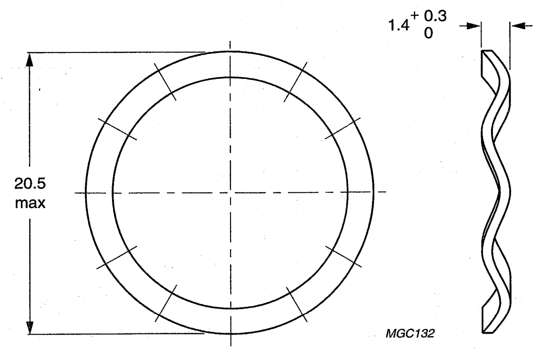
Dimensions in mm.

Fig.5 Tag plate: TGP-P22/13-8P.



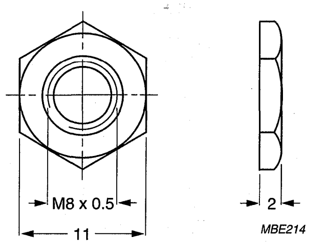
Dimensions in mm.

Fig.6 Container: CON-P22/13.



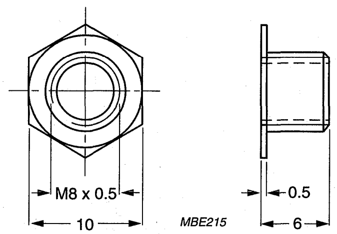
Dimensions in mm.

Fig.7 Spring: SPR-P22/13.



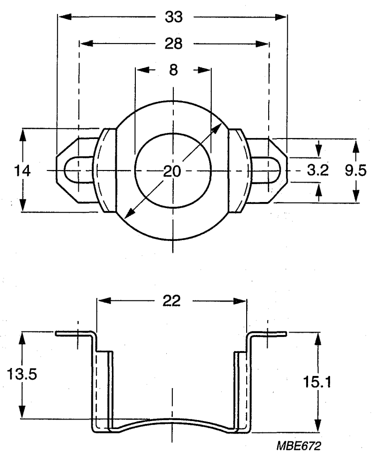
Dimensions in mm.

Fig.8 Fixing nut.



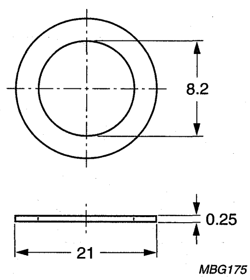
Dimensions in mm.

Fig.9 Fixing bush.



Dimensions in mm.

Fig.10 Clamp: CLM/S-P22/13.



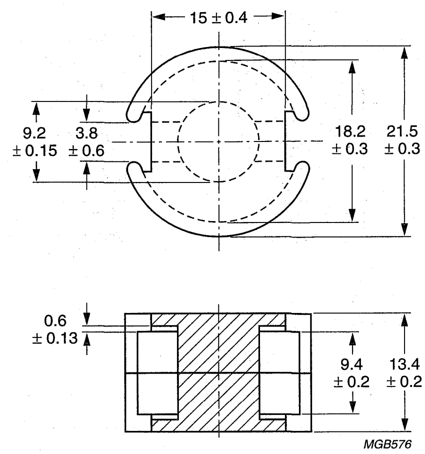
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TS-P22/13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.450	mm^{-1}
V_e	effective volume	2460	mm^3
l_e	effective length	33.3	mm
A_e	effective area	73.4	mm^2
A_{min}	minimum area	53.6	mm^2
m	mass of set	≈13	g



Dimensions in mm.

Fig.1 P22/13/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈90	≈417	P22/13/I-3C81-A250
	315 ±3%	≈113	≈320	P22/13/I-3C81-A315
	400 ±3%	≈143	≈241	P22/13/I-3C81-A400
	630 ±3%	≈225	≈142	P22/13/I-3C81-A630
	1000 ±5%	≈358	≈81	P22/13/I-3C81-A1000
	5330 ±25%	≈1910	≈0	P22/13/I-3C81
3C91 prot	5330 ±25%	≈1910	≈0	P22/13/I-3C91
3F3	250 ±3%	≈90	≈417	P22/13/I-3F3-A250
	315 ±3%	≈113	≈320	P22/13/I-3F3-A315
	400 ±3%	≈143	≈241	P22/13/I-3F3-A400
	630 ±3%	≈225	≈142	P22/13/I-3F3-A630
	1000 ±5%	≈358	≈81	P22/13/I-3F3-A1000
	4070 ±25%	≈1459	≈0	P22/13/I-3F3

P cores and accessories P22/13/I

Properties of core sets under power conditions

For coil former and mounting data, see data sheet, *"P22/13"*.

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤0.57	–	–	–
3C91	≥320	–	≈0.23(1)	≈1.3(1)	–
3F3	≥320	–	≤0.27	–	≤0.47

Note

1. Measured at 60 °C.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.470	mm^{-1}
V_e	effective volume	1740	mm^3
l_e	effective length	28.6	mm
A_e	effective area	61.0	mm^2
A_{min}	minimum area	53.6	mm^2
m	mass of set	≈10.5	g

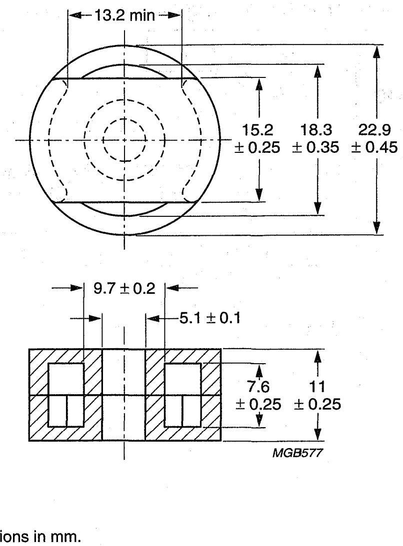


Fig.1 PT23/11 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈59	≈564	PT23/11-3C81-A160
	250 ±3%	≈93	≈338	PT23/11-3C81-A250
	315 ±3%	≈117	≈259	PT23/11-3C81-A315
	400 ±3%	≈149	≈196	PT23/11-3C81-A400
	630 ±5%	≈235	≈114	PT23/11-3C81-A630
	5500 ±25%	≈2050	≈0	PT23/11-3C81
3F3	160 ±3%	≈59	≈564	PT23/11-3F3-A160
	250 ±3%	≈93	≈338	PT23/11-3F3-A250
	315 ±3%	≈117	≈259	PT23/11-3F3-A315
	400 ±3%	≈149	≈196	PT23/11-3F3-A400
	630 ±5%	≈235	≈114	PT23/11-3F3-A630
	3700 ±25%	≈1380	≈0	PT23/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	8400 ±25%	≈3134	≈0	PT23/11-3E27

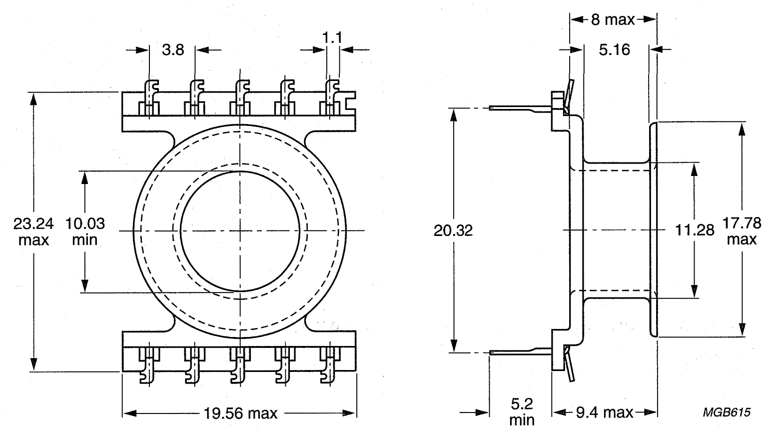
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.40	–	–
3F3	≥320	–	≤0.19	≤0.33

COIL FORMERS

General data 10-pins PT23/11 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"* class B
Resistance to soldering heat	*"IEC 68-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PT23/11 coil former; 10-pins.

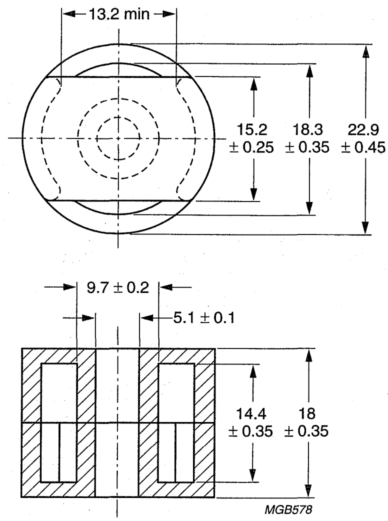
Winding data for 10-pins PT23/11 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.1	5.2	45.2	CPV-PT23/11-1S-10P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.670	mm^{-1}
V_e	effective volume	2590	mm^3
l_e	effective length	41.6	mm
A_e	effective area	62.2	mm^2
A_{min}	minimum area	53.6	mm^2
m	mass of set	≈14	g



Dimensions in mm.

Fig.1 PT23/18 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	160 ±3%	≈85	≈581	PT23/18-3C81-A160
	250 ±3%	≈133	≈345	PT23/18-3C81-A250
	315 ±3%	≈168	≈262	PT23/18-3C81-A315
	400 ±3%	≈213	≈196	PT23/18-3C81-A400
	630 ±5%	≈335	≈112	PT23/18-3B9-A630
	4100 ±25%	≈2180	≈0	PT23/18-3C81
3F3	160 ±3%	≈85	≈581	PT23/18-3F3-A160
	250 ±3%	≈133	≈345	PT23/18-3F3-A250
	315 ±3%	≈168	≈262	PT23/18-3F3-A315
	400 ±3%	≈213	≈196	PT23/18-3F3-A400
	630 ±5%	≈335	≈112	PT23/18-3B9-A630
	2750 ±25%	≈1480	≈0	PT23/18-3F3

P cores and accessories

PT23/18 (2318TS)

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	6400 ±25%	≈3410	≈0	PT23/18-3E27

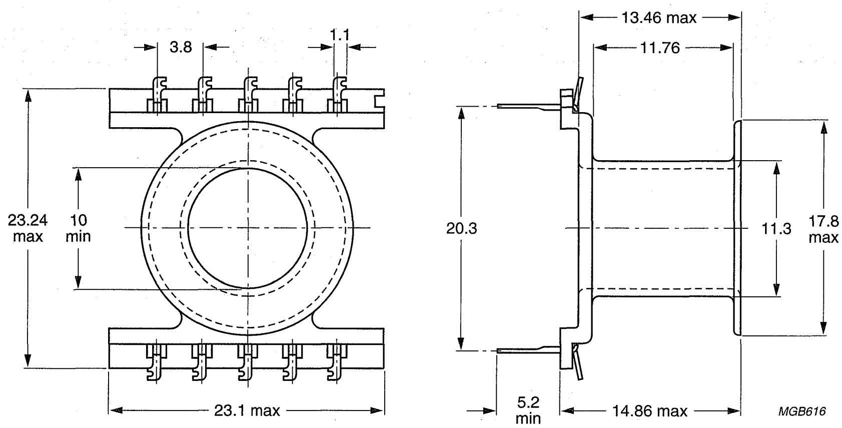
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.60	–	–
3F3	≥320	–	≤0.29	≤0.49

COIL FORMER

General data 10-pins PT23/18 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PT23/18 coil former; 10-pins.

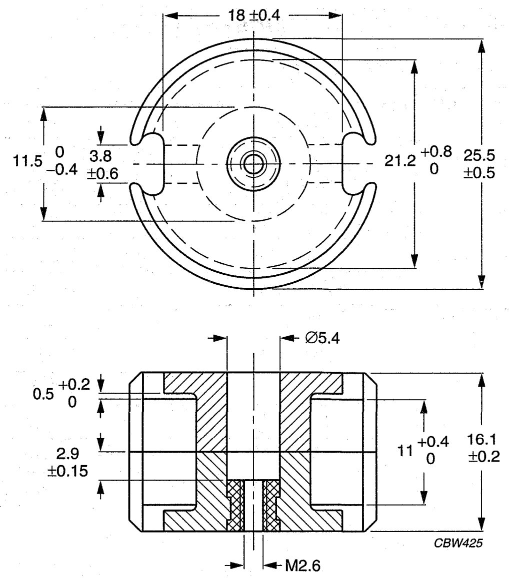
Winding data for 10-pins PT23/18 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	36.0	11.8	45.2	CPV-PT23/18-1S-10P

CORE SETS

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
m	mass of set	≈20	g



Dimensions in mm.

Fig.1 P26/16 core set.

Core sets for filter applications

Clamping force for A_L measurements, 200 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	100 ±3%	≈32	≈1600	P26/16-3D3-E100/N	P26/16-3D3-E100
	160 ±3%	≈51	≈900	P26/16-3D3-E160/N	P26/16-3D3-E160
	250 ±3%	≈80	≈500	P26/16-3D3-E250/N	P26/16-3D3-E250
	2150 ±25%	≈680	≈0	−	P26/16-3D3
3H3 sup	160 ±3%	≈51	≈900	P26/16-3H3-E160/N	P26/16-3H3-E160
	250 ±3%	≈80	≈500	P26/16-3H3-E250/N	P26/16-3H3-E250
	315 ±3%	≈100	≈370	P26/16-3H3-E315/N	P26/16-3H3-E315
	400 ±3%	≈127	≈260	P26/16-3H3-E400/N	P26/16-3H3-E400
	630 ±3%	≈200	≈150	P26/16-3H3-A630/N	P26/16-3H3-A630
	5000 ±25%	≈1590	≈0	−	P26/16-3H3

P cores and accessories P26/16

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 200 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈51	≈900	P26/16-3C81-E160
	250 ±3%	≈80	≈500	P26/16-3C81-A250
	315 ±3%	≈100	≈370	P26/16-3C81-A315
	400 ±3%	≈127	≈260	P26/16-3C81-A400
	630 ±3%	≈200	≈150	P26/16-3C81-A630
	6700 ±25%	≈2130	≈0	P26/16-3C81
3F3 sup	160 ±3%	≈51	≈90	P26/16-3F3-E160
	250 ±3%	≈80	≈500	P26/16-3F3-A250
	315 ±3%	≈100	≈370	P26/16-3F3-A315
	400 ±3%	≈127	≈260	P26/16-3F3-A400
	630 ±3%	≈200	≈150	P26/16-3F3-A630
	4600 ±25%	≈1460	≈0	P26/16-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 200 ±50 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	9000 ±25%	≈2860	P26/16-3E1
3E27	12000 ±25%	≈3810	P26/16-3E27
3E4	12100 +40/−30%	≈3850	P26/16-3E4

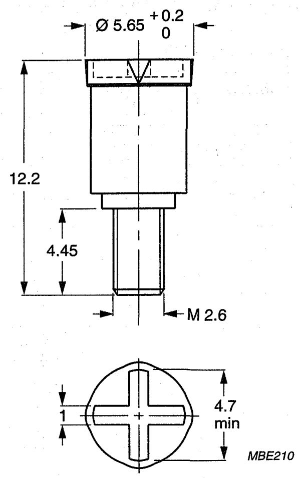
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.82	−	−
3F3	≥315	−	≤0.40	≤0.65

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P26/16 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1)
3H3	63	–	–	–	–	ADJ-P26-RED	25
	100	–	–	–	–	ADJ-P26-RED	22
	160	–	–	ADJ-P26-RED	15	–	–
	250	ADJ-P26-RED	10	–	–	ADJ-P26-BROWN	23
	315	ADJ-P26-RED	8	–	–	ADJ-P26-BROWN	18
	400	ADJ-P26-RED	6	ADJ-P26-BROWN	13	ADJ-P26-GREY	25
	630	ADJ-P26-BROWN	8	ADJ-P26-GREY	16	–	–
	1000	ADJ-P26-BROWN	5	ADJ-P26-GREY	9	–	–
	1600	–	–	ADJ-P26-GREY	5	–	–
3D3	100	–	–	–	–	ADJ-P26-RED	21
	160	–	–	ADJ-P26-RED	14	–	–
	250	ADJ-P26-RED	9	–	–	ADJ-P26-GREY	35
	400	–	8	ADJ-P26-GREY	17	–	–

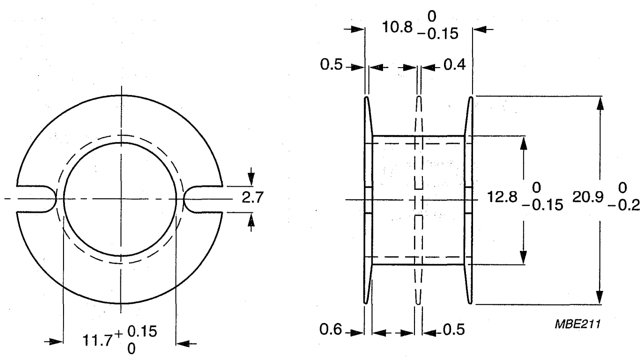
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P26/16 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

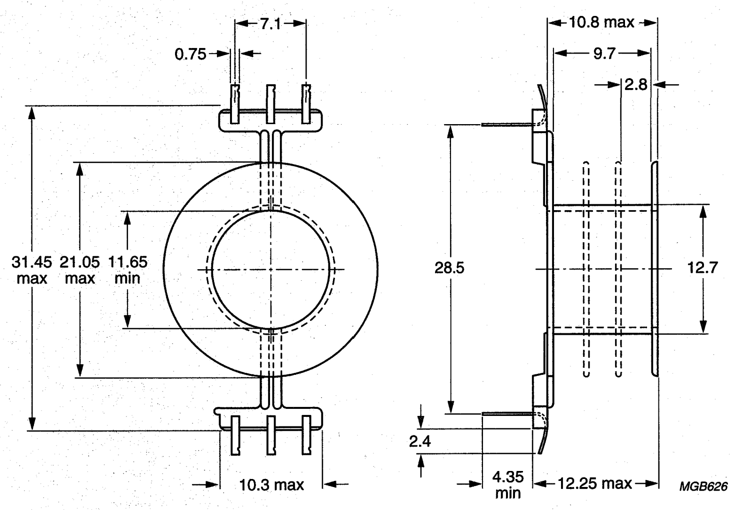
Fig.3 Coil former CP-P26/16.

Winding data for CP-P26/16 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	37.1	9.3	52.6	CP-P26/16-1S
2	2 × 17.5	2 × 4.35	52.6	CP-P26/16-2S
3	3 × 11	3 × 2.7	52.6	CP-P26/16-3S

General data 6-pins P26/16 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.4 P26/16 coil former for PCB mounting; 6-pins.

Data for 6-pins P26/16 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	36.7	9.7	52.7	4.4	CPV-P26/16-1S-6PD
1	36.7	9.7	52.7	6.8	CPV-P26/16-1S-6PDL
2	2 × 16.6	2 × 4.5	52.7	4.4	CPV-P26/16-2S-6PD
2	2 × 16.6	2 × 4.5	52.7	6.8	CPV-P26/16-2S-6PDL
3	3 × 10.3	3 × 2.8	52.7	4.4	CPV-P26/16-3S-6PD(1)
3	3 × 10.3	3 × 2.8	52.7	6.8	CPV-P26/16-3S-6PDL(1)

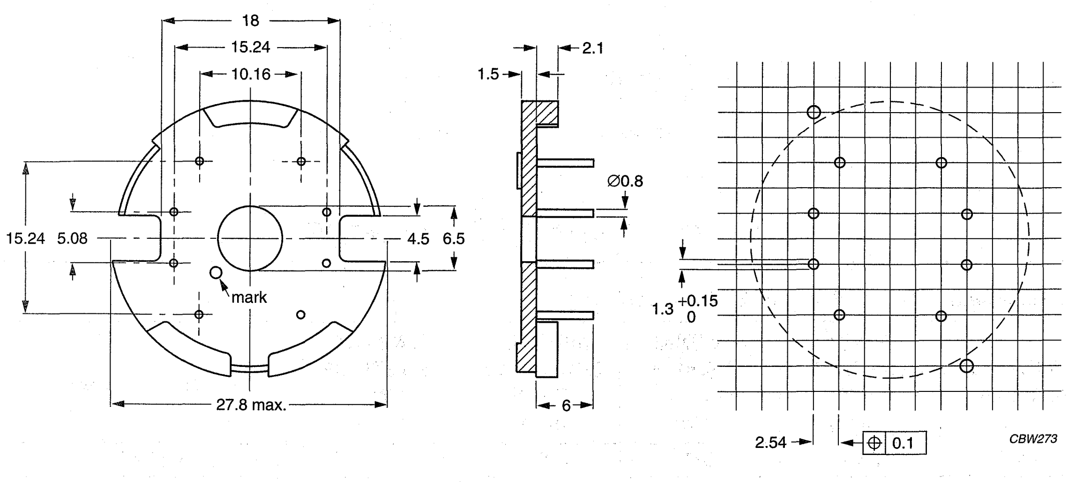
Note

1. In accordance with *"UL 94-HB"*.

MOUNTING PARTS

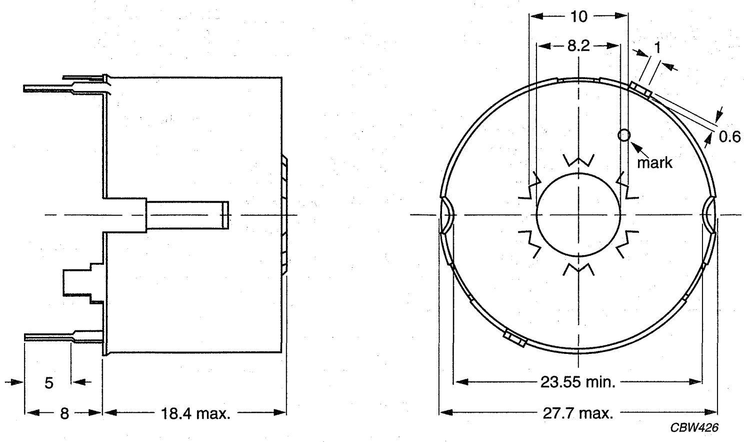
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P26/16-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy, SnPb-plated	6	CON-P26/16
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P26/16
	spring force: ≈200 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TP-P26/16



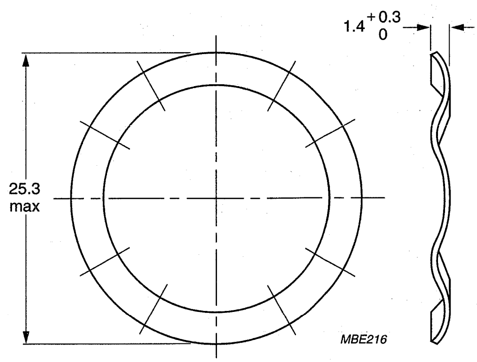
Dimensions in mm.

Fig.5 P26/16 tag plate.



Dimensions in mm.

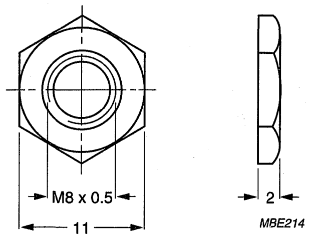
Fig.6 P26/16 container.



Dimensions in mm.

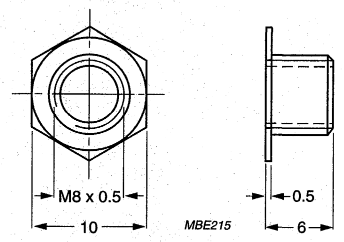
Fig.7 P26/16 spring.

P cores and accessories P26/16



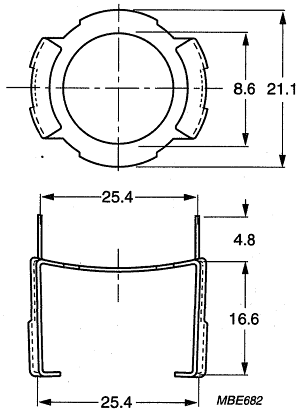
Dimensions in mm.

Fig.8 Fixing nut.



Dimensions in mm.

Fig.9 Fixing bush.



Dimensions in mm.

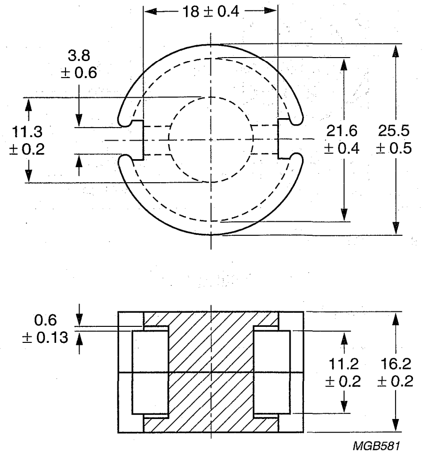
Fig.10 Clamp: CLM/TP-P26/16.

P cores and accessories P26/16/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.360	mm^{-1}
V_e	effective volume	4370	mm^3
l_e	effective length	39.6	mm
A_e	effective area	110	mm^2
A_{min}	minimum area	82.8	mm^2
m	mass of set	≈21	g



Dimensions in mm.

Fig.1 P26/16/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 50 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	250 ±3%	≈72	≈638	P26/16/I-3C81-E250
	315 ±3%	≈90	≈488	P26/16/I-3C81-A315
	400 ±3%	≈115	≈371	P26/16/I-3C81-A400
	630 ±3%	≈181	≈218	P26/16/I-3C81-A630
	1000 ±3%	≈287	≈127	P26/16/I-3C81-A1000
	7000 ±25%	≈2010	≈0	P26/16/I-3C81
3C91 prot	7000 ±25%	≈2010	≈0	P26/16/I-3C91
3F3	250 ±3%	≈72	≈638	P26/16/I-3F3-E250
	315 ±3%	≈90	≈488	P26/16/I-3F3-A315
	400 ±3%	≈115	≈371	P26/16/I-3F3-A400
	630 ±3%	≈181	≈218	P26/16/I-3F3-A630
	1000 ±3%	≈287	≈127	P26/16/I-3F3-A1000
	5250 ±25%	≈1505	≈0	P26/16/I-3F3

P cores and accessories P26/16/I

Properties of core sets under power conditions

For coil former and winding data, see data sheet, *"P26/16'*.

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.0	–	–	–
3C91	≥320	–	≈0.40(1)	≈2.3(1)	–
3F3	≥320	–	≤0.48	–	≤0.83

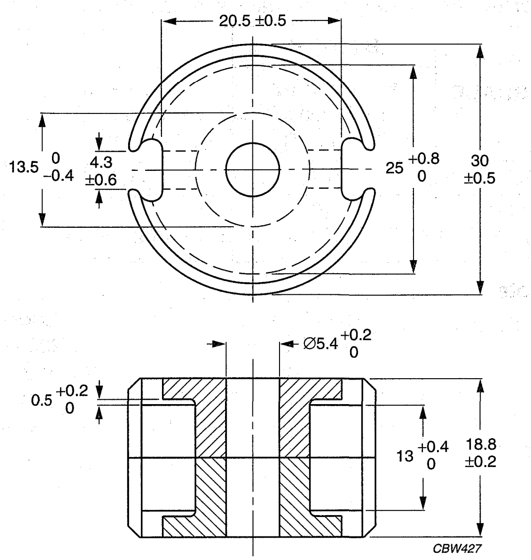
Note

1. Measured at 60 °C.

CORE SETS

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
m	mass of set	≈34	g



Dimensions in mm.

Fig.1 P30/19 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 250 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈66	≈700	P30/19-3C81-E250
	315 ±3%	≈83	≈550	P30/19-3C81-A315
	400 ±3%	≈105	≈400	P30/19-3C81-A400
	630 ±3%	≈165	≈250	P30/19-3C81-A630
	1000 ±3%	≈263	≈160	P30/19-3C81-A1000
	8300 ±25%	≈2170	≈0	P30/19-3C81
3F3	250 ±3%	≈66	≈700	P30/19-3F3-E250
	315 ±3%	≈83	≈550	P30/19-3F3-A315
	400 ±3%	≈105	≈400	P30/19-3F3-A400
	630 ±3%	≈165	≈250	P30/19-3F3-A630
	1000 ±3%	≈263	≈160	P30/19-3F3-A1000
	5750 ±25%	≈1500	≈0	P30/19-3F3

P cores and accessories P30/19

Core sets of high permeability grades

Clamping force for A_L measurements, 250 ±50 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	10300 ±25%	≈2700	P30/19-3E1
3E27	14000 ±25%	≈3650	P30/19-3E27
3E4 sup	15100 +40/−30%	≈3960	P30/19-3E4

Properties of core sets under power conditions

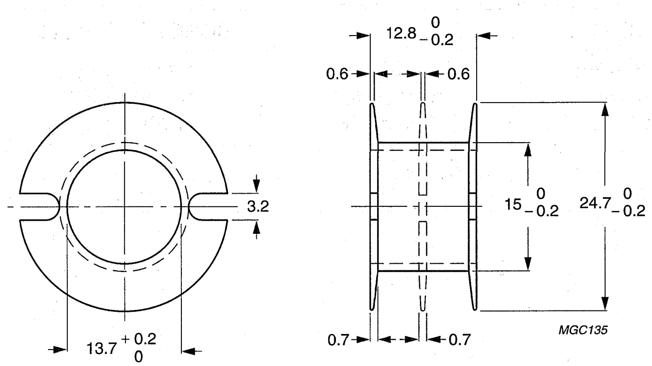
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤1.43	−	−
3F3	≥315	−	≤0.70	≤1.20

P cores and accessories P30/19

COIL FORMERS

General data CP-P30/19 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.2 Coil former: CP-P30/19.

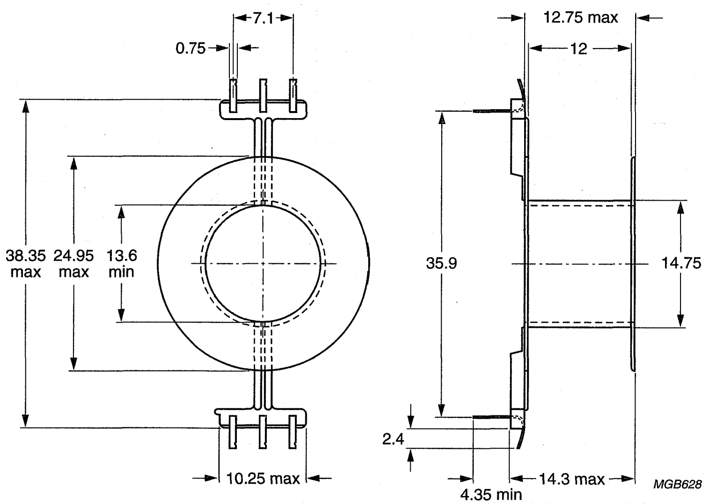
Winding data for P30/19 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	53.2	11.1	62	CP-P30/19-1S
2	2 × 24.9	2 × 5.15	62	CP-P30/19-2S
3	3 × 15.5	3 × 3.2	62	CP-P30/19-3S

P cores and accessories P30/19

General data 6-pins P30/19 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 1, Test Tb, method 1B, 350 °C, 3.5 s. For connection of wire to pins: 430 °C, 2 seconds
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 P30/19 coil former for PCB mounting; 6-pins.

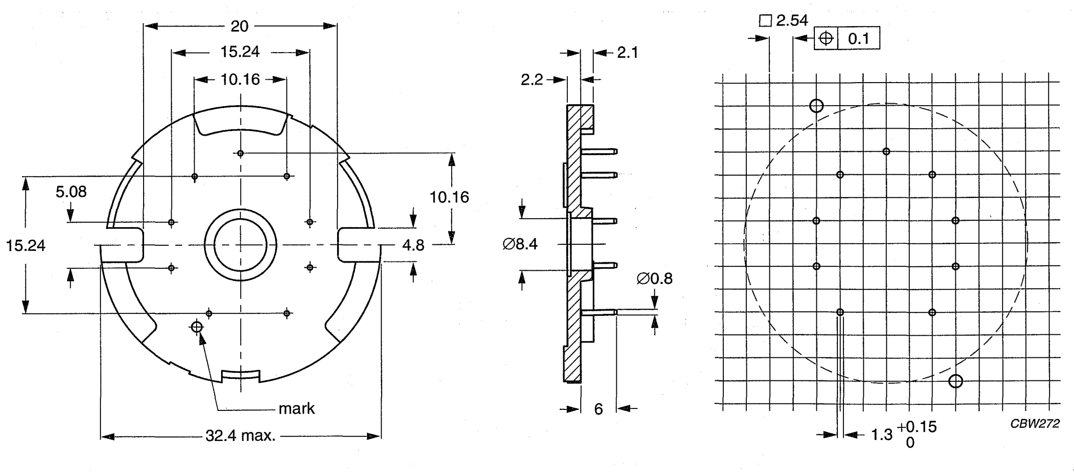
Data for 6-pins P30/19 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	55.2	12.8	62.2	4.4	CPV-P30/19-1S-6PD
1	55.2	12.8	62.2	6.8	CPV-P30/19-1S-6PDL

MOUNTING PARTS

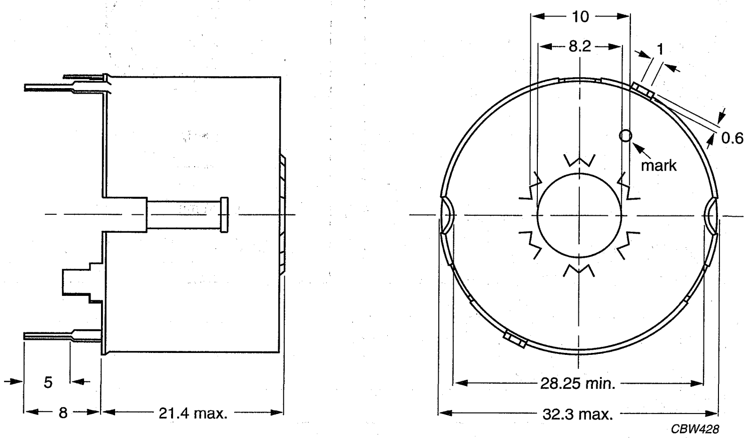
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	4	TGP-P30/19-9P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	5	CON-P30/19
	earth pins: presoldered		
Spring	CrNi-steel	6	SPR-P30/19
	spring force: ≈250 N when mounted		
Nut	copper-zinc alloy, nickel-plated	7	NUT
Bush	copper-zinc alloy, nickel-plated	8	FIB
Clamp	spring steel, tin-plated	9	CLM/TS-P30/19



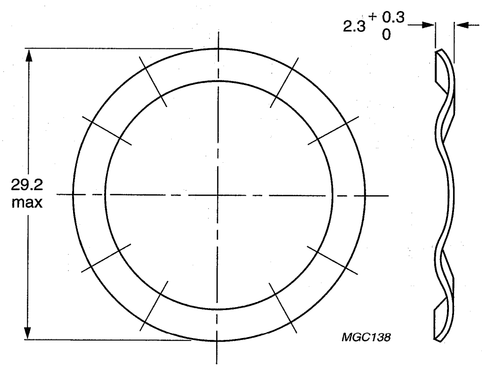
Dimensions in mm.

Fig.4 P30/19 tag plate.



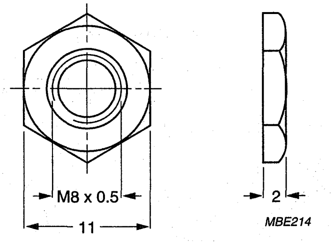
Dimensions in mm.

Fig.5 P30/19 container.



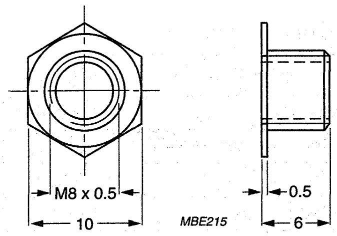
Dimensions in mm.

Fig.6 P30/19 spring.



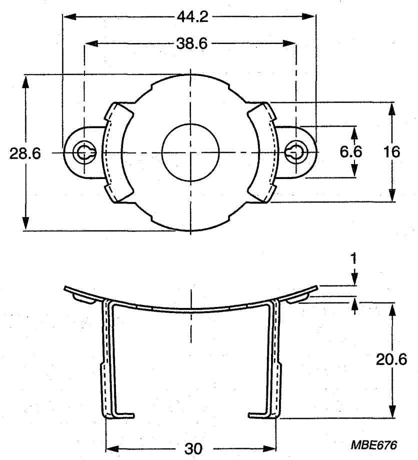
Dimensions in mm.

Fig.7 Fixing nut.



Dimensions in mm.

Fig.8 Fixing bush.



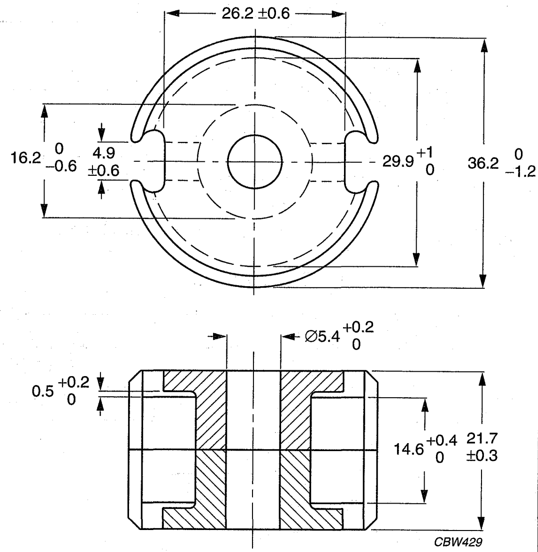
Dimensions in mm.

Fig.9 Clamp CLM/TS-P30/19.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈54	g



Dimensions in mm.

Fig.1 P36/22 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 350 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	315 ±3%	≈66	≈800	P36/22-3C81-E315
	400 ±3%	≈84	≈600	P36/22-3C81-E400
	630 ±3%	≈132	≈400	P36/22-3C81-A630
	1000 ±3%	≈210	≈200	P36/22-3C81-A1000
	1600 ±5%	≈336	≈160	P36/22-3C81-A1600
	10800 ±25%	≈2260	≈0	P36/22-3C81
3F3	250 ±3%	≈53	≈1100	P36/22-3F3-E250
	315 ±3%	≈66	≈800	P36/22-3F3-E315
	400 ±3%	≈84	≈600	P36/22-3F3-E400
	630 ±3%	≈132	≈400	P36/22-3F3-A630
	1000 ±3%	≈210	≈200	P36/22-3F3-A1000
	1600 ±5%	≈336	≈160	P36/22-3F3-A1600
	7350 ±25%	≈1540	≈0	P36/22-3F3

P cores and accessories | P36/22

Core sets of high permeability grades

Clamping force for A_L measurements, 350 ±50 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	13300 ±25%	≈2800	P36/22-3E1
3E27	17500 ±25%	≈3670	P36/22-3E27
3E4 sup	19300 +40/-30%	≈4050	P36/22-3E4

Properties of core sets under power conditions

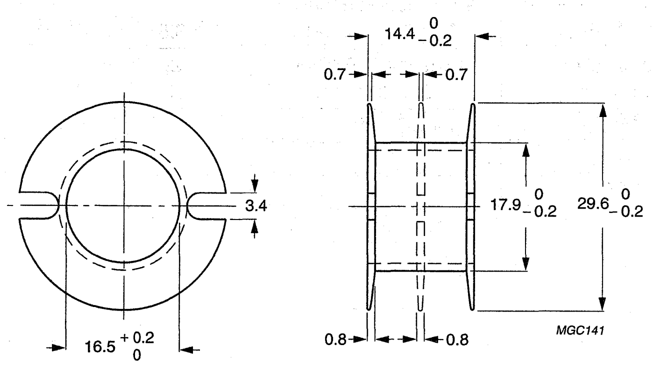
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤2.5	–	–
3F3	≥315	–	≤1.2	≤2.0

P cores and accessories P36/22

COIL FORMERS

General data for coil former CP-P36/22

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329 (R)
Maximum operating temperature	155 °C, *"IEC 60085"*, class F



Dimensions in mm.

Fig.2 Coil former CP-P36/22.

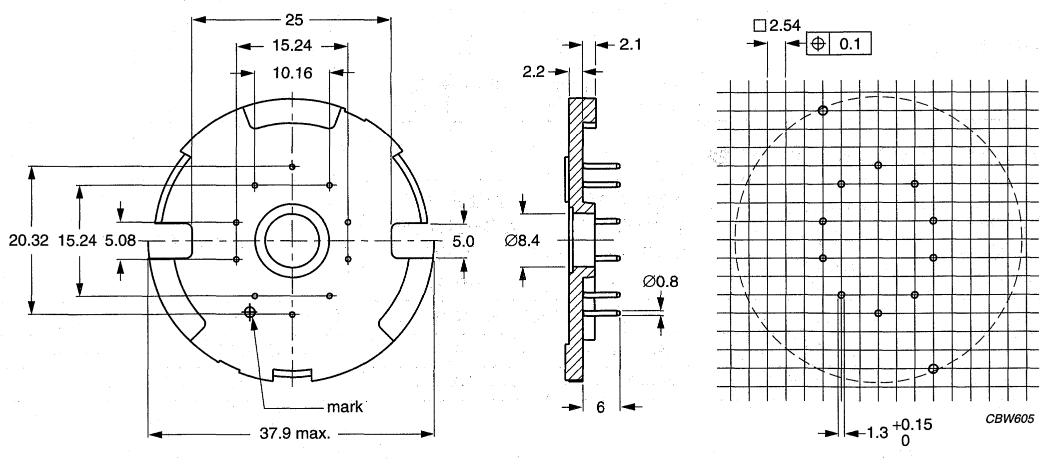
Winding data for coil former CP-P36/22

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	72.4	12.5	74.3	CP-P36/22-1S
2	2 × 33.9	2 × 5.8	74.3	CP-P36/22-2S
3	3 × 21.0	3 × 3.6	74.3	CP-P36/22-3S

MOUNTING PARTS

General data and ordering information

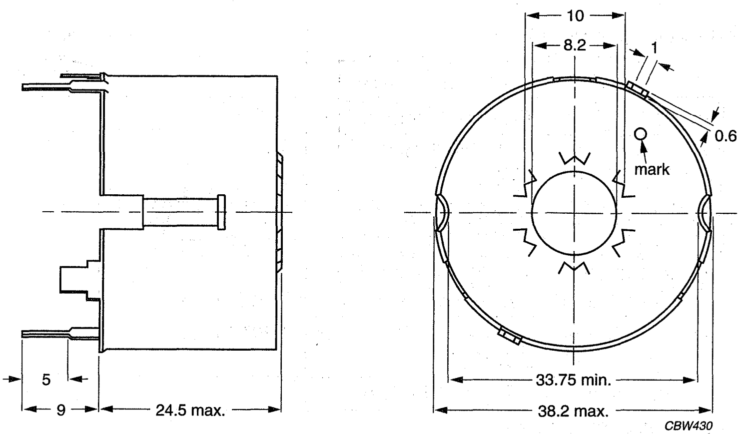
ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	3	TGP-P36/22-10P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	4	CON-P36/22
	earth pins: presoldered		
Spring	CrNi-steel	5	SPR-P36/22
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	6	NUT
Bush	copper-zinc alloy, nickel-plated	7	FIB



Dimensions in mm.

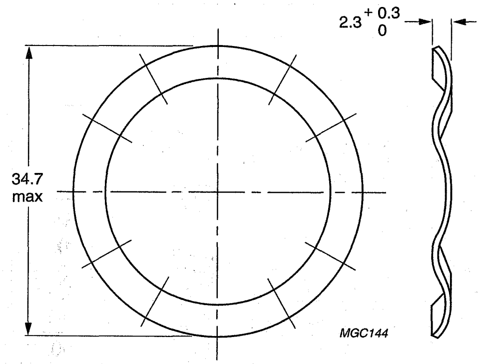
Fig.3 P36/22 tag plate.

P cores and accessories P36/22



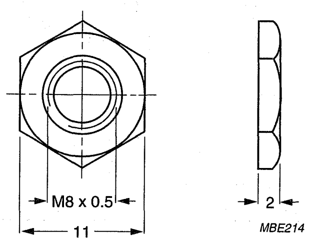
Dimensions in mm.

Fig.4 P36/22 container.



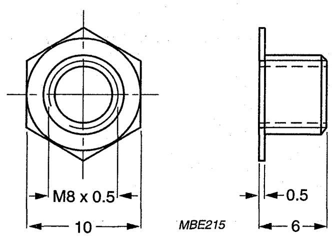
Dimensions in mm.

Fig.5 P36/22 spring.



Dimensions in mm.

Fig.6 Fixing nut.



Dimensions in mm.

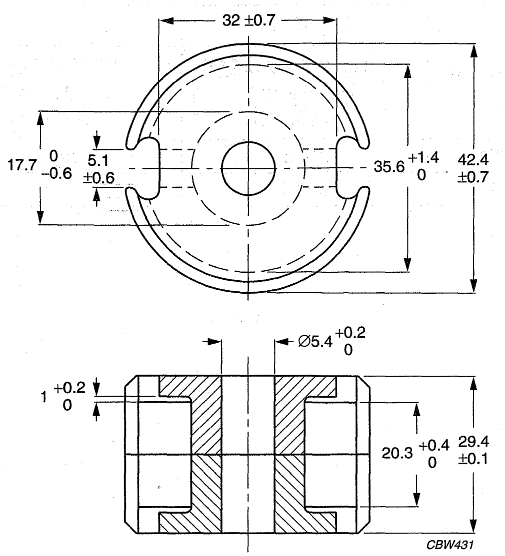
Fig.7 Fixing bush.

P cores and accessories　P42/29

CORE SETS

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
m	mass of set	≈104	g



Dimensions in mm.

Fig.1 P42/29 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 550 ±100 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈65	≈1100	P42/29-3C81-E315
	400 ±3%	≈81	≈800	P42/29-3C81-E400
	630 ±3%	≈130	≈500	P42/29-3C81-A630
	1000 ±3%	≈205	≈270	P42/29-3C81-A1000
	1600 ±5%	≈325	≈150	P42/29-3C81-A1600
	11500 ±25%	≈2340	≈0	P42/29-3C81
3F3	315 ±3%	≈65	≈1100	P42/29-3F3-E315
	400 ±3%	≈81	≈800	P42/29-3F3-E400
	630 ±3%	≈130	≈500	P42/29-3F3-A630
	1000 ±3%	≈205	≈270	P42/29-3F3-A1000
	1600 ±5%	≈325	≈150	P42/29-3F3-A1600
	7700 ±25%	≈1600	≈0	P42/29-3F3

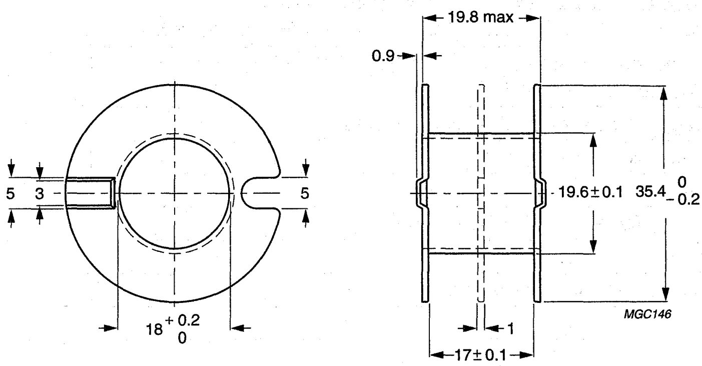
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤4.2	–	–
3F3	≥315	–	≤2.0	≤3.5

COIL FORMERS

General data CP-P42/29 coil former

PARAMETER	SPECIFICATION
Coil former material	polycarbonate (PC), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41613(M)
Maximum operating temperature	115 °C



Dimensions in mm.

Fig.2 Coil former: CP-P42/29.

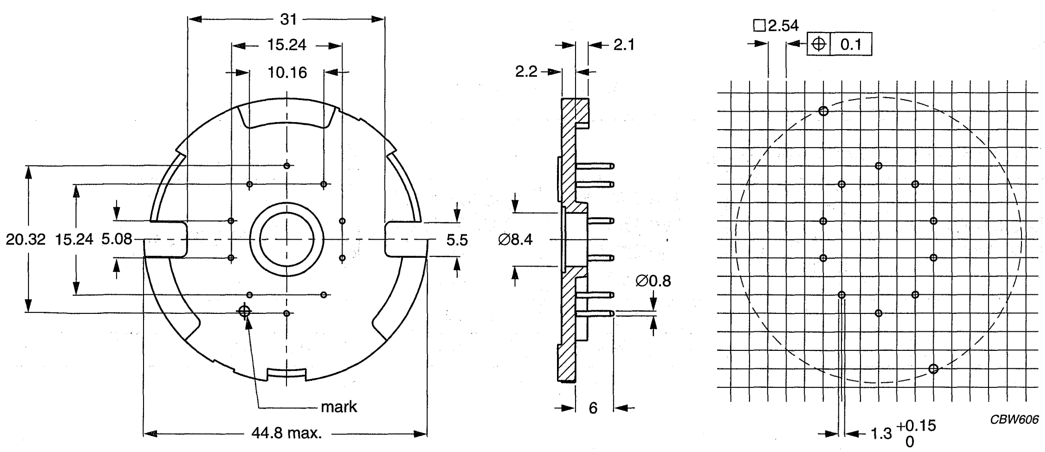
Winding data for CP-P42/29 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	140	17.7	86	CP-P42/29-1S
2	2 × 63	2 × 8	86	CP-P42/29-2S

MOUNTING PARTS

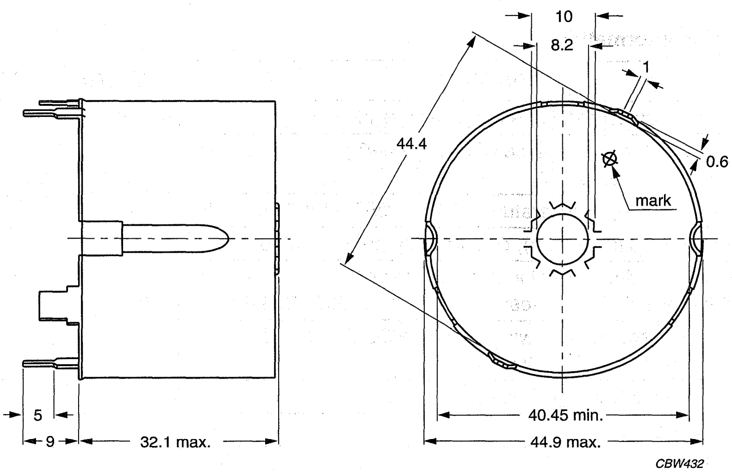
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	3	TGP-P42/29-10P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	4	CON-P42/29
	earth pins: presoldered		
Spring	CrNi-steel	5	SPR-P42/29
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	6	NUT
Bush	copper-zinc alloy, nickel-plated	7	FIB



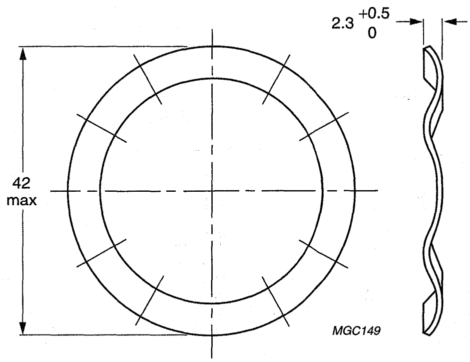
Dimensions in mm.

Fig.3 P42/29 tag plate.



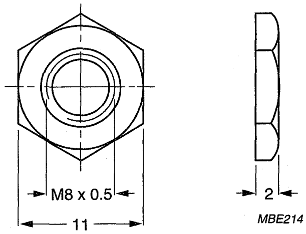
Dimensions in mm.

Fig.4 P42/29 container.



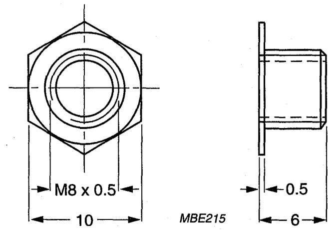
Dimensions in mm.

Fig.5 P42/29 spring.



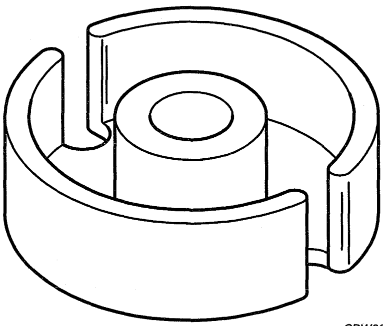
Dimensions in mm.

Fig.6 Fixing nut: NUT.



Dimensions in mm.

Fig.7 Fixing bush: FIB.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PH cores

CORE TYPE
PH5.6/3.6
PH7.4/3.9
PH9.4/4.8

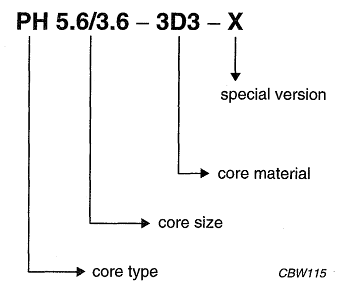
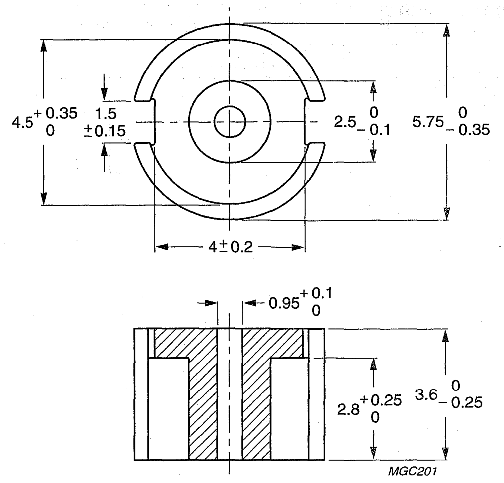


Fig.1 Type number structure for cores.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH5.6/3.6-3D3



Dimensions in mm.

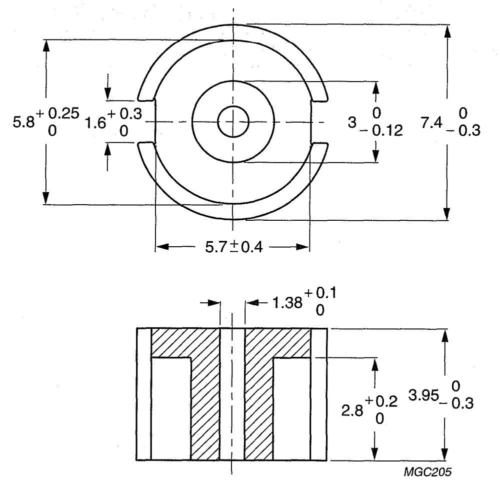
Fig.1 PH5.6/3.6 core half.

PH cores PH7.4/3.9

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH7.4/3.9-3D3



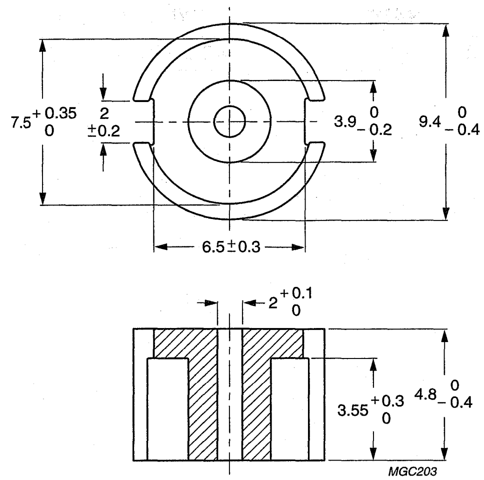
Dimensions in mm.

Fig.1 PH7.4/3.9 core half.

CORE HALF

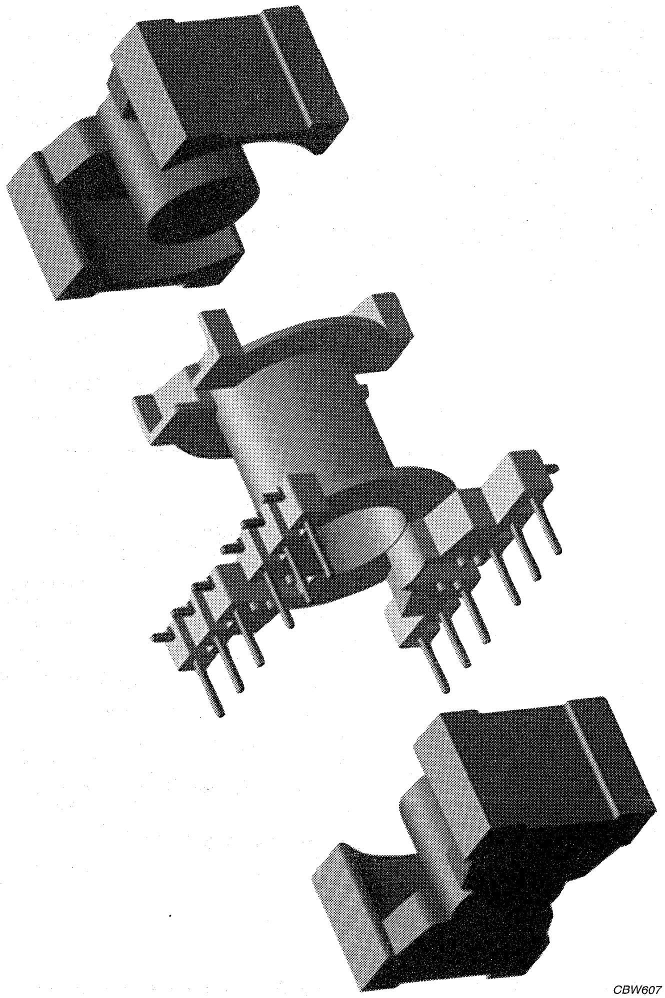
Ordering information

GRADE	TYPE NUMBER
3D3	PH9.4/4.8-3D3



Dimensions in mm.

Fig.1 PH9.4/4.8 core half.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PQ cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
PQ20/16	2330	61.9	11
PQ20/20	2850	62.6	14
PQ26/20	5820	121	29
PQ26/25	6530	120	32
PQ32/20	9440	169	47
PQ32/30	12500	167	62
PQ35/35	16300	190	80

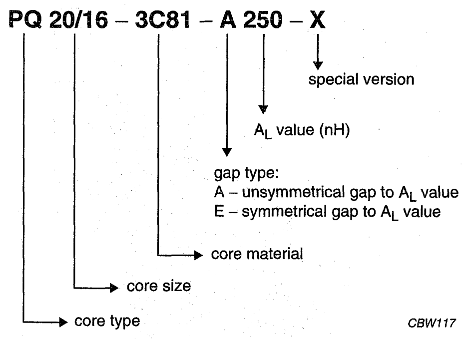


Fig.1 Type number structure for cores.

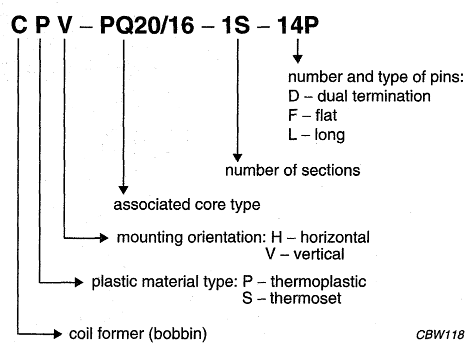
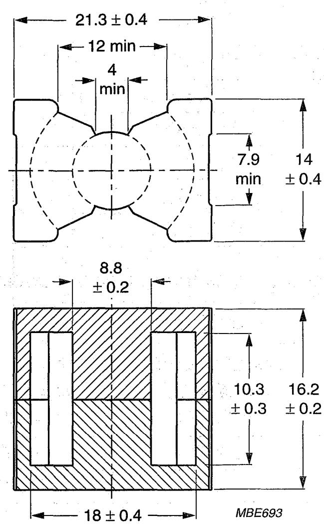


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.607	mm^{-1}
V_e	effective volume	2330	mm^3
l_e	effective length	37.6	mm
A_e	effective area	61.9	mm^2
A_{min}	minimum area	59.1	mm^2
m	mass of set	≈11	g



Dimensions in mm.

Fig.1 PQ20/16 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈78	≈577	PQ20/16-3C81-A160
	250 ±3%	≈121	≈340	PQ20/16-3C81-A250
	315 ±3%	≈153	≈262	PQ20/16-3C81-A315
	400 ±3%	≈194	≈196	PQ20/16-3C81-A400
	630 ±5%	≈305	≈114	PQ20/16-3C81-A630
	4080 ±25%	≈1980	≈0	PQ20/16-3C81
3C90	160 ±3%	≈78	≈577	PQ20/16-3C90-A160
	250 ±3%	≈121	≈340	PQ20/16-3C90-A250
	315 ±3%	≈153	≈262	PQ20/16-3C90-A315
	400 ±3%	≈194	≈196	PQ20/16-3C90-A400
	630 ±5%	≈305	≈114	PQ20/16-3C90-A630
	3250 ±25%	≈1580	≈0	PQ20/16-3C90
3C91 prot	4080 ±25%	≈1980	≈0	PQ20/16-3C91
3C94 des	3250 ±25%	≈1580	≈0	PQ20/16-3C94
3C96 prot	3250 ±25%	≈1580	≈0	PQ20/16-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3F3	160 ±3%	≈78	≈577	PQ20/16-3F3-A160
	250 ±3%	≈121	≈340	PQ20/16-3F3-A250
	315 ±3%	≈153	≈262	PQ20/16-3F3-A315
	400 ±3%	≈194	≈196	PQ20/16-3F3-A400
	630 ±5%	≈305	≈114	PQ20/16-3F3-A630
	3080 ±25%	≈1492	≈0	PQ20/16-3F3

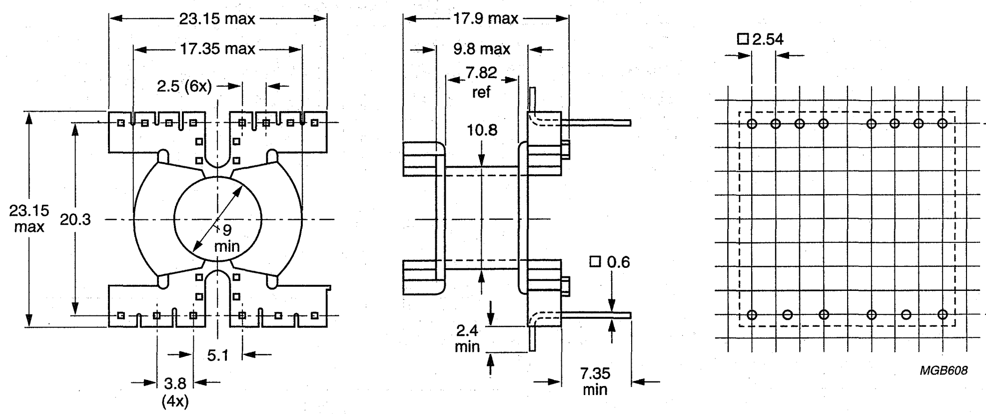
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C81	≥320	≤0.54	–	–	–
3C90	≥320	≤0.28	≤0.30	–	–
3C91	≥320	–	≈0.25	≈1.5	–
3C94	≥320	–	≤0.22	≈1.0	≈0.49
3C96	≥320	–	≈0.16	≈0.7	≈0.35
3F3	≥320	–	≤0.26	–	≤0.44

COIL FORMER

General data 14-pins PQ20/16 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ20/16 coil former; 14-pins.

Winding data for 14-pins PQ20/16 coil former

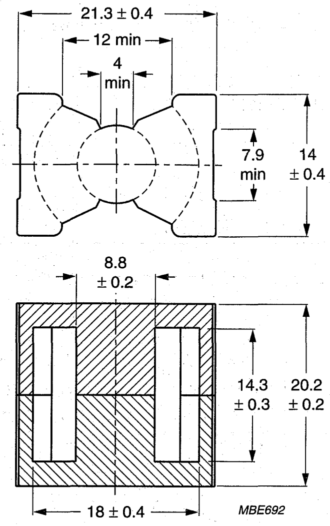
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	23.5	7.95	44.0	CPV-PQ20/16-1S-14P
1	23.5	7.95	44.0	CPV-PQ20/16-1S-14PD

PQ cores and accessories PQ20/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.731	mm^{-1}
V_e	effective volume	2850	mm^3
l_e	effective length	45.7	mm
A_e	effective area	62.6	mm^2
A_{min}	minimum area	59.1	mm^2
m	mass of set	≈14	g



Dimensions in mm.

Fig.1 PQ20/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈93	≈582	PQ20/20-3C81-A160
	250 ±3%	≈145	≈340	PQ20/20-3C81-A250
	315 ±3%	≈183	≈259	PQ20/20-3C81-A315
	400 ±3%	≈232	≈193	PQ20/20-3C81-A400
	630 ±5%	≈365	≈109	PQ20/20-3C81-A630
	3580 ±25%	≈2080	≈0	PQ20/20-3C81
3C90	160 ±3%	≈93	≈582	PQ20/20-3C90-A160
	250 ±3%	≈145	≈340	PQ20/20-3C90-A250
	315 ±3%	≈183	≈259	PQ20/20-3C90-A315
	400 ±3%	≈232	≈193	PQ20/20-3C90-A400
	630 ±5%	≈365	≈109	PQ20/20-3C90-A630
	2820 ±25%	≈1635	≈0	PQ20/20-3C90
3C91 prot	3580 ±25%	≈2080	≈0	PQ20/20-3C91
3C94 des	2820 ±25%	≈1635	≈0	PQ20/20-3C94
3C96 prot	2820 ±25%	≈1635	≈0	PQ20/20-3C96

PQ cores and accessories PQ20/20

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈93	≈582	PQ20/20-3F3-A160
	250 ±3%	≈145	≈340	PQ20/20-3F3-A250
	315 ±3%	≈183	≈259	PQ20/20-3F3-A315
	400 ±3%	≈232	≈193	PQ20/20-3F3-A400
	630 ±5%	≈365	≈109	PQ20/20-3F3-A630
	2650 ±25%	≈1538	≈0	PQ20/20-3F3

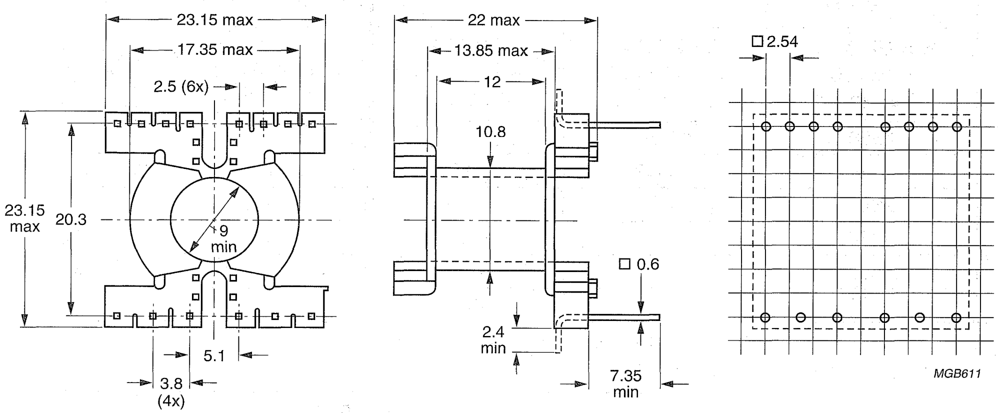
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.66	–	–	–
3C90	≥320	≤0.35	≤0.37	–	–
3C91	≥320	–	≈0.3	≈2.0	–
3C94	≥320	–	≤0.27	≈1.3	≈0.60
3C96	≥320	–	≈0.2	≈1.0	≈0.45
3F3	≥320	–	≤0.31	–	≤0.54

COIL FORMER

General data 14-pins PQ20/20 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ20/20 coil former; 14-pins.

Winding data for 14-pins PQ20/20 coil former

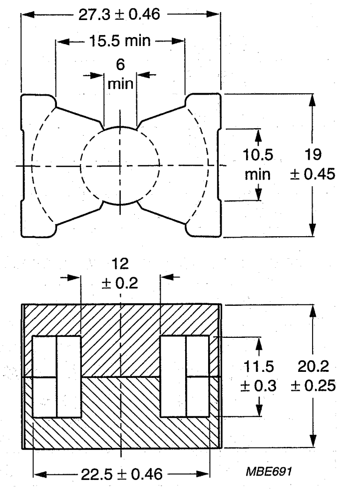
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	36.0	12.0	44.0	CPV-PQ20/20-1S-14P
1	36.0	12.0	44.0	CPV-PQ20/20-1S-14PD

PQ cores and accessories PQ26/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.372	mm^{-1}
V_e	effective volume	5470	mm^3
l_e	effective length	45.0	mm
A_e	effective area	121	mm^2
A_{min}	minimum area	109	mm^2
m	mass of set	≈29	g



Dimensions in mm.

Fig.1 PQ26/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈74	≈704	PQ26/20-3C81-E250
	315 ±3%	≈93	≈539	PQ26/20-3C81-A315
	400 ±3%	≈118	≈406	PQ26/20-3C81-A400
	630 ±3%	≈186	≈241	PQ26/20-3C81-A630
	1000 ±5%	≈259	≈137	PQ26/20-3C81-A1000
	7020 ±25%	≈2070	≈0	PQ26/20-3C81
3C90	250 ±3%	≈74	≈704	PQ26/20-3C90-E250
	315 ±3%	≈93	≈539	PQ26/20-3C90-A315
	400 ±3%	≈118	≈406	PQ26/20-3C90-A400
	630 ±3%	≈186	≈241	PQ26/20-3C90-A630
	1000 ±5%	≈259	≈137	PQ26/20-3C90-A1000
	5530 ±25%	≈1630	≈0	PQ26/20-3C90
3C91 prot	7020 ±25%	≈2070	≈0	PQ26/20-3C91
3C94 des	5530 ±25%	≈1580	≈0	PQ26/20-3C94
3C96 prot	5530 ±25%	≈1580	≈0	PQ26/20-3C96

PQ cores and accessories PQ26/20

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3F3	250 ±3%	≈74	≈704	PQ26/20-3F3-E250
	315 ±3%	≈93	≈539	PQ26/20-3F3-A315
	400 ±3%	≈118	≈406	PQ26/20-3F3-A400
	630 ±3%	≈186	≈241	PQ26/20-3F3-A630
	1000 ±5%	≈259	≈137	PQ26/20-3C81-A1000
	5200 ±25%	≈1535	≈0	PQ26/20-3F3

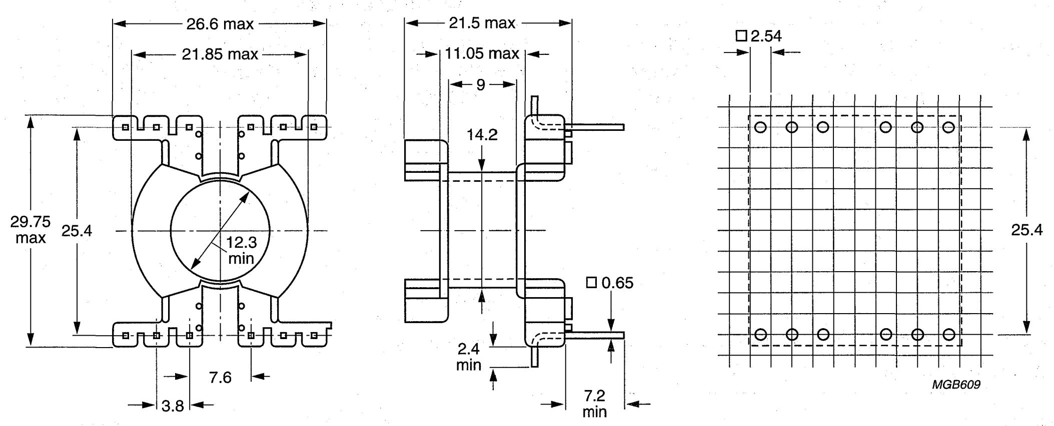
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.3	–	–	–
3C90	≥320	≤0.66	≤0.70	–	–
3C91	≥320	–	≈0.6	≈3.5	–
3C94	≥320	–	≤0.52	≈2.4	≈1.2
3C96	≥320	–	≈0.4	≈1.7	≈0.9
3F3	≥320	–	≤0.64	–	≤1.1

COIL FORMER

General data 12-pins PQ26/20 coil former

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ26/20 coil former; 12-pins.

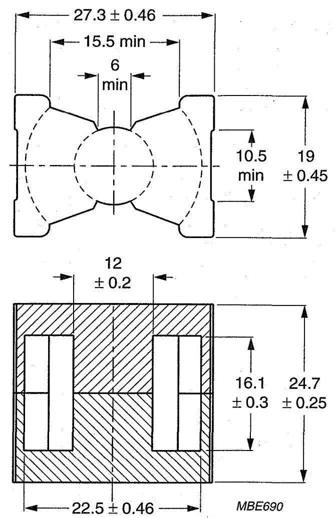
Winding data for 12-pins PQ26/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	31.1	9.0	56.4	CPV-PQ26/20-1S-12P
1	31.1	9.0	56.4	CPV-PQ26/20-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.451	mm^{-1}
V_e	effective volume	6530	mm^3
l_e	effective length	54.3	mm
A_e	effective area	120	mm^2
A_{min}	minimum area	108	mm^2
m	mass of set	≈32	g



Dimensions in mm.

Fig.1 PQ26/25 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	250 ±3%	≈90	≈701	PQ26/25-3C81-E250
	315 ±3%	≈113	≈533	PQ26/25-3C81-A315
	400 ±3%	≈143	≈401	PQ26/25-3C81-A400
	630 ±3%	≈226	≈234	PQ26/25-3C81-A630
	1000 ±5%	≈359	≈132	PQ26/25-3C81-A1000
	6010 ±25%	≈2160	≈0	PQ26/25-3C81
3C90	250 ±3%	≈90	≈701	PQ26/25-3C90-E250
	315 ±3%	≈113	≈533	PQ26/25-3C90-A315
	400 ±3%	≈143	≈401	PQ26/25-3C90-A400
	630 ±3%	≈226	≈234	PQ26/25-3C90-A630
	1000 ±5%	≈359	≈132	PQ26/25-3C90-A1000
	4700 ±25%	≈1690	≈0	PQ26/25-3C90
3C91 prot	6010 ±25%	≈2160	≈0	PQ26/25-3C91
3C94 des	4700 ±25%	≈1690	≈0	PQ26/25-3C94
3C96 prot	4700 ±25%	≈1690	≈0	PQ26/25-3C96

PQ cores and accessories PQ26/25

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3F3	250 ±3%	≈90	≈701	PQ26/25-3F3-E250
	315 ±3%	≈113	≈533	PQ26/25-3F3-A315
	400 ±3%	≈143	≈401	PQ26/25-3F3-A400
	630 ±3%	≈226	≈234	PQ26/25-3F3-A630
	1000 ±5%	≈359	≈132	PQ26/25-3F3-A1000
	4390 ±25%	≈1574	≈0	PQ26/25-3F3

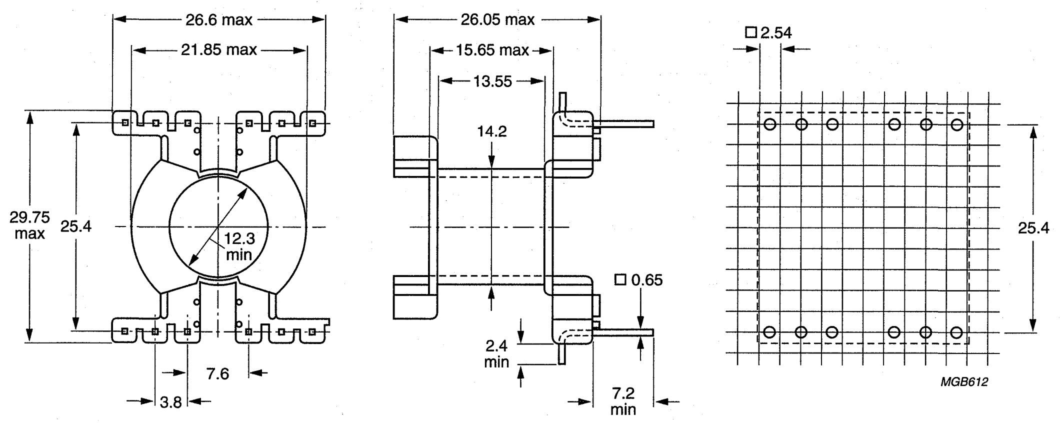
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.5	–	–	–
3C90	≥320	≤0.79	≤0.83	–	–
3C91	≥320	–	≈0.65	≈4.0	–
3C94	≥320	–	≤0.62	≈2.8	≈1.4
3C96	≥320	–	≈0.45	≈2.0	≈1.0
3F3	≥320	–	≤0.72	–	≤1.2

COIL FORMER

General data 12-pins PQ26/25 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ26/25 coil former; 12-pins.

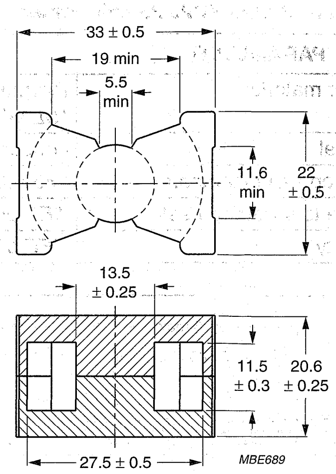
Winding data for 12-pins PQ26/25 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	47.5	13.6	56.4	CPV-PQ26/25-1S-12P
1	47.5	13.6	56.4	CPV-PQ26/25-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.331	mm^{-1}
V_e	effective volume	9440	mm^3
l_e	effective length	55.9	mm
A_e	effective area	169	mm^2
A_{min}	minimum area	142	mm^2
m	mass of set	≈47	g



Dimensions in mm.

Fig.1 PQ32/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L() (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈83	≈765	PQ32/20-3C81-E315
	400 ±3%	≈105	≈582	PQ32/20-3C81-A400
	630 ±3%	≈166	≈343	PQ32/20-3C81-A630
	1000 ±3%	≈263	≈198	PQ32/20-3C81-A1000
	1600 ±5%	≈421	≈109	PQ32/20-3C81-A1600
	7560 ±25%	≈1990	≈0	PQ32/20-3C81
3C90	315 ±3%	≈83	≈765	PQ32/20-3C90-E315
	400 ±3%	≈105	≈582	PQ32/20-3C90-A400
	630 ±3%	≈166	≈343	PQ32/20-3C90-A630
	1000 ±3%	≈263	≈198	PQ32/20-3C90-A1000
	1600 ±5%	≈421	≈109	PQ32/20-3C90-A1600
	6000 ±25%	≈1580	≈0	PQ32/20-3C90
3C91 prot	7560 ±25%	≈1990	≈0	PQ32/20-3C91
3C94 des	6000 ±25%	≈1580	≈0	PQ32/20-3C94
3C96 prot	6000 ±25%	≈1580	≈0	PQ32/20-3C96

GRADE	A_L () (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈83	≈765	PQ32/20-3F3-E315
	400 ±3%	≈105	≈582	PQ32/20-3F3-A400
	630 ±3%	≈166	≈343	PQ32/20-3F3-A630
	1000 ±3%	≈263	≈198	PQ32/20-3F3-A1000
	1600 ±5%	≈421	≈109	PQ32/20-3C81-A1600
	6000 ±25%	≈1580	≈0	PQ32/20-3F3

Properties of core sets under power conditions

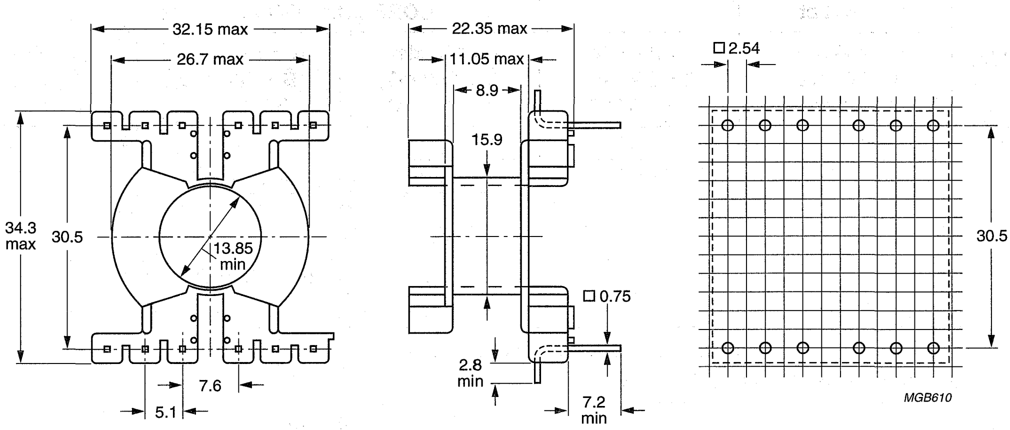
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.9	–	–	–
3C90	≥320	≤1.2	≤1.3	–	–
3C91	≥320	–	≈1.0	≈6.0	–
3C94	≥320	–	≤0.90	≈4.0	≈2.0
3C96	≥320	–	≈0.65	≈3.0	≈1.4
3F3	≥320	–	≤1.0	≈4.0	≤1.8

PQ cores and accessories PQ32/20

COIL FORMER

General data 12-pins PQ32/20 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94 V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 6068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ32/20 coil former; 12-pins.

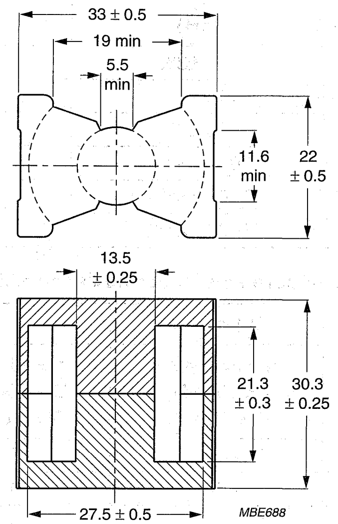
Winding data for 12-pins PQ32/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	44.8	8.9	66.7	CPV-PQ32/20-1S-12P
1	44.8	8.9	66.7	CPV-PQ32/20-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.447	mm^{-1}
V_e	effective volume	12500	mm^3
l_e	effective length	74.7	mm
A_e	effective area	167	mm^2
A_{min}	minimum area	142	mm^2
m	mass of set	≈62	g



Dimensions in mm.

Fig.1 PQ32/30 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	315 ±3%	≈112	≈766	PQ32/30-3C81-E315
	400 ±3%	≈142	≈576	PQ32/30-3C81-A400
	630 ±3%	≈224	≈334	PQ32/30-3C81-A630
	1000 ±3%	≈356	≈188	PQ32/30-3C81-A1000
	1600 ±5%	≈569	≈99	PQ32/30-3C81-A1600
	6570 ±25%	≈2335	≈0	PQ32/30-3C81
3C90	315 ±3%	≈112	≈766	PQ32/30-3C90-E315
	400 ±3%	≈142	≈576	PQ32/30-3C90-A400
	630 ±3%	≈224	≈334	PQ32/30-3C90-A630
	1000 ±3%	≈356	≈188	PQ32/30-3C90-A1000
	1600 ±5%	≈569	≈99	PQ32/30-3C90-A1600
	5040 ±25%	≈1790	≈0	PQ32/30-3C90
3C91 prot	6570 ±25%	≈2335	≈0	PQ32/30-3C91
3C94 des	5040 ±25%	≈1790	≈0	PQ32/30-3C94
3C96 prot	5040 ±25%	≈1790	≈0	PQ32/30-3C96

PQ cores and accessories PQ32/30

GRADE	A_L() (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈112	≈766	PQ32/30-3F3-E315
	400 ±3%	≈142	≈576	PQ32/30-3F3-A400
	630 ±3%	≈224	≈334	PQ32/30-3F3-A630
	1000 ±3%	≈356	≈188	PQ32/30-3F3-A1000
	1600 ±5%	≈569	≈99	PQ32/30-3C81-A1600
	4580 ±25%	≈1630	≈0	PQ32/30-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤2.6	–	–	–
3C90	≥320	≤1.5	≤1.6	–	–
3C91	≥320	–	≈1.3	≈8.0	–
3C94	≥320	–	≤1.2	≈5.4	≈2.6
3C96	≥320	–	≈0.9	≈4.0	≈1.8
3F3	≥320	–	≤1.4	–	≤2.4

COIL FORMER

General data 14-pins PQ32/30 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 60094V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

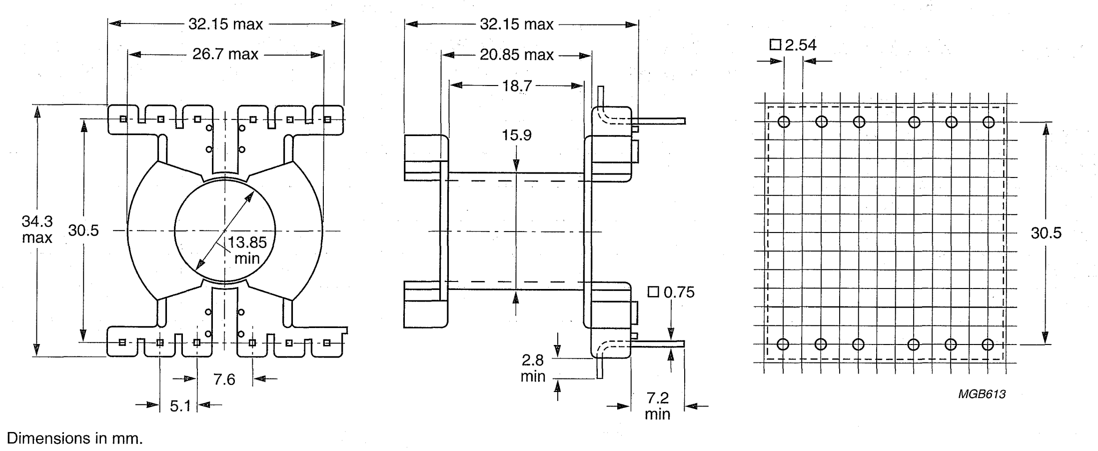


Fig.2 PQ32/30 coil former; 12-pins.

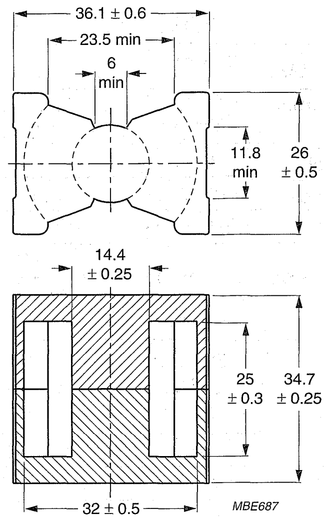
Winding data for 12-pins PQ32/30 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	53.0	18.7	66.7	CPV-PQ32/30-1S-12P
1	53.0	18.7	66.7	CPV-PQ32/30-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.454	mm^{-1}
V_e	effective volume	16300	mm^3
l_e	effective length	86.1	mm
A_e	effective area	190	mm^2
A_{min}	minimum area	162	mm^2
m	mass of set	≈80	g



Dimensions in mm.

Fig.1 PQ35/35 core set.

Core sets for general purpose transformers and power applications

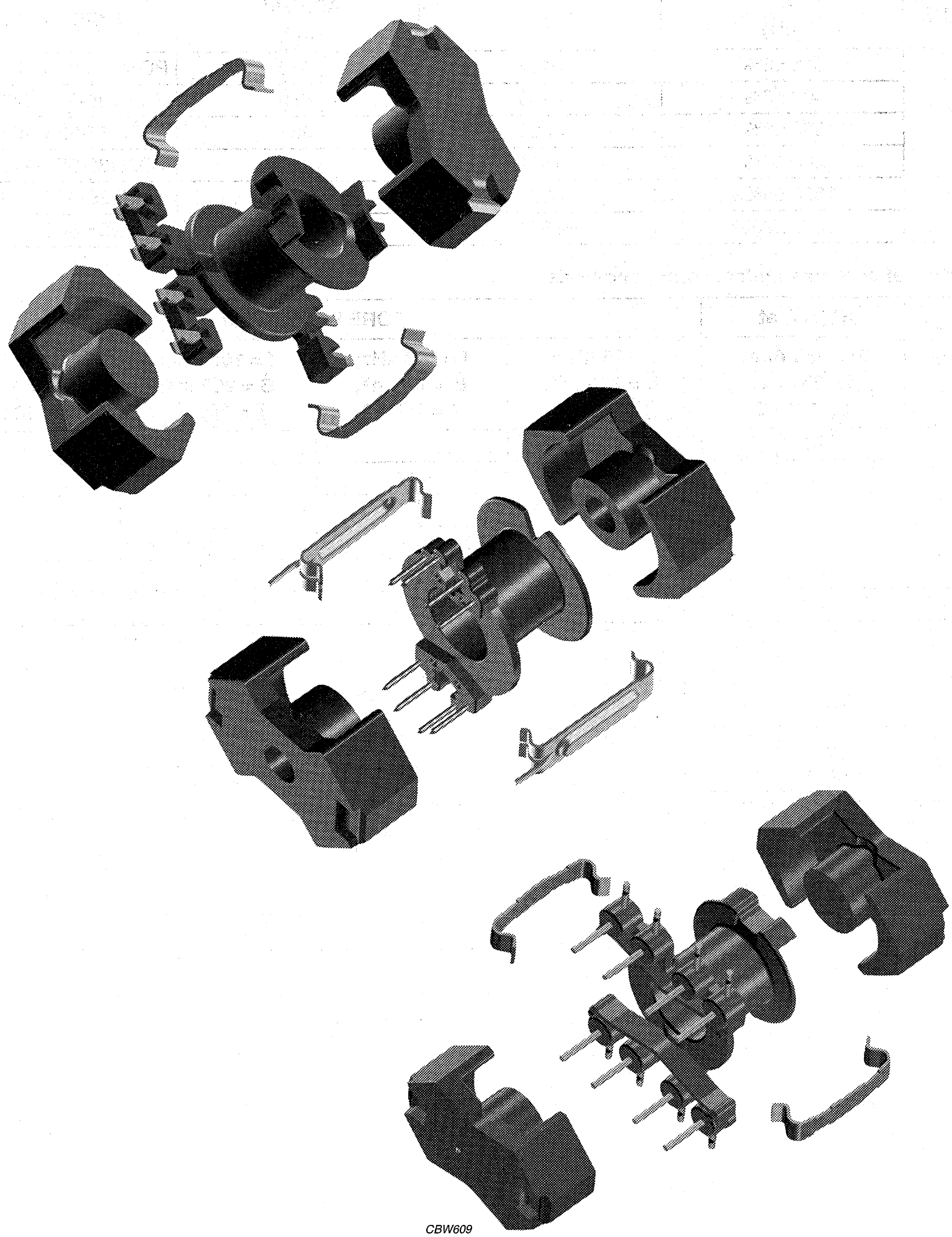
Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈114	≈880	PQ35/35-3C81-E315
	400 ±3%	≈145	≈660	PQ35/35-3C81-E400
	630 ±3%	≈228	≈381	PQ35/35-3C81-A630
	1000 ±3%	≈361	≈214	PQ35/35-3C81-A1000
	1600 ±5%	≈578	≈112	PQ35/35-3C81-A1600
	5330 ±25%	≈1920	≈0	PQ35/35-3C81
3C90	315 ±3%	≈114	≈880	PQ35/35-3C90-E315
	400 ±3%	≈145	≈660	PQ35/35-3C90-E400
	630 ±3%	≈228	≈381	PQ35/35-3C90-A630
	1000 ±3%	≈361	≈214	PQ35/35-3C90-A1000
	1600 ±5%	≈578	≈112	PQ35/35-3C90-A1600
	4300 ±25%	≈1550	≈0	PQ35/35-3C90
3C91 prot	5330 ±25%	≈1920	≈0	PQ32/35-3C91
3C94 des	4300 ±25%	≈1550	≈0	PQ32/35-3C94
3C96 prot	4300 ±25%	≈1550	≈0	PQ32/35-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈114	≈880	PQ35/35-3F3-E315
	400 ±3%	≈145	≈660	PQ35/35-3F3-E400
	630 ±3%	≈228	≈381	PQ35/35-3F3-A630
	1000 ±3%	≈361	≈214	PQ35/35-3F3-A1000
	1600 ±5%	≈578	≈112	PQ35/35-3F3-A1600
	4570 ±25%	≈1650	≈0	PQ35/35-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤3.8	–	–	–
3C90	≥320	≤2.0	≤2.1	–	–
3C91	≥320	–	≈1.7	≈10	–
3C94	≥320	–	≤1.6	≈7.0	≈3.4
3C96	≥320	–	≈1.2	≈5.0	≈2.4
3F3	≥320	–	≤1.8	–	≤3.1



CBW609

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview RM cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
RM4	230	11.0	2.5
RM4/I	322	13.8	2.8
RM4/ILP	251	14.5	1.5
RM5	450	21.2	3.0
RM5/I	574	24.8	3.3
RM5/ILP	430	24.5	2.2
RM6S	840	31.4	4.5
RM6S/I	1090	37.0	4.9
RM6S/ILP	820	37.5	4.2
RM6R	810	32.0	4.5
RM7/I	1325	44.1	7.7
RM7/ILP	1060	45.3	6.0
RM8	1850	52.0	10.9
RM8/I	2440	63.0	12.0
RM8/ILP	1860	64.9	10.0
RM10/I	4310	96.6	22
RM10/ILP	3360	99.1	17
RM12/I	8340	146	45
RM12/ILP	6195	148	34
RM14/I	13900	198	74
RM14/ILP	10230	201	55

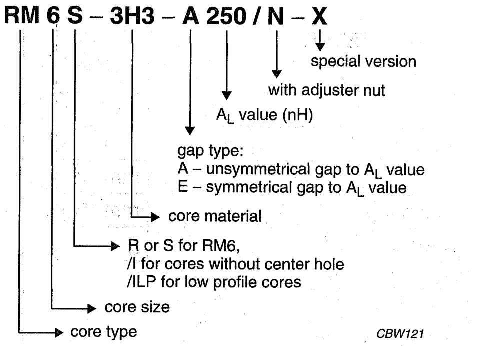


Fig.1 Type number structure for cores.

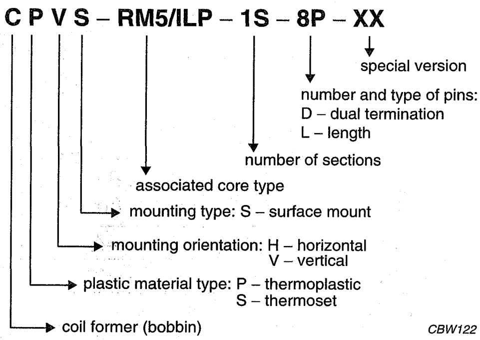


Fig.2 Type number structure for coil formers.

RM cores and accessories RM4

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈1.4	g

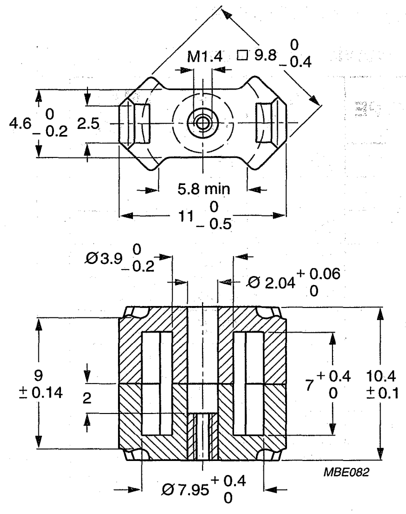


Fig.1 RM4 core set.

Core sets for filter applications

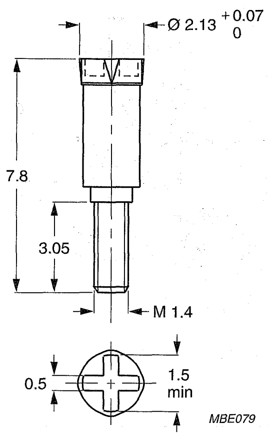
Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	40 ±3%	≈62	≈400	RM4-3D3-E40/N	RM4-3D3-E40
	63 ±3%	≈96	≈200	RM4-3D3-A63/N	RM4-3D3-A63
	400 ±25%	≈610	≈0	−	RM4-3D3
3H3	63 ±3%	≈96	≈200	RM4-3H3-A63/N	RM4-3H3-A63
	100 ±3%	≈152	≈120	RM4-3H3-A100/N	RM4-3H3-A100
	160 ±3%	≈242	≈80	RM4-3H3-A160/N	RM4-3H3-A160
	900 ±25%	≈1360	≈0	−	RM4-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM4 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L %(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L %(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L %(1)
3H3; 3D3	63	–	–	–	–	ADJ-RM4/RM5-RED	27
	100	–	–	ADJ-RM4/RM5-RED	17	ADJ-RM4/RM5-BROWN	25
	160	ADJ-RM4/RM5-GREEN	5	ADJ-RM4/RM5-BROWN	14	ADJ-RM4/RM5-GREY	26
	250	ADJ-RM4/RM5-RED	5	ADJ-RM4/RM5-GREY	12	ADJ-RM4/RM5-BLACK	17

Note

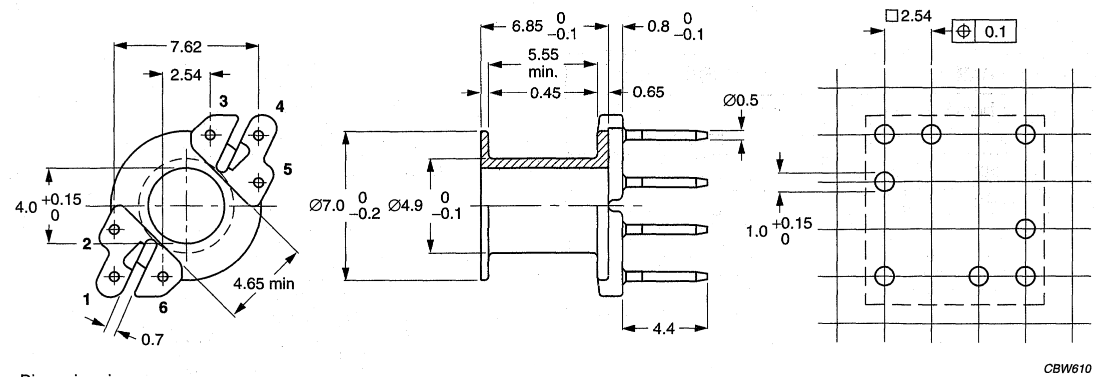
1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

RM cores and accessories RM4



Dimensions in mm.

Fig.3 RM4 coil former.

Winding data for RM4 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	6	all	20	7.4	5.55	CSV-RM4-1S-6P(1)
1	5	1, 2, 4, 5, 6	20	7.4	5.55	CSV-RM4-1S-5P(1)

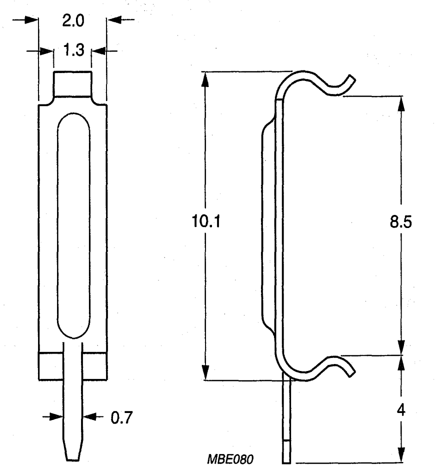
Note

1. Also avilable with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



Dimensions in mm.

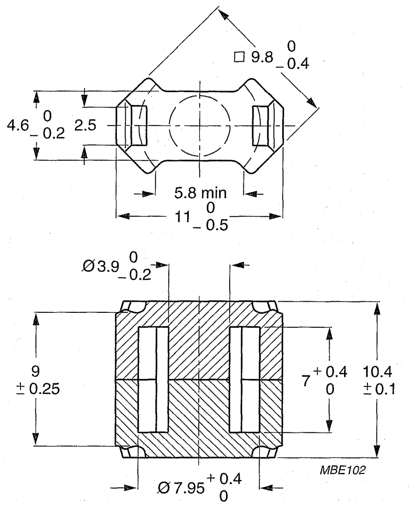
Fig.4 Mounting clip for RM4.

RM cores and accessories — RM4/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of set	≈1.7	g



Dimensions in mm.

Fig.1 RM4/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	1125 ±25%	≈1520	≈0	RM4/I-3C90
3C94 des	1125 ±25%	≈1520	≈0	RM4/I-3C94
3C96 prot	1000 ±25%	≈1350	≈0	RM4/I-3C96
3F3	100 ±3%	≈134	≈170	RM4/I-3F3-A100
	160 ±3%	≈215	≈100	RM4/I-3F3-A160
	250 ±10%	≈336	≈50	RM4/I-3F3-A250
	950 ±25%	≈1280	≈0	RM4/I-3F3
3F35 prot	800 ±25%	≈1080	≈0	RM4/I-3F35
3F4 des	100 ±3%	≈134	≈150	RM4/I-3F4-A100
	160 ±3%	≈215	≈80	RM4/I-3F4-A160
	250 ±10%	≈336	≈40	RM4/I-3F4-A250
	560 ±25%	≈750	≈0.12	RM4/I-3F4

RM cores and accessories RM4/I

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A (nH)	μ_e	TYPE NUMBER
3E1 sup	1800 ±25%	≈2400	RM4/I-3E1
3E4 sup	2500 +40/–30%	≈3360	RM4/I-3E4
3E5	3500 +40/–30%	≈4700	RM4/I-3E5

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥320	≤0.039	≤0.04	–	–
3C94	≥320	–	≤0.03	≈0.14	≈0.07
3C96	≥320	–	≈0.02	≈0.10	≈0.05
3F3	≥300	–	≤0.05	–	≤0.07
3F35	≥300	–	–	–	≈0.03
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

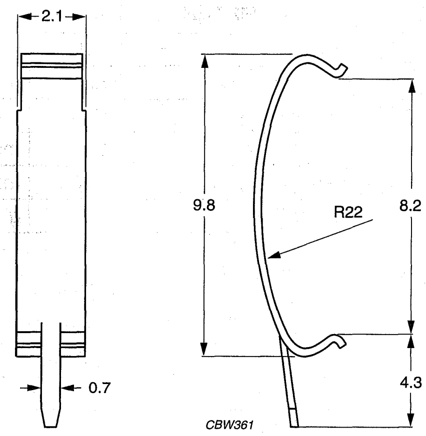
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.05	≈0.35	–	–
3F4	≥250	–	–	≤0.065	≤0.11

COIL FORMERS

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Clip plating	lead tin alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

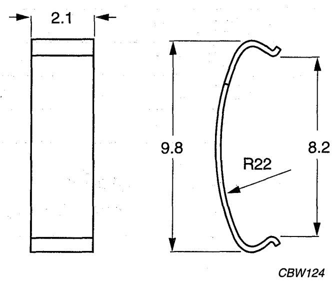


Dimensions in mm.

Fig.2 Mounting clip with earth pin for RM4/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/I



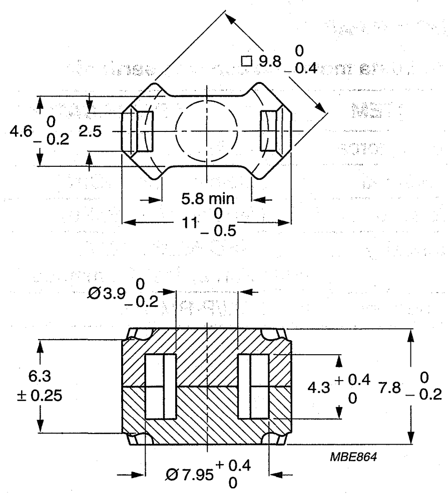
Dimensions in mm.

Fig.3 Mounting clip without earth pin for RM4/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.20	mm^{-1}
V_e	effective volume	251	mm^3
l_e	effective length	17.3	mm
A_e	effective area	14.5	mm^2
A_{min}	minimum area	11.3	mm^2
m	mass of set	≈1.5	g



Dimensions in mm.

Fig.1 RM4/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	1400 ±25%	≈1340	≈0	RM4/ILP-3C90
3C94 des	1400 ±25%	≈1340	≈0	RM4/ILP-3C94
3C96 prot	1250 ±25%	≈1190	≈0	RM4/ILP-3C96
3F3	1200 ±25%	≈1150	≈0	RM4/ILP-3F3
3F35 prot	1000 ±25%	≈960	≈0	RM4/ILP-3F35
3F4 des	750 ±25%	≈720	≈0	RM4/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E5 des	5000 +40/−30%	≈4800	≈0	RM4/ILP-3E5
3E6 des	6000 +40/−30%	≈5700	≈0	RM4/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥320	≤0.04	≤0.04	–	–
3C94	≥320	–	≤0.024	≈0.11	≈0.055
3C96	≥320	–	≈0.018	≈0.08	≈0.04
3F3	≥300	–	≤0.04	–	≤0.06
3F35	≥300	–	–	–	≈0.022
3F4	≥250	–	–	–	–

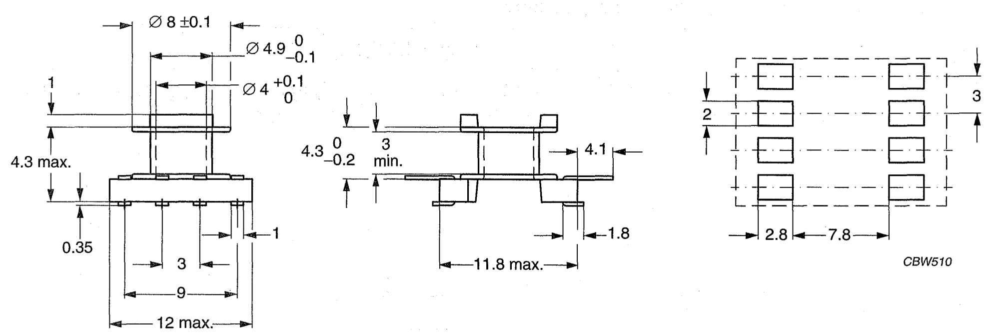
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.04	≈0.3	–	–
3F4	≥250	–	–	≤0.05	≤0.08

COIL FORMERS

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 SMD coil former for RM4/ILP.

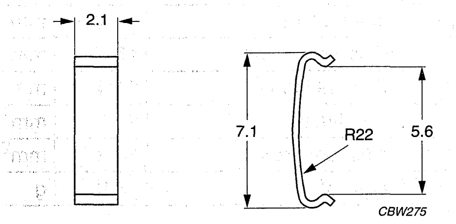
Winding data for RM4/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	3.75	3.0	20.7	CPVS-RM4/LP-1S-8PL

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



Dimensions in mm.

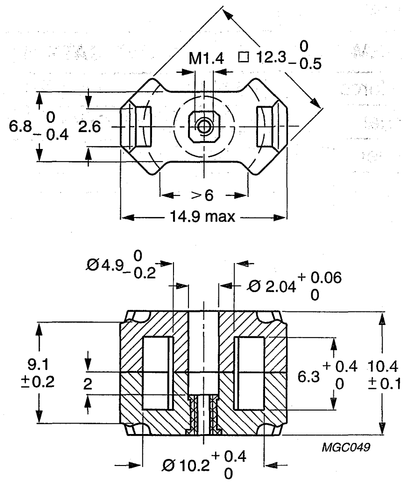
Fig.3 Mounting clip for RM4/ILP.

RM cores and accessories RM5

CORE SETS

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
m	mass of set	≈3.0	g



Dimensions in mm.

Fig.1 RM5 core set.

Core sets for filter applications

Clamping force for A_L measurements, 25 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	40 ±3%	≈33	≈700	RM5-3D3-E40/N	RM5-3D3-E40
	63 ±3%	≈51	≈400	RM5-3D3-E63/N	RM5-3D3-E63
	100 ±3%	≈82	≈300	RM5-3D3-E100/N	RM5-3D3-E100
	800 ±25%	≈630	≈0	–	RM5-3D3
3H3	160 ±3%	≈130	≈200	RM5-3H3-A160/N	RM5-3H3-A160
	250 ±3%	≈200	≈120	RM5-3H3-A250/N	RM5-3H3-A250
	315 ±3%	≈250	≈90	RM5-3H3-A315/N	RM5-3H3-A315
	400 ±5%	≈320	≈70	RM5-3H3-A400/N	RM5-3H3-A400
	1650 ±25%	≈1310	≈0	–	RM5-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C

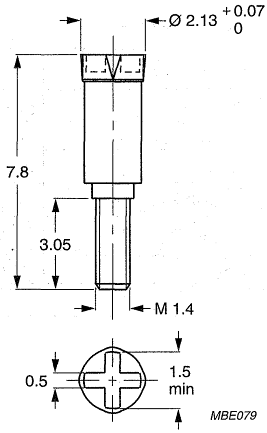


Fig.2 RM5 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L %(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L %(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L %(1)
3H3	63	–	–	–	–	ADJ-RM4/RM5-RED	23
	100	–	–	ADJ-RM4/RM5-RED	15	ADJ-RM4/RM5-BROWN	24
	160	ADJ-RM4/RM5-RED	11	ADJ-RM4/RM5-BROWN	15	ADJ-RM4/RM5-GREY	28
	250	ADJ-RM4/RM5-RED	6	ADJ-RM4/RM5-BROWN	10	ADJ-RM4/RM5-GREY	17
	315	ADJ-RM4/RM5-BROWN	7	ADJ-RM4/RM5-GREY	13	–	–
	400	ADJ-RM4/RM5-BROWN	5	ADJ-RM4/RM5-BLACK	14	–	–
3D3	40	–	–	ADJ-RM4/RM5-GREEN	15	ADJ-RM4/RM5-RED	30
	63	–	–	–	–	ADJ-RM4/RM5-RED	20
	100	–	–	ADJ-RM4/RM5-RED	14	–	–

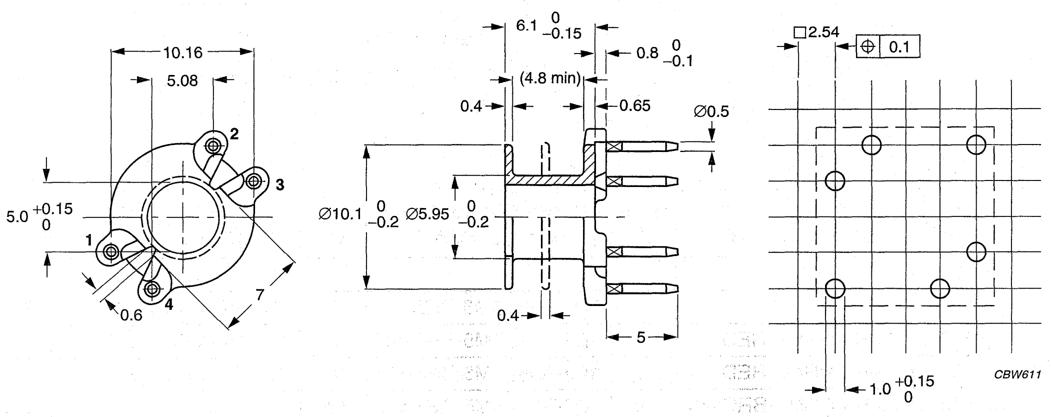
Note

1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

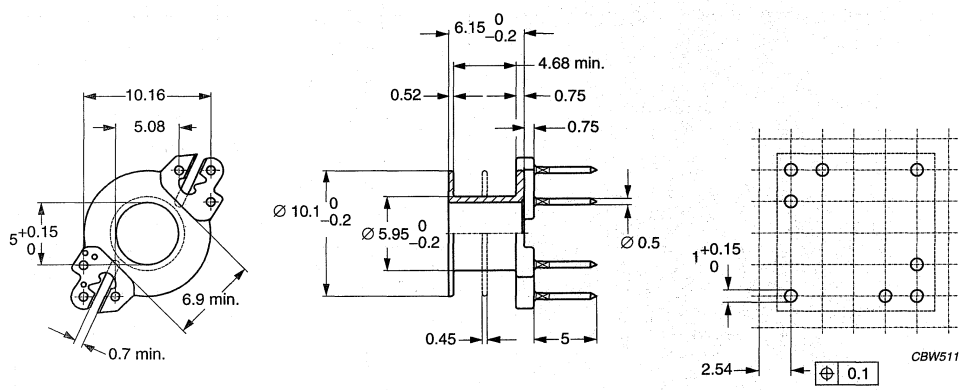
Fig.3 RM5 coil former; 4-pins.

Winding data for 4-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4	all	9.5	4.8	25	CSV-RM5-1S-4P
2	4	all	2 × 4.35	2 × 2.2	25	CSV-RM5-2S-4P

General data coil former

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-tin alloy CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 Coil former for RM5; 6-pins

Winding data for 6-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITION S USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	9.2	4.68	24.9	CSV-RM5-1S-6P-G(1)
1	5	1, 2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-5P-G(1)
1	4	2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-4P-G(1)
2	6	all	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-6P-G(1)
2	5	1, 2, 3, 5, 6	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-5P-G(1)

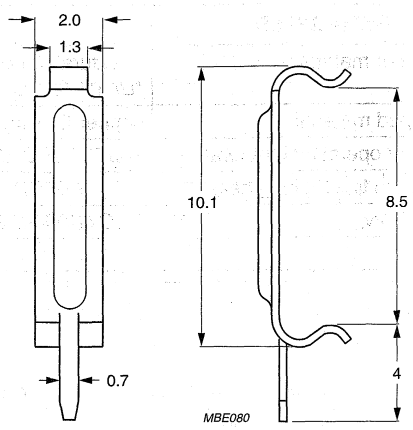
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈12 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



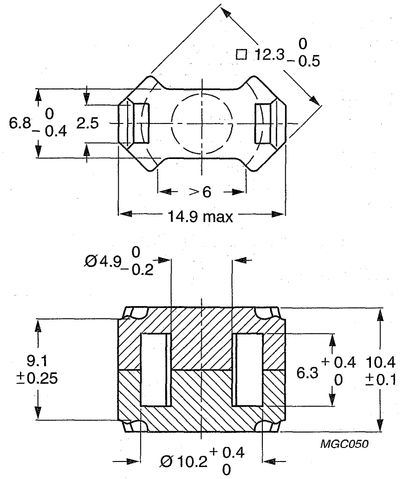
Dimensions in mm.

Fig.5 Mounting clip for RM5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈3.3	g



Dimensions in mm.

Fig.1 RM5/I core set.

Core sets for general purpose

Clamping force for A_L measurements, 12 ±5 N.

GRADE	A (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈47	≈640	RM5/I-3C90-A63
	100 ±3%	≈74	≈300	RM5/I-3C90-A100
	160 ±3%	≈119	≈200	RM5/I-3C90-A160
	250 ±3%	≈186	≈130	RM5/I-3C90-A250
	315 ±5%	≈234	≈100	RM5/I-3C90-A315
	2000 ±25%	≈1490	≈0	RM5/I-3C90
3C94 des	63 ±3%	≈47	≈640	RM5/I-3C94-A63
	100 ±3%	≈74	≈300	RM5/I-3C94-A100
	160 ±3%	≈119	≈200	RM5/I-3C94-A160
	250 ±3%	≈186	≈130	RM5/I-3C94-A250
	315 ±5%	≈234	≈100	RM5/I-3C94-A315
	2000 ±25%	≈1490	≈0	RM5/I-3C94
3C96 prot	1800 ±25%	≈1340	≈0	RM5/I-3C96
3F3	63 ±3%	≈47	≈640	RM5/I-3F3-A63
	100 ±3%	≈74	≈300	RM5/I-3F3-A100
	160 ±3%	≈119	≈200	RM5/I-3F3-A160
	250 ±3%	≈186	≈130	RM5/I-3F3-A250
	315 ±5%	≈234	≈100	RM5/I-3F3-A315
	1700 ±25%	≈1270	≈0	RM5/I-3F3

RM cores and accessories

RM5/I

GRADE	A (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F35 prot	1400 ±25%	≈1050	≈0	RM5/I-3F35
3F4 des	100 ±3%	≈74	≈300	RM5/I-3F4-A100
	160 ±3%	≈119	≈200	RM5/I-3F4-A160
	250 ±3%	≈186	≈130	RM5/I-3F4-A250
	1000 ±25%	≈750	≈0	RM5/I-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 12 ±5 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	3150 ±25%	≈2350	RM5/I-3E1
3E4 sup	4500 +40/−30%	≈3350	RM5/I-3E4
3E27	4975 ±25%	≈3700	RM5/I-3E27
3E5	6700 +40/−30%	≈4980	RM5/I-3E5
3E6	8500 +40/−30%	≈6300	RM5/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.07	≤0.08	−	−
3C94	≥320	−	≤0.055	≈0.25	≤0.12
3C96	≥320	−	≈0.04	≈0.18	≈0.09
3F3	≥315	−	≤0.08	−	≤0.11
3F35	≥300	−	−	−	≈0.06
3F4	≥250	−	−	−	−

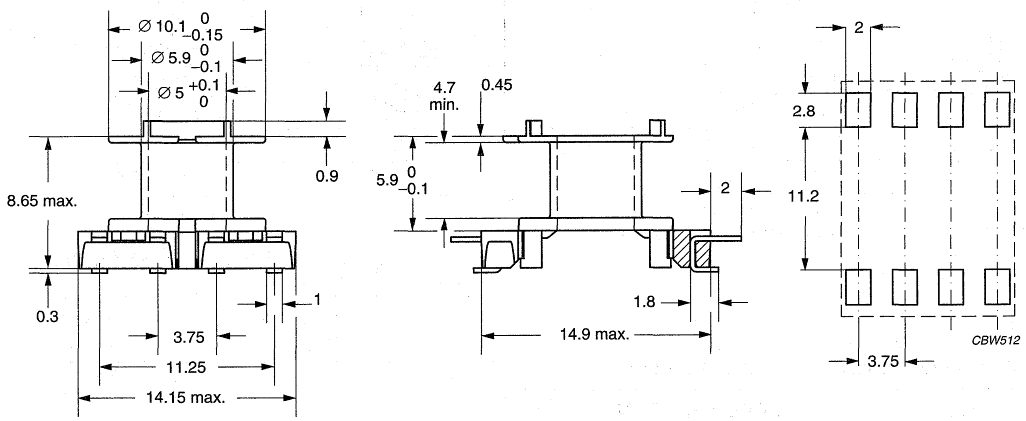
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ =10 mT; T = 100 °C
3C90	≥320	−	−	−	−
3C94	≥320	−	−	−	−
3C96	≥320	−	−	−	−
3F3	≥315	−	−	−	−
3F35	≥300	≈0.09	≈0.7	−	−
3F4	≥250	−	−	≤0.11	≤0.20

COIL FORMERS

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 SMD coil former for RM5/I.

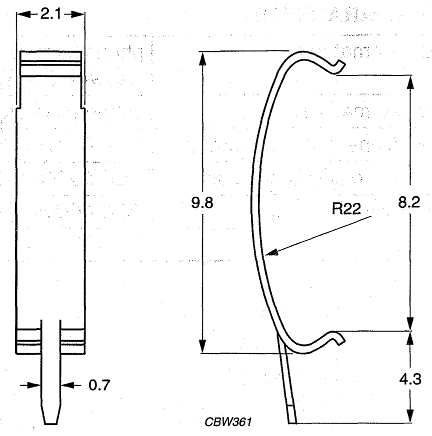
Winding data for RM5/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	9.5	4.7	24.9	CSVS-RM5-1S-8P

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈6 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

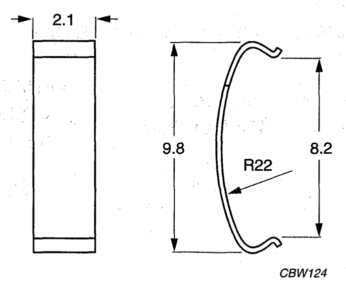


Dimensions in mm.

Fig.3 Mounting clip with earth pin for RM5/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/I



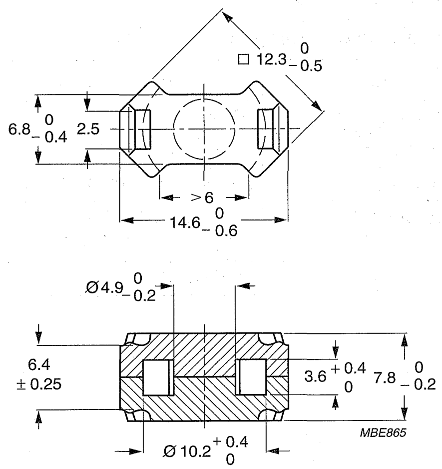
Dimensions in mm.

Fig.4 Mounting clip without earth pin for RM5/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.710	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	17.5	mm
A_e	effective area	24.5	mm^2
A_{min}	minimum area	18.1	mm^2
m	mass of set	≈2.2	g



Dimensions in mm.

Fig.1 RM5/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2350 ±25%	≈1320	≈0	RM5/ILP-3C90
3C94 des	2350 ±25%	≈1320	≈0	RM5/ILP-3C94
3C96 prot	2100 ±25%	≈1180	≈0	RM5/ILP-3C96
3F3	2000 ±25%	≈1130	≈0	RM5/ILP-3F3
3F35 prot	1700 ±25%	≈950	−	RM5/ILP-3F35
3F4 des	1250 ±25%	≈710	≈0	RM5/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5 des	8500 +40/−30%	≈4800	≈0	RM5/ILP-3E5
3E6 des	10000 +40/−30%	≈5650	≈0	RM5/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.06	≤0.06	–	–
3C94	≥320	–	≤0.04	≈0.19	≈0.09
3C96	≥320	–	≈0.03	≈0.14	≈0.06
3F3	≥300	–	≤0.06	–	≤0.08
3F35	≥300	–	–	–	≈0.05
3F4	≥250	–	–	–	–

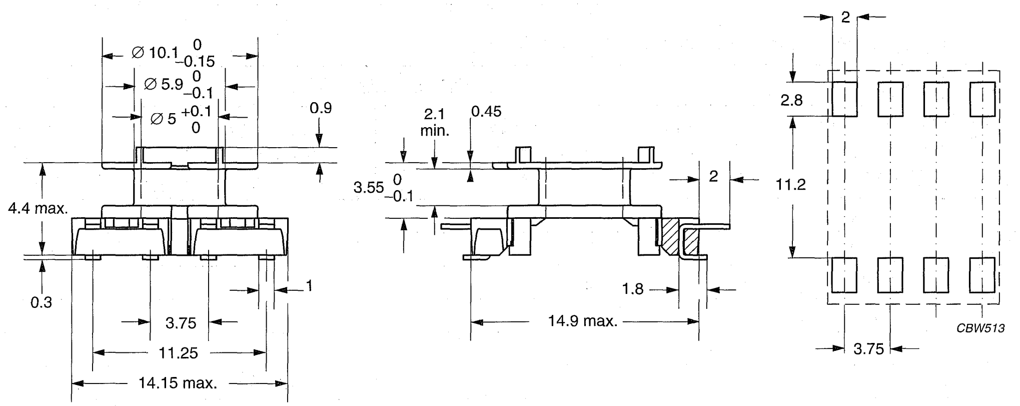
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.07	≈0.5	–	–
3F4	≥250	–	–	≤0.086	≤0.14

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number: E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 RM5/ILP SMD coil former.

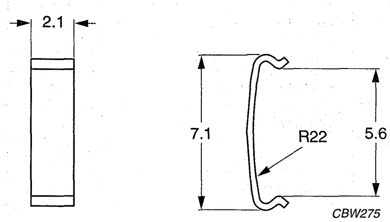
Winding data for 8-pads RM5/ILP SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.6	2.1	24.9	CSVS-RM5/LP-1S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



Dimensions in mm.

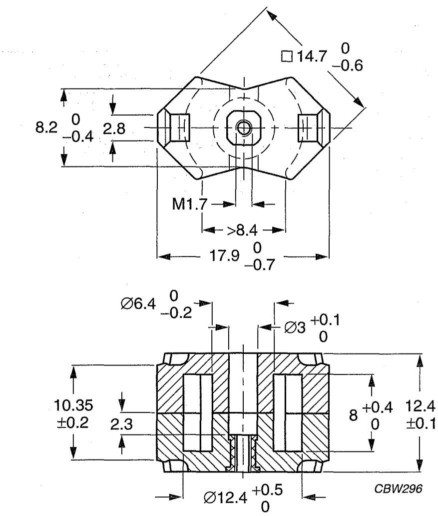
Fig.3 Mounting clip for RM5/ILP.

RM cores and accessories RM6S

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈4.5	g



Dimensions in mm.

Fig.1 RM6S core set.

Core sets for filter applications

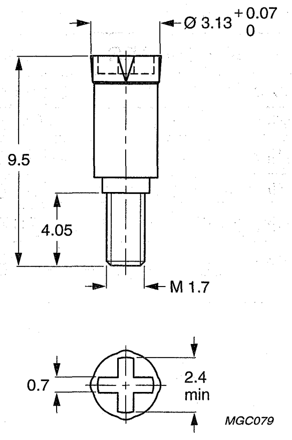
Clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	63 ±3%	≈43	≈700	RM6S-3D3-E63/N	RM6S-3D3-E63
	100 ±3%	≈69	≈400	RM6S-3D3-E100/N	RM6S-3D3-E100
	160 ±3%	≈110	≈200	RM6S-3D3-A160/N	RM6S-3D3-A160
	950 ±25%	≈650	≈0	−	RM6S-3D3
3H3	160 ±3%	≈110	≈230	RM6S-3H3-A160/N	RM6S-3H3-A160
	250 ±3%	≈171	≈110	RM6S-3H3-A250/N	RM6S-3H3-A250
	315 ±3%	≈216	≈90	RM6S-3H3-A315/N	RM6S-3H3-A315
	400 ±3%	≈274	≈70	RM6S-3H3-A400/N	RM6S-3H3-A400
	2100 ±25%	≈1440	≈0	−	RM6S-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM6S inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1) %	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L(1) %	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1) %
3H3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	10	ADJ-RM6-RED	16	–	–
	160	ADJ-RM6-GREEN	6	ADJ-RM6-RED	11	ADJ-RM6-WHITE	19
	200	ADJ-RM6-RED	9	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	19
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	20
	315	ADJ-RM6-WHITE	9	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	23
	400	ADJ-RM6-VIOLET	8	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	26
	630	ADJ-RM6-BLACK	9	ADJ-RM6-GREY	15	–	–
	1000	ADJ-RM6-BLACK	5	ADJ-RM6-GREY	9	–	–
	1250	–	–	ADJ-RM6-GREY	5	–	–
3D3	40	–	–	–	–	ADJ-RM6-GREEN	19
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	9	ADJ-RM6-RED	15	ADJ-RM6-WHITE	27
	160	ADJ-RM6-RED	9	ADJ-RM6-WHITE	16	–	–

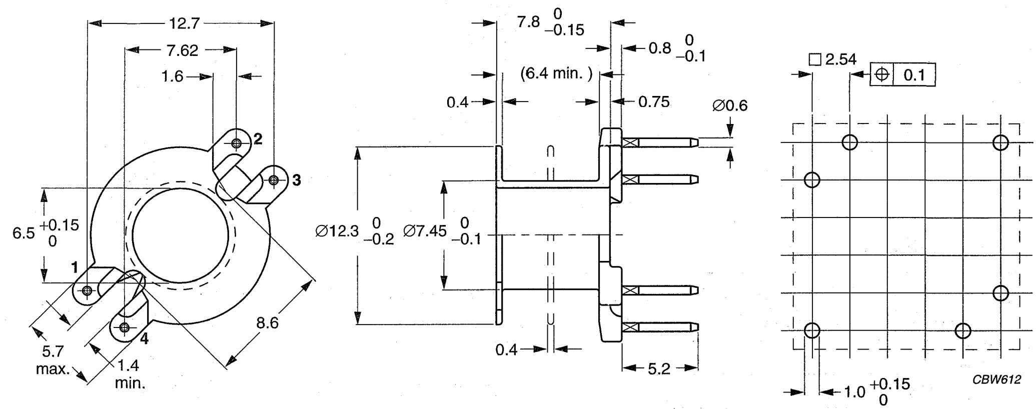
Note

1. Maximum adjustment range.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

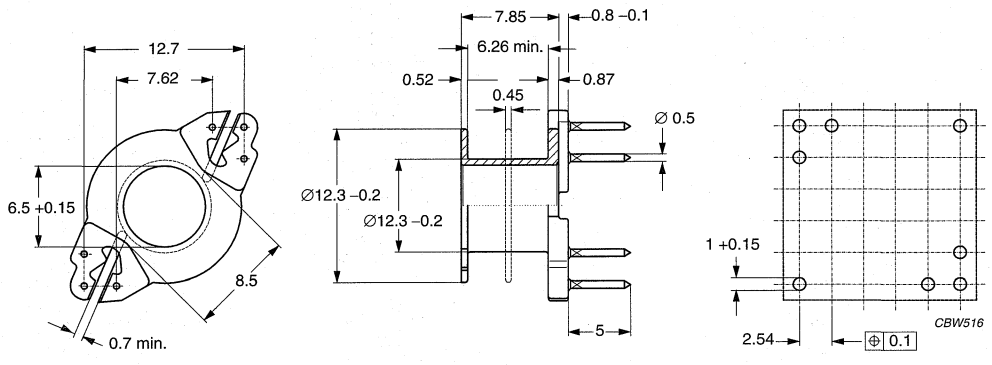
Fig.3 RM6S coil former; 4-pins.

Winding data for 4-pins RM6S coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4	all	15	6.4	30	CSV-RM6S/R-1S-4P
2	4	all	2 × 7.0	2 × 3.0	30	CSV-RM6S/R-2S-4P

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-tin alloy CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 Coil former for RM6S; 6-pins.

Winding data for RM6S coil former

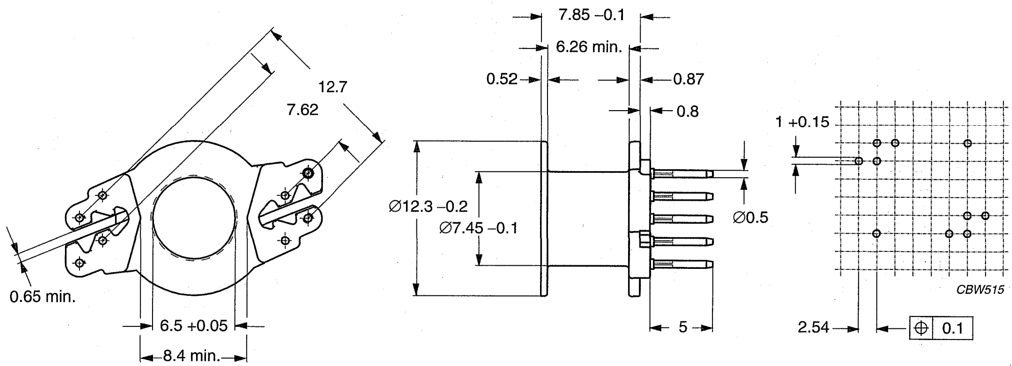
NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	15.0	6.3	30.0	CSV-RM6S-1S-6P-G(1)
1	5	1, 2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-5P-G(1)
1	4	2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-4P-G(1)
2	6	all	2 × 7	2 × 3	30.0	CSV-RM6S-2S-6P-G(1)

Note

1. Also available with post-inserted pins.

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.5 Coil former for RM6S; 8-pins.

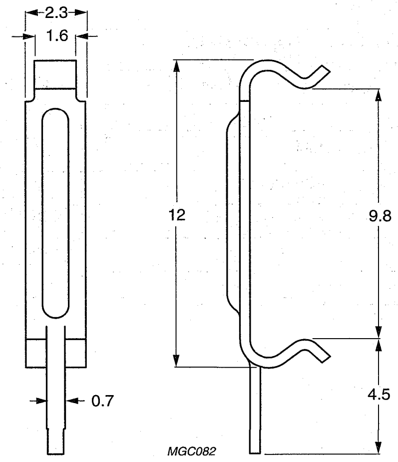
Winding data for RM6S coil former

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14.5	6.26	30.7	CSV-RM6S-1S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



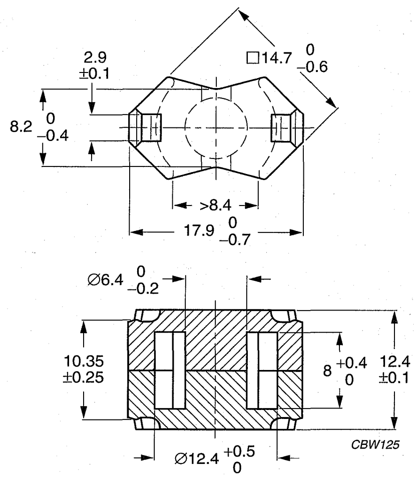
Dimensions in mm.

Fig.6 Mounting clip for RM6S.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(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
m	mass of set	≈4.9	g



Dimensions in mm.

Fig.1 RM6S/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈39	≈950	RM6S/I-3C81-E63
	100 ±3%	≈62	≈500	RM6S/I-3C81-A100
	160 ±3%	≈100	≈300	RM6S/I-3C81-A160
	250 ±3%	≈156	≈200	RM6S/I-3C81-A250
	315 ±3%	≈197	≈150	RM6S/I-3C81-A315
	3000 ±25%	≈1870	≈0	RM6S/I-3C81
3C90	63 ±3%	≈39	≈950	RM6S/I-3C90-A63
	100 ±3%	≈62	≈500	RM6S/I-3C90-A100
	160 ±3%	≈100	≈300	RM6S/I-3C90-A160
	250 ±3%	≈156	≈200	RM6S/I-3C90-A250
	315 ±3%	≈197	≈150	RM6S/I-3C90-A315
	400 ±3%	≈250	≈120	RM6S/I-3C90-A400
	630 ±5%	≈390	≈70	RM6S/I-3C90-A630
	2600 ±25%	≈1630	≈0	RM6S/I-3C90
3C91 prot	3000 ±25%	≈1870	≈0	RM6S/I-3C91

RM cores and accessories RM6S/I

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	63 ±3%	≈39	≈950	RM6S/I-3C94-A63
	100 ±3%	≈62	≈500	RM6S/I-3C94-A100
	160 ±3%	≈100	≈300	RM6S/I-3C94-A160
	250 ±3%	≈156	≈200	RM6S/I-3C94-A250
	315 ±3%	≈197	≈150	RM6S/I-3C94-A315
	400 ±3%	≈250	≈120	RM6S/I-3C94-A400
	630 ±5%	≈390	≈70	RM6S/I-3C94-A630
	2600 ±25%	≈1630	≈0	RM6S/I-3C94
3C96 prot	2350 ±3%	≈1470	≈950	RM6S/I-3C96
3D3 des	160 ±3%	≈100	≈300	RM6S/I-3D3-A160
	250 ±5%	≈156	≈200	RM6S/I-3D3-A250
	315 ±8%	≈197	≈150	RM6S/I-3D3-A315
	1050 ±25%	≈655	≈0	RM6S/I-3D3
3F3	63 ±3%	≈39	≈950	RM6S/I-3F3-A63
	100 ±3%	≈62	≈500	RM6S/I-3F3-A100
	160 ±3%	≈100	≈300	RM6S/I-3F3-A160
	250 ±3%	≈156	≈200	RM6S/I-3F3-A250
	315 ±3%	≈197	≈150	RM6S/I-3F3-A315
	2150 ±25%	≈1350	≈0	RM6S/I-3F3
3F35 prot	1750 ±25%	≈1100	≈0	RM6S/I-3F35
3F4 des	63 ±3%	≈39	≈950	RM6S/I-3F4-A63
	100 ±3%	≈62	≈500	RM6S/I-3F4-A100
	160 ±3%	≈100	≈300	RM6S/I-3F4-A160
	250 ±3%	≈156	≈200	RM6S/I-3F4-A250
	315 ±3%	≈197	≈150	RM6S/I-3F4-A315
	1250 ±25%	≈780	≈0	RM6S/I-3F4
3H3 des	315 ±3%	≈197	≈150	RM6S/I-3H3-A315
	400 ±3%	≈250	≈120	RM6S/I-3H3-A400
	630 ±5%	≈390	≈70	RM6S/I-3H3-A630
	2350 ±25%	≈1470	≈0	RM6S/I-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	4100 ±25%	≈2600	RM6S/I-3E1
3E27	6000 ±25%	≈3800	RM6S/I-3E27
3E4 sup	5750 +40/–30%	≈3590	RM6S/I-3E4
3E5	8600 +40/–30%	≈5370	RM6S/I-3E5
3E6	11000 +40/–30%	≈6850	RM6S/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.25	–	–	–
3C90	≥320	≤0.13	≤0.14	–	–
3C91	≥315	–	≈0.11	≈0.65	–
3C94	≥320	–	≤0.11	≈0.47	≈0.23
3C96	≥320	–	≈0.08	≈0.33	≈0.16
3F3	≥315	–	≤0.14	–	≤0.20
3F35	≥315	–	–	–	≈0.11
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

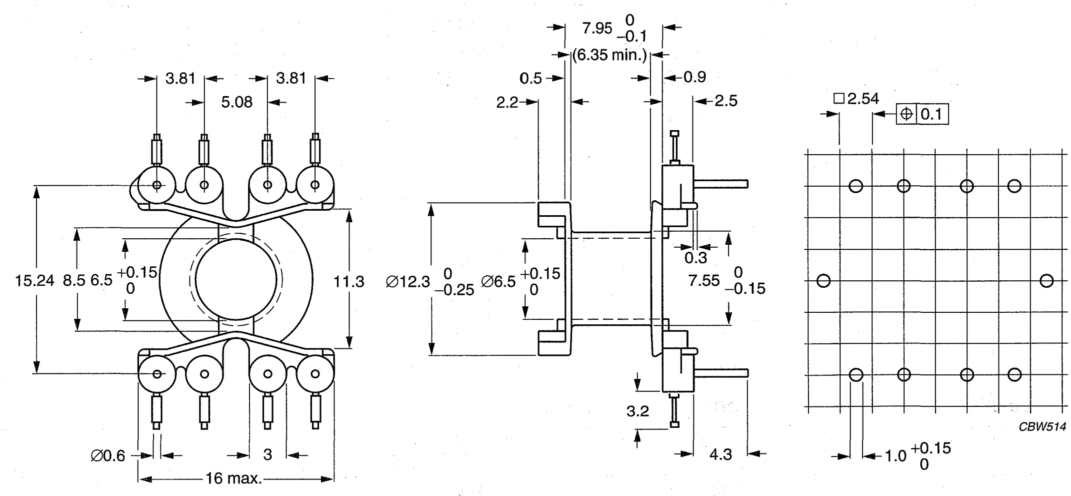
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥315	–	–	–	–
3F35	≥315	≈0.18	≈1.3	–	–
3F4	≥250	–	–	≤0.22	≤0.35

COIL FORMERS

General data

For the information on other coil formers suitable for RM6S/I, see data sheet *"RM6S"*.

PARAMETER	DESCRIPTION
Coil former material	polybutyleneterephthalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 60094V-0"*; UL file number E45329(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM6S/I coil former; 8-pins (DIL).

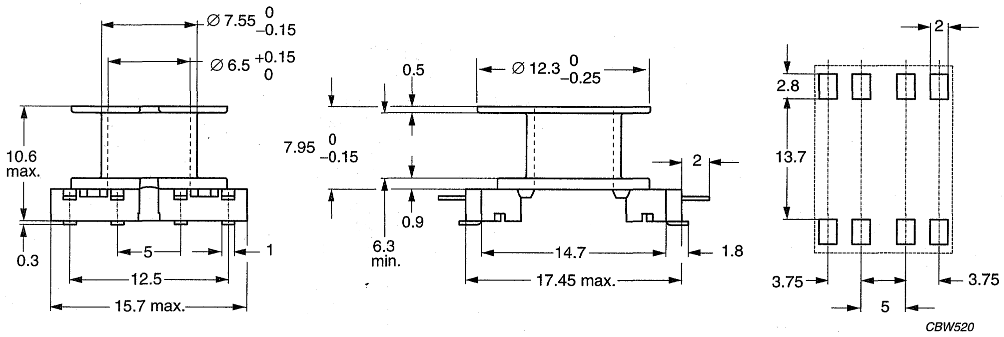
Winding data for 8-pins RM6S/I coil former (DIL)

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.7	6.2	31	CPV-RM6S/I-1S-8PD

RM cores and accessories | RM6S/I

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

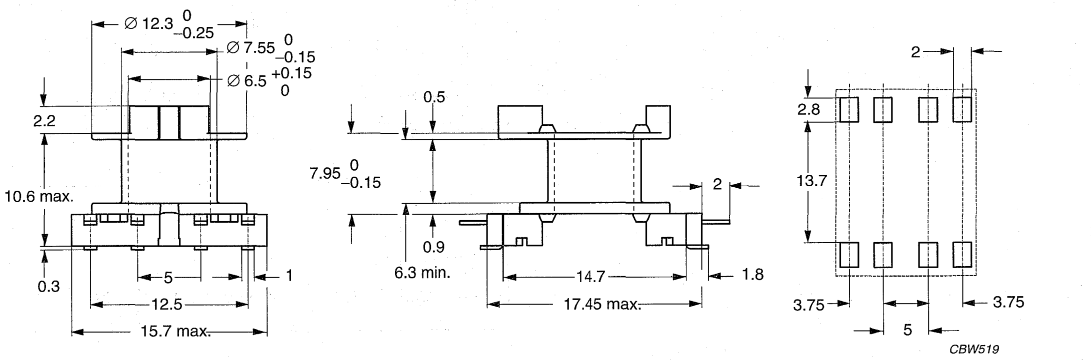
Fig.3 SMD coil former for RM6S/I.

Winding data for RM6S/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14	6.3	31	CSVS-RM6S-1S-8P

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 SMD coil former for RM6S/I.

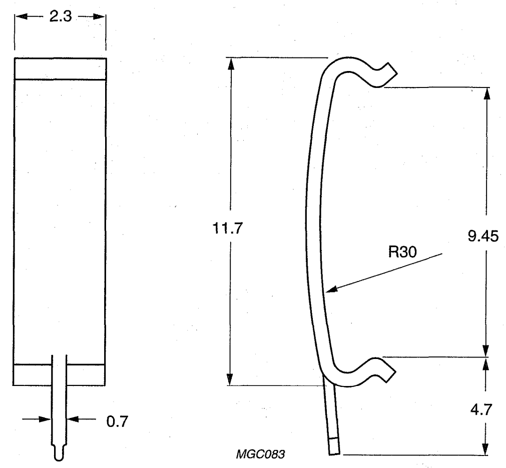
Winding data for RM6S/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14.2	6.3	31.4	CSVS-RM6S-1S-8P-B

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6/I

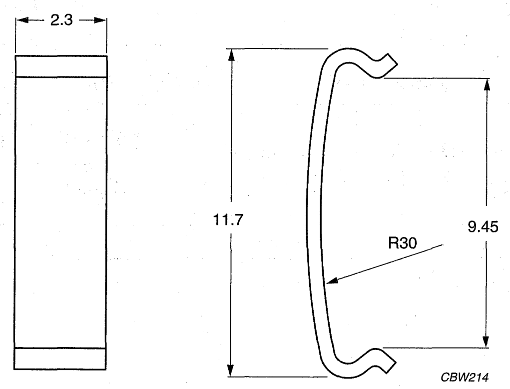


Dimensions in mm.

Fig.5 Mounting clip with earth pin for RM6/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/I



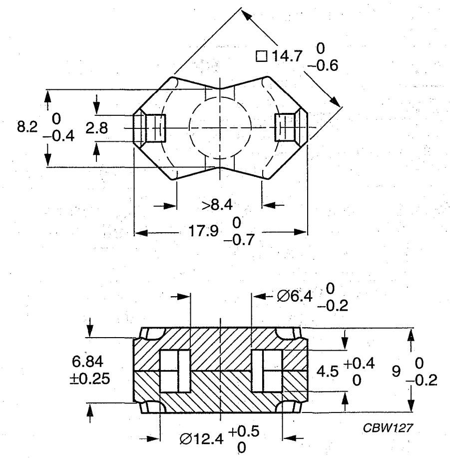
Dimensions in mm.

Fig.6 Mounting clip without earth pin for RM6/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.580	mm^{-1}
V_e	effective volume	820	mm^3
l_e	effective length	21.8	mm
A_e	effective area	37.5	mm^2
A_{min}	minimum area	31.2	mm^2
m	mass of set	≈4.2	g



Dimensions in mm.

Fig.1 RM6S/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	3175 ±25%	≈1470	≈0	RM6S/ILP-3C90
3C94 des	3175 ±25%	≈1470	≈0	RM6S/ILP-3C94
3C96 prot	2900 ±25%	≈1340	≈0	RM6S/ILP-3C96
3D3 des	160 ±3%	≈74	≈350	RM6S/ILP-3D3-A160
	250 ±5%	≈116	≈200	RM6S/ILP-3D3-A250
	315 ±5%	≈146	≈150	RM6S/ILP-3D3-A315
	1350 ±25%	≈625	≈0	RM6S/ILP-3D3
3F3	2700 ±25%	≈1250	≈0	RM6S/ILP-3F3
3F35 prot	2200 ±25%	≈1020	≈0	RM6S/ILP-3F35
3F4 des	1600 ±25%	≈740	≈0	RM6S/ILP-3F4
3H3 des	315 ±3%	≈146	≈150	RM6S/ILP-3H3-A315
	400 ±5%	≈185	≈120	RM6S/ILP-3H3-A400
	630 ±8%	≈290	≈80	RM6S/ILP-3H3-A630
	2900 ±25%	≈1340	≈0	RM6S/ILP-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3E5 des	10500 +40/–30%	≈4850	≈0	RM6S/ILP-3E5
3E6 des	13000 +40/–30%	≈6000	≈0	RM6S/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.10	≤0.11	–	–
3C94	≥320	–	≤0.08	≈0.35	≈0.17
3C96	≥320	–	≈0.06	≈0.25	≈0.12
3F3	≥300	–	≤0.10	–	≤0.15
3F35	≥300	–	–	–	≈0.08
3F4	≥250	–	–	–	–

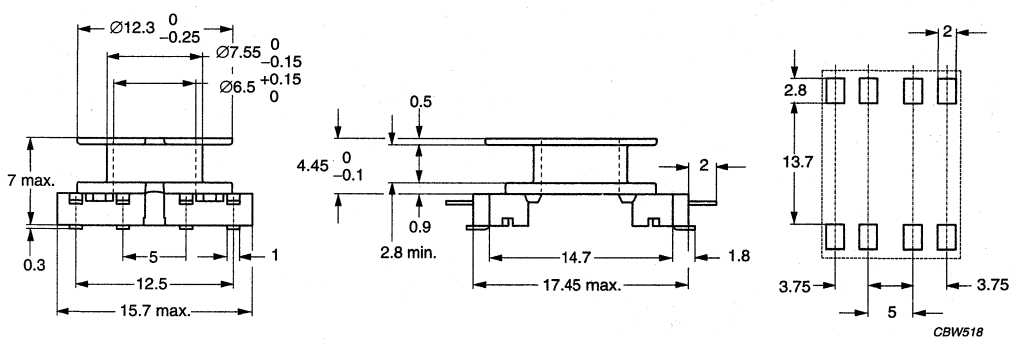
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≈0.13	≈1.0	–	–
3F4	≥250	–	–	≤0.16	≤0.26

COIL FORMERS

General data

PARAMETER	DESCRIPTION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

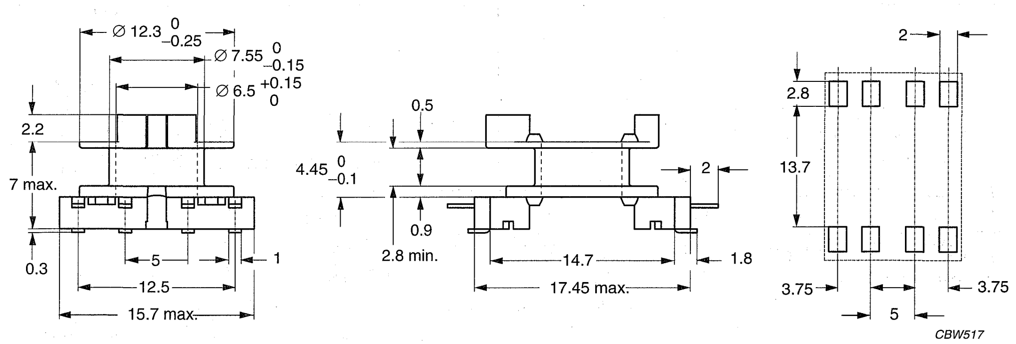
Fig.2 SMD coil former for RM6S/ILP.

Winding data for RM6S/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.3	2.85	31.0	CSVS-RM6S/LP-1S-8P

General data (continued)

PARAMETER	DESCRIPTION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 SMD coil former for RM6S/ILP.

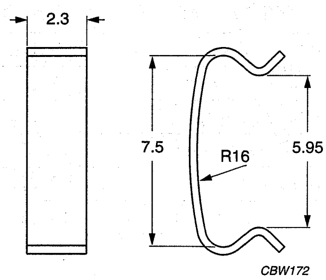
Winding data for RM6S/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.4	2.85	31.4	CSVS-RM6S/LP-1S-8P-B

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/ILP



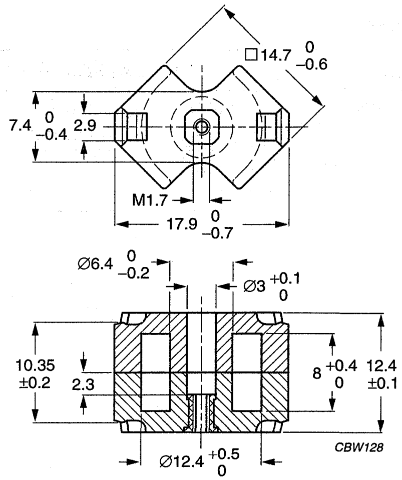
Dimensions in mm.

Fig.4 Mounting clip for RM6/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈4.5	g



Dimensions in mm.

Fig.1 RM6R core set.

Core sets for filter applications

Clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈26	≈1200	RM6R-3D3-E40/N	RM6R-3D3-E40
	63 ±3%	≈41	≈700	RM6R-3D3-E63/N	RM6R-3D3-E63
	100 ±3%	≈65	≈400	RM6R-3D3-E100/N	RM6R-3D3-E100
	160 ±3%	≈103	≈200	RM6R-3D3-A160/N	RM6R-3D3-A160
	1000 ±25%	≈650	≈0	−	RM6R-3D3
3H3 sup	160 ±3%	≈103	≈230	RM6R-3H3-A160/N	RM6R-3H3-A160
	250 ±3%	≈161	≈110	RM6R-3H3-A250/N	RM6R-3H3-A250
	315 ±3%	≈203	≈90	RM6R-3H3-A315/N	RM6R-3H3-A315
	400 ±3%	≈258	≈70	RM6R-3H3-A400/N	RM6R-3H3-A400
	2200 ±25%	≈1420	≈0	−	RM6R-3H3

INDUCTANCE ADJUSTER

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C

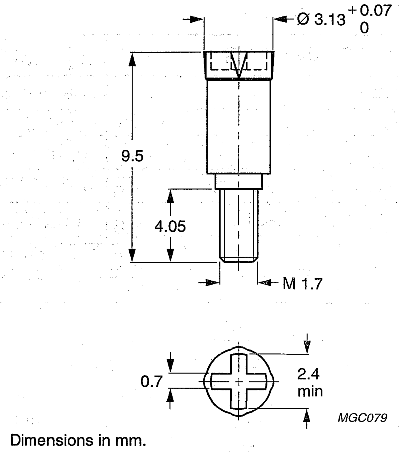


Fig.2 RM6R inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1) %	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L(1) %	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1) %
3H3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	10	ADJ-RM6-RED	16	–	–
	160	ADJ-RM6-GREEN	6	ADJ-RM6-RED	10	ADJ-RM6-WHITE	19
	200	ADJ-RM6-RED	8	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	18
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	20
	315	ADJ-RM6-WHITE	9	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	22
	400	ADJ-RM6-VIOLET	8	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	30
	630	ADJ-RM6-BLACK	9	ADJ-RM6-GREY	15	–	–
	1000	ADJ-RM6-BLACK	5	ADJ-RM6-GREY	8	–	–
	1250	–	–	ADJ-RM6-GREY	5	–	–
3D3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	23
	100	ADJ-RM6-GREEN	9	ADJ-RM6-RED	16	ADJ-RM6-WHITE	28
	160	ADJ-RM6-RED	10	ADJ-RM6-WHITE	17	–	–

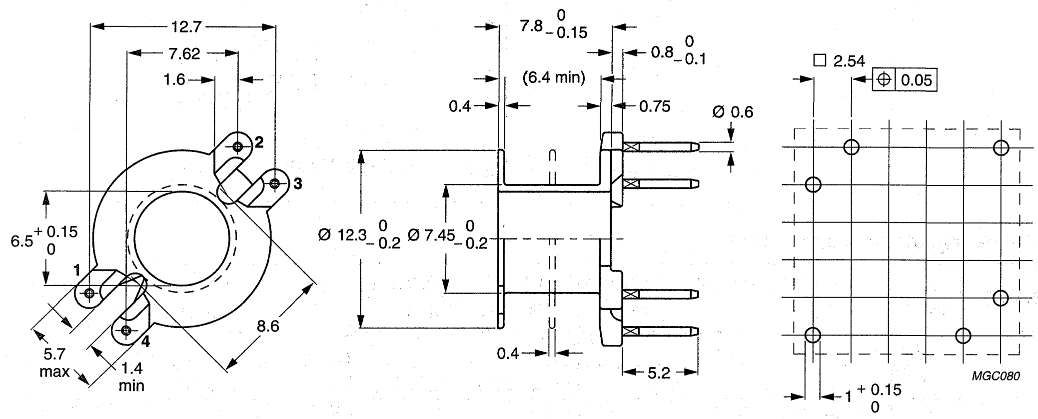
Note

1. Maximum adjustment range.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

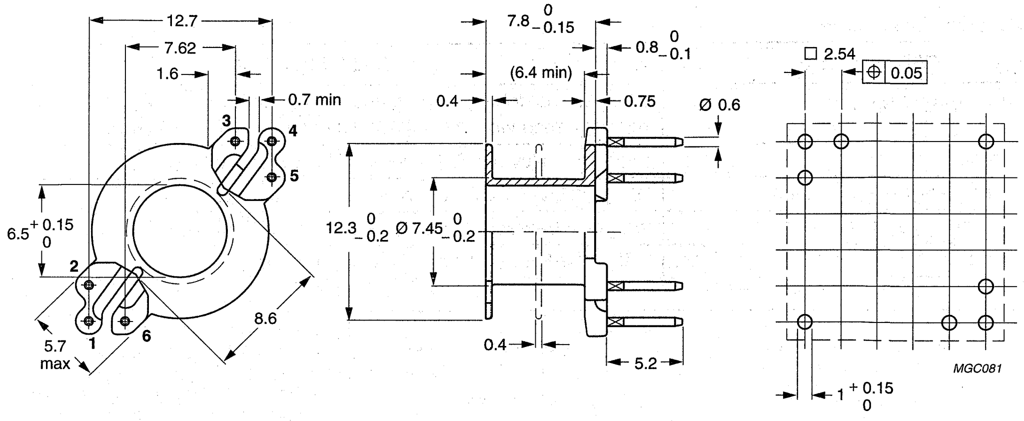


Dimensions in mm.

Fig.3 RM6R coil former; 4-pins.

Winding data for 4-pins RM6R coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	4	all	30	15	6.4	CSV-RM6S/R-1S-4P
2	4	all	30	2 × 7.0	2 × 3.0	CSV-RM6S/R-2S-4P



Dimensions in mm.

Fig.4 RM6R coil former; 6-pins.

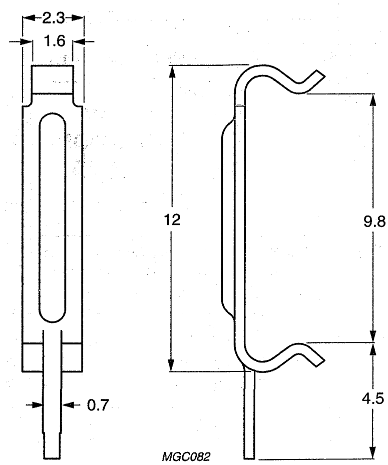
Winding data for 6-pins RM6R coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	6	all	30	15	6.4	CSV-RM6R-1S-6P
2	6	all	30	2 × 7.0	2 × 3.0	CSV-RM6R-2S-6P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



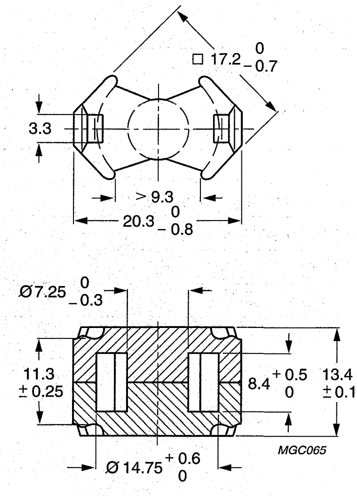
Dimensions in mm.

Fig.5 Mounting clip for RM6R.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM7/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90 sup	100 ±3%	≈56	≈800	RM7/I-3C90-A100
	160 ±3%	≈89	≈400	RM7/I-3C90-A160
	250 ±3%	≈139	≈200	RM7/I-3C90-A250
	3000 ±25%	≈1670	≈0	RM7/I-3C90
3F3 sup	100 ±3%	≈56	≈800	RM7/I-3F3-A100
	160 ±3%	≈89	≈400	RM7/I-3F3-A160
	250 ±3%	≈139	≈200	RM7/I-3F3-A250
	2500 ±25%	≈1390	≈0	RM7/I-3F3

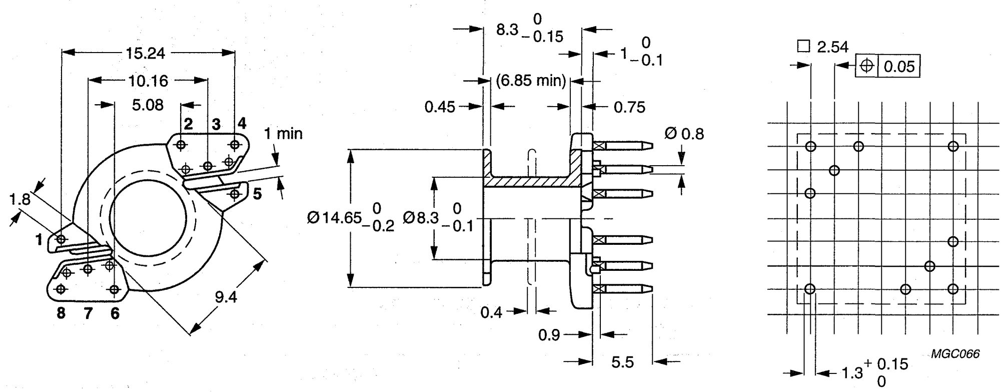
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.16	≤0.17	–
3F3	≥315	–	≤0.15	≤0.25

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM7/I coil former.

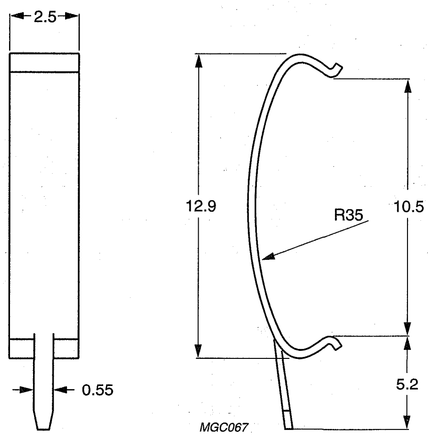
Winding data for RM7/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	4	1, 2, 5, 6	35	21	6.85	CSV-RM7-1S-4P
1	8	all	35	21	6.85	CSV-RM7-1S-8P
2	8	all	35	2 × 9.8	2 × 3.2	CSV-RM7-2S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM7



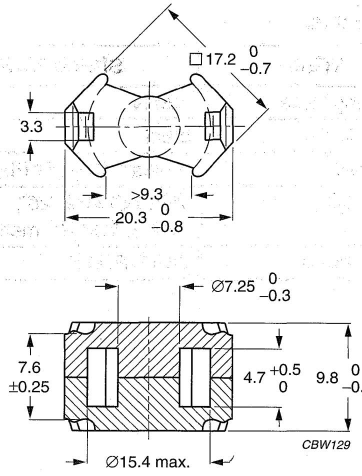
Dimensions in mm.

Fig.3 Mounting clip for RM7/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.520	mm^{-1}
V_e	effective volume	1 060	mm^3
l_e	effective length	23.5	mm
A_e	effective area	45.3	mm^2
A_{min}	minimum area	39.6	mm^2
m	mass of set	≈6.0	g



Dimensions in mm.

Fig.1 RM7/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90 sup	3650 ±25%	≈1510	≈0	RM7/ILP-3C90
3F3 sup	3100 ±25%	≈1280	≈0	RM7/ILP-3F3
3F4 sup	1800 ±25%	≈740	≈0	RM7/ILP-3F4

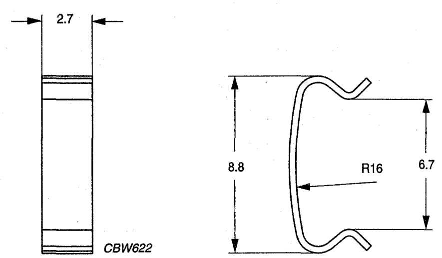
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	≤0.13	≤0.14	−	−	−
3F3	≥300	−	≤0.12	≤0.20	−	−
3F4	≥250	−	−	−	≤0.21	≤0.34

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI-RM7/ILP



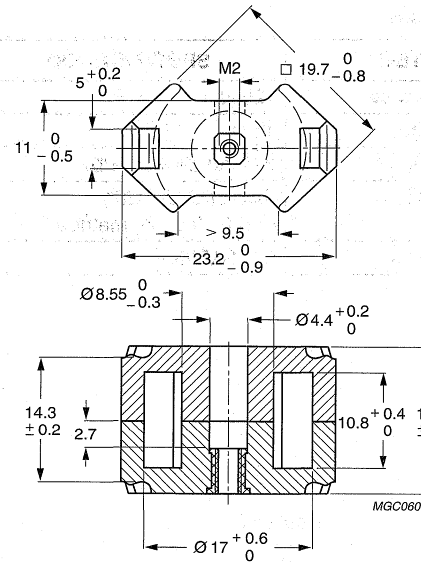
Dimensions in mm.

Fig.2 Mounting clip for RM7/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈10.9	g



Dimensions in mm.

Fig.1 RM8 core set.

Core sets for filter applications

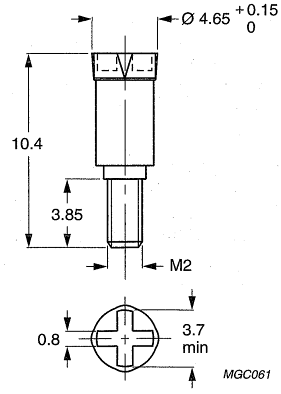
Clamping force for A_L measurements, 60 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	100 ±3%	≈54	≈750	RM8-3D3-E100/N	RM8-3D3-E100
	160 ±3%	≈87	≈400	RM8-3D3-E160/N	RM8-3D3-E160
	1240 ±25%	≈670	≈0	–	RM8-3D3
3H3	250 ±3%	≈135	≈210	RM8-3H3-A250/N	RM8-3H3-A250
	315 ±3%	≈170	≈160	RM8-3H3-A315/N	RM8-3H3-A315
	400 ±3%	≈220	≈130	RM8-3H3-A400/N	RM8-3H3-A400
	630 ±5%	≈340	≈100	RM8-3H3-A630/N	RM8-3H3-A630
	2850 ±25%	≈1540	≈0	–	RM8-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM8 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L %(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L %(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L %(1)
3H3	63	–	–	–	–	ADJ-P22/RM8-RED	24
	100	–	–	ADJ-P22/RM8-RED	16	ADJ-P22/RM8-ORANGE	21
	160	–	–	ADJ-P22/RM8-ORANGE	14	ADJ-P22/RM8-YELLOW	18
	250	ADJ-P22/RM8-RED	7	ADJ-P22/RM8-YELLOW	12	ADJ-P22/RM8-WHITE	18
	315	ADJ-P22/RM8-YELLOW	9	ADJ-P22/RM8-WHITE	13	ADJ-P22/RM8-BROWN	21
	400	ADJ-P22/RM8-YELLOW	7	ADJ-P22/RM8-WHITE	10	ADJ-P22/RM8-BROWN	15
	630	ADJ-P22/RM8-YELLOW	4	ADJ-P22/RM8-BROWN	8	ADJ-P22/RM8-BLACK	13
3D3	63	–	–	–	–	ADJ-P22/RM8-RED	23
	100	–	–	ADJ-P22/RM8-RED	15	ADJ-P22/RM8-ORANGE	22
	160	–	–	ADJ-P22/RM8-ORANGE	14	ADJ-P22/RM8-YELLOW	17

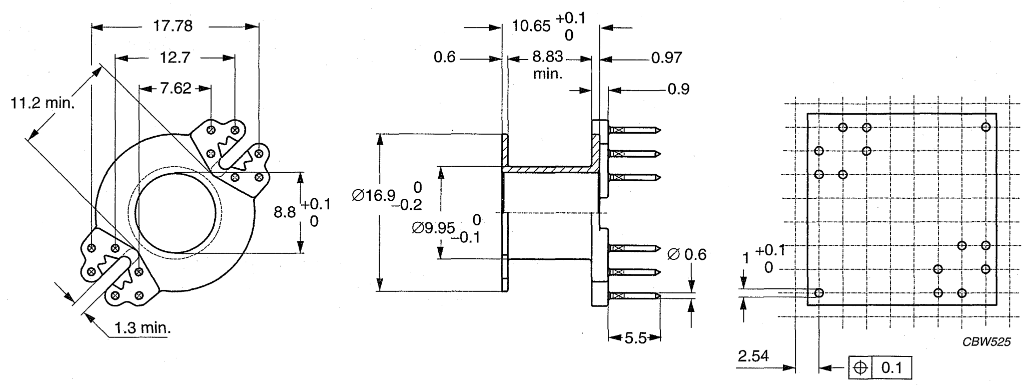
Note

1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E61040 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM8 coil former.

Winding data for RM8 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	8	1, 2, 5, 6, 7, 8, 11, 12	42	30	9.1	CSV-RM8-1S-8P-G(1)
1	12	all	42	30	9.1	CSV-RM8-1S-12P-G(1)
2	8	1, 2, 5, 6, 7, 8, 11, 12	42	2 × 13.5	2 × 4.3	CSV-RM8-2S-8P-G
2	12	all	42	2 × 13.5	2 × 4.3	CSV-RM8-2S-12P-G

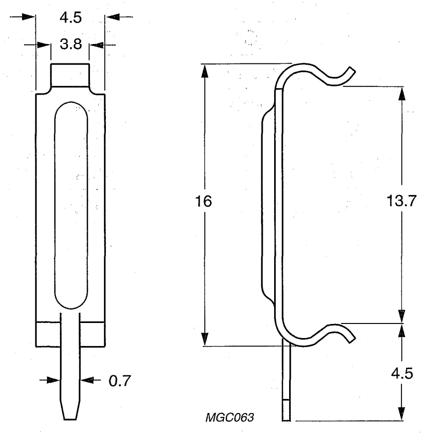
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8



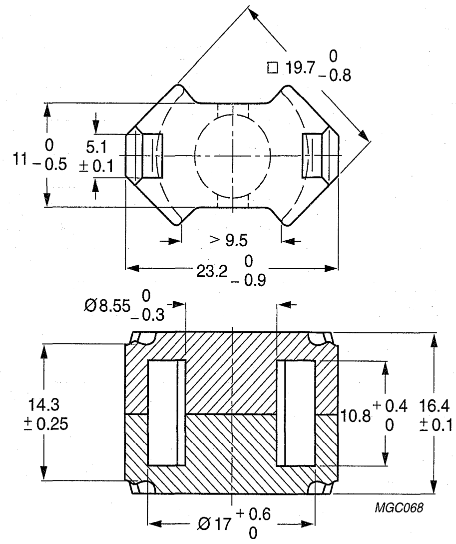
Dimensions in mm.

Fig.4 Mounting clip for RM8.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈12.0	g



Dimensions in mm.

Fig.1 RM8/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈50	≈1100	RM8/I-3C81-E100
	160 ±3%	≈77	≈550	RM8/I-3C81-A160
	250 ±3%	≈120	≈300	RM8/I-3C81-A250
	315 ±3%	≈151	≈250	RM8/I-3C81-A315
	400 ±3%	≈192	≈180	RM8/I-3C81-A400
	3400 ±25%	≈1630	≈0	RM8/I-3C81
3C90	100 ±3%	≈50	≈1100	RM8/I-3C90-A100
	160 ±3%	≈77	≈550	RM8/I-3C90-A160
	250 ±3%	≈120	≈300	RM8/I-3C90-A250
	315 ±3%	≈151	≈250	RM8/I-3C90-A315
	400 ±3%	≈192	≈180	RM8/I-3C90-A400
	3600 ±25%	≈1730	≈0	RM8/I-3C90
3C91 prot	3400 ±25%	≈1630	≈0	RM8/I-3C91

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	100 ±3%	≈50	≈1100	RM8/I-3C94-A100
	160 ±3%	≈77	≈550	RM8/I-3C94-A160
	250 ±3%	≈120	≈300	RM8/I-3C94-A250
	315 ±3%	≈151	≈250	RM8/I-3C94-A315
	400 ±3%	≈192	≈180	RM8/I-3C94-A400
	3600 ±25%	≈1730	≈0	RM8/I-3C94
3C96 prot	3250 ±25%	≈1560	≈0	RM8/I-3C96
3D3 des	250 ±3%	≈120	≈300	RM8/I-3D3-A250
	315 ±5%	≈151	≈250	RM8/I-3D3-A315
	400 ±5%	≈192	≈180	RM8/I-3D3-A400
	1400 ±25%	≈675	≈0	RM8/I-3D3
3F3	100 ±3%	≈50	≈1100	RM8/I-3F3-A100
	160 ±3%	≈77	≈550	RM8/I-3F3-A160
	250 ±3%	≈120	≈300	RM8/I-3F3-A250
	315 ±3%	≈151	≈250	RM8/I-3F3-A315
	400 ±3%	≈192	≈180	RM8/I-3F3-A400
	3000 ±25%	≈1440	≈0	RM8/I-3F3
3F35 prot	2400 ±25%	≈1150	≈0	RM8/I-3F35
3F4 des	100 ±3%	≈50	≈1100	RM8/I-3F4-A100
	160 ±3%	≈77	≈550	RM8/I-3F4-A160
	250 ±3%	≈120	≈300	RM8/I-3F4-A250
	315 ±3%	≈151	≈250	RM8/I-3F4-A315
	400 ±3%	≈192	≈180	RM8/I-3F4-A400
	1700 ±25%	≈820	≈0	RM8/I-3F4
3H3 des	400 ±3%	≈192	≈180	RM8/I-3H3-A400
	630 ±5%	≈302	≈115	RM8/I-3H3-A630
	1000 ±10%	≈480	≈70	RM8/I-3H3-A1000
	3250 ±25%	≈1560	≈0	RM8/I-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E1 sup	5800 ±25%	≈2800	RM8/I-3E1
3E27	8000 ±25%	≈3800	RM8/I-3E27
3E4 sup	8000 +40/−30%	≈3800	RM8/I-3E4
3E5	12500 +40/−30%	≈6000	RM8/I-3E5
3E6	15500 +40/−30%	≈7450	RM8/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤0.56	–	–	≈0.17
3C90	≥320	≤0.30	≤0.31	–	–
3C91	≥315	–	≈0.25	≈1.5	–
3C94	≥320	–	≤0.23	≈1.1	≈0.51
3C96	≥320	–	≈0.16	≈0.8	≈0.35
3F3	≥315	–	≤0.27	–	≤0.47
3F35	≥315	–	–	–	≈0.25
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

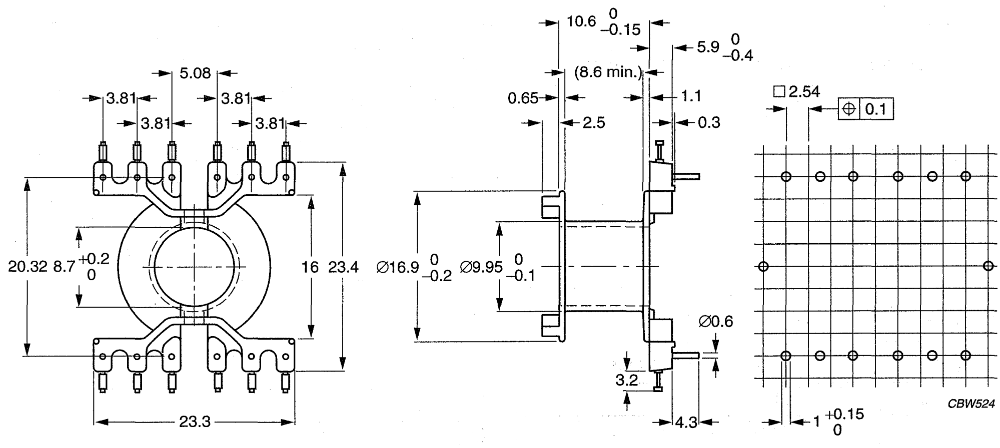
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥315	–	–	–	–
3F35	≥315	≈0.4	≈3.0	–	–
3F4	≥250	–	–	≤0.49	≤0.78

COIL FORMER

General data

For the information on another coil former suitable for RM8/I, see *"Data sheet: RM8"*.

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM8/I coil former (DIL).

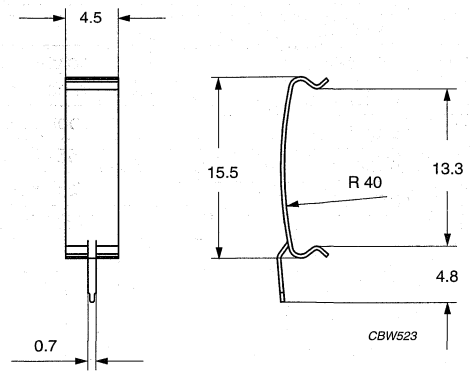
Winding data for RM8/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	42	30.9	8.6	CPV-RM8/I-1S-12PD

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8/I

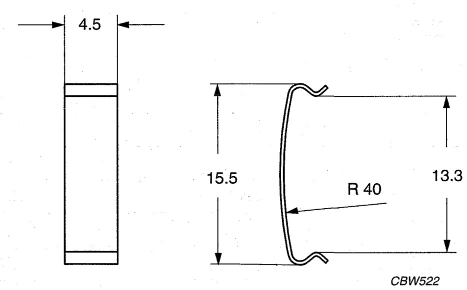


Dimensions in mm.

Fig.3 Mounting clip with earth pin for RM8/I.

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Type number	CLI-RM8/I



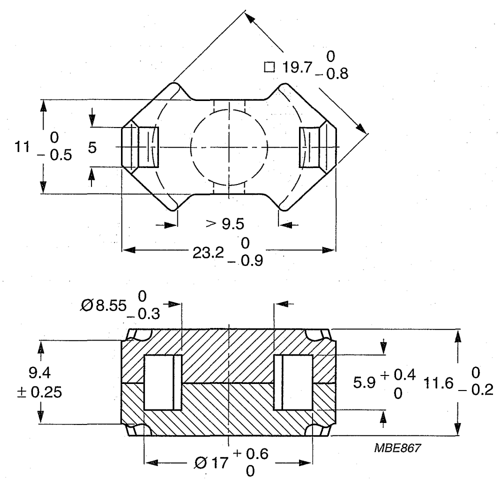
Dimensions in mm.

Fig.4 Mounting clip without earth pin for RM8/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.440	mm^{-1}
V_e	effective volume	1860	mm^3
l_e	effective length	28.7	mm
A_e	effective area	64.9	mm^2
A_{min}	minimum area	55.4	mm^2
m	mass of set	≈10	g



Dimensions in mm.

Fig.1 RM8/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4550 ±25%	≈1600	≈0	RM8/ILP-3C90
3C94 des	4550 ±25%	≈1600	≈0	RM8/ILP-3C94
3C96 prot	4100 ±25%	≈1440	≈0	RM8/ILP-3C96
3D3 des	250 ±3%	≈88	≈400	RM8/ILP-3D3-A250
	315 ±3%	≈110	≈300	RM8/ILP-3D3-A315
	400 ±5%	≈140	≈200	RM8/ILP-3D3-A400
	1850 ±25%	≈650	≈0	RM8/ILP-3D3
3F3	3800 ±25%	≈1330	≈0	RM8/ILP-3F3
3F35 prot	3100 ±25%	≈1090	≈0	RM8/ILP-3F35
3F4 des	2200 ±25%	≈770	≈0	RM8/ILP-3F4
3H3 des	400 ±3%	≈140	≈200	RM8/ILP-3H3-A400
	630 ±5%	≈220	≈130	RM8/ILP-3H3-A630
	1000 ±8%	≈350	≈80	RM8/ILP-3H3-A1000
	4100 ±25%	≈1440	≈0	RM8/ILP-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5 des	16000 +40/−30%	≈5600	≈0	RM8/ILP-3E5
3E6 des	19500 +40/−30%	≈6800	≈0	RM8/ILP-3E6

Properties of core sets under power conditions

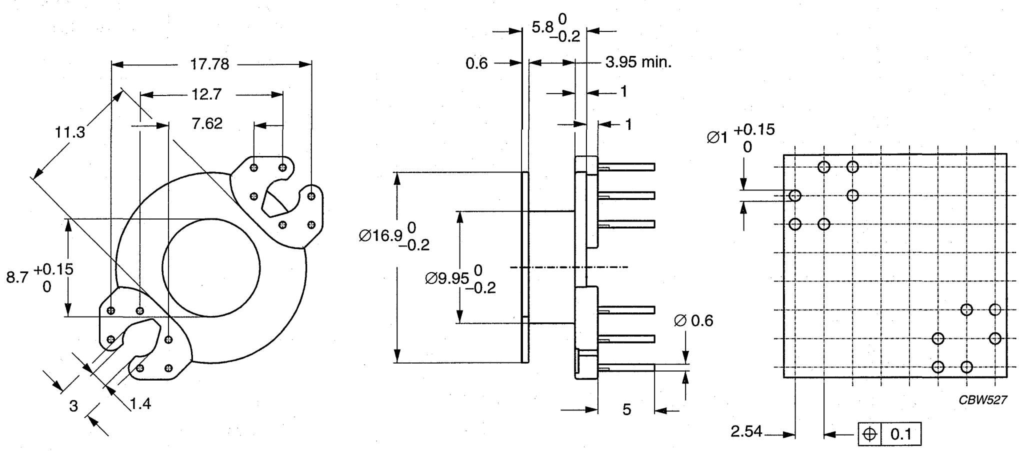
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥320	≤0.23	≤0.24	−	−
3C94	≥320	−	≤0.18	≈0.80	≈0.39
3C96	≥320	−	≈0.14	≈0.55	≈0.28
3F3	≥315	−	≤0.21	−	≤0.36
3F35	≥300	−	−	−	≈0.2
3F4	≥250	−	−	−	−

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥320	−	−	−	−
3C94	≥320	−	−	−	−
3C96	≥320	−	−	−	−
3F3	≥315	−	−	−	−
3F35	≥300	≈0.3	≈2.2	−	−
3F4	≥250	−	−	≤0.37	≤0.60

General data coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 Coil former for RM8/ILP; 12 pins.

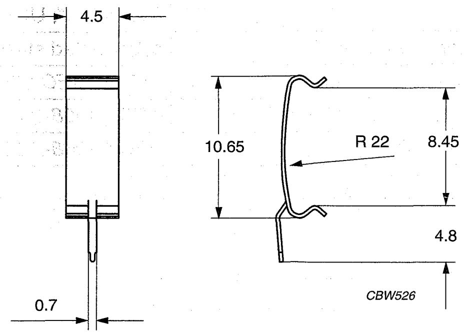
Winding data for RM8/ILP coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	12	all	13.3	3.95	41.8	CSV-RM8/ILP-1S-12P
1	10	1, 2, 3, 4, 6, 7, 8, 9, 10, 11	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P
1	10	1, 2, 3, 4, 6, 8, 9, 10, 11, 12	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P-T

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8/ILP



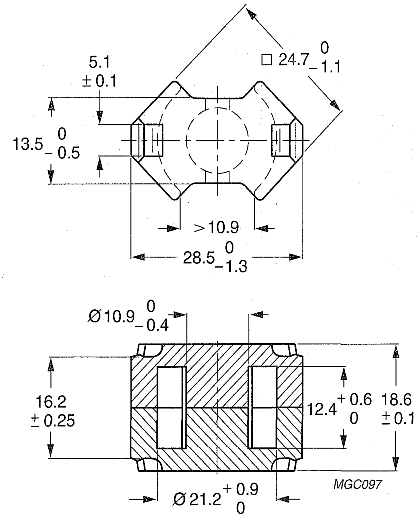
Dimensions in mm.

Fig.3 Mounting clip for RM8/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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	89.1	mm^2
m	mass of set	≈22	g



Dimensions in mm.

Fig.1 RM10/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈59	≈900	RM10/I-3C81-E160
	250 ±3%	≈92	≈500	RM10/I-3C81-A250
	315 ±3%	≈116	≈400	RM10/I-3C81-A315
	400 ±3%	≈147	≈300	RM10/I-3C81-A400
	630 ±3%	≈232	≈150	RM10/I-3C81-A630
	5400 ±25%	≈2000	≈0	RM10/I-3C81
3C90	160 ±3%	≈59	≈900	RM10/I-3C90-A160
	250 ±3%	≈92	≈500	RM10/I-3C90-A250
	315 ±3%	≈116	≈400	RM10/I-3C90-A315
	400 ±3%	≈147	≈300	RM10/I-3C90-A400
	630 ±3%	≈232	≈150	RM10/I-3C90-A630
	4950 ±25%	≈1820	≈0	RM10/I-3C90
3C91 prot	5400 ±25%	≈2000	≈0	RM10/I-3C91
3C94 des	160 ±3%	≈59	≈900	RM10/I-3C94-A160
	250 ±3%	≈92	≈500	RM10/I-3C94-A250
	315 ±3%	≈116	≈400	RM10/I-3C94-A315
	400 ±3%	≈147	≈300	RM10/I-3C94-A400
	630 ±3%	≈232	≈150	RM10/I-3C94-A630
	4950 ±25%	≈1820	≈0	RM10/I-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C96 prot	4400 ±25%	≈1820	≈0	RM10/I-3C96
3D3 des	315 ±3%	≈116	≈400	RM10/I-3D3-A315
	400 ±5%	≈147	≈300	RM10/I-3D3-A400
	630 ±8%	≈232	≈150	RM10/I-3D3-A630
	1900 ±25%	≈700	≈0	RM10/I-3D3
3F3 des	160 ±3%	≈59	≈900	RM10/I-3F3-A160
	250 ±3%	≈92	≈500	RM10/I-3F3-A250
	315 ±3%	≈116	≈400	RM10/I-3F3-A315
	400 ±3%	≈147	≈300	RM10/I-3F3-A400
	630 ±3%	≈232	≈150	RM10/I-3F3-A630
	4050 ±25%	≈1490	≈0	RM10/I-3F3
3H3 des	400 ±3%	≈147	≈300	RM10/I-3H3-A400
	630 ±3%	≈232	≈150	RM10/I-3H3-A630
	1000 ±10%	≈368	≈120	RM10/I-3H3-A1000
	4400 ±25%	≈1620	≈0	RM10/I-3H3

Core sets of high permeability grades

Clamping force for AL measurements, 60 ±20 N.

GRADE	A_L() (nH)	μ_e	TYPE NUMBER
3E1 sup	8000 ±25%	≈2900	RM10/I-3E1
3E27	10700 ±25%	≈3880	RM10/I-3E27
3E4 sup	11000 +40/−30%	≈4040	RM10/I-3E4
3E5	16000 +40/−30%	≈5900	RM10/I-3E5

Properties of core sets under power conditions

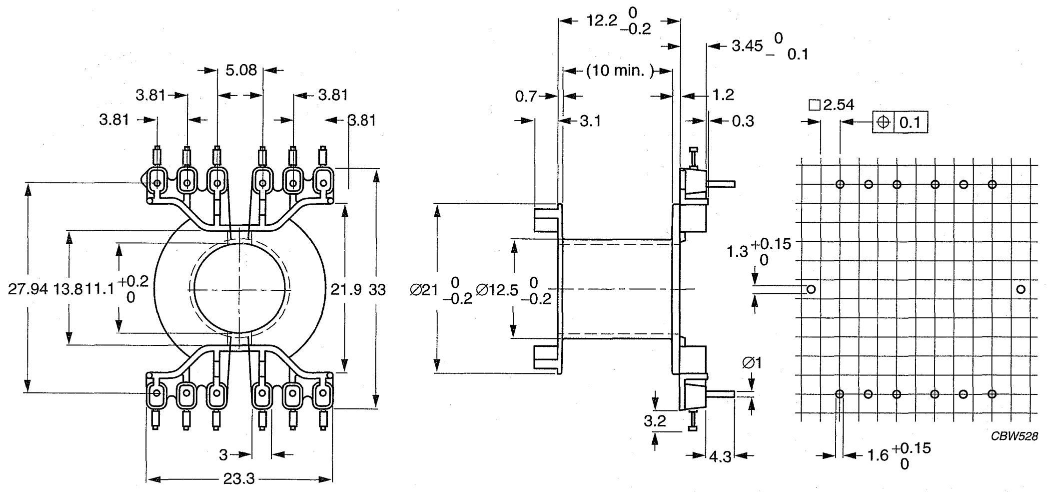
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤1.0	−	−	−
3C90	≥320	≤0.52	≤0.55	−	−
3C91	≥315	−	≈0.50	≈2.6	−
3C94	≥320	−	≤0.41	≈1.9	≈0.9
3C96	≥320	−	≈0.3	≈1.4	≈0.65
3F3	≥315	−	≤0.48	−	≤0.82

RM cores and accessories RM10/I

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM10/I coil former (DIL).

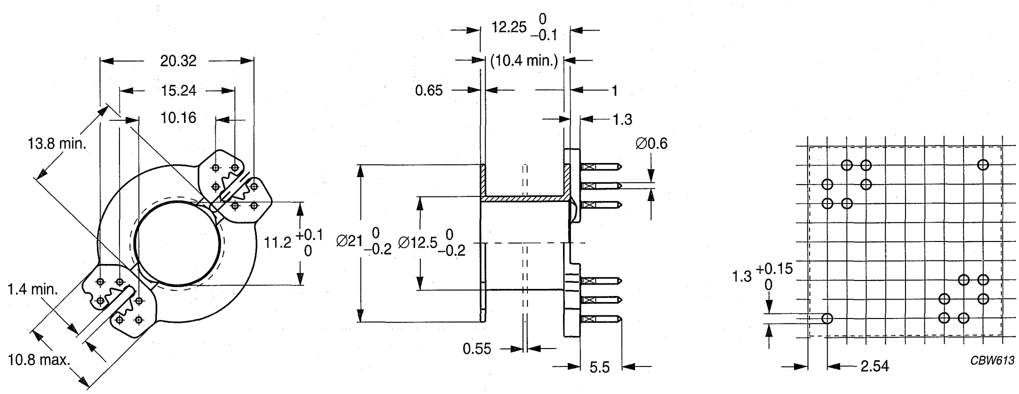
Winding data for RM10 coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	52	44.2	10.0	CPV-RM10-1S-12PD

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM10/I coil former.

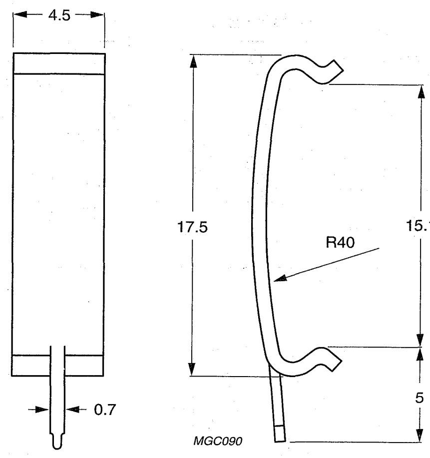
Winding data for RM10/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	12	all	52.3	42.7	10.3	CSV-RM10-1S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/I



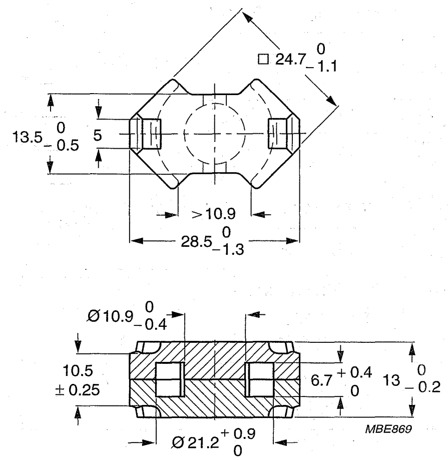
Dimensions in mm.

Fig.4 Mounting clip for RM10/I.

CORE SETS

Effective core parametersRM10/ILP

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.340	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	33.9	mm
A_e	effective area	99.1	mm^2
A_{min}	minimum area	89.1	mm^2
m	mass of set	≈17	g



Dimensions in mm.

Fig.1 RM10/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	6300 ±25%	≈1700	≈0	RM10/ILP-3C90
3C94 des	6300 ±25%	≈1700	≈0	RM10/ILP-3C94
3C96 prot	5600 ±25%	≈1510	≈0	RM10/ILP-3C96
3D3 des	315 ±3%	≈85	≈500	RM10/ILP-3D3-A315
	400 ±3%	≈108	≈350	RM10/ILP-3D3-A400
	630 ±5%	≈170	≈200	RM10/ILP-3D3-A630
	2500 ±25%	≈675	≈0	RM10/ILP-3D3
3F3	5200 ±25%	≈1410	≈0	RM10/ILP-3F3
3F4 des	3000 ±25%	≈810	≈0	RM10/ILP-3F4
3H3 des	400 ±3%	≈108	≈350	RM10/ILP-3H3-A400
	630 ±3%	≈170	≈200	RM10/ILP-3H3-A630
	1000 ±5%	≈270	≈130	RM10/ILP-3H3-A1000
	5600 ±25%	≈1510	≈0	RM10/ILP-3H3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5 des	22000 +40/–30%	≈5950	≈0	RM10/ILP-3E5
3E6 des	27000 +40/–30%	≈7300	≈0	RM10/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.41	≤0.43	–	–
3C94	≥320	–	≤0.32	≈1.5	≈0.7
3C96	≥320	–	≈0.22	≈1.1	≈0.5
3F3	≥300	–	≤0.37	–	≤0.64
3F4	≥250	–	–	–	–

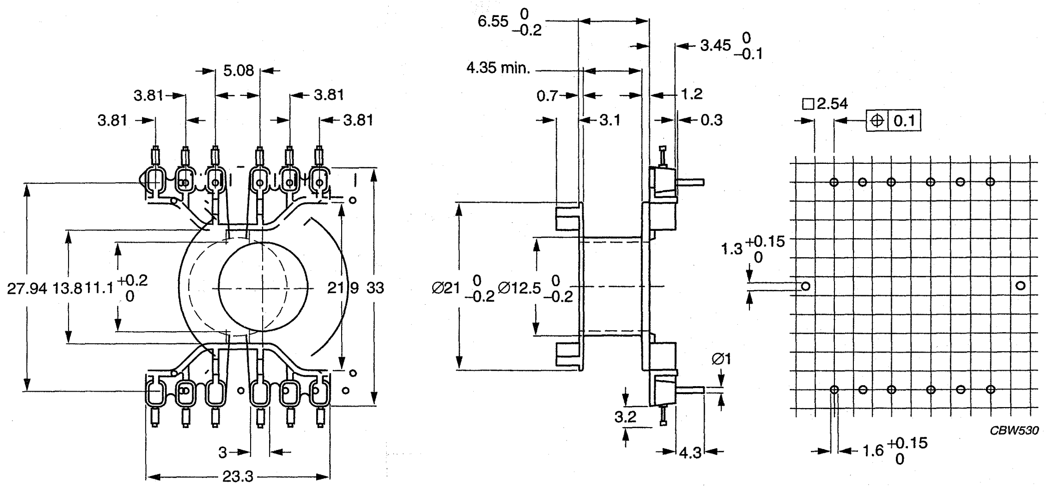
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥320	–	–	–	–
3F3	≥300	–	–	–	–
3F4	≥250	–	–	≤0.67	≤1.1

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM10/ILP coil former (DIL).

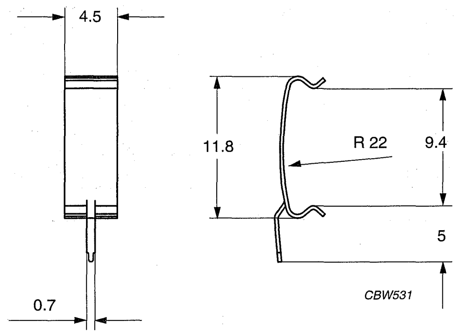
Winding data for RM10/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	52	21.0	4.35	CPV-RM10/ILP-1S-12PD

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/ILP



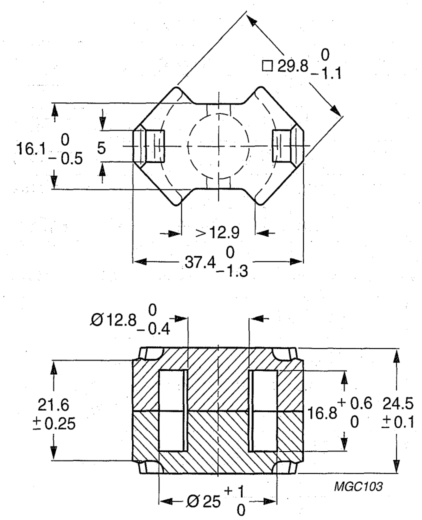
Dimensions in mm.

Fig.3 Mounting clip for RM10/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of set	≈45	g



Dimensions in mm.

Fig.1 RM12/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	160 ±3%	≈49	≈1400	RM12/I-3C90-A160
	250 ±3%	≈77	≈800	RM12/I-3C90-A250
	315 ±5%	≈97	≈550	RM12/I-3C90-A315
	400 ±5%	≈123	≈450	RM12/I-3C90-A400
	630 ±5%	≈196	≈300	RM12/I-3C90-A630
	6200 ±25%	≈1910	≈0	RM12/I-3C90
3C94 des	160 ±3%	≈49	≈1400	RM12/I-3C94-A160
	250 ±3%	≈77	≈800	RM12/I-3C94-A250
	315 ±5%	≈97	≈550	RM12/I-3C94-A315
	400 ±5%	≈123	≈450	RM12/I-3C94-A400
	630 ±5%	≈196	≈300	RM12/I-3C94-A630
	6200 ±25%	≈1910	≈0	RM12/I-3C94
3C96 prot	5500 ±25%	≈1510	≈0	RM12/I-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈49	≈1400	RM12/I-3F3-A160
	250 ±3%	≈77	≈800	RM12/I-3F3-A250
	315 ±5%	≈97	≈550	RM12/I-3F3-A315
	400 ±5%	≈123	≈450	RM12/I-3F3-A400
	630 ±5%	≈196	≈300	RM12/I-3F3-A630
	5050 ±25%	≈1560	≈0	RM12/I-3F3

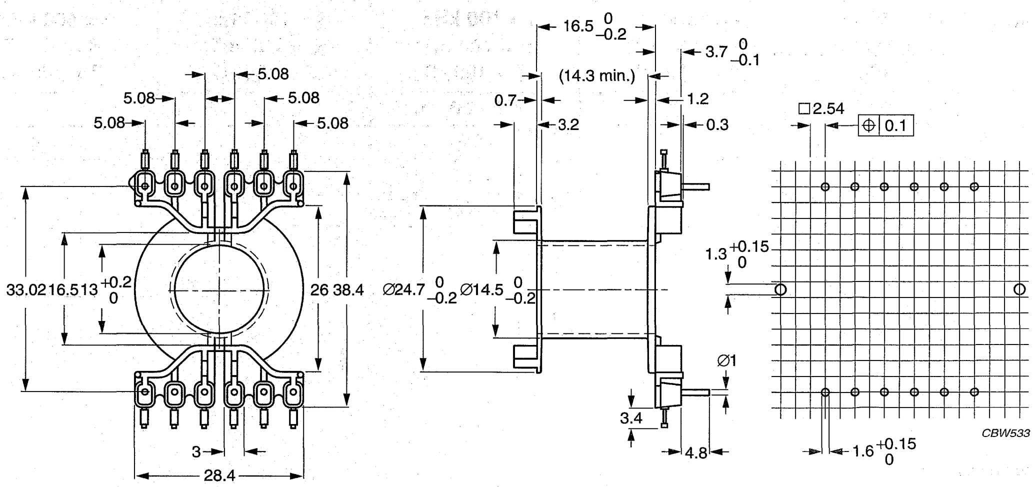
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤1.00	≤1.06	–	–
3C94	≥315	–	≤0.8	≈3.5	≈1.8
3C96	≥320	–	≈0.55	≈2.5	≈1.3
3F3	≥315	–	≤0.92	–	≤1.60

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM12/I coil former (DIL).

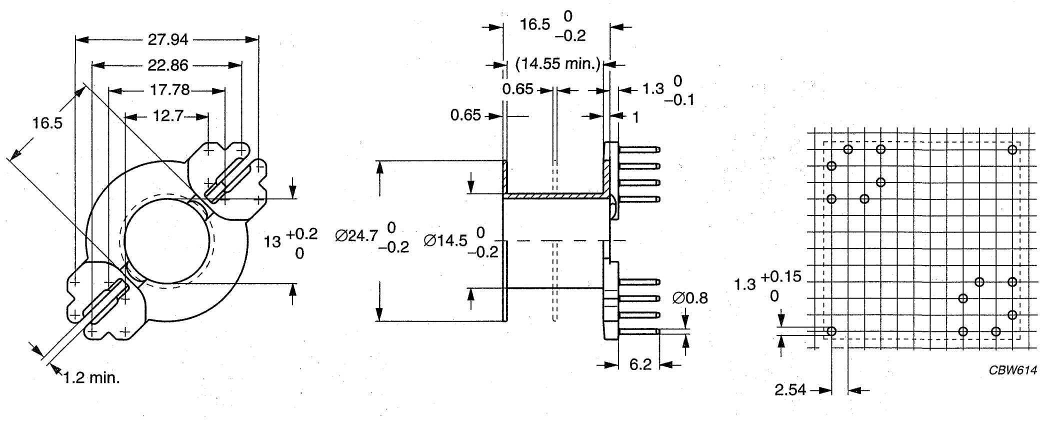
Winding data for RM12/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	61	75.0	14.3	CPV-RM12/I-1S-12PD

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 RM12/I coil former; 12-pins.

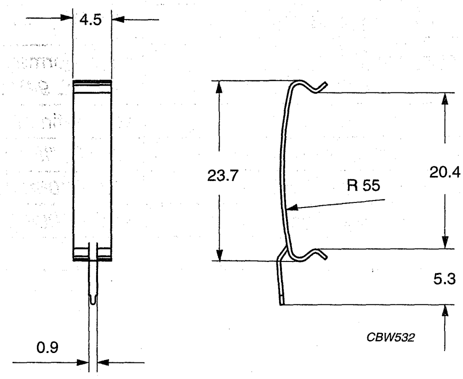
Winding data for RM12/I coil former with 12-pins

NUMBER OF SECTIONS	WINDING AREA (mm²)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	72	14.4	61	CSV-RM12-1S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈35 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM12/I



Dimensions in mm.

Fig.4 Mounting clip for RM12/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.280	mm^{-1}
V_e	effective volume	6200	mm^3
l_e	effective length	42	mm
A_e	effective area	148	mm^2
A_{min}	minimum area	125	mm^2
m	mass of set	≈34	g

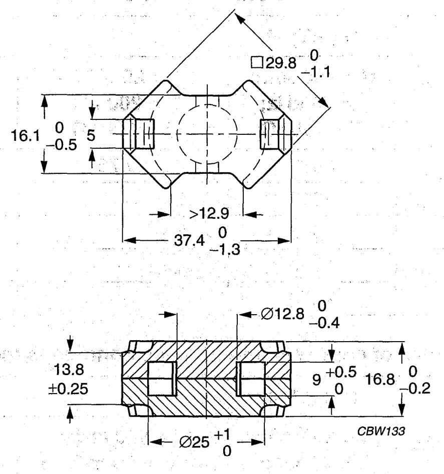


Fig.1 RM12/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	8100 ±25%	≈1810	≈0	RM12/ILP-3C90
3C94 des	8100 ±25%	≈1810	≈0	RM12/ILP-3C94
3C96 prot	7200 ±25%	≈1450	≈0	RM12/ILP-3C96
3F3	6700 ±25%	≈1490	≈0	RM12/ILP-3F3
3F4 des	3600 ±25%	≈800	≈0	RM12/ILP-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤0.75	≤0.79	–	–
3C94	≥315	–	≤0.65	≈2.7	≈1.3
3C96	≥315	–	≈0.45	≈1.9	≈0.9
3F3	≥300	–	≤0.68	–	≤1.2
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

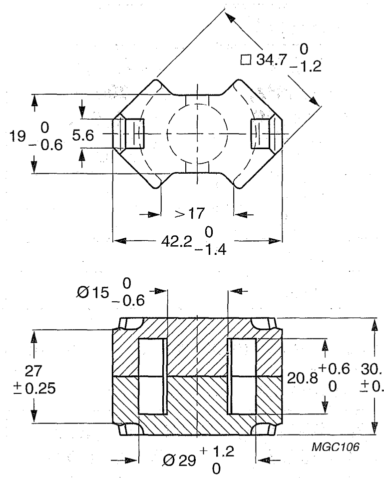
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥315	–	–	–	–
3C94	≥315	–	–	–	–
3C96	≥315	–	–	–	–
3F3	≥300	–	–	–	–
3F4	≥250	–	–	≤1.2	≤2.0

RM cores and accessories RM14/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of set	≈74	g



Dimensions in mm.

Fig.1 RM14/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈70	≈950	RM14/I-3C90-A250
	315 ±3%	≈88	≈700	RM14/I-3C90-A315
	400 ±3%	112	≈550	RM14/I-3C90-A400
	630 ±5%	≈177	≈250	RM14/I-3C90-A630
	1000 ±5%	≈281	≈150	RM14/I-3C90-A1000
	7100 ±25%	≈1990	≈0	RM14/I-3C90
3C94 des	250 ±3%	≈70	≈950	RM14/I-3C94-A250
	315 ±3%	≈88	≈700	RM14/I-3C94-A315
	400 ±3%	112	≈550	RM14/I-3C94-A400
	630 ±5%	≈177	≈250	RM14/I-3C94-A630
	1000 ±5%	≈281	≈150	RM14/I-3C94-A1000
	7100 ±25%	≈1990	≈0	RM14/I-3C94
3C96 prot	6200 ±25%	≈1740	≈0	RM14/I-3C96
3F3	250 ±3%	≈70	≈950	RM14/I-3F3-A250
	315 ±3%	≈88	≈700	RM14/I-3F3-A315
	400 ±3%	112	≈550	RM14/I-3F3-A400
	630 ±5%	≈177	≈250	RM14/I-3F3-A630
	1000 ±5%	≈281	≈150	RM14/I-3F3-A1000
	5700 ±25%	≈1600	≈0	RM14/I-3F3

Properties of core sets under power conditions

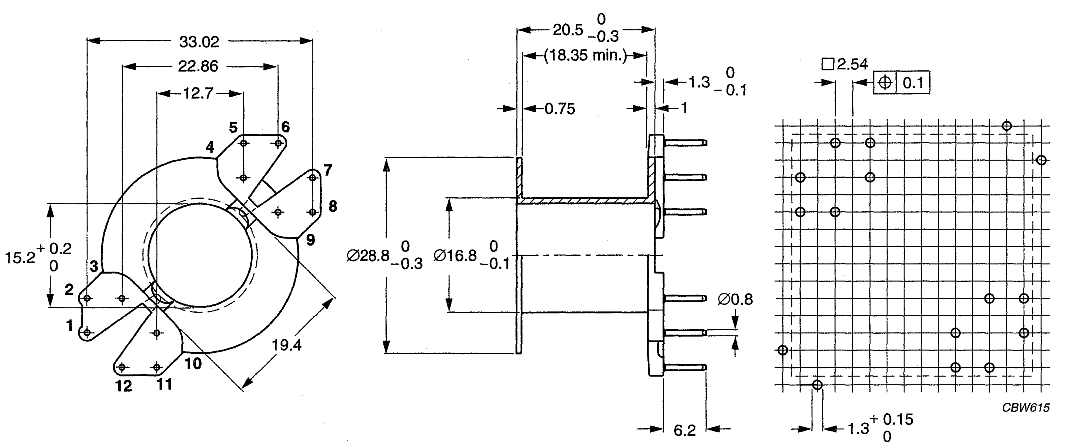
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤1.67	≤1.76	−	−
3C94	≥315	−	≤1.55	≈6.0	≈3.5
3C96	≥315	−	≈1.2	≈4.5	≈2.5
3F3	≥315	−	≤1.55	−	≤2.65

RM cores and accessories RM14/I

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

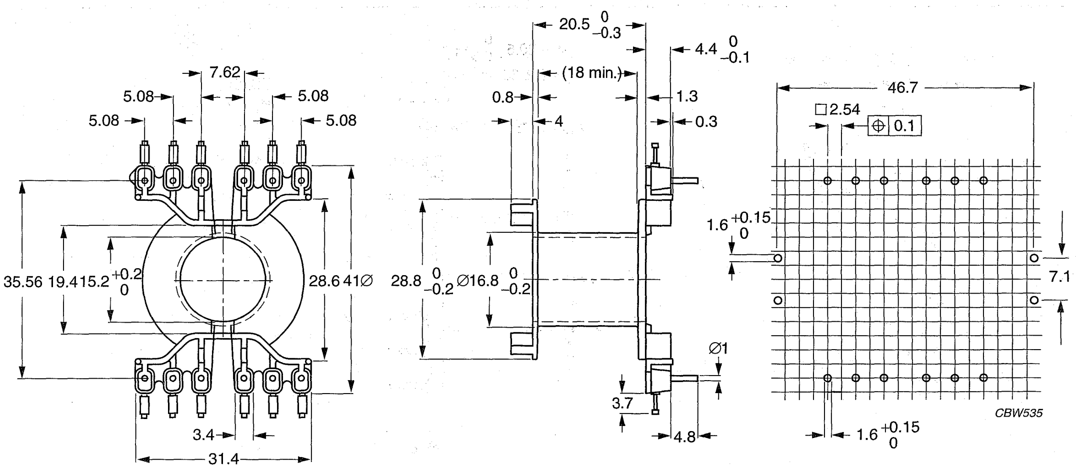
Fig.2 RM14/I coil former; 12-pins.

Winding data for 12-pins RM14/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	10	1, 2, 3, 4, 6, 7, 9, 10, 11, 12	71	112	18.4	CSV-RM14-1S-10P
1	12	all	71	112	18.4	CSV-RM14-1S-12P

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardent in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM14/I coil former; 12-pins (DIL).

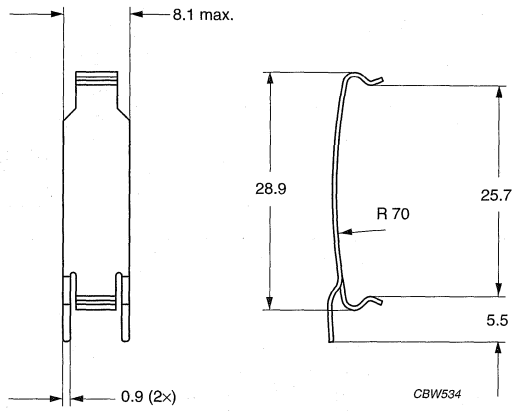
Winding data for 12-pins RM14/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	71	111	18.0	CPV-RM14/I-1S-12PD

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈40 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM14/I



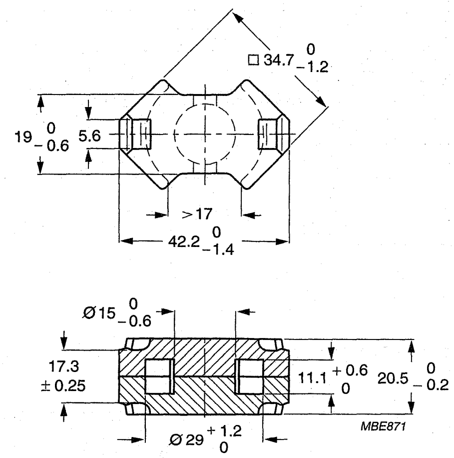
Dimensions in mm.

Fig.4 Mounting clip for RM14/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.250	mm^{-1}
V_e	effective volume	10230	mm^3
l_e	effective length	50.9	mm
A_e	effective area	201	mm^2
A_{min}	minimum area	168	mm^2
m	mass of set	≈55	g



Dimensions in mm.

Fig.1 RM14/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

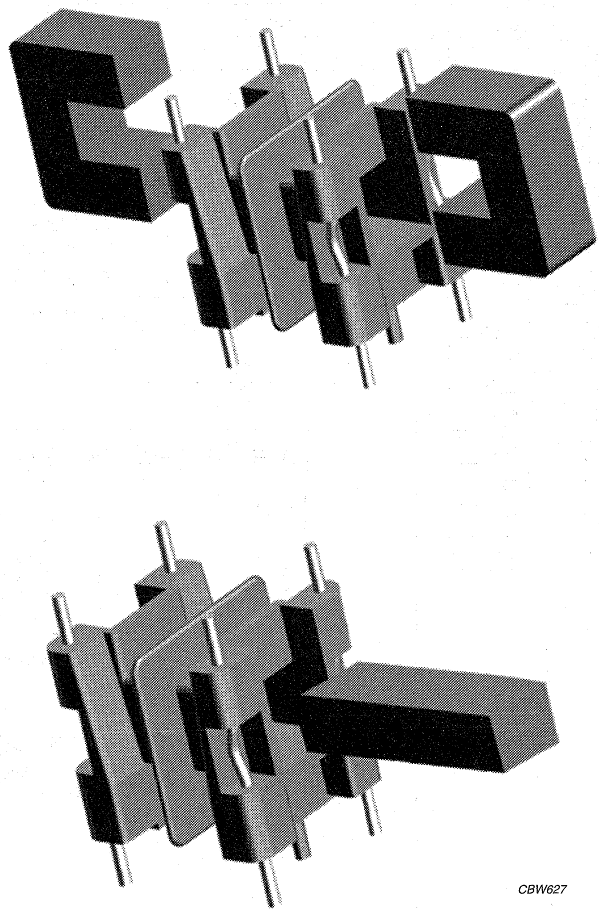
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	9400 ±25%	≈1870	≈0	RM14/ILP-3C90
3C94 des	9400 ±25%	≈1870	≈0	RM14/ILP-3C94
3C96 prot	8300 ±25%	≈1650	≈0	RM14/ILP-3C96
3F3	7700 ±25%	≈1530	≈0	RM14/ILP-3F3
3F4 des	4200 ±25%	≈840	≈0	RM14/ILP-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥315	≤1.3	≤1.4	–	–
3C94	≥315	–	≤1.1	≈4.6	≈2.4
3C96	≥315	–	≈0.80	≈3.5	≈1.7
3F3	≥300	–	≤1.2	–	≤2.0
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
3C90	≥315	–	–	–	–
3C94	≥315	–	–	–	–
3C96	≥315	–	–	–	–
3F3	≥300	–	–	–	–
3F4	≥250	–	–	≤2.0	≤2.3



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview U, I cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
U10/8/3	309	8.07	0.9
U15/11/6	1680	32.3	4
I15/3/3	–	–	0.6
U20/16/7	3800	56	9
I20/6/5	–	–	3
U25/16/6	3380	40.3	8
I25/6/6	2590	40.3	4.5
U25/20/13	9180	104	23.5
I25/7/7	–	–	6
U30/25/16	17900	161	43
U33/22/9	9490	86.5	24
U67/27/14	35200	204	85
U93/76/16	159000	448	400
I93/28/16	115000	447	200
U93/52/30	217000	840	560
U93/76/30	297000	840	760
I93/28/30	175000	836	370
U100/57/25	199000	645	500
I100/25/25	158000	645	300

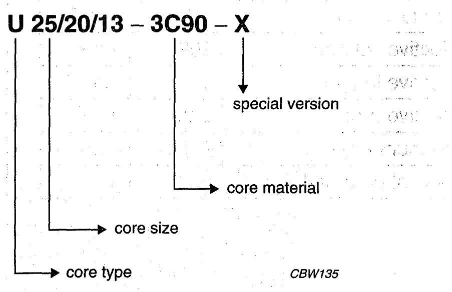


Fig.1 Type number structure for cores.

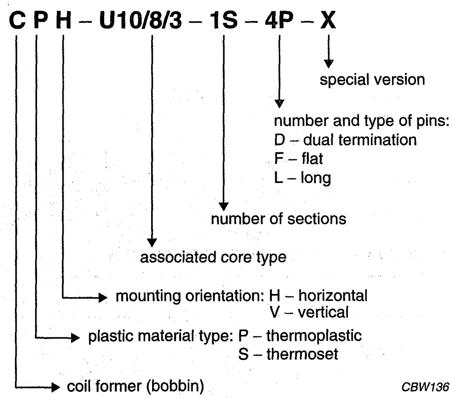
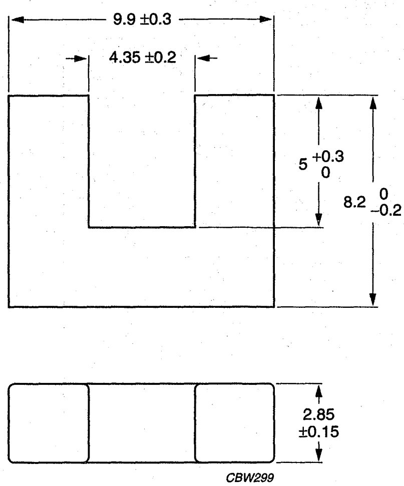


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.74	mm^{-1}
V_e	effective volume	309	mm^3
l_e	effective length	38.3	mm
A_e	effective area	8.07	mm^2
A_{min}	minimum area	7.91	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 U10/8/3 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	420 ±25%	≈1580	U10/8/3-3C90

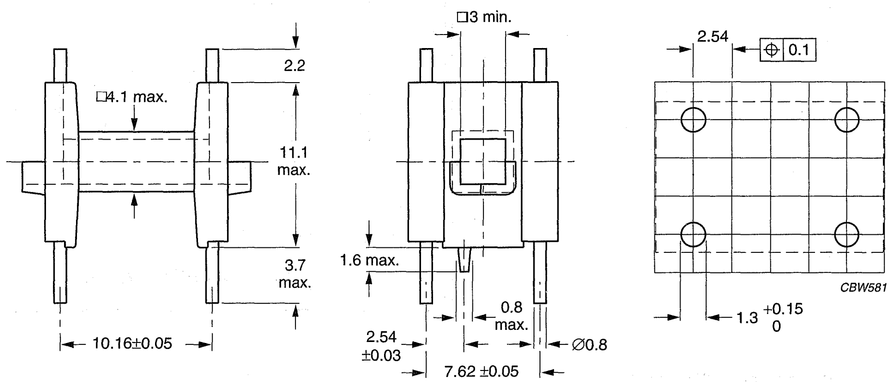
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.04	≤0.04

COIL FORMERS

General data 4-pins U10/8/3 coil former

PARAMETER	SPECIFICATION
Coil former material	polybuteleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 U10/8/3 coil former; 4-pins.

Winding data for 4-pins U10/8/3 coil former

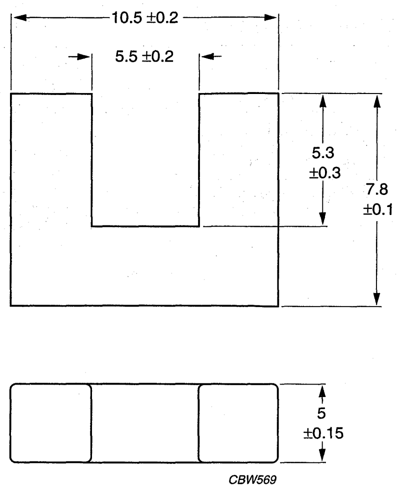
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	28	8	30	CPH-U10/8/3-1S-4P

U cores and accessories U11/8/5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.20	mm^{-1}
V_e	effective volume	501	mm^3
l_e	effective length	40	mm
A_e	effective area	12.5	mm^2
A_{min}	minimum area	12.5	mm^2
m	mass of core half	≈1.5	g



Dimensions in mm.

Fig.1 U11/8/5 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	680 ±25%	≈1730	U11/8/5-3C90
3E25	1200 ±25%	≈3050	U11/8/5-3E25

Properties of core sets under power conditions

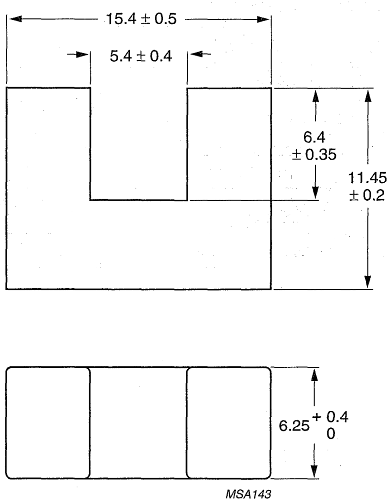
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥315	≤0.08	≤0.095

U cores and accessories U15/11/6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈4	g



Dimensions in mm.

Fig.1 U15/11/6 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	1400 ±25%	≈1900	U15/11/6-3C90
3E25 des	3400 ±25%	≈4300	U15/11/6-3E25

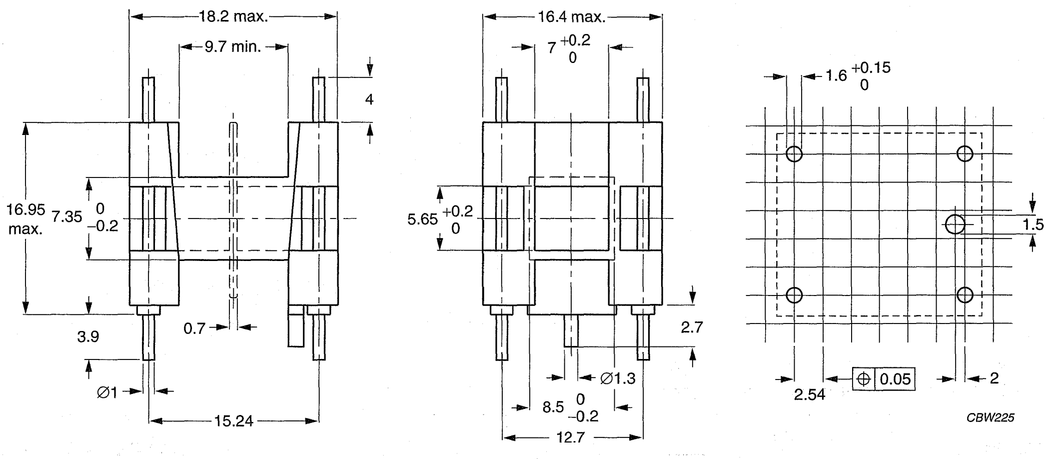
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.20	≤0.22

COIL FORMERS

General data 4-pins U15/11/6 coil former

PARAMETER	SPECIFICATION
Coil former material	polyethyleneterephtalate (PET), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 U15/11/6 coil former; 4-pins.

Winding data for 4-pins U15/11/6 coil former

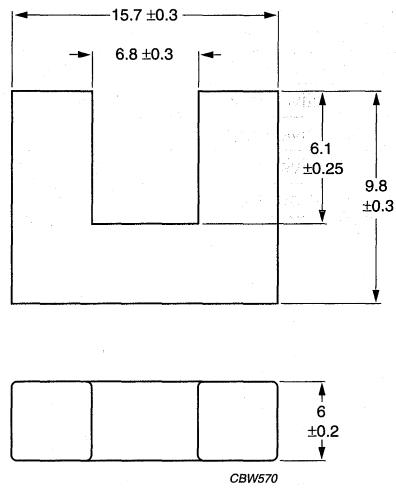
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	38.7	9.7	46.6	CPH-U15/11/6-1S-4P
2	2 × 17.9	2 × 4.45	46.6	CPH-U15/11/6-2S-4P

U cores and accessories U16/9.8/6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.07	mm^{-1}
V_e	effective volume	1255	mm^3
l_e	effective length	51	mm
A_e	effective area	24.6	mm^2
A_{min}	minimum area	22.2	mm^2
m	mass of core half	≈3.6	g



Dimensions in mm.

Fig.1 U16/9.8/6 core half.

Core halves

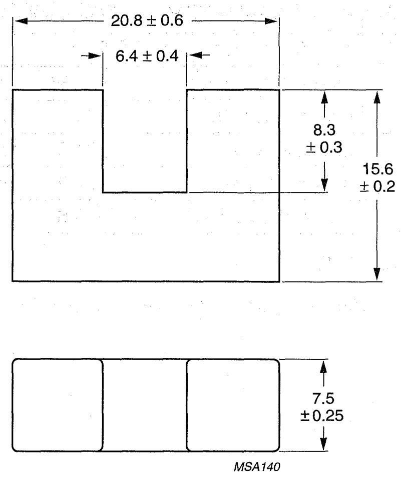
A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E25	2600 ±25%	≈4280	U16/9.8/6-3E25
3E26	≥2890	≥4760	U16/9.8/6-3E26

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core half	≈9	g



Dimensions in mm.

Fig.1 U20/16/7 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	1900 ±25%	≈1950	U20/16/7-3C90
3E25 des	4800 ±25%	≈4600	U20/16/7-3E25

Properties of core sets under power conditions

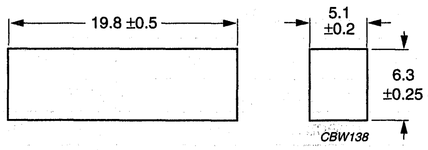
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.46	≤0.48

I cores and accessories I20/6/5

CORE

Ordering information

GRADE	TYPE NUMBER
3C90	I20/6/5-3C90



Dimensions in mm.

Fig.1 I20/6/5 core.

COIL FORMER

For coil former data, see data sheet, *"U15/11/6"*.

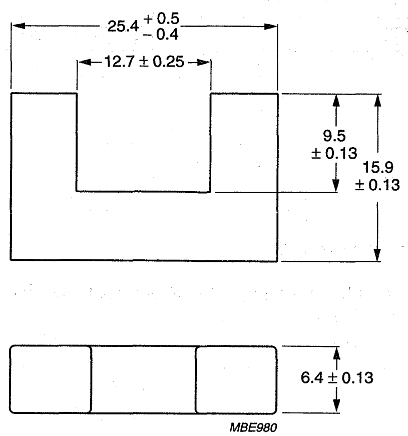
U cores and accessories

U25/16/6 (376U250)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.07	mm^{-1}
V_e	effective volume	3380	mm^3
l_e	effective length	83.6	mm
A_e	effective area	40.3	mm^2
m	mass of core half	≈8	g



Dimensions in mm.

Fig.1 U25/16/6 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	1400 ±25%	≈2300	U25/16/6-3C81
3E25 sup	2320 ±25%	≈3800	U25/16/6-3E25
3E27	2320 ±25%	≈3800	U25/16/6-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤0.78

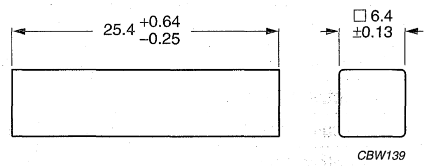
I core and accessories

I25/6/6 (376B250)

CORE SETS

Effective core parameters measured in combination with U25/16/6

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.59	mm^{-1}
V_e	effective volume	2590	mm^3
l_e	effective length	64.3	mm
A_e	effective area	40.3	mm^2
m	mass of I core	≈4.5	g



Dimensions in mm.

Fig.1 I25/6/6 core.

Core halves

A_L measured in combination with *"U25/16/6"*.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81 sup	1750 ±25%	≈2250	I25/6/6-3C81
3E25 sup	2500 ±25%	≈3200	I25/6/6-3E25
3E27 sup	2500 ±25%	≈3200	I25/6/6-3E27

Properties of core sets under power conditions

Measured in combination with *"U25/16/6"*.

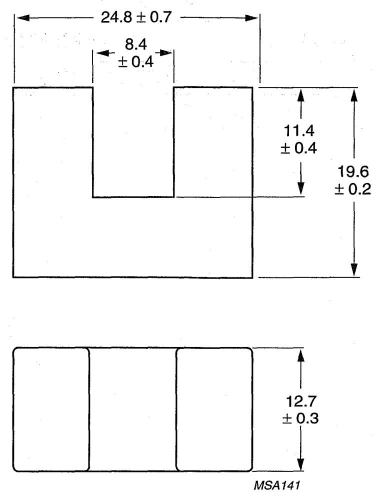
GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤0.60

U cores and accessories U25/20/13

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.85	mm^{-1}
V_e	effective volume	9180	mm^3
l_e	effective length	88.2	mm
A_e	effective area	104	mm^2
m	mass of core half	≈23.5	g



Dimensions in mm.

Fig.1 U25/20/13 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90 des	2900 ±25%	≈2000	U25/20/13-3C90
3E25	6300 ±25%	≈4300	U25/20/13-3E25

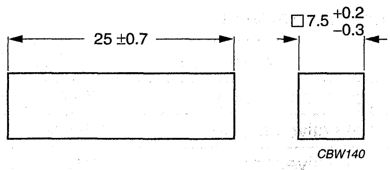
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤1.10	≤1.20

CORE

Ordering information

GRADE	TYPE NUMBER
3C90	I25/7/7-3C90



Dimensions in mm.

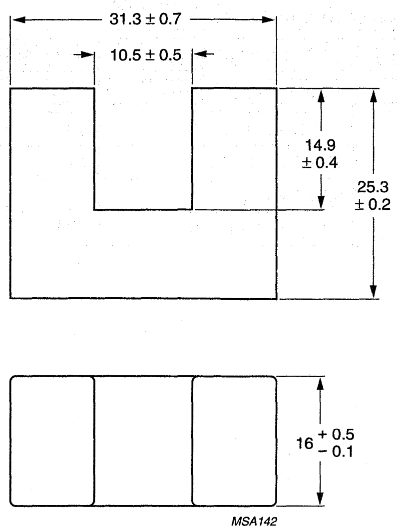
Fig.1 I25/7/7 core.

U cores and accessories U30/25/16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.690	mm^{-1}
V_e	effective volume	17900	mm^3
l_e	effective length	111	mm
A_e	effective area	161	mm^2
m	mass of core half	≈43	g



Dimensions in mm.

Fig.1 U30/25/16 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	3700 ±25%	≈2000	U30/25/16-3C90

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤2.15	≤2.30

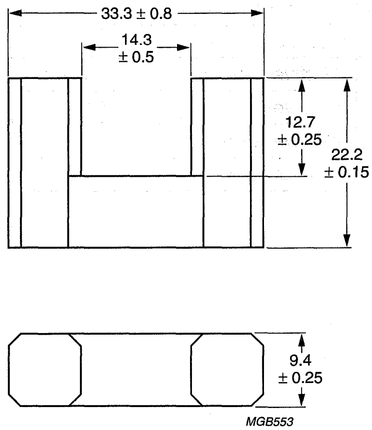
U cores and accessories

U33/22/9 (1F30)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.27	mm^{-1}
V_e	effective volume	9490	mm^3
l_e	effective length	110	mm
A_e	effective area	86.5	mm^2
m	mass of core half	≈24	g



Dimensions in mm.

Fig.1 U33/22/9 core half.

Core half

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	2300 ±25%	≈2320	U33/22/9-3C81

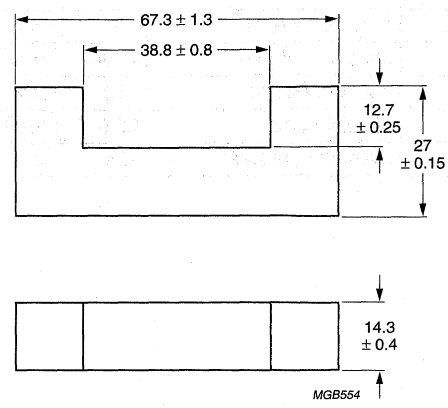
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥330	≤2.2

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.850	mm^{-1}
V_e	effective volume	35200	mm^3
l_e	effective length	173	mm
A_e	effective area	204	mm^2
m	mass of core half	≈85	g



Dimensions in mm.

Fig.1 U67/27/14 core half.

Core half

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	3800 ±25%	≈2570	U67/27/14 -3C81

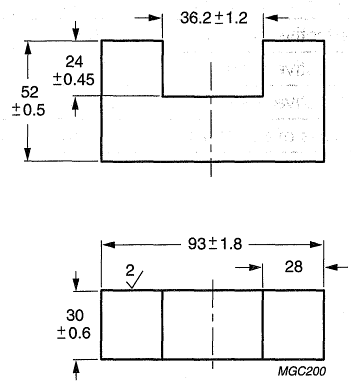
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤8.1

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.307	mm^{-1}
V_e	effective volume	217000	mm^3
l_e	effective length	258	mm
A_e	effective area	840	mm^2
m	mass of core half	≈560	g



Dimensions in mm.

Fig.1 U93/52/30 core half.

Core half

A_L measured on a combination of two u-cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	8700 ±25%	≈2100	U93/52/30-3C90

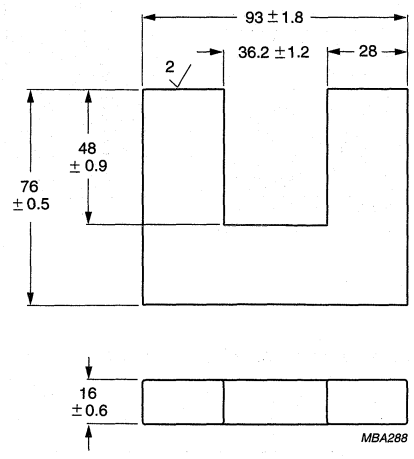
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤26	≤28

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.790	mm^{-1}
V_e	effective volume	159000	mm^3
l_e	effective length	354	mm
A_e	effective area	448	mm^2
m	mass of core half	≈400	g



Dimensions in mm.

Fig.1 U93/76/16 core half.

Core half

A_L measured on a combination of two U-cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	3400 ±25%	≈2200	U93/76/16-3C90

Properties of core sets under power conditions

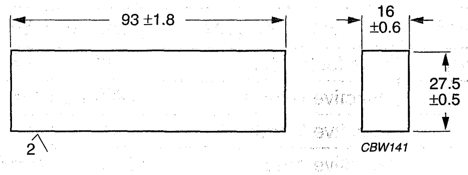
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤19	≤21

I cores and accessories I93/28/16

CORE SETS

Effective core parameters in combination with U93/76/16

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.576	mm^{-1}
V_e	effective volume	115000	mm^3
l_e	effective length	258	mm
A_e	effective area	447	mm^2
m	mass of core	≈200	g



Dimensions in mm.

Fig.1 I93/28/16 core.

Core data

A_L measured in combination with *"U93/76/16"*.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	4600 ±25%	≈2100	I93/28/16-3C90

Properties of core sets under power conditions

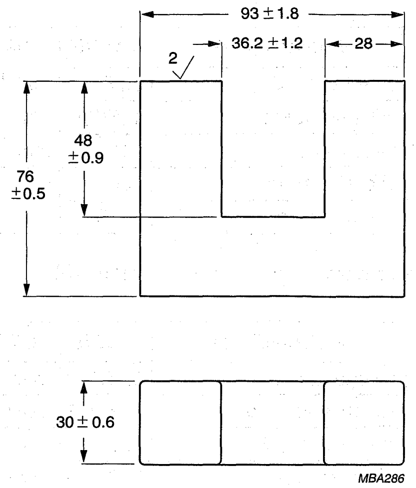
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤14	≤15

U cores and accessories — U93/76/30

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.421	mm^{-1}
V_e	effective volume	297000	mm^3
l_e	effective length	354	mm
A_e	effective area	840	mm^2
m	mass of core half	≈760	g



Dimensions in mm.

Fig.1 U93/76/30 core half.

Core halves

A_L measured on a combination of two U-cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	6400 ±25%	≈2200	U93/76/30-3C90

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤35	≤38

I cores and accessories I93/28/30

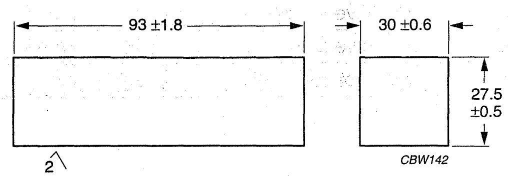
CORE SETS

Effective core parameters in combination with U93/52/30

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.251	mm^{-1}
V_e	effective volume	175000	mm^3
l_e	effective length	210	mm
A_e	effective area	836	mm^2
m	mass of core	≈370	g

Effective core parameters in combination with U93/76/30

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.307	mm^{-1}
V_e	effective volume	217000	mm^3
l_e	effective length	258	mm
A_e	effective area	840	mm^2
m	mass of core	≈370	g



Dimensions in mm.

Fig.1 I93/28/30 core.

Core data

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	10700 ±25%(1)	≈2150	I93/28/30-3C90
	8700 ±25%(2)	≈2150	

Notes

1. Measured in combination with *"U93/52/30"*.
2. Measured in combination with *"U93/76/30"*.

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤21.0(1)	≤23(1)
	≥330	≤25.0(2)	≤28(2)

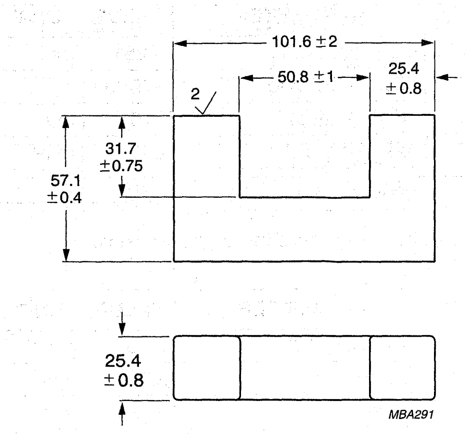
Notes

1. Measured in combination with *"U93/52/30"*.
2. Measured in combination with *"U93/76/30"*.

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.478	mm^{-1}
V_e	effective volume	199 000	mm^3
l_e	effective length	308	mm
A_e	effective area	645	mm^2
m	mass of core half	≈500	g



Dimensions in mm.

Fig.1 U100/57/25 core half.

Core half

A_L measured on a combination of two U-cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	5500 ±25%	≈2200	U100/57/25-3C90

Properties of core sets under power conditions

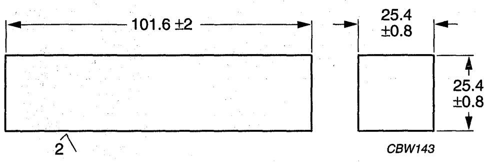
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤23	≤26

I cores and accessories I100/25/25

CORE SETS

Effective core parameters in combination with U100/57/25

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.379	mm^{-1}
V_e	effective volume	158000	mm^3
l_e	effective length	245	mm
A_e	effective area	645	mm^2
m	mass of core	≈300	g



Dimensions in mm.

Fig.1 I100/25/25 core.

Core data

A_L measured in combination with *"U100/57/25"*.

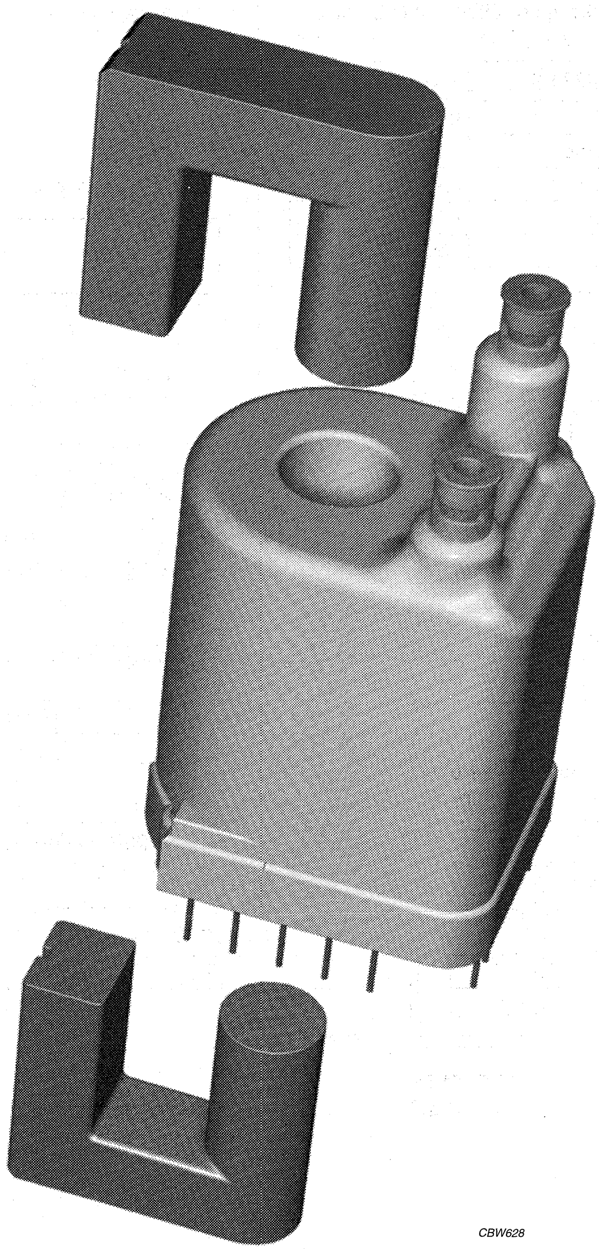
GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	6700 ±25%	≈2150	I100/25/25-3C90

Properties of core sets under power conditions

Core loss measured in combination with *"U100/57/25"*.

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤19	≤20

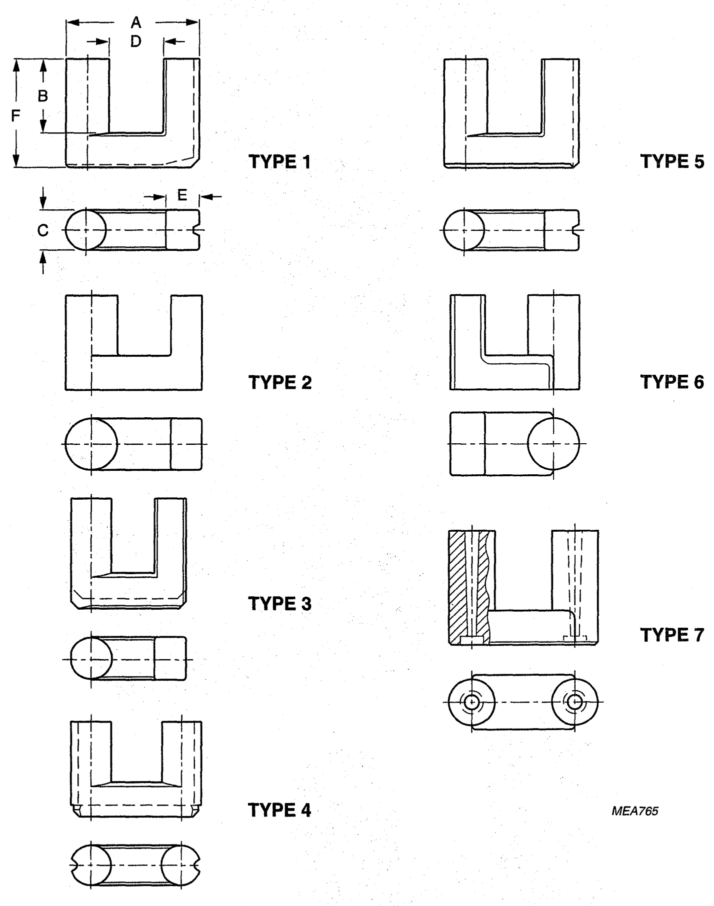
UR cores and accessories UR cores



For more information on Product Status Definitions, see page 3.

PRESENT TYPES AND ORDERING CODES

Our present selection is displayed in Table 2. In principle, any core shape can be supplied in all available grades. Other customized shapes can be manufactured on request.

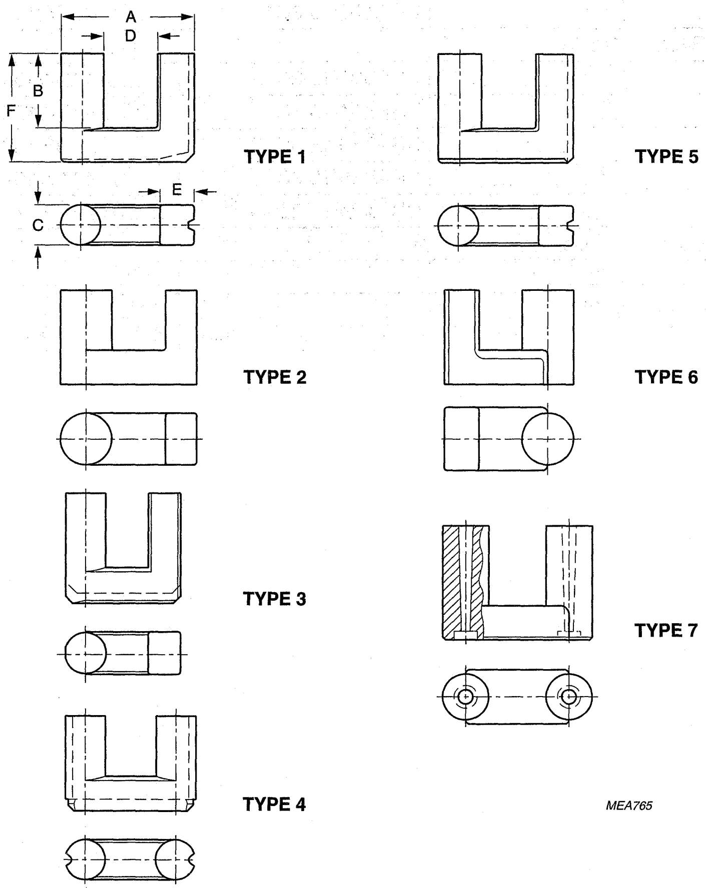


For dimensions see Table 1.

Fig.2 UR cores for line output transformers.

Table 1 Mechanical data

DESCRIPTION	SHAPE	DIMENSIONS (mm)						EFFECTIVE CORE PARAMETERS				
		A	B	C	D_{min}	E	F	C1 (mm^{-1})	V_e (mm^3)	l_e (mm)	A_e (mm^2)	MASS (g)
UR20/14/13	6	19.8	10.6	12.9	9.8	3.0	13.8	2.07	2956	78.2	37.8	8
UR28/20/14	6	28.3	13.0	11.2	8.5	7.5	20.4	0.990	9460	97	98	25
UR35/28/13	5	35.2	18.8	12.7	13.1	9.3	28.3	1.100	15900	132	120	42
UR39/35/15	3	38.7	24.8	14.9	15.0	9.1	35.2	1.094	24300	163	149	64
UR42/21/12	4	41.8	11.1	11.9	18.2	11.9	20.6	1.09	11800	113	104	31
UR42/32/15	5	42.5	20.2	15.2	14.4	12.0	31.8	0.832	26670	149	179	69
UR43/34/16	2	42.1	24.0	15.8	15.7	9.6	34.0	0.982	27100	163	166	71
UR44/36/15	1	43.8	24.45	14.65	16.65	11.8	35.9	1.006	28700	170	169	71
UR47/36/16	5	47.55	23.8	15.95	18.25	12.6	35.7	0.900	33800	174	194	86
UR48/39/17	5	48.0	26.9	17.0	17.4	13.0	39.4	0.865	39990	186	215	99
UR64/29/14	4	64.0	18.1	13.8	36.1	13.8	29.5	1.26	27000	185	147	71
UR64/40/20	7	64.0	26.5	20.0	23.2	20.0	40.5	0.726	61000	210	290	160

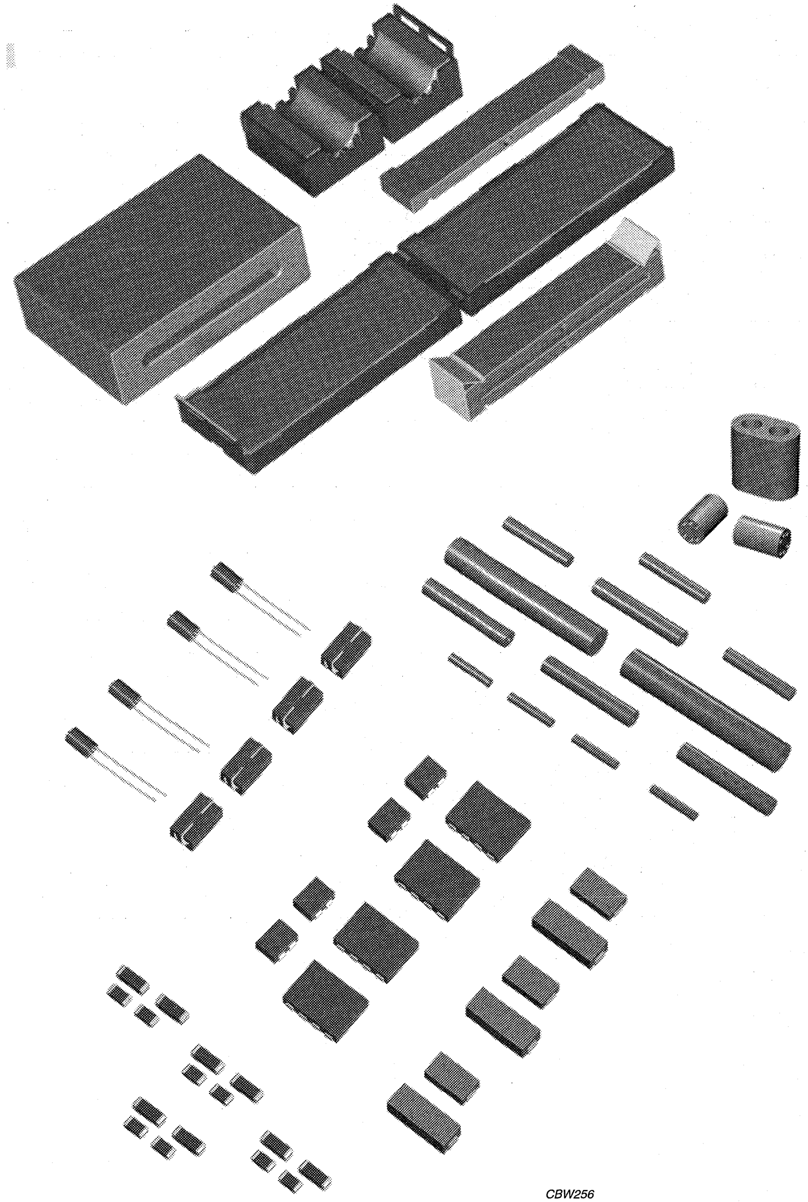


For type numbers see Table 2.

Fig.3 UR cores for line output transformers.

Table 2 Type numbers

SHAPE	MATERIAL GRADE		
	3C81/3F3	3C15	3C30
6	–	–	UR20/14/13-3C30 des
6	–	–	UR28/20/14-3C30 des
5	–	UR35/28/13-3C15	UR35/28/13-3C30 des
3	–	UR39/35/15-3C15	UR39/35/15-3C30 des
4	UR42/21/12-3C81	–	–
5	–	UR42/32/15-3C15	UR42/32/15-3C30 des
2	–	UR43/34/16-3C15	UR43/34/16-3C30 des
1	–	UR44/36/15-3C15	UR44/36/15-3C30 des
5	–	UR47/36/16-3C15	UR47/36/16-3C30 des
5	–	UR48/39/17-3C15	UR48/39/17-3C30 des
4	UR64/29/14-3C81	–	–
7	–	–	–
7	UR64/40/20-3F3	–	–



CBW256

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EMI-suppression products

CORE TYPE	DESCRIPTION
BC	bobbin core
CMS	common mode choke SMD
CSA	cable shield arcade
CSA-EN	cable shield arcade encapsulated
CSC	cable shield C-shape
CSC-EN	cable shield C-shape encapsulated
CSU	cable shield U-shape
CSU-EN	cable shield U-shape encapsulated
CSF	cable shield flat
CST	cable shield tubular
BD	bead
BDS	bead SMD
BDW	bead on wire
MHB	multihole core binocular
MHC	multihole core circular
MHR	multihole core rectangular
MLS	mutilayer suppressors
ROD	rod
WBC	wideband choke
WBS	wideband choke SMD
TUB	tube
T	toroid (ring core)
TC	toroid coated with parylene C
TL	toroid coated with lacquer
TN	toroid coated with nylon
TX	toroid coated with epoxy

BOBBIN CORES

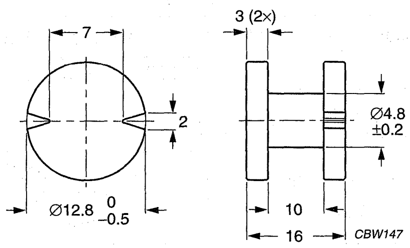
Type BC13/4.8/16

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	50	BC13/4.8/16-3C90 sup

Winding data for BC13/4.8/16

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
38.8	27.3



Dimensions in mm.

Fig.1 BC13/4.8/16.

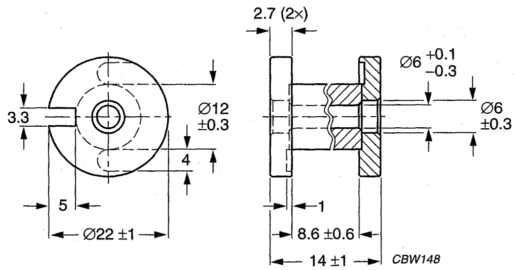
Type BC22/12/14

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	86	BC22/12/14-3C90 sup

Winding data for BC22/12/14

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
43.0	53.4



Dimensions in mm.

Fig.2 BC22/12/14.

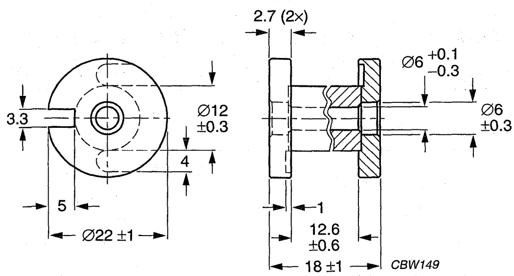
Type BC22/12/18

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	85	BC22/12/18-3C90 sup

Winding data for BC22/12/18

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
63.0	53.4



Dimensions in mm.

Fig.3 BC22/12/18.

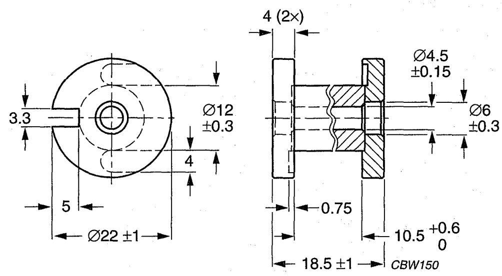
Type BC22/12/19

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	91	BC22/12/19-3C90 sup

Winding data for BC22/12/19

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
52.5	53.4



Dimensions in mm.

Fig.4 BC22/12/19.

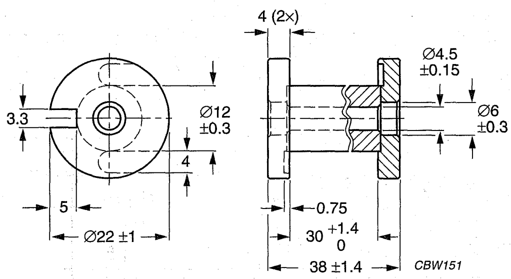
Type BC22/12/38

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	74	BC22/12/38-3C90 sup

Winding data for BC22/12/38

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
150	53.4



Dimensions in mm.

Fig.5 BC22/12/38.

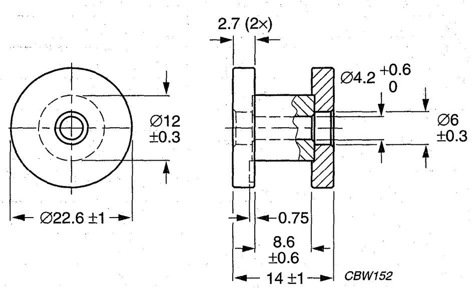
Type BC23/12/14

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	86	BC23/12/14-3C90 sup

Winding data for BC23/12/14

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
45.6	54.3

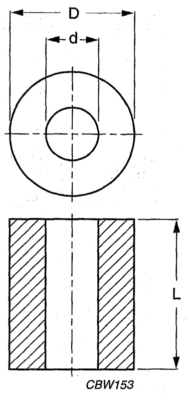


Dimensions in mm.

Fig.6 BC23/12/14.

CABLE SHIELDS FOR EMI-SUPPRESSION

Tubular cable shields



For dimensions see Table 1.

Fig.1 Tubular cable shield.

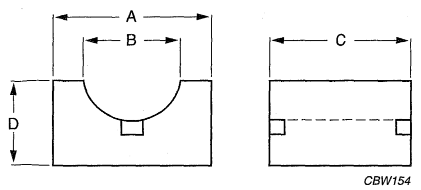
Table 1 Type numbers, dimensions and parameters; see Fig.1

TYPE NUMBER		DIMENSIONS			$\lvert Z \rvert_{typ}$(1) (Ω) at	
		D	d	L	25 MHz	100 MHz
CST7.8/5.3/9.8-3S4	des	7.8 ±0.2	5.3 +0.3	9.8 ±0.2	33	50
CST8.3/3.5/10-3S4	des	8.3 −0.4	3.5 +0.3	10 −0.6	70	96
CST9.5/4.8/6.4-4S2	des	9.5 ±0.25	4.75 ±0.25	6.35 ±0.35	23	50
CST9.5/4.8/10-4S2	des	9.5 ±0.25	4.75 ±0.25	10.4 ±0.25	53	80
CST9.5/4.8/19-4S2	des	9.5 ±0.25	4.75 ±0.25	19.05 ±0.7	100	145
CST9.5/5.1/15-3S4	des	9.5 ±0.3	5.1 ±0.15	14.5 ±0.45	66	110
CST9.7/5/5.1-4S2	des	9.65 ±0.25	5 ±0.2	5.05 −0.45	26	43
CST14/6.4/29-4S2	des	14.3 ±0.45	6.35 ±0.25	28.6 ±0.75	170	250
CST14/7.3/29-4S2	des	14.3 ±0.45	7.25 ±0.15	28.6 ±0.75	143	215
CST16/7.9/14-4S2	des	16.25 −0.75	7.9 ±0.25	14.3 ±0.35	70	113
CST16/7.9/29-4S2	des	16.25 −0.75	7.9 ±0.25	28.6 ±0.75	130	213
CST17/9.5/13-3S4	des	17.45 ±0.35	9.53 ±0.25	12.7 ±0.5	55	90
CST17/9.5/13-4S2	des	17.45 ±0.4	9.5 ±0.25	12.7 ±0.5	55	88
CST17/9.5/29-3S4	des	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	200
CST17/9.5/29-4S2	des	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	250
CST17/11/60-3S4	des	17.2 −1.2	11 ±0.5	60 −2.5	200	320
CST19/10/29-4S2	des	19 −0.65	10.15 ±0.25	28.6 ±0.75	128	196
CST19/11/12-3S4	des	19 ±0.4	10.6 ±0.3	11.5 ±0.4	50	75
CST26/13/29-4S2	des	25.9 ±0.75	12.8 ±0.25	28.6 ±0.8	145	225
CST29/19/7.5-4S2	des	29 ±0.75	19 ±0.5	7.5 ±0.25	28	47

Note

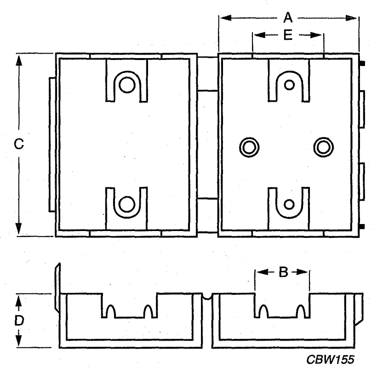
1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ −20%.

Round cable shields (split)



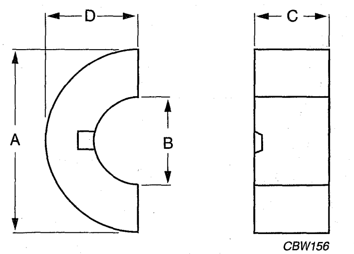
For dimensions see Table 2.

Fig.2 Shield (CSA) outline.



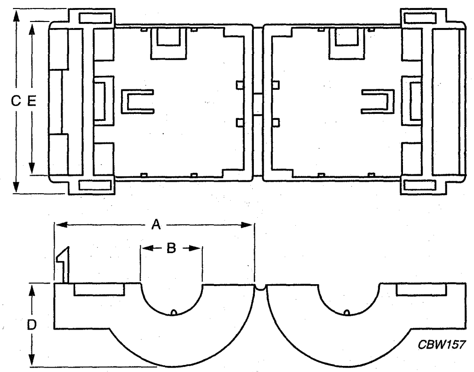
For dimensions see Table 2.

Fig.3 Nylon case.



For dimensions see Table 2.

Fig.4 Shield (CSC) outline.



For dimensions see Table 2.

Fig.5 Nylon case.

General data

ITEM	SPECIFICATION
Case material	polyamide (PA66), glass reinforced, flame retardant in accordance with *"UL94V-0"*, grade A82, colour black

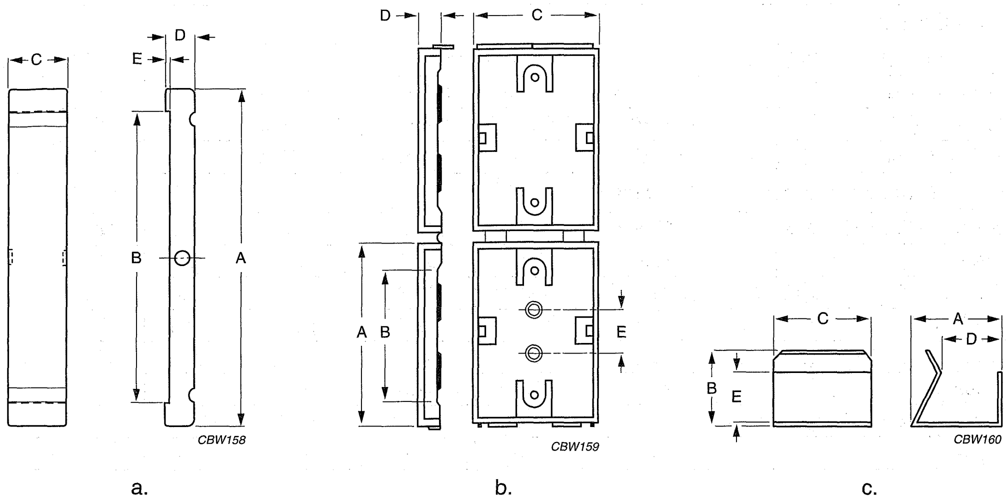
Table 2 Type numbers, dimensions and parameters; see Figs 2 to 5

TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z \rvert_{typ}$[1] (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Round cable shields								
CSA15/7.5/29-4S2 des	2	15 ±0.25	6.6 ±0.3	28.6 ±0.8	7.5 ±0.15	–	165	275
CSA19/9.4/29-4S2 des	2	18.65 ±0.4	10.15 ±0.3	28.6 ±0.8	9.4 ±0.15	–	140	225
CSA26/13/29-4S2 des	2	25.9 ±0.5	13.05 ±0.3	28.6 ±0.8	12.8 ±0.25	–	155	250
CSC16/7.9/14-4S2 des	4	15.9 ±0.4	7.9 ±0.3	14.3 ±0.4	7.95 ±0.2	–	50	113
Round cable shields in matching nylon cases								
CSA15/7.5/29-4S2-EN des	2+3	17.9	7.0	32.3	9.2	9.0	165	275
Nylon case	3	17.9	7.0	32.3	9.2	9.0	–	–
CSA19/9.4/29-4S2-EN des	2+3	22.1	10.2	32.3	11.7	9.0	140	225
Nylon case	3	22.1	10.2	32.3	11.7	9.0	–	–
CSA26/13/29-4S2-EN des	2+3	29	13.4	32.5	14.8	18.0	155	250
Nylon case	3	29	13.4	32.5	14.8	18.0	–	–
CSC16/7.9/14-4S2-EN des	4+5	24.7	7.6	22.8	10.2	17.8	50	113
Nylon case	5	24.7	7.6	22.8	10.2	17.8	–	–

Note

1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ –20%.

Flat cable shields (split)



For dimensions see Table 3.

Fig.6 Outlines of flat cable shields (split) and accessories.

General data

ITEM	SPECIFICATION
Case material	polyamide (PA66), glass reinforced, flame retardant in accordance with *"UL94V-0"*, grade A82, colour black
Clip material	spring steel (0.5 mm), zinc plated

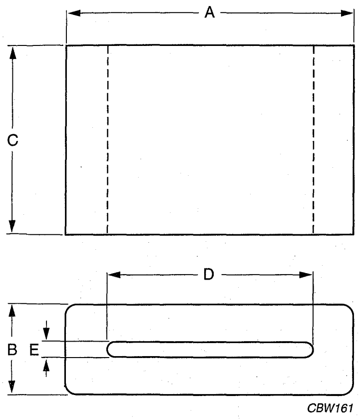
Table 3 Type numbers, dimensions and parameters; see Fig.6

TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z \rvert_{typ}$(1) (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Flat cable shields (split)								
CSU45/6.4/29-4S2 des	6a	45.1 ±0.75	34.4 ±0.7	28.6 ±0.7	6.35 ±0.25	0.85 ±0.2	96	225
CSU76/6.4/13-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	12.7 ±0.4	6.35 ±0.25	0.85 ±0.2	36	110
CSU76/6.4/15-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	15.0 ±0.6	6.35 ±0.25	0.85 ±0.2	50	159
CSU76/6.4/29-4S2 des	6a	76.2 ±1.5	65.3 ±1.3	28.6 ±0.8	6.35 ±0.25	0.85 ±0.2	75	215
CSU76/6.4/29-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	28.6 ±0.8	6.35 ±0.25	0.85 ±0.2	70	235
CLI-CSU6.4 des	6c	16.1	11.0	12.7	11.4	8.0	–	–
Flat cable shields in matching nylon cases								
CSU45/6.4/29-4S2-EN des	6a+b	49.5	34.3	32.3	8.1	20	96	225
Nylon case	6b	49.5	34.3	32.3	8.1	20	–	–
CSU76/6.4/29-4S2-EN des	6a+b	80.8	65.5	32.3	8.1	50.8	75	215
Nylon case	6b	80.8	65.5	32.3	8.1	50.8	–	–

Note

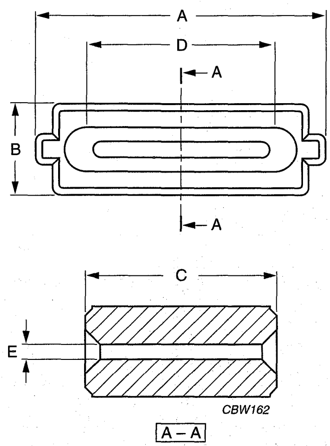
1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ −20%.

Flat cable shields



For dimensions see Table 4.

Fig.7 CSF38/12/25 outline.



For dimensions see Table 4.

Fig.8 CSF38/12/25-S outline.

Table 4 Type numbers, dimensions and parameters; see Figs 7 and 8

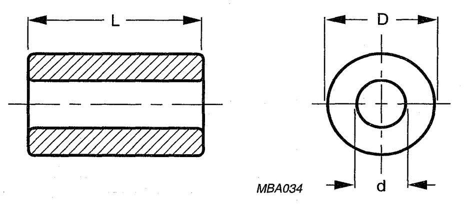
TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z\rvert_{typ}$ (1) (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Flat cable shields								
CSF38/12/25-3S4 des	7	38.1 ±1.0	12.1 ±0.35	25.4 ±0.75	26.7 ±0.75	1.9 ±0.35	110	215
CSF38/12/25-3S4-S des	8	38.5 ±0.6	12.1 ±0.4	25.4 ±0.8	26.8 ±0.8	1.9 ±0.4	98	196

Note

1. Minimum guaranteed impedance is $\lvert Z\rvert_{typ}$ −20%.

EMI-SUPPRESSION BEADS

Colour marking: 4S2 has a flash of yellow paint.



For dimensions see Table 1.

Fig.1 EMI suppression bead.

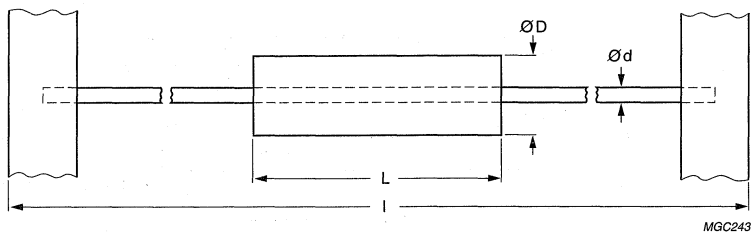
Table 1 Grades, parameters and type numbers; see Fig.1

GRADE	$\|Z_{typ}\|$ (Ω)(1) at frequency (MHz)							DIMENSIONS (mm)			TYPE NUMBER
	1	3	10	25	30	100	300	D	d	L	
3S1	24	48	49	–	39	33	29	3 ±0.1	0.7 +0.1	4 ±0.2	BD3/0.7/4-3S1 sup
	18	36	38	–	30	25	23	3 ±0.1	1 +0.1/–0.05	4 ±0.2	BD3/1/4-3S1
	41	90	91	–	74	63	55	3 ±0.1	1 +0.1/–0.05	10 ±0.3	BD3/1/10-3S1 sup
	34	65	66	–	53	45	40	5.1 –0.3	0.75 +0.1	4 ±0.2	BD5.1/0.8/4-3S1 sup
	16	28	40	–	33	28	25	5.1 –0.3	1.5 +0.15	4 ±0.2	BD5.1/1.5/4-3S1
	50	90	100	–	80	69	60	5.1 –0.3	1.5 +0.15	10 ±0.3	BD5.1/1.5/10-3S1 sup
	13	23	30	–	25	21	19	5.1 –0.3	2 +0.2	4 ±0.2	BD5.1/2/4-3S1
	36	64	76	–	61	53	46	5.1 –0.3	2 +0.2	10 ±0.3	BD5.1/2/10-3S1 sup
4S2	7	20	35	–	54	69	76	1.9 +0.2	0.8 +0.2	9.75 –0.2	BD1.9/0.8/9.8-4S2 sup
	4	11	23	–	31	48	54	3 ±0.1	1 +0.1/–0.05	4 ±0.2	BD3/1/4-4S2
	–	–	–	27	–	40	–	3.5 ±0.2	1.3 ±0.1	3.25 ±0.25	BD3.5/1.3/3.3-4S2
	–	–	–	47	–	60	–	3.5 ±0.2	1.3 ±0.1	6 ±0.25	BD3.5/1.3/6-4S2
	–	–	–	89	–	125	–	3.5 ±0.2	1.3 ±0.1	12.7 ±0.35	BD3.5/1.3/13-4S2
	15	50	94	–	138	213	238	5.1 –0.3	0.75 +0.1	10 ±0.3	BD5.1/0.8/10-4S2 sup
	4	13	25	–	34	51	59	5.1 –0.3	1.5 +0.15	4 ±0.2	BD5.1/1.5/4-4S2
	9	31	56	–	85	130	145	5.1 –0.3	1.5 +0.15	10 ±0.3	BD5.1/1.5/10-4S2
	3	10	19	–	25	40	45	5.1 –0.3	2 +0.2	4 ±0.2	BD5.1/2/4-4S2
	–	–	34	–	–	78	–	5.1 –0.3	2 +0.2	7.1 ±0.2	BD5.1/2/7.1-4S2
	8	19	38	–	64	100	111	5.1 –0.3	2 +0.2	10 ±0.3	BD5.1/2/10-4S2 sup
	–	–	–	135	–	200	–	6.35 ±0.15	2.95 +0.45	25.4 ±0.75	BD6.4/3/25-4S2
	–	–	–	63	–	92	–	7.65 –0.25	2.25 +0.25	7.55 ±0.25	BD7.7/2.3/7.6-4S2
	5	13	25	–	39	61	69	8 ±0.2	2 +0.2	4 ±0.2	BD8/2/4-4S2
	3	10	19	–	28	43	48	8 ±0.2	3 +0.2	4 ±0.2	BD8/3/4-4S2
	8	25	50	–	69	106	119	8 ±0.2	3 +0.2	10 ±0.3	BD8/3/10-4S2

Note

1. Typical values at 100 MHz, $|Z|_{min}$ is –20%.

BEADS ON WIRE FOR EMI-SUPPRESSION



For dimensions, see Table 2.
Taping standard in accordance with *"IEC 60286, part 1"* and *"EIA-RS-296-D"*.

Fig.2 Bead on wire.

Table 2 Grades, parameters and type numbers; see Fig.2

GRADE	$\lvert Z_{typ} \rvert$ (Ω)(1) at frequency (MHz)							DIMENSIONS (mm)				TYPE NUMBER
	1	**3**	**10**	**25**	**30**	**100**	**300**	**ØD**	**L**	**l**	**Ød**	
4S2	4	13	24	–	36	58	65	3.5 ±0.2	3.5 −0.5	64.4	0.64	BDW3.5/3.5-4S2
	5	16	33	–	49	75	88	3.5 ±0.2	4.7 −0.5	64.4	0.64	BDW3.5/4.7-4S2
	–	–	–	54	–	82	–	3.5 ±0.25	5.25 ±0.25	64.4	0.64	BDW3.5/5.3-4S2
	6	21	44	–	66	100	119	3.5 ±0.2	6.0 ±0.25	64.4	0.64	BDW3.5/6-4S2
	8	25	49	–	74	110	131	3.5 ±0.2	6.7 ±0.25	64.4	0.64	BDW3.5/6.7-4S2
	9	28	55	–	84	131	150	3.5 ±0.2	7.6 ±0.35	64.4	0.64	BDW3.5/7.6-4S2
	10	33	65	–	98	146	175	3.5 ±0.2	8.9 ±0.35	64.4	0.64	BDW3.5/8.9-4S2
	–	–	–	96	–	150	–	3.5 ±0.25	9.5 ±0.3	64.4	0.64	BDW3.5/9.5-4S2
	–	–	–	117	–	180	–	3.5 ±0.25	11.4 ±0.4	64.4	0.64	BDW3.5/11-4S2
	–	–	–	143	–	220	–	3.5 ±0.25	13.8 ±0.5	64.4	0.64	BDW3.5/14-4S2

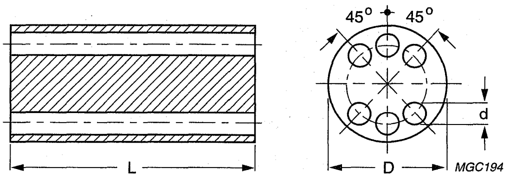
Note

1. Typical values at 100 MHz, $\lvert Z \rvert_{min}$ is −20%.

MULTIHOLE CORES

Table 1 MHC6 grades, parameters and type numbers; see Fig.1

GRADE	DIMENSIONS (mm)			TYPE NUMBER
	D	d	L	
3S4	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-3S4
4B1	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-4B1
4S2	6 ±0.3	0.7 +0.2	5 −0.2	MHC6-6/5-4S2



For dimensions see Table 1.

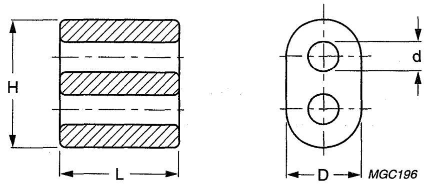
Fig.1 Multihole core circular (MHC6).

Table 2 MHB2 grades, parameters and type numbers; see Fig.2

GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
4B1	8.5 −0.5	3.5 +0.5	8 ±0.3	14 ±0.5	MHB2-14/8.5/8-4B1 sup
	8.5 −0.5	3.5 +0.5	14 ±0.4	14 ±0.5	MHB2-14/8.5/14-4B1
	8.0 ±0.3	3 ±0.3	6 ±0.3	13 ±0.3	MHB2-13/8/6-4B1(1)
3C90	8.0 ±0.3	3 ±0.3	6 ±0.3	13 ±0.3	MHB2-13/8/6-3C90(1)

Note

1. Chamfered holes and sides.

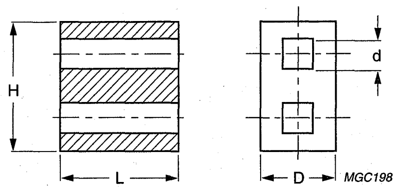


For dimensions see Table 2.

Fig.2 Multihole core binocular (MHB2).

Table 3 MHR2 grades, parameters and type numbers; see Fig.3

GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
4A11	5.4 ±0.3	2.0 ±0.3	10.9 ±0.4	10.8 ±0.3	MHR2-11/5.4/11-4A11 sup
3C90	5.4 ±0.3	2.0 ±0.3	10.9 ±0.4	10.8 ±0.3	MHR2-11/5.4/11-3C90 sup

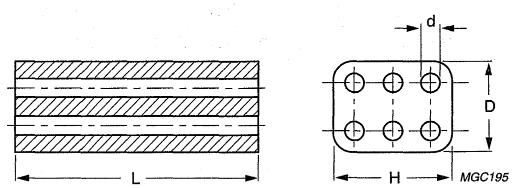


For dimensions see Table 3.

Fig.3 Multihole core rectangular (MHR2).

Table 4 MHR6 grades, parameters and type numbers; see Fig.4

GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
3B1	4 ±0.2	0.7 +0.3	10 ±0.5	6.1 ±0.3	MHR6-6.1/4/10-3B1 sup



For dimensions see Table 4.

Fig.4 Multihole core rectangular (MHR6).

MULTILAYER SUPPRESSORS

Multilayer suppressors are a powerful solution for EMI/RFI attenuation for electronic equipment. Supplied in four standard sizes (0603, 0805, 1206 and 1806), they have impedances between 30 and 1 000 Ω at 100 MHz.

When installed in series with signal and/or power circuits, high frequency noise is suppressed. There is no need for ground termination, which makes these devices very suitable for circuits with difficult ground. Typical suppression frequencies range from 10 MHz to 1 000 MHz and rated currents are between 0.1 and 0.6 A.

Multilayer suppressors are specially designed to reduce noise in low impedance circuits while keeping the signal free from distortion. This is because at the interfering frequencies these components behave as a resistor. The high frequency noise is converted into heat rather than reflected to the source. This dissipation prevents ringing and parasitic oscillations.

These characteristics can be used for many different purposes:

- Absorption of generated noise.
- Filtering and wave-shape correction of digital signals from high speed clock oscillators.
- Prevention of high frequency interference entering circuit electronics.

Product construction

The use of silver for electrodes and terminations in multilayer suppressors ensures high electrical conductivity, which minimizes heat generation and crosstalk.

The internal construction can be single layer or multilayer, depending on impedance requirements. Single layer products have a meander design and are suitable for lower impedances, while multilayer types have alternating layers of ferrite and conductor stacked up to achieve higher impedance levels.

The terminal electrode forms a conductive connection to the circuit. It is formed by three layers:

- Silver: for good conductivity
- Nickel: to protect silver termination against leaching
- Tin-lead: applied to ensure good solderability.

The products are suitable for both reflow and wave soldering.

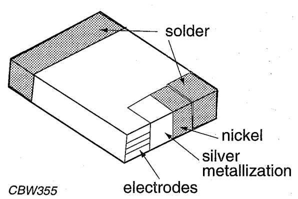


Fig.1 Structure of electrodes.

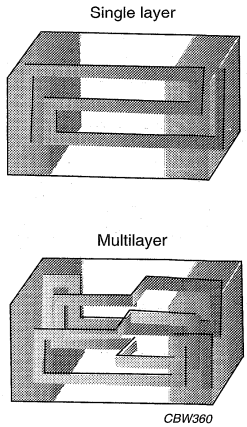


Fig.2 Internal structure of multilayer suppressors.

TYPE NUMBER STRUCTURE

Type numbers for these products consist of the following:

- Product type
- Size
- Material
- Impedance.

Product type

MLS: multilayer suppressor.

Size

0603: 1.6 × 0.80 mm

0805: 2.0 × 1.25 mm

1206: 3.2 × 1.60 mm

1806: 4.5 × 1.60 mm.

Material

4S4

4S7

Impedance value

Expressed in ohms (Ω)

First two digits are significant figures

Last digit is the number of zeros to follow.

EXAMPLES

600: 60 Ω

101: 100 Ω

121: 120 Ω

151: 150 Ω

301: 300 Ω

102: 1000 Ω

Example of the ordering code: MLS0603-4S7-600

TYPE	SIZE	MATERIAL	IMPEDANCE
MLS	0603	4S7	60

Standard products are delivered taped on reel and have a tolerance on impedance of 25%. For different specifications a fifth group is added to the type number.

MULTILAYER SUPPRESSORS MLS0603

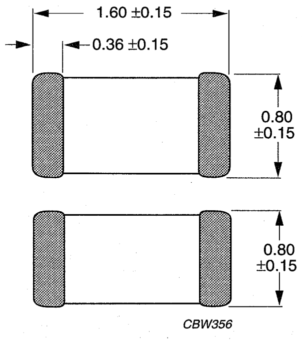


Fig.3 Outline of MLS0603.

Mass

Approximately 5 mg.

Product specifications

GRADE	SIZE	|Z| at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
4S7	0603	60	0.2	300	MLS0603-4S7-600 des
		100	0.3	250	MLS0603-4S7-101 des
		120	0.3	250	MLS0603-4S7-121 des
		150	0.3	250	MLS0603-4S7-151 des
		300	0.35	230	MLS0603-4S7-301 des
		600	0.45	210	MLS0603-4S7-601 des
		1000	0.6	190	MLS0603-4S7-102 des

MULTILAYER SUPPRESSORS MLS0805

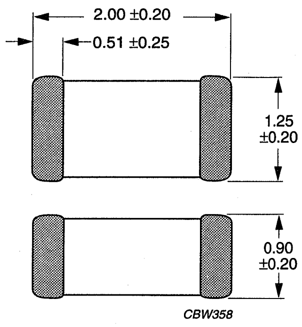


Fig.4 Outline of MLS0805.

Mass

Approximately 11 mg.

Product specifications

GRADE	SIZE	|Z| at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
4S4	0805	30	0.1	600	MLS0805-4S4-300 des
		60	0.1	600	MLS0805-4S4-600 des
4S7	0805	120	0.2	400	MLS0805-4S7-121 des
		150	0.3	200	MLS0805-4S7-151 des
		300	0.3	200	MLS0805-4S7-301 des
		600	0.3	200	MLS0805-4S7-601 des
		1000	0.4	200	MLS0805-4S7-102 des

MULTILAYER SUPPRESSORS MLS1206

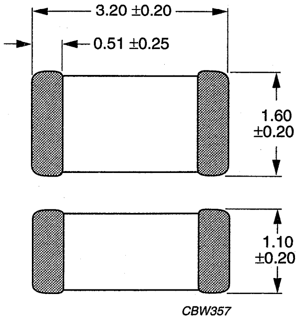


Fig.5 Outline of MLS1206.

Mass

Approximately 28 mg.

Product specifications

GRADE	SIZE	|Z| at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
4S4	1206	30	0.1	600	MLS1206-4S4-300 des
		70	0.1	600	MLS1206-4S4-700 des
		90	0.2	400	MLS1206-4S4-900 des
		120	0.2	300	MLS1206-4S4-121 des
		600	0.4	200	MLS1206-4S4-601 des
4S7	1206	1000	0.6	150	MLS1206-4S7-102 des

MULTILAYER SUPPRESSORS MLS1806

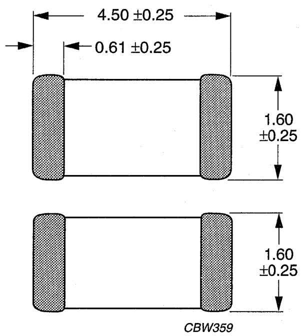


Fig.6 Outline of MLS1806.

Mass

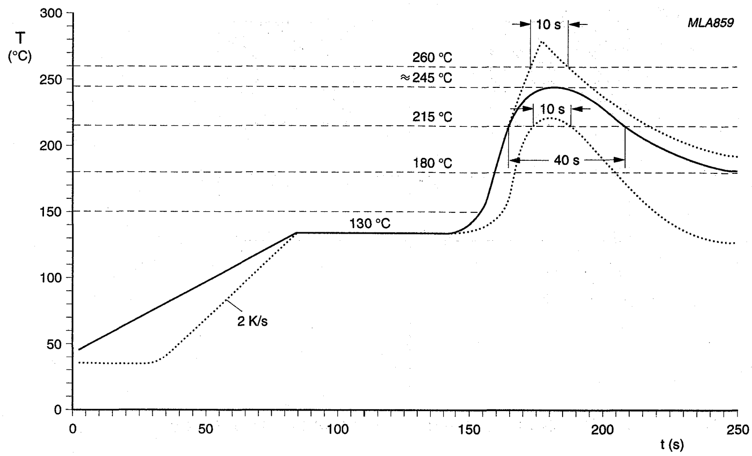
Approximately 55 mg.

Product specifications

GRADE	SIZE	|Z| at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
4S4	1806	80	0.1	600	MLS1806-4S4-800 des
		150	0.2	500	MLS1806-4S4-151 des

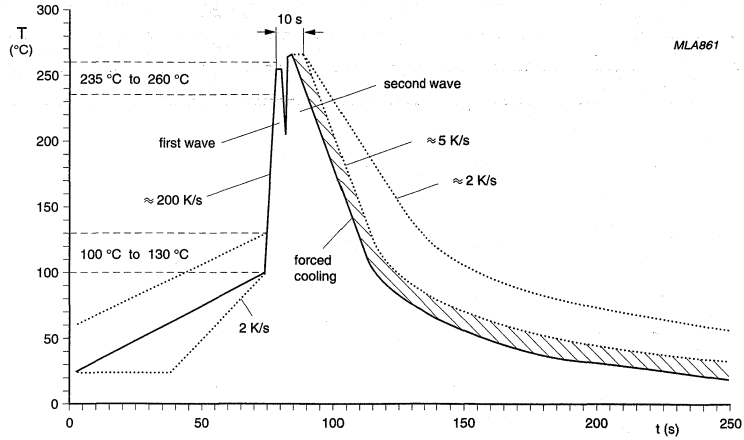
MOUNTING

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

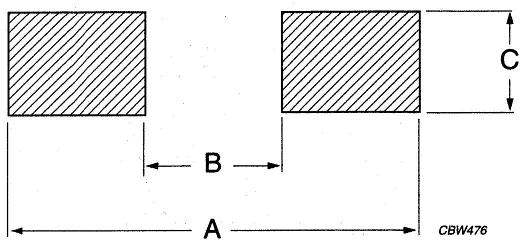
Fig.7 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.8 Double wave soldering.

Dimensions of solderlands



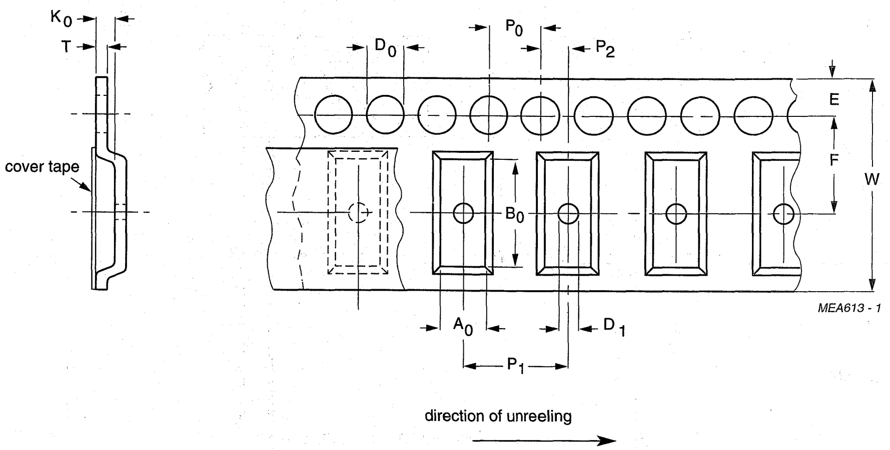
For dimensions see Table 1.

Fig.9 Recommended dimensions of solder lands.

Table 1 Solder land dimensions; see Fig.9

CASE SIZE	FOOTPRINT DIMENSIONS (mm)		
	A	B	C
0603	2.1	0.7	0.7
0805	2.6	1.0	1.0
1206	4.4	2.2	1.35
1806	6.0	3.0	1.35

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 2.

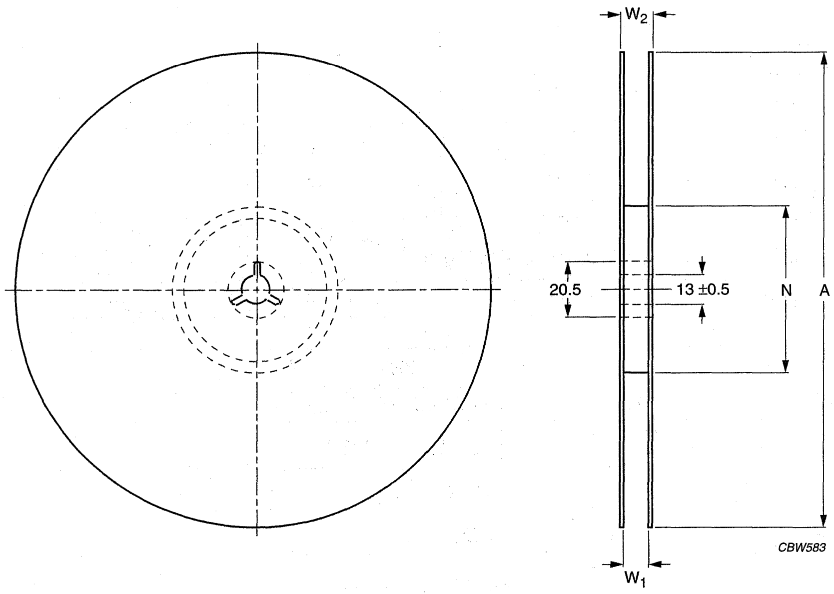
Fig.10 Blister tape.

Table 2 Dimensions of blister tape for relevant product size code; see Fig.10

DIMENSION	PRODUCT SIZE CODE			
	0603	**0805**	**1206**	**1806**
A_0	1.1 ±0.1	1.6 ±0.1	2.0 ±0.1	2.0 ±0.1
B_0	1.9 ±0.1	2.4 ±0.1	3.6 ±0.1	5.0 ±0.2
K_0 minimum clearance; note 1	1.1	1.2	1.2	2.0
W	8.0 ±0.2	8.0 ±0.2	8.0 ±0.2	12.0 ±0.3
E	–	–	–	–
F	–	–	–	–
$D_{0\ min}$	0.5	0.5	0.5	0.5
$D_{1\ min}$	0.5	0.5	0.5	0.5
P_0	4.0	4.0	4.0	8.0
P_1	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1
P_2	–	–	–	–
T_{max}	0.3	0.3	0.3	0.3

Note

1. Typical product displacement in pocket.



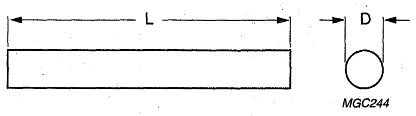
Dimensions in mm.
For dimensions see Table 3.

Fig.11 Reel.

Table 3 Reel dimensions; see Fig.11

TAPE WIDTH	DIMENSIONS (mm)			
	A	N MIN.	W_1	W_2
8	178 ±2	50	10 ±1.5	–
12			14 ±1.5	–

RODS



For dimensions see Table 1.

Fig.1 Rod.

Table 1 Grades, parameters and type numbers; see Fig.1

DIMENSIONS (mm)		TYPE NUMBER		
D	**L**	**3B1**	**3S3**	**4B1**
2 −0.05	20 −0.9	ROD2/20-3B1-D sup	−	−
3 −0.05	15 −0.8	−	−	ROD3/15-4B1-D
3 −0.3	20 ±0.4	−	ROD3/20-3S3	−
3 −0.05	20 −0.9	ROD3/20-3B1-D	−	−
3 −0.05	25 −1.0	ROD3/25-3B1-D	−	−
3.3 ±0.10	17 ±0.3	−	ROD3.3/17-3S3	−
4 −0.05	15 −0.8	ROD4/15-3B1-D	−	ROD4/15-4B1-D
4 −0.05	25 −1.0	ROD4/25-3B1-D	−	−
5 −0.30	20 ±0.5	−	ROD5/20-3S3	−
5 −0.05	20 −0.9	ROD5/20-3B1-D	−	ROD5/20-4B1-D sup
5 −0.30	25 −1.0	−	ROD5/25-3S3	−
5 −0.05	25 −1.0	ROD5/25-3B1-D	−	−
5 −0.05	30 −1.2	ROD5/30-3B1-D	−	ROD5/30-4B1-D sup
5.25 −0.3	18 ±0.3	−	ROD5.3/18-3S3	−
6 −0.30	25 ±0.6	−	ROD6/25-3S3	−
6 −0.30	30 ±0.9	−	ROD6/30-3S3	−
6 −0.10	30 −1.2	ROD6/30-3B1-D	−	ROD6/30-4B1-D sup
6 −0.10	40 −1.6	−	−	ROD6/40-4B1-D sup
6 −0.10	50 ±1.0	−	−	ROD6/50-4B1-D sup
6.5 −0.30	25 ±0.6	−	ROD6.5/25-3S3	−
8 −0.5	25 ±0.75	−	ROD8/25-3S3	−
8 −0.40	50 ±1.0	ROD8/50-3B1 sup	−	ROD8/50-4B1 sup
8 −0.40	150 ±3.0	−	−	ROD8/150-4B1 sup
10 −0.50	200 ±4.0	ROD10/200-3B1 sup	−	ROD10/200-4B1 sup

SMD BEADS FOR EMI SUPPRESSION

General data

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-3"* and *"EIA 481-1"*

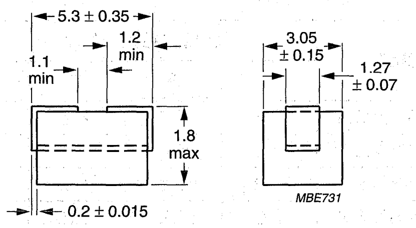
Grades, parameters and type numbers

GRADE	|Z|(1) (Ω)	at f (MHz)	TYPE NUMBER
BDS 3/1.8/5.3; mass ≈0.1 g			
3S1	28	10	BDS 3/1.8/5.3-3S1
	33	25	
	25	100	
4S2	25	25	BDS 3/1.8/5.3-4S2
	38	100	
	45	300	
BDS 3/3/4.6; mass ≈0.15 g			
3S1	25	3	BDS3/3/4.6-3S1
	45	10	
	35	25	
4S2	30	25	BDS3/3/4.6-4S2
	50	100	
	55	300	
BDS 3/3/8.9; mass ≈0.3 g			
3S1	55	3	BDS 3/3/8.9-3S1
	80	10	
	55	25	
4S2	65	25	BDS 3/3/8.9-4S2
	100	100	
	110	300	
BDS 4.6/3/8.9; mass ≈0.5 g			
4S2	65	25	BDS 4.6/3/8.9-4S2
	100	100	
	110	300	

Note

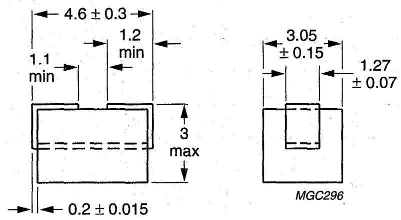
1. Typical values, $|Z|_{min}$ is –20%; DC resistance <0.6 mΩ.

Mechanical data



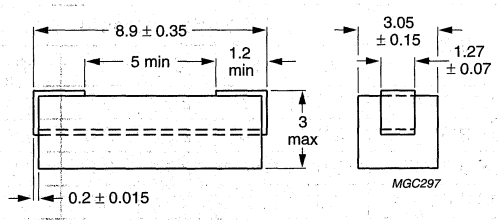
Dimensions in mm.

Fig.1 BDS 3/1.8/5.3.



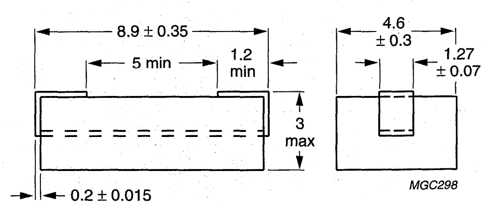
Dimensions in mm.

Fig.2 BDS 3/3/4.6.



Dimensions in mm.

Fig.3 BDS 3/3/8.9.



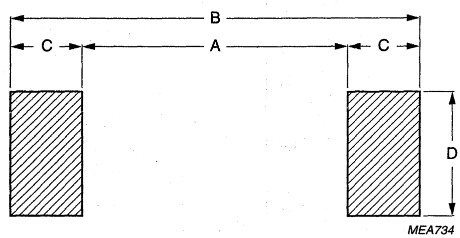
Dimensions in mm.

Fig.4 BDS 4.6/3/8.9.

RECOMMENDED DIMENSIONS OF SOLDER LANDS

Table 1 Reflow soldering

SIZE	DIMENSIONS (mm)			
	A	B	C	D
BDS 3/1.8/5.3	2.8	7.2	2.2	3.3
BDS 3/3/4.6	2.8	6.4	1.8	3.3
BDS 3/3/8.9	7.0	10.8	1.9	3.3
BDS 4.6/3/8.9	7.0	10.8	1.9	3.3

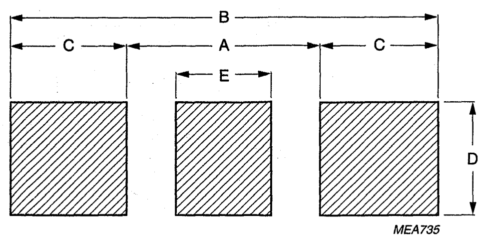


For dimensions see Table 1.
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm^2).

Fig.5 Reflow and vapour phase soldering.

Table 2 Wave soldering

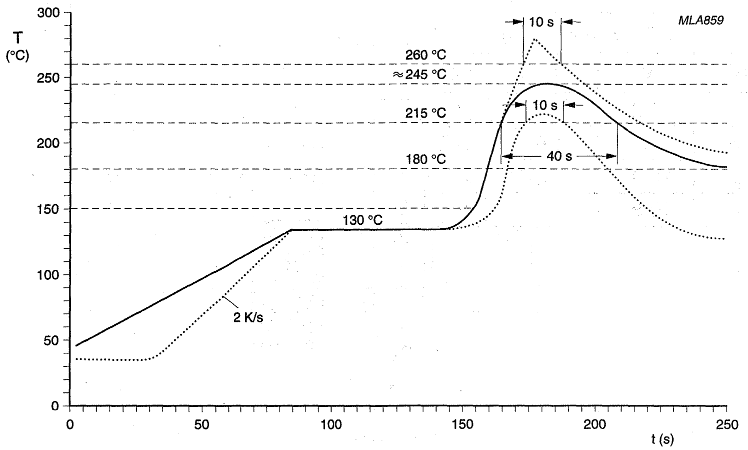
SIZE	DIMENSIONS (mm)				
	A	B	C	D	E
BDS 3/1.8/5.3	2.0	7.2	2.6	3.0	0.8
BDS 3/3/4.6	2.0	6.4	2.2	3.0	0.8
BDS 3/3/8.9	6.0	12.2	3.1	3.0	2.5
BDS 4.6/3/8.9	6.0	12.2	3.1	3.0	2.5



For dimensions see Table 2.

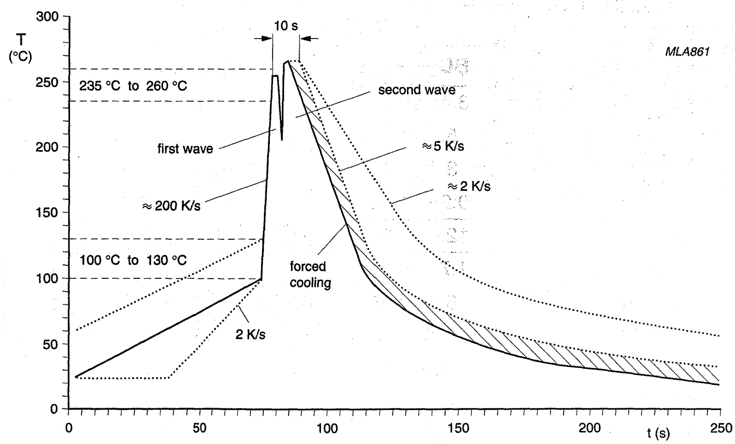
Fig.6 Wave soldering.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

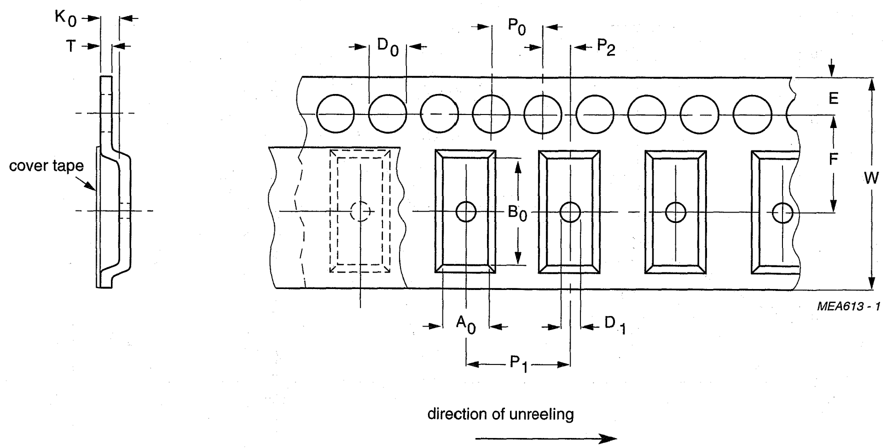
Fig.7 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.8 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

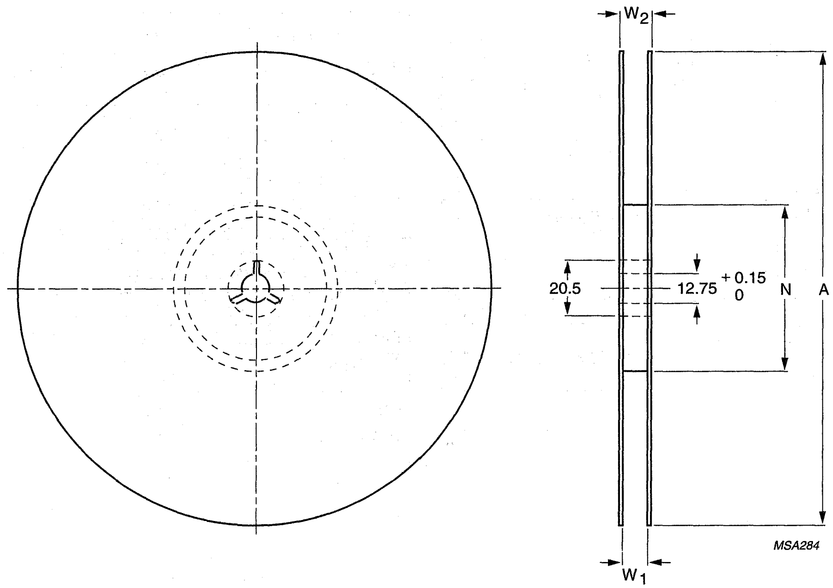


For dimensions see Table 3.

Fig.9 Blister tape.

Table 3 Physical dimensions of blister tape; see Fig.9

SIZE	DIMENSIONS (mm)			
	BDS3/1.8/5.3	**BDS3/3/4.6**	**BDS3/3/8.9**	**BDS4.6/3/8.9**
A_0	3.25 ±0.1	3.45 ±0.1	3.45 ±0.1	5.1 ±0.1
B_0	5.85 ±0.1	5.1 ±0.1	9.4 ±0.1	9.4 ±0.1
K_0	2.0 ±0.1	3.1 ±0.1	3.1 ±0.1	3.1 ±0.1
T	0.3 ±0.05	0.25 ±10%	0.35 ±0.05	0.3 ±0.05
W	12.0 ±0.3	12.0 ±0.3	16.0 ±0.3	16.0 ±0.3
E	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	5.5 ±0.05	5.5 ±0.05	7.5 ±0.1	7.5 ±0.1
D_0	1.5 +0.1	1.5 +0.1	1.5 +0.1	1.5 +0.1
D_1	≥1.5	≥1.5	≥1.5	≥1.5
P_0	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1
P_1	8.0 ±0.1	8.0 ±0.1	8.0 ±0.1	8.0 ±0.1
P_2	2.0 ±0.1	2.0 ±0.05	2.0 ±0.1	2.0 ±0.1



Dimensions in mm.
For dimensions see Table 4.

Fig.10 Reel.

Table 4 Reel dimensions; see Fig.10

SIZE	DIMENSIONS (mm)			
	A	**N**	**W_1**	**W_2**
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4

SMD COMMON MODE CHOKES FOR EMI-SUPPRESSION

General data

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-A"* and *"EIA 481-A"*

Grades, parameters and type numbers

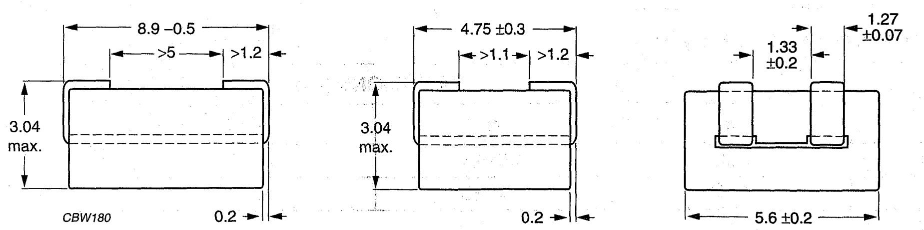
GRADE	|Z|(1) (Ω)	at f (MHz)	TYPE NUMBER
CMS2-5.6/3/4.8; mass ≈0.3 g			
4S2	23	30	CMS2-5.6/3/4.8-4S2
	35	100	
	50	300	
CMS2-5.6/3/8.9; mass ≈0.6 g			
4S2	38	25	CMS2-5.6/3/8.9-4S2
	60	100	

GRADE	|Z|(1) (Ω)	at f (MHz)	TYPE NUMBER
CMS4-11/3/4.8; mass ≈0.6 g			
4S2 inner channel	13	30	CMS4-11/3/4.8-4S2
	23	100	
	42	300	
4S2 outer channel	16	30	
	30	100	
	50	300	
CMS4-11/3/8.9; mass ≈1.1 g			
4S2 inner channel	25	25	CMS4-11/3/8.9-4S2
	45	100	
	82	300	
4S2 outer channel	27	25	
	58	100	
	97	300	

Note

1. Typical values, $|Z|_{min}$ is −20%.
   DC resistance <0.6 mΩ.

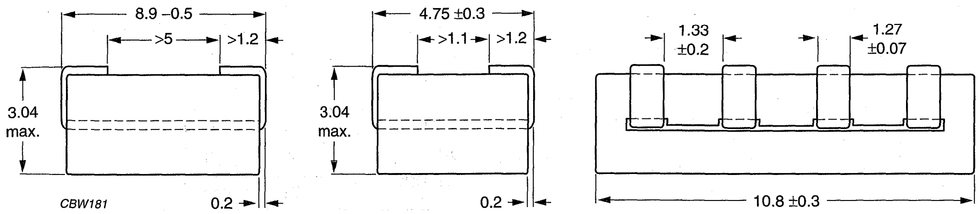
Mechanical data



a. CMS2-5.6/3/8.9 (side view). b. CMS2-5.6/3/4.8 (side view). Front view (a and b).

Dimensions in mm.

Fig.1 CMS2-5.6/3/4.8 and CMS2-5.6/3/8.9.

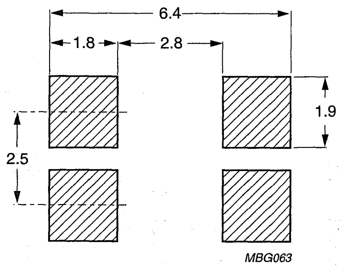


a. CMS4-11/3/8.9 (side view). b. CMS4-11/3/4.8 (side view). Front view (a and b).

Dimensions in mm.

Fig.2 CMS4-11/3/4.8 and CMS4-11/3/8.9.

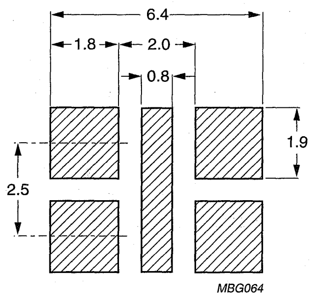
Recommended dimensions of solder lands



Dimensions in mm.

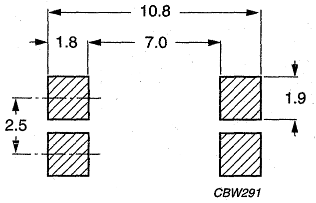
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm^2).

Fig.3 Solder lands for reflow soldering of CMS2-5.6/3/4.8.



Dimensions in mm.

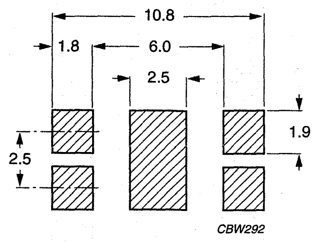
Fig.4 Solder lands for wave soldering of CMS2-5.6/3/4.8.



Dimensions in mm.

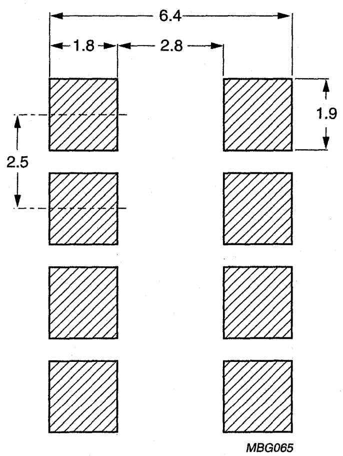
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm^2).

Fig.5 Solder lands for reflow soldering of CMS2-5.6/3/8.9.



Dimensions in mm.

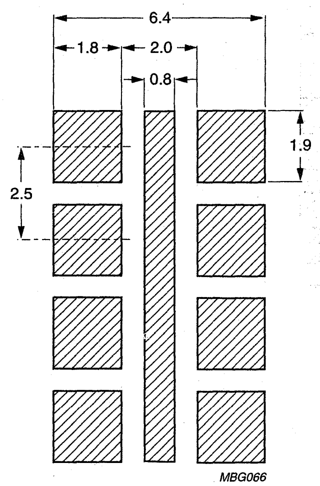
Fig.6 Solder lands for wave soldering of CMS2-5.6/3/8.9.



Dimensions in mm.

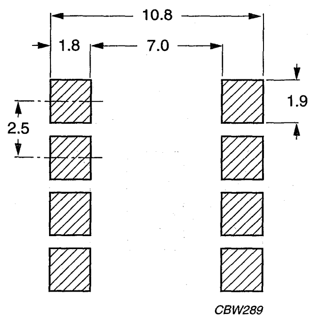
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm^2).

Fig.7 Solder lands for reflow soldering of CMS4-11/3/4.8.



Dimensions in mm.

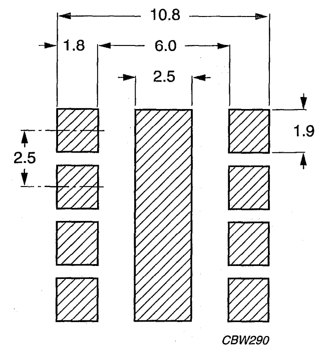
Fig.8 Solder lands for wave soldering of CMS4-11/3/4.8.



Dimensions in mm.

Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

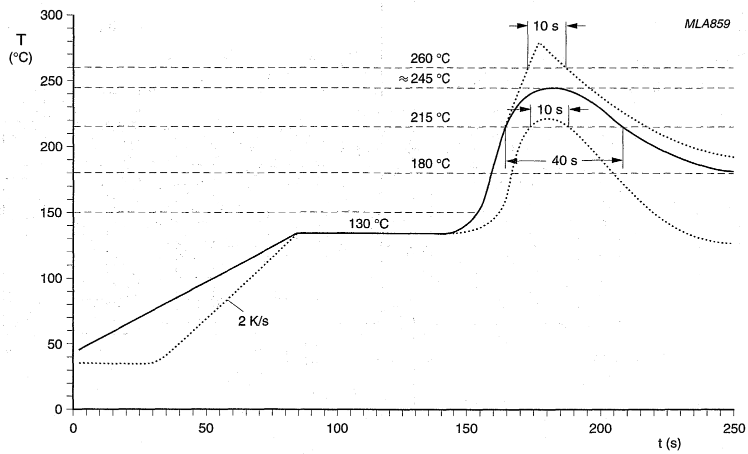
Fig.9 Solder lands for reflow soldering of CMS4-11/3/8.9.



Dimensions in mm.

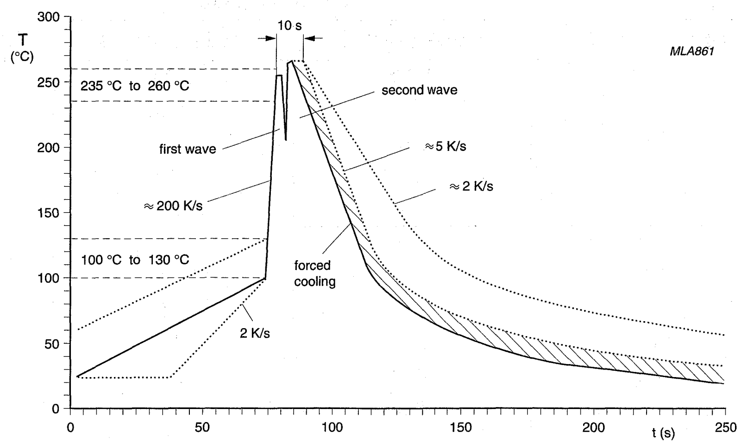
Fig.10 Solder lands for wave soldering of CMS4-11/3/8.9.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

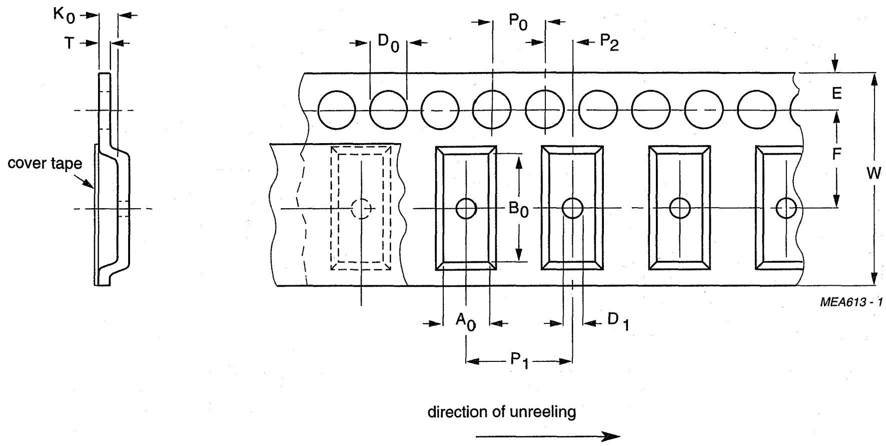
Fig.11 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.12 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

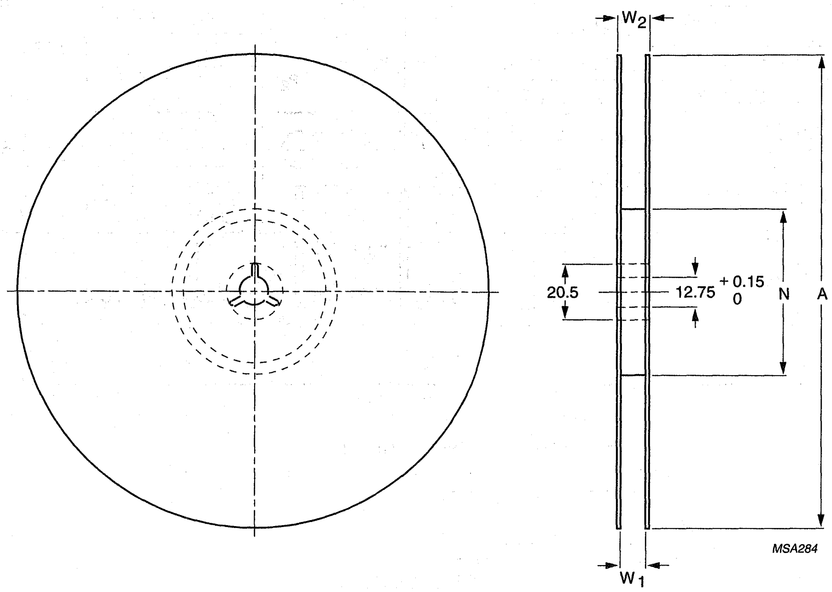


For dimensions see Table 1.

Fig.13 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.13

SIZE	DIMENSIONS (mm)			
	CMS2-5.6/3/4.8	**CMS2-5.6/3/8.9**	**CMS2-5.6/3/8.9**	**CMS4-11/3/8.9**
A_0	5.26	5.99	5.23	10.13
B_0	6.07	9.09	11.18	11.56
K_0	3.18	3.18	4.5	4.5
T	0.3	0.33	0.34	0.36
W	12	16	24	24
E	1.75	1.75	1.75	1.75
F	5.5	7.5	11.75	11.5
D_0	1.5	1.5	1.5	1.5
D_1	≥1.5	≥1.5	≥1.5	≥1.5
P_0	4.0	4.0	4.0	4.0
P_1	8.0	8.0	8.0	16.0
P_2	2.0	2.0	2.0	2.0



Dimensions in mm.
For dimensions see Table 2.

Fig.14 Reel.

Table 2 Reel dimensions; see Fig.14

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4
24	330	100 ±5	24.4	≤28.4

SMD WIDEBAND CHOKES

SMD wideband choke WBS1.5-5/4.8/10

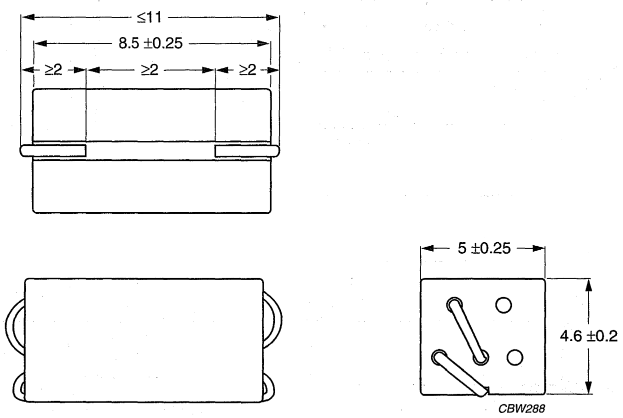
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	*"IEC 60286-A"* and *"EIA 481-A"*

Grades, parameters and type numbers; see Fig.1

GRADE	$\lvert Z \rvert$(1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	230	10	WBS1.5-5/4.8/10-3S4
	400	50	
	430	100	
4B1	275	25	WBS1.5-5/4.8/10-4B1
	500	100	
	350	300	

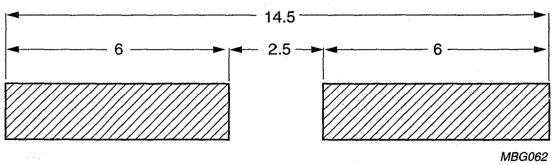
Note

1. Typical values, $\lvert Z \rvert_{min}$ is −20%; DC resistance <7.5 mΩ.



Dimensions in mm.

Fig.1 WBS1.5-5/4.8/10.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm²).

Fig.2 Solder lands for reflow soldering of WBS1.5-5/4.8/10.

SMD wideband choke WBS2.5-5/4.8/10

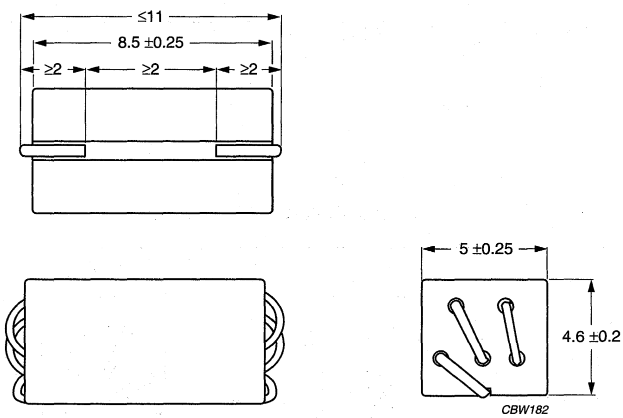
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	*"IEC 60286-A"* and *"EIA 481-A"*

Grades, parameters and type numbers; see Fig.3

GRADE	$\|Z\|$(1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	300	10	WBS2.5-5/4.8/10-3S4
	625	50	
	600	100	
4B1	485	25	WBS2.5-5/4.8/10-4B1
	850	100	
	350	300	

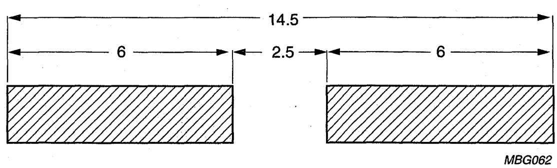
Note

1. Typical values, $|Z|_{min}$ is −20%; DC resistance <7.5 mΩ.



Dimensions in mm.

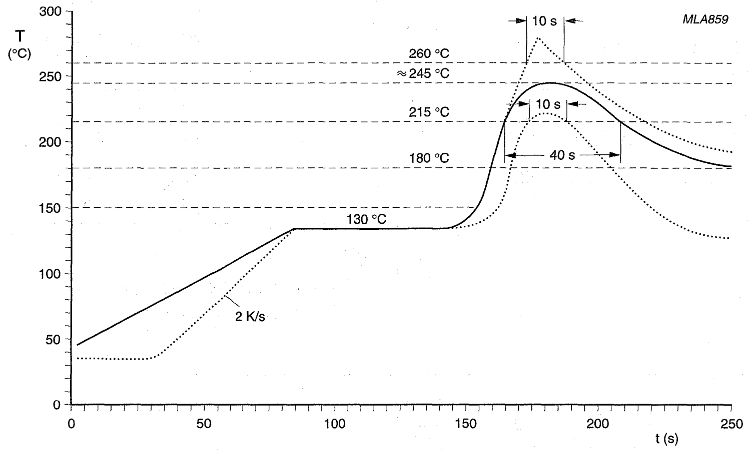
Fig.3 WBS1.5-5/4.8/10.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 µm (≈0.7 mg solder paste per mm[2]).

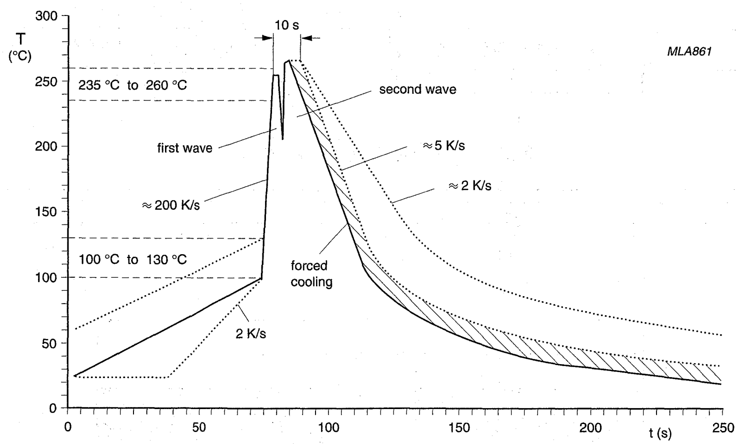
Fig.4 Solder lands for reflow soldering of WBS2.5-5/4.8/10.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

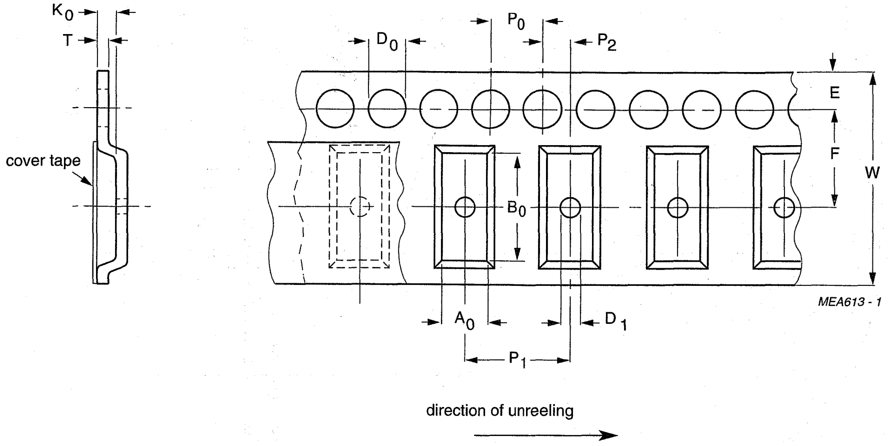
Fig.5 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.6 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

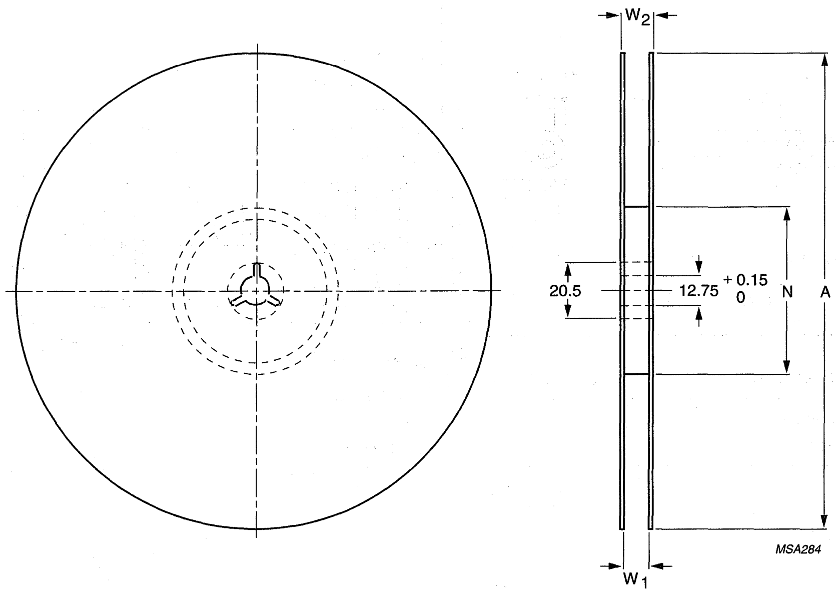


For dimensions see Table 1.

Fig.7 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.7

SIZE	DIMENSIONS (mm)	
	WBS1.5-5/4.8/10	**WBS2.5-5/4.8/10**
A_0	5.51	5.51
B_0	11	11
K_0	5.03	5.03
T	0.36	0.36
W	24	24
E	1.75	1.75
F	11.5	11.5
D_0	1.5	1.5
D_1	≥1.5	≥1.5
P_0	4.0	4.0
P_1	8.0	8.0
P_2	2.0	2.0



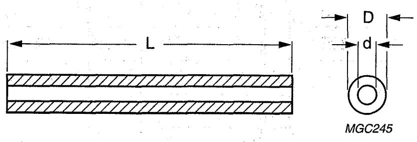
Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

Table 2 Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
24	330	100 ±5	24.4	≤28.4

TUBES



For dimensions see Table 1.

Fig.1 Tube.

Table 1 Grades, parameters and type numbers; see Fig.1

DIMENSIONS (mm)			TYPE NUMBER		
D	d	L	4B1	3B1	3C90
3.1 −0.02	1.3 +0.2	18.8 −0.5	−	TUB3.1/1.3/19-3B1-DL sup	−
3.5 +0.1/−0.2	1.3 +0.2	3.0 +0.5	−	TUB3.5/1.3/3-3B1 sup	−
3.5 ±0.2	1.3 +0.2	7.5 +0.5	−	TUB3.5/1.3/7.5-3B1 sup	−
3.7−0.4	1.2 +0.2	3.5 −0.5	TUB3.7/1.2/3.5-4B1 sup	TUB3.7/1.2/3.5-3B1 sup	−
3.8 ±0.1	2.8 ±0.1	8 ±0.25	TUB3.8/2.8/8-4B1 sup	−	−
4.0 −0.25	1.6 +0.15	40 −1.6	TUB4/1.6/40-4B1 sup	−	−
4 ±0.2	2 ±0.2	5 ±0.5	−	TUB4/2/5-3B1 sup	−
4 ±0.1	3 +0.2	9.45 +0.75	TUB4/3/9.5-4B1 sup	−	−
4.1 +0.1	2 +0.2	7 ±0.2	−	TUB4.1/2/7-3B1-D sup	−
4.1+0.1	2 +0.2	11 ±0.2	−	TUB4.1/2/11-3B1-D sup	−
4.1 −0.2	2 +0.2	25.5 −1	TUB4.1/2/26-4B1 sup	−	−
4.15 −0.05	2 +0.2	12.2 −0.4	TUB4.2/2/12-4B1-DL sup	−	−
4.3 −0.2	2 +0.2	15.4 −0.8	TUB4.3/2/15-4B1 sup	TUB4.3/2/15-3B1 sup	−
4.3 −0.2	2 +0.2	25.5 −1	−	TUB4.3/2/26-3B1 sup	−
5.0 −0.30	2.0 +0.2	50 ±1	−	−	TUB5/2/50-3C90 sup
5.3 −0.2	3.0 +0.2	22.4 −0.8	−	TUB5.3/3/22-3B1 sup	−
6.0 −0.3	3.0 +0.2	20 −0.9	−	TUB6/3/20-3B1 sup	TUB6/3/20-3C90 sup
6.0 −0.3	3.0 +0.2	30 −1.2	−	−	TUB6/3/30-3C90 sup
8.0 −0.4	4.0 +0.3	20 −0.9	TUB8/4/20-4B1 sup	TUB8/4/20-3B1 sup	−
8.0 −0.4	4.0 +0.3	40 −1.6	−	TUB8/4/40-3B1 sup	−
9.5 ±0.3	6.5 ±0.2	17 +0.5/−0.4	−	TUB9.5/6.5/17-3B1 sup	−
10.0 −0.5	4.2 +0.3	20 −0.9	−	TUB10/4.2/20-3B1 sup	−

WIDEBAND CHOKES FOR EMI-SUPPRESSION

General data WBC1.5/A

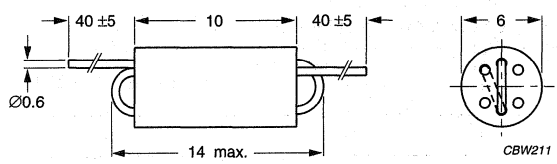
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.1

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	1.5	≥300	120	WBC1.5/A-3S4
4B1	1.5	≥350	250	WBC1.5/A-4B1
4S2	1.5	213(1)	10	WBC1.5/A-4S2
		400(1)	50	
		470(1)	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ −20%.



Dimensions in mm.

Fig.1 WBC1.5/A.

General data WBC1.5/1.5/A

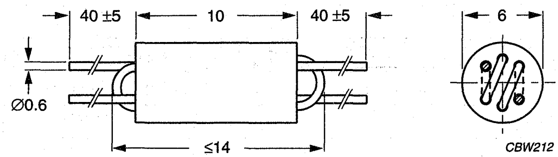
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.2

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2 × 1.5	≥700(1)	50	WBC1.5/1.5/A-3S4
4B1	2 × 1.5	≥800(1)	110	WBC1.5/1.5/A-4B1
4S2	2 × 1.5	213(2)	10	WBC1.5/1.5/A-4S2
		400(2)	50	
		470(2)	100	

Notes

1. |Z| measured with both windings connected in series.
2. Minimum guaranteed impedance is $|Z|_{typ}$ −20%; measured with one winding.



Dimensions in mm.

Fig.2 WBC1.5/1.5/A.

General data WBC2/R

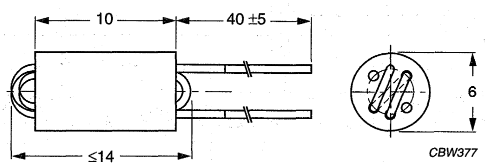
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.3

GRADE	No. OF TURNS	|Z|(1) at f		TYPE NUMBER
		(Ω)	(MHz)	
4S2	2	300	10	WBC2/R-4S2
		650	50	
		600	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ −20%.



Dimensions in mm.

Fig.3 WBC2/R.

General data WBC2.5/A

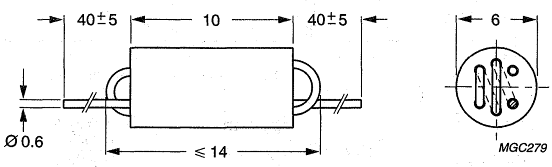
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.4

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/A-3S4
4B1	2.5	≥700	180	WBC2.5/A-4B1
4S2	2.5	400(1)	10	WBC2.5/A-4S2
		850(1)	50	
		725(1)	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ −20%.



Dimensions in mm.

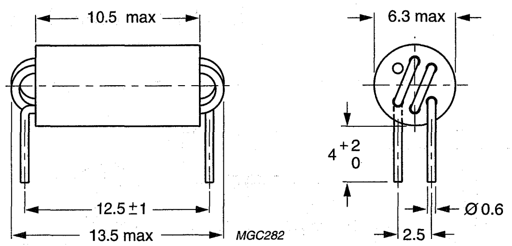
Fig.4 WBC2.5/A.

General data WBC2.5/R

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.5

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/R-3S4 sup
4B1	2.5	≥700	75	WBC2.5/R-4B1 sup



Dimensions in mm.

Fig.5 WBC2.5/R.

General data WBC2.5/SP

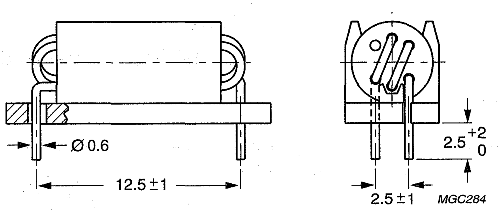
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Support	polyamide (PA6.6) plate to allow mounting across circuit tracks; flame retardant in accordance with UL 94V-0
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.6

GRADE note 1	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/SP-3S4 sup
4B1	2.5	≥700	75	WBC2.5/SP-4B1 sup

Note

1. Colour code 3S4 = blue, 4B1 = green.



Dimensions in mm.

Fig.6 WBC2.5/SP.

General data WBC3/R

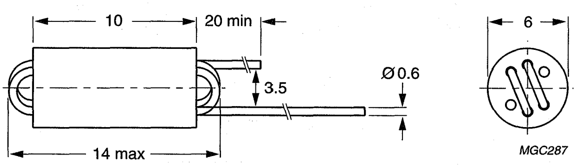
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.7

GRADE	No. OF TURNS	|Z| at f (Ω)	(MHz)	TYPE NUMBER
3S4	3	≥650	63	WBC3/R-3S4
4B1	3	≥800	110	WBC3/R-4B1
4S2	3	500(1)	10	WBC3/R-4S2
		1 000(1)	50	
		688(1)	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ −20%.



Dimensions in mm.

Fig.7 WBC3/R.

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Ferrite ring cores (toroids)

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TC2.5/1.3/0.8	2.7	0.49	0.012
TC2.5/1.3/1.3	4.29	0.76	0.022
TC2.5/1.3/2.5	8.57	1.55	0.044
TC2.5/1.5/0.8	2.21	0.37	0.012
TC2.5/1.5/1-S	2.94	0.49	0.015
TC3.1/1.3/1.3	6.35	1.06	0.033
TC3.1/1.8/2	9.10	1.26	0.05
TC3.4/1.8/1.3	7.3	0.96	0.035
TC3.4/1.8/2	11.5	1.52	0.06
TC3.5/1.6/1.3	8.3	1.15	0.043
TC3.5/1.8/1.8	11.0	1.44	0.06
TC3.9/1.8/1.8	14.8	1.83	0.09
TC3.9/1.8/2.5	21.1	2.6	0.12
TC3.9/2.2/1.3	9.2	1.0	0.045
TC4/2/2	16.7	1.92	0.095
TC4/2.2/1.1	8.8	0.96	0.04
TC4/2.2/1.3	9.8	1.07	0.05
TC4/2.2/1.6	12.9	1.40	0.06
TC4/2.2/1.8	14.4	1.56	0.07
TC5.8/3.1/1.5	26.1	2.00	0.13
TC5.8/3.1/3.2	55.8	4.28	0.31
TC6/4/2	30.2	1.97	0.15
TC6.3/3.8/2.5	46.5	3.06	0.23
TC7.6/3.2/4.8	148	9.92	0.7
TN9/6/3	102	4.44	0.5
TC9.5/4.8/3.2	148	7.16	0.7
TN10/6/4	188	7.8	0.95
TN13/7.5/5	368	12.2	1.8
TX13/7.1/4.8	361	12.3	1.8
TX13/7.9/6.4	442	14.1	2.2
TN14/9/5	430	12.3	2.1
TN14/9/9	774	22.1	3.8
TX16/9.1/4.7	548	14.7	2.7
TN16/9.6/6.3	760	19.7	3.8
TN19/11/10	1795	40.8	9.2
TN19/11/15	2692	61.2	13.8
TN20/10/7	1465	33.6	7.7
TX22/14/6.4	1340	24.8	6.5
TX22/14/13	2750	50.9	14

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TN23/14/7	1722	30.9	8.4
TN25/15/10	2944	48.9	15
TN26/15/10	3360	55.9	17
TN26/15/20	6720	112	34
TN29/19/7.5	2700	36.9	13.5
TX29/19/7.6	2600	35.5	13
TN19/19/15	5410	73.9	28
TN32/19/13	5820	76.5	29
TN36/23/10	5730	63.9	28
TN36/23/15	8600	95.9	42
TX36/23/15	8410	93.8	40
TX39/20/13	9513	112	45
TL42/26/13	9860	95.8	53
T50/30/19	22378	186	100
TX51/32/19	21500	172	100
TL58/41/18	23200	152	110
TL63/38/25	46500	306	220
TX74/39/13	34300	208	170
TL87/54/14	46400	217	220
T87/56/13	42133	194	200
TL102/66/15	68200	267	325
TL107/65/18	96000	370	456
T107/65/25	133000	514	680
T140/106/25	161100	422	800

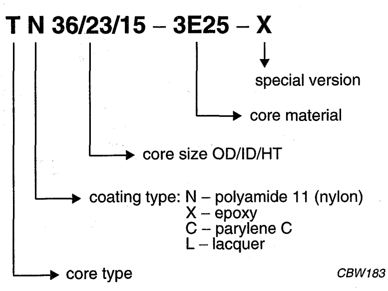


Fig.1 Type number structure for toroids.

Ferrite ring cores (toroids) TC2.5/1.3/0.8

RING CORES (TOROIDS)

Effective core parameters

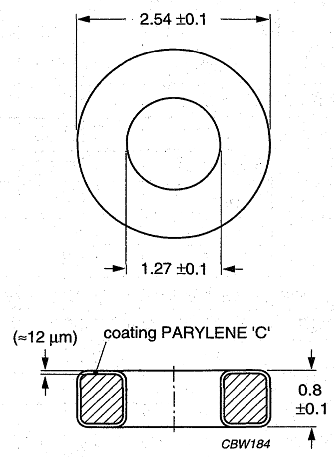
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	11.3	mm^{-1}
V_e	effective volume	2.7	mm^3
l_e	effective length	5.53	mm
A_e	effective area	0.49	mm^2
m	mass of core	≈0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/0.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	94 +25/−20%	≈850	TC2.5/1.3/0.8-4A11

Ferrite ring cores (toroids) TC2.5/1.3/1.3

RING CORES (TOROIDS)

Effective core parameters

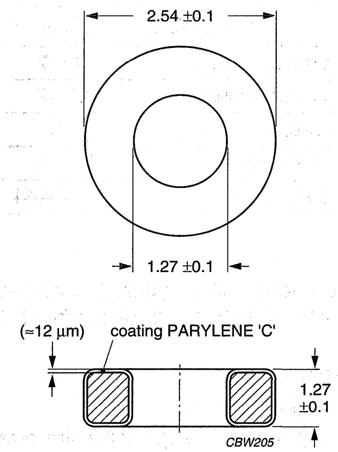
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	7.14	mm^{-1}
V_e	effective volume	4.29	mm^3
l_e	effective length	5.53	mm
A_e	effective area	0.76	mm^2
m	mass of core	≈0.022	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	150 ±25%	≈850	TC2.5/1.3/1.3-4A11
3S4 des	300 ±25%	≈1700	TC2.5/1.3/1.3-3S4
3E25 des	970 ±30%	≈5500	TC2.5/1.3/1.3-3E25
3E6 des	1835 ±30%	≈10000	TC2.5/1.3/1.3-3E6(1)

Note

1. Maximum tolerances on mechanical dimensions are ±0.13 mm.

Ferrite ring cores (toroids) TC2.5/1.3/2.5

RING CORES (TOROIDS)

Effective core parameters

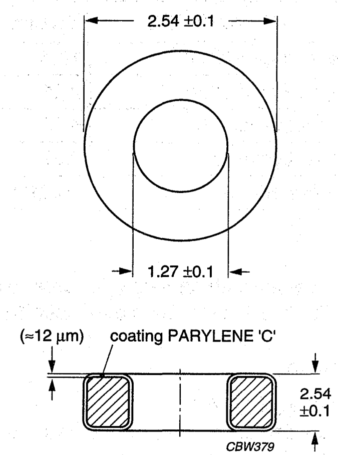
SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	3.57	mm^{-1}
V_e	effective volume	8.57	mm^3
l_e	effective length	5.53	mm
A_e	effective area	1.55	mm^2
m	mass of core	≈0.044	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1400 ±25%	≈4000	TC2.5/1.3/2.5-3E28

Ferrite ring cores (toroids) TC2.5/1.5/0.8

RING CORES (TOROIDS)

Effective core parameters

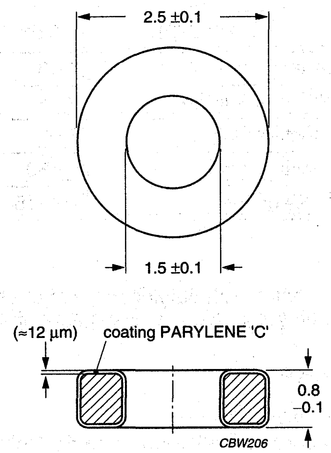
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	16.4	mm^{-1}
V_e	effective volume	2.21	mm^3
l_e	effective length	6.02	mm
A_e	effective area	0.37	mm^2
m	mass of core	≈0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.5/0.8 ring core.

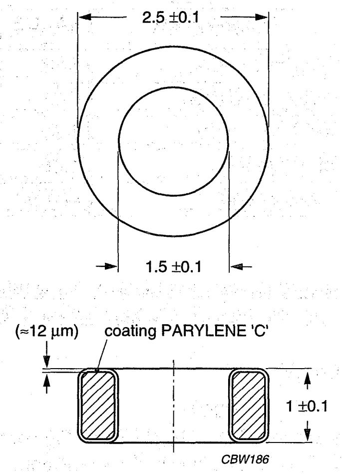
Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	765 ±30%	≈10000	TC2.5/1.5/0.8-3E6

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
m	mass of core	≈0.015	g



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.5/1-S ring core.

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	71 ±25%	≈700	TC2.5/1.5/1-4A11-S
3E5 des	920 ±30%	≈9000	TC2.5/1.5/1-3E5-S
3E6 des	1020 ±30%	≈10000	TC2.5/1.5/1-3E6-S

Ferrite ring cores (toroids) TC3.1/1.3/1.3

RING CORES (TOROIDS)

Effective core parameters

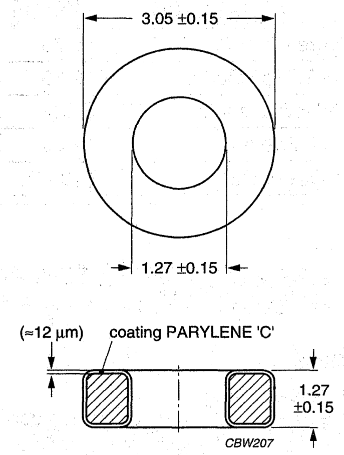
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.65	mm^{-1}
V_e	effective volume	6.35	mm^3
l_e	effective length	5.99	mm
A_e	effective area	1.06	mm^2
m	mass of core	≈0.033	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.1/1.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	190 ±20%	≈850	TC3.1/1.3/1.3-4A11
3E25 des	1225 ±25%	≈5500	TC3.1/1.3/1.3-3E25

Ferrite ring cores (toroids) TC3.1/1.8/2

RING CORES (TOROIDS)

Effective core parameters

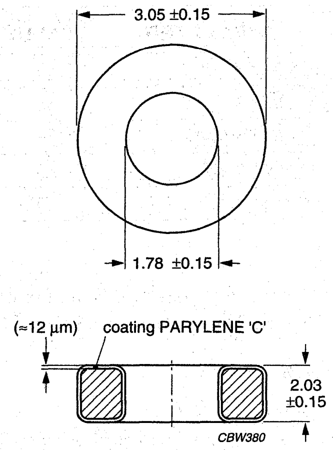
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.75	mm^{-1}
V_e	effective volume	9.10	mm^3
l_e	effective length	7.23	mm
A_e	effective area	1.26	mm^2
m	mass of core	≈0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.1/1.8/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1100 ±25%	≈5000	TC3.1/1.8/2-3E28

Ferrite ring cores (toroids) TC3.4/1.8/1.3

RING CORES (TOROIDS)

Effective core parameters

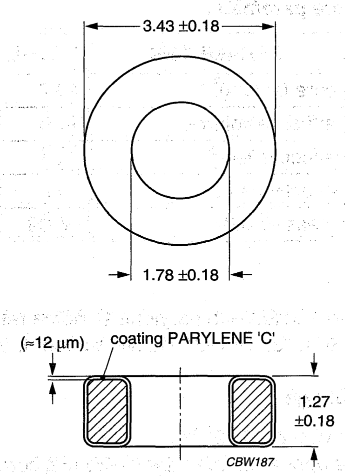
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	7.93	mm^{-1}
V_e	effective volume	7.3	mm^3
l_e	effective length	7.62	mm
A_e	effective area	0.96	mm^2
m	mass of core	≈0.035	g

Coating

The cores are coated with parylene C; flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation



Dimensions in mm.

Fig.1 TC3.4/1.8/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	110 ±20%	≈750	TC3.4/1.8/1.3-3D3
3B7 sup	375 ±20%	≈2300	TC3.4/1.8/1.3-3B7
3E27	660 ±20%	≈4200	TC3.4/1.8/1.3-3E27
3E6 des	1580 ±30%	≈10000	TC3.4/1.8/1.3-3E6

Ferrite ring cores (toroids) TC3.4/1.8/2.1

RING CORES (TOROIDS)

Effective core parameters

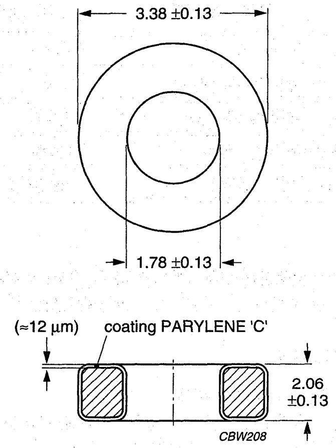
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	11.5	mm^3
l_e	effective length	7.54	mm
A_e	effective area	1.52	mm^2
m	mass of core	≈0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.4/1.8/2.1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25 des	1420 ±25%	≈5600	TC3.4/1.8/2.1-3E25
3E28 des	1045 ±25%	≈4000	TC3.4/1.8/2.1-3E28

Ferrite ring cores (toroids) | TC3.5/1.6/1.3

RING CORES (TOROIDS)

Effective core parameters

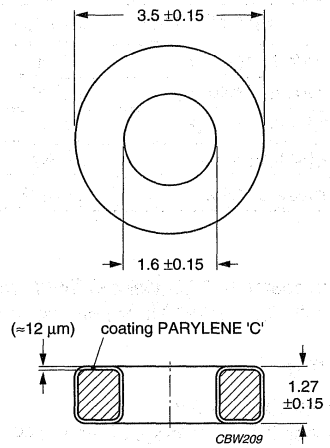
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	6.32	mm^{-1}
V_e	effective volume	8.3	mm^3
l_e	effective length	7.25	mm
A_e	effective area	1.15	mm^2
m	mass of core	≈0.043	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.6/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	862 ±20%	≈4300	TC3.5/1.6/1.3-3C11

Ferrite ring cores (toroids) TC3.5/1.8/1.8

RING CORES (TOROIDS)

Effective core parameters

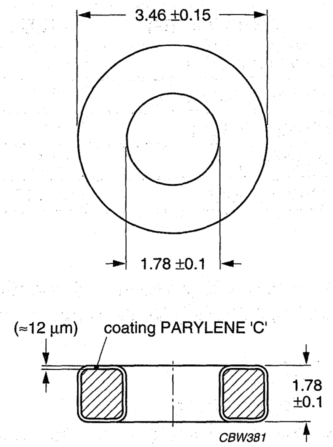
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.31	mm^{-1}
V_e	effective volume	11.0	mm^3
l_e	effective length	7.65	mm
A_e	effective area	1.44	mm^2
m	mass of core	≈0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.8/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	950 ±25%	≈4000	TC3.5/1.8/1.8-3E28

RING CORES (TOROIDS)

Effective core parameters

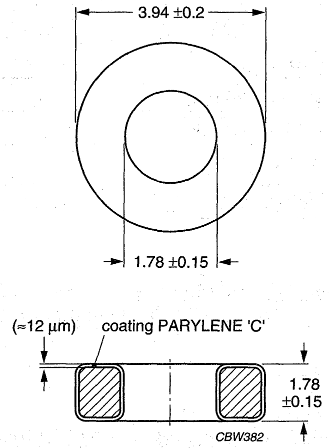
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	4.44	mm^{-1}
V_e	effective volume	14.8	mm^3
l_e	effective length	8.1	mm
A_e	effective area	1.83	mm^2
m	mass of core	≈0.086	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/1.8/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1400 ±30%	≈5000	TC3.9/1.8/1.8-3E28

Ferrite ring cores (toroids) TC3.9/1.8/2.5

RING CORES (TOROIDS)

Effective core parameters

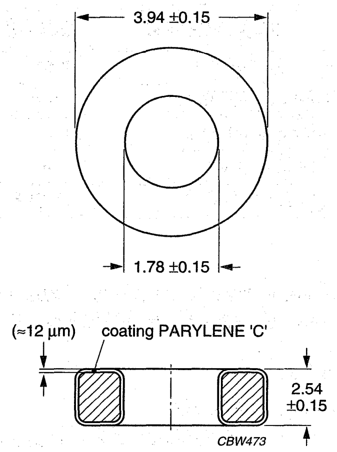
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.11	mm^{-1}
V_e	effective volume	21.1	mm^3
l_e	effective length	8.1	mm
A_e	effective area	2.6	mm^2
m	mass of core	≈0.12	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/1.8/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28	2020 ±30%	≈4000	TC3.9/1.8/2.5-3E28

Ferrite ring cores (toroids) TC3.9/2.2/1.3

RING CORES (TOROIDS)

Effective core parameters

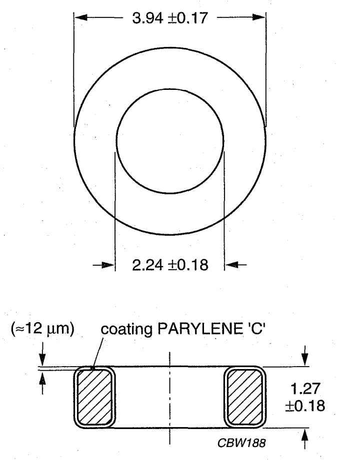
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	9.20	mm^{-1}
V_e	effective volume	9.20	mm^3
l_e	effective length	9.20	mm
A_e	effective area	1.00	mm^2
m	mass of core	≈0.045	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/2.2/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	97 ±20%	≈750	TC3.9/2.2/1.3-3D3
3B7 sup	325 ±20%	≈2300	TC3.9/2.2/1.3-3B7
3E27	575 ±20%	≈4100	TC3.9/2.2/1.3-3E27

RING CORES (TOROIDS)

Effective core parameters

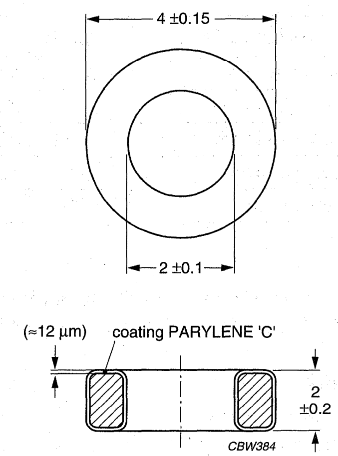
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.54	mm^{-1}
V_e	effective volume	16.7	mm^3
l_e	effective length	8.71	mm
A_e	effective area	1.92	mm^2
m	mass of core	≈0.095	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	1190 ±25%	≈4300	TC4/2/2-3C11
3E28 des	1110 ±25%	≈4000	TC4/2/2-3E28

Ferrite ring cores (toroids) TC4/2.2/1.1

RING CORES (TOROIDS)

Effective core parameters

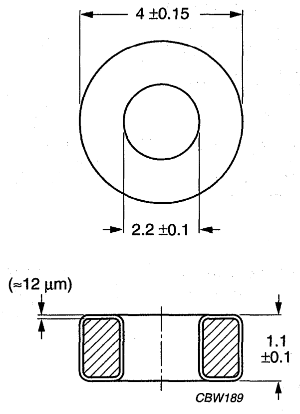
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	9.55	mm^{-1}
V_e	effective volume	8.82	mm^3
I_e	effective length	9.18	mm
A_e	effective area	0.961	mm^2
m	mass of core	≈0.04	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	16 ±25%	≈125	TC4/2.2/1.1-4C65
4A11	92 ±25%	≈700	TC4/2.2/1.1-4A11
3F3	260 ±25%	≈2000	TC4/2.2/1.1-3F3
3E25	725 ±30%	≈5500	TC4/2.2/1.1-3E25
3E5	1120 ±30%	≈8500	TC4/2.2/1.1-3E5
3E6 des	1315 ±30%	≈10 000	TC4/2.2/1.1-3E6

Ferrite ring cores (toroids) TC4/2.2/1.3

RING CORES (TOROIDS)

Effective core parameters

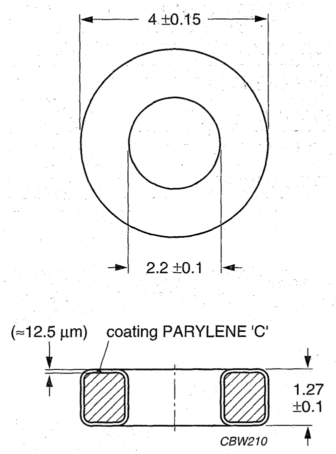
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	8.28	mm^{-1}
V_e	effective volume	10.2	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.11	mm^2
m	mass of core	≈0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133.

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	122 ±20%	≈800	TC4/2.2/1.3-4A11
3E25	720 ±25%	≈5500	TC4/2.2/1.3-3E25

Ferrite ring cores (toroids) TC4/2.2/1.6

RING CORES (TOROIDS)

Effective core parameters

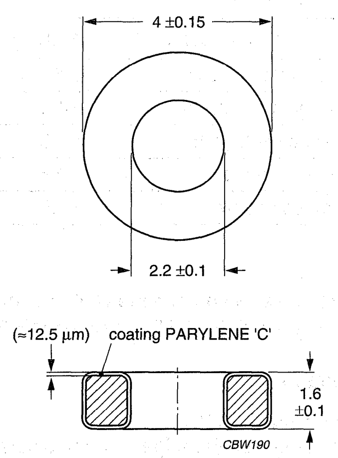
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.56	mm^{-1}
V_e	effective volume	12.9	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.4	mm^2
m	mass of core	≈0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	24 ±25%	≈125	TC4/2.2/1.6-4C65
4A11	134 ±25%	≈700	TC4/2.2/1.6-4A11
3S4 des	325 ±25%	≈1700	TC4/2.2/1.6-3S4
3F3	380 ±25%	≈2000	TC4/2.2/1.6-3F3
3E25	1050 ±30%	≈5500	TC4/2.2/1.6-3E25
3E5	1630 ±30%	≈8500	TC4/2.2/1.6-3E5
3E6 des	1915 ±30%	≈10000	TC4/2.2/1.6-3E6

Ferrite ring cores (toroids) TC4/2.2/1.8

RING CORES (TOROIDS)

Effective core parameters

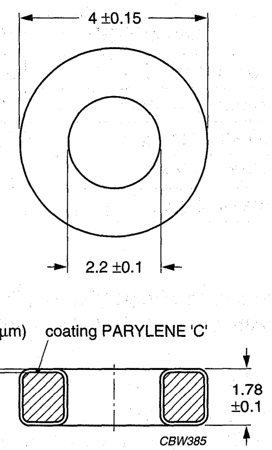
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.89	mm^{-1}
V_e	effective volume	14.4	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.56	mm^2
m	mass of core	≈0.07	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	2130 ±30%	≈10000	TC4/2.2/1.8-3E6

Ferrite ring cores (toroids) TC5.8/3.1/1.5

RING CORES (TOROIDS)

Effective core parameters

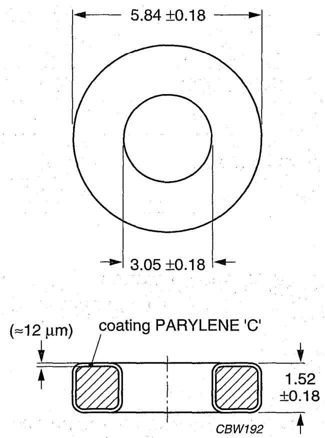
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	6.52	mm^{-1}
V_e	effective volume	26.1	mm^3
l_e	effective length	13.0	mm
A_e	effective area	2.00	mm^2
m	mass of core	≈0.13	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.8/3.1/1.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	25 ±25%	≈125	TC5.8/3.1/1.5-4C65(1)
4B1 des	50 ±25%	≈250	TC5.8/3.1/1.5-4B1(1)
3B7 sup	450 ±20%	≈2300	TC5.8/3.1/1.5-3B7
3E27	890 ±20%	≈4600	TC5.8/3.1/1.5-3E27

Note

1. Dimensions with coating.

Ferrite ring cores (toroids) TC5.8/3.1/3.2

RING CORES (TOROIDS)

Effective core parameters

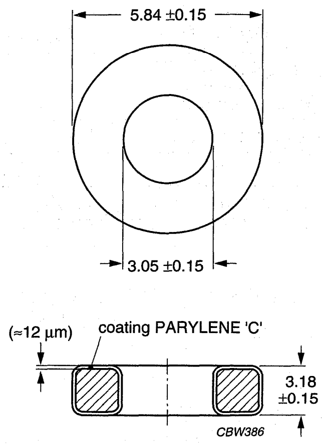
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	3.04	mm^{-1}
V_e	effective volume	55.8	mm^3
l_e	effective length	13.0	mm
A_e	effective area	4.28	mm^2
m	mass of core	≈0.31	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

Dc isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.8/3.1/3.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3B7 sup	940 ±25%	≈2300	TC5.8/3.1/3.2-3B7(1)
3E28 des	1650 ±25%	≈4000	TC5.8/3.1/3.2-3E28
3E6 des	4130 ±30%	≈10000	TC5.8/3.1/3.2-3E6

Note

1. Dimensions with coating.

Ferrite ring cores (toroids) — TC6/4/2

RING CORES (TOROIDS)

Effective core parameters

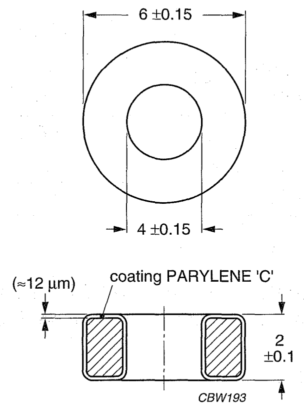
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.75	mm^{-1}
V_e	effective volume	30.2	mm^3
l_e	effective length	15.3	mm
A_e	effective area	1.97	mm^2
m	mass of core	≈0.15	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC6/4/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	20 ±25%	≈125	TC6/4/2-4C65
4A11	114 ±25%	≈700	TC6/4/2-4A11
3S4 des	275 ±25%	≈1700	TC6/4/2-3S4
3F3	325 ±25%	≈2000	TC6/4/2-3F3
3E25	890 ±30%	≈5500	TC6/4/2-3E25
3E5	1380 ±30%	≈8500	TC6/4/2-3E5
3E6 des	1620 ±30%	≈10000	TC6/4/2-3E6

Ferrite ring cores (toroids) TC6.3/3.8/2.5

RING CORES (TOROIDS)

Effective core parameters

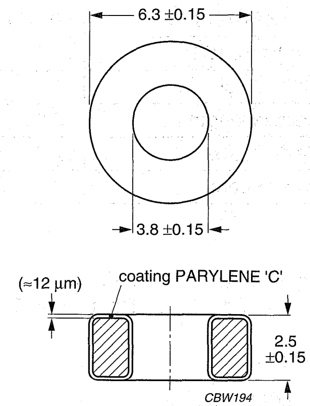
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	46.5	mm^3
l_e	effective length	15.2	mm
A_e	effective area	3.06	mm^2
m	mass of core	≈0.23	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC6.3/3.8/2.5 ring core.

Ring core data

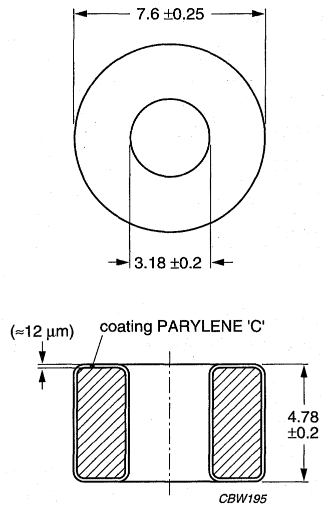
GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	177 ±25%	≈700	TC6.3/3.8/2.5-4A11
3F3	500 ±25%	≈2000	TC6.3/3.8/2.5-3F3
3E25	1390 ±30%	≈5500	TC6.3/3.8/2.5-3E25
3E5	2150 ±30%	≈8500	TC6.3/3.8/2.5-3E5
3E6 des	2530 ±30%	≈10000	TC6.3/3.8/2.5-3E6
3E7 des	3600 +30/−40%	≈12000	TC6.3/3.8/2.5-3E7

Ferrite ring cores (toroids) TC7.6/3.2/4.8

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.51	mm^{-1}
V_e	effective volume	148	mm^3
l_e	effective length	15.0	mm
A_e	effective area	9.92	mm^2
m	mass of core	≈0.7	g



Dimensions (uncoated) in mm.

Fig.1 TC7.6/3.2/4.8 ring core.

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

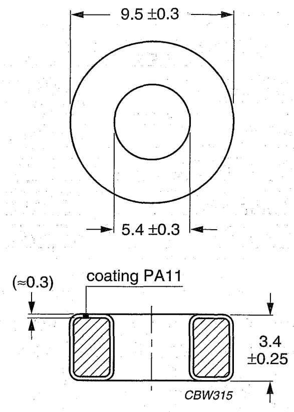
Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	3800 ±30%	≈4000	TC7.6/3.2/4.8-3E28
3E6 des	8360 ±30%	≈10000	TC7.6/3.2/4.8-3E6

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(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
m	mass of core	≈0.5	g



Dimensions in mm.

Fig.1 TN9/6/3 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	30 ±25%	≈125	violet	TN9/6/3-4C65
4A11	170 ±25%	≈700	pink	TN9/6/3-4A11
3R1(1)	–	≈800	black	TN9/6/3-3R1
3F3	440 ±25%	≈1800	blue	TN9/6/3-3F3
3C90 des	560 ±25%	≈2300	ultramarine	TN9/6/3-3C90
3E25	1340 ±30%	≈5500	orange	TN9/6/3-3E25
3E5(2)	2070 ±30%	≈8500	yellow/white	TL9/6/3-3E5
3E6(3) des	2435 ±30%	≈10000	–	TC9/6/3-3E6

Notes

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.
2. Ring cores in 3E5 are lacquered (polyurethane) and have different dimensions:
Outside diameter = 9.3 ±0.4 mm; inside diameter = 5.75 ±0.3 mm; height = 3.25 ±0.3 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.
3. Ring cores in 3E6 are coated with parylene C and have different dimensions:
Outside diameter = 9.0 ±0.2 mm; inside diameter = 6.0 ±0.2 mm; height = 3.0 ±0.15 mm.

WARNING
Do not use grade 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Tag plate

General data

PARAMETER	SPECIFICATION
Tag plate material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s

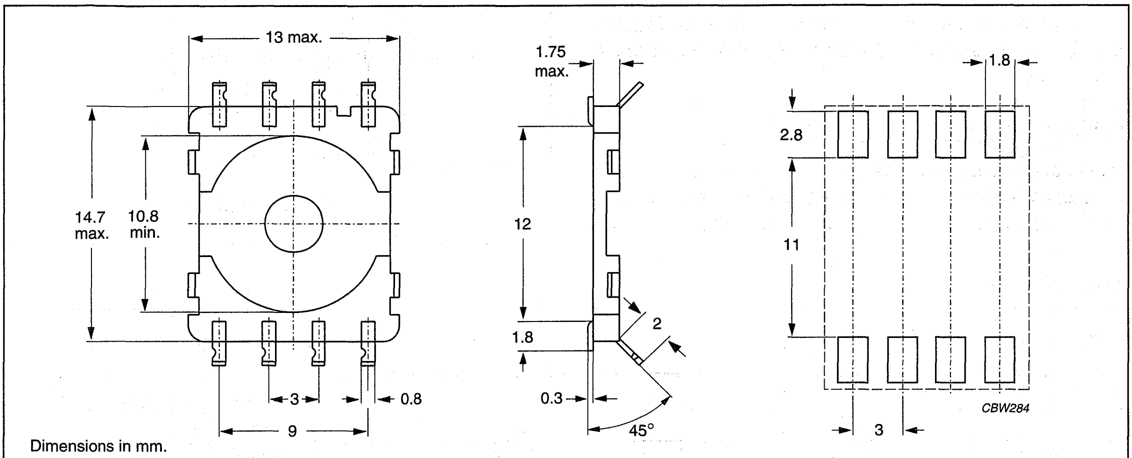


Fig.2 TN9/6/3 tag plate (SMD); 8-solder pads.

Type number informationfor TN9/6/3 tag plate (SMD) with 8 solder pads

NUMBER OF SOLDER PADS	TYPE NUMBER
8	TGPS9

Cover data

PARAMETER	SPECIFICATION
Cover material	polyamide (PA4.6) glass reinforced, flame retardant in accordance with *"UL 94V-0"*
Maximium operating temperature	130 °C, *"IEC 60085"* class B
Type number	COV9

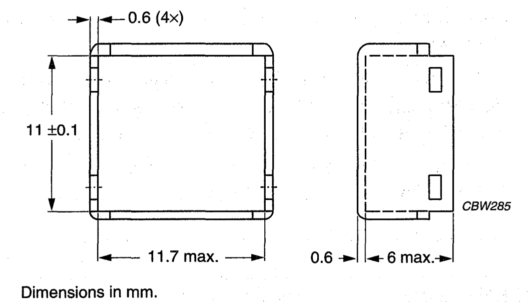


Fig.3 TN9/6/3 tag plate (SMD); 8-solder pads.

Ferrite ring cores (toroids) — TC9.5/4.8/3.2

RING CORES (TOROIDS)

Effective core parameters

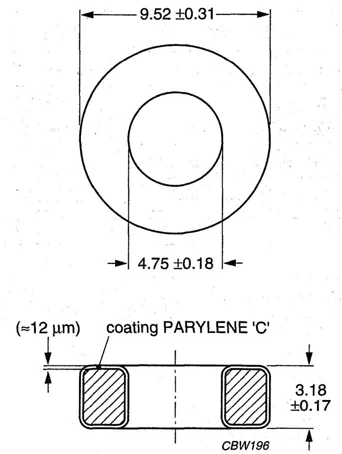
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.98	mm^{-1}
V_e	effective volume	144	mm^3
l_e	effective length	20.7	mm
A_e	effective area	6.95	mm^2
m	mass of core	≈0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TC9.5/4.8/3.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	330 ±20%	≈750	TC9.5/4.8/3.2-3D3
3B7 sup	1000 ±20%	≈2300	TC9.5/4.8/3.2-3B7
3C81	1200 ±20%	≈2700	TC9.5/4.8/3.2-3C81
3E27	2135 ±20%	≈4900	TC9.5/4.8/3.2-3E27
3E6 des	4390 ±30%	≈10100	TC9.5/4.8/3.2-3E6(1)
3E7 des	5323 ±30%	≈12000	TC9.5/4.8/3.2-3E7(1)

Note

1. Dimensions with coating.

Ferrite ring cores (toroids) TN10/6/4

RING CORES (TOROIDS)

Effective core parameters

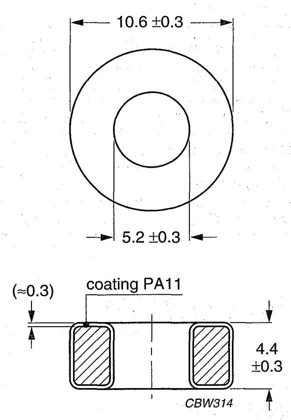
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.07	mm^{-1}
V_e	effective volume	188	mm^3
l_e	effective length	24.1	mm
A_e	effective area	7.8	mm^2
m	mass of core	≈0.95	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1 000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN10/6/4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	52 ±25%	≈125	violet	TN10/6/4-4C65
4A11	286 ±25%	≈700	pink	TN10/6/4-4A11
3F3	740 ±25%	≈1800	blue	TN10/6/4-3F3
3C90 des	940 ±25%	≈2300	ultramarine	TN10/6/4-3C90
3C11	1750 ±25%	≈4300	white	TN10/6/4-3C11
3E25	2250 ±30%	≈5500	orange	TN10/6/4-3E25
3E5	3470 ±30%	≈8500	yellow/white	TL10/6/4-3E5(1)
3E6 des	4085 ±30%	≈10000	purple/white	TL10/6/4-3E6(1)

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: Outside diameter = 10.25 ±0.4 mm; inside diameter = 5.75 ±0.3 mm; height = 4.25 ±0.3 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.021	≤0.021	–
3F3	≥320	–	≤0.03	≤0.04

Ferrite ring cores (toroids) TX13/7.1/4.8

RING CORES (TOROIDS)

Effective core parameters

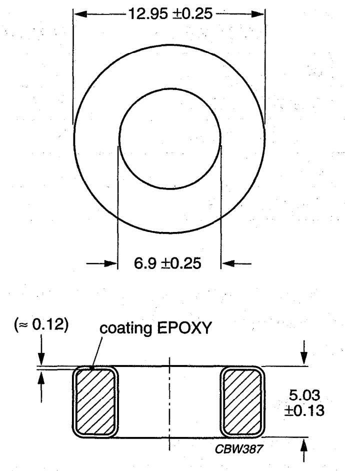
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.40	mm^{-1}
V_e	effective volume	361	mm^3
l_e	effective length	29.5	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈1.8	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX13/7.1/4.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3D3 sup	415 ±20%	≈750	–	TX13/7.1/4.8-3D3
3F3	990 ±20%	≈1800	blue/white	TX13/7.1/4.8-3F3
3C90 des	1260 ±20%	≈2300	ultramarine/white	TX13/7.1/4.8-3C90
3C81	1475 ±20%	≈2700	brown/white	TX13/7.1/4.8-3C81
3E27	2750 ±20%	≈5000	green/white	TX13/7.1/4.8-3E27
3E6 des	5400 ±30%	≈10400	purple/white	TX13/7.1/4.8-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.08	–	–
3C90	≥320	≤0.036	≤0.036	–
3F3	≥320	–	≤0.04	≤0.07

Ferrite ring cores (toroids) TN13/7.5/5

RING CORES (TOROIDS)

Effective core parameters

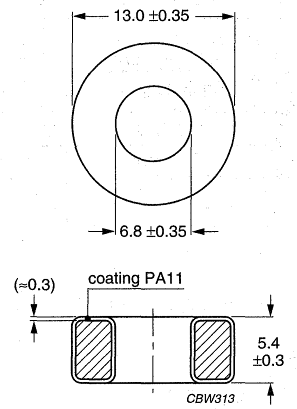
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.46	mm^{-1}
V_e	effective volume	368	mm^3
l_e	effective length	30.1	mm
A_e	effective area	12.2	mm^2
m	mass of core	≈1.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN13/7.5/5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	64 ±25%	≈125	violet	TN13/7.5/5-4C65
4A11	360 ±25%	≈700	pink	TN13/7.5/5-4A11
3F4	460 ±25%	≈900	beige	TN13/7.5/5-3F4
3F3	900 ±25%	≈1800	blue	TN13/7.5/5-3F3
3C90 des	1170 ±25%	≈2300	ultramarine	TN13/7.5/5-3C90
3C11	2200 ±25%	≈4300	white	TN13/7.5/5-3C11
3E25	2810 ±30%	≈5500	orange	TN13/7.5/5-3E25
3E5(1)	4340 ±30%	≈8500	yellow/white	TL13/7.5/5-3E5
3E6(1) des	5095 ±30%	≈10000	purple/white	TL13/7.5/5-3E6
3R1(2)	–	–	black	TN13/7.5/5-3R1

Notes

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions:
   Outside diameter = 12.75 ±0.4 mm; inside diameter = 7.25 ±0.35 mm; height = 5.25 ±0.3 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.041	≤0.041	−
3F3	≥320	−	≤0.04	≤0.07

Ferrite ring cores (toroids) TX13/7.9/6.4

RING CORES (TOROIDS)

Effective core parameters

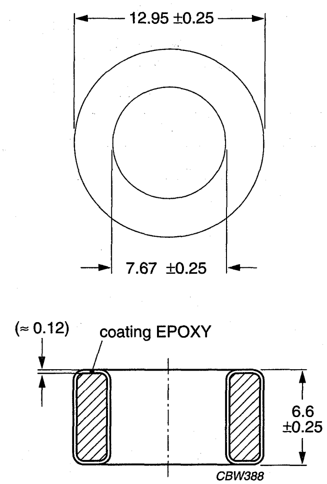
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.21	mm^{-1}
V_e	effective volume	442	mm^3
l_e	effective length	31.2	mm
A_e	effective area	14.1	mm^2
m	mass of core	≈2.2	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX13/7.9/6.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1100 ±20%	≈1800	blue/white	TX13/7.9/6.4-3F3
3C90 des	1380 ±20%	≈2300	ultramarine/white	TX13/7.9/6.4-3C90
3C81	1620 ±20%	≈2700	brown/white	TX13/7.9/6.4-3C81
3E27	3000 ±20%	≈5000	green/white	TX13/7.9/6.4-3E27
3E25	3000 ±20%	≈5000	orange/white	TX13/7.9/6.4-3E25
3E6 des	5900 ±30%	≈10600	purple/white	TX13/7.9/6.4-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.10	–	–
3C90	≥320	≤0.044	≤0.044	–
3F3	≥320	–	≤0.05	≤0.09

Ferrite ring cores (toroids) TN14/9/5

RING CORES (TOROIDS)

Effective core parameters

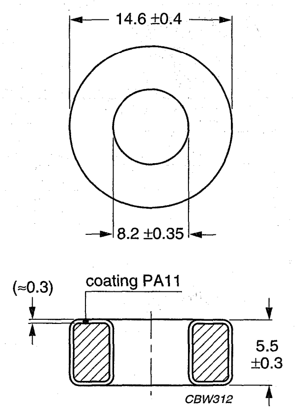
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.84	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	35	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈2.1	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN14/9/5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	55 ±25%	≈125	violet	TN14/9/5-4C65
4A11	310 ±25%	≈700	pink	TN14/9/5-4A11
3R1(1)	−	≈800	black	TN14/9/5-3R1
3F3	790 ±25%	≈1800	blue	TN14/9/5-3F3
3C90 des	1015 ±25%	≈2300	ultramarine	TN14/9/5-3C90
3C11	1900 ±25%	≈4300	white	TN14/9/5-3C11
3E25	2430 ±30%	≈5500	orange	TN14/9/5-3E25
3E5(2)	3760 ±30%	≈8500	yellow/white	TL14/9/5-3E5
3E6(2) des	4415 ±30%	≈10000	purple/white	TL14/9/5-3E6

Notes

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.
2. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: Outside diameter = 14.25 ±0.4 mm; inside diameter = 8.75 ±0.35 mm; height = 5.25 ±0.3 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Ferrite ring cores (toroids) TN14/9/5

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.048	≤0.048	–
3F3	≥320	–	≤0.05	≤0.08

Ferrite ring cores (toroids) TN14/9/9

RING CORES (TOROIDS)

Effective core parameters

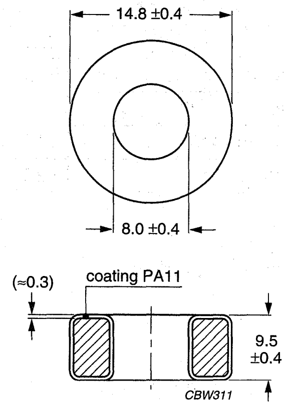
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.58	mm^{-1}
V_e	effective volume	774	mm^3
l_e	effective length	35	mm
A_e	effective area	22.1	mm^2
m	mass of core	≈3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN14/9/9 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	560 ±25%	≈700	pink	TN14/9/9-4A11
3F3	1430 ±25%	≈1800	blue	TN14/9/9-3F3
3C90 des	1825 ±25%	≈2300	ultramarine	TN14/9/9-3C90
3C11	3400 ±25%	≈4300	white	TN14/9/9-3C11
3E25	4370 ±30%	≈5500	orange	TN14/9/9-3E25
3E5(1)	6760 ±30%	≈8500	yellow/white	TL14/9/9-3E5
3E6(1) des	7955 ±30%	≈10000	purple/white	TL14/9/9-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: outside diameter = 14.25 ±0.4 mm; inside diameter = 8.75 ±0.35 mm; height = 9.25 ±0.4 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192084.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °D	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.087	≤0.087	–
3F3	≥320	–	≤0.09	≤0.15

Ferrite ring cores (toroids) — TX16/9.1/4.7

RING CORES (TOROIDS)

Effective core parameters

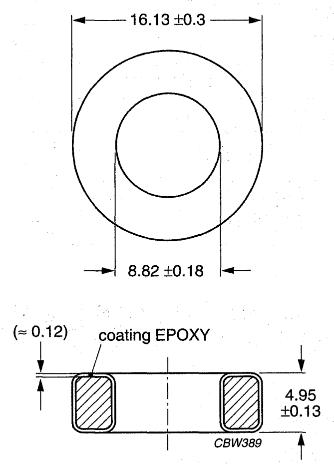
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.53	mm^{-1}
V_e	effective volume	548	mm^3
l_e	effective length	37.2	mm
A_e	effective area	14.7	mm^2
m	mass of core	≈2.7	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX16/9.1/4.7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	1215 ±20%	≈2300	ultramarine/white	TX16/9.1/4.7-3C90
3C81	1400 ±20%	≈2700	brown/white	TX16/9.1/4.7-3C81
3E27	2600 ±20%	≈5000	green/white	TX16/9.1/4.7-3E27
3E6 des	5200 ±30%	≈10500	purple/white	TX16/9.1/4.7-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤0.11	–
3C90	≥320	≤ 0.055	≤0.055

Ferrite ring cores (toroids) TN16/9.6/6.3

RING CORES (TOROIDS)

Effective core parameters

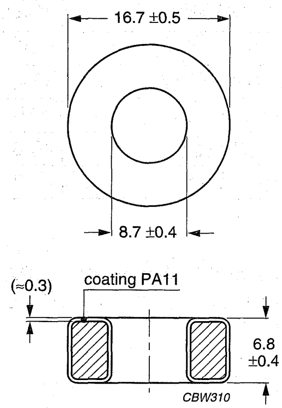
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.95	mm^{-1}
V_e	effective volume	760	mm^3
l_e	effective length	38.5	mm
A_e	effective area	19.7	mm^2
m	mass of core	≈3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN16/9.6/6.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	450 ±25%	≈700	pink	TN16/9.6/6.3-4A11
3F3	1160 ±25%	≈1800	blue	TN16/9.6/6.3-3F3
3C90 des	1480 ±25%	≈2300	ultramarine	TN16/9.6/6.3-3C90
3C11	2700 ±25%	≈4300	white	TN16/9.6/6.3-3C11
3E25	3540 ±30%	≈5500	orange	TN16/9.6/6.3-3E25
3E5(1)	5470 ±30%	≈8500	yellow/white	TL16/9.6/6.3-3E5
3E6(1) des	6430 ±30%	≈10000	purple/white	TL16/9.6/6.3-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: Outside diameter = 16.25 ±0.5 mm; inside diameter = 9.35 ±0.4 mm; height = 6.55 ±0.4 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.085	≤0.085	–
3F3	≥320	–	≤0.09	≤0.15

Ferrite ring cores (toroids) TN19/11/10

RING CORES (TOROIDS)

Effective core parameters

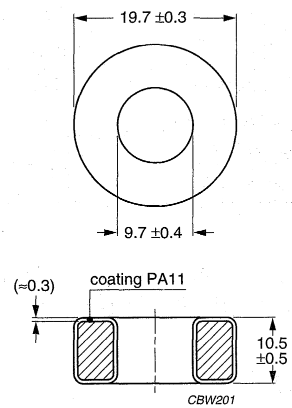
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	1795	mm^3
l_e	effective length	44.0	mm
A_e	effective area	40.8	mm^2
m	mass of core	≈9.2	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN19/11/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2680 ±25%	≈2300	ultramarine	TN19/11/10-3C90
3C11	5000 ±25%	≈4300	white	TN19/11/10-3C11
3E25	6420 ±25%	≈5500	orange	TN19/11/10-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.20	≤0.20

RING CORES (TOROIDS)

Effective core parameters

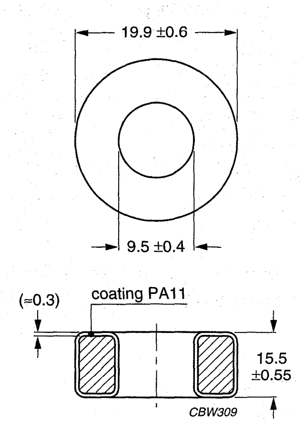
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.718	mm^{-1}
V_e	effective volume	2692	mm^3
l_e	effective length	44.0	mm
A_e	effective area	61.2	mm^2
m	mass of core	≈13.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN19/11/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	4020 ±25%	≈2300	ultramarine	TN19/11/15-3C90
3C11	7500 ±25%	≈4300	white	TN19/11/15-3C11
3E25	9630 ±25%	≈5500	orange	TN19/11/15-3E25

Properties of cores under power conditions

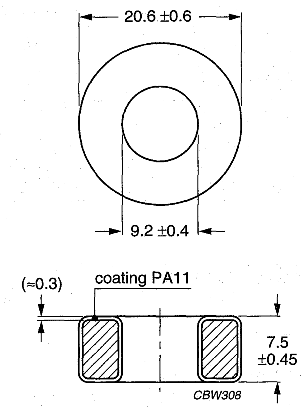
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.30	≤0.30

Ferrite ring cores (toroids) TN20/10/7

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
m	mass of core	≈7.7	g



Dimensions in mm.

Fig.1 TN20/10/7 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	121 ±25%	≈125	violet	TN20/10/7-4C65
3C90 des	2230 ±25%	≈2300	ultramarine	TN20/10/7-3C90
3C11	4150 ±25%	≈4300	white	TN20/10/7-3C11
3E25	5340 ±25%	≈5500	orange	TN20/10/7-3E25
3E5(1)	8250 ±30%	≈8500	yellow/white	TL20/10/7-3E5
3E6(1) des	9685 ±30%	≈10000	purple/white	TL20/10/7-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions:
Outside diameter = 20.25 ±0.6 mm; inside diameter = 9.75 ±0.4 mm; height = 7.25 ±0.45 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

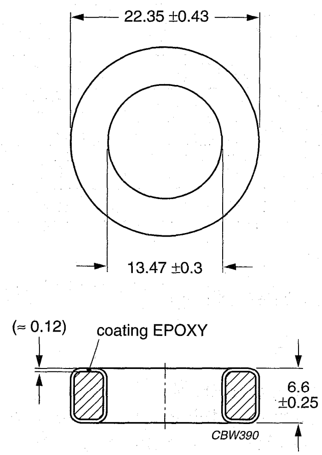
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.15	≤0.16

Ferrite ring cores (toroids) TX22/14/6.4

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.20	mm^{-1}
V_e	effective volume	1340	mm^3
l_e	effective length	54.2	mm
A_e	effective area	24.8	mm^2
m	mass of core	≈6.5	g



Dimensions in mm.

Fig.1 TX22/14/6.4 ring core.

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65[(1)]	75 ±25%	≈125	violet/white	TL22/14/6.4-4C65
3C90 des	1400 ±20%	≈2300	ultramarine/white	TX22/14/6.4-3C90
3C81	1650 ±20%	≈2700	brown/white	TX22/14/6.4-3C81
3E27	3055 ±20%	≈5300	green/white	TX22/14/6.4-3E27
3E6 des	6000 ±30%	≈10500	purple/white	TX22/14/6.4-3E6

Note

1. Ring cores in 4C65 are lacquered (polyurethane) and have different dimensions: outside diameter = 22.35 ±0.4 mm; inside diameter = 13.45 ±0.6 mm; height = 6.6 ±0.4 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192084.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤0.21	–
3C90	≥320	≤0.13	≤0.13

Ferrite ring cores (toroids) TX22/14/13

RING CORES (TOROIDS)

Effective core parameters

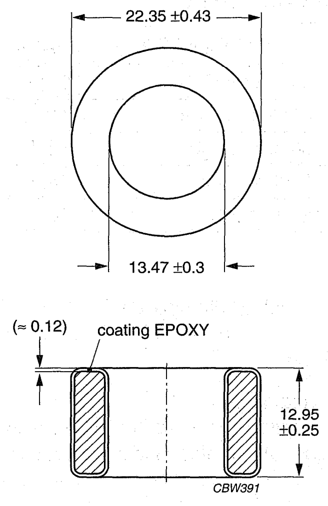
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.07	mm^{-1}
V_e	effective volume	2750	mm^3
l_e	effective length	54.2	mm
A_e	effective area	50.9	mm^2
m	mass of core	≈14	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX22/14/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2200 ±20%	≈1800	blue/white	TX22/14/13-3F3
3E27	6110 ±20%	≈5000	green/white	TX22/14/13-3E27
3E6 des	12080 ±30%	≈10300	purple/white	TX22/14/13-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥320	≤0.30	≤0.52

RING CORES (TOROIDS)

Effective core parameters

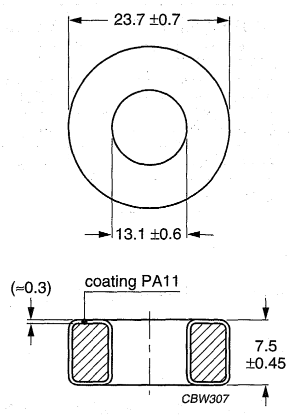
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.81	mm^{-1}
V_e	effective volume	1722	mm^3
l_e	effective length	55.8	mm
A_e	effective area	30.9	mm^2
m	mass of core	≈8.4	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN23/14/7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	87 ±25%	≈125	violet	TN23/14/7-4C65
4A11	485 ±25%	≈700	pink	TN23/14/7-4A11
3R1(1)	–	≈800	black	TN23/14/7-3R1
3F3	1250 ±25%	≈1800	blue	TN23/14/7-3F3
3C90 des	1600 ±25%	≈2300	ultramarine	TN23/14/7-3C90
3C11	3000 ±25%	≈4300	white	TN23/14/7-3C11
3E25	3820 ±25%	≈5500	orange	TN23/14/7-3E25

Note

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use grade 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Ferrite ring cores (toroids) TN23/14/7

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.19	≤0.19	–
3F3	≥320	–	≤0.19	≤0.33

Ferrite ring cores (toroids) TN25/15/10

RING CORES (TOROIDS)

Effective core parameters

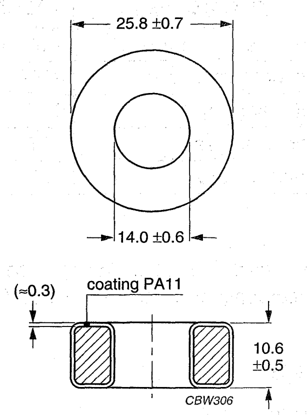
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	2944	mm^3
l_e	effective length	60.2	mm
A_e	effective area	48.9	mm^2
m	mass of core	≈15	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN25/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1840 ±25%	≈1800	blue	TN25/15/10-3F3
3C90 des	2350 ±25%	≈2300	ultramarine	TN25/15/10-3C90
3C11	4400 ±25%	≈4300	white	TN25/15/10-3C11
3E25	5620 ±25%	≈5500	orange	TN25/15/10-3E25
3E5(1)	8680 ±30%	≈8500	yellow/white	TL25/15/10-3E5
3E6(1) des	10200 ±30%	≈10000	purple/white	TL25/15/10-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions:
Outside diameter = 25.25 ±0.7 mm; Inside diameter = 14.75 ±0.6 mm; Height = 10.25 ±0.5 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.33	≤0.33	–
3F3	≥320	–	≤0.32	≤0.56

Ferrite ring cores (toroids) — TN26/15/10

RING CORES (TOROIDS)

Effective core parameters

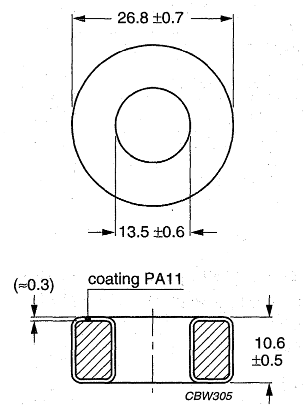
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	60.1	mm
A_e	effective area	55.9	mm^2
m	mass of core	≈17	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN26/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2645 ±25%	≈2300	ultramarine	TN26/15/10-3C90
3C11	5000 ±25%	≈4300	white	TN26/15/10-3C11
3E25	6420 ±25%	≈5500	orange	TN26/15/10-3E25
3E5(1)	10000 ±30%	≈8500	yellow/white	TL26/15/10-3E5

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and have different dimensions:
   Outside diameter = 26.25 ±0.7 mm; Inside diameter = 14.25 ±0.6 mm; Height = 10.35 ±0.5 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.38	≤0.38

Ferrite ring cores (toroids) TN26/15/20

RING CORES (TOROIDS)

Effective core parameters

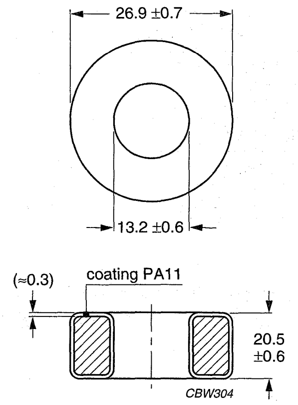
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.538	mm^{-1}
V_e	effective volume	6720	mm^3
l_e	effective length	60.1	mm
A_e	effective area	112	mm^2
m	mass of set	≈34	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN26/15/20 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	5400 ±25%	≈2300	red	TN26/15/20-3C90
3C11	10000 ±25%	≈4300	white	TN26/15/20-3C11
3E25	12800 ±25%	≈5500	orange	TN26/15/20-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.75	≤0.75

Ferrite ring cores (toroids) TN29/19/7.5

RING CORES (TOROIDS)

Effective core parameters

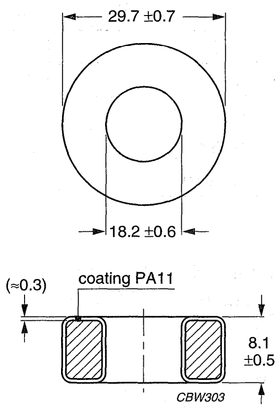
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.98	mm^{-1}
V_e	effective volume	2700	mm^3
l_e	effective length	73.2	mm
A_e	effective area	36.9	mm^2
m	mass of core	≈13.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN29/19/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	1460 ±25%	≈2300	ultramarine	TN29/19/7.5-3C90
3C11	2700 ±25%	≈4300	white	TN29/19/7.5-3C11
3E25	3550 ±25%	≈5500	orange	TN29/19/7.5-3E25
3E6(1) des	6340 ±30%	≈10000	purple/white	TL29/19/7.5-3E6

Note

1. Ring cores in 3E6 are lacquered (polyurethane) and have different dimensions: outside diameter = 29.25 ±0.7 mm; inside diameter = 18.75 ±0.6 mm; height = 7.75 ±0.5 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.30	≤0.30

Ferrite ring cores (toroids) TX29/19/7.6

RING CORES (TOROIDS)

Effective core parameters

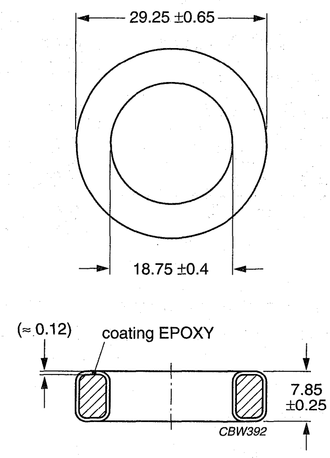
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.06	mm^{-1}
V_e	effective volume	2600	mm^3
l_e	effective length	73.2	mm
A_e	effective area	35.5	mm^2
m	mass of core	≈13	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX29/19/7.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C81	1740 ±20%	≈2800	brown/white	TX29/19/7.6-3C81
3E27	3225 ±20%	≈5300	green/white	TX29/19/7.6-3E27

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤0.53

Ferrite ring cores (toroids) TN29/19/15

RING CORES (TOROIDS)

Effective core parameters

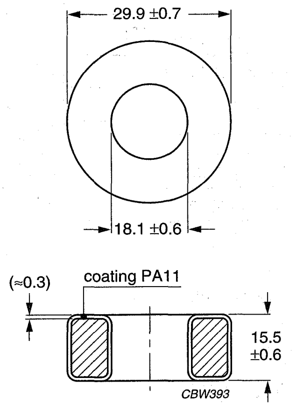
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.98	mm^{-1}
V_e	effective volume	5410	mm^3
I_e	effective length	73.2	mm
A_e	effective area	73.9	mm^2
m	mass of core	≈28	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN29/19/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E25	7000 ±25%	≈5500	orange	TN29/19/15-3E25
3E6(1)	12850 ±30%	≈10000	purple/white	TL29/19/15-3E6

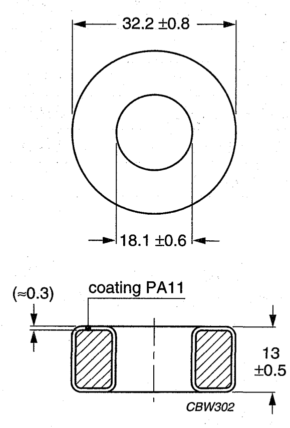
Note

1. Ring cores in 3E6 are lacquered (polyurethane) and have different dimensions: outside diameter = 29.25 ±0.7 mm; inside diameter = 18.75 ±0.6 mm; height = 15.45 ±0.5 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.99	mm^{-1}
V_e	effective volume	5820	mm^3
l_e	effective length	76	mm
A_e	effective area	76.5	mm^2
m	mass of core	≈29	g



Dimensions in mm.

Fig.1 TN32/19/13 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2270 ±25%	≈1800	blue	TN32/19/13-3F3
3C90 des	2910 ±25%	≈2300	ultramarine	TN32/19/13-3C90
3C11	5450 ±25%	≈4300	white	TN32/19/13-3C11
3E25	6950 ±25%	≈5500	orange	TN32/19/13-3E25
3E5(1)	10700 ±30%	≈8500	yellow/white	TL32/19/13-3E5

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and have different dimensions: outside diameter = 31.75 ±0.8 mm; inside diameter = 18.75 ±0.7 mm; height = 12.75 ±0.5 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.65	≤0.65	–
3F3	≥320	–	≤0.64	≤1.1

RING CORES (TOROIDS)

Effective core parameters

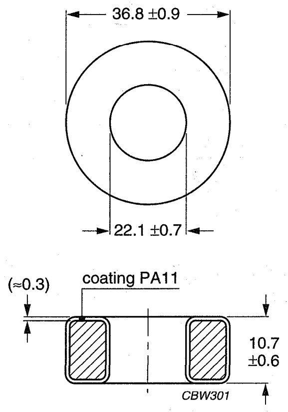
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.40	mm^{-1}
V_e	effective volume	5730	mm^3
l_e	effective length	89.6	mm
A_e	effective area	63.9	mm^2
m	mass of core	≈28	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN36/23/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	112 ±25%	≈125	violet	TN36/23/10-4C65
3C90 des	2060 ±25%	≈2300	ultramarine	TN36/23/10-3C90
3C11	3900 ±25%	≈4300	white	TN36/23/10-3C11

Properties of core under power conditions

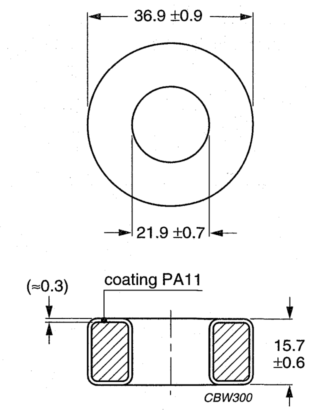
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.64	≤0.64

Ferrite ring cores (toroids) | TN36/23/15

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.935	mm^{-1}
V_e	effective volume	8600	mm^3
l_e	effective length	89.6	mm
A_e	effective area	95.9	mm^2
m	mass of core	≈42	g



Dimensions in mm.

Fig.1 TN36/23/15 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.

Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	170 ±25%	≈125	violet	TN36/23/15-4C65
4A11	940 ±25%	≈700	uncoated	T36/23/15-4A11(1)
3R1	–	≈800	black	TN36/23/15-3R1(2)
3S4	2285 ±25%	≈1700	uncoated	T36/23/15-3S4(1)
3F3	2420 ±25%	≈1800	blue	TN36/23/15-3F3
3C90 des	3090 ±25%	≈2300	ultramarine	TN36/23/15-3C90
3C11	5800 ±25%	≈4300	white	TN36/23/15-3C11
3E25	7390 ±25%	≈5500	orange	TN36/23/15-3E25
3E5	11400 ±30%	≈8500	yellow/white	TL36/23/15-3E5(3)
3E6 des	13600 ±30%	≈1000	purple/white	TL36/23/15-3E6(3)

Notes

1. Uncoated ring cores have the following dimensions: outside diameter = 36 ±0.7 mm; inside diameter = 23 ±0.5 mm; height = 15 ±0.3 mm.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.
3. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: outside diameter = 36.25 ±0.9 mm; inside diameter = 22.75 ±0.7 mm; height = 15.25 ±0.6 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Ferrite ring cores (toroids) TN36/23/15

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.96	≤0.96	–
3F3	≥320	–	≤0.95	≤1.7

Ferrite ring cores (toroids) TX36/23/15

RING CORES (TOROIDS)

Effective core parameters

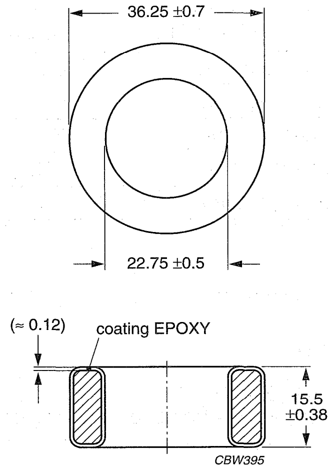
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.96	mm^{-1}
V_e	effective volume	8440	mm^3
l_e	effective length	89.7	mm
A_e	effective area	94.1	mm^2
m	mass of core	≈40	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX36/23/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C81	3670 ±20%	≈2700	brown/white	TX36/23/15-3C81
3E27	6800 ±20%	≈5000	green/white	TX36/23/15-3E27
3E6 des	13600 ±30%	≈10400	purple/white	TX36/23/15-3E6

Properties of cores 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
3C81	≥320	≤1.7

Ferrite ring cores (toroids) — TX39/20/13

RING CORES (TOROIDS)

Effective core parameters

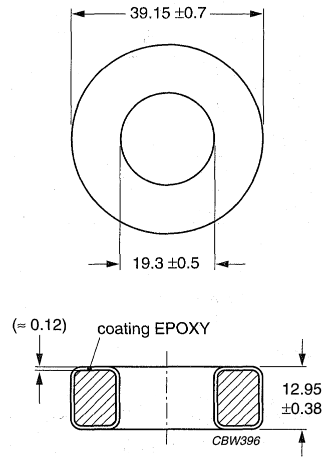
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.76	mm^{-1}
V_e	effective volume	9513	mm^3
l_e	effective length	84.9	mm
A_e	effective area	112	mm^2
m	mass of core	≈45	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX39/20/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	3800 ±20%	≈2300	ultramarine/white	TX39/20/13-3C90
3C81	4700 ±20%	≈2700	brown/white	TX39/20/13-3C81
3E27	8720 ±20%	≈5000	green/white	TX39/20/13-3E27

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤1.9	–
3C90	≥320	≤1.1	≤1.1

RING CORES (TOROIDS)

Effective core parameters

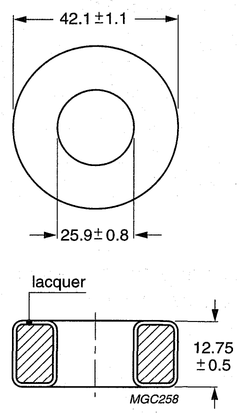
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.076	mm^{-1}
V_e	effective volume	9860	mm^3
l_e	effective length	103	mm
A_e	effective area	95.8	mm^2
m	mass of core	≈53	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL42/26/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2690 ±25%	≈2300	ultramarine/white	TL42/26/13-3C90
3C11	5000 ±25%	≈4300	white	TL42/26/13-3C11
3E25	6425 ±25%	≈5500	orange/white	TL42/26/13-3E25
4A11	820 ±25%	≈700	pink/white	TL42/26/13-4A11

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤1.1	≤1.1

RING CORES (TOROIDS)

Effective core parameters

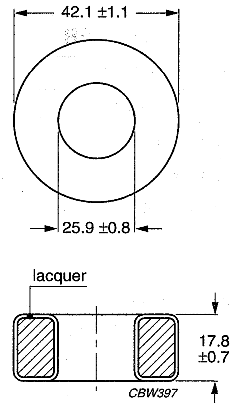
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.769	mm^{-1}
V_e	effective volume	13810	mm^3
l_e	effective length	103	mm
A_e	effective area	134	mm^2
m	mass of core	≈55	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL42/26/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	12900 ±30%	≈8500	yellow/white	TL42/26/18-3E5

Ferrite ring cores (toroids)

T50/30/19

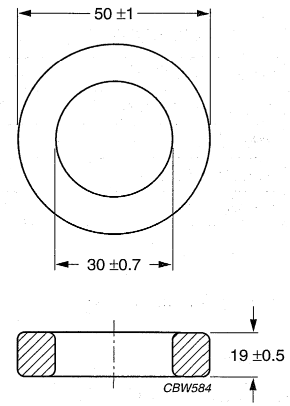
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.65	mm^{-1}
V_e	effective volume	22378	mm^3
l_e	effective length	120.4	mm
A_e	effective area	186	mm^2
m	mass of core	≈100	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T50/30/19 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	19400 ±30%	≈10000	T50/30/19-3E6

Ferrite ring cores (toroids) TX51/32/19

RING CORES (TOROIDS)

Effective core parameters

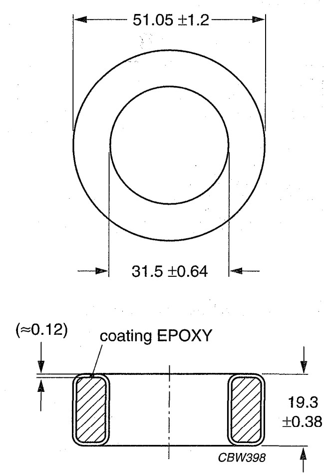
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.73	mm^{-1}
V_e	effective volume	21500	mm^3
l_e	effective length	125	mm
A_e	effective area	172	mm^2
m	mass of core	≈100	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX51/32/19 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	3200 ±20%	≈1800	blue/white	TX51/32/19-3F3
3C90 des	3980 ±20%	≈2300	ultramarine/white	TX51/32/19-3C90
3C81	4800 ±20%	≈2700	brown/white	TX51/32/19-3C81
3E25	8890 ±20%	≈5000	orange/white	TX51/32/19-3E25
3E27	8890 ±20%	≈5000	green/white	TX51/32/19-3E27
3E6 des	17300 ±20%	≈10000	purple/white	TX51/32/19-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤4.4	–	–
3C90	≥320	≤2.4	≤2.4	–
3F3	≥320	–	≤2.4	≤4.1

Ferrite ring cores (toroids) TL55/32/18

RING CORES (TOROIDS)

Effective core parameters

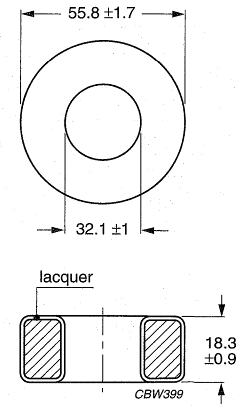
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.651	mm^{-1}
V_e	effective volume	26580	mm^3
l_e	effective length	132	mm
A_e	effective area	202	mm^2
m	mass of core	≈134	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL55/32/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	1350 ±25%	≈700	pink/white	TL55/32/18-4A11
3E25	10620 ±25%	≈5500	orange/white	TL55/32/18-3E25
3E27	10620 ±25%	≈5500	green/white	TL55/32/18-3E27

RING CORES (TOROIDS)

Effective core parameters

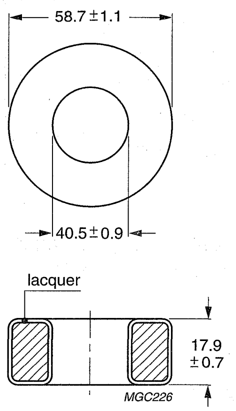
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.0	mm^{-1}
V_e	effective volume	23200	mm^3
l_e	effective length	152	mm
A_e	effective area	152	mm^2
m	mass of core	≈110	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL58/41/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2890 ±25%	≈2300	ultramarine/white	TL58/41/18-3C90
3C11	5400 ±25%	≈4300	white	TL58/41/18-3C11
3E25	6900 ±25%	≈5500	orange/white	TL58/41/18-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤2.6	≤2.6

Ferrite ring cores (toroids) TL63/38/25

RING CORES (TOROIDS)

Effective core parameters

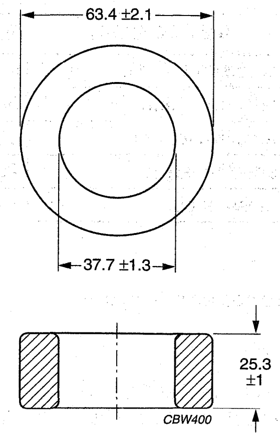
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.497	mm^{-1}
V_e	effective volume	46500	mm^3
l_e	effective length	152	mm
A_e	effective area	306	mm^2
m	mass of core	≈220	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL63/38/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	4550 ±25%	≈1800	blue/white	TL63/38/25-3F3
3E25	13900 ±25%	≈5500	orange/white	TL63/38/25-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥320	≤5.1	≤8.8

Ferrite ring cores (toroids) TX74/39/13

RING CORES (TOROIDS)

Effective core parameters

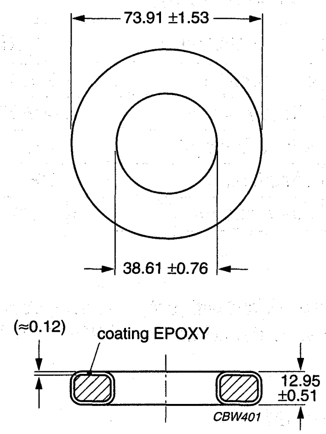
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.80	mm^{-1}
V_e	effective volume	34300	mm^3
l_e	effective length	165	mm
A_e	effective area	208	mm^2
m	mass of core	≈170	g

Coating

The cores are coated with epoxy.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX74/39/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2900 ±20%	≈1800	blue/white	TX74/39/13-3F3
3C90 des	3620 ±20%	≈2300	ultramarine/white	TX74/39/13-3C90
3C81	4350 ±20%	≈2700	brown/white	TX74/39/13-3C81
3E25	8060 ±20%	≈5000	orange/white	TX74/39/13-3E25
3E6(1) des	15776 ±30%	≈10000	purple/white	TL74/39/13-3E6

Note

1. Ring cores in 3E6 are lacquered (polyurethane); flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤7.0	–	–
3C90	≥320	≤4.0	≤4.0	–
3F3	≥320	–	≤3.8	≤8.1

Ferrite ring cores (toroids) TL87/54/14

RING CORES (TOROIDS)

Effective core parameters

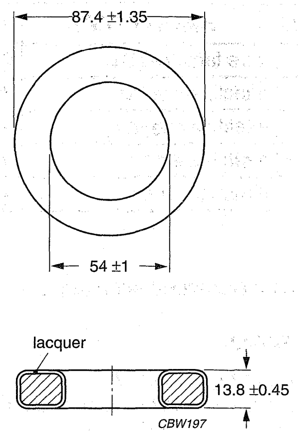
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.987	mm^{-1}
V_e	effective volume	46400	mm^3
l_e	effective length	214	mm
A_e	effective area	217	mm^2
m	mass of core	≈220	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL87/54/14 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2930 ±25%	≈2300	ultramarine/white	TL87/54/14-3C90
3C11 des	5470 ±25%	≈4300	white	TL87/54/14-3C11

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤5.5	≤5.5

Ferrite ring cores (toroids) T87/56/13

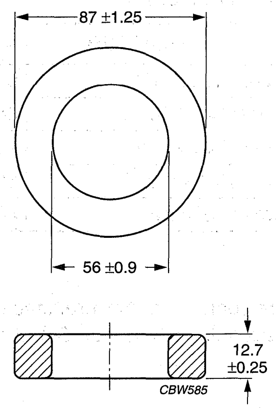
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.123	mm^{-1}
V_e	effective volume	42133	mm^3
l_e	effective length	217.5	mm
A_e	effective area	194	mm^2
m	mass of core	≈200	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T87/56/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	11190 ±30%	≈10000	T87/56/13-3E6

Ferrite ring cores (toroids) — TL102/66/15

RING CORES (TOROIDS)

Effective core parameters

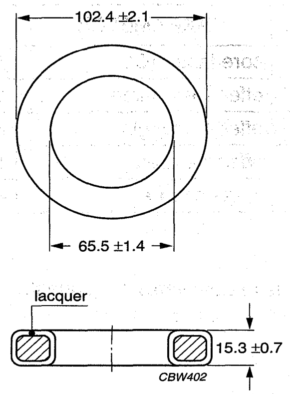
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.956	mm^{-1}
V_e	effective volume	68200	mm^3
l_e	effective length	255	mm
A_e	effective area	267	mm^2
m	mass of core	≈325	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL102/66/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65 des	165 ±25%	≈125	violet/white	TL102/66/15-4C65
3C11 des	5300 ±25%	≈4300	white	TL102/66/15-3C11
3E25 des	7900 ±25%	≈5500	orange/white	TL102/66/15-3E25

RING CORES (TOROIDS)

Effective core parameters

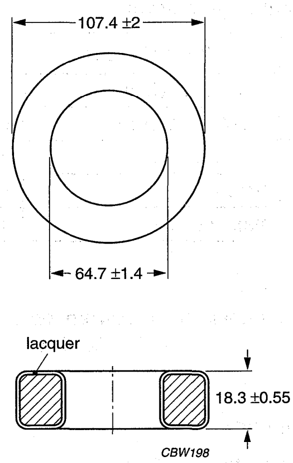
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.700	mm^{-1}
V_e	effective volume	96000	mm^3
l_e	effective length	259	mm
A_e	effective area	370	mm^2
m	mass of core	≈456	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL107/65/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F4 des	1354 ±25%	≈750	–	T107/65/18-3F4(1)
3E25 des	9900 ±25%	≈5500	orange/white	TL107/65/18-3E25

Note

1. Non-coated. Dimensions for this core are: outside diameter = 107 ±2 mm; inside diameter = 65 ±1.3 mm; height = 18 ±0.35 mm.

Ferrite ring cores (toroids) T107/65/25

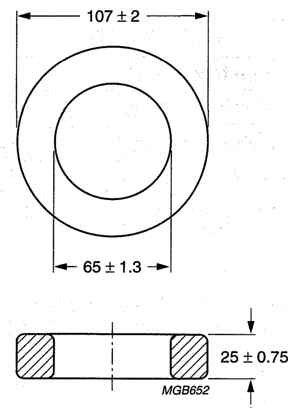
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.504	mm^{-1}
V_e	effective volume	133000	mm^3
l_e	effective length	259	mm
A_e	effective area	514	mm^2
m	mass of core	≈680	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T107/65/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3F4 des	1870 ±25%	≈750	T107/65/25-3F4
3F3 des	4485 ±25%	≈1800	T107/65/25-3F3

Ferrite ring cores (toroids) T140/106/25

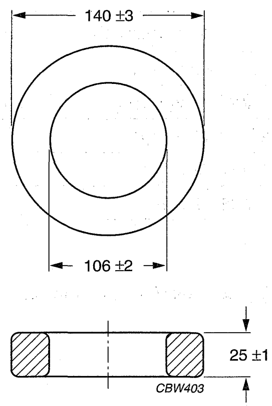
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.903	mm^{-1}
V_e	effective volume	161100	mm^3
l_e	effective length	382	mm
A_e	effective area	422	mm^2
m	mass of core	≈800	g

Coating

Coated cores are available on request.

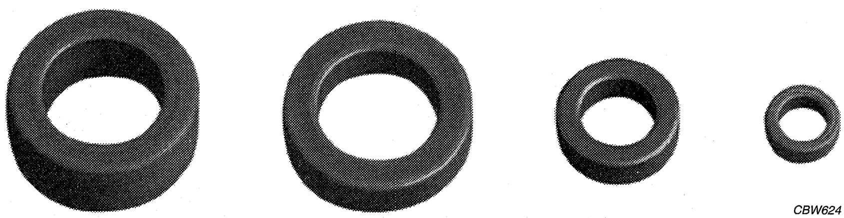


Dimensions in mm.

Fig.1 T107/65/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25 des	7700 ±30%	≈5500	T140/106/25-3E25



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For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview iron powder ring cores (toroids)

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TN7.5/4.1/3	83	4.81	0.6
TN12/8/4.4	290	9.37	2
TN17/9.8/4.4	635	15.8	5
TN20/13/6	1020	20.4	7.5
TN24/15/7.5	1895	32.8	13
TN27/15/11	3720	60.4	25
TN33/20/11	5200	65.0	35

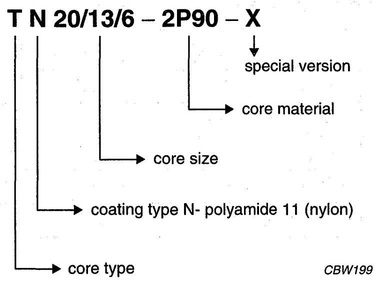


Fig.1 Type number structure for ring cores.

Iron powder ring cores (toroids) TN7.5/4.1/3

RING CORES (TOROIDS)

Effective core parameters

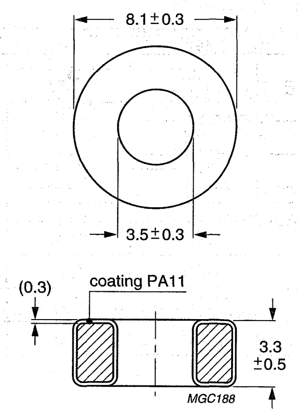
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.58	mm^{-1}
V_e	effective volume	83	mm^3
l_e	effective length	17.3	mm
A_e	effective area	4.81	mm^2
m	mass of core	≈0.6	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1 500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN7.5/4.1/3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	14 ±10%	≈40	dark yellow	TN7.5/4.1/3-2P40
2P50 sup	18 ±10%	≈50	dark blue	TN7.5/4.1/3-2P50
2P65 sup	23 ±10%	≈65	dark red	TN7.5/4.1/3-2P65
2P80 sup	28 ±10%	≈80	dark green	TN7.5/4.1/3-2P80
2P90 sup	30 +10/–15%	≈90	dark brown	TN7.5/4.1/3-2P90

Iron powder ring cores (toroids) TN12/8/4.4

RING CORES (TOROIDS)

Effective core parameters

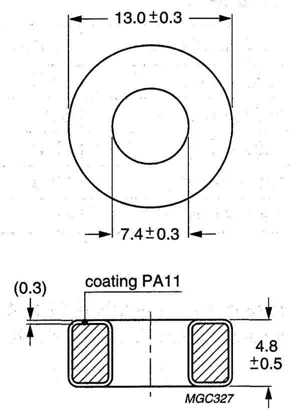
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.30	mm^{-1}
V_e	effective volume	290	mm^3
l_e	effective length	30.9	mm
A_e	effective area	9.37	mm^2
m	mass of core	≈2	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN12/8/4.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	15 ±10%	≈40	dark yellow	TN12/8/4.4-2P40
2P50 sup	19 ±10%	≈50	dark blue	TN12/8/4.4-2P50
2P65 sup	25 ±10%	≈65	dark red	TN12/8/4.4-2P65
2P80 sup	31 ±10%	≈80	dark green	TN12/8/4.4-2P80
2P90 sup	33 +10/−15%	≈90	dark brown	TN12/8/4.4-2P90

Iron powder ring cores (toroids) TN17/9.8/4.4

RING CORES (TOROIDS)

Effective core parameters

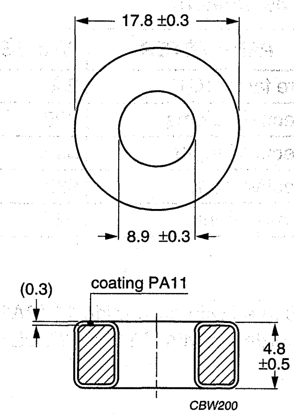
SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	2.55	mm^{-1}
V_e	effective volume	635	mm^3
l_e	effective length	40.2	mm
A_e	effective area	15.8	mm^2
m	mass of core	≈5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN17/9.8/4.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	20 ±10%	≈40	dark yellow	TN17/9.8/4.4-2P40
2P50 sup	25 ±10%	≈50	dark blue	TN17/9.8/4.4-2P50
2P65 sup	32 ±10%	≈65	dark red	TN17/9.8/4.4-2P65
2P80 sup	40 ±10%	≈80	dark green	TN17/9.8/4.4-2P80
2P90 sup	42 +10/−15%	≈90	dark brown	TN17/9.8/4.4-2P90

RING CORES (TOROIDS)

Effective core parameters

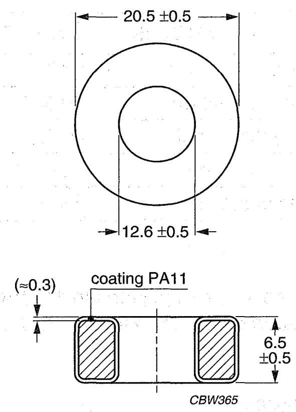
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.44	mm^{-1}
V_e	effective volume	1020	mm^3
l_e	effective length	49.9	mm
A_e	effective area	20.4	mm^2
m	mass of core	≈7.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN20/13/6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	21 ±10%	≈40	dark yellow	TN20/13/6-2P40
2P50 sup	26 ±10%	≈50	dark blue	TN20/13/6-2P50
2P65 sup	34 ±10%	≈65	dark red	TN20/13/6-2P65
2P80 sup	41 ±10%	≈80	dark green	TN20/13/6-2P80
2P90 sup	44 +10/−15%	≈90	dark brown	TN20/13/6-2P90

RING CORES (TOROIDS)

Effective core parameters

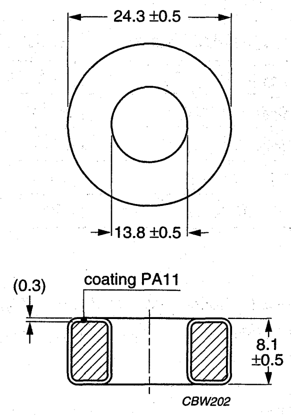
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.76	mm^{-1}
V_e	effective volume	1895	mm^3
l_e	effective length	57.8	mm
A_e	effective area	32.8	mm^2
m	mass of core	≈13	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN24/15/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	29 ±10%	≈40	dark yellow	TN24/15/7.5-2P40
2P50 sup	36 ±10%	≈50	dark blue	TN24/15/7.5-2P50
2P65 sup	47 ±10%	≈65	dark red	TN24/15/7.5-2P65
2P80 sup	57 ±10%	≈80	dark green	TN24/15/7.5-2P80
2P90 sup	61 +10/−15%	≈90	dark brown	TN24/15/7.5-2P90

Iron powder ring cores (toroids) TN27/15/11

RING CORES (TOROIDS)

Effective core parameters

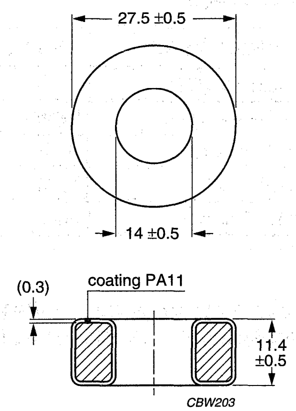
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	3720	mm^3
l_e	effective length	61.6	mm
A_e	effective area	60.4	mm^2
m	mass of core	≈25	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN27/15/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	49 ±10%	≈40	dark yellow	TN27/15/11-2P40
2P50 sup	62 ±10%	≈50	dark blue	TN27/15/11-2P50
2P65 sup	80 ±10%	≈65	dark red	TN27/15/11-2P65
2P80 sup	94 ±10%	≈80	dark green	TN27/15/11-2P80
2P90 sup	105 +10/−15%	≈90	dark brown	TN27/15/11-2P90

Iron powder ring cores (toroids) TN33/20/11

RING CORES

Effective core parameters

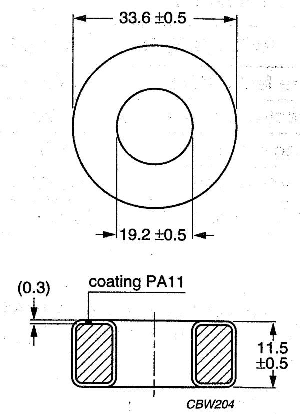
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	5200	mm^3
l_e	effective length	80.0	mm
A_e	effective area	65.0	mm^2
m	mass of core	≈35	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

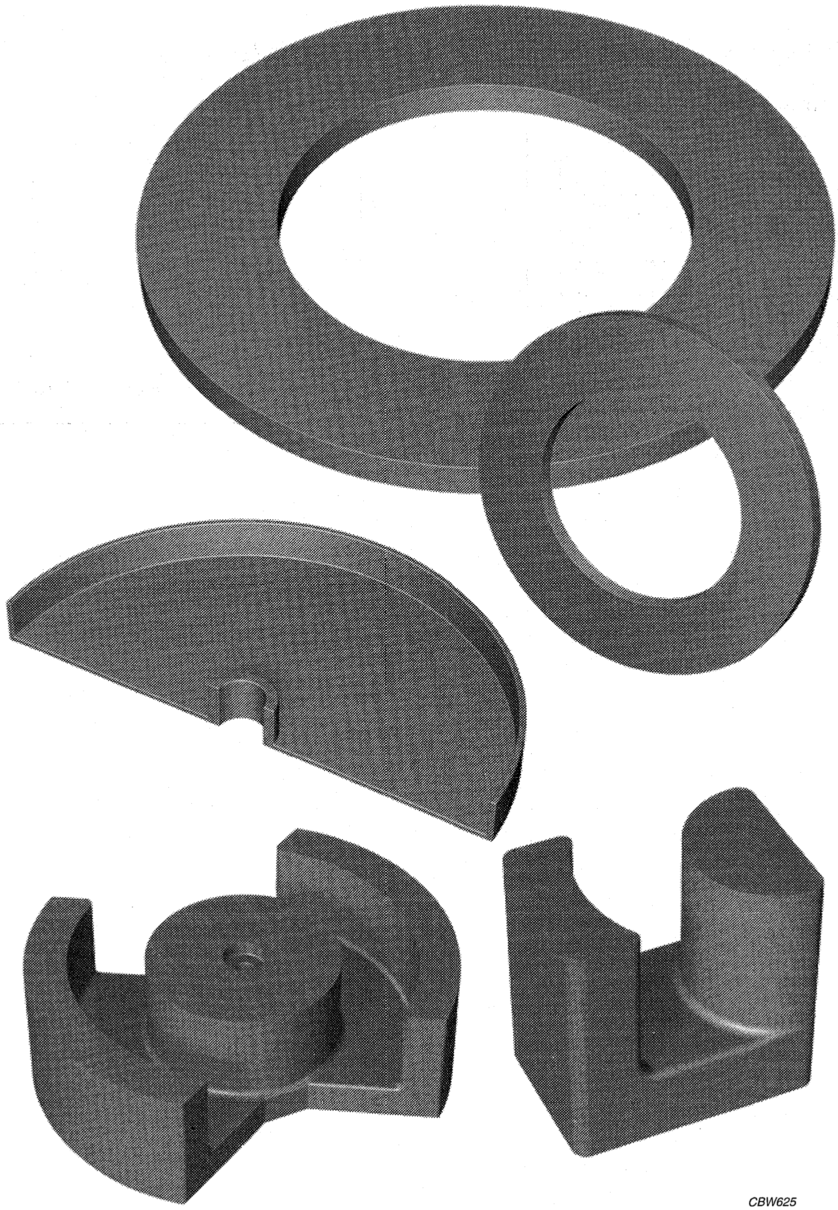


Dimensions in mm.

Fig.1 TN33/20/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	41 ±10%	≈40	dark yellow	TN33/20/11-2P40
2P50 sup	51 ±10%	≈50	dark blue	TN33/20/11-2P50
2P65 sup	67 ±10%	≈65	dark red	TN33/20/11-2P65
2P80 sup	82 ±10%	≈80	dark green	TN33/20/11-2P80
2P90 sup	87 +10/–15%	≈90	dark brown	TN33/20/11-2P90



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

- Machined Ferrites
- Ferrites for particle accelerators toroids.

Product overview tooroids

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
T76/38/13	38500	232	≈220
T170/110/20	251500	589	≈1300
T240/160/20	482000	789	≈2500
T498/270/25	3120000	2760	≈17000
T498/300/25	2900000	2420	≈15000
T500/240/25	3300000	3100	≈19000
T500/300/25	2950000	2450	≈16000

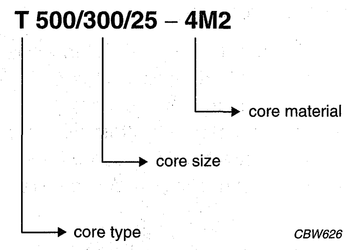


Fig.1 Type number structure for toroids.

MACHINED FERRITES AND SPECIALTY SHAPES

We stock most of our material grades in blocks and are able to machine numerous prototype cores. Very close tolerances can be realized if required.

Ferrites, being very hard and brittle are difficult to work. The machining and grinding of ferrites and similar materials to micron precision, places stringent requirements on machines and men. To attain optimum standards requires close cooperation between us, the manufacturers of the machines and the machine tools we use.

There are several reasons to choose machined ferrite cores. Samples are sometimes required on very short notice, while pressing tools are not yet available. On other occasions, only a limited number of cores will be needed and it is not worthwhile to make a tool at all. Cores can be so complicated or large that machining is the only viable solution.

Figures 1 to 5 provide a good impression of the variety of cores we have produced. For some of the cores we also have pressing tools available.

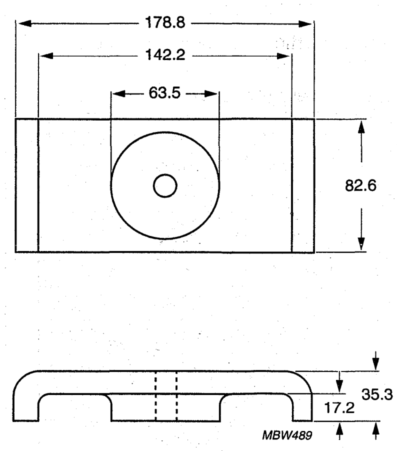


Fig.1 ER type core.

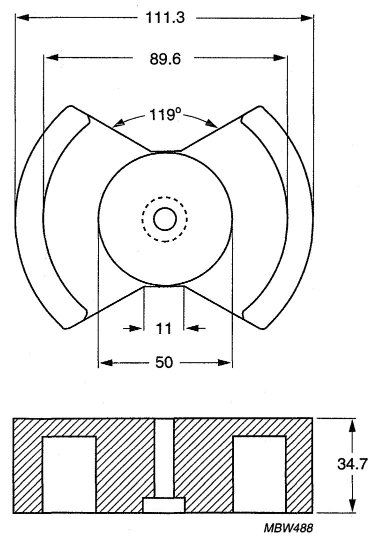


Fig.2 PM type core.

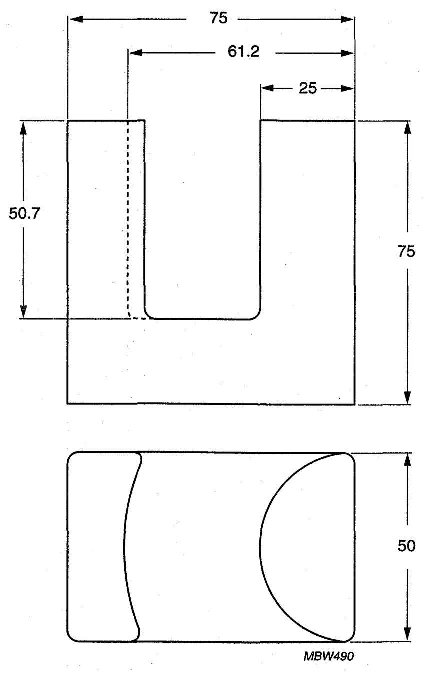


Fig.3 Quarter part of an ETD150 core set.

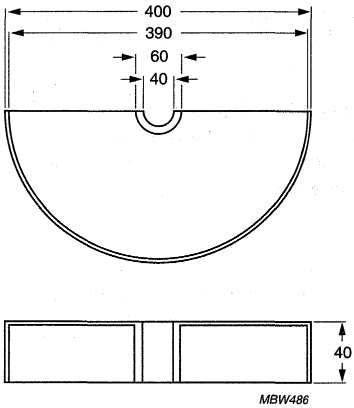


Fig.4 Huge P core section.

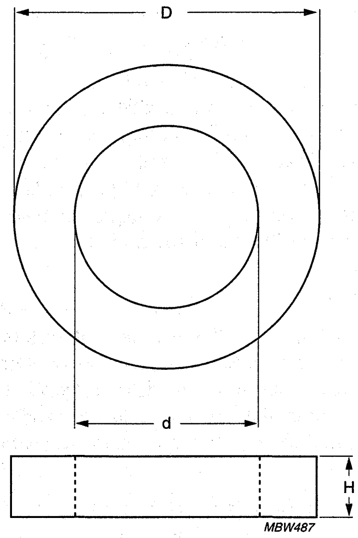


Fig.5 Example of large ring cores: T90/40/35, T120/60/35, T130/80/35.

FERRITE IN SCIENTIFIC PARTICLE ACCELERATORS

The application

Ferrites are used extensively in modern scientific experiments. One of the most exciting and advanced applications is in particle accelerators. Scientists are trying to discover the mysteries of the universe by smashing atomic particles with titanic forces. This requires particle beams to be accelerated to very high speeds and guided into a collision chamber with the help of specially designed magnetic rings and kicker magnets.

Our materials

At Philips' research and development laboratories located in Eindhoven, The Netherlands, we can build on 50 years' experience in ferrite technology. We developed the required materials which fulfil the demanding specifications. Due to our long involvement with ferrite technology, we are one of only two major suppliers in the world who support such demanding projects. Because of the extremely demanding nature of the specifications, these magnetic rings and blocks are designed and developed in close interaction with the scientists. This has enabled us to develop unique material grades, which are processed in our highly controlled production environment to deliver the required product performance.

Our product range

Our range of large ring cores and blocks was developed especially for use in scientific particle accelerators. Applications include kicker magnets and acceleration stations. Dynamic behaviour under pulse conditions is important for both applications, so special ferrite grades are optimized for low losses at high flux densities. These large rings have also been used successfully in delay lines for very high powers such as in pulsed lasers or radar equipment. Sizes other than those mentioned in the following tables can be made on request.

- Standard range of sizes
- Optimized grades for particle accelerators
- Other sizes on request.

General properties of the grades are described in the section on Material Grades. Specific properties, related to their use in particle accelerators, are provided in the following table.

Relevant properties of ferrites in accelerator applications

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 dimension ∅25 × ∅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. Detailed specifications are given in the data sheets or product drawings.

MATERIAL GRADES

Material grades and relevant values

PARAMETER	8C11	8C12	4M2	4E2	4B3
μ_i (±20%)	1200	900	140	25	300
μ_{rem} approx.	850	600	130	20	–
B_s 25 °C (mT, 800 A/m)	≥300	280	250	250	≥300
B_s 40 °C (mT, 800 A/m)	≥280	250	220	220	–
H_c (A/m, after 800 A/m)	≤20	30	100	500	<80
ρ DC (Ωm)	$>10^5$	$>10^5$	$>10^5$	$>10^5$	$>10^5$
T_C (°C)	≥125	≥125	≥150	≥400	≥250
μQ in remanence 200 kHz:					
10 mT		15×10^3			
20 mT		9×10^3			
50 mT		4×10^3			
μQ in remanence 500 kHz:					
10 mT		10×10^3			
20 mT		6×10^3			
50 mT		25×10^3			
μQ in remanence 1 MHz:					
5 mT		10×10^3	20×10^3		
10 mT		75×10^3	20×10^3		
20 mT		5×10^3	15×10^3		
30 mT		–	8×10^3		
μQ in remanence 2.5 MHz:					
5 mT			20×10^3		
10 mT			20×10^3		
20 mT			15×10^3		
30 mT			7×10^3		
μQ in remanence 5 MHz:					
5 mT			15×10^3		
10 mT			15×10^3		
20 mT			10×10^3		
30 mT			7×10^3		
μQ in remanence 10 MHz:					
5 mT			12×10^3		
10 mT			10×10^3		
μQ in remanence 80 MHz:					
1 mT				2.5×10^3	
μQ in remanence 100 MHz				2×10^3	

PARAMETER	8C11	8C12	4M2	4E2	4B3
Decrease in μQ (%), measured 10 ms after application of DC bias (approx.)		10	15	30	
μ_Δ with DC bias field (approx.):					
0 A/m		600	130		
250 A/m		120	80		
500 A/m		50	40		
1000 A/m		22	22		
2000 A/m		8	12		
3000 A/m		5.5	8		
Frequency range (with or without DC bias) in MHz		0.5 to 10	2 to 10	20 to 100	
Application area and special features	kicker magnets; high resistance	high frequency ratio possible with DC bias	fast recovery after magnetic bias	high frequency material	high ($B_s + B_r$)

Ferrite for particle accelerators T76/38/13

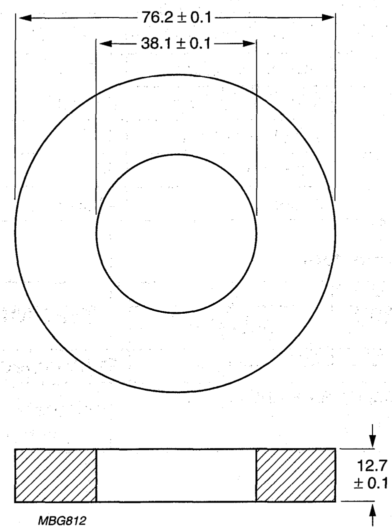
RING CORES (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.716	mm^{-1}
V_e	effective volume	38500	mm^3
l_e	effective length	166	mm
A_e	effective area	232	mm^2
	mass	≈220	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4M2	≈250	T76/38/13-4M2
8C11	≈2000	T76/38/13-8C11
8C12	≈1600	T76/38/13-8C12



Dimensions in mm.

Fig.1 Ring core T76/38/13.

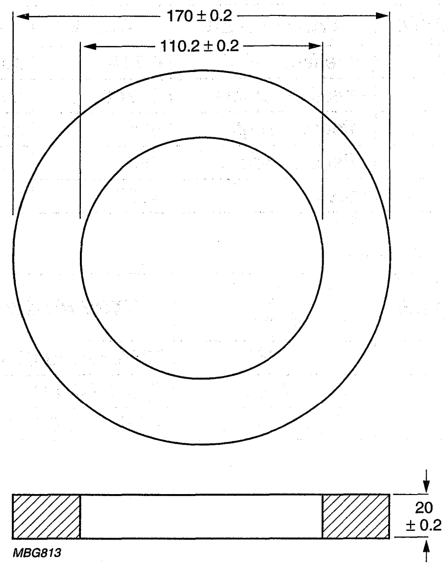
RING CORES (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.725	mm^{-1}
V_e	effective volume	251 500	mm^3
l_e	effective length	427	mm
A_e	effective area	589	mm^2
	mass	≈1300	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C11	≈2600	T170/110/20-8C11



Dimensions in mm.

Fig.1 Ring core T170/110/20.

Ferrite for particle accelerators T240/160/20

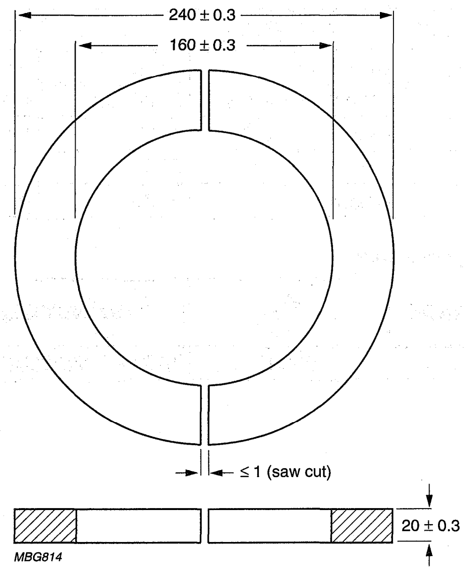
SPLIT RING CORE (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.774	mm^{-1}
V_e	effective volume	482000	mm^3
l_e	effective length	611	mm
A_e	effective area	789	mm^2
	mass	≈2500	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C11	–	T240/160/20-8C11



Dimensions in mm.

Fig.1 Split ring core T240/160/20.

Ferrite for particle accelerators T498/270/25

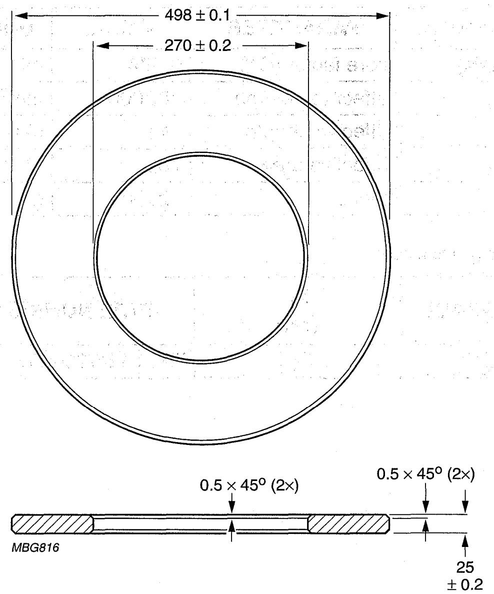
RING CORE (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.409	mm^{-1}
V_e	effective volume	3120000	mm^3
l_e	effective length	1 t130	mm
A_e	effective area	2760	mm^2
	mass	≈17000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C12	≈2 800	T498/270/25-8C12



Dimensions in mm.

Fig.1 Ring core T498/270/25.

Ferrite for particle accelerators T498/300/25

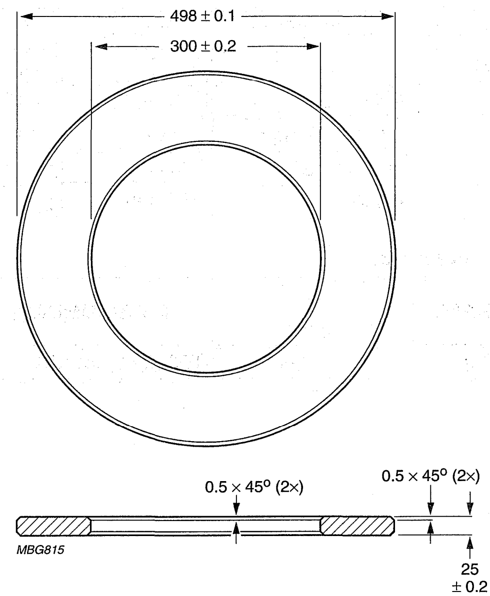
RING CORE (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.496	mm^{-1}
V_e	effective volume	2900000	mm^3
l_e	effective length	1200	mm
A_e	effective area	2420	mm^2
	mass	≈15000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C12	≈2300	T498/300/25-8C12



Dimensions in mm.

Fig.1 Ring core T498/300/25.

Ferrite for particle accelerators T500/240/25

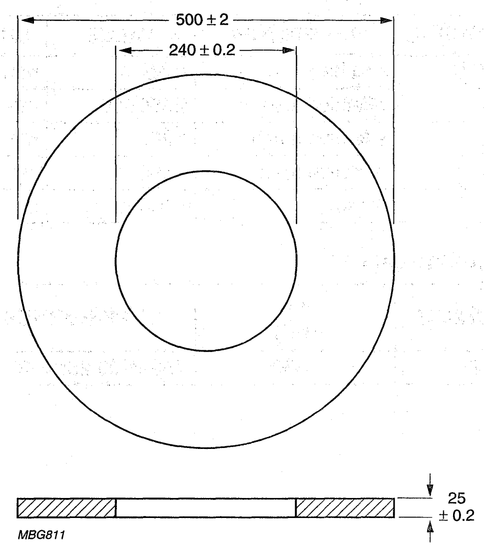
RING CORE (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.342	mm^{-1}
V_e	effective volume	3300000	mm^3
l_e	effective length	1060	mm
A_e	effective area	3100	mm^2
	mass	≈19000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4B3	≈1300	T500/240/25-4B3



Dimensions in mm.

Fig.1 Ring core T500/240/25.

Ferrite for particle accelerators T500/300/25

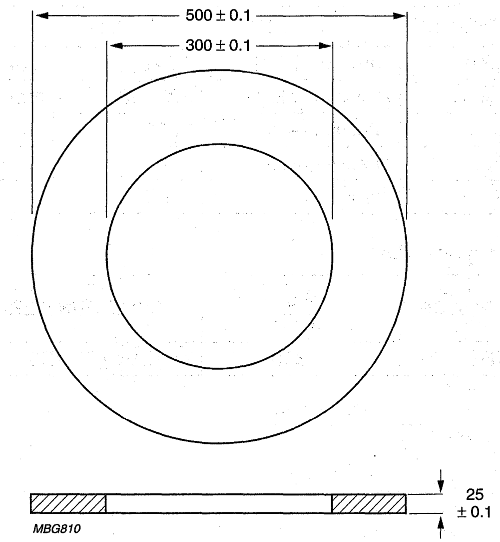
RING CORE (TOROID)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.49	mm^{-1}
V_e	effective volume	2950000	mm^3
l_e	effective length	1200	mm
A_e	effective area	2450	mm^2
	mass	≈16000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4M2	≈350	T500/300/25-4M2



Dimensions in mm.

Fig.1 Ring core T500/300/25.

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