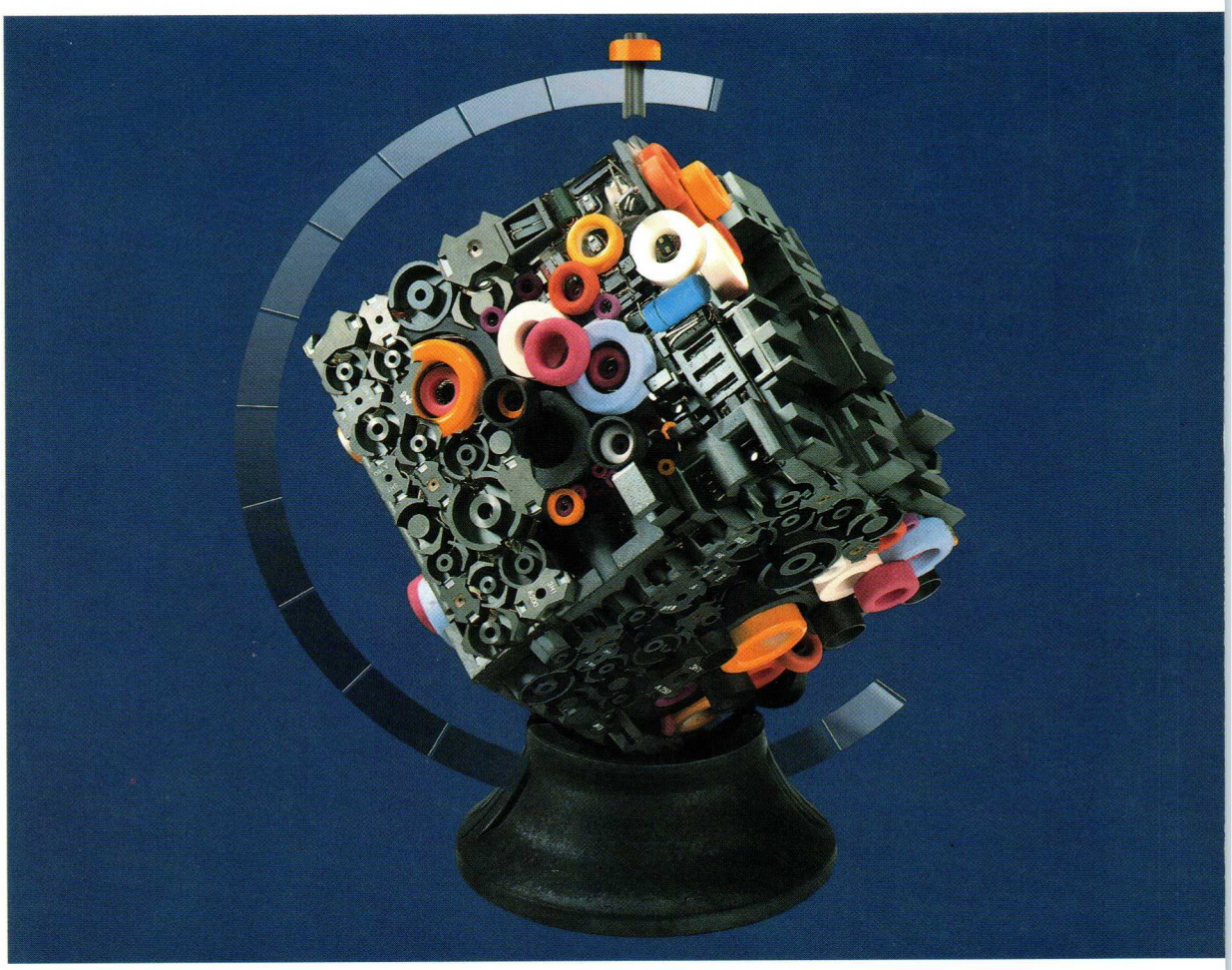
MAGNETIC PRODUCTS

Soft Ferrites



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DATA HANDBOOK MA01

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Soft Ferrites

CONTENTS

	Page
INTRODUCTION	4
QUALITY	12
ENVIRONMENTAL ASPECTS	19
ORDERING INFORMATION	20
APPLICATIONS	21
LITERATURE AND REFERENCE PUBLICATIONS	64
FERRITE MATERIALS	66
MATERIAL GRADE SPECIFICATIONS	69

CORES AND ACCESSORIES FOR FILTER INDUCTORS, GENERAL PURPOSE, PULSE AND POWER TRANSFORMERS:

E cores and accessories	**149**
Planar E cores and accessories	**265**
EC cores and accessories	**291**
EFD cores and accessories	**313**
EP cores and accessories	**337**
ER cores and accessories	**363**
ETD cores and accessories	**389**
H cores	**420**
P,P/I, PT and PTS cores and accessories	**433**
PH cores and accessories	**557**
PQ cores and accessories	**565**
RM, RM/I and RM/ILP cores and accessories	**587**
U, I cores and accessories	**677**
UR cores	**705**

Soft Ferrites

CONTENTS (CONTINUED)

Page

X cores and accessories 711

Yoke rings 729

PRODUCTS AND CORES MAINLY FOR EMI-SUPPRESION APPLICATIONS:

Bobbin cores (BC) 736

Cable shields (CST, CSU, CSF) 738

Cup and mushroom cores (CUP, MSC) 744

EMI-suppresion beads (BD) 745

EMI-suppresion beads on wire (BDW) 746

Impeder cores (IMP) 747

Multi-hole cores (MHC, MHB, MHR) 748

Rods (ROD) 751

SMD beads (BDS) 753

SMD common mode chokes (CMS) 759

SMD wideband chokes (WBS) 761

Tubes (TUB) 762

Wideband chokes (WBC) 763

Ferrite ring cores (T,TC,TL,TN,TX) 773

Iron powder ring cores (TN) 831

CONVERSION LIST841

LITERATURE AND REFERENCE PUBLICATIONS 883

Data Handbook System 885

DEFINITIONS

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

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 customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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 1000 °C. A solid state reaction takes place between the constituents and, at this stage, a ferrite is already formed.

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

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 center pole grinding.

Magnetism in ferrites

A sintered ferrite consists of small crystals, typically 10 - 20 μm in dimension. Domains exist within these crystals (Weiss domains) in which the molecular magnets are already aligned (ferrimagnetism). When a driving magnetic field (H) is applied to the material the domains progressively align with it, as shown in Fig.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. Also the shape of the hysteresis loop has a marked influence on other properties, for example. power losses.

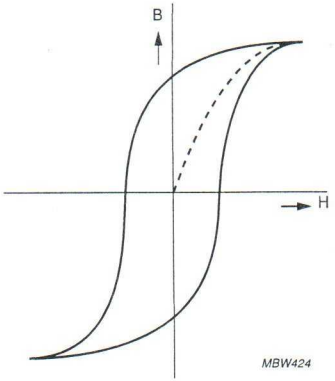


Fig.1 Hysteresis loop.

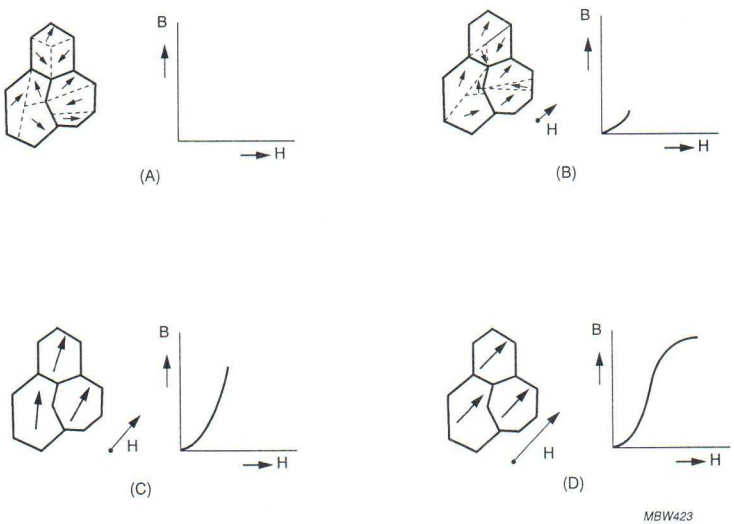


Fig.2 Alignment of domains.

EXPLANATION OF TERMS AND FORMULAS

Symbols and units

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

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.

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

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.

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

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

$$\frac{B}{H} = \mu_0 \mu_r \tag{3}$$

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.

$$\mu_i = \frac{1}{\mu_0} \cdot \frac{\Delta B}{\Delta H} \quad (\Delta H \rightarrow 0) \tag{4}$$

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.

$$\mu_e = \frac{\mu_i}{1 + \frac{G \cdot \mu_i}{l_e}} \tag{5}$$

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.

$$\mu_a = \frac{1}{\mu_0} \cdot \frac{\hat{B}}{\hat{H}} \tag{6}$$

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.

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

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.

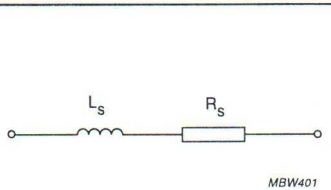


Fig.3 Series representation.

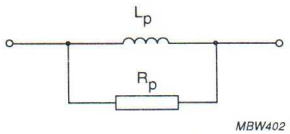


Fig.4 Parallel representation.

For series representation

$$\underline{Z} = j\omega L_s + R_s \qquad (8)$$

and for parallel representation,

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

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

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

The phase shift caused by magnetic losses is given by:

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

For calculations on inductors and also to characterise 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

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

Loss Factor

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

- hysteresis losses
- eddy current losses
- residual losses

This gives the formula:

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

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

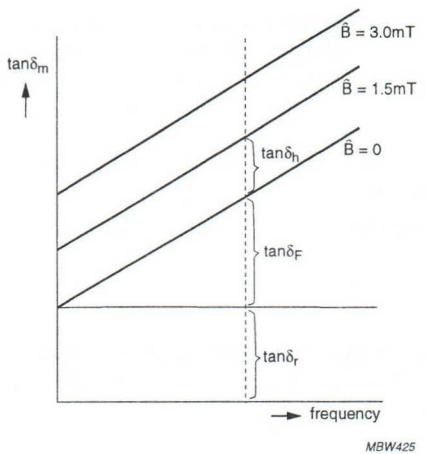


Fig.5 Magnetic losses ($\tan\delta_m$) as a function of frequency.

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:

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

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

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

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

$$(\tan\delta_m)_{gapped} = \frac{\tan\delta_m}{\mu_i} \cdot \mu_e \qquad (16)$$

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

$$(\tan\delta)_{gapped} = \frac{\tan\delta}{\mu_i} \cdot \mu_e \qquad (17)$$

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:

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

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:

$$\eta_B = \frac{\Delta \tan \delta_m}{\mu_e \cdot \Delta \hat{B}} \qquad (19)$$

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

$$\frac{\tan \delta_h}{\mu_e} = \eta_B \cdot \hat{B} \qquad (20)$$

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:

$$\frac{l_e}{\mu \cdot A_e} \qquad (21)$$

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

$$\frac{1}{\mu_e} \cdot \Sigma \frac{l}{A} \qquad (22)$$

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

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

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

for sine wave:

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

for square wave:

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

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):

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

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:

$$L = N^2 \cdot A_L \quad \text{(nH)} \qquad (27)$$

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

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

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.

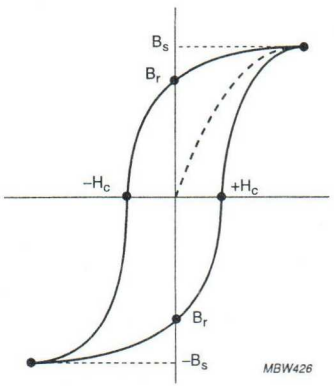


Fig.6 Typical BH curve showing points B_s, B_r and H_c.

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:

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

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

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

So α_F is defined as:

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

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

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

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:

$$D = \frac{\mu_1 - \mu_2}{\mu_1} \quad (33)$$

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

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

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:

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

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

$$\frac{L_1 - L_2}{L_1} = \mu_e \cdot D_F \quad (36)$$

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 - 10 Ωm for MnZn ferrites and 10^4 - 10^6 Ωm for NiZn an 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	$\approx 5.10^7$
20	$\approx 10^7$
60	$\approx 10^6$
100	$\approx 10^5$

At higher frequencies the crystal boundaries are more or less short-circuited by heir capacitance and the measured resistivity decreases, as shown in Table 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	$\approx 10^5$
1	$\approx 5.10^4$
10	$\approx 10^4$
100	$\approx 10^3$

PERMITTIVITY

The basic permittivity of all ferrites is of the order of 10. This is valid for MnZn and NiZn materials. Also the isolating material on the grain boundaries has a permittivity of approximately 10. However, if the bulk permittivity of a ferrite is measured, very different values of apparent permittivity result. This is caused by the conductivity inside the crystallites. The complicated network of more or less leaky capacitors also shows a strong frequency 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)	PERMITITVITY (ε_r)
0.1	$\approx 2.10^5$
1	$\approx 10^5$
10	$\approx 5.10^4$
100	$\approx 10^4$

Table 6. Permittivity as a function of frequency for NiZn ferrites

FREQUENCY (MHz)	PERMITITVITY (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 IEC367. A sampling system, in accordance with IEC 410 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 68-2-6 (test Fc):

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

Bump test, IEC 68-2-29 (test Eb)

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

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[1]

CORE TYPE	APPLICATION AREA	CLASSIFICATION OF FAULT				
		FAULT TYPE	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	0.4%	(II)	2.5%	(II)
		mechanical	0.4%	(II)	2.5%	(II)

Note

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

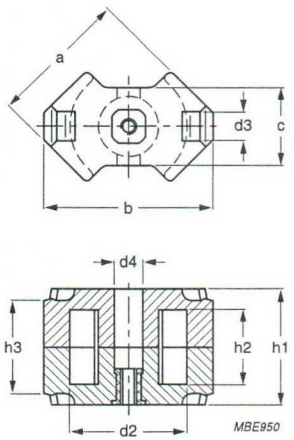


Fig.1 RM core.

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

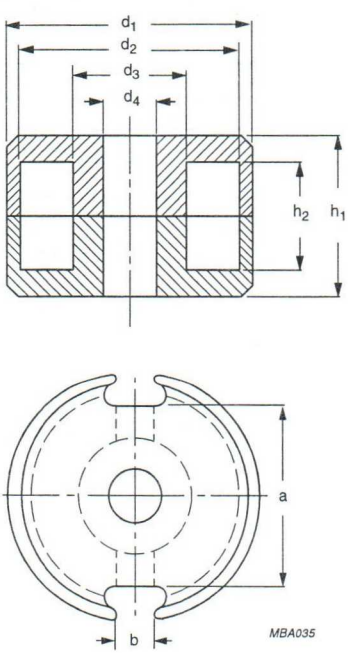


Fig.2 P core.

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

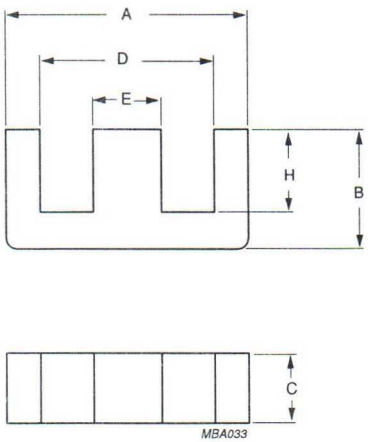


Fig.3 E core.

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

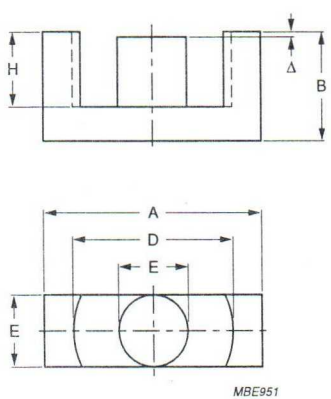


Fig.4 ETD core.

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

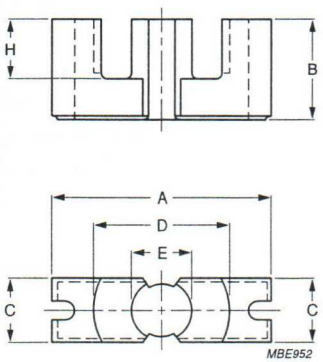


Fig.5 EC core.

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

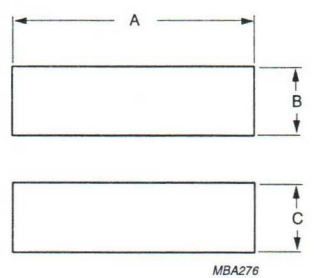


Fig.6 I core.

Classification of mechanical defects

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

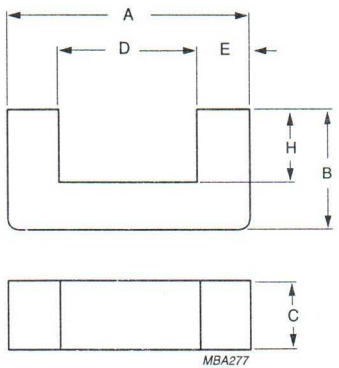


Fig.7 U core.

Classification of mechanical defects

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

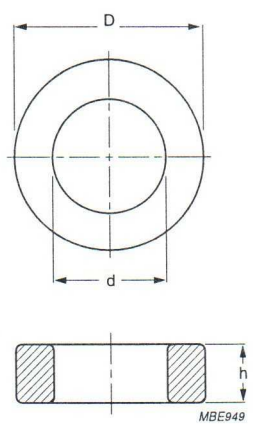


Fig.8 Ring cores.

Classification of mechanical defects

CORE TYPE	FIGURE	FAULT CLASSIFICATION	
		MAJOR	MINOR
ring cores	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

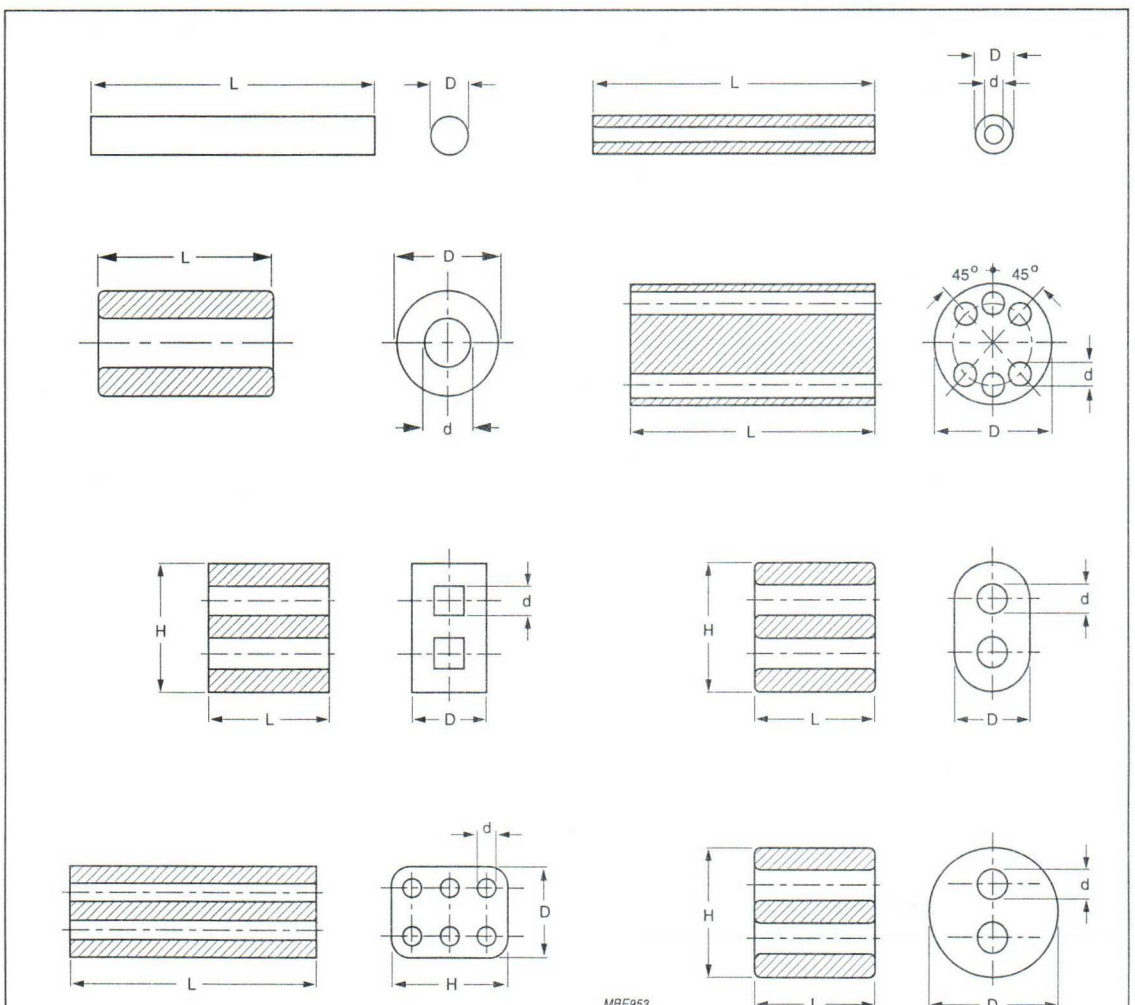


Fig.9 Rods, tubes, beads, multi-hole tubes.

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 extracted on a small scale.

In the event of a fire, dust particles with metal oxides will be formed.

Disposal with industrial waste, depending on local rules and circumstances.

ORDERING INFORMATION

For the first time our total capability in soft ferrites is presented in a single handbook. It comprises the ranges available from all manufacturing centres worldwide.The products in this handbook are identified by a type number. This type number is a human readable code and contains most important information about the product. All physical and technical properties of the product are described by this number. It is therefore recommended for ordering and for use on technical drawings and equipment parts lists.

The 11 digit code used in former editions of handbook MA01 and the part numbers used in USA catalogs are still valid for ordering of products. Our ordering desks will translate all requests into Philips 12 NC codes, which is the basis of our logistic system.

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

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

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

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

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: 4C6, 3D3, 3H1, 3H3, 3B9, 3B7.

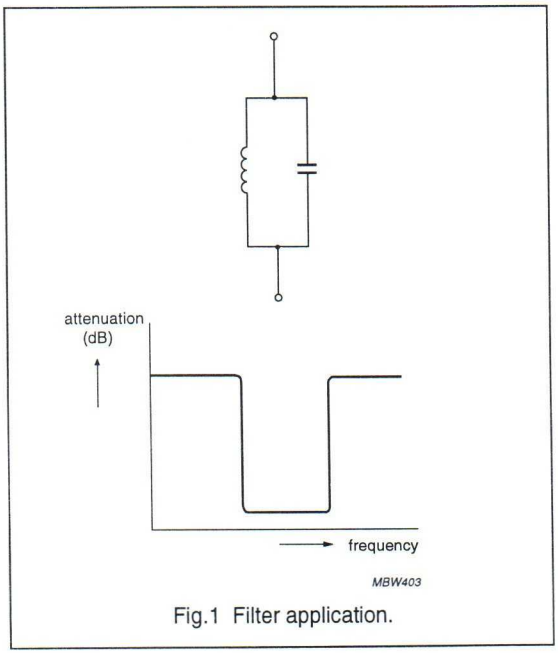


Fig.1 Filter application.

BLOCKING/SUPPRESSION/DECOUPLING

Unwanted high frequency signals are blocked, wanted signals can pass. With increasing use of electronic equipment it is of vital importance to prevent interfering signals from leaving their

Coupling and decoupling.

Material requirements

- High impedance in covered frequency range.

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

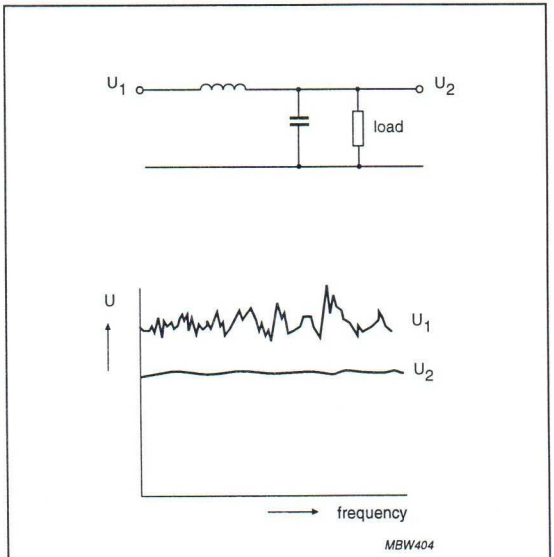


Fig.2 Blocking/suppression/decoupling application.

DELAYING PULSES

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

Material requirements:

- High permeability(μ_i).

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

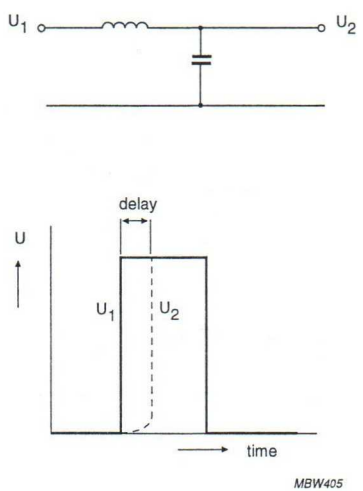


Fig.3 Pulse delay application.

SMOOTHING/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, 3C85, 3C90, 2P-iron powder grades.

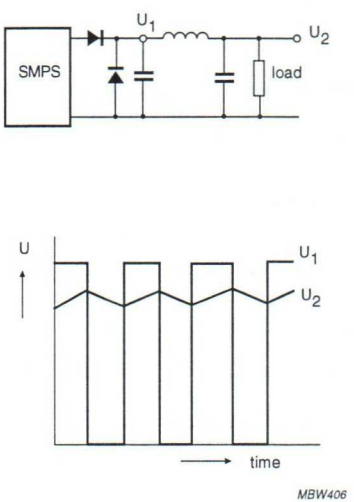


Fig.4 Smoothing/storage application.

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: 3B7, 3B8, 3C81, 3H1, 3E1, 3E4, 3E25, 3E5, 3E6.

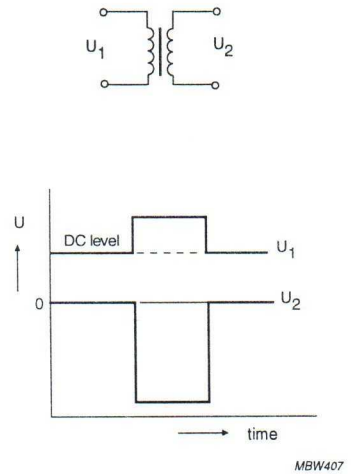


Fig.5 Pulse and general purpose transformer.

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, 3C81, 3C85, 3C90, 3F3, 3F4, 4F1.

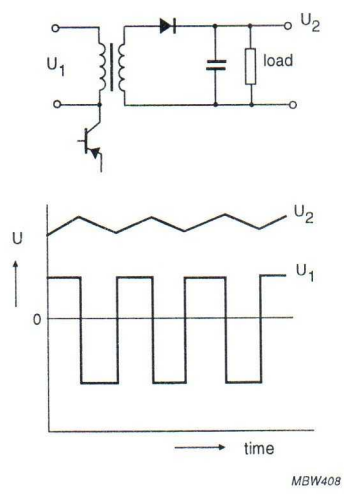


Fig.6 Power transformer application.

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, 1P-iron powder grades.

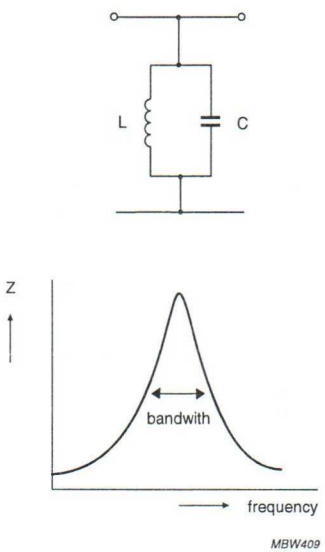


Fig.7 Tuning application.

Ferrites for telecommunication

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 coils
- Pulse and matching transformers.

FILTER COILS

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

The P core is the oldest design. It is still rather popular because the closed shape

provides excellent magneticscreening.

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

For filter coils, the following design parameters are important:

- 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 coils should generally be as high as possible. For this reason filter materials such as 3H1, 3B7, 3B9, 3H3, 3D3 and 4C6 have low magnetic losses in their frequency ranges (100 kHz, 2MHz and 10 MHz respectively).

Losses in a coil can be divided into:

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

$$\frac{R_{tot}}{L} = \frac{R_0}{L} + \frac{R_{ec}}{L} + \frac{R_d}{L} + \frac{R_h}{L} + \frac{R_{e+r}}{L} \quad (\Omega/H) \qquad (1)$$

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:

$$\frac{R_0}{L} = \frac{1}{\mu_e} \cdot \frac{1}{f_{Cu}} \cdot \text{constant} \quad (\Omega/H) \qquad (2)$$

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:

$$\frac{R_{ec}}{L} = \frac{C_{wCu} V_{Cu} f^2 d^2}{\mu_e} \quad (\Omega/H) \qquad (3)$$

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:

$$\frac{R_d}{L} = \omega^3 LC\left(\frac{2}{Q} + \tan\delta_c\right) \quad (\Omega/H) \qquad (4)$$

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:

$$\frac{R_h}{L} = \omega \eta_B \hat{B} \mu_e \quad (\Omega/H) \qquad (5)$$

Eddy-current and residual losses

The effective series resistance due to eddy-current and residual losses is calculated from the loss factor:

$$\frac{R_{e+r}}{L} = \omega \mu_e (\tan\delta/\mu_i) \quad (\Omega/H) \qquad (6)$$

COIL 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 adjustment
- Variability.

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

- Core size
- Material grade
- A_L value
- Type of conductor (solid or bunched)
- Type of adjuster.

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 3B7, 3B9, 3H1 or 3H3 material. Winding wire should be solid, with minimum-thickness insulation

  Note: high inductance factors are associated with high temperature coefficients of inductance
- Frequencies between 20 kHz and 200 kHz:
  high Q will generally be obtained with a core also in 3B7, 3B9, 3H1 or 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 constructors 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
- Frequencies between 2 MHz and 12 MH:
  use a core of 4C6. Bunched conductors of maximum strand diameter 0.04 mm are recommended for frequencies up to 5 MHz. Solid conductors should be used at frequencies between 5 MHz and 12 MHz.

SIGNAL LEVEL

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

The following expression for third harmonic voltage U_3 may be used as a guide to the amount of distortion.

$$\frac{U_3}{U_1} = 0.6 \tan \delta_h \qquad (7)$$

For low distortion, RM cores with small hysteresis loss factors should be used.

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.

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.

$$L = N^2 \cdot A_L \quad (nH) \qquad (8)$$

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

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

INDUCTANCE ADJUSTERS

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

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

INDUCTANCE STABILITY

The stability of a correctly assembled inductors depends mainly on the stability of the ferrite's permeability.

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

- Variation of permeability with temperature (temperature coefficient)
- Variation of permeability with time (disaccomodation)

Changes in inductance may also occur due to:

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

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

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

The change in inductance of an RM core assembly using clips with earth pins when subjected to IEC 68-2-6, test F_c (vibration conditions) is less than 1000.10^{-6}. Such severe conditions are unlikely to be encountered in practice.

Bump tests of RM-core assemblies with earth pins (IEC 68-2-29, test Eb) have also been carried out. The observed change in the inductance of RM6-R cores of 3H1 material was less than 300.10^{-6}.

Fig.8 shows the principle outline of a typical adjuster.

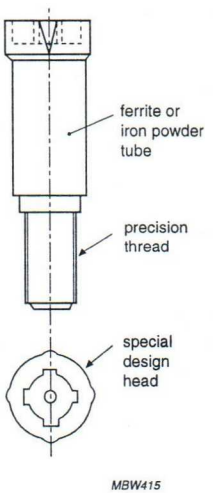


Fig.8 Inductance adjuster outline.

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

Fig.9 shows a typical curve of a specified adjuster in a core set, pre-adjusted on A_L.

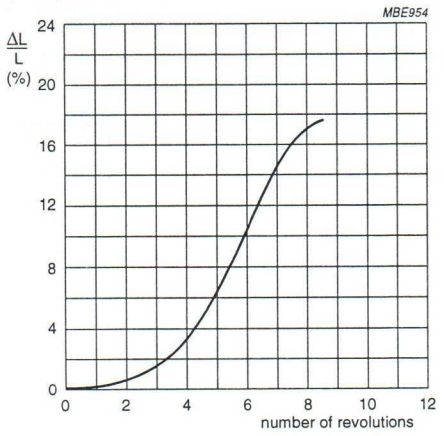


Fig.9 Typical curve of a specified adjuster in a core set, pre-adjusted on A_L.

Dependent on size, the screw-head of the adjuster is suited for tools of M1.4, M1,7 and M2,6. An adjusting tool, combining M1.4 and M1.7 is available (catalogue number 4322 058 0326) as well as a tool combining M2 and M2.6 (catalogue number 43222 058 9327). For customers who wish to make the adjuster tool themselves, the four outlines are depicted in Fig.10

The thread of both the nut and the adjuster have close tolerances (4H) to allow smooth rotation without backlash or friction.

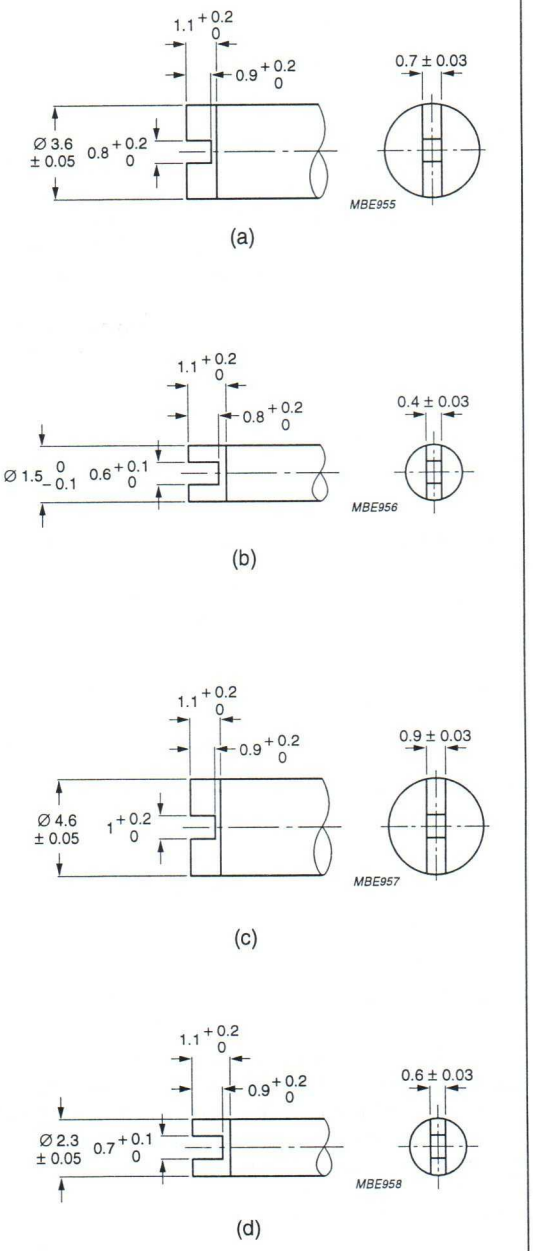


Fig.10 Dimensions of tools for adjusters.

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.

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

The principal function of the transformer core is to provide optimum coupling between the windings.

The general equivalent circuit of a signal transformer is shown in Fig.11.

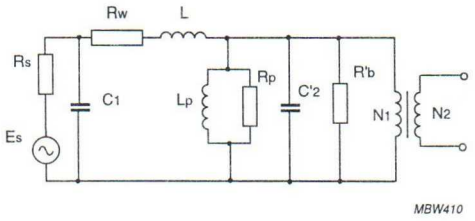


Fig.11 Simplified equivalent circuit of a transformer.

The elements of the circuit depicted in Fig.11 may be defined as follows:

E_s = source voltage

R_s = source resistance

R_w = total winding resistance = $R_1 + R_2'$ where R_1 is the primary winding resistance and R_2' is the secondary winding resistance referred to the primary

L = total leakage inductance = the primary inductance with the secondary shorted

L_p = open circuit inductance

R_p = the shunt loss resistance representing the core loss

N_1, N_2' = the primary and refereed secondary self or stray capacitance respectively

R_b' = load resistance referred to the primaryr = 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.12.

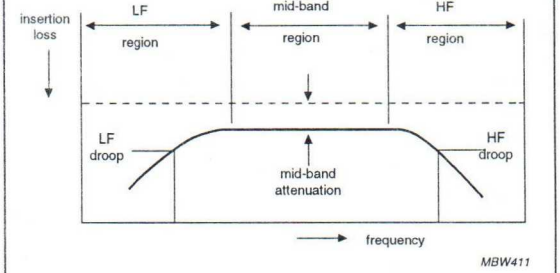


Fig.12 Transmission characteristic of a wideband transformer.

The corresponding distortion of a rectangular pulse by the same circuit is shown in Fig.13.

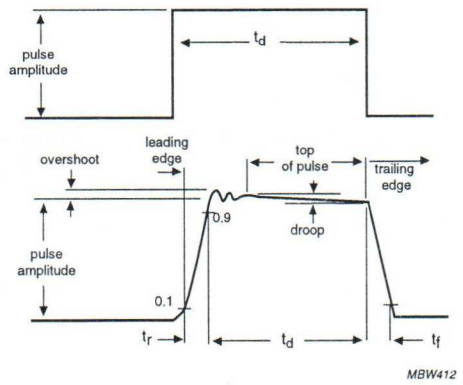


Fig.13 An ideal reactangular pulse and the main pulse distortions that may be introduced by a transformer.

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

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

The high frequency droop of an analogue transformer may be due to either the increasing series reactance of the leakage 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 are:

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

in the material grades 3E25, 3E1, 3E4, 3E5 and 3E6.

If the signal is superimposed on a DC current, core saturation my become a problem. In that case, a lower permeability material grade such as 3H1, 3B7, 3B8, 3C81 or 3C85 is recommended.

Ferrites for power conversion

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

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

Output chokes must tolerate high DC currents; this means a gapped magnetic circuit or a special material with 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 POWDER SUPPLY CIRCUITS

The basic arrangement of a Switched Mode Power Supply (SMPS) is shown in Fig.14.

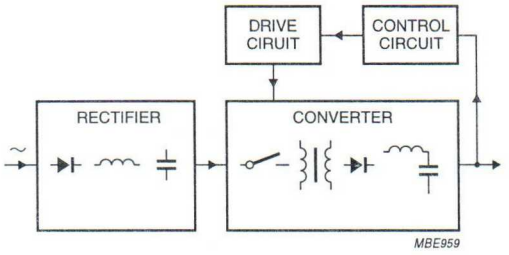


Fig.14 Block diagram of a Switched Mode Power Supply.

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

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

Fig.15 shows the basic circuit of a flyback converter and its associated waveforms.

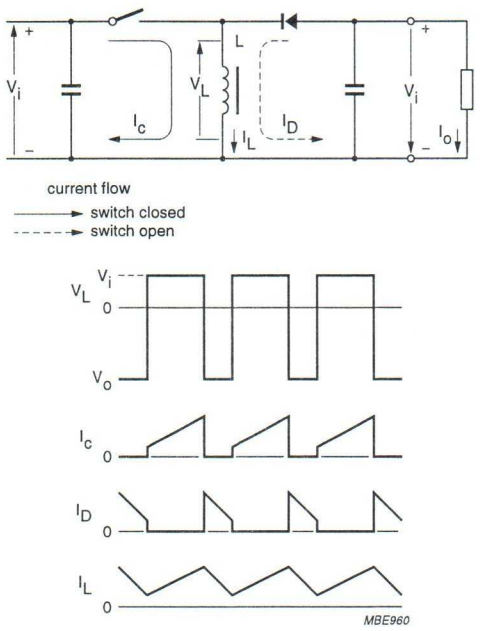


Fig.15 Basic circuit of a DC to DC flyback converter with associated waveforms.

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 basis circuit can be developed into a practical circuit using an inductor with two windings (see Fig.16).

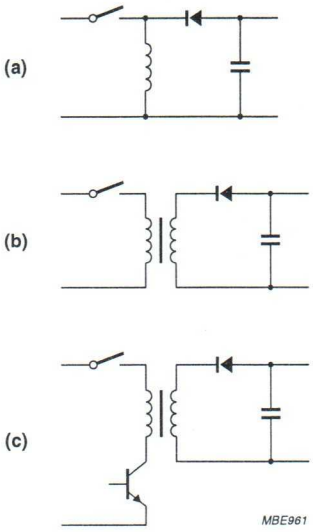


Fig.16 Practical flyback converter circuit.

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

Another advantage of the flyback converter is that no smoothing choke is required in the output circuit. This is important in high-voltage supplies and in power supplies with a number of output circuits (see Fig.17).

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.

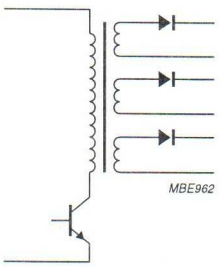


Fig.17 Multiple output flyback converter circuit.

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.18.

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.19.

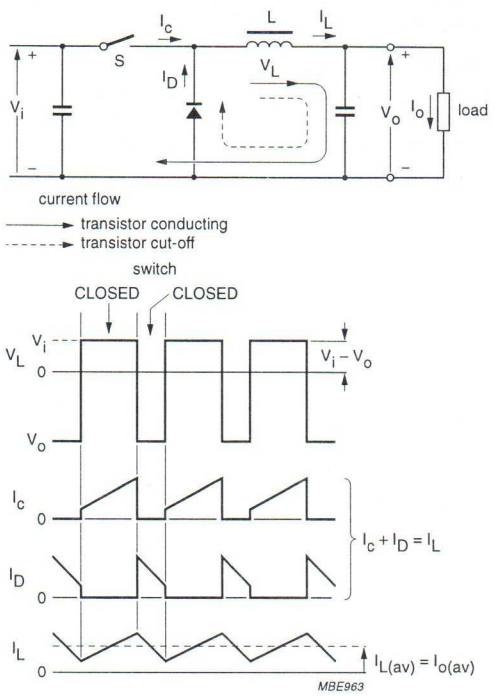


Fig.18 Basic circuit of a DC to DC forward converter with associated waveforms.

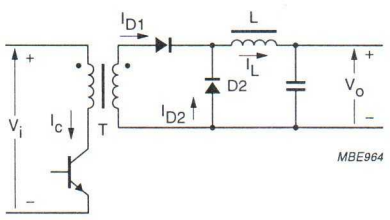
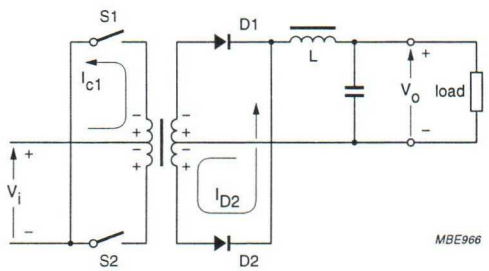


Fig.19 Forward converter with line isolation.

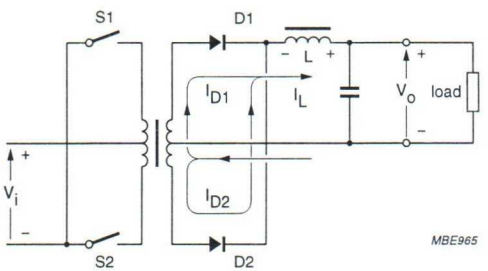
PUSH-PULL CONVERTER

The basic circuit of the push-pull converter, with voltage and current waveforms is shown in Fig.20.

The push-pull converter is an arrangement of two forward converters operating in antiphase (push-pull action). With switch S_1 closed (Fig.20a.) diode D_2 conducts and energy is simultaneously stored in the inductor and supplied to the load. With S_1 and S_2 open (Fig.20b), the energy stored in the inductor continues to support the load current via the parallel diodes D_1 and D_2, which are now acting as flywheel diodes. When switch S_2 closes (Fig.20c), diode D_1 continues to conduct, diode D_2 stops conducting and the process repeats itself.

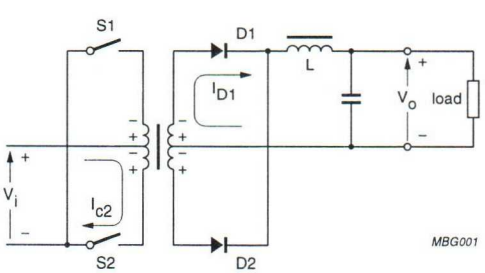


(a)

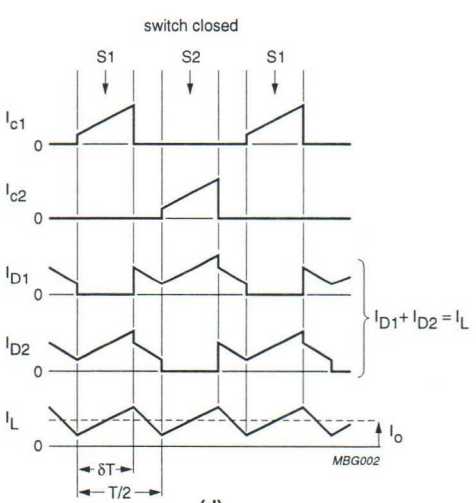


(b)

(b)



(c)



(d)

Fig.20 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.

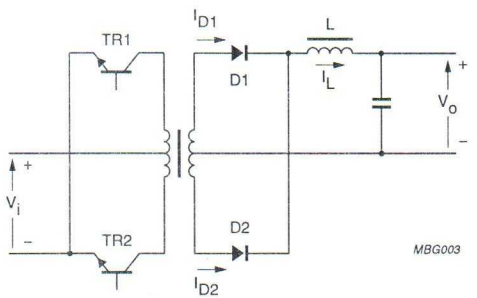


Fig.21 Conventional push-pull converter circuit.

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.22).

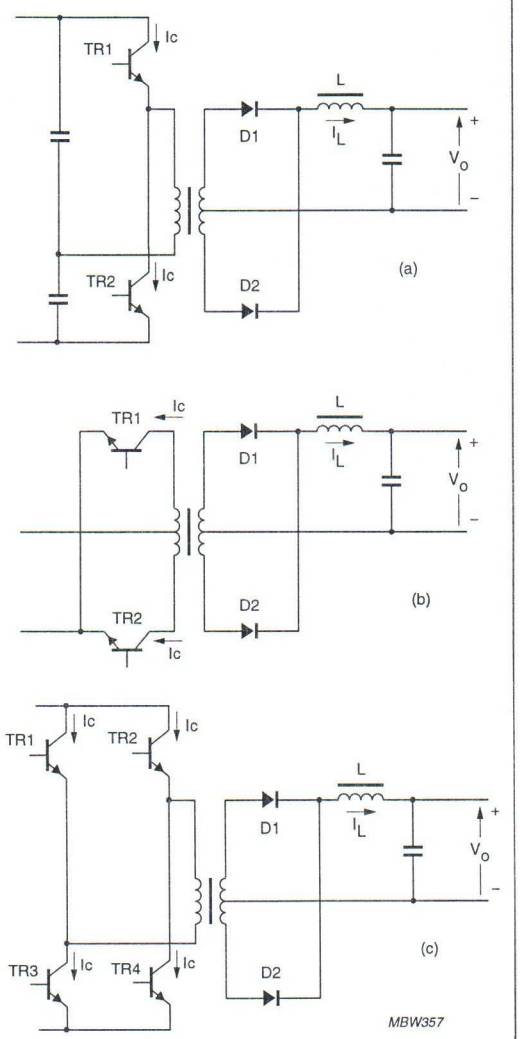


Fig.22 Several push-pull converter circuits.

Depending upon how the transformer primary is driven, it is possible to differentiate between single-ended (see Fig.22a), push-pull (see Fig.22b) and full-bridge circuits (see Fig.22c). Decisions on circuit details are determined by the transistor capabilities.

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.23 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.

"Converter design selection chart (I)" 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.

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.

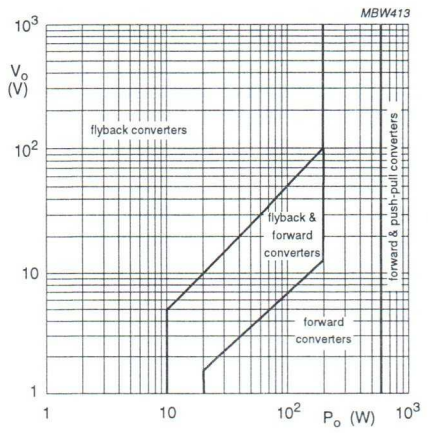


Fig.23 Converter circuit selection as a function of output voltage and throughput power.

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. "+" = Favorable; "0" = Average; "-" = Unfavorable.

CORE SELECTION

"Converter design selection chart(II)" shows which core type could be considered suitable for the different types of converter design.

Converter design selection chart(II)

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

Note

1. "+" = Favorable; "0" = Average; "-" = Unfavorable.

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.

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. "Power throughput for different core types (at 100 kHz switching frequency)" gives an overview of core types as a function of power throughput, and this may be useful to the designer for an initial selection.

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

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

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

Choice of ferrite grade for powder transformers

For a more detailed choice we have developed a computer selection program. It is available for the designer as part of the "Soft Ferrite Design Tools" disc (ordering code: 9398 402 12011). Also on this disc are programs for a complete initial winding design for the selected cores.

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

3C10:

Low frequency material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers

3C15:

Low frequency material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers

3C30:

Medium frequency material with improved saturation level. Suitable for flyback converters e.g. Line Output Transformers

3C80:

Low frequency material (<100 kHz) for power transformers.

3C85:

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

3C90:

Medium frequency (<200 kHz) material for industrial use. Lower losses than 3C85

3F3:

High frequency material (up to 700 kHz). Top material for modern high frequency designs.

3F4:

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

4F1:

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

Performance factor of power ferrites

The performance factor (f.B) is a measure of the power throughput that a ferrite core can handle at a loss level of 300 mW/cm^3. This level is considered to be acceptable for a good medium size transformer design. From the graph it is clear that for low frequencies there is not much difference between the grades, because the cores are saturation limited. At higher frequencies, the differences between the grades increase. There is an optimum operating frequency for each material grade. It is evident that in order to increase power throughput or power density a high operating frequency and a better ferrite should be chosen.

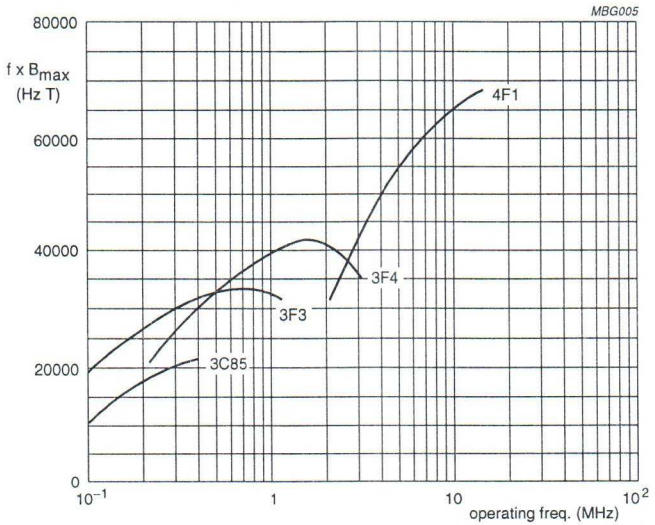


Fig.24 Performance factor (f¥Bmax) as a function of frequency for material grades 3C80, 3C85, 3F3, 3F4 and 4F1.

OUTPUT CHOKES

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

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

There are two remedies against this effect:

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

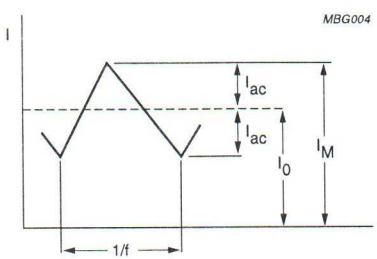


Fig.25 Choke waveform.

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 for most core types, the proper core and air-gap can be selected quickly at a glance. There is a choke design program on the disc "Soft Ferrite Design Tools" (9398 402 12011) for a more detailed design, including the required number of turns. This program also covers design of inductors on open magnetic circuits like bobbin cores and rods.

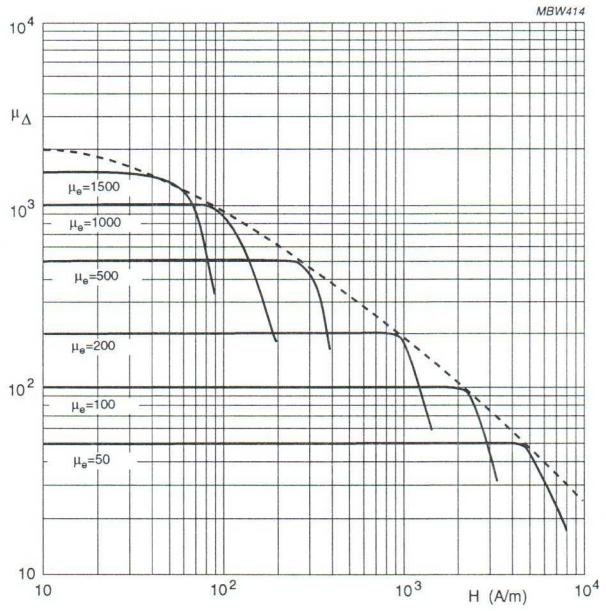


Fig.26 Effect of increased gap length.

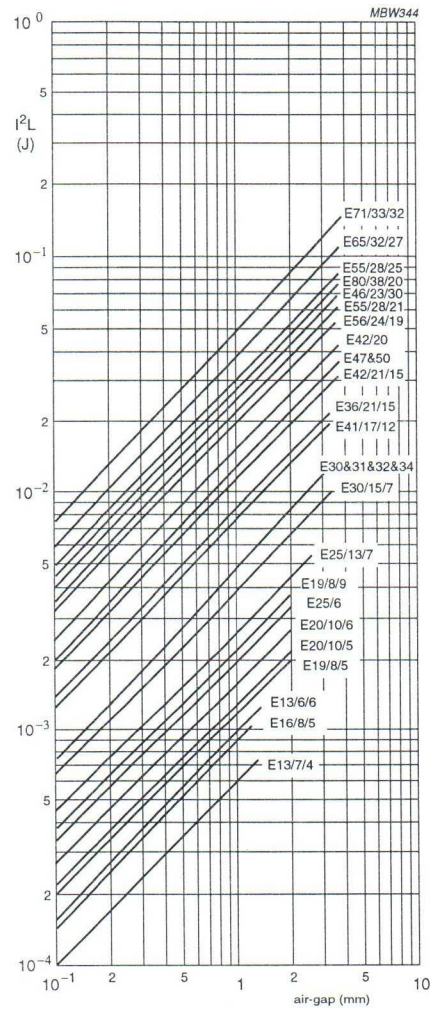


Fig.27 I^2L graph for E cores.

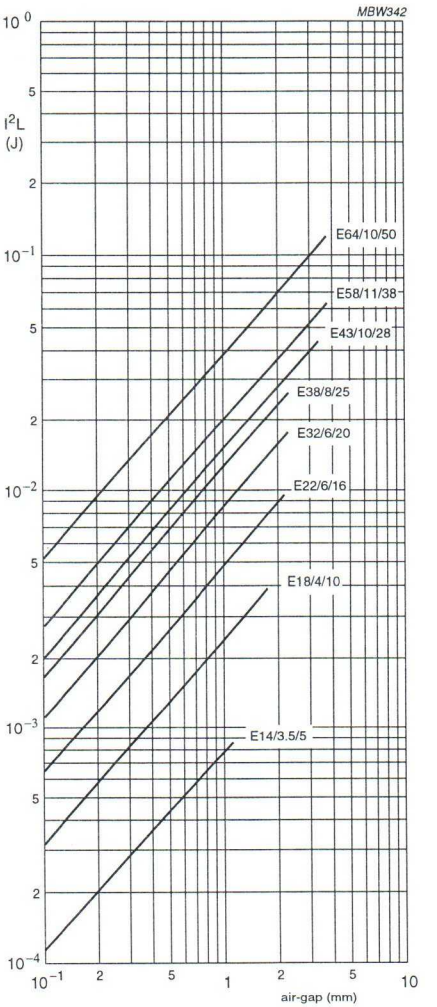


Fig.28 I^2L graph for planar E cores.

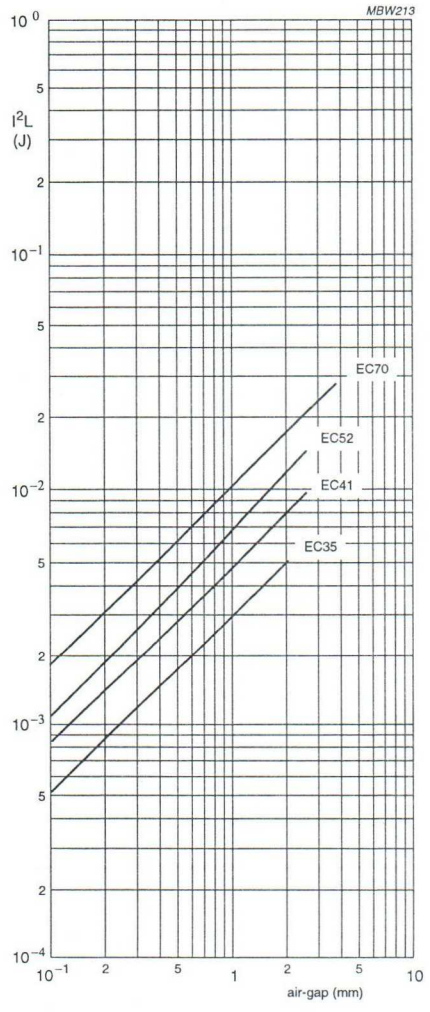


Fig.29 I^2L graph for EC cores.

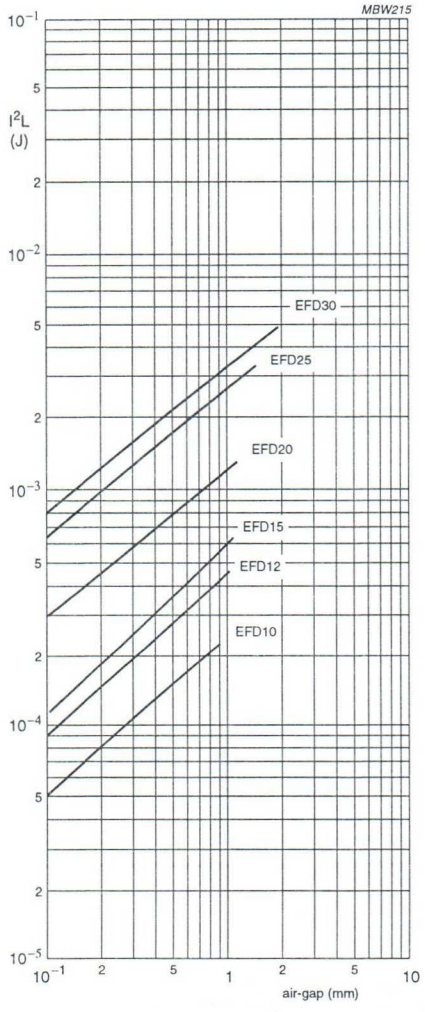


Fig.30 I^2L graph for EFD cores.

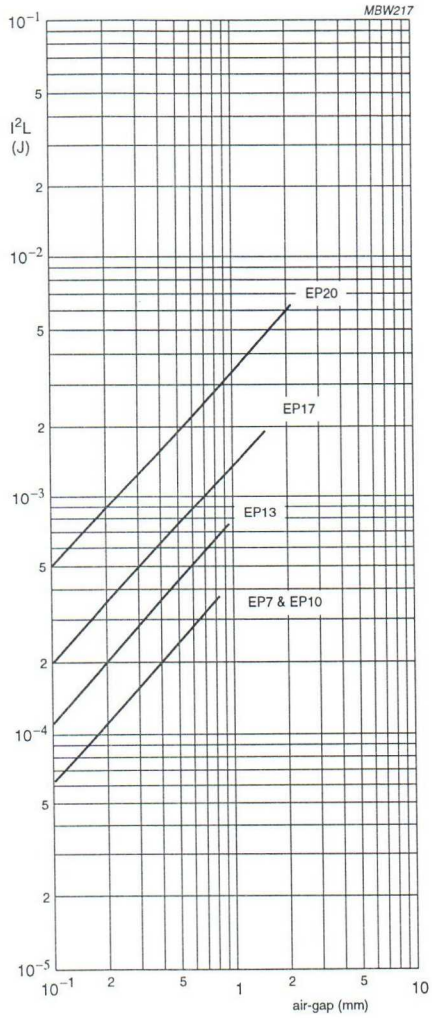


Fig.31 I^2L graph for EP cores.

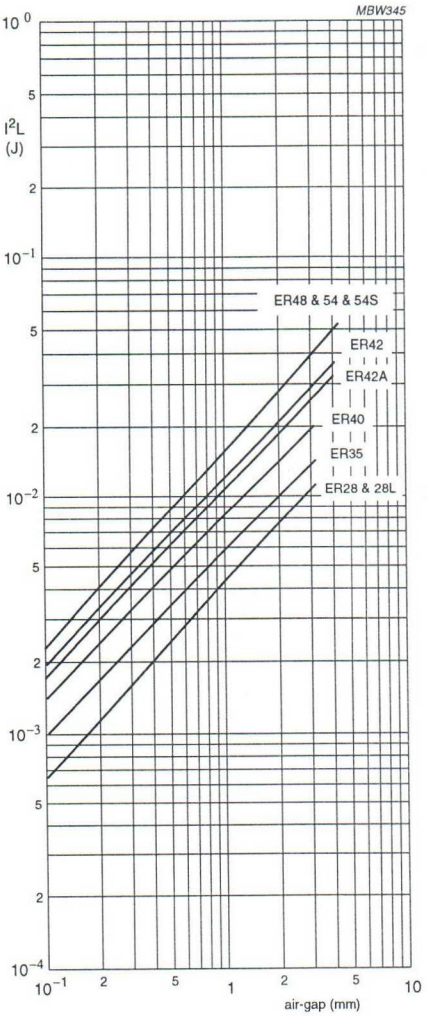


Fig.32 I^2L graph for ER cores.

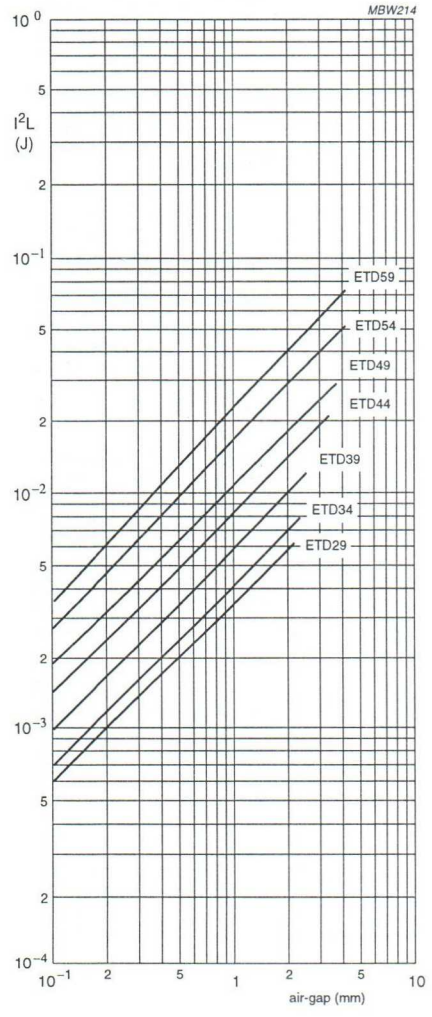


Fig.33 I^2L graph for ETD cores.

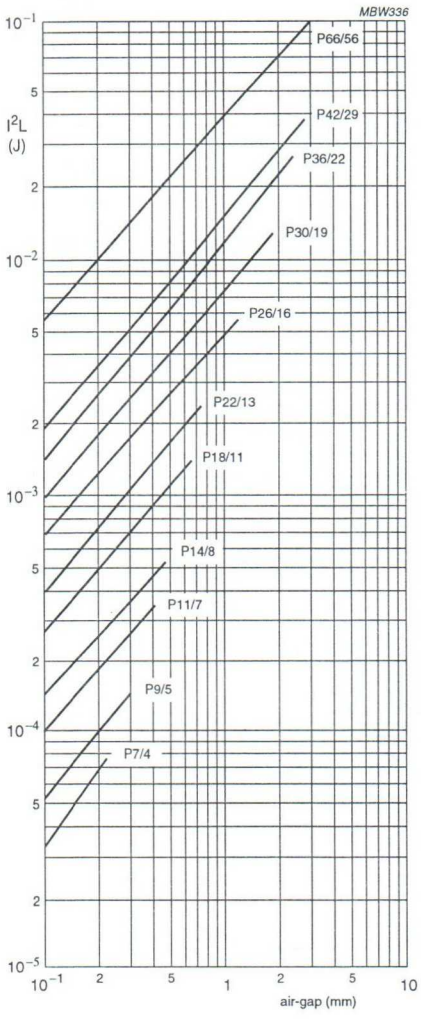


Fig.34 I^2L graph for P cores.

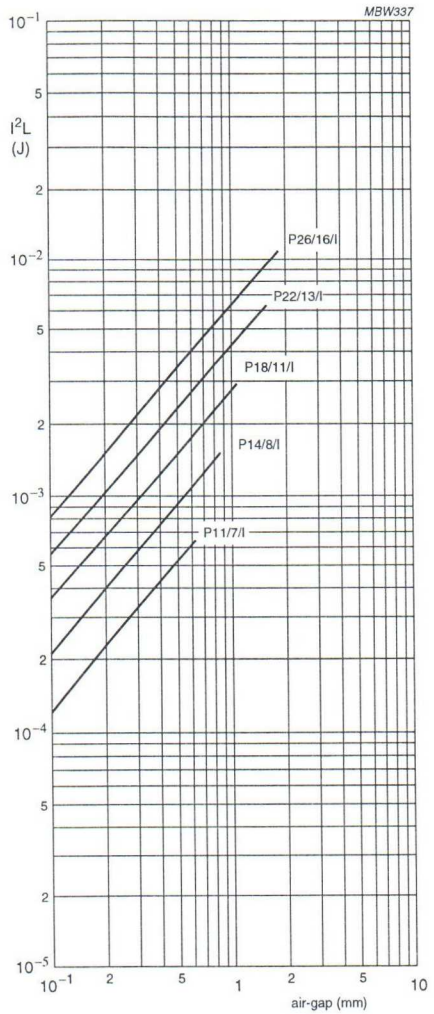


Fig.35 I^2L graph for P/I cores.

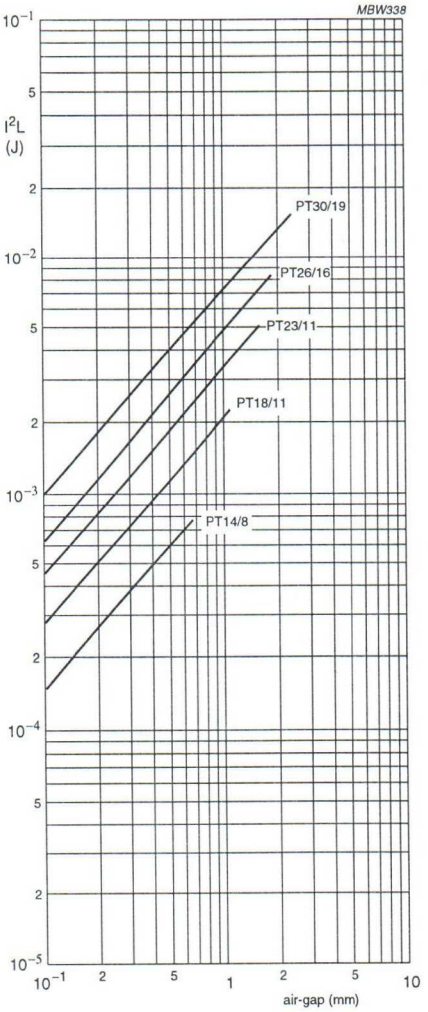


Fig.36 I^2L graph for PT cores.

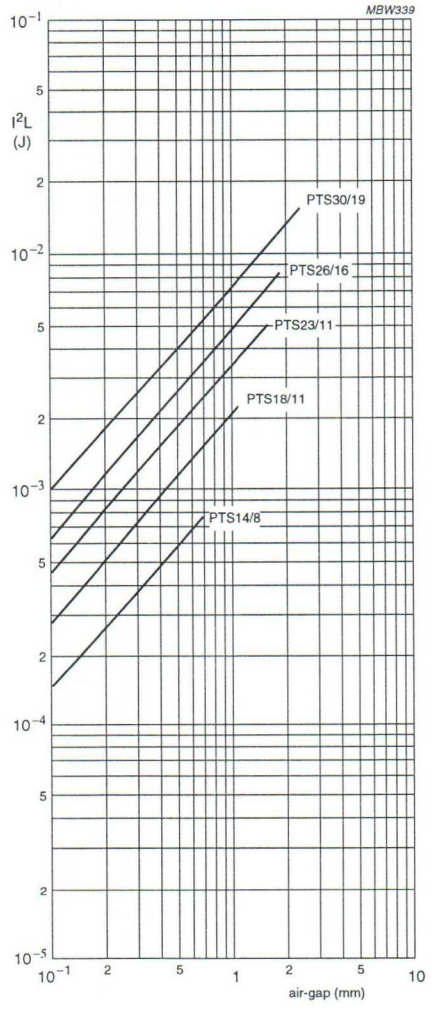


Fig.37 I^2L graph for PTS cores.

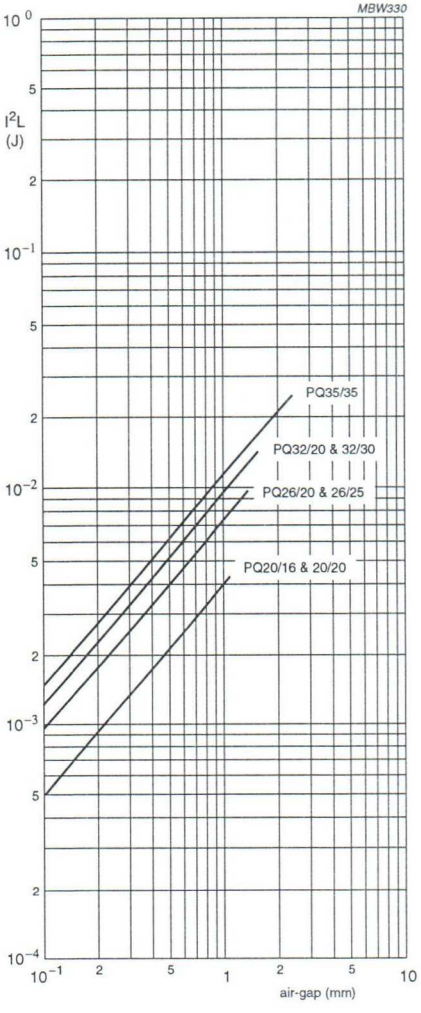


Fig.38 I^2L graph for PQ cores.

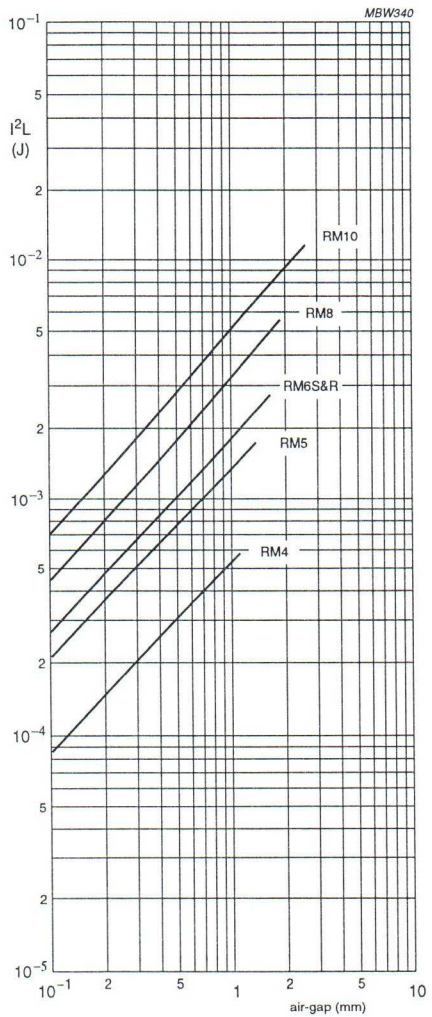


Fig.39 I^2L graph for RM cores.

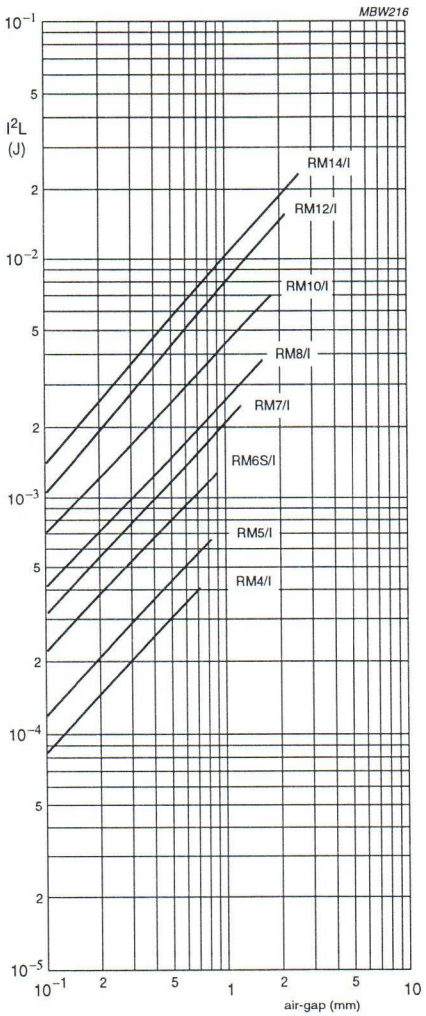


Fig.40 I^2L graph for RM/I cores.

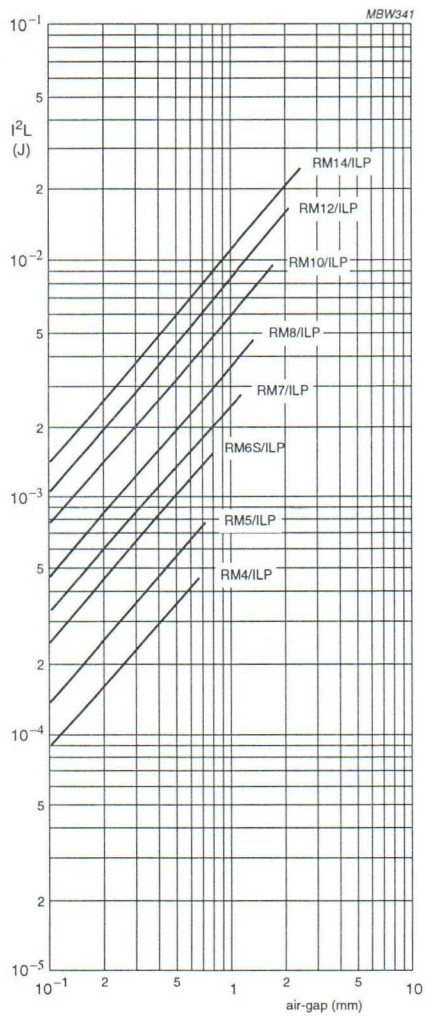


Fig.41 I^2L graph for RM/ILP cores.

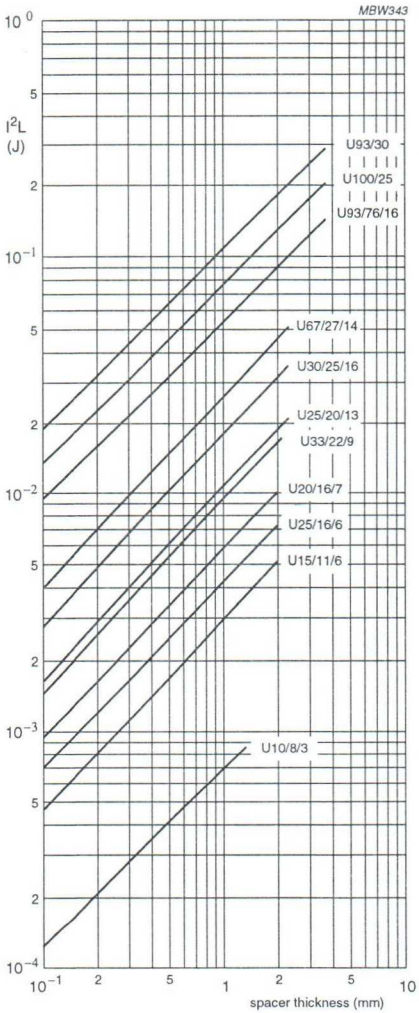


Fig.42 I^2L graph for U cores.

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 act 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 (CURRENT COMPENSATED CHOKES)

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

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

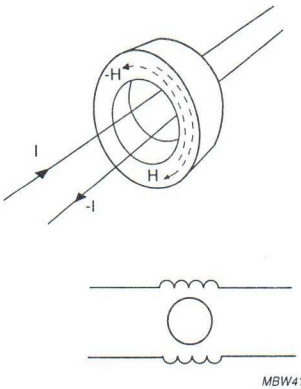


Fig.43 Current compensated choke.

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

If, for some reason, current compensation is not complete or impossible, high permeability grades will saturate. In that case one of the power grades may be a better compromise. Another important factor in the design process is the frequency range of the interference signal.

High permeability ferrites have a limited bandwidth as can be seen from Fig.44.

These grades only preform well as an inductance below the frequency where ferromagnetic resonance occurs. Above this cut-off frequency, a coil will have a highly resistive character and the Q-factor of the LC filter circuit will be limited an thus, also the impedance. A better result could have been obtained with a grade having a lower permeability. Fig.45 provides a quick method of choosing the right ferrite grade for the job. A design program for a complete current-compensated input filter is provided on our "Soft Ferrite Design Tools" disc (9398 402 12011).

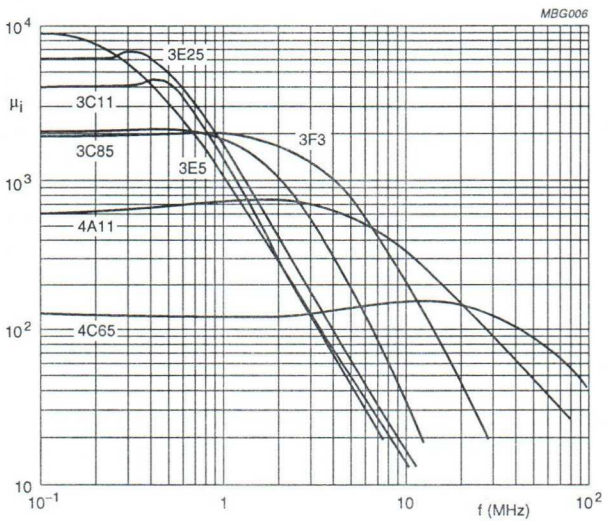


Fig.44 Permeability as a function of frequency of different material grades.

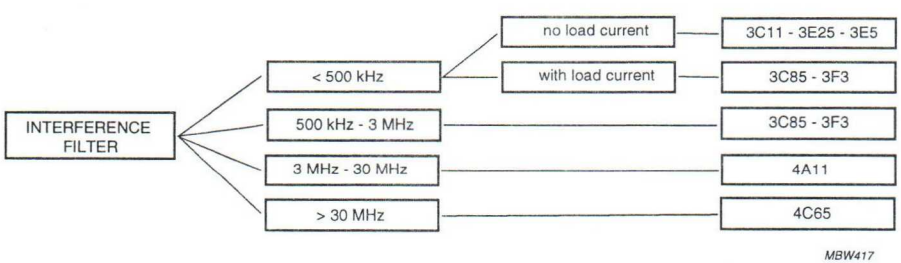


Fig.45 Selection chart for materials used in input filters.

MAGNETIC REGULATORS

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

A schematic of a saturable inductor circuit (without regulation) together with associated waveforms is shown in Fig.46.

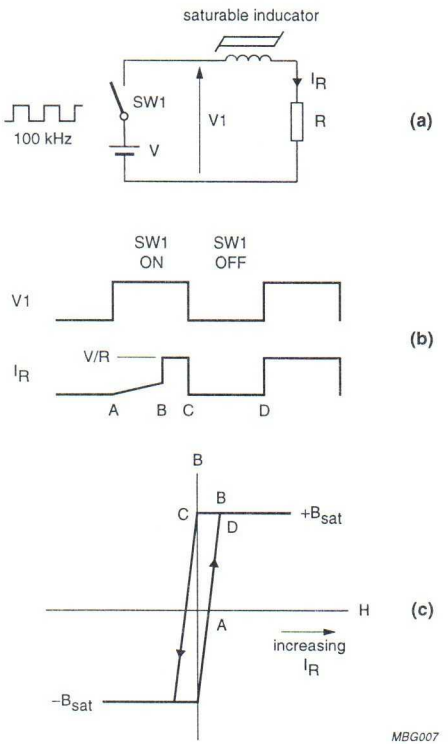


Fig.46 Schematic of a saturable inductor and associated waveforms (without regulation).

TYPICAL CYCLE CHARACTERISTICS

During a typical cycle:

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

A schematic of a regulated circuit and its associated waveforms is shown in Fig.47.

In this circuit, the inductor is saturated while switch SW1 is closed, thus reducing the period during which energy is conducted from the transformer to the load. Varying the level of this control current modulates the main output voltage waveform (see Fig.48), thus regulating the output voltage across the load.

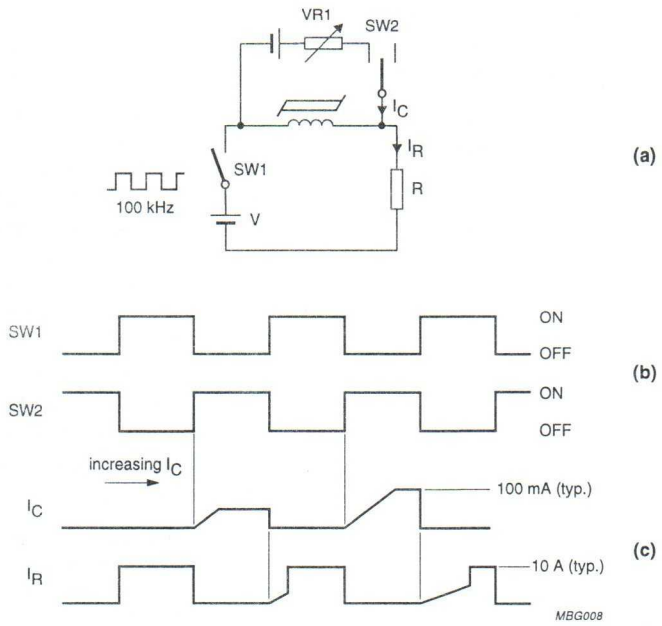


Fig.47 Schematic of a saturable inductor and associated waveforms (with regulation).

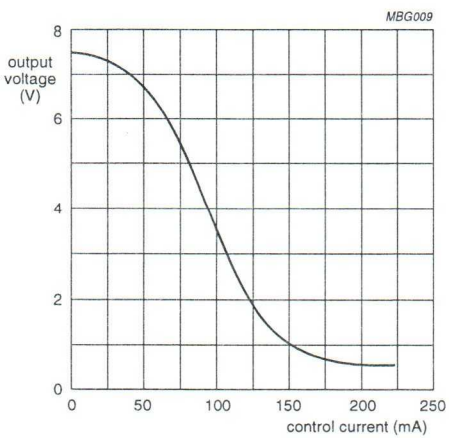


Fig.48 Typical control curve for a 3R1 ring core (size 14 × 9 × mm, with 15 turns).

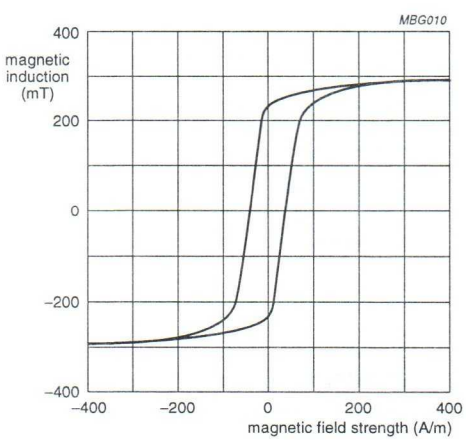


Fig.49 Properties of 3R1 ferrite material; f = 100 kHz, T = 25°C

The 3R1 ferrite material is an excellent alternative to amorphous metal for the cores of saturable inductors of SMPS.

Remark:

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

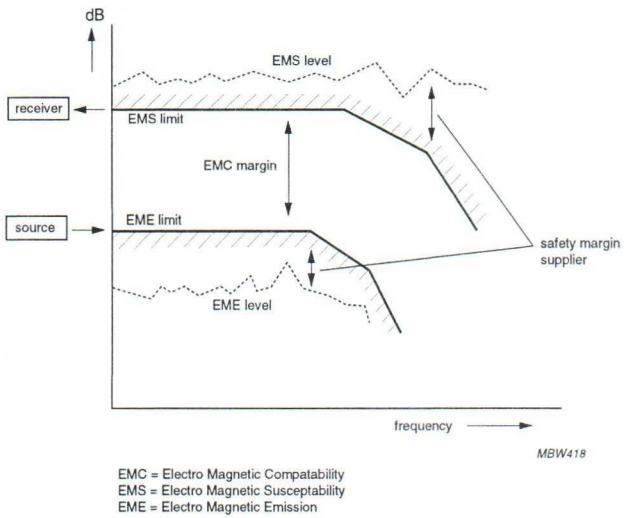
D_o = outside diameter (mm)

D_i = inside diameter (mm)

Ferrites for Interference Suppression and 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 (EMR) 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.



EMC = Electro Magnetic Compatability
EMS = Electro Magnetic Susceptability
EME = Electro Magnetic Emission

Fig.50 Principles of Electromagnetic Compatability (EMC).

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.51.

Capacitors are used as a shunt impedance for the unwanted signal.

Unfortunately for high frequencies, most capacitors do not have the low impedance one might expect because of parasitic inductance or resistance.

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

Philips have a full range of ring cores, 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.

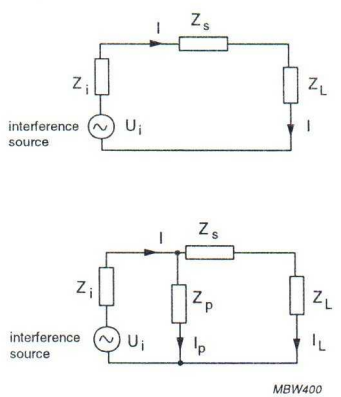


Fig.51 Basic suppression circuits.

SAMPLE BOXES

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

- Sample box 1: ferrite ring cores for mains, filters and pulse transformers.
- Sample box 2: soft magnetic cores for switched mode power supplies
- Sample box 3: iron powder cores for output chokes and EMI-suppresion
- Sample box 4: ferrite cores for EMI-suppression and impedance matching
- Sample box 5: wired and SMD ferrites for EMI-suppression
- Sample box 6: ferrite rods for EMI-suppresion.

INTERFERENCE SUPPRESSION BEADS

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

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

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

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

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 52 and 53).

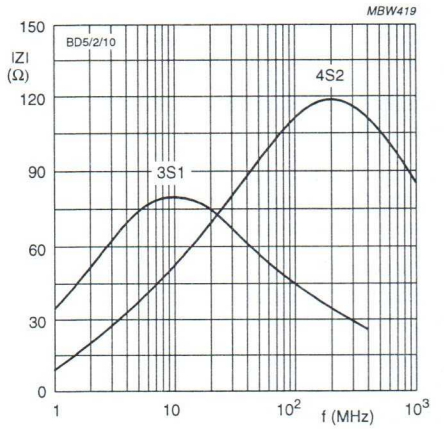


Fig.52 Impedance as a function of frequency for material grades 3S1 and 4S2; bead size 5 × 2 × 10 mm.

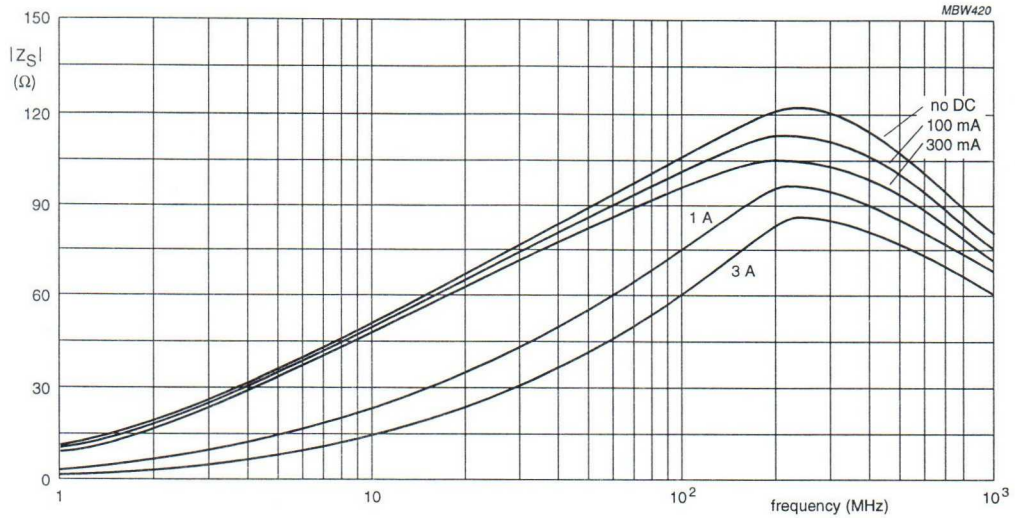


Fig.53 Impedance as a function of frequency at different DC levels for material grade 4S2.

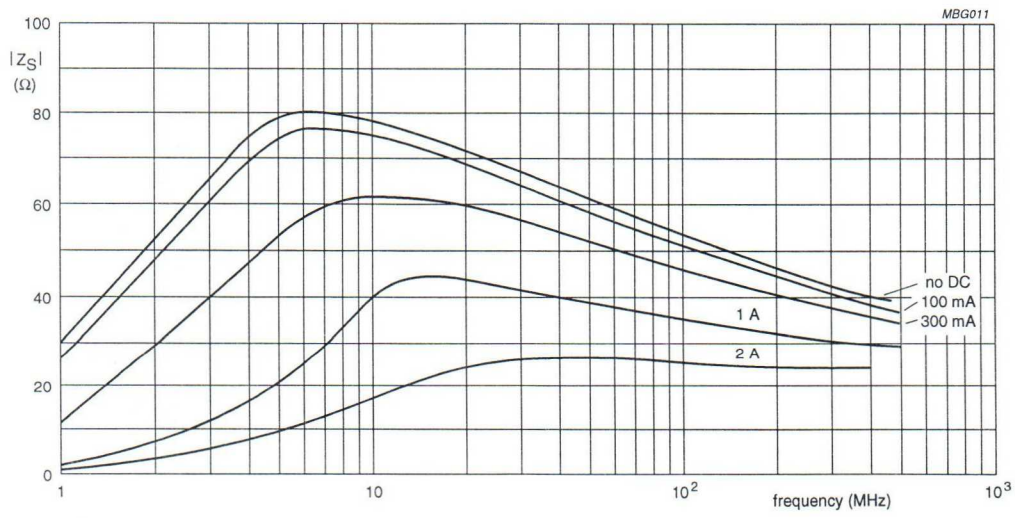


Fig.54 Impedance as a function of frequency at different DC levels for material grade 3S1.

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.

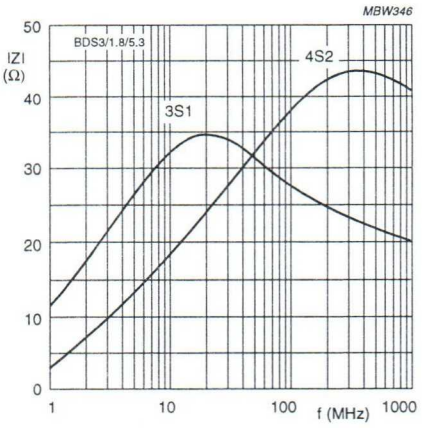


Fig.55 Impedance as a function of frequency for SMD beads..

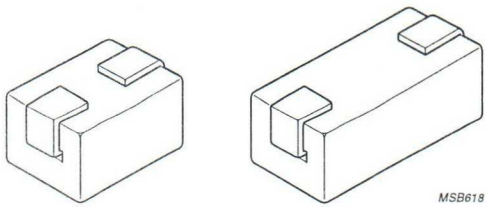


Fig.56 Outline of SMD beads.

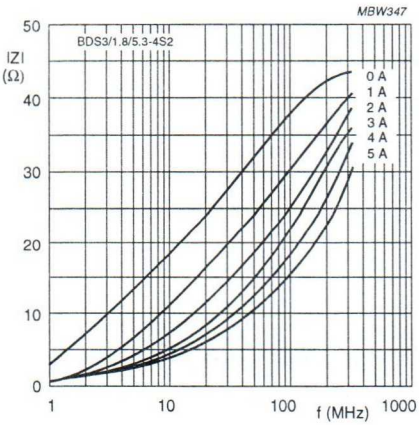


Fig.57 Impedance as a function of frequency for an SMD bead with bias current as a parameter.

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 (a 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.

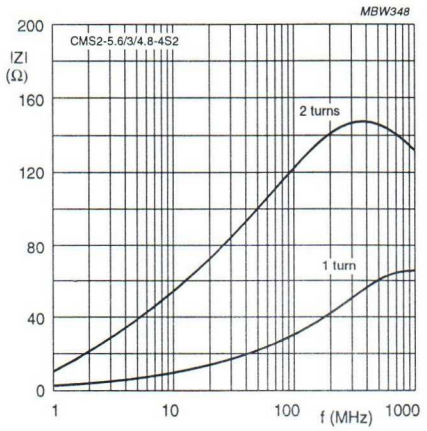


Fig.58 Impedance as a function of frequency of an SMD common mode bead with two conductors.

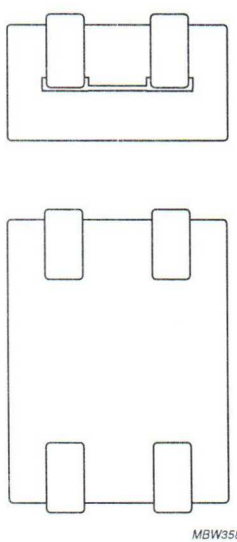


Fig.59 Outline of an SMD common-mode choke.

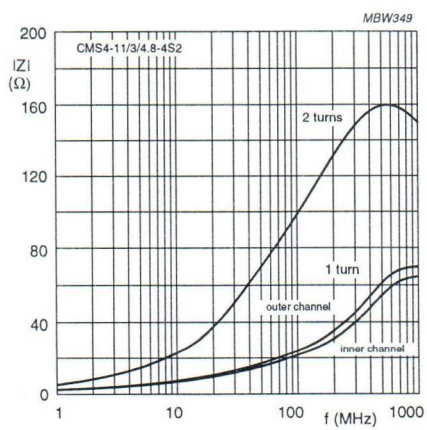


Fig.60 Impedance as a function of frequency of an SMD common mode bead with four conductors.

WIDEBAND CHOKES

Wideband chokes are wired multi-hole beads. Since they have up to 2 1/2 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.

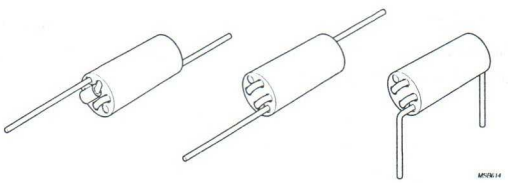


Fig.61 Outline of wideband chokes.

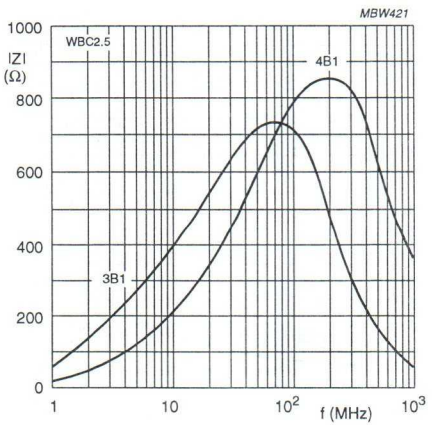


Fig.62 Impedance as a function of frequency for a wideband choke.

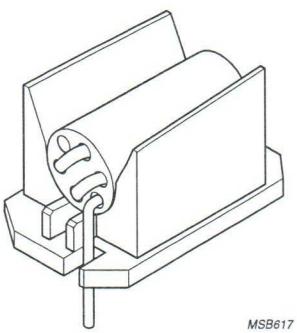


Fig.63 Outline of a wideband choke with support plate.

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.

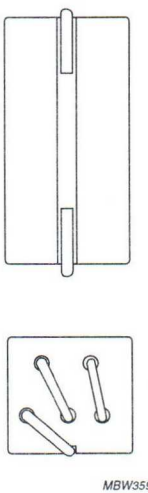


Fig.64 Outline of an SMD wideband choke.

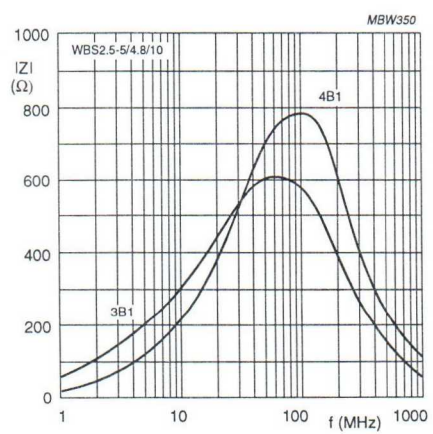


Fig.65 Impedance as a function of frequency for SMD wideband chokes.

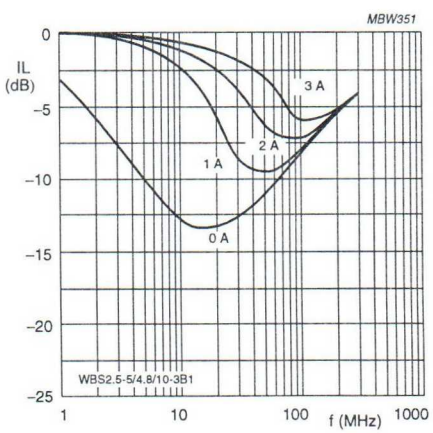


Fig.66 Insertion loss of a 3B1 SMD wideband choke as a function of frequency (50Ω circuit).

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 grade 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.

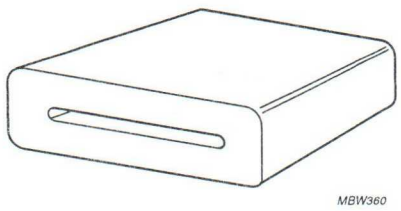


Fig.67 Outline of a cable shield.

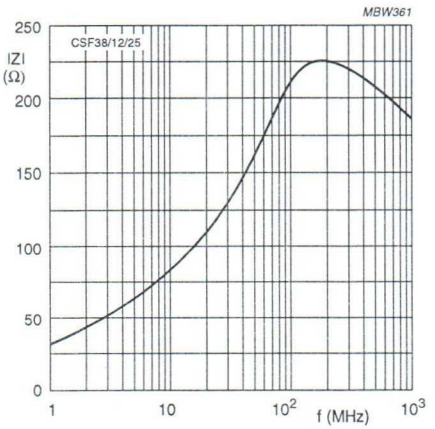


Fig.68 Impedance of a cable shield as a function of frequency

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.69) 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:

$$L = \mu_0 \mu_{rod} \frac{N^2 A}{l} (H) \quad (9)$$

where:

N = number of turns

A = cross sectional area of rod

l = length of coil

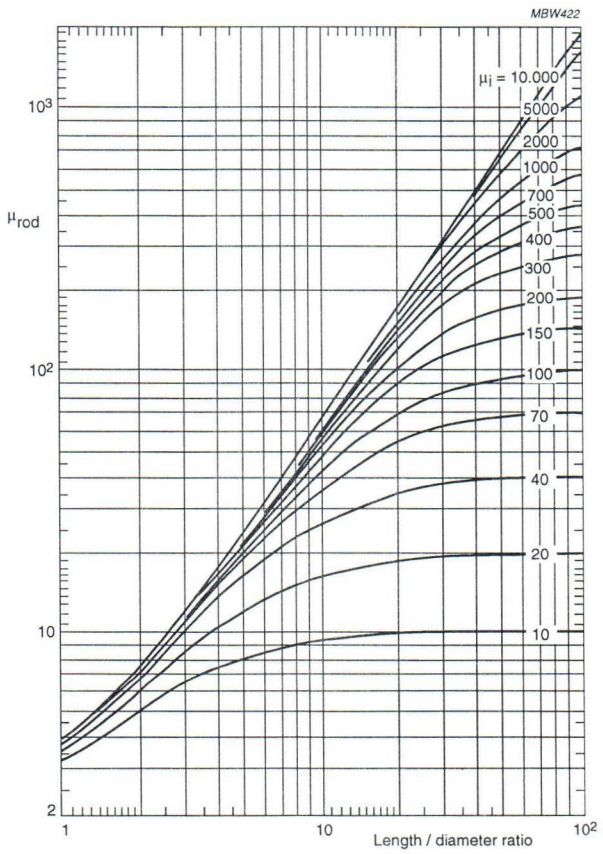


Fig.69 Rod permeability (μ_{rod}) as a function of length to diameter ratio with material permeability as a parameter.

Philips Components Application Literature

9398 082 97011	Loss formulas for power ferrites and their use in transformer design
9398 074 80011	Application note on the design of low profile high frequency transformers
9398 083 05011	The use of soft ferrites for interference suppression
9398 069 70011	EFD for low-profile DC-DC converters
9398 080 00011	3F4 ferrite for MHz power conversion
9398 235 82011	SMD coil formers and cores
9398 235 68011	SMD beads and chokes
9398 235 69011	3S4 a new soft ferrite for EMI-suppression
9398 387 00011	Wideband chokes
9398 075 00011	3R1 ferrite ring cores in magnetic amplifiers
9398 973 30011	Calculation program for 3R1 saturable inductors (disc)
9398 236 01011	3C90 and 3C30, new low-loss power ferrites
9398 402 12011	Soft ferrite design tools (disc)

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

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

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 which are not subjected to external stresses. Products generally do not fully comply with the material specification. Deviations may occur due to shape, size and grinding operations etc.
Specified product properties are given in the data sheets or product drawings.

FERRITE MATERIALS SURVEY

FERRITE MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	T_C	ρ (Ωm)	FERRITE TYPE	MAIN APPLICATION AREA	AVAILABLE CORE SHAPES
4C6	100	≈400	≥350	≈10^5	NiZn	telecom filters signal transformers pulse transformers delay lines	RM, P, PT, PTS, EP, H, E, ER, ring cores (toroids)
3D3	750	≈400	≥200	≈2	MnZn		
3B7	2300	≈450	≥170	≈1	MnZn		
3B9	1800	≈400	≥145	≈1	MnZn		
3H1	2300	≈400	≥130	≈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		
3E6	12000	≈400	≥130	≈0.1	MnZn		
3E7	15000	≈400	≥130	≈0.1	MnZn		
3E25	6000	≈400	≥125	≈0.5	MnZn		
3E27	6000	≈480	≥175	≈0.5	MnZn		
3B8	2300	≈450	≥200	≈1	MnZn	power conversion general purpose transformers	E, EC, EFD, EP, ETD, ER, U, UR, I, RM, RM/I, P, P/I, PT, PTS, PQ, ring cores (toroids)
3C10	1800	≈500	≥190	≈1	MnZn		
3C15	1800	≈500	≥190	≈1	MnZn		
3C30	1800	≈500	≥220	≈2	MnZn		
3C80	2000	≈450	≥200	≈1	MnZn		
3C81	2000	≈450	210	≈1	MnZn		
3C85	2000	≈450	≥200	≈2	MnZn		
3C90	2000	≈450	≥220	≈5	MnZn		
3F3	1800	≈450	≥200	≈2	MnZn		
3F4	900	≈450	≥220	≈10	MnZn		
4F1	80	≈350	≥260	≈10^5	NiZn		
3S1	4000	≈400	≥125	≈1	MnZn	EMI-suppression	EMI beads, beads on wire, SMD beads, common-mode beads, cable shields, rods, ring cores (toroids)
3S3	350	≈350	≥225	≈10^4	MnZn		
3S4	1700	≈350	≥110	≈10^3	MnZn		
4S2	700	≈350	≥125	≈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		
3E27	6000	≈480	≥175	≈0.5	MnZn		
3C2	900	≈400	≥150	≈0.1	MnZn	deflection coils	yoke rings
2A2	350	≈250	≥135	≈10^6	MgZn		
2B1	350	≈250	≥125	≈10^6	MgZn		
4E1	15	≈200	≥500	≈10^5	NiZn	tuning EMI-suppression	rods, tubes, wideband chokes
4D2	60	≈240	≥400	≈10^5	NiZn		
4B1	250	≈350	≥250	≈10^5	NiZn		
3B1	900	≈400	≥150	≈0.2	MnZn		
3R1	800	≈450	≥230	≈10^3	MnZn	magnetic regulators	ring cores (toroids)

Material grade specification 1P..

Material grade specification - 1P04

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	4 ±10%	
$\tan\delta/\mu_i$	25 °C; 3MHz; 0.1 mT 25 °C; 100MHz; 0.1 mT	$\approx 800 \times 10^{-6}$ $\approx 3000 \times 10^{-6}$	
α_F	25 to 55 °C	$\approx 10 \times 10^{-6}$	K^{-1}
T_{max}		130	°C

Material grade specification - 1P11

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	11 ±10%	
$\tan\delta/\mu_i$	25 °C; 1MHz; 0.1 mT 25 °C; 50MHz; 0.1 mT	$\approx 350 \times 10^{-6}$ $\approx 2000 \times 10^{-6}$	
α_F	25 to 55 °C	$\approx 15 \times 10^{-6}$	K^{-1}
T_{max}		130	°C

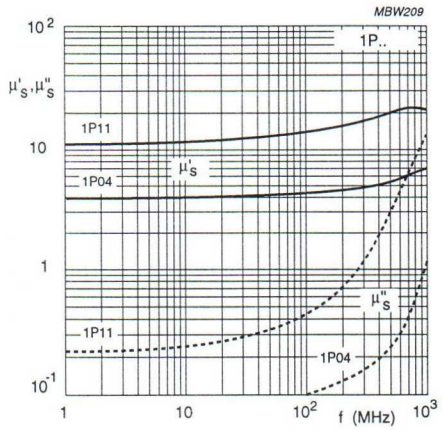


Fig.1 Complex permeability as a function of frequency.

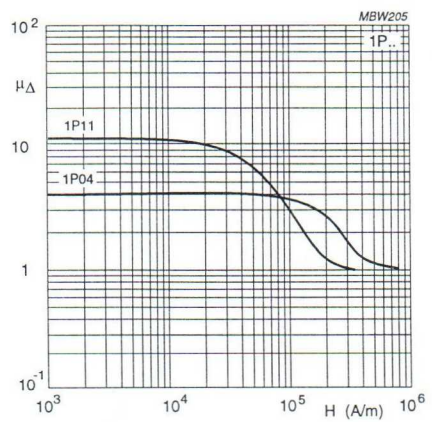


Fig.2 Incremental permeability as a function of temperature.

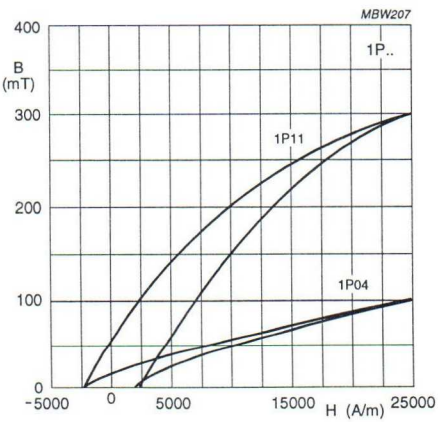


Fig.3 Typical B-H loops.

Material grade specification 2A2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	350 ±25%	
B	25 °C; 10 kHz; 250 A/ m	≈200	mT
	100 °C; 10 kHz; 250 A/ m	≈130	
P_V	25 °C; 16 kHz; 100 mT	≤250	kW/m^3
	85 °C; 16 kHz; 100 mT	≤200	
H_C	from 800 A/m	≤60	A/m
ρ	DC; 25 °C	≈10^6	Ωm
T_C		≥135	°C
density		≈4300	kg/m^3

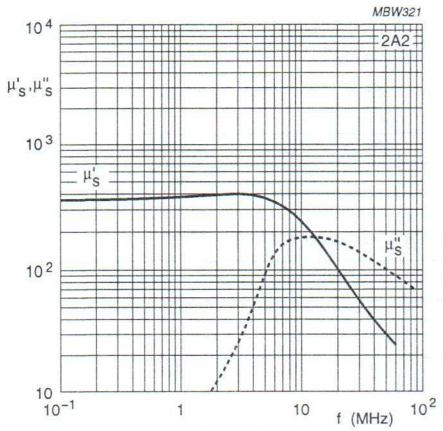


Fig.1 Complex permeability as a function of frequency.

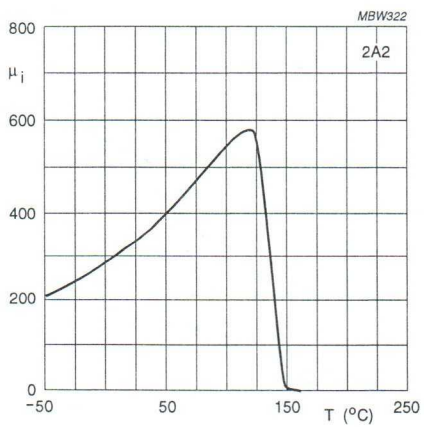


Fig.2 Initial permeability as a function of temperature.

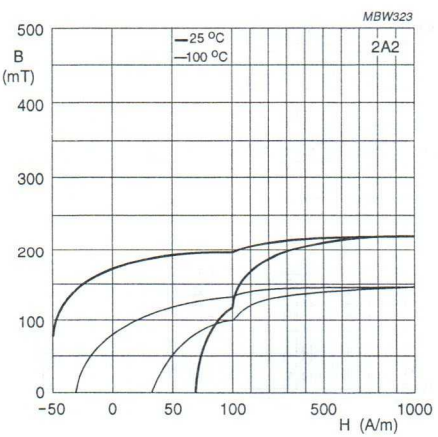


Fig.3 Typical B-H loops.

Material grade specification 2A2

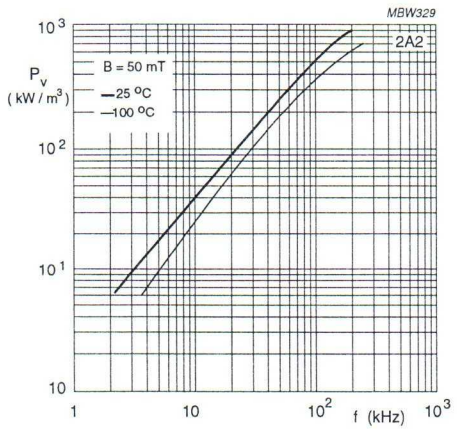


Fig.4 Specific power loss as a function of frequency.

Material grade specification 2B1

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

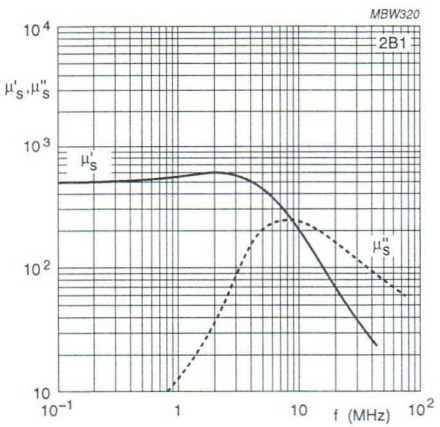


Fig.1 Complex permeability as a function of frequency.

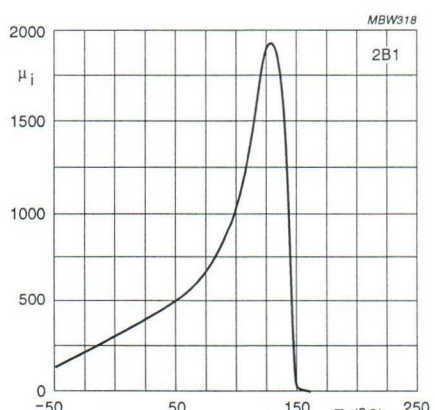


Fig.2 Initial permeability as a function of temperature.

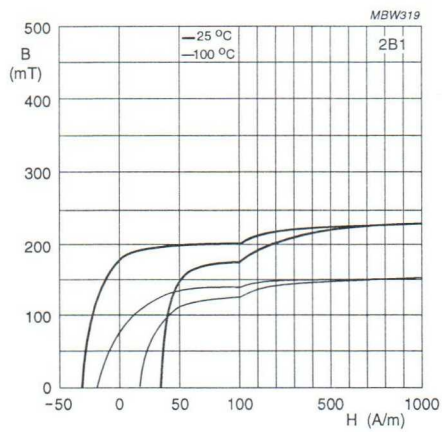


Fig.3 Typical B-H loops.

Material grade specification 2B1

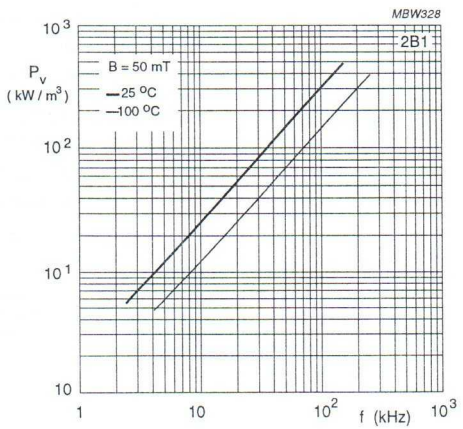


Fig.4 Specific power loss as a function of frequency.

Material grade specification 2P..

Material grade specification - 2P40

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	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

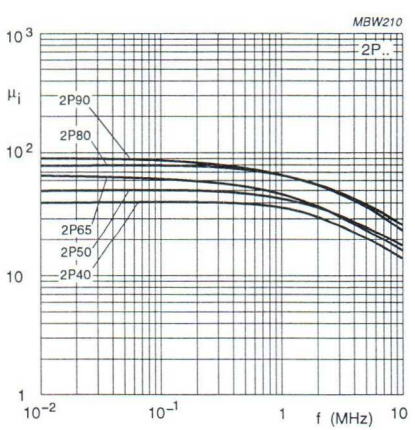


Fig.1 Initial permeability as function of frequency.

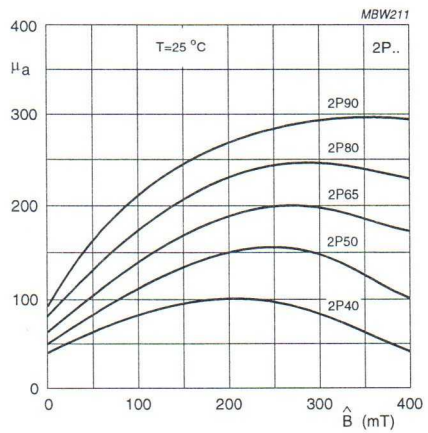


Fig.2 Amplitude permeability as function of peak flux density.

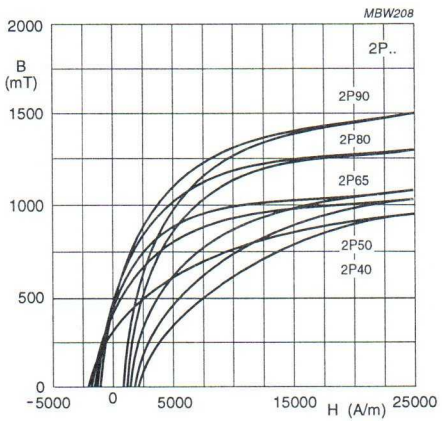


Fig.3 Typical B-H loops.

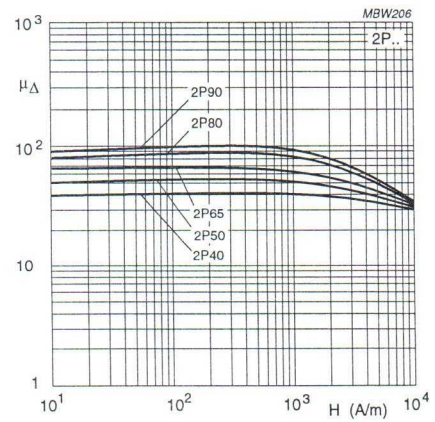


Fig.4 Incremental permeability as a function of magnetic field strenght.

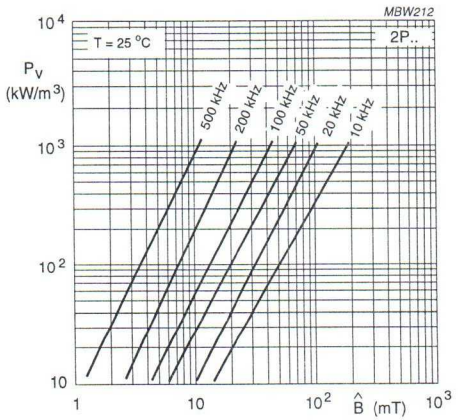


Fig.5 Specific power loss as a function of peak flux density with frequency as a parameter

Material grade specification 3B1

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

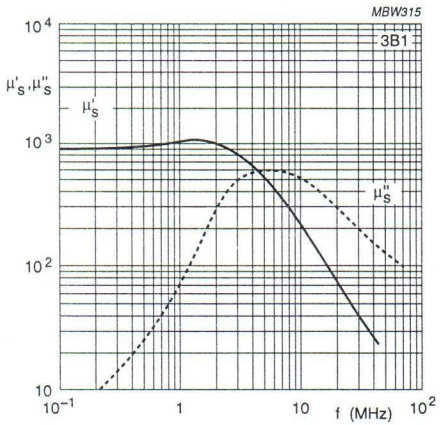


Fig.1 Complex permeability as a function of frequency.

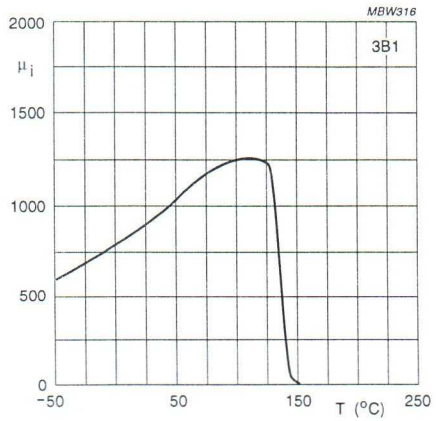


Fig.2 Initial permeability as a function of temperature.

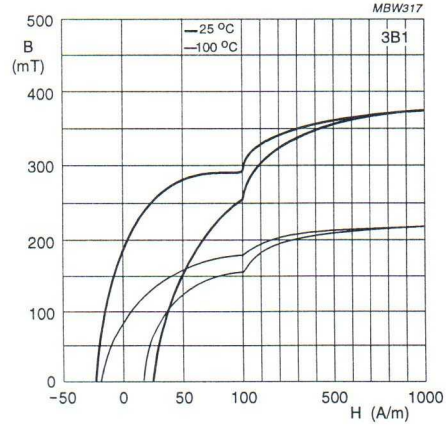


Fig.3 Typical B-H loops.

Material grade specification

3B7

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	$\leq 3.5 \times 10^{-6}$	
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

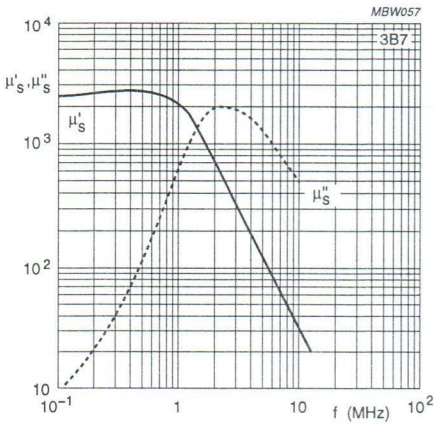


Fig.1 Complex permeability as a function of frequency.

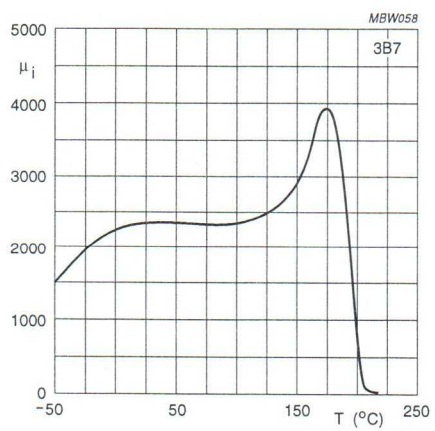


Fig.2 Initial permeability as a function of temperature.

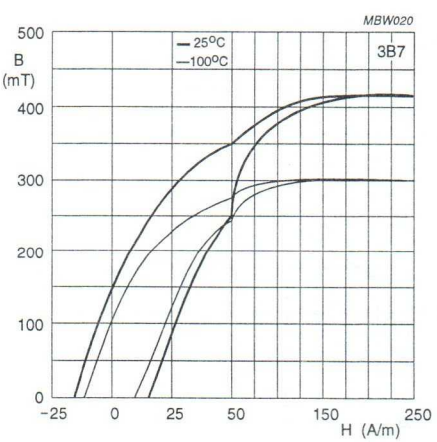


Fig.3 Typical B-H loops.

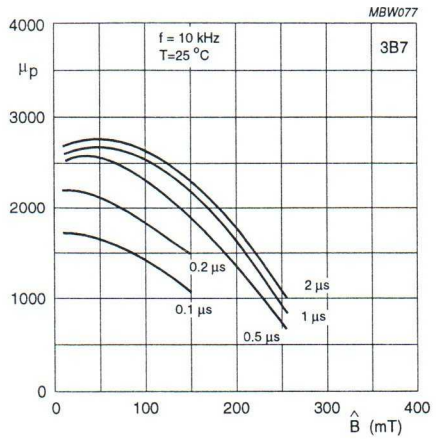


Fig.4 Pulse characteristics (unipolar pulses).

Material grade specification 3B8

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
B	25 °C; 10 kHz; 250 A/ m	≈420	mT
	100 °C; 10 kHz; 250 A/ m	≈330	
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 5 \times 10^{-6}$	
P_V	25 °C; 25 kHz; 200 mT	≤140	kW/m³
	25 °C; 100 kHz; 100 mT	≤155	
ρ	DC; 25 °C	≈2	Ωm
T_C		≥200	°C
density		≈4800	kg/m³

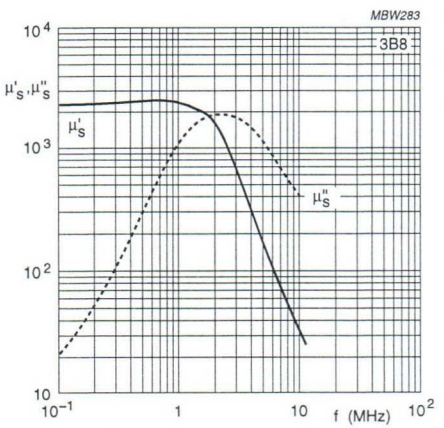


Fig.1 Complex permeability as a function of frequency.

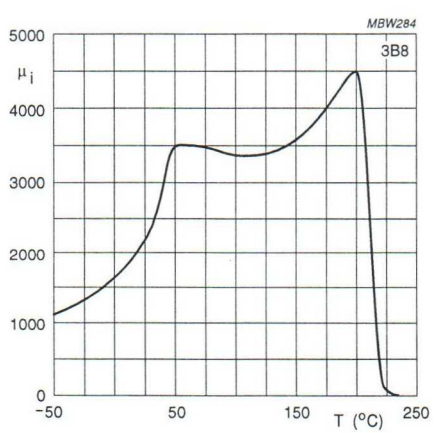


Fig.2 Initial permeability as a function of temperature.

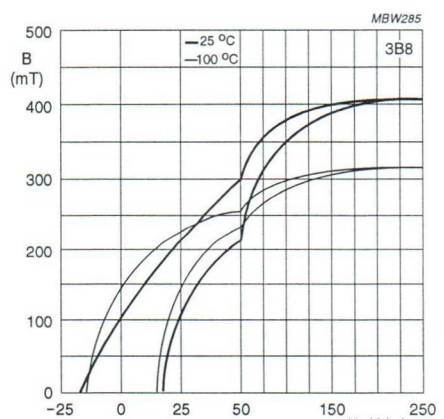


Fig.3 Typical B-H loops.

Material grade specification 3B8

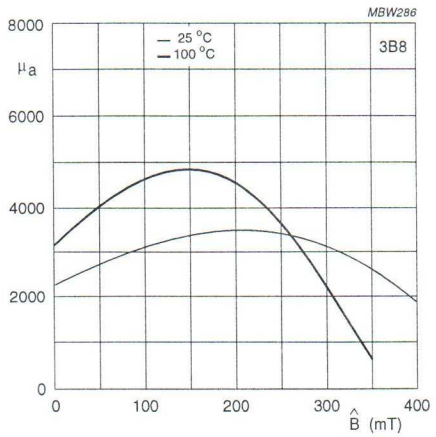


Fig.4 Amplitude permeability as function of peak flux density.

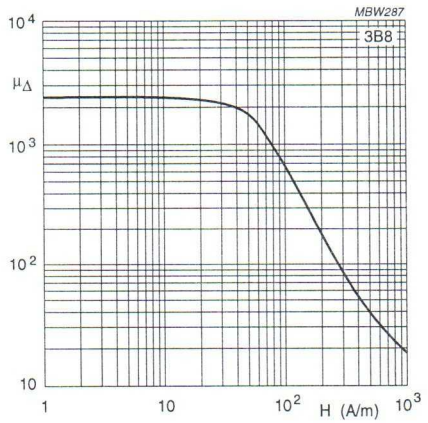


Fig.5 Incremental permeability as a function of magnetic field strenght.

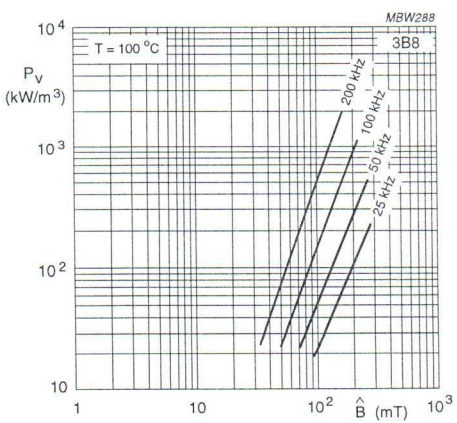


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

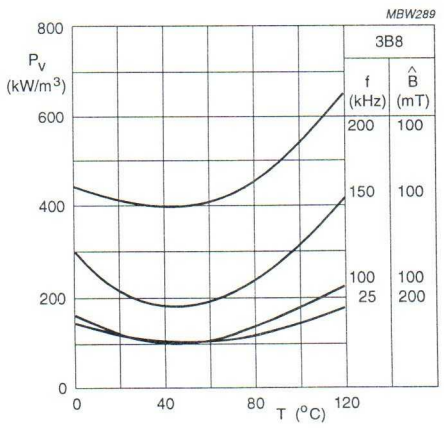


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification 3B9

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1800 ±20%	
B	25 °C; 10 kHz; 250 A/ m	≈350	mT
$\tan\delta/\mu_i$	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	$\leq 2.5 \times 10^{-6}$	
α_F	−30 to 70 °C; ≤10 kHz; 0.1 mT	$(1.4 \pm 0.5) \times 10^{-6}$	K^{-1}
ρ	DC; 25 °C	≈1	Ωm
T_C		≥145	°C
density		≈4800	kg/m^3

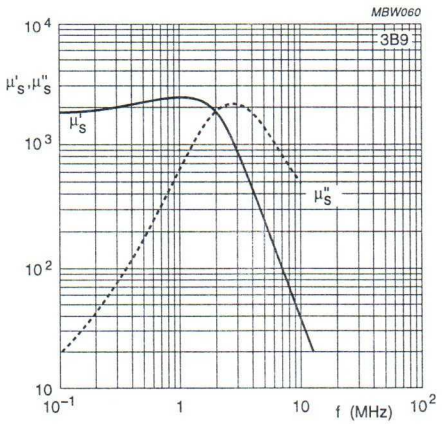


Fig.1 Complex permeability as a function of frequency.

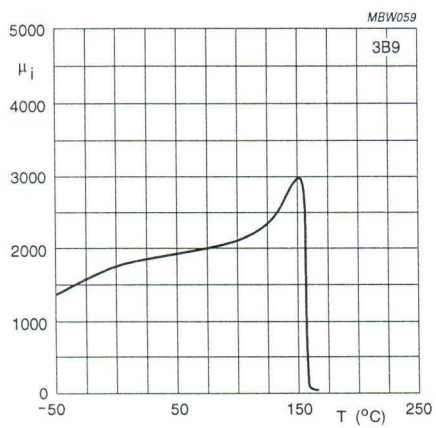


Fig.2 Initial permeability as a function of temperature.

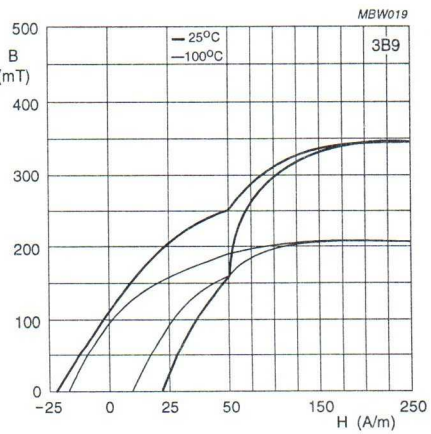


Fig.3 Typical B-H loops.

Material grade specification — 3C2

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	700 ±25%	
B	25 °C; 10 kHz; 250 A/ m	≈250	mT
	100 °C; 10 kHz; 250 A/ m	≈200	
P_V	25 °C; 16 kHz; 200 mT	≤100	kW/m^3
	85 °C; 16 kHz; 100 mT	≤120	
	25 °C; 64 kHz; 100 mT	≤450	
	85 °C; 64 kHz; 100 mT	≤500	
H_C	from 800 A/m	≤40	A/m
ρ	DC; 25 °C	≈1	Ωm
T_C		≤150	°C
density		≈4800	kg/m^3

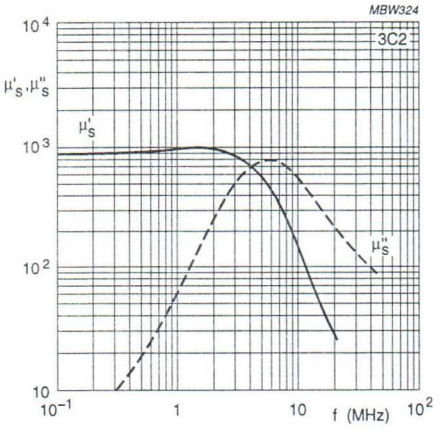


Fig.1 Complex permeability as a function of frequency.

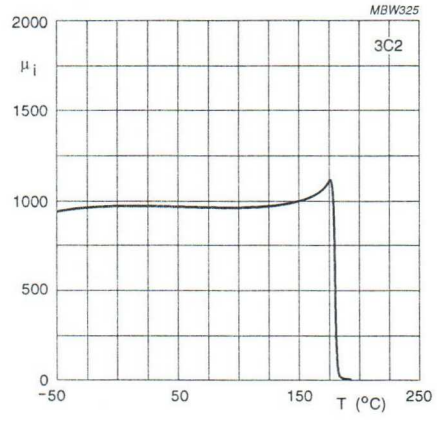


Fig.2 Initial permeability as a function of temperature.

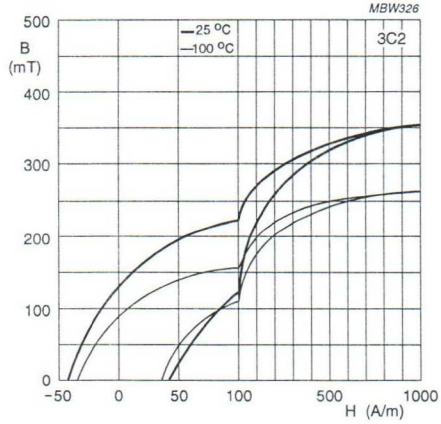


Fig.3 Typical B-H loops.

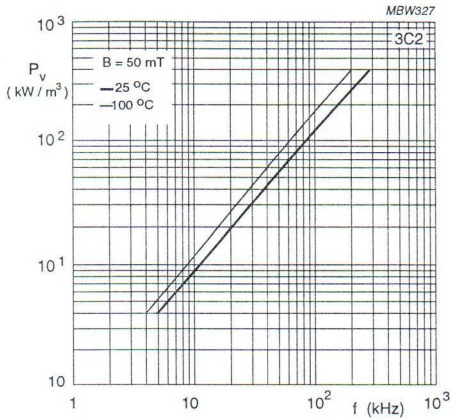


Fig.4 Specific power loss as a function of frequency.

Material grade specification

3C10

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

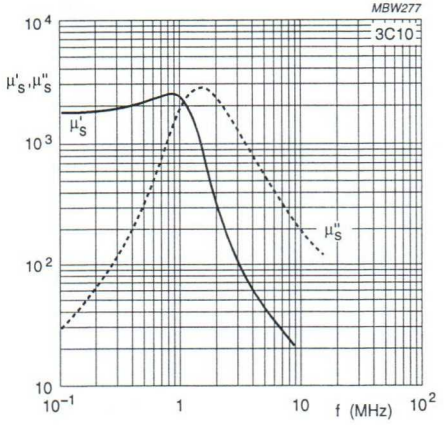


Fig.1 Complex permeability as a function of frequency.

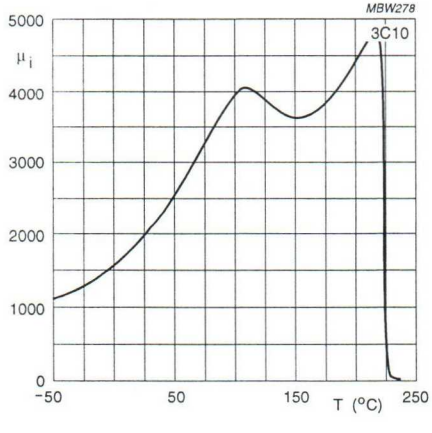


Fig.2 Initial permeability as a function of temperature.

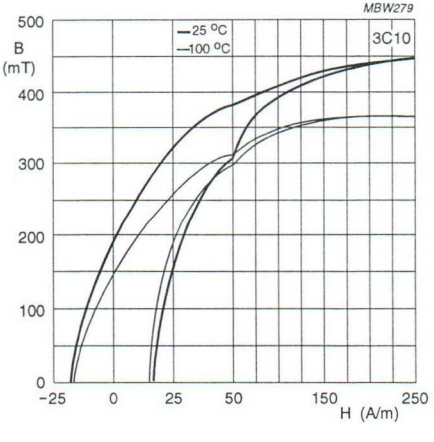


Fig.3 Typical B-H loops.

Material grade specification 3C10

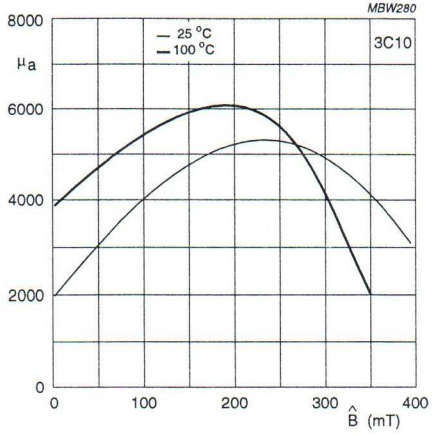


Fig.4 Amplitude permeability as function of peak flux density.

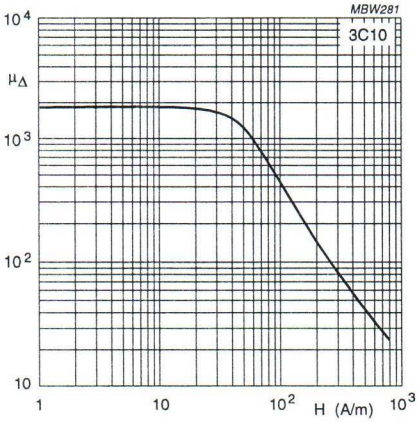


Fig.5 Incremental permeability as a function of magnetic field strenght.

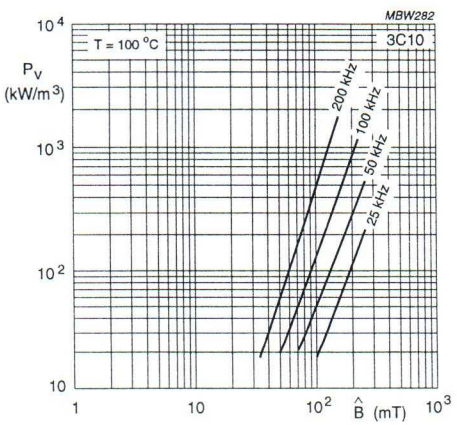


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

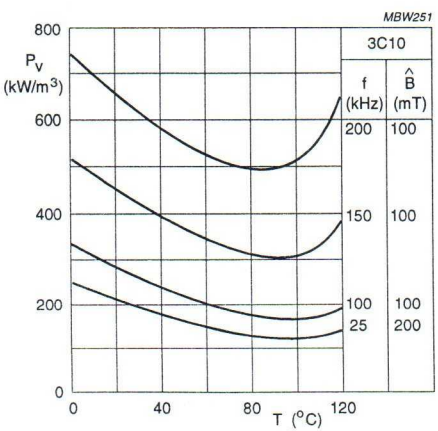


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material grade specification 3C11

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/m^3

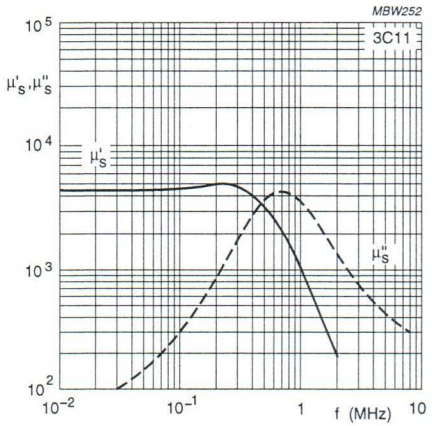


Fig.1 Complex permeability as a function of frequency.

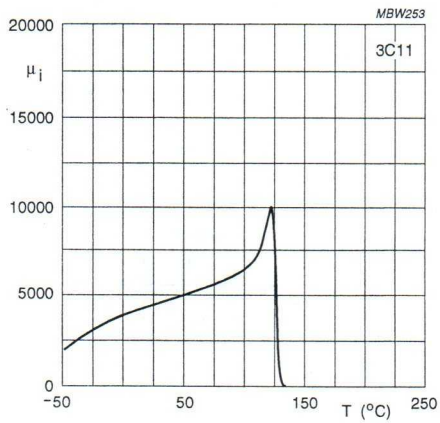


Fig.2 Initial permeability as a function of temperature.

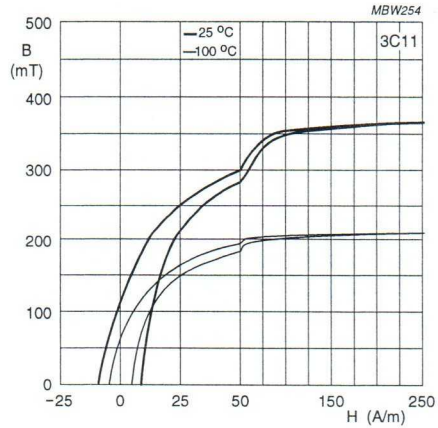


Fig.3 Typical B-H loops.

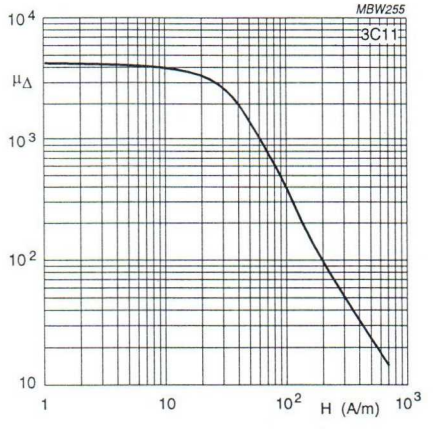


Fig.4 Incremental permeability as a function of magnetic field strenght.

Material grade specification

3C15

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

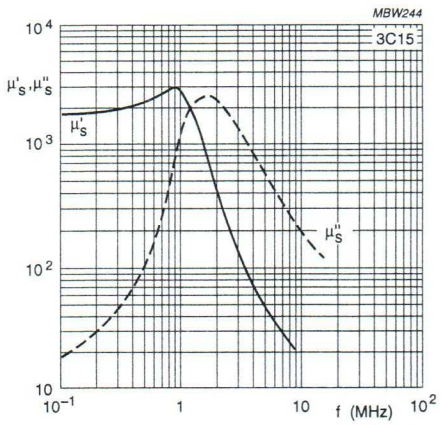


Fig.1 Complex permeability as a function of frequency.

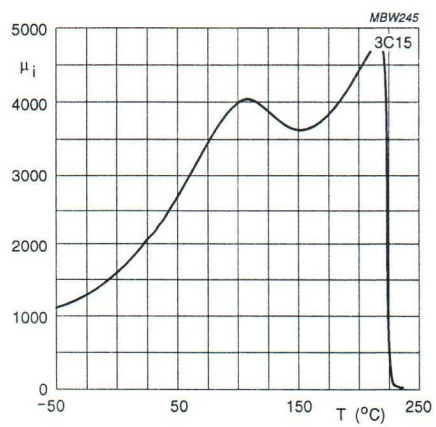


Fig.2 Initial permeability as a function of temperature.

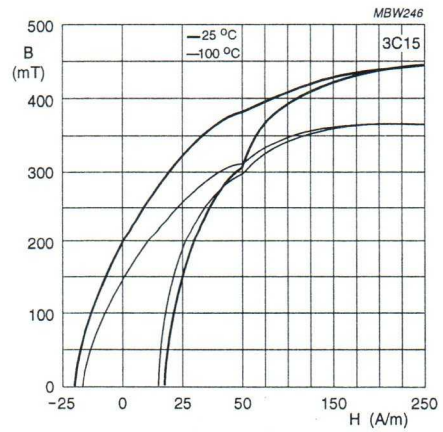


Fig.3 Typical B-H loops.

Material grade specification

3C15

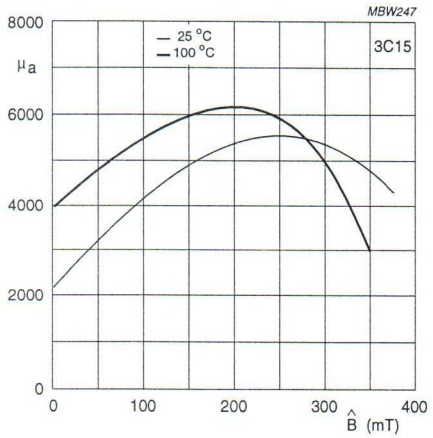


Fig.4 Amplitude permeability as function of peak flux density.

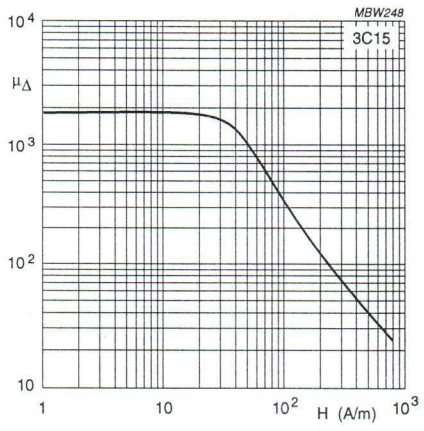


Fig.5 Incremental permeability as a function of magnetic field strenght.

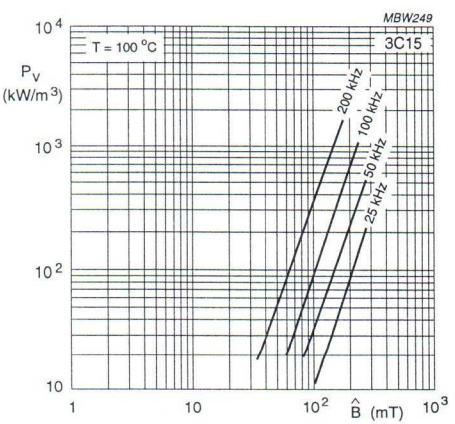


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

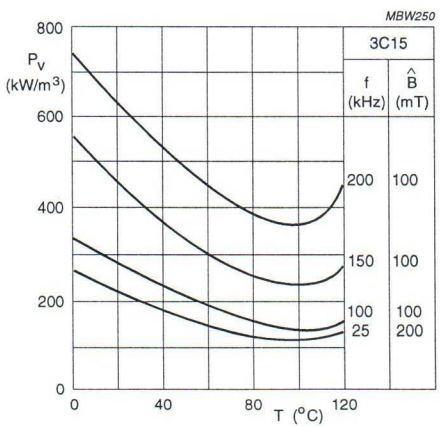


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification — 3C30

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1800 ±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/m^3
	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/m^3

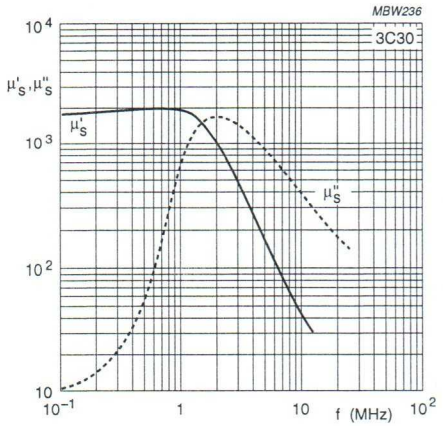


Fig.1 Complex permeability as a function of frequency.

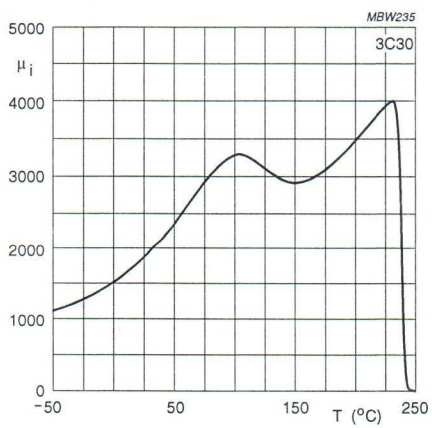


Fig.2 Initial permeability as a function of temperature.

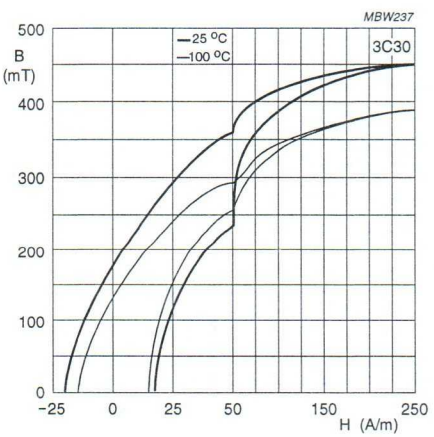


Fig.3 Typical B-H loops.

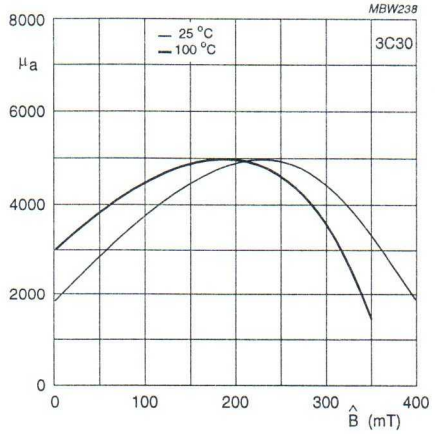


Fig.4 Amplitude permeability as function of peak flux density.

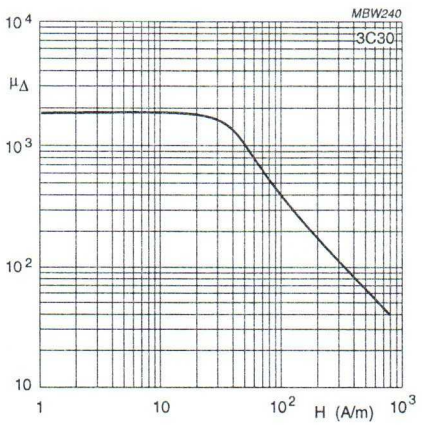


Fig.5 Incremental permeability as a function of magnetic field strenght.

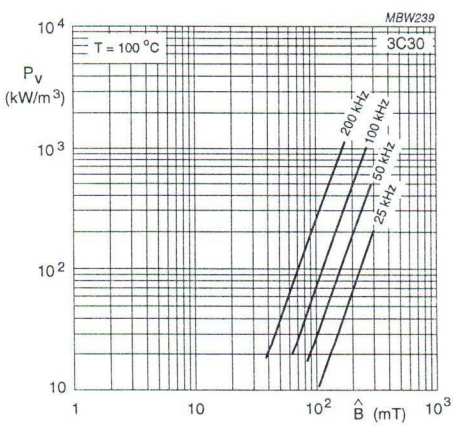


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

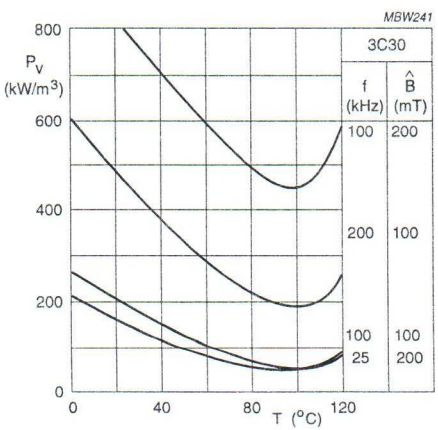


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification

3C80

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
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	≤200	kW/m^3
ρ	DC; 25 °C	≈1	Ωm
T_C		≥200	°C
density		≈4800	kg/m^3

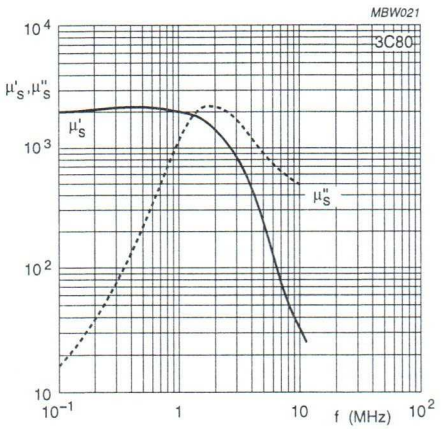


Fig.1 Complex permeability as a function of frequency.

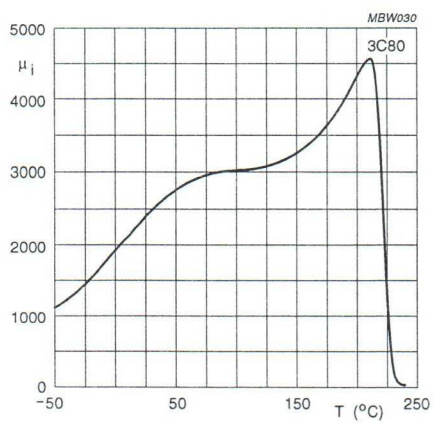


Fig.2 Initial permeability as a function of temperature.

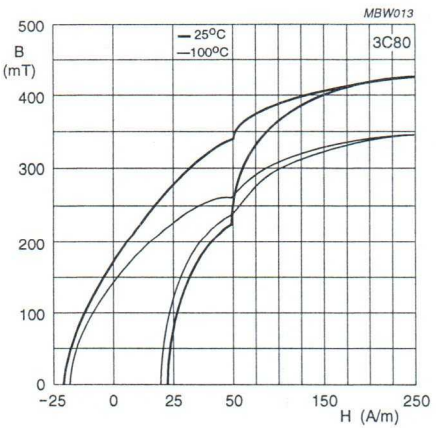


Fig.3 Typical B-H loops.

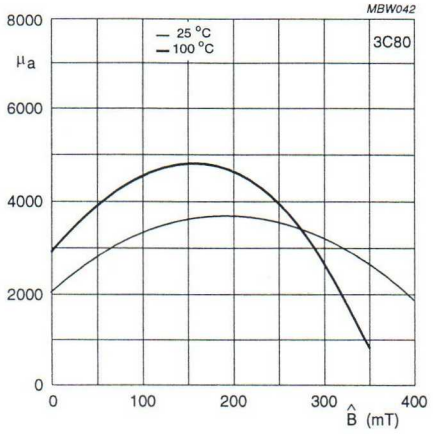


Fig.4 Amplitude permeability as function of peak flux density.

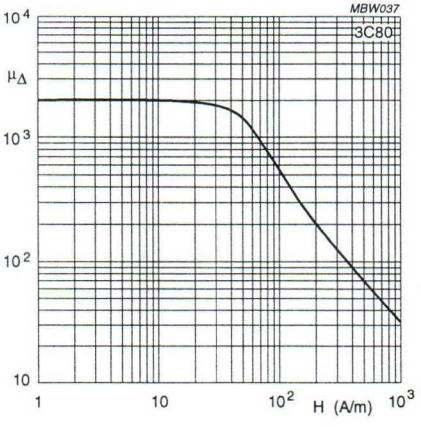


Fig.5 Incremental permeability as a function of magnetic field strenght.

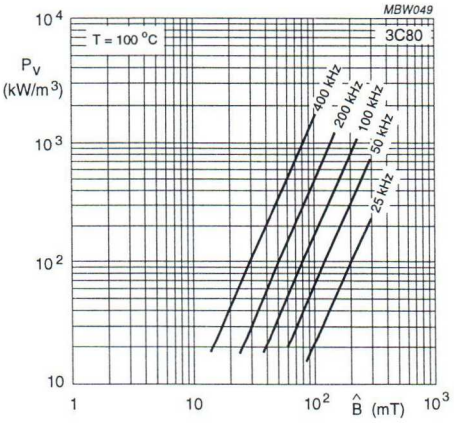


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

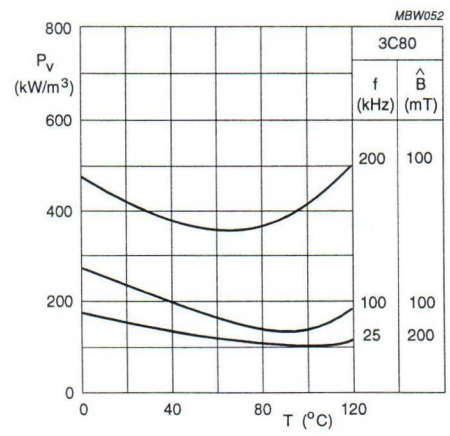


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification

3C81

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 25 °C; 10 kHz; 250 A/ m	≈420 ≈330	mT
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

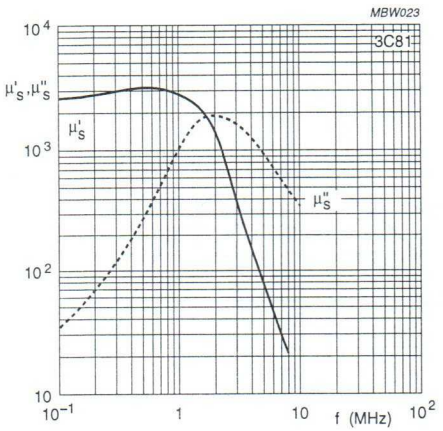


Fig.1 Complex permeability as a function of frequency.

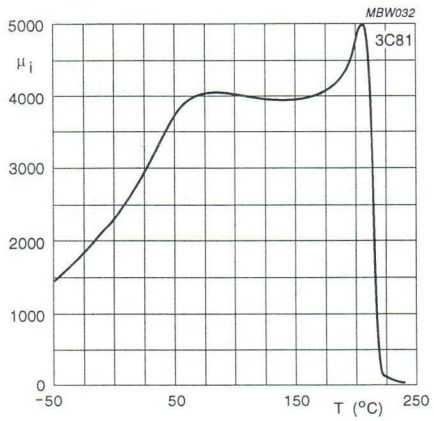


Fig.2 Initial permeability as a function of temperature.

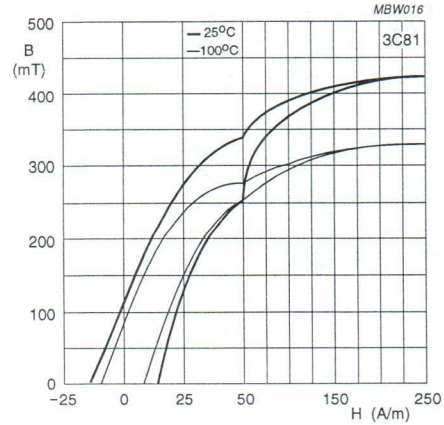


Fig.3 Typical B-H loops.

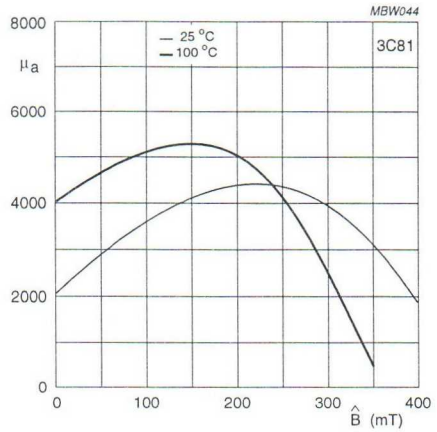


Fig.4 Amplitude permeability as function of peak flux density.

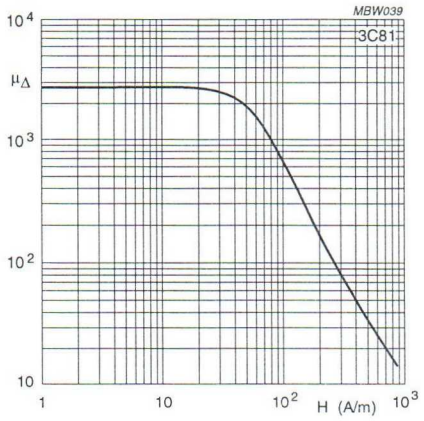


Fig.5 Incremental permeability as a function of magnetic field strenght.

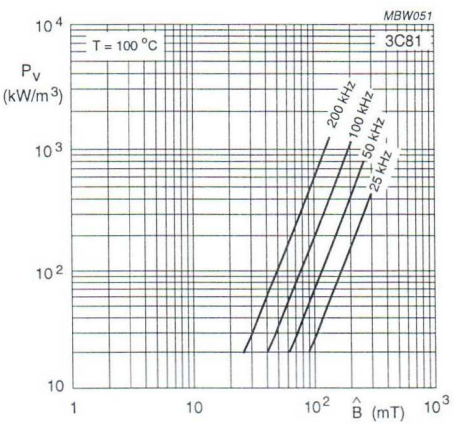


Fig.6 Specific power loss as a function of peak flux density with frequency as aparameter

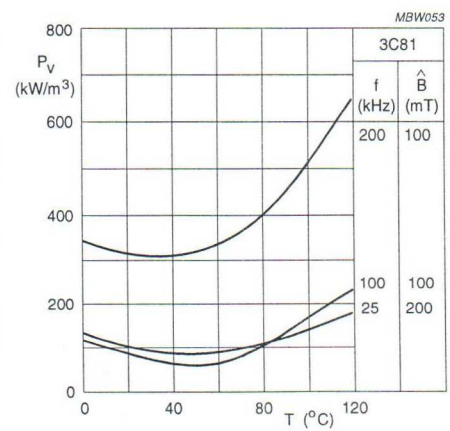


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification

3C85

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/ m	≥400	mT
	100 °C; 10 kHz; 250 A/ m	≥330	
P_V	100 °C; 25 kHz; 200 mT	≤140	kW/m³
	100 °C; 100 kHz; 100 mT	≤165	
ρ	DC; 25 °C	≈2	Ωm
T_C		≥200	°C
density		≈4800	kg/m³

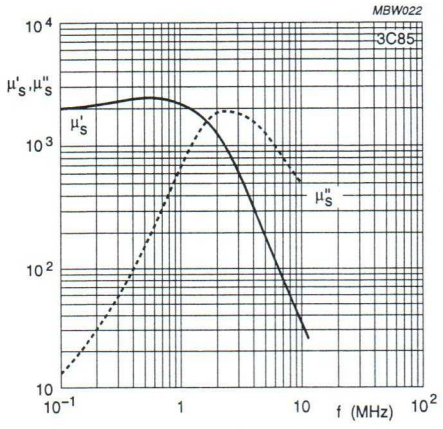


Fig.1 Complex permeability as a function of frequency.

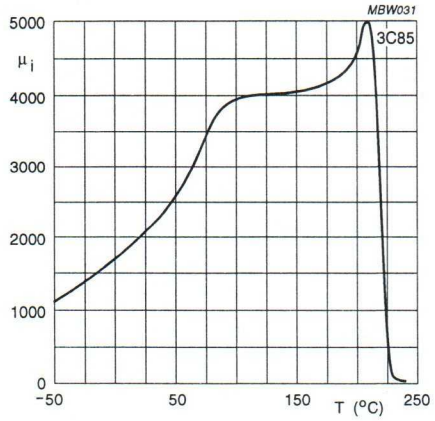


Fig.2 Initial permeability as a function of temperature.

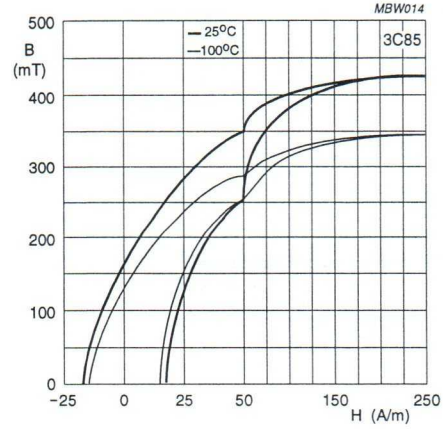


Fig.3 Typical B-H loops.

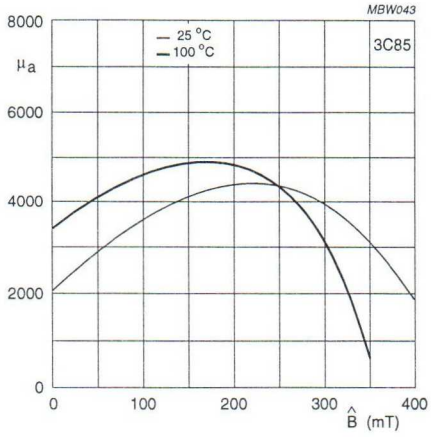


Fig.4 Amplitude permeability as function of peak flux density.

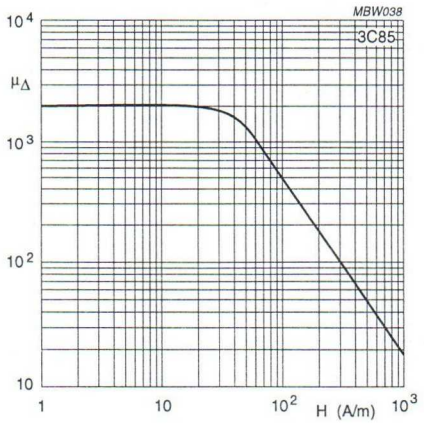


Fig.5 Incremental permeability as a function of magnetic field strenght.

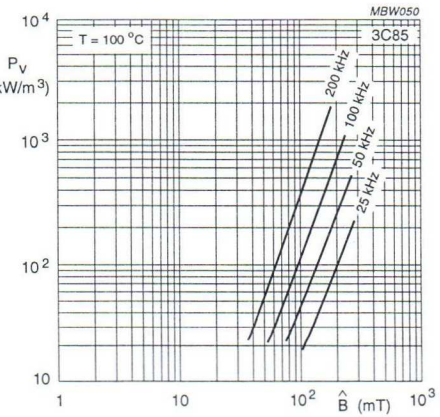


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

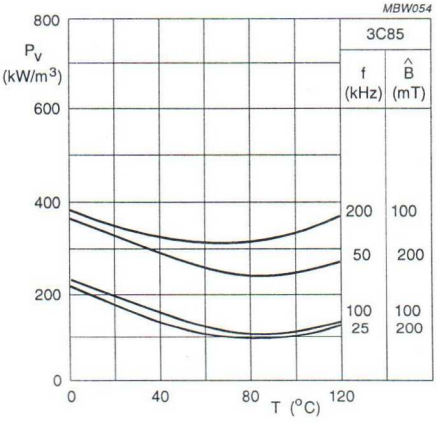


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification 3C90

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±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

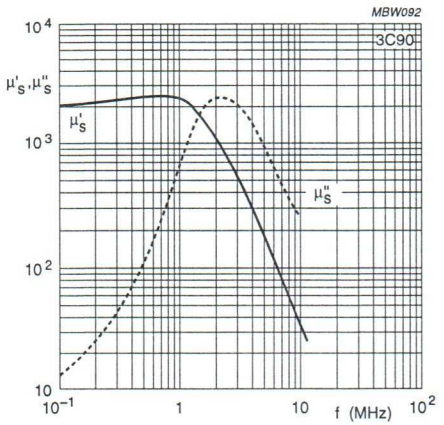


Fig.1 Complex permeability as a function of frequency.

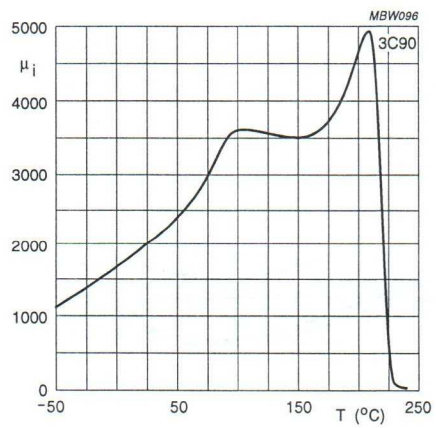


Fig.2 Initial permeability as a function of temperature.

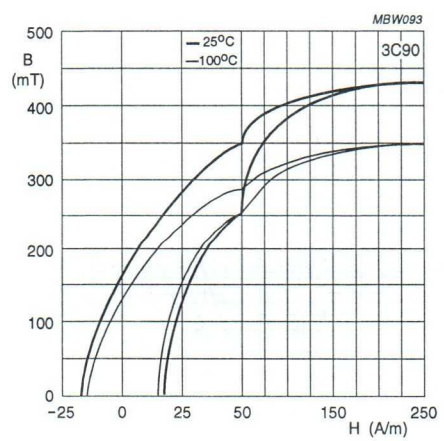


Fig.3 Typical B-H loops.

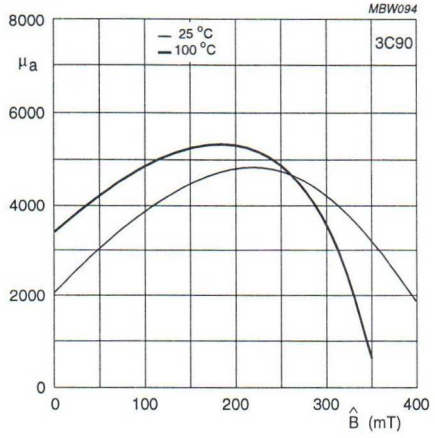


Fig.4 Amplitude permeability as function of peak flux density.

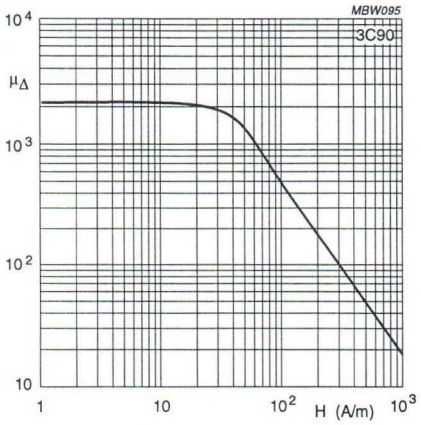


Fig.5 Incremental permeability as a function of magnetic field strenght.

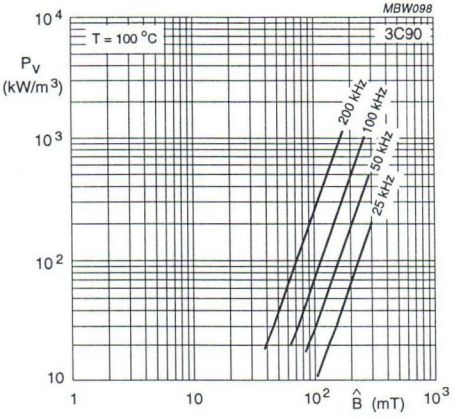


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

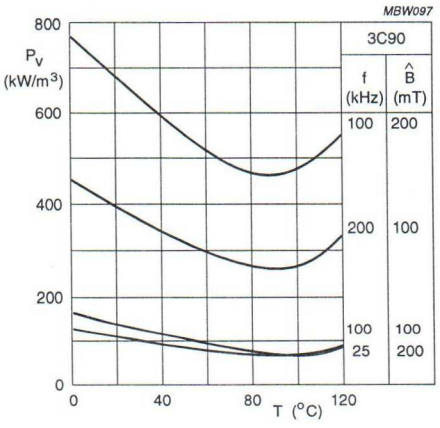


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification

3D3

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/m^3

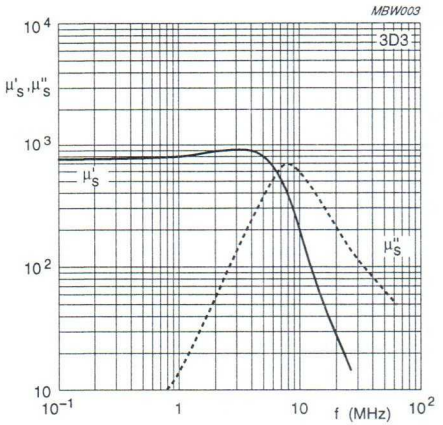


Fig.1 Complex permeability as a function of frequency.

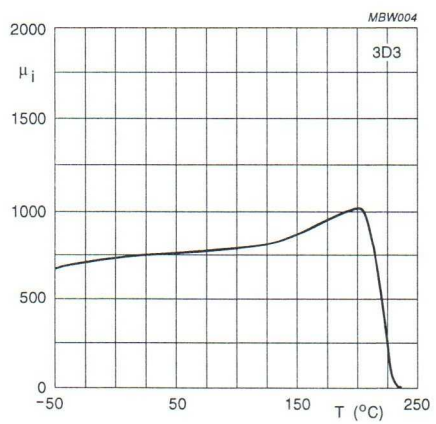


Fig.2 Initial permeability as a function of temperature.

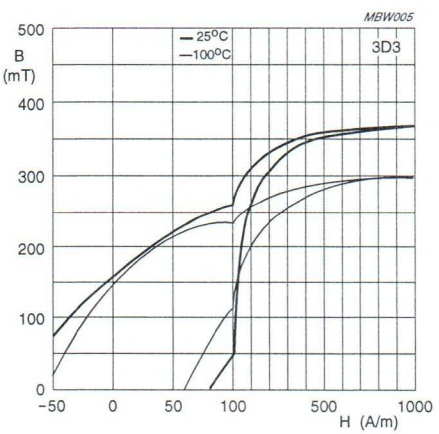


Fig.3 Typical B-H loops.

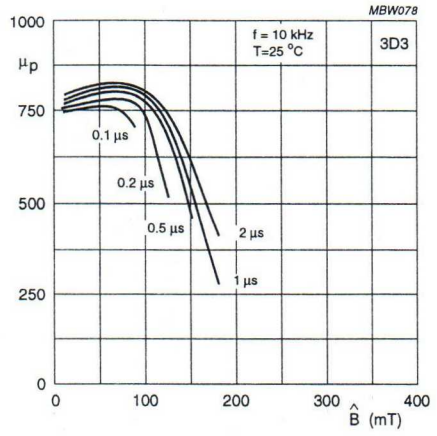


Fig.4 Pulse characteristics (unip[olar pulses).

Material grade specification

3E1

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/m^3

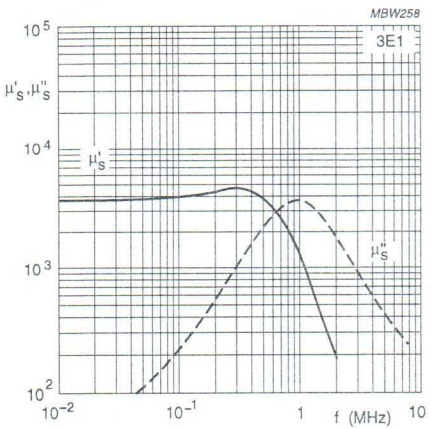


Fig.1 Complex permeability as a function of frequency.

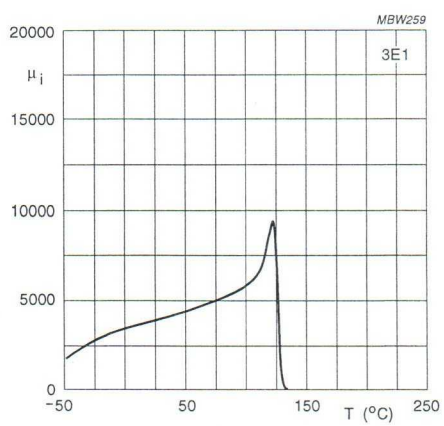


Fig.2 Initial permeability as a function of temperature.

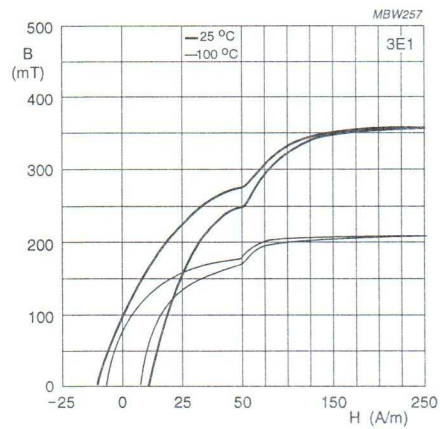


Fig.3 Typical B-H loops.

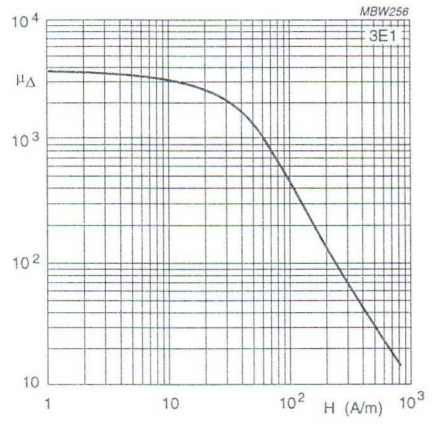


Fig.4 Incremental permeability as a function of magnetic field strenght.

Material grade specification

3E4

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	4700 ±20%	
B	25 °C; 10 kHz; 250 A/ m	≈360	mT
	100 °C; 10 kHz; 250 A/ m	≈210	
$\tan\delta/\mu_i$	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	$\leq 1 \times 10^{-3}$	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

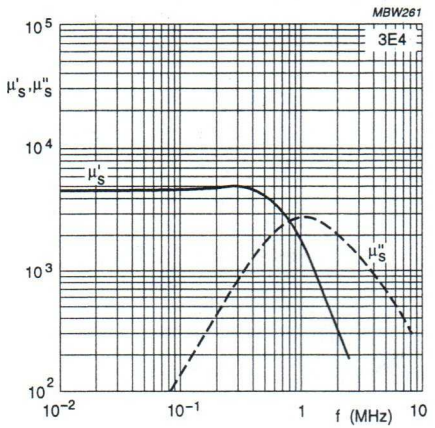


Fig.1 Complex permeability as a function of frequency.

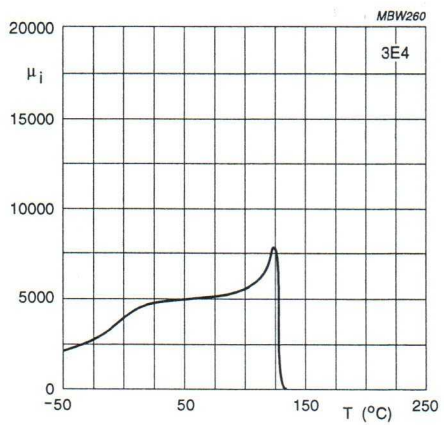


Fig.2 Initial permeability as a function of temperature.

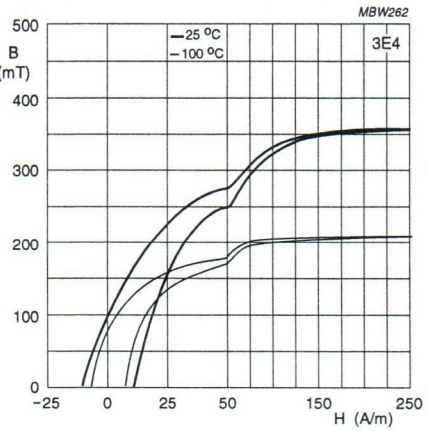


Fig.3 Typical B-H loops.

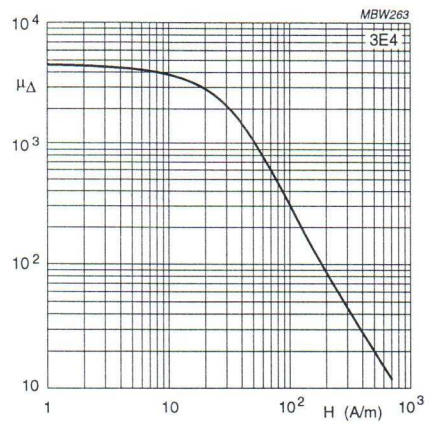


Fig.4 Incremental permeability as a function of magnetic field strenght.

Material grade specification

3E5

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

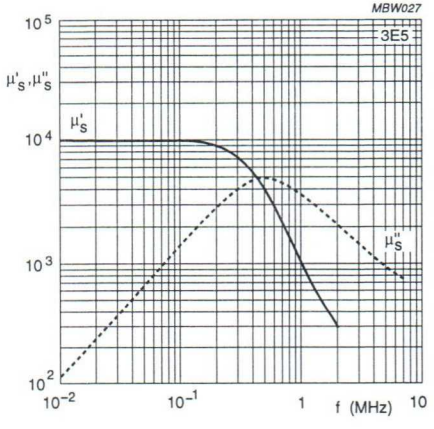


Fig.1 Complex permeability as a function of frequency.

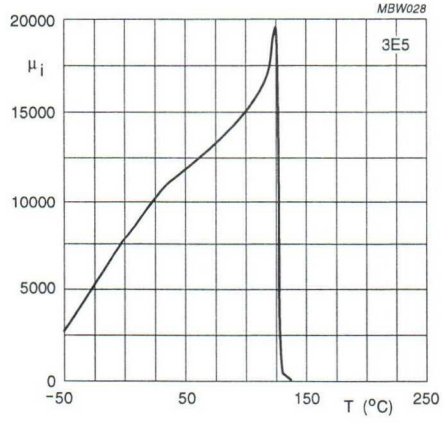


Fig.2 Initial permeability as a function of temperature.

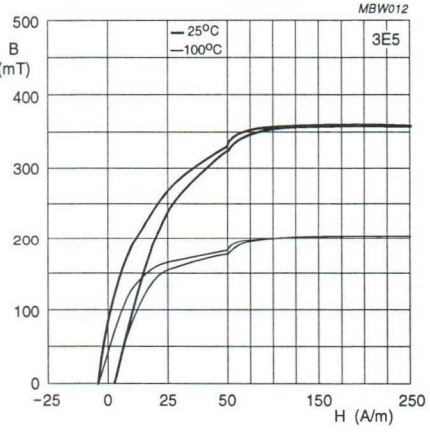


Fig.3 Typical B-H loops.

Material grade specification 3E5

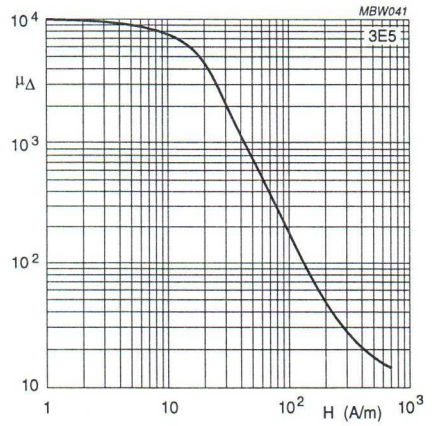


Fig.4 Incremental permeability as a function of magnetic field strenght.

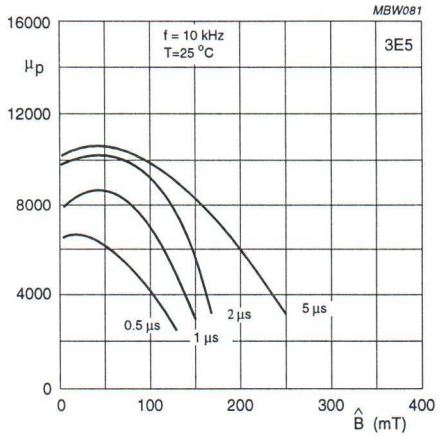


Fig.5 Pulse characteristics (unipolar pulses).

Material grade specification — 3E6

SYMBOL	CONDITIONS	VALUE(1)	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	12000 ±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.

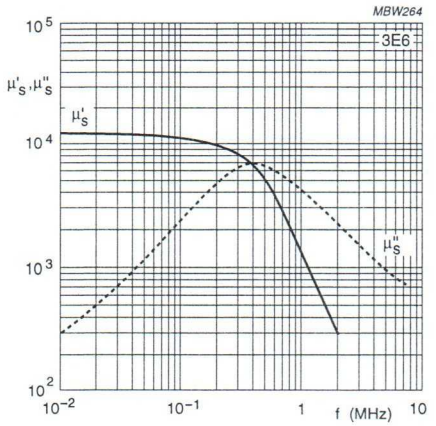


Fig.1 Complex permeability as a function of frequency.

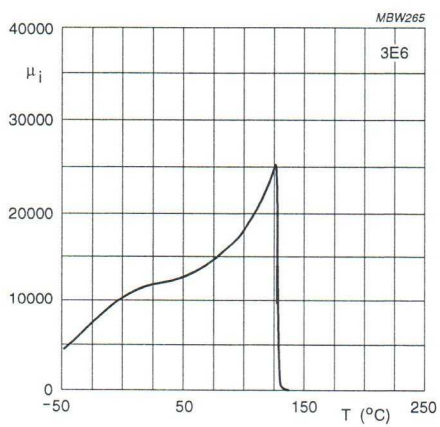


Fig.2 Initial permeability as a function of temperature.

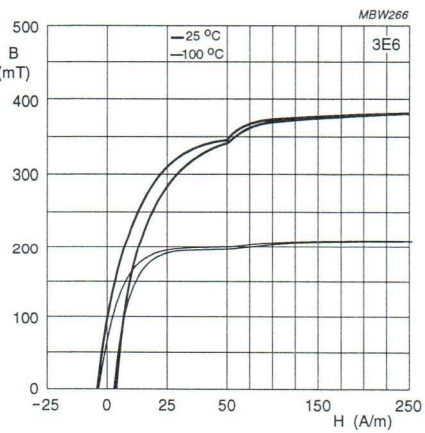


Fig.3 Typical B-H loops.

Material grade specification 3E6

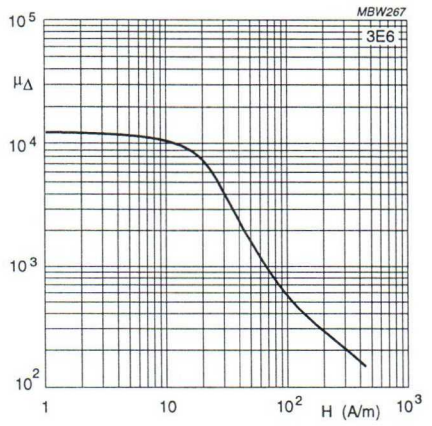


Fig.4 Incremental permeability as a function of magnetic field strenght.

Material grade specification

3E7

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.

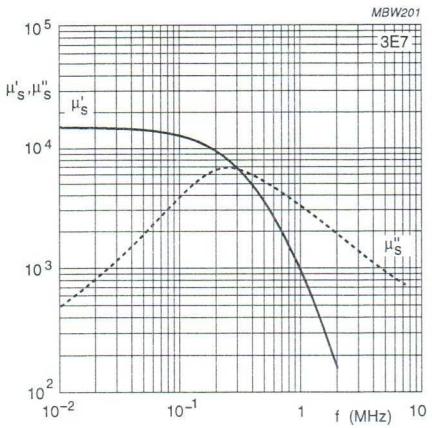


Fig.1 Complex permeability as a function of frequency.

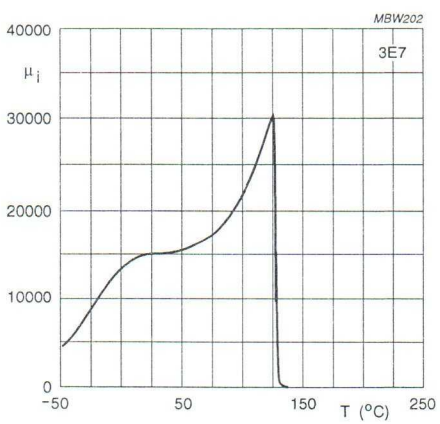


Fig.2 Initial permeability as a function of temperature.

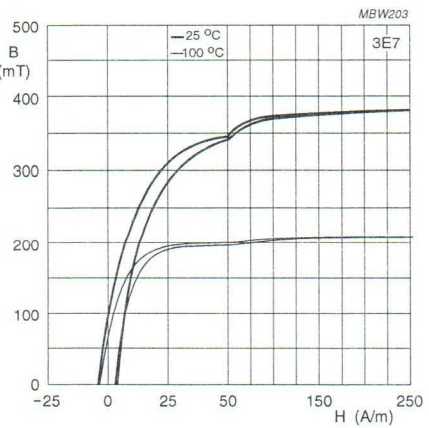


Fig.3 Typical B-H loops.

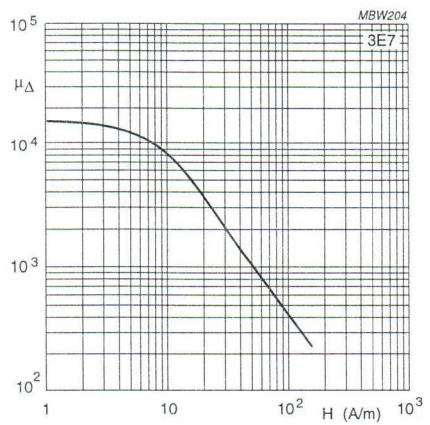


Fig.4 Incremental permeability as a function of magnetic field strenght.

Material grade specification — 3E25

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

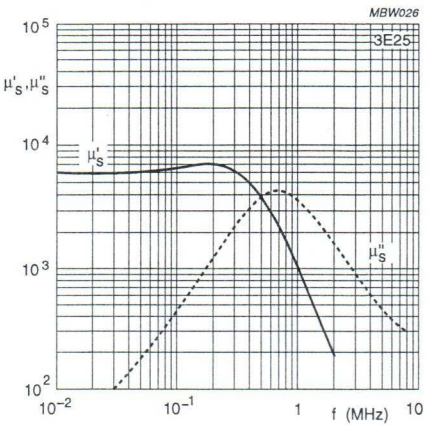


Fig.1 Complex permeability as a function of frequency.

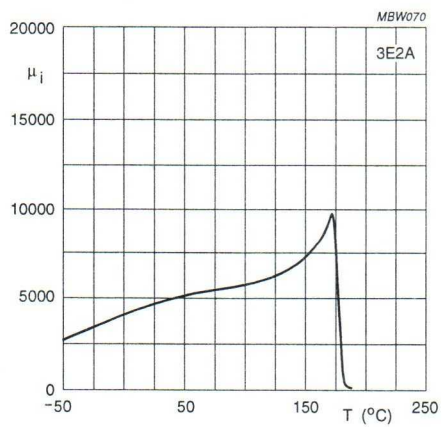


Fig.2 Initial permeability as a function of temperature.

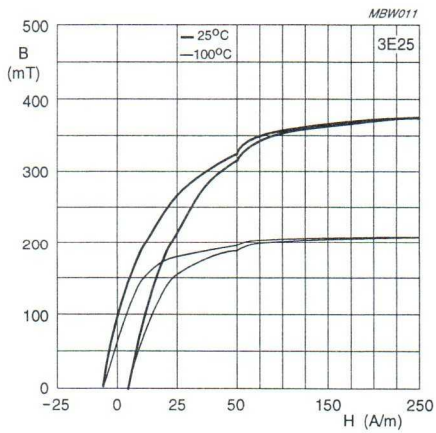


Fig.3 Typical B-H loops.

Material grade specification 3E25

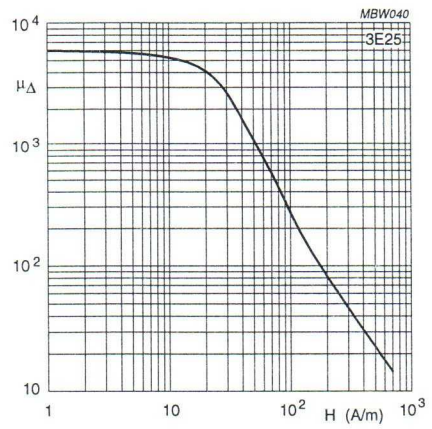


Fig.4 Incremental permeability as a function of magnetic field strenght.

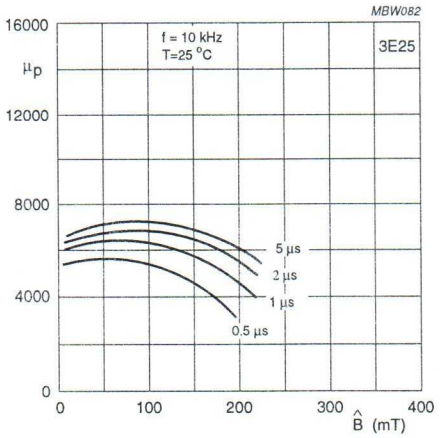


Fig.5 Pulse characteristics (unipolar pulses).

Material grade specification 3E27

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	6000 ±20%	
B	25 °C; 10 kHz; 250 A/ m 100 °C; 10 kHz; 250 A/ m	≈400 ≈280	mT
$\tan\delta/\mu_i$	25 °C; 100 kHz; 0.1 mT	$\leq 15 \times 10^{-6}$	
ρ	DC; 25 °C	≈0.5	Ωm
T_C		≥175	°C
density		≈4800	kg/m^3

Remark:

The USA material 3E2A will be replaced by 3E27. Products in material 3E2A remain available on request, but should not be considered for new designs.

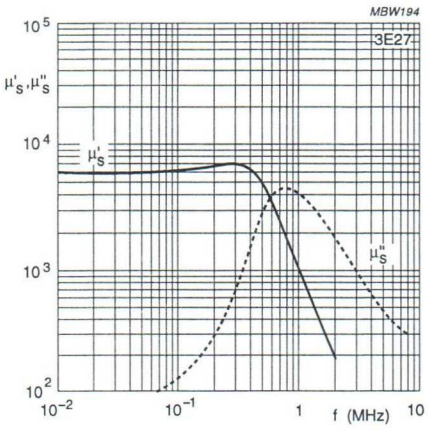


Fig.1 Complex permeability as a function of frequency.

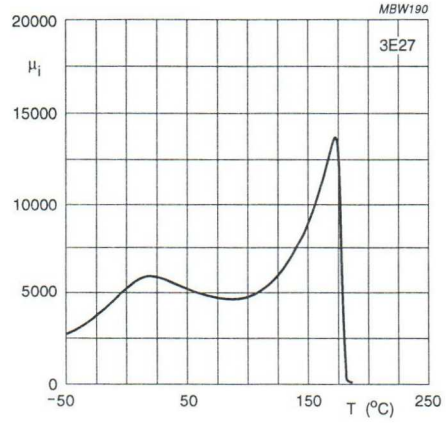


Fig.2 Initial permeability as a function of temperature.

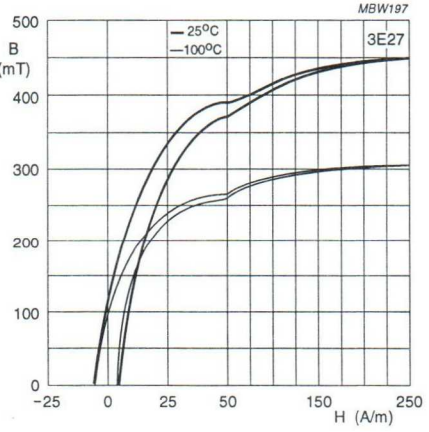


Fig.3 Typical B-H loops.

Material grade specification 3E27

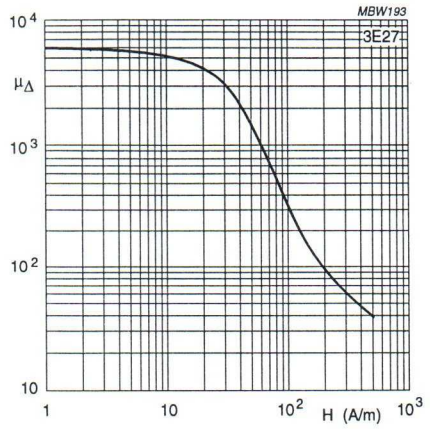


Fig.4 Incremental permeability as a function of magnetic field strenght.

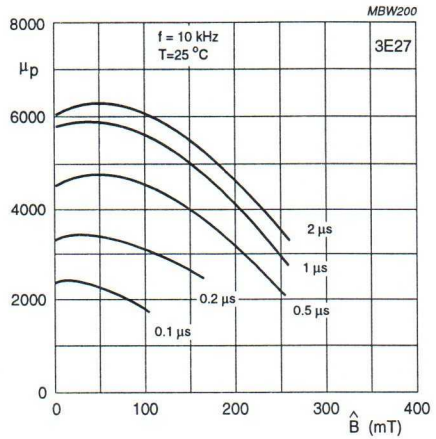


Fig.5 Pulse characteristics (unipolar pulses).

Material grade specification 3F3

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1800 ±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/m^3
	100 °C; 400 kHz; 50 mT	≤150	
ρ	DC, 25 °C	≈2	Ωm
T_C		≥200	°C
density		≈4750	kg/m^3

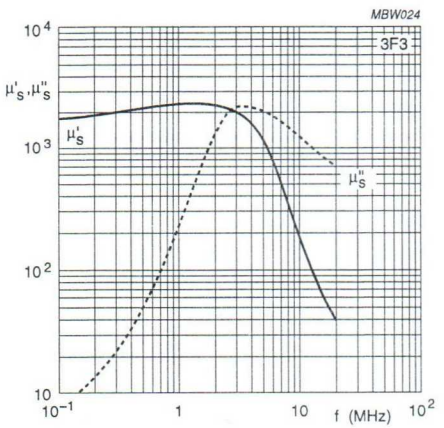


Fig.1 Complex permeability as a function of frequency.

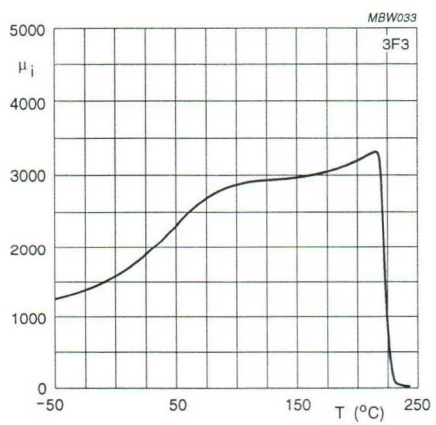


Fig.2 Initial permeability as a function of temperature.

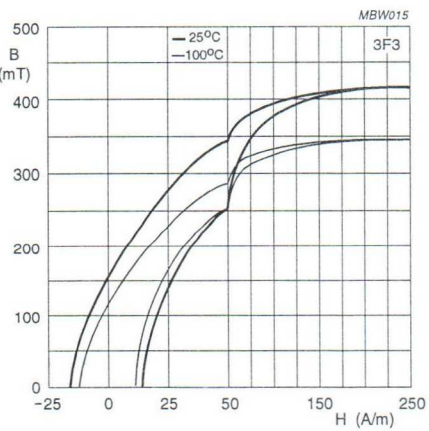


Fig.3 Typical B-H loops.

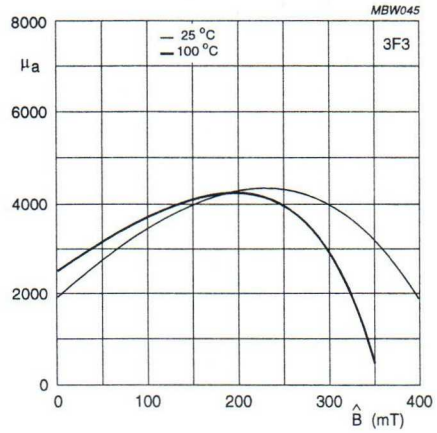


Fig.4 Amplitude permeability as function of peak flux density.

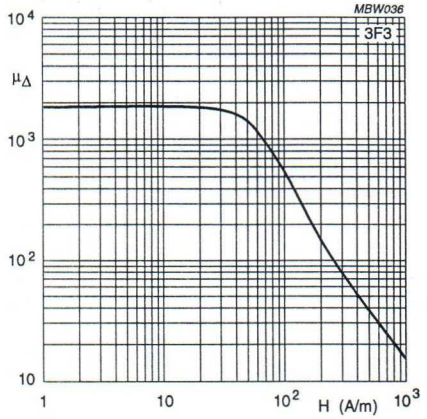


Fig.5 Incremental permeability as a function of magnetic field strenght.

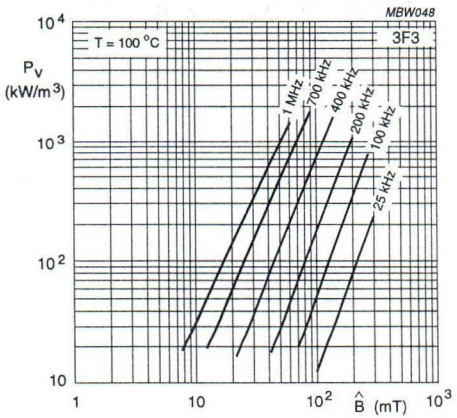


Fig.6 Specific power loss as a function of frequency peak flux density with frequency as a parameter

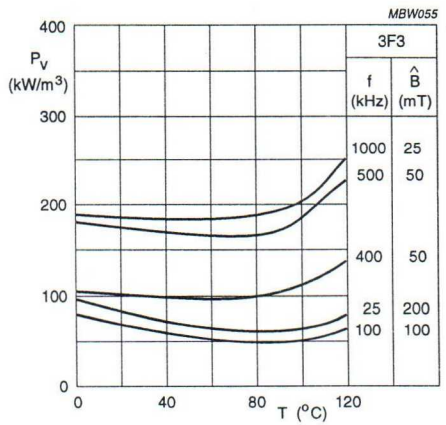


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification

3F4

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/m^3
	100 °C; 3 MHz; 10 mT	≤320	
ρ	DC; 25 °C	≈10	Ωm
T_C		≥220	°C
density		≈4700	kg/m^3

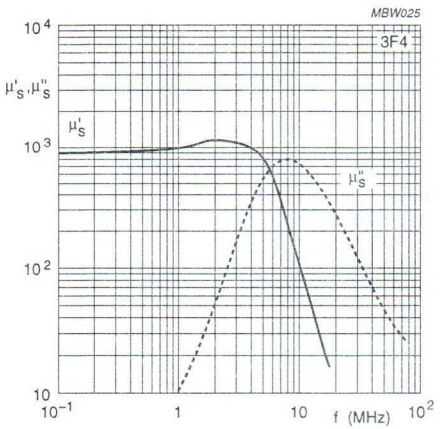


Fig.1 Complex permeability as a function of frequency.

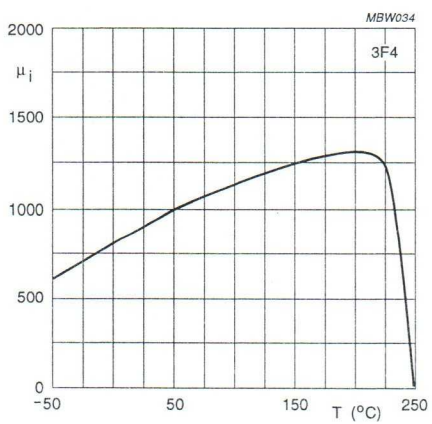


Fig.2 Initial permeability as a function of temperature.

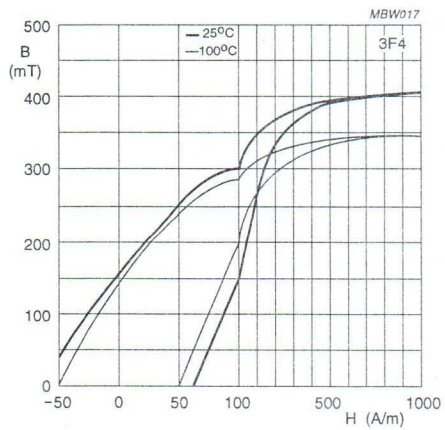


Fig.3 Typical B-H loops.

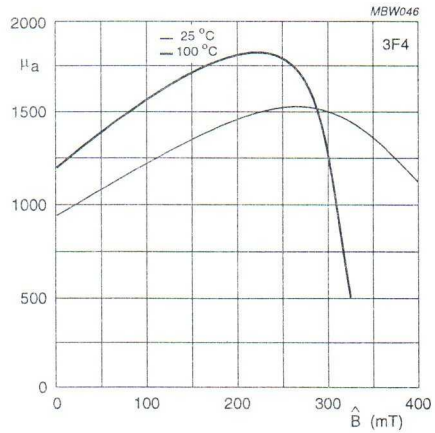


Fig.4 Amplitude permeability as function of peak flux density.

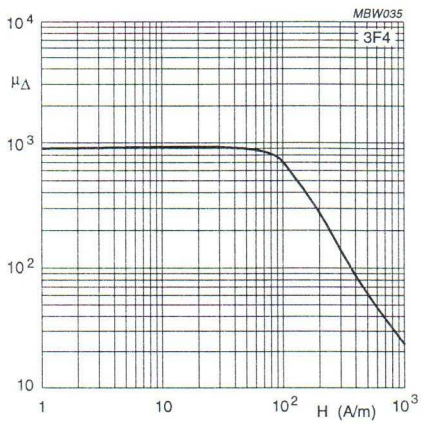


Fig.5 Incremental permeability as a function of magnetic field strenght.

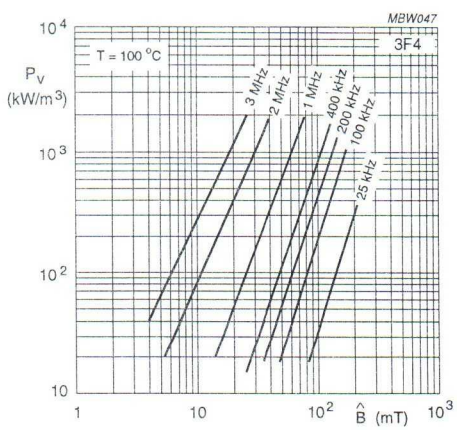


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

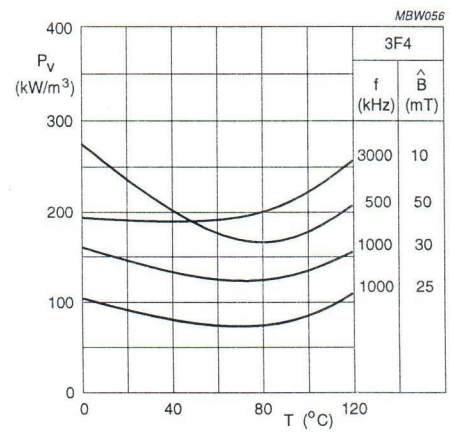


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification — 3H1

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
B	25 °C; 10 kHz; 250 A/ m 100 °C; 10 kHz; 250 A/ m	≈350 ≈210	mT
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT 25 °C; 100 kHz; 0.1 mT	$\leq 1.5 \times 10^{-6}$ $\leq 5 \times 10^{-6}$	
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	$\leq 4.5 \times 10^{-6}$	
α_F	≤10 kHz; 0.1 mT: 5 to 25 °C 25 to 55 °C 25 to 70 °C	 $(1 \pm 0.5) \times 10^{-6}$ $(1 \pm 0.5) \times 10^{-6}$ $(1 \pm 0.5) \times 10^{-6}$	K^{-1}
ρ	DC; 25 °C	≈1	Ωm
T_C		≥130	°C
density		≈4800	kg/m^3

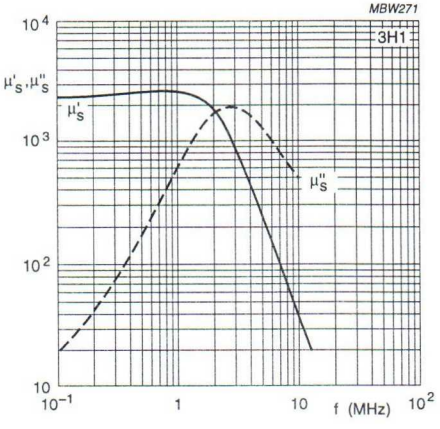


Fig.1 Complex permeability as a function of frequency.

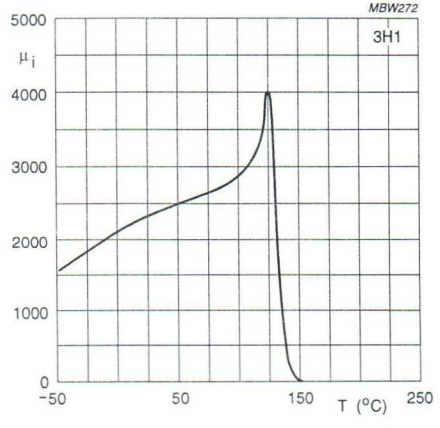


Fig.2 Initial permeability as a function of temperature.

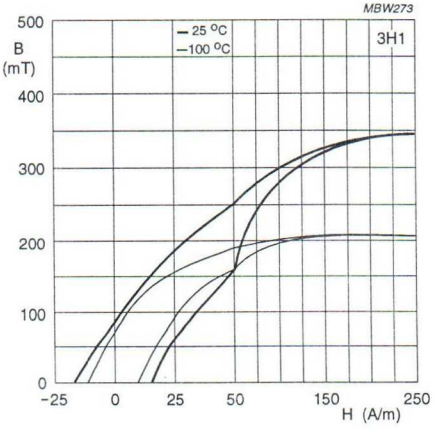


Fig.3 Typical B-H loops.

Material grade specification — 3H3

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

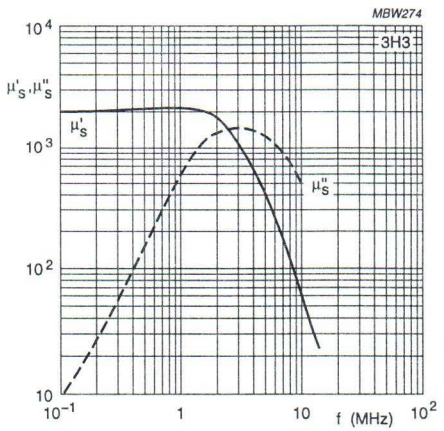


Fig.1 Complex permeability as a function of frequency.

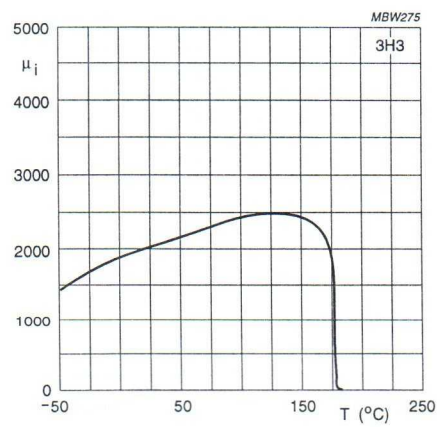


Fig.2 Initial permeability as a function of temperature.

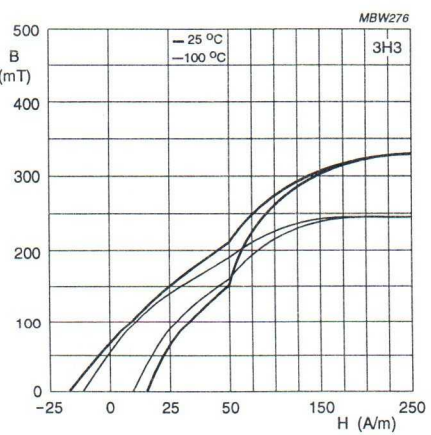


Fig.3 Typical B-H loops.

Material grade specification 3R1

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

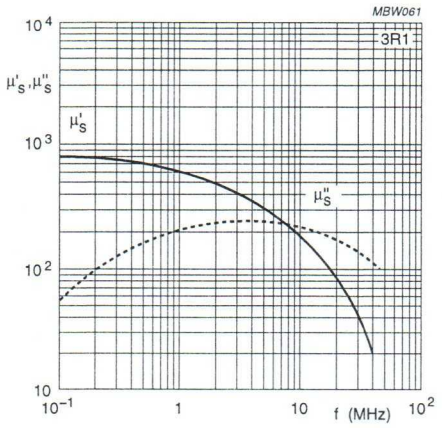


Fig.1 Complex permeability as a function of frequency.

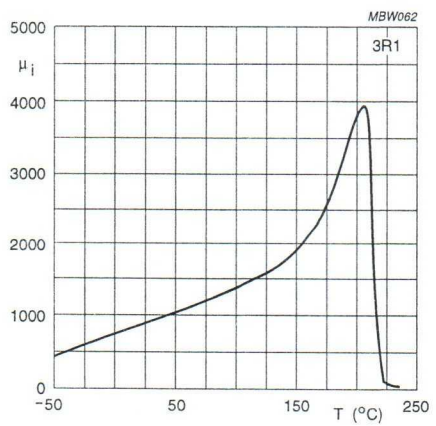


Fig.2 Initial permeability as a function of temperature.

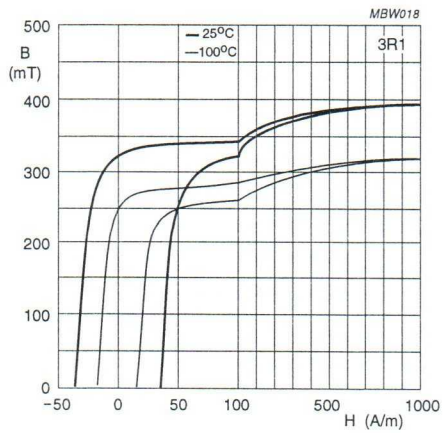


Fig.3 Typical B-H loops.

Material grade specification 3R1

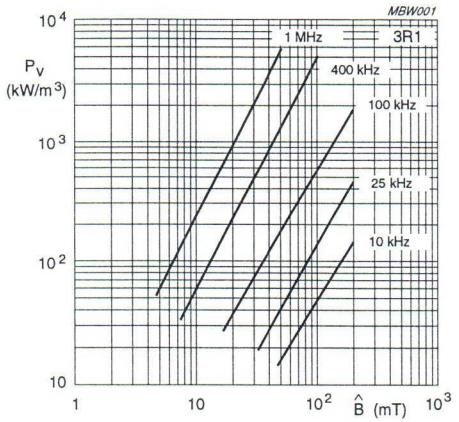


Fig.4 Specific power loss as a function of peak flux density with frequency as a parameter.

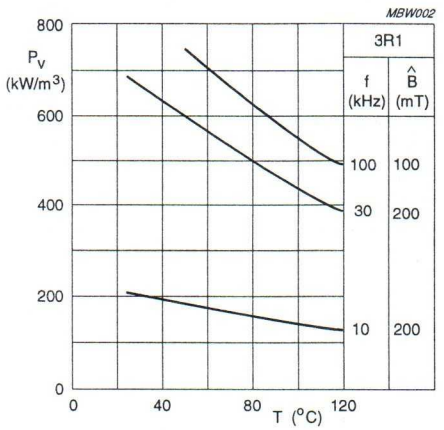


Fig.5 Specific powerl loss for several frequency/flux density combinations as a function of temperature.

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

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	
$\lvert Z \rvert$ (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

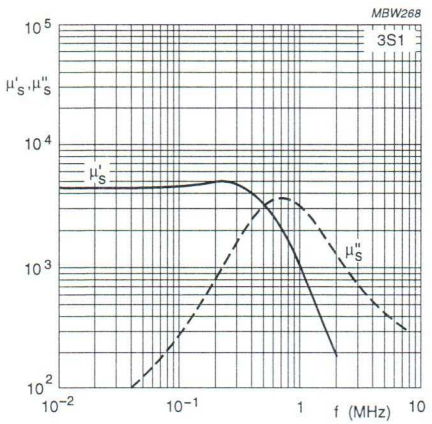


Fig.1 Complex permeability as a function of frequency.

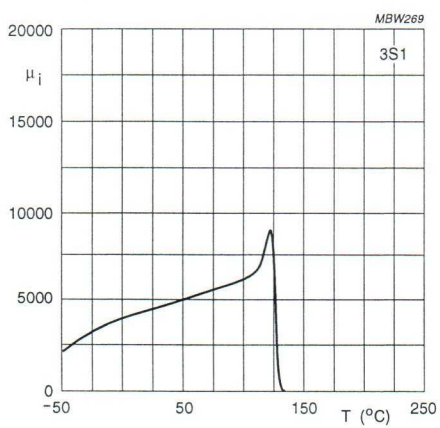


Fig.2 Initial permeability as a function of temperature.

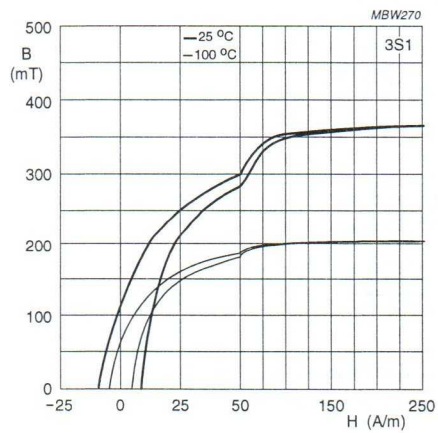


Fig.3 Typical B-H loops.

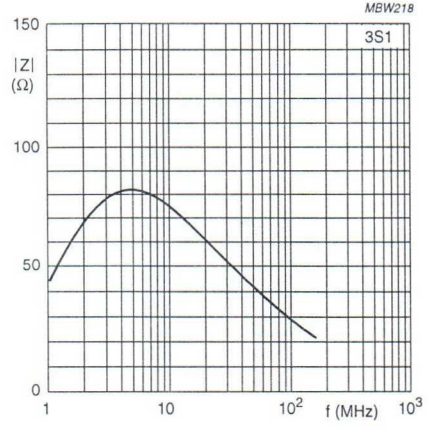


Fig.4 Impedance as a function of frequency.

Material grade specification 3S3

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	
$\lvert Z \rvert$ (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 Ø5 × Ø2 × 10 mm

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

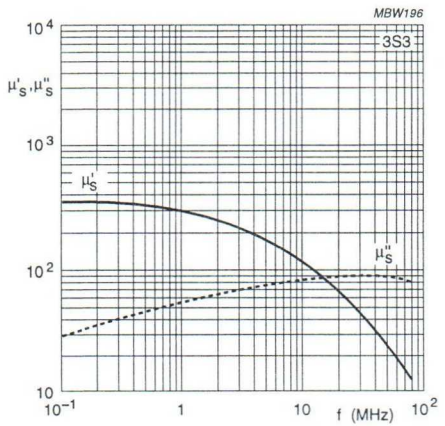


Fig.1 Complex permeability as a function of frequency.

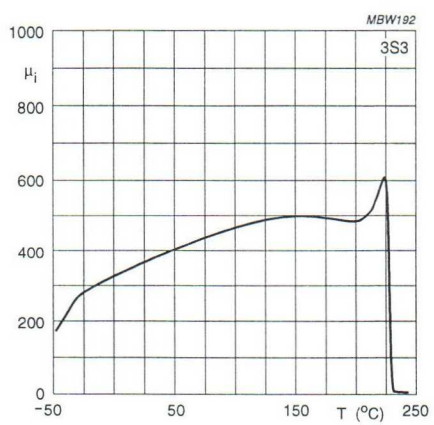


Fig.2 Initial permeability as a function of temperature.

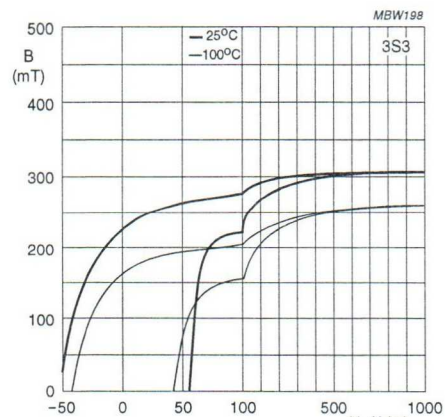


Fig.3 Typical B-H loops.

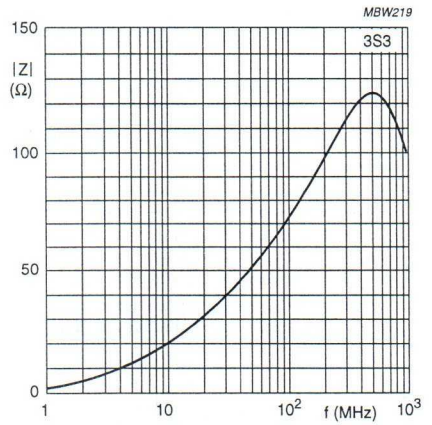


Fig.4 Impedance as a function of frequency.

Material grade specification 3S4

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	
$\lvert Z \rvert$ (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	≈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).

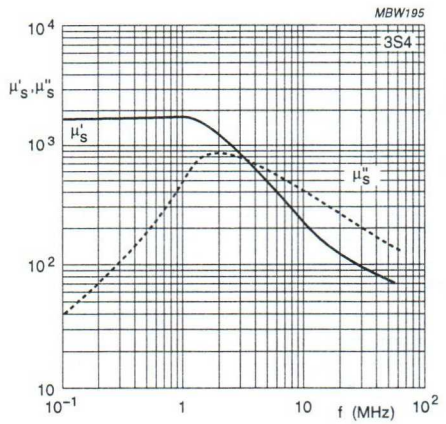


Fig.1 Complex permeability as a function of frequency.

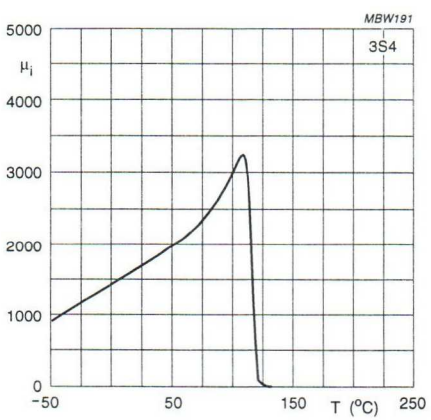


Fig.2 Initial permeability as a function of temperature.

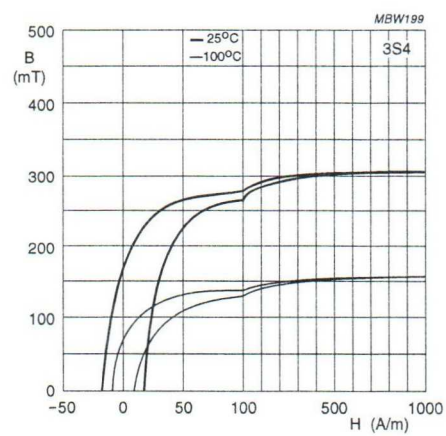


Fig.3 Typical B-H loops.

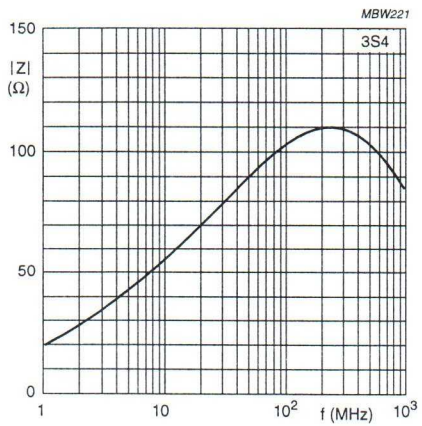


Fig.4 Impedance as a function of frequency.

Material grade specification

4A11

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

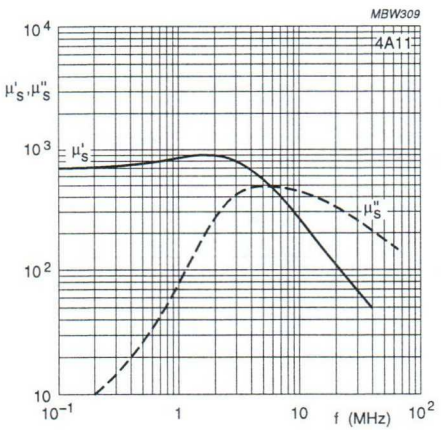


Fig.1 Complex permeability as a function of frequency.

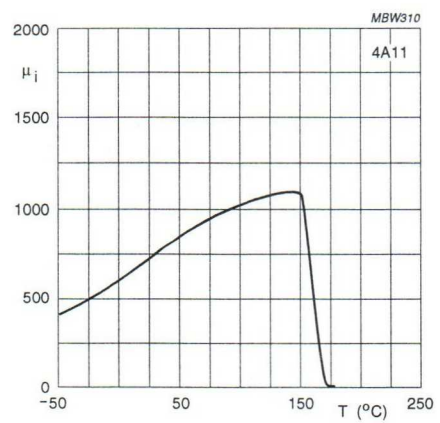


Fig.2 Initial permeability as a function of temperature.

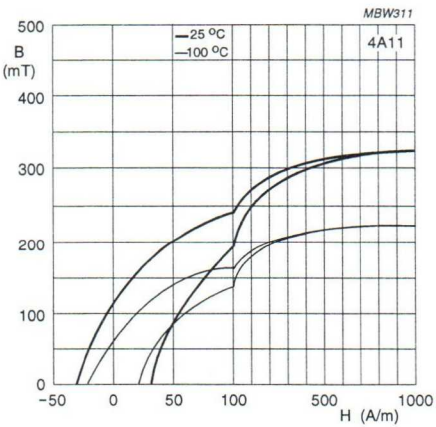


Fig.3 Typical B-H loops.

Material grade specification 4A15

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/m³

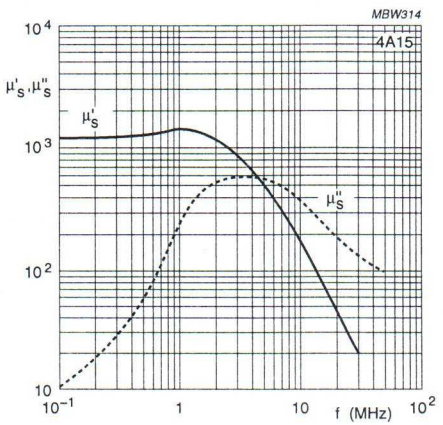


Fig.1 Complex permeability as a function of frequency

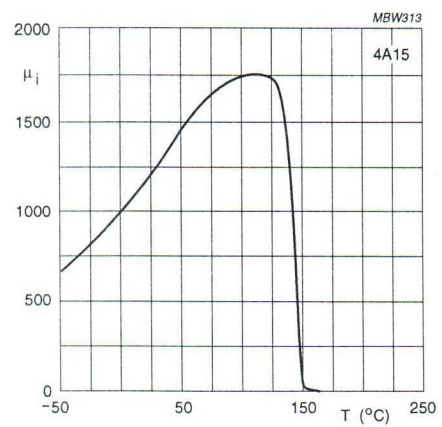


Fig.2 Initial permeability as a function of temperature.

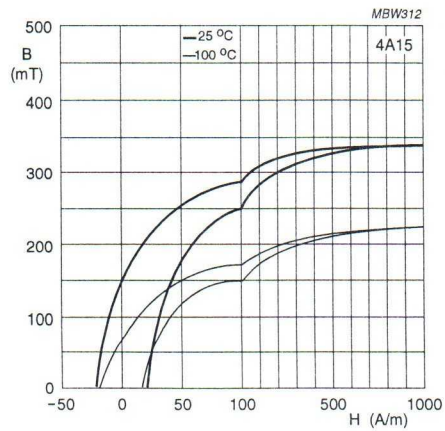


Fig.3 Typical B-H loops.

Material grade specification 4B1

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/m^3

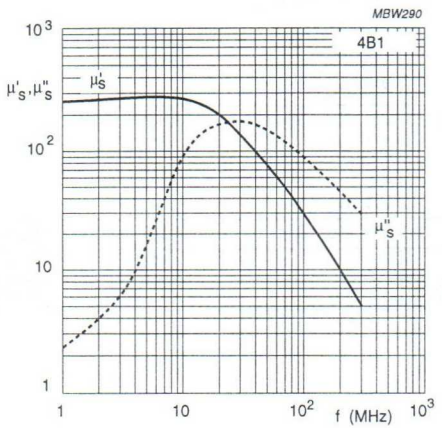


Fig.1 Complex permeability as a function of frequency.

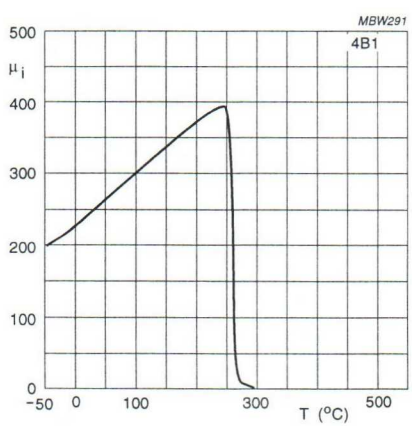


Fig.2 Initial permeability as a function of temperature.

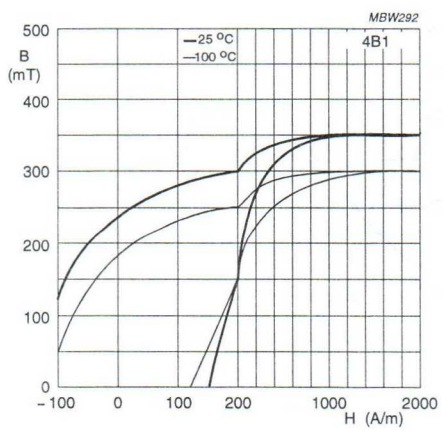


Fig.3 Typical B-H loops.

Material grade specification

4C6

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	100 ±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	$\leq 60 \times 10^{-6}$	
	25 °C; 10 MHz; 0.1 mT	$\leq 100 \times 10^{-6}$	
η_B	25 °C; 100 kHz; 1.5 to 3 mT	$\leq 20 \times 10^{-3}$	T^{-1}
D_F	25 °C; 100 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
α_F	5 to 25 °C; ≤10 kHz; 0.1 mT	$(3 \pm 3) \times 10^{-6}$	K^{-1}
	25 to 55 °C; ≤10 kHz; 0.1 mT	$(3 \pm 3) \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥350	°C
density		≈4500	kg/m^3

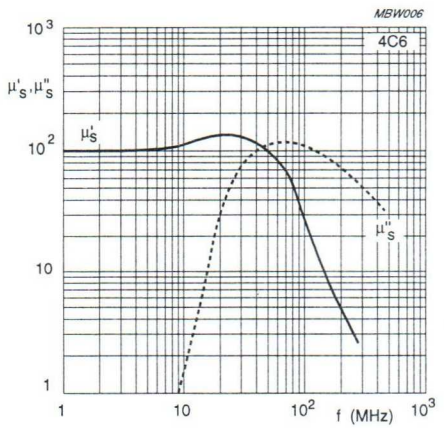


Fig.1 Complex permeability as a function of frequency.

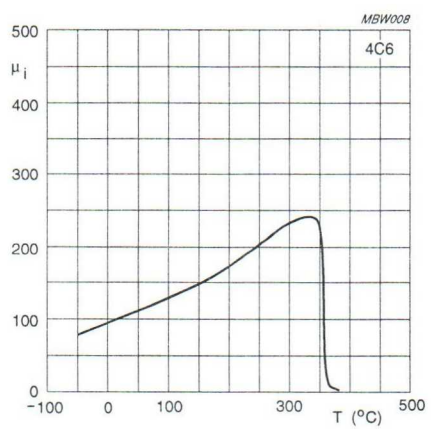


Fig.2 Initial permeability and loss factor as function of temperature.

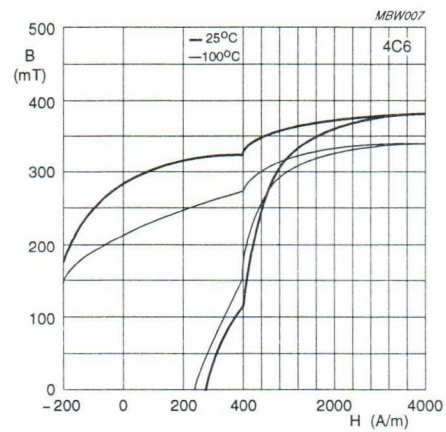


Fig.3 Typical B-H loops.

Material grade specification 4C6

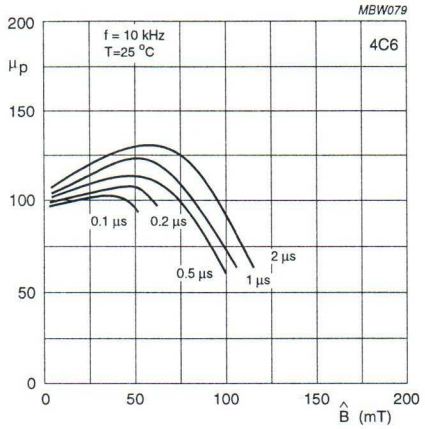


Fig.4 Pulse characteristics (unipolar pulses).

Material grade specification — 4C65

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/m³

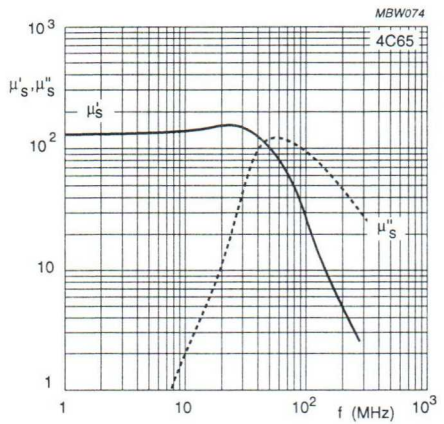


Fig.1 Complex permeability as a function of frequency.

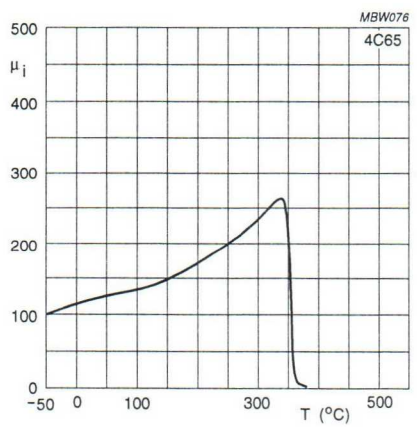


Fig.2 Initial permeability as a function of temperature.

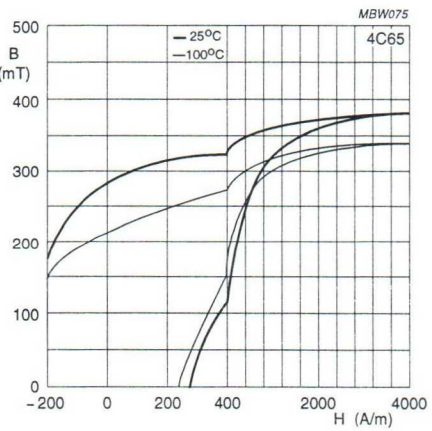


Fig.3 Typical B-H loops.

Material grade specification 4C65

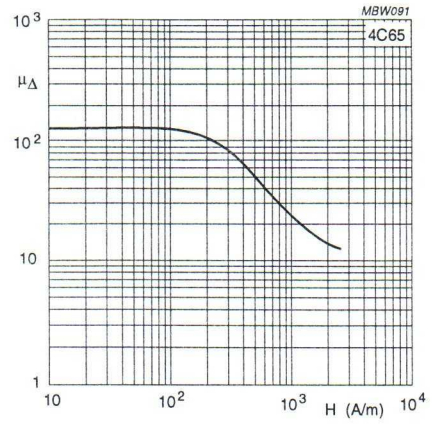


Fig.4 Incremental permeability as a function of magnetic field strenght.

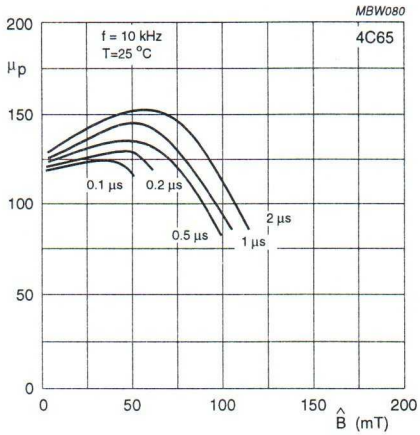


Fig.5 Pulse characteristics (unipolar pulses).

Material grade specification 4D2

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

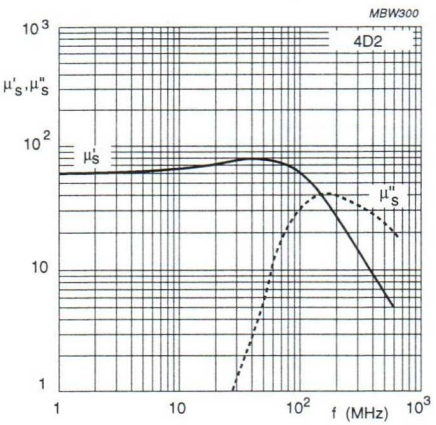


Fig.1 Complex permeability as a function of frequency.

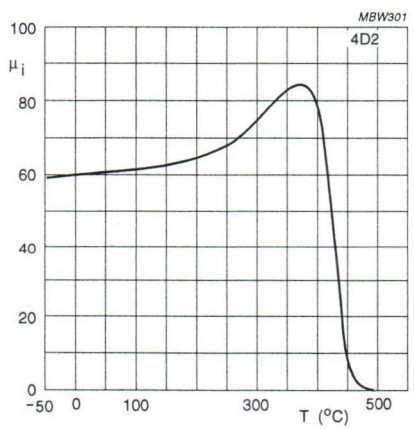


Fig.2 Initial permeability as a function of temperature.

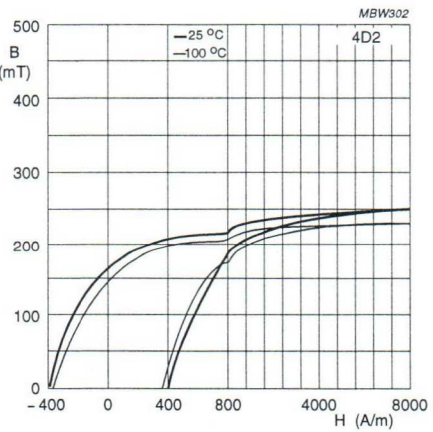


Fig.3 Typical B-H loops.

Material grade specification

4E1

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	mT
$\tan\delta/\mu_i$	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

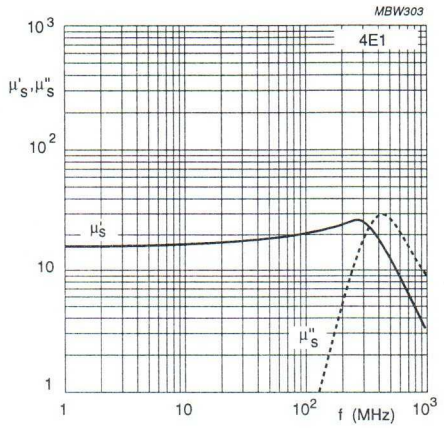


Fig.1 Complex permeability as a function of frequency.

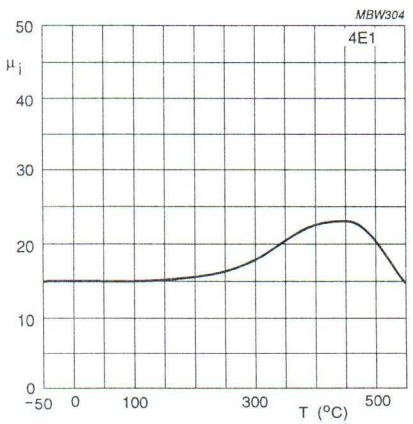


Fig.2 Initial permeability as a function of temperature.

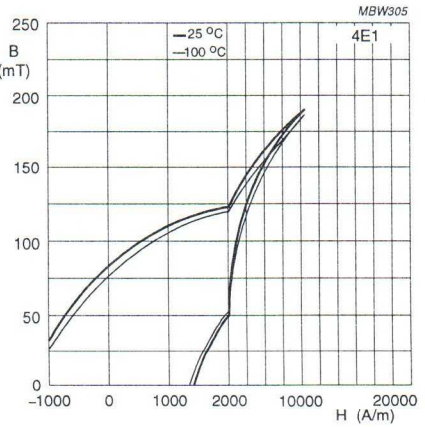


Fig.3 Typical B-H loops.

Material grade specification 4F1

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/m³
	100 °C; 10 MHz; 5 mT	≤200	
ρ	DC, 25 °C	≈10^5	Ωm
T_C		≥260	°C
density		≈4600	kg/m³

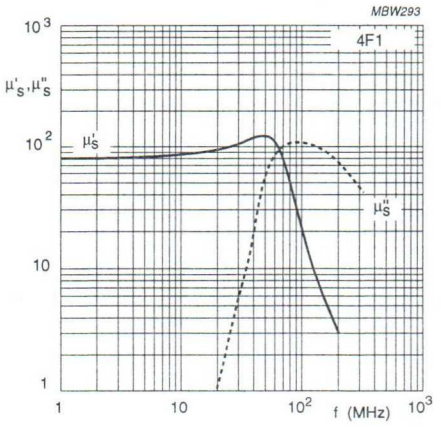


Fig.1 Complex permeability as a function of frequency.

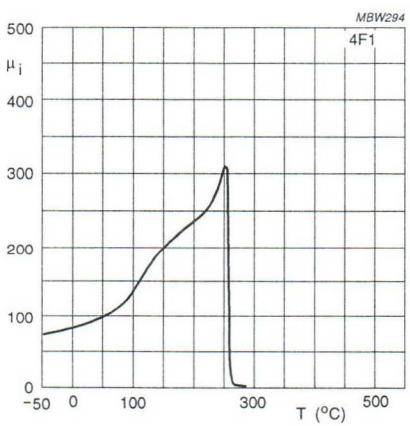


Fig.2 Initial permeability as a function of temperature.

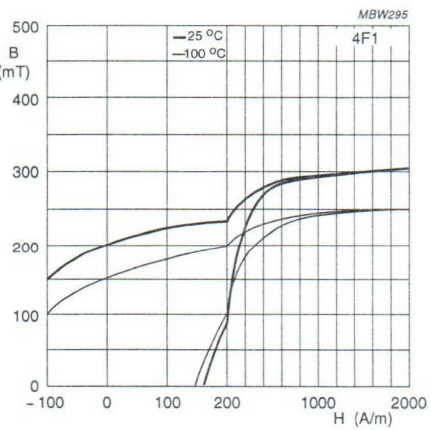


Fig.3 Typical B-H loops.

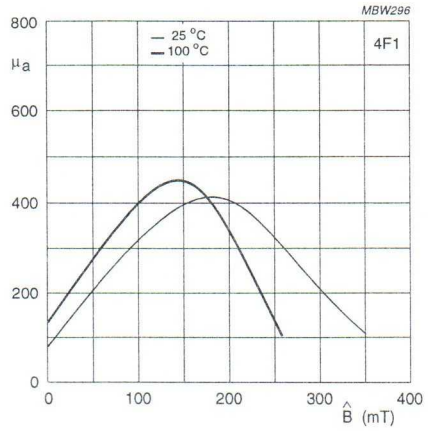


Fig.4 Amplitude permeability as function of peak flux density.

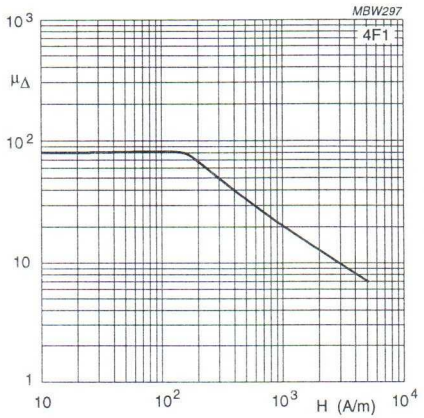


Fig.5 Incremental permeability as a function of magnetic field strenght.

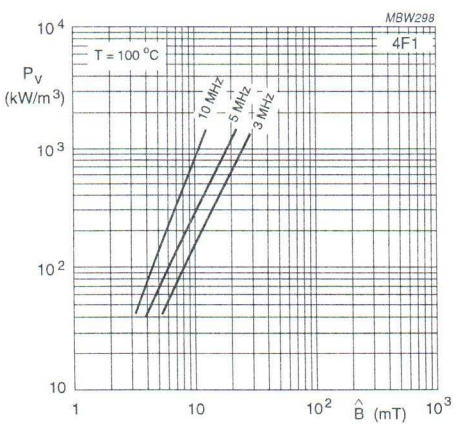


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter

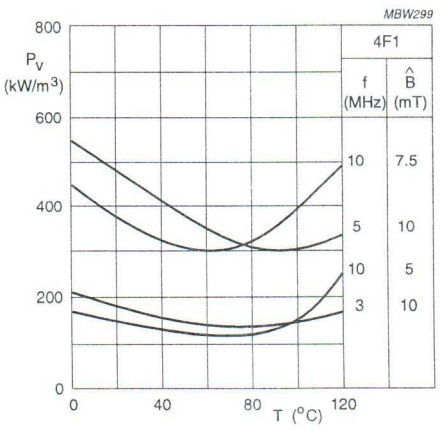


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature

Material grade specification 4S2

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/m³

Note

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

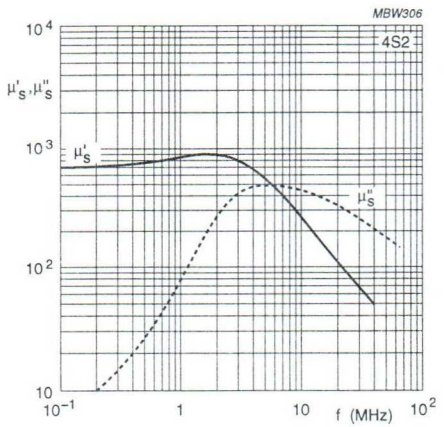


Fig.1 Complex permeability as a function of frequency.

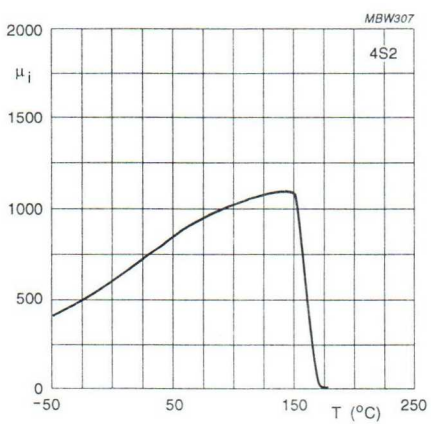


Fig.2 Initial permeability as a function of temperature.

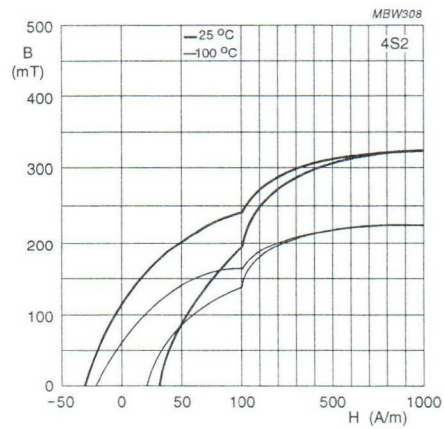


Fig.3 Typical B-H loops.

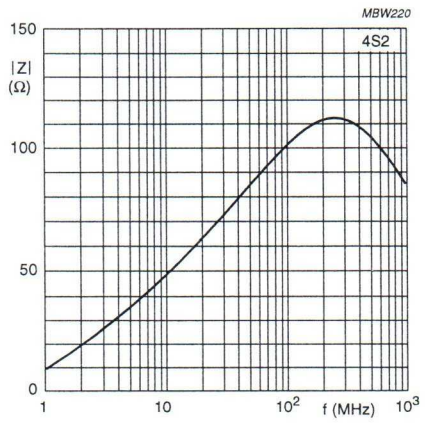
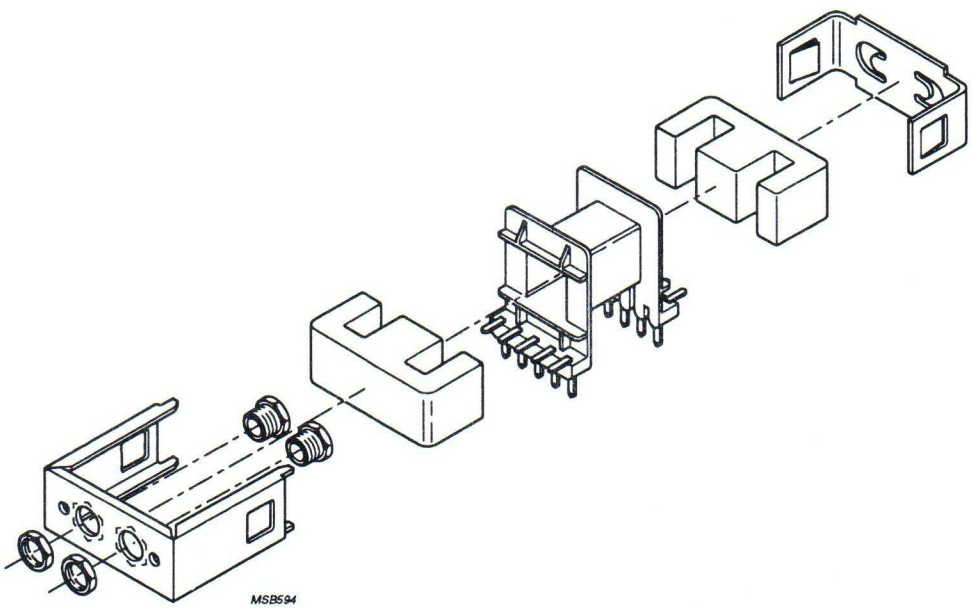


Fig.4 Impedance as a function of frequency.


MSB594

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview E cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
E5.3/2.7/2	31.4	2.50	0.08
E6.3/2.9/2	40.6	3.30	0.12
E13/6/6	559	20.2	1.4
E13/7/4	369	12.4	0.9
E16/8/5	750	20.1	2.0
E19/8/5	898	22.5	2.3
E19/8/9	1640	41.2	4
E20/10/5	1340	31.2	4.0
E20/10/6	1490	32.0	3.7
E25/9/6	1860	38.4	4.8
E25/10/6	1890	38.4	4.8
E25/13/7	2990	52.0	8.0
E25/16/6	2840	38.4	7.1
E30/15/7	4000	60.0	11
E30/15/13	6830	102	19
E31/13/9	5150	83.2	13
E32/16/9	6180	83.0	16
E34/14/9	5640	81.3	14
E36/21/15	15200	158	34
E41/17/12	11500	149	30
E42/21/15	17300	178	44
E42/21/20	22700	233	56
E42/33/20	34200	236	82
E46/23/30	43300	412	109
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	200
E71/33/32	102000	683	260
E80/38/20	72300	392	180

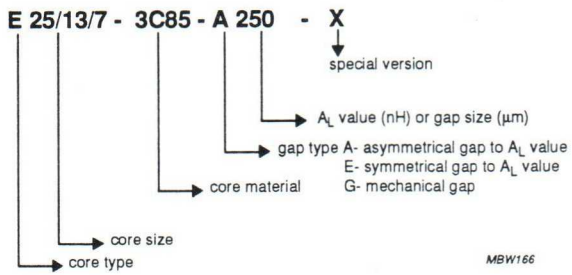


Fig.1 Type number structure for cores.

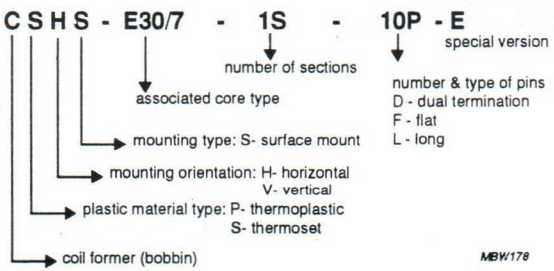
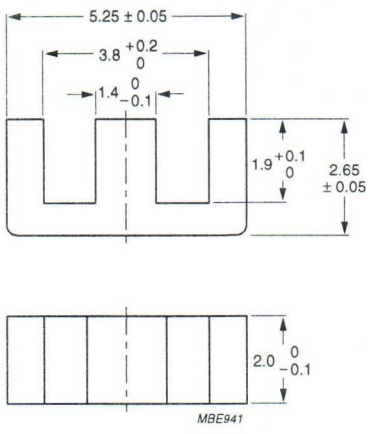


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.13	mm^{-1}
V_e	effective volume	31.4	mm^3
l_e	effective length	12.7	mm
A_e	effective area	2.5	mm^2
A_{min}	minimum area	2.3	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	265 ±25%	≈1080	≈0	E5.3/2.7/2-3F3
3F4	165 ±25%	≈670	≈0	E5.3/2.7/2-3F4

Note

1. Measured in combination with an ungapped core half, clamping force 5 ±2 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	1100 +40/–30%	≈4490	≈0	E5.3/2.7/2-3E5
3E6	1450 +40/–30%	≈5920	≈0	E5.3/2.7/2-3E6

Note

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

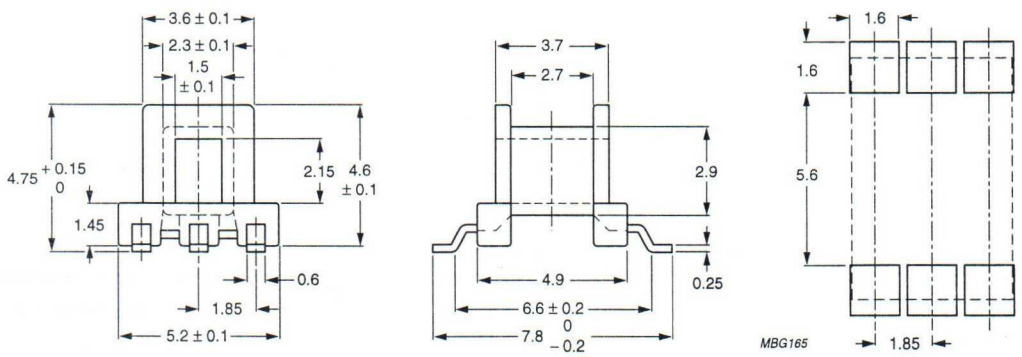
Properties of core sets under power conditions

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
3F3	≥300	–	≤0.005	≤0.008	–	–
3F4	≥250	–	–	–	≤0.010	≤0.012

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 E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

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

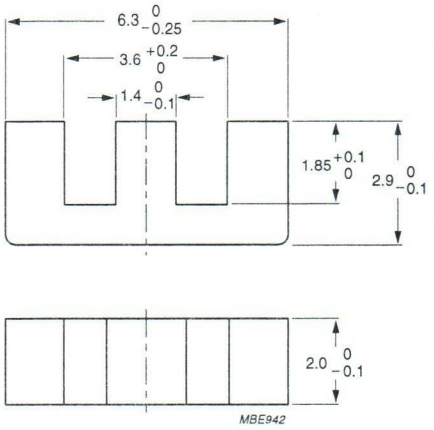
Winding data for E5.3/2.7/2 coil former (SMD) with 6 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.76	2.7	13	CPHS-E5.3/2.7/2-1S-6P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	360 ±25%	≈1050	≈0	E6.3/2.9/2-3F3
3F4	225 ±25%	≈660	≈0	E6.3/2.9/2-3F4

Note

1. Measured in combination with an ungapped core half, clamping force 5 ±2 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	1500 +40/–30%	≈4380	≈0	E6.3/2.9/2-3E5
3E6	2000 +40/–30%	≈5840	≈0	E6.3/2.9/2-3E6

Note

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

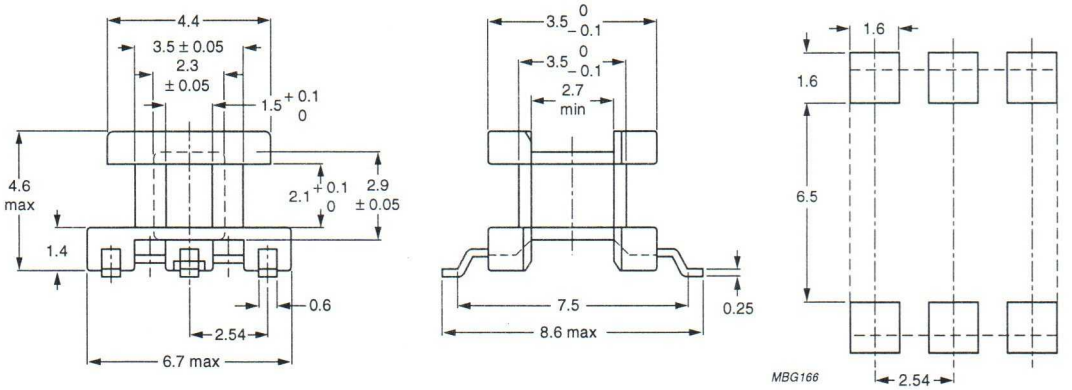
Properties of core sets under power conditions

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
3F3	≥300	–	≤0.007	≤0.010	–	–
3F4	≥250	–	–	–	≤0.012	≤0.015

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 E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 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-E6.3/2.9/2-1S-6P

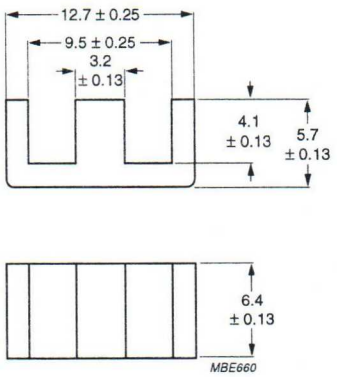
E cores and accessories

E13/6/6 (814E250)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥1350	≥1470	≈0	E13/6/6-3C80
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		E13/6/6-3C81
3C85	63 ±3%	≈70	≈520	E13/6/6-3C85-A63
	100 ±3%	≈110	≈300	E13/6/6-3C85-A100
	160 ±3%	≈175	≈170	E13/6/6-3C85-A160
	250 ±5%	≈275	≈100	E13/6/6-3C85-A250
	315 ±10%	≈340	≈75	E13/6/6-3C85-A315
	1465 ±25%	≈1600	≈0	E13/6/6-3C85
3C90	1465 ±25%	≈1600	≈0	E13/6/6-3C90

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Measured in combination with a non gapped core half, clamping force 15 ±5 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	2600 ±25%	≈2840	≈0	E13/6/6-3E25
3E27	2600 ±25%	≈2840	≈0	E13/6/6-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 15 ±5 N.

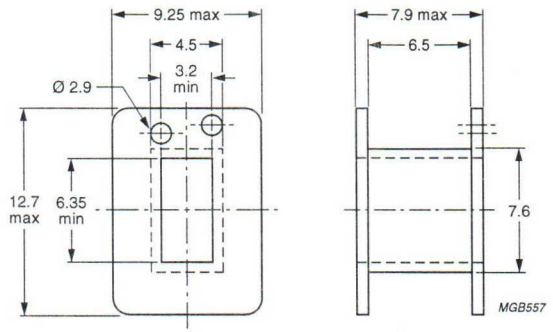
Properties of core sets under power conditions

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
3C80	≥320	≤0.08	–	–
3C81	≥320	≤0.12	–	–
3C85	≥320	≤0.09	≤0.10	–
3C90	≥320	≤0.06	≤0.06	–
3F3	≥320	–	≤0.06	≤0.11

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	85 °C



Dimensions in mm.

Fig.2 E13/6/6 coil former.

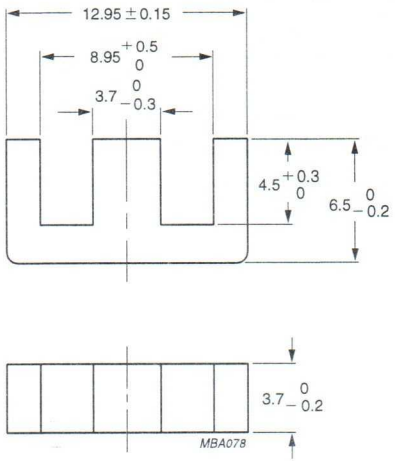
Winding data for E13/6/6 coil former

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
$\Sigma(l/A)$	core factor (C1)	2.39	mm^{-1}
V_e	effective volume	369	mm^3
l_e	effective length	29.7	mm
A_e	effective area	12.4	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 E13/7/4 core half.

Core halves

GRADE	A_L(1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C30	700 ±25%	≈1300	≈0	E13/7/4-3C30
3C80	900 ±25%	≈1700	≈0	E13/7/4-3C80
	≈250	≈450	50	E13/7/4-3C80-G50
	≈110	≈200	150	E13/7/4-3C80-G150
	≈45	≈80	500	E13/7/4-3C80-G500
3C85	900 ±25%	≈1700	≈0	E13/7/4-3C85
	≈250	≈450	50	E13/7/4-3C85-G50
	≈110	≈200	150	E13/7/4-3C85-G150
	≈45	≈80	500	E13/7/4-3C85-G500
3C90	800 ±25%	≈1500	≈0	E13/7/4-3C90
3F3	700 ±25%	≈1300	≈0	E13/7/4-3F3
	≈245	≈440	50	E13/7/4-3F3-G50
	≈110	≈200	150	E13/7/4-3F3-G150
	≈45	≈80	500	E13/7/4-3F3-G500

Note

1. Measured in combination with a non gapped core half, clamping force 15 ±5 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

Core halves of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	1200 ±25%	≈2200	≈0	E13/7/4-3C11
3E25	1500 ±25%	≈2800	≈0	E13/7/4-3E25

Note

1. Measured in combination with an ungapped core half, clamping force 15 ±5 N.

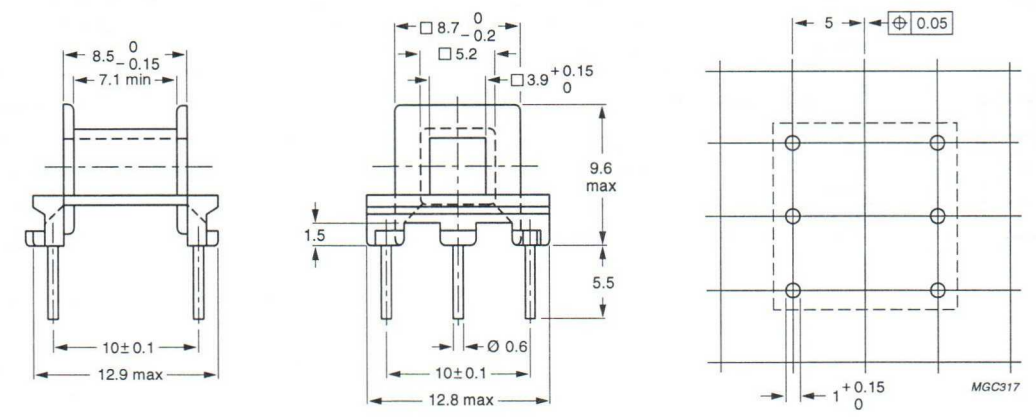
Properties of core sets under power conditions

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
3C30	≥350	≤0.05	≤0.05	–
3C80	≥320	≤0.1	–	–
3C85	≥320	≤0.06	≤0.07	–
3C90	≥320	≤0.05	≤0.05	–
3F3	≥320	–	≤0.05	≤0.07

COIL FORMER

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

ITEM	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 85 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, 235 °C, 2 s



Dimensions in mm.

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

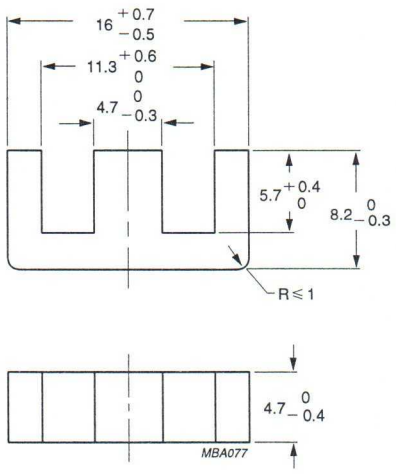
Winding data 6-pins for E13/7/4 coil former

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-E13/7/5-1S -6P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈2.0	g



Dimensions in mm.

Fig.1 E16/8/5 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	1000 ±25%	≈1500	≈0	E16/8/5-3C30
3C80	1050 +30% −20%	≈1550	≈0	E16/8/5-3C80
	≈350	≈520	50	E16/8/5-3C80-G50
	≈165	≈240	150	E16/8/5-3C80-G150
	≈70	≈105	500	E16/8/5-3C80-G500
3C85	1050 +30% −20%	≈1550	≈0	E16/8/5-3C85
	≈350	≈520	50	E16/8/5-3C85-G50
	≈165	≈240	150	E16/8/5-3C85-G150
	≈70	≈105	500	E16/8/5-3C85-G500
3C90	1000 ±25%	≈1500	≈0	E16/8/5-3C90
3F3	900 ±25%	≈1350	≈0	E16/8/5-3F3
	≈350	≈500	50	E16/8/5-3F3-G50
	≈165	≈240	150	E16/8/5-3F3-G150
	≈70	≈100	500	E16/8/5-3F3-G500

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	1800 ±25%	≈2700	≈0	E16/8/5-3C11
3E25	2200 ±25%	≈3300	≈0	E16/8/5-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

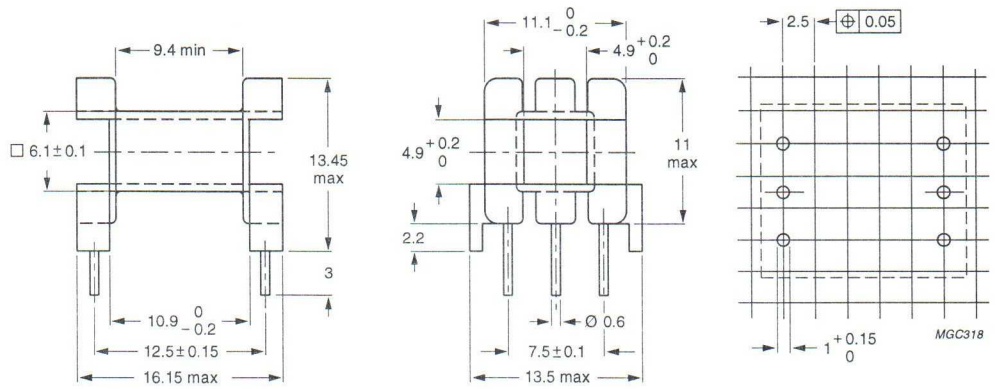
Properties of core sets under power conditions

GRADE	B (mT) at	CCORE 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
3C30	≥350	≤0.10	≤0.10	–
3C80	≥320	≤0.20	–	–
3C85	≥320	≤0.12	≤0.14	–
3C90	≥320	≤0.10	≤0.10	–
3F3	≥320	–	≤0.10	≤0.15

COIL FORMER

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

ITEM	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 85 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, 235 °C, 2 s



Dimensions in mm.

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

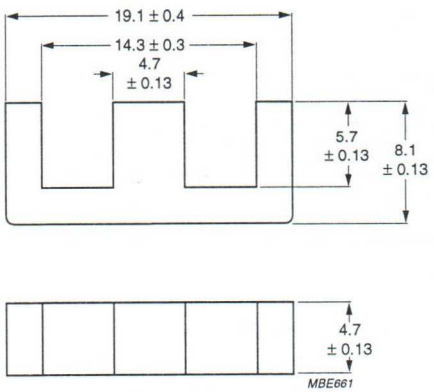
Winding data for 6-pins E16/8/5 coil former

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

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥1090	≥1530	≈0	E19/8/5-3C80
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
3C85	63 ±3%	≈90	≈590	E19/8/5-3C85-A63
	100 ±3%	≈140	≈330	E19/8/5-3C85-A100
	160 ±3%	≈225	≈190	E19/8/5-3C85-A160
	250 ±5%	≈350	≈110	E19/8/5-3C85-A250
	315 ±10%	≈440	≈80	E19/8/5-3C85-A315
	1170 ±25%	≈1650	≈0	E19/8/5-3C85
3C90	1170 ±25%	≈1650	≈0	E19/8/5-3C90

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	2300 ±25%	≈3230	≈0	E19/8/5-3E25
3E27	2300 ±25%	≈3230	≈0	E19/8/5-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

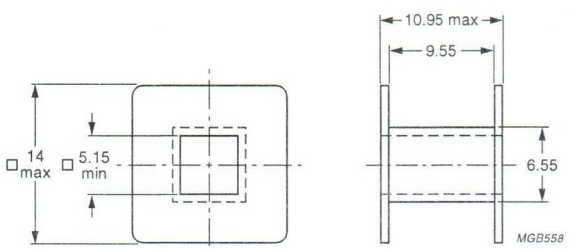
Properties of core sets under power conditions

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
3C80	≥320	≤0.11	–	–
3C81	≥320	≤0.20	–	–
3C85	≥320	≤0.14	≤0.16	–
3C90	≥320	≤0.09	≤0.10	–
3F3	≥320	–	≤0.10	≤0.17

COIL FORMERS

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL94V 2; UL file number E41938(M)
Maximum operating temperature	85 °C



Dimensions in mm.

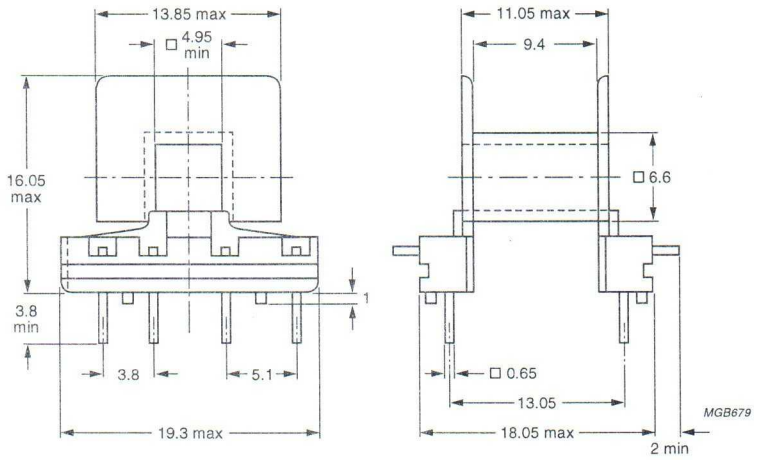
Fig.2 E19/8/5 coil former.

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

ITEM	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
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, 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

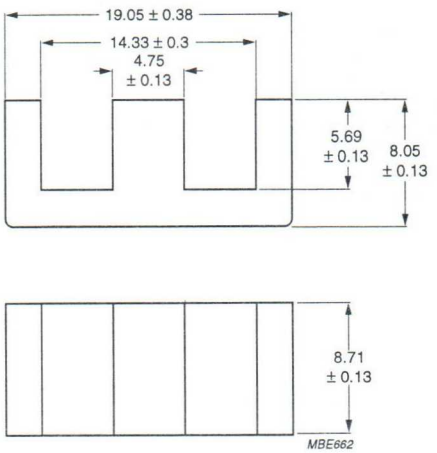
E core and accessories

E19/8/9 (813E343)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥1985	≥1510	≈0	E19/8/9-3C80
3C81	100 ±3%	≈75	≈650	E19/8/9-3C81-E100(2)
	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%	≈	≈0	E19/8/9-3C81
3C85	100 ±3%	≈75	≈650	E19/8/9-3C81-E100(2)
	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
	2150 ±25%	≈2100	≈0	E19/8/9-3C81
3C90	2150 ±25%	≈2100	≈0	E19/8/9-3C90

E core and accessories

E19/8/9 (813E343)

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±3%	≈75	≈650	E19/8/9-3C81-E100[2]
	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
	1830 ±25%	≈1400	≈0	E19/8/9-3C81

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.
2. Measured in combination with an Equal-gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	4250 ±25%	≈3270	≈0	E19/8/9-3E25
3E27	4250 ±25%	≈3270	≈0	E19/8/9-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

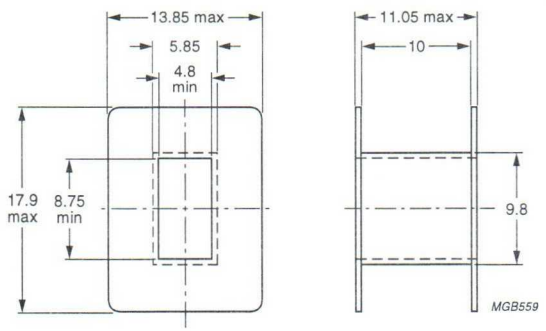
Properties of core sets under power conditions

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
3C80	≥320	≤0.21	–	–
3C85	≥320	≤0.26	≤0.30	–
3C90	≥320	≤0.17	≤0.18	–
3F3	≥320	–	≤0.18	≤0.31

COIL FORMER

General data for E19/8/9 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	85 °C



Dimensions in mm.

Fig.2 E19/8/9 coil former.

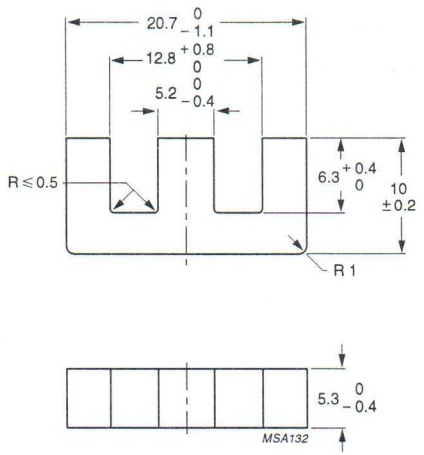
Winding data for E19/8/9 coil former

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
$\Sigma(l/A)$	core factor (C1)	1.37	mm^{-1}
V_e	effective volume	1340	mm^3
l_e	effective length	42.8	mm
A_e	effective area	31.2	mm^2
A_{min}	minimum area	25.2	mm^2
m	mass of core half	≈4	g



Dimensions in mm.

Fig.1 E20/10/5 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	1200 ±25%	≈1390	≈0	E20/10/5-3C30
3C80	1300 ±25%	≈1430	≈0	E20/10/5-3C80
	≈460	≈510	50	E20/10/5-3C80-G50
	≈210	≈230	150	E20/10/5-3C80-G150
	≈85	≈100	500	E20/10/5-3C80-G500
3C85	1300 ±25%	≈1430	≈0	E20/10/5-3C85
	≈460	≈510	50	E20/10/5-3C85-G50
	≈210	≈230	150	E20/10/5-3C85-G150
	≈85	≈100	500	E20/10/5-3C85-G500
3C90	1400 ±25%	≈1500	≈0	E20/10/5-3C90
3F3	1150 ±25%	≈1270	≈0	E20/10/5-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

Core halves of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈2850	≈0	E20/10/5-3C11
3E25	2800 ±25%	≈3000	≈0	E20/10/5-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

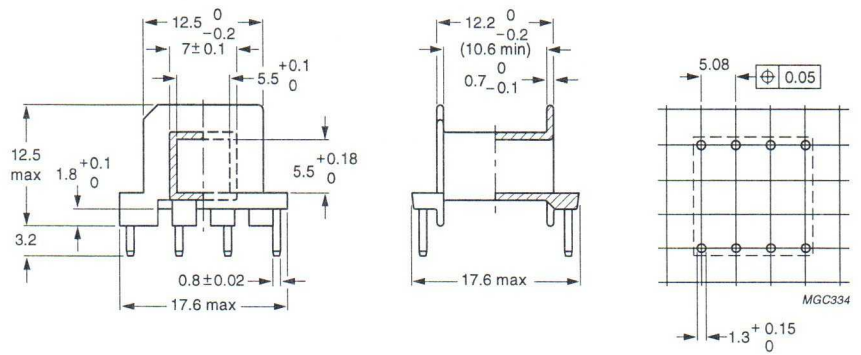
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤0.14	≤0.15	–
3C80	≥330	≤0.50	–	–
3C85	≥330	≤0.20	≤0.25	–
3C90	≥330	≤0.14	≤0.15	–
3F3	≥320	–	≤0.15	≤0.25

COIL FORMER

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

ITEM	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 85 class H
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 E20/10/5 coil former; 8-pins.

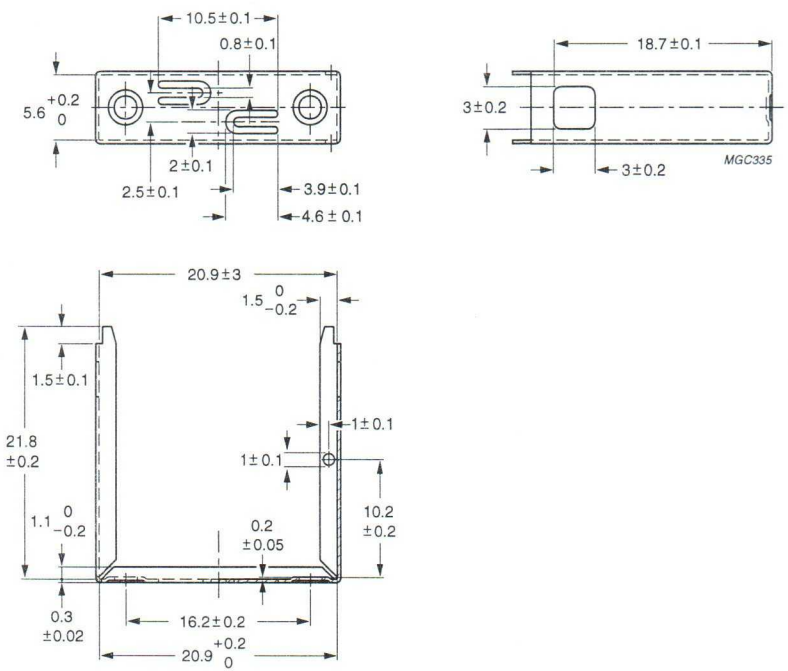
Winding data for 8-pins E20/10/5 coil former

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

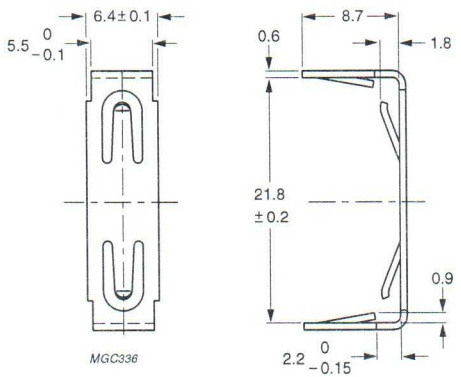
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	material: copper-zinc alloy (CuZn), nickel (Ni) plated	3	CLA-E20/10/5
Spring	material: copper-tin alloy (CuSn), nickel (Ni) plated	4	SPR-E20/10/5



Dimensions in mm.

Fig.3 E20/10/5 clasp.



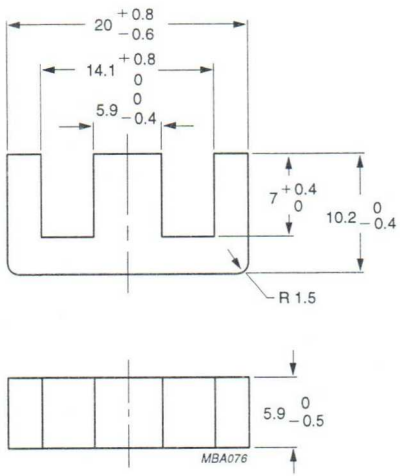
Dimensions in mm.

Fig.4 E20/10/5 spring.

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	1200 ±25%	≈1380	≈0	E20/10/6-3C30
3C80	1350 ±25%	≈1550	≈0	E20/10/6-3C80
	≈540	≈620	50	E20/10/6-3C80-G50
	≈250	≈290	150	E20/10/6-3C80-G150
	≈100	≈115	500	E20/10/6-3C80-G500
3C85	1350 ±25%	≈1550	≈0	E20/10/6-3C85
	≈540	≈620	50	E20/10/6-3C85-G50
	≈250	≈290	150	E20/10/6-3C85-G150
	≈100	≈115	500	E20/10/6-3C85-G500
3C90	1380 ±25%	≈1590	≈0	E20/10/6-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP[2] (μm)	TYPE NUMBER
3F3	1200 ±25%	≈1380	≈0	E20/10/6-3F3
	≈520	≈620	50	E20/10/6-3F3-G50
	≈250	≈290	150	E20/10/6-3F3-G150
	≈100	≈115	500	E20/10/6-3F3-G500

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈3000	≈0	E20/10/6-3C11
3E25	3100 ±25%	≈3600	≈0	E20/10/6-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±40 N.

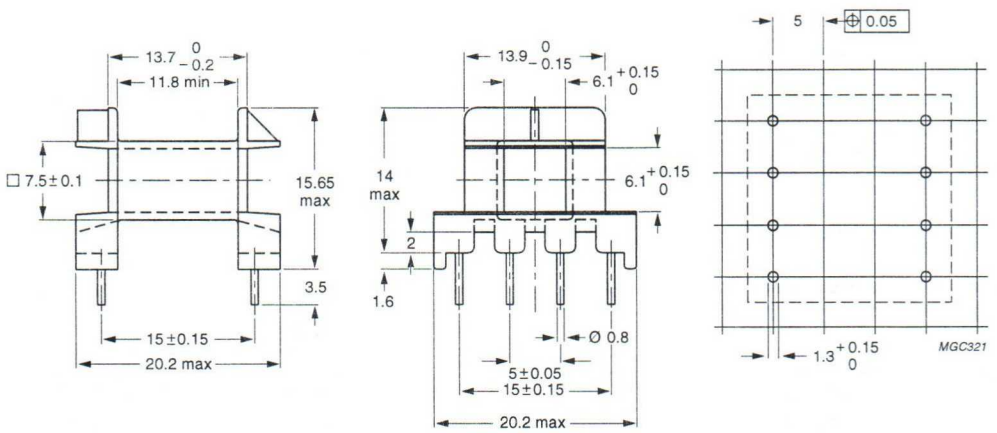
Properties of core sets under power conditions

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
3C30	≥360	≤0.16	≤0.18	–
3C80	≥330	≤0.40	–	–
3C85	≥330	≤0.22	≤0.27	–
3C90	≥330	≤0.16	≤0.18	≤
3F3	≥320	–	≤0.20	≤0.30

COIL FORMER

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

ITEM	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
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, 235 °C, 2 s



Dimensions in mm.

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

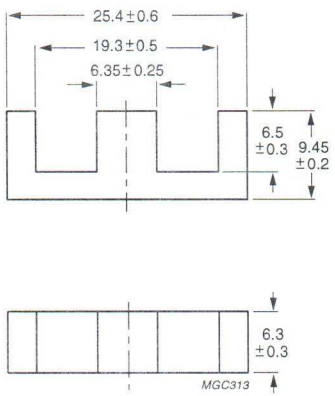
Winding data for 8-pins E20/10/6 coil former

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

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	1860	mm^3
l_e	effective length	47.4	mm
A_e	effective area	38.4	mm^2
A_{min}	effective 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

GRADE	A_L[1] (nH)	μ_e	AIR GAP[2] (μm)	TYPE NUMBER
3C30	1400 ±25%	≈1380	≈0	E25/9/6-3C30
3C85	2000 ±25%	≈1950	≈0	E25/9/6-3C85
3C90	1600 ±25%	≈1540	≈0	E25/9/6-3C90

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈2550	≈0	E25/9/6-3C11
3E25	2900 ±25%	≈2800	≈0	E25/9/6-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

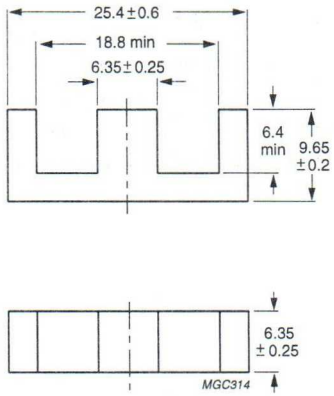
Properties of core sets under power conditions

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
3C30	≥360	≤0.2	≤0.22	–
3C85	≥330	≤0.3	≤0.4	–
3C90	≥330	≤0.2	≤0.22	–

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1400 ±25%	≈1400	≈0	E25/10/6-3C30
3C80	1600 +35/–25%	≈1600	≈0	E25/10/6-3C80
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
3C85	100 ±3%	≈100	≈600	E25/10/6-3C85-A100
	160 ±3%	≈165	≈340	E25/10/6-3C85-A160
	250 ±3%	≈255	≈200	E25/10/6-3C85-A250
	315 ±3%	≈320	≈150	E25/10/6-3C85-A315
	400 ±5%	≈410	≈110	E25/10/6-3C85-A400
	1600+35/–25%	≈1600	≈0	E25/10/6-3C85
3C90	1600+35/–25%	≈1600	≈0	E25/10/6-3C90

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈2650	≈0	E25/10/6-3C11
3E25	3200 ±25%	≈3200	≈0	E25/10/6-3E25
3E27	3200 ±25%	≈3200	≈0	E25/10/6-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±40 N.

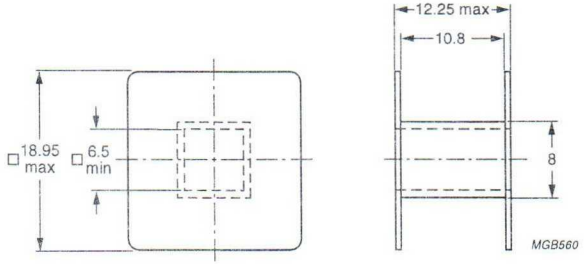
Properties of core sets under power conditions

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
3C30	≥360	≤0.20	≤0.22	–
3C80	≥320	≤0.25	–	–
3C81	≥320	≤0.4	–	–
3C85	≥330	≤0.3	≤0.4	–
3C90	≥330	≤0.2	≤0.22	–
3F3	≥320	–	≤0.22	≤0.38

COIL FORMERS

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-2
Maximum operating temperature	85 °C



Dimensions in mm.

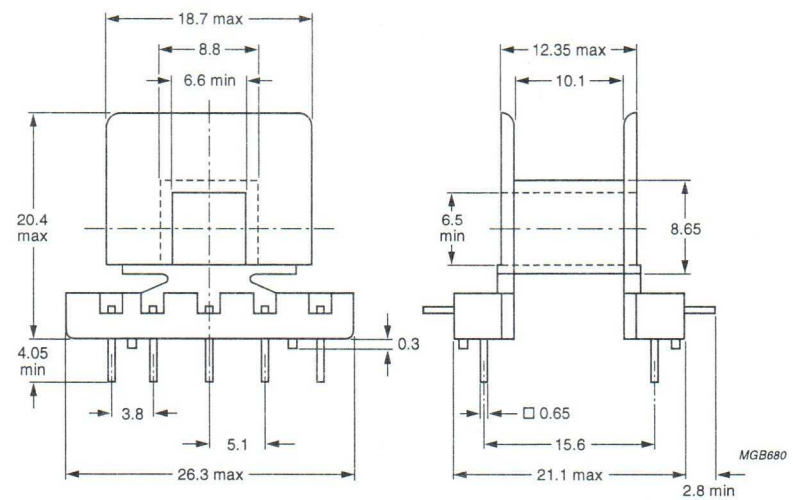
Fig.2 E25/10/6 coil former.

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

ITEM	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 85 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, 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.

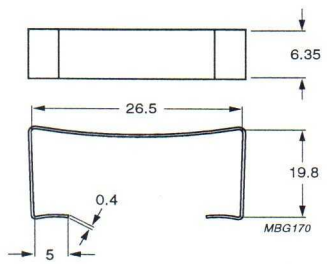
Winding data for 10-pins E25/10/6 coil former

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
Clip	material: NiCr-steel clamping force ≈30 N	4	CLM-E25/10/6



Dimensions in mm.

Fig.4 E25/10/6 clip.

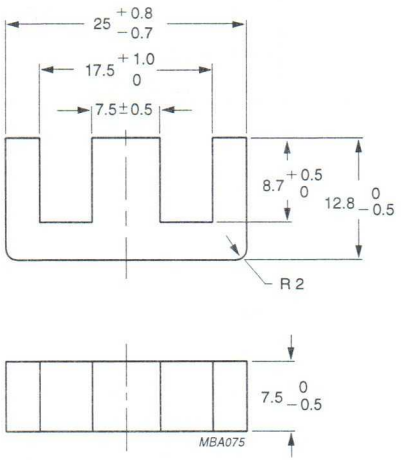
E cores and accessories

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1650 ±25%	≈1460	≈0	E25/13/7-3C30
3C80	1900 ±25%	≈1680	≈0	E25/13/7-3C80
	≈900	≈780	50	E25/13/7-3C80-G50
	≈410	≈360	150	E25/13/7-3C80-G150
	≈165	≈150	500	E25/13/7-3C80-G500
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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈140	≈480	E25/13/7-3C85-A160
	250 ±3%	≈220	≈270	E25/13/7-3C85-A250
	315 ±3%	≈280	≈200	E25/13/7-3C85-A315
	400 ±3%	≈355	≈150	E25/13/7-3C85-A400
	630 ±5%	≈560	≈80	E25/13/7-3C85-A630
	1900 ±25%	≈1680	≈0	E25/13/7-3C85
	≈900	≈780	50	E25/13/7-3C85-G50
	≈410	≈360	150	E25/13/7-3C85-G150
	≈165	≈150	500	E25/13/7-3C85-G500
3C90	1900 ±25%	≈1680	≈0	E25/13/7-3C90
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
	≈865	≈750	50	E25/13/7-3F3-G50
	≈400	≈350	150	E25/13/7-3F3-G150
	≈165	≈150	500	E25/13/7-3F3-G500

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3100 ±25%	≈2740	≈0	E25/13/7-3C11
3E25	4000 ±25%	≈3530	≈0	E25/13/7-3E25
3E27	4000 ±25%	≈3530	≈0	E25/13/7-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Properties of core sets under power conditions

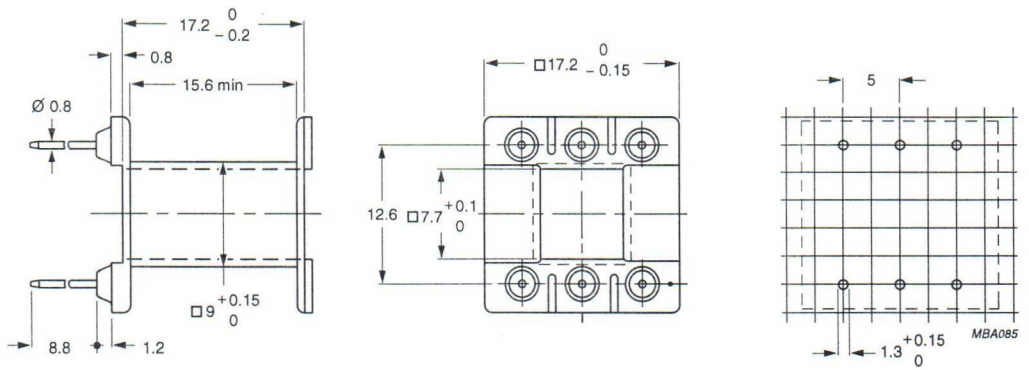
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤0.30	≤0.35	–
3C80	≥330	≤0.80	–	–
3C81	≥320	≤0.61	–	–

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
3C85	≥330	≤0.47	≤0.55	–
3C90	≥330	≤0.30	≤0.35	–
3F3	≥320	–	≤0.35	≤0.60

COIL FORMER

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

ITEM	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 85 class F
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, 235 °C, 2 s



Dimensions in mm.

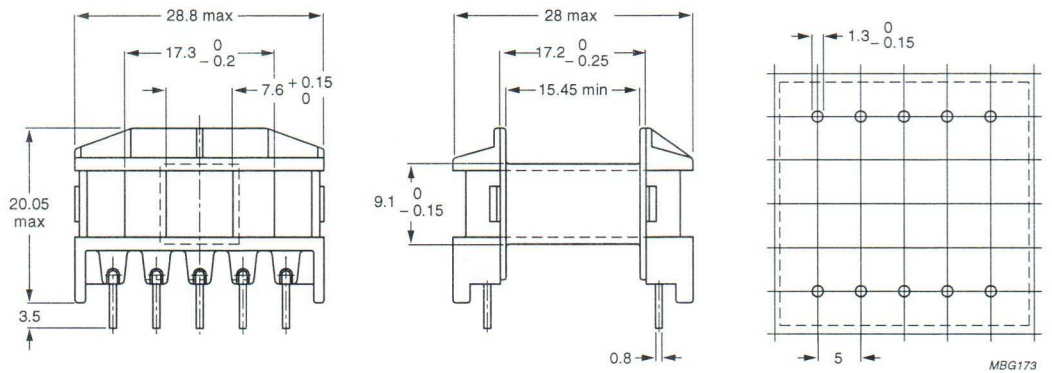
Fig.2 E25/13/7 coil former; 6-pins.

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

ITEM	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 85 class F
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, 235 °C, 2 s



Dimensions in mm.

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

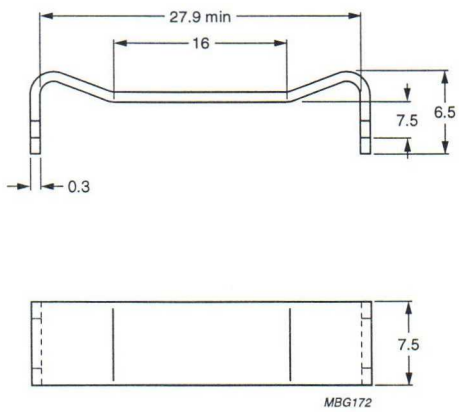
Winding data for 10-pins E25/13/7 coil former

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	material: CrNi-steel	3	CLI-E25/13/7



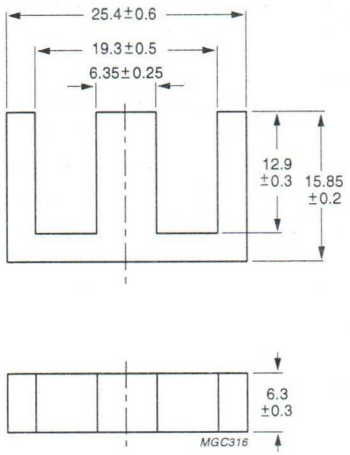
Dimensions in mm.

Fig.4 E25/13/7 clip.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.93	mm^{-1}
V_e	effective volume	2840	mm^3
l_e	effective length	74.0	mm
A_e	effective area	38.4	mm^2
A_{min}	effective area	37.0	mm^2
m	mass of core half	≈7.1	g



Dimensions in mm.

Fig.1 E25/16/6 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1000 ±25%	≈1550	≈0	E25/16/6-3C30
3C85	1400 ±25%	≈2150	≈0	E25/16/6-3C85
3C90	1100 ±25%	≈1700	≈0	E25/16/6-3C90
3F3	1000 ±25%	≈1550	≈0	E25/16/6-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2000 ±25%	≈3100	≈0	E25/16/6-3C11
3E25	2400 ±25%	≈3700	≈0	E25/16/6-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

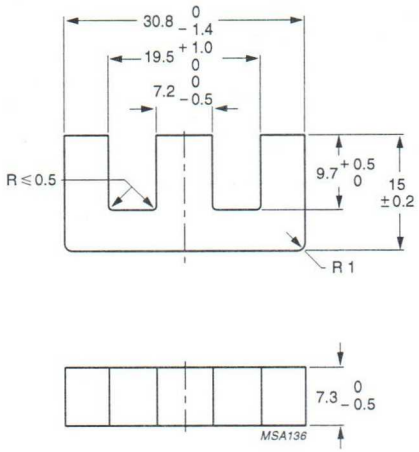
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤0.30	≤0.32	–
3C85	≥330	≤0.50	≤0.70	–
3C90	≥330	≤0.30	≤0.32	–
3F3	≥320	–	≤0.32	≤0.55

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.12	mm^{-1}
V_e	effective volume	4000	mm^3
l_e	effective length	67.0	mm
A_e	effective area	60.0	mm^2
A_{min}	minimum area	49.0	mm^2
m	mass of core half	≈11	g



Dimensions in mm.

Fig.1 E30/15/7 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1650 ±25%	≈1	≈0	E30/15/7-3C30
3C80	1900 ±25%	≈1700	≈0	E30/15/7-3C80
	≈480	≈430	100	E30/15/7-3C80-G100
	≈300	≈260	200	E30/15/7-3C80-G200
	≈150	≈140	500	E30/15/7-3C80-G500
	≈110	≈100	800	E30/15/7-3C80-G800
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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈145	≈530	E30/15/7-3C85-A160
	250 ±3%	≈225	≈300	E30/15/7-3C85-A250
	315 ±3%	≈285	≈230	E30/15/7-3C85-A315
	400 ±3%	≈365	≈170	E30/15/7-3C85-A400
	630 ±5%	≈580	≈90	E30/15/7-3C85-A630
	1900 ±25%	≈1700	≈0	E30/15/7-3C85
	≈480	≈430	100	E30/15/7-3C85-G100
	≈300	≈260	200	E30/15/7-3C85-G200
	≈150	≈140	500	E30/15/7-3C85-G500
	≈110	≈100	800	E30/15/7-3C85-G800
3C90	2000 ±25%	≈1780	≈0	E25/13/7-3C90
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
	≈470	≈420	100	E30/15/7-3F3-G100
	≈300	≈260	200	E30/15/7-3F3-G200
	≈150	≈140	500	E30/15/7-3F3-G500
	≈110	≈100	800	E30/15/7-3F3-G800

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3300 ±25%	≈2930	≈0	E30/15/7-3C11
3E25	4100 ±25%	≈3650	≈0	E30/15/7-3E25
3E27	4100 ±25%	≈3650	≈0	E30/15/7-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

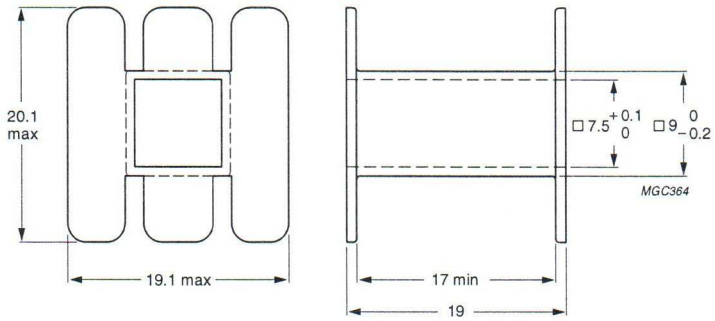
Properties of core sets under power conditions

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
3C30	≥360	≤0.40	≤0.45	–
3C80	≥330	≤0.9	–	–
3C81	≥320	≤0.82	–	–
3C85	≥330	≤0.65	≤0.75	–
3C90	≥330	≤0.40	≤0.45	–
3F3	≥320	–	≤0.45	≤0.75

COIL FORMERS

General data for E30/15/7 coil former without pins (E)

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



Dimensions in mm.

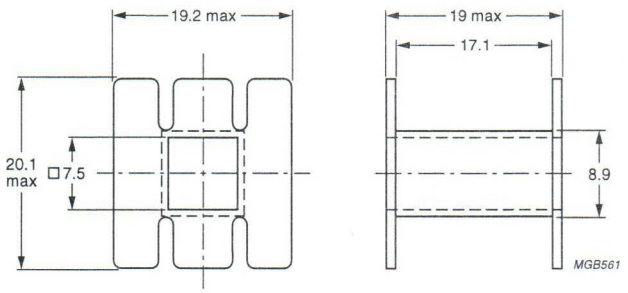
Fig.2 E30/15/7 coil former (E).

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-E

General data for E30/15/7 coil former without pins (A)

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41871(M)
Maximum operating temperature	130 °C, IEC 85 class B



Dimensions in mm.

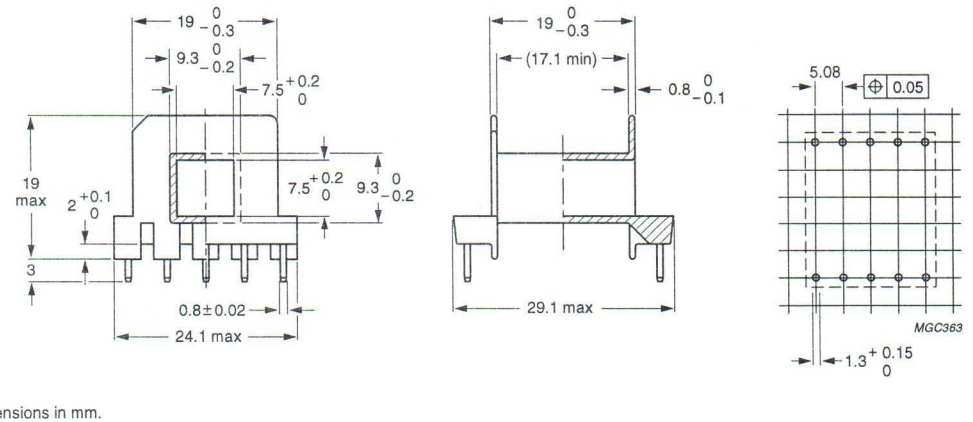
Fig.3 E30/15/7 coil former (A).

Winding data for E30/15/7 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	80.6	17.1	53.0	CP-E30/15/7-1S-A

General data for 10-pins E30/15/7 coil former (E)

ITEM	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 85 class H
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, 235 °C, 2 s



Dimensions in mm.

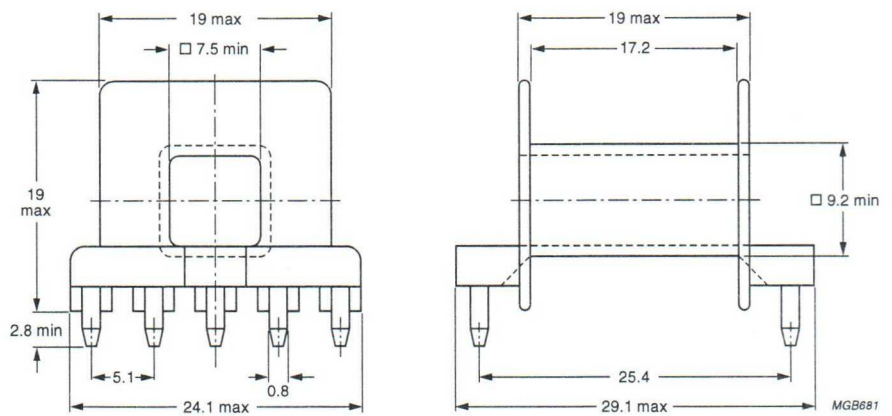
Fig.4 E30/15/7 coil former; 10-pins (E).

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-E

General data for 10-pins E30/15/7 coil former (A)

ITEM	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E123472(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C
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, 235 °C, 2 s



Dimensions in mm.

Fig.5 E30/15/7 coil former; 10-pins (A).

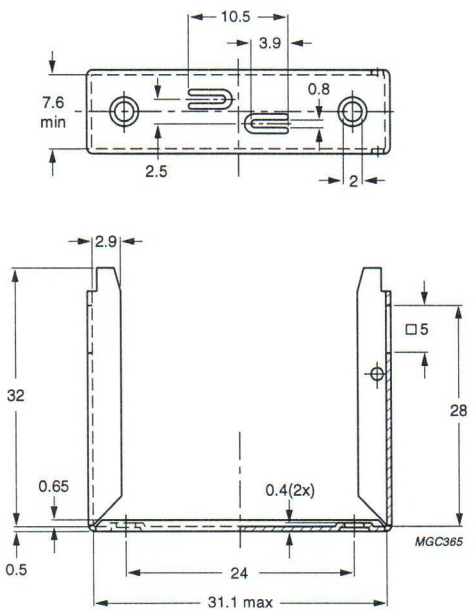
Winding data for 10-pins E30/15/7 coil former (A)

NUMBER OF NECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80.3	17.2	52.2	CSH-E30/7-1S-10P-A

MOUNTING PARTS

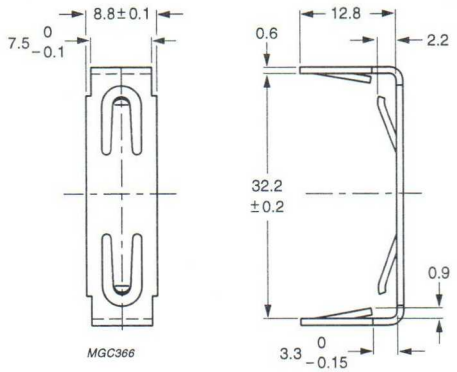
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	material: CuZn alloy, Ni plated	6	CLA-E30/15/7
Spring	material: CrNi-steel	7	SPR-E30/15/7



Dimensions in mm.

Fig.6 E30/15/7 clasp.



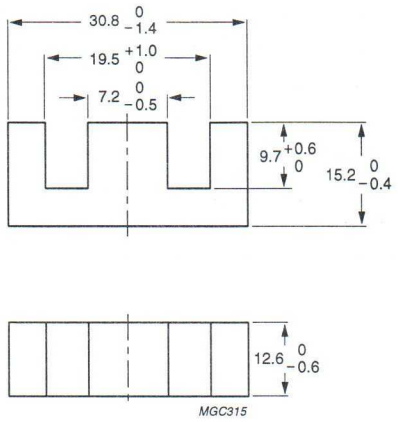
Dimensions in mm.

Fig.7 E30/15/7 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.657	mm^{-1}
V_e	effective volume	6830	mm^3
l_e	effective length	67.0	mm
A_e	effective area	102	mm^2
A_{min}	effective area	84.0	mm^2
m	mass of core half	≈19	g



Dimensions in mm.

Fig.1 E30/15/13 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	2800 ±25%	≈1450	≈0	E30/15/13-3C30
3C80	3000 ±25%	≈1570	≈0	E30/15/13-3C80
3C85	3000 ±25%	≈1570	≈0	E30/15/13-3C85
3C90	3200 ±25%	≈1670	≈0	E30/15/13-3C90
3F3	2800 ±25%	≈1450	≈0	E30/15/13-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	5600 ±25%	≈2930	≈0	E30/15/13-3C11
3E25	7000 ±25%	≈3650	≈0	E30/15/13-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

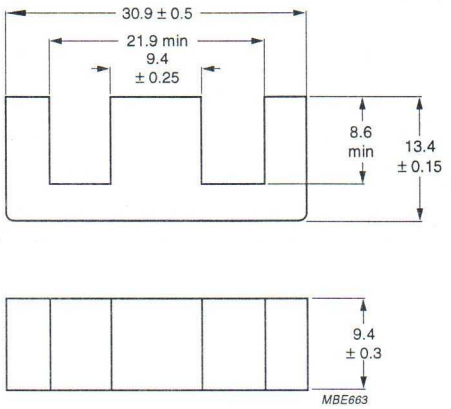
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤0.70	≤0.75	–
3C80	≥330	≤1.5	–	–
3C85	≥330	≤1.0	≤1.2	–
3C90	≥330	≤0.70	≤0.75	–
3F3	≥320	–	≤0.75	≤1.30

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥2180	≥1280	≈0	E31/13/9-3C80
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
3C85	250 ±3%	≈150	≈470	E31/13/9-3C85-A250
	315 ±3%	≈190	≈350	E31/13/9-3C85-A315
	400 ±3%	≈235	≈260	E31/13/9-3C85-A400
	630 ±3%	≈375	≈150	E31/13/9-3C85-A630
	1000 ±5%	≈590	≈80	E31/13/9-3C85-A1000
	2970 ±25%	≈1750	≈0	E31/13/9-3C85
3C90	2970 ±25%	≈1750	≈0	E31/13/9-3C90

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	6790 ±25%	≈4000	≈0	E31/13/9-3E25
3E27	6790 ±25%	≈4000	≈0	E31/13/9-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

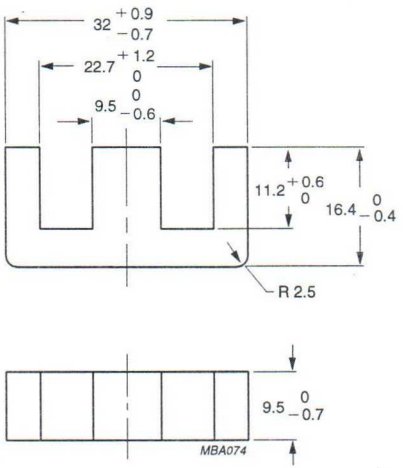
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥320	≤1.2	≤	–
3C81	≥320	≤1.1	≤	–
3C85	≥320	≤0.80	≤0.93	–
3C90	≥320	≤0.52	≤0.58	–
3F3	≥320	–	≤0.57	≤0.98

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.894	mm^{-1}
V_e	effective volume	6180	mm^3
l_e	effective length	74	mm
A_e	effective area	83	mm^2
m	mass of core half	≈16	g



Dimensions in mm.

Fig.1 E32/16/9 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	2000 ±25%	≈1420	≈0	E32/16/9-3C30
3C80	2200 ±25%	≈1560	≈0	E32/16/9-3C80
	≈730	≈520	100	E32/16/9-3C80-G100
	≈460	≈320	200	E32/16/9-3C80-G200
	≈240	≈170	500	E32/16/9-3C80-G500
	≈170	≈120	800	E32/16/9-3C80-G800
3C85	2200 ±25%	≈1560	≈0	E32/16/9-3C85
	≈730	≈520	100	E32/16/9-3C85-G100
	≈460	≈320	200	E32/16/9-3C85-G200
	≈240	≈170	500	E32/16/9-3C85-G500
	≈170	≈120	800	E32/16/9-3C85-G800
3C90	2350 ±25%	≈1680	≈0	E32/16/9-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP[2] (μm)	TYPE NUMBER
3F3	2000 ±25%	≈1400	≈0	E32/16/9-3F3
	≈730	≈500	100	E32/16/9-3F3-G100
	≈460	≈320	200	E32/16/9-3F3-G200
	≈240	≈170	500	E32/16/9-3F3-G500
	≈170	≈120	800	E32/16/9-3F3-G800

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	4000 ±25%	≈2850	≈0	E32/16/9-3C11
3E25	5400 ±25%	≈3800	≈0	E32/16/9-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

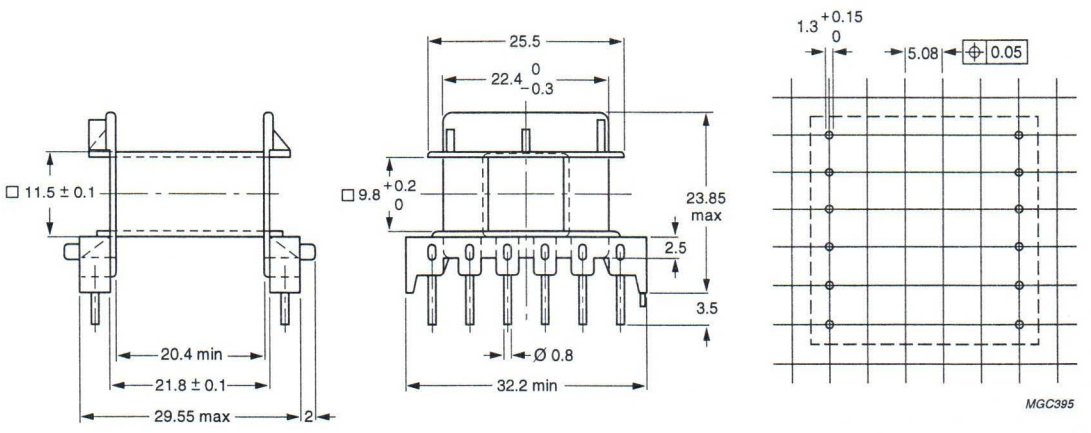
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤0.6	≤0.7	–
3C80	≥330	≤1.3	–	–
3C85	≥330	≤0.9	≤1.10	–
3C90	≥330	≤0.6	≤0.7	–
3F3	≥320	–	≤0.70	≤1.20

COIL FORMER

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

ITEM	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 85 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, 235 °C, 2 s



Dimensions in mm.

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

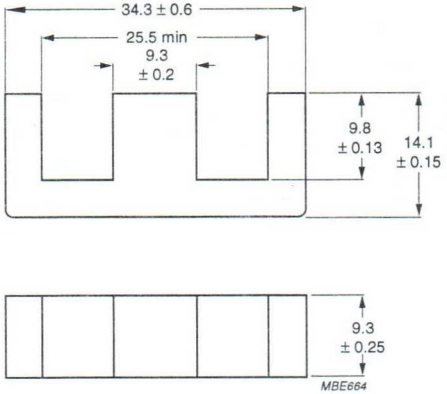
Winding data for 12-pins E32/16/9 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97	20.5	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥2185	≥1475	≈0	E34/14/9-3C80
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
3C85	250 ±3%	≈170	≈450	E34/14/9-3C85-A250
	315 ±3%	≈215	≈340	E34/14/9-3C85-A315
	400 ±3%	≈270	≈250	E34/14/9-3C85-A400
	630 ±3%	≈430	≈140	E34/14/9-3C85-A630
	1000 ±5%	≈680	≈70	E34/14/9-3C85-A1000
	2440 ±25%	≈1660	≈0	E34/14/9-3C85
3C90	2440 ±25%	≈1660	≈0	E34/14/9-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	4695 ±25%	≈3190	≈0	E34/14/9-3E25
3E27	4695 ±25%	≈3190	≈0	E34/14/9-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

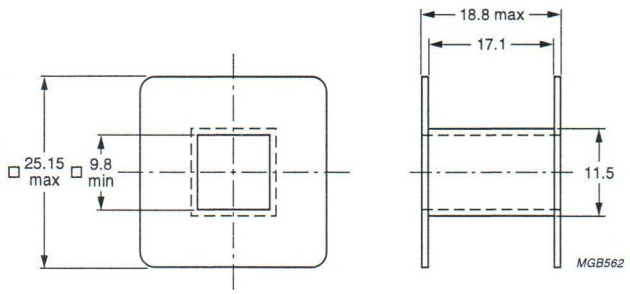
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C80	≥320	≤1.3	–	–
3C81	≥320	≤1.2	–	–
3C85	≥320	≤0.9	≤1.0	–
3C90	≥320	≤0.56	≤0.63	–
3F3	≥320	–	≤0.62	≤1.1

COIL FORMERS

General data for E34/14/9 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	85 °C



Dimensions in mm.

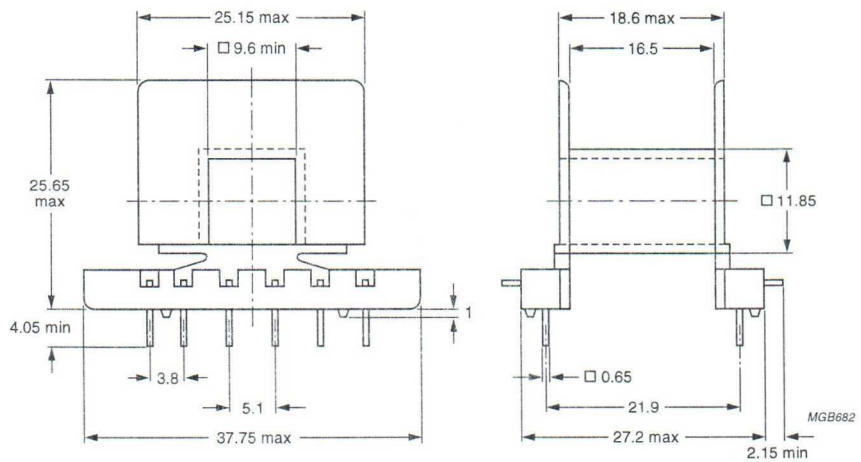
Fig.2 E34/14/9 coil former.

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41938(M)
Maximum operating temperature	130 °C, IEC 85 class B
Pin material	copper-zinc alloy (CuZnP), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

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

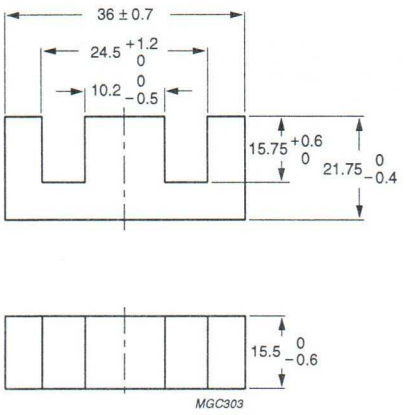
Winding data for 12-pins E34/14/9 coil former

NUMBER OF SECTIONS	MINIMUMWINDING 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
$\Sigma(l/A)$	core factor (C1)	0.608	mm^{-1}
V_e	effective volume	15200	mm^3
l_e	effective length	96.0	mm
A_e	effective area	158	mm^2
A_{min}	minimum area	151	mm^2
m	mass of core half	≈34	g



Dimensions in mm.

Fig.1 E36/21/15 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3300 ±25%	≈1600	≈0	E36/21/15-3C30
3C80	3400 ±25%	≈1650	≈0	E36/21/15-3C80
3C85	3400 ±25%	≈1650	≈0	E36/21/15-3C85
3C90	3600 ±25%	≈1750	≈0	E36/21/15-3C90
3F3	3300 ±25%	≈1600	≈0	E36/21/15-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	6700 ±25%	≈3250	≈0	E36/21/15-3C11
3E25	8600 ±25%	≈4150	≈0	E36/21/15-3E25

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

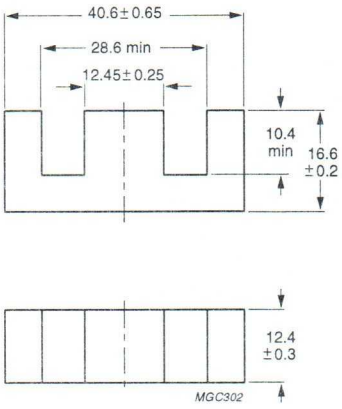
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤1.6	≤1.7	–
3C80	≥330	≤3.2	–	–
3C85	≥330	≤2.1	≤2.5	–
3C90	≥330	≤1.6	≤1.7	–
3F3	≥320	–	≤1.7	≤3.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.517	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	77.0	mm
A_e	effective area	149	mm^2
A_{min}	minimum area	142	mm^2
m	mass of core half	≈30	g



Dimensions in mm.

Fig.1 E41/17/12 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3750 ±25%	≈1550	≈0	E41/17/12-3C30
3C80	4100 ±25%	≈1670	≈0	E41/17/12-3C80
3C81	250 ±3%	≈105	≈880	E41/17/12-3C81-E250(2)
	315 ±5%	≈130	≈670	E41/17/12-3C81-E315(2)
	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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈105	≈880	E41/17/12-3C85-E250[2]
	315 ±5%	≈130	≈670	E41/17/12-3C85-E315[2]
	400 ±5%	≈165	≈500	E41/17/12-3C85-A400
	630 ±10%	≈260	≈290	E41/17/12-3C85-A630
	1000 ±10%	≈415	≈160	E41/17/12-3C85-A1000
	4100 ±25%	≈1690	≈0	E41/17/12-3C85
3C90	4100 ±25%	≈1700	≈0	E41/17/12-3C90
3F3	250 ±3%	≈105	≈880	E41/17/12-3F3-E250[2]
	315 ±5%	≈130	≈670	E41/17/12-3F3-E315[2]
	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 a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an **E**qual-gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	7800 ±25%	≈3200	≈0	E41/17/12-3C11
3E25	9400 ±25%	≈3870	≈0	E41/17/12-3E25
3E27	9400 ±25%	≈3870	≈0	E41/17/12-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

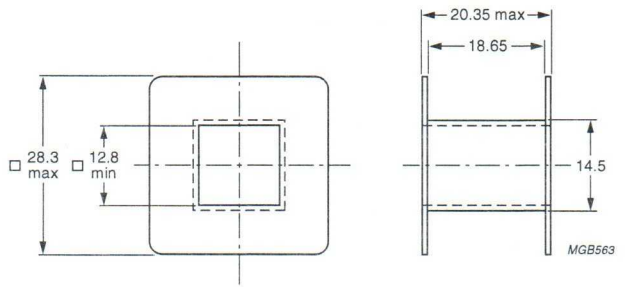
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤1.25	≤1.40	–
3C80	≥330	≤2.50	–	–
3C81	≥320	≤2.4	–	–
3C85	≥330	≤2.00	≤2.0	–
3C90	≥330	≤1.25	≤1.40	–
3F3	≥320	–	≤1.40	≤2.20

COIL FORMERS

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

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	85 °C



Dimensions in mm.

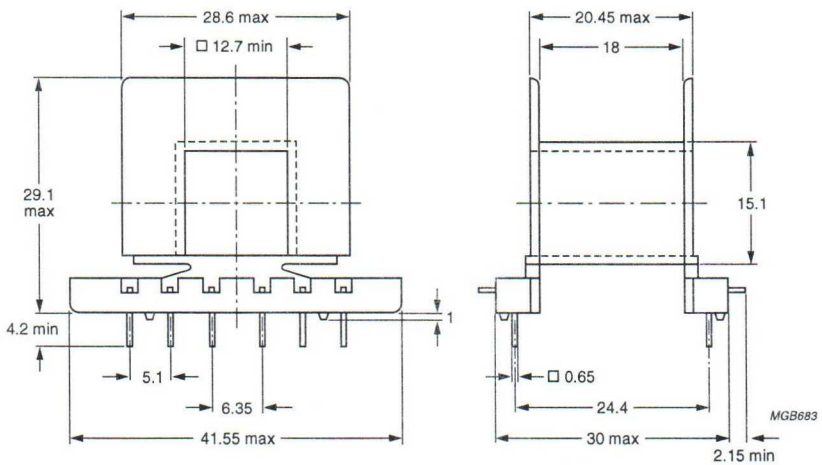
Fig.2 E41/17/12 coil former.

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C
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, 235 °C, 2 s



Dimensions in mm.

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

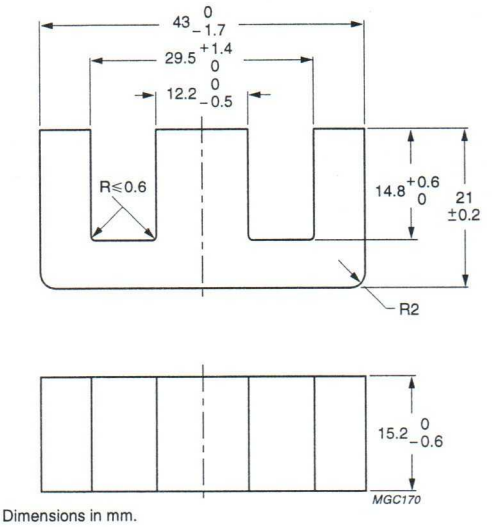
Winding data for 12-pins E41/17/12 coil former

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
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3700 ±25%	≈1610	≈0	E42/21/15-3C30
3C80	3900 ±25%	≈1700	≈0	E42/21/15-3C80
	≈1400	≈600	100	E42/21/15-3C80-G100
	≈900	≈380	200	E42/21/15-3C80-G200
	≈490	≈210	500	E42/21/15-3C80-G500
	≈330	≈140	800	E42/21/15-3C80-G800
3C81	250 ±3%	≈110	≈1110	E42/21/15-3C81-E250(2)
	315 ±3%	≈135	≈840	E42/21/15-3C81-E315(2)
	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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈110	≈1110	E42/21/15-3C85-E250[2]
	315 ±3%	≈135	≈840	E42/21/15-3C85-E315[2]
	400 ±5%	≈170	≈630	E42/21/15-3C85-A400
	630 ±5%	≈270	≈360	E42/21/15-3C85-A630
	1000 ±10%	≈430	≈200	E42/21/15-3C85-A1000
	3900 ±25%	≈1700	≈0	E42/21/15-3C85
	≈1400	≈600	100	E42/21/15-3C85-G100
	≈900	≈380	200	E42/21/15-3C85-G200
	≈490	≈210	500	E42/21/15-3C85-G500
	≈330	≈140	800	E42/21/15-3C85-G800
3C90	4100 ±25%	≈1780	≈0	E42/21/15-3C90
3F3	250 ±3%	≈110	≈1110	E42/21/15-3F3-E250[2]
	315 ±3%	≈135	≈840	E42/21/15-3F3-E315[2]
	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
	≈1350	≈580	100	E42/21/15-3F3-G100
	≈900	≈380	200	E42/21/15-3F3-G200
	≈490	≈210	500	E42/21/15-3F3-G500
	≈330	≈140	800	E42/21/15-3F3-G800

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	8000 ±25%	≈3480	≈0	E42/21/15-3C11
3E25	8000 ±25%	≈3480	≈0	E42/21/15-3E25
3E27	8000 ±25%	≈3480	≈0	E42/21/15-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

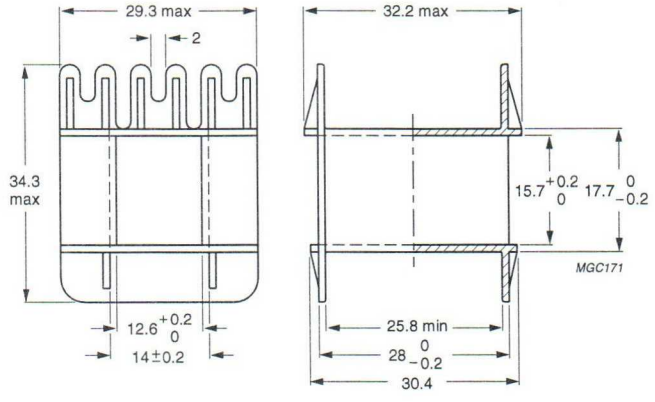
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤1.8	≤2.0	–
3C80	≥330	≤4.0	–	–
3C81	≥320	≤3.6	–	–
3C85	≥330	≤2.8	≤3.2	–
3C90	≥330	≤1.8	≤2.0	–
3F3	≥320	–	≤2.0	≤3.8

COIL FORMERS

General data for E42/21/15 coil former without pins (E)

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



Dimensions in mm.

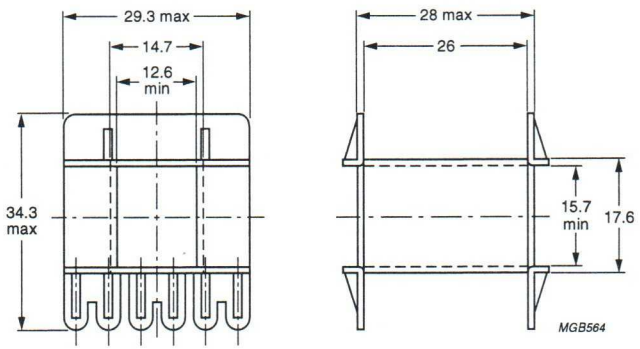
Fig.2 E42/21/15 coil former (E).

Winding data for E42/21/15 coil former without pins (E)

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-E

General data for E42/21/15 coil former without pins (A)

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41871(M)
Maximum operating temperature	130 °C



Dimensions in mm.

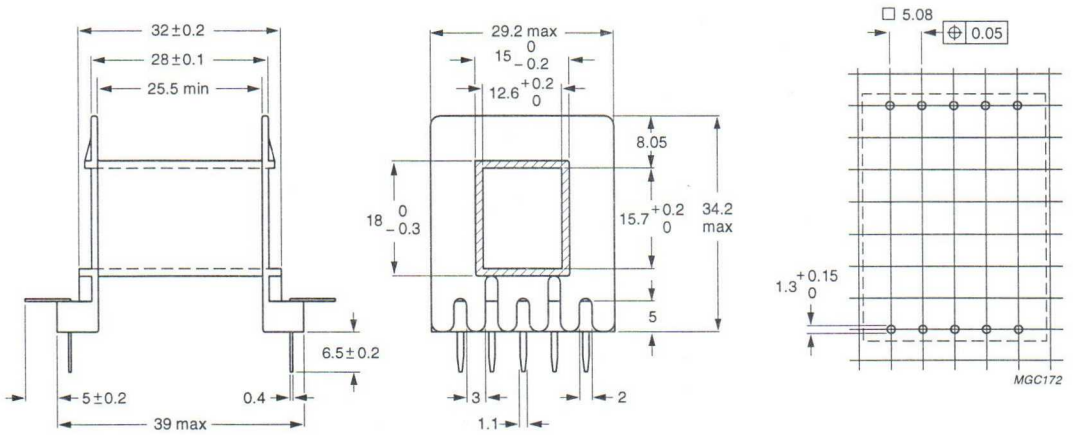
Fig.3 E42/21/15 coil former (A).

Winding data for E42/21/15 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	191	26	87	CP-E42/21/15-1S-A

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	120 °C
Resistance to soldering heat	350 °C, 3.5 s
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

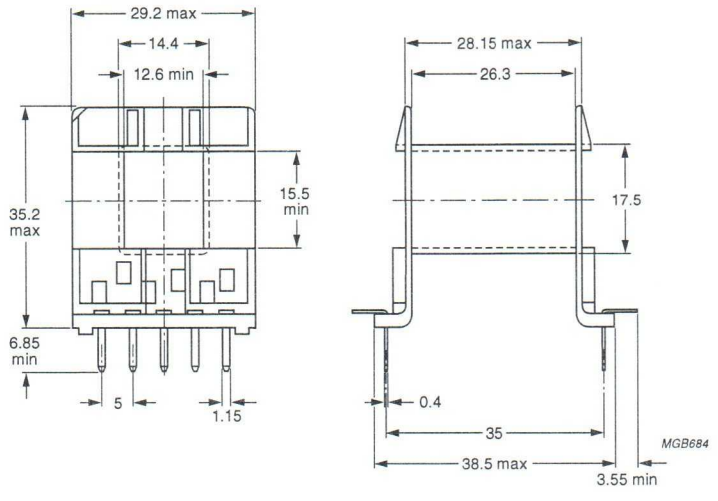
Fig.4 E42/21/15 coil former; 10-pins (E).

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	26	93	CPH-E42/15-1S-10P-E

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

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	150 °C
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, 235 °C, 2 s



Dimensions in mm.

Fig.5 E42/21/15 coil former; 10-pins (A).

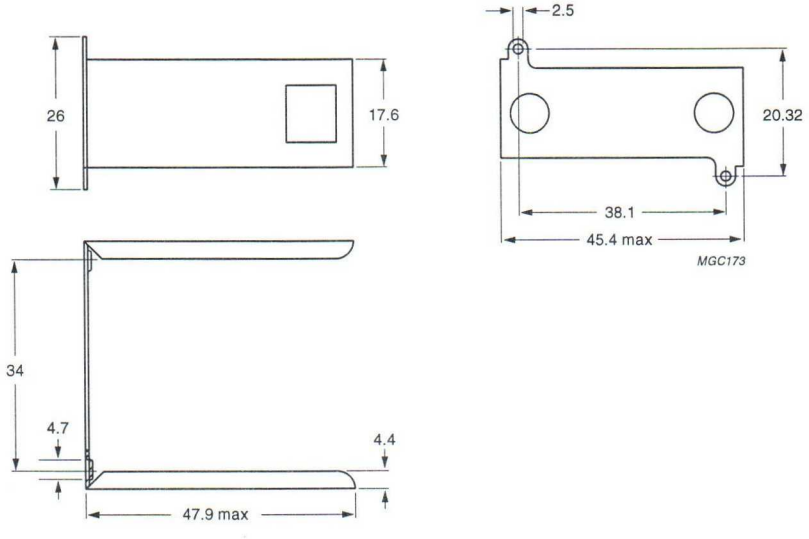
Winding data for 10-pins E42/21/15 coil former

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

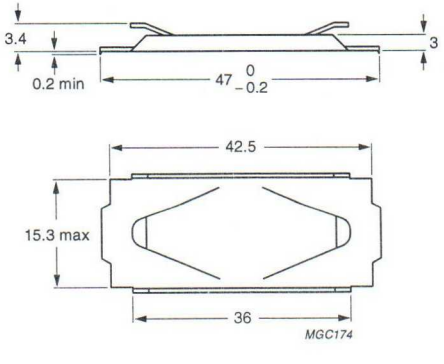
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	material: steel, zinc (Zn) plated	6	CLA-E42/21/15
Spring	material: steel, zinc (Zn) plated	7	SPR-E42/21/15



Dimensions in mm.

Fig.6 E42/21/15 clasp.



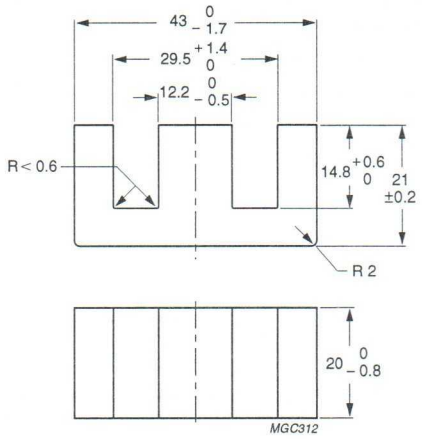
Dimensions in mm.

Fig.7 E42/21/15 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	4800 ±25%	≈1600	≈0	E42/21/20-3C30
3C80	5000 ±25%	≈1650	≈0	E42/21/20-3C80
	1900	≈630	≈100	E42/21/20-3C80-G100
	≈1200	≈400	≈200	E42/21/20-3C80-G200
	≈650	≈210	≈500	E42/21/20-3C80-G500
	≈440	≈145	≈800	E42/21/20-3C80-G800
3C81	250 ±3%	≈84	≈1470	E42/21/20-3C81-E250(2)
	315 ±3%	≈105	≈1110	E42/21/20-3C81-E315(2)
	400 ±3%	≈134	≈830	E42/21/20-3C81-E400(2)
	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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈84	≈1470	E42/21/20-3C85-E250[2]
	315 ±3%	≈105	≈1110	E42/21/20-3C85-E315[2]
	400 ±3%	≈134	≈830	E42/21/20-3C85-E400[2]
	630 ±5%	≈211	≈480	E42/21/20-3C85-A630
	1000 ±10%	≈334	≈270	E42/21/20-3C85-A1000
	5000 ±25%	≈1660	≈0	E42/21/20-3C85
	≈1900	≈630	≈100	E42/21/20-3C85-G100
	≈1200	≈400	≈200	E42/21/20-3C85-G200
	≈650	≈210	≈500	E42/21/20-3C85-G500
	≈440	≈145	≈800	E42/21/20-3C85-G800
3C90	5200 ±25%	≈1720	≈0	E42/21/20-3C90
3F3	250 ±3%	≈84	≈1470	E42/21/20-3F3-E250[2]
	315 ±3%	≈105	≈1110	E42/21/20-3F3-E315[2]
	400 ±3%	≈134	≈830	E42/21/20-3F3-E400[2]
	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
	≈1800	≈600	≈100	E42/21/20-3F3-G100
	≈1200	≈400	≈200	E42/21/20-3F3-G200
	≈650	≈210	≈500	E42/21/20-3F3-G500
	≈440	≈145	≈800	E42/21/20-3F3-G800

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	10500 ±25%	≈3520	≈0	E42/21/20-3E25
3E27	10500 ±25%	≈3520	≈0	E42/21/20-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

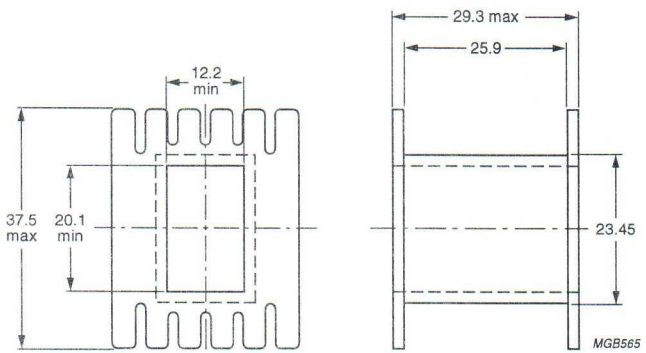
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤2.4	≤2.6	–
3C80	≥330	≤5.2	–	–
3C81	≥320	≤4.7	–	–
3C85	≥330	≤3.5	≤4.1	–
3C90	≥330	≤2.4	≤2.9	–
3F3	≥320	–	≤2.6	≤5.1

COIL FORMER

General data for E42/21/20 coil former

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E69578(M)
Maximum operating temperature	150 °C



Dimensions in mm.

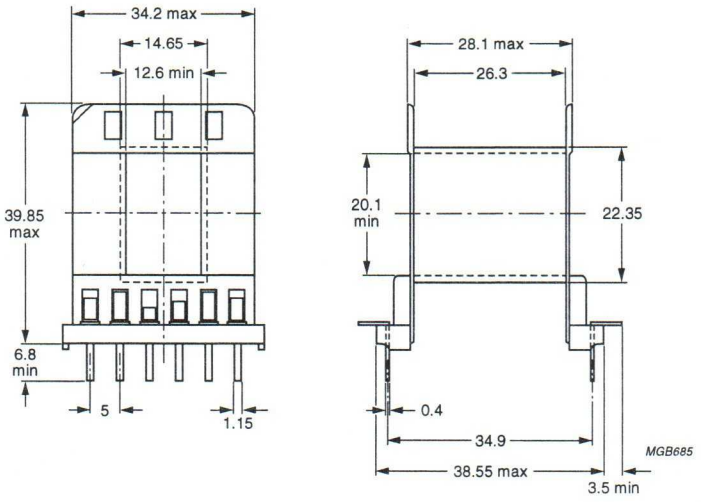
Fig.2 E42/21/20 coil former.

Winding data for E42/21/2 coil former without pins

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	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

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E69578(M)
Maximum operating temperature	150 °C
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

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

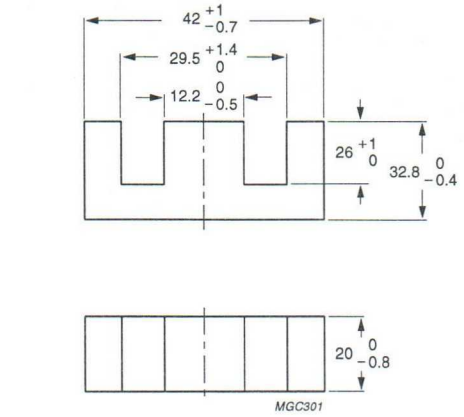
Winding data for 12-pins E42/21/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	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
$\Sigma(l/A)$	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	236	mm^2
m	mass of core half	≈82	g



Dimensions in mm.

Fig.1 E42/33/20 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3400 ±25%	≈1680	≈0	E42/33/20-3C30
3C80	3600 ±25%	≈1750	≈0	E42/33/20-3C80
3C85	3600 ±25%	≈1750	≈0	E42/33/20-3C85
3C90	3700 ±25%	≈1800	≈0	E42/33/20-3C90
3F3	3300 ±25%	≈1600	≈0	E42/33/20-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

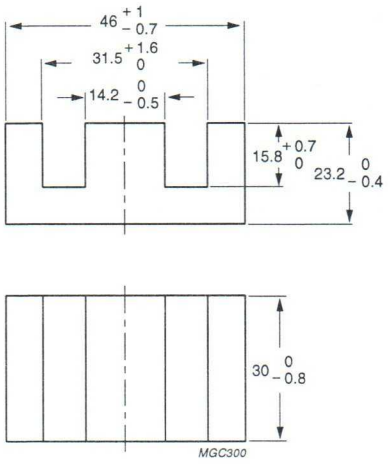
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥350	≤3.5	≤3.8	–
3C80	≥330	≤7.5	–	–
3C85	≥330	≤4.8	≤6.0	–
3C90	≥330	≤3.5	≤3.8	–
3F3	≥320	–	≤3.8	≤7.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.255	mm^{-1}
V_e	effective volume	43300	mm^3
l_e	effective length	105	mm
A_e	effective area	412	mm^2
A_{min}	minimum area	385	mm^2
m	mass of core half	≈109	g



Dimensions in mm.

Fig.1 E46/23/30 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	7200 ±25%	≈1470	≈0	E46/23/30-3C30
3C80	8300 ±25%	≈1680	≈0	E46/23/30-3C80
3C85	8300 ±25%	≈1680	≈0	E46/23/30-3C85
3C90	8400 ±25%	≈1700	≈0	E46/23/30-3C90
3F3	7200 ±25%	≈1470	≈0	E46/23/30-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

Properties of core sets under power conditions

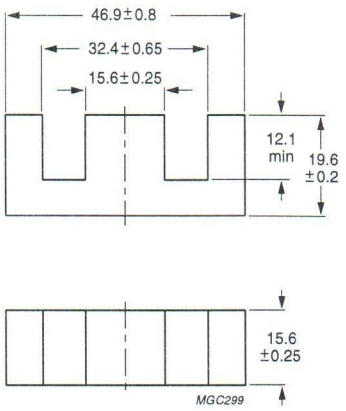
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥350	≤4.5	≤6.0	–
3C80	≥330	≤9.5	–	–
3C85	≥320	≤6.1	≤8.4	–
3C90	≥330	≤4.5	≤6.0	–
3F3	≥320	–	≤6.0	≤9.8

E cores and accessories E47/20/16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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



Dimensions in mm.

Fig.1 E47/20/16 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	5100 ±25%	≈1550	≈0	E47/20/16-3C30
3C80	5500 ±3%	≈1660	≈0	E47/20/16-3C80
3C81	250 ±25%	≈76	≈1460	E47/20/16-3C81-E250(2)
	315 ±3%	≈95	≈1100	E47/20/16-3C81-E315(2)
	400 ±3%	≈121	≈830	E47/20/16-3C81-E400(2)
	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
3C85	250 ±3%	≈76	≈1460	E47/20/16-3C85-E250(2)
	315 ±3%	≈95	≈1100	E47/20/16-3C85-E315(2)
	400 ±3%	≈121	≈830	E47/20/16-3C85-E400(2)
	630 ±5%	≈191	≈480	E47/20/16-3C85-A630
	1000 ±10%	≈303	≈270	E47/20/16-3C85-A1000
	5500 ±25%	≈1660	≈0	E47/20/16-3C85
3C90	5500 ±25%	≈1660	≈0	E47/20/16-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%	≈76	≈1458	E47/20/16-3F3-E250[2]
	315 ±3%	≈95	≈1100	E47/20/16-3F3-E315[2]
	400 ±3%	≈121	≈830	E47/20/16-3F3-E400[2]
	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 a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	11475 ±25%	≈3480	≈0	E47/20/16-3E25
3E27	11475 ±25%	≈3480	≈0	E47/20/16-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

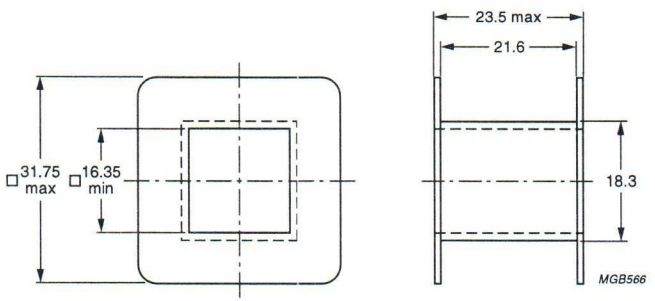
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥350	≤2.3	≤2.5	–
3C80	≥330	≤4.3	–	–
3C81	≥320	≤4.3	–	–
3C85	≥330	≤3.3	≤3.8	–
3C90	≥330	≤2.3	≤2.5	–
3F3	≥320	–	≤2.5	≤4.0

COIL FORMERS

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

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	85 °C



Dimensions in mm.

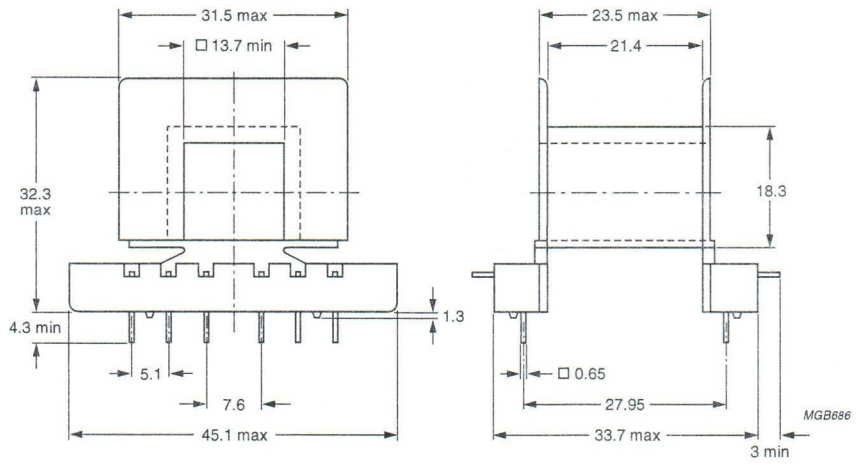
Fig.2 E47/20/16 coil former.

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

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

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41938(M)
Maximum operating temperature	130 °C
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

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

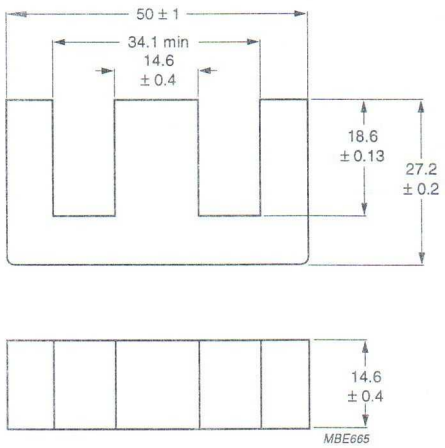
Winding data for 12-pins E47/20/16 coil former

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

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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈106	≈1410	E50/27/15-3C81-E250[2]
	315 ±3%	≈133	≈1060	E50/27/15-3C81-E315[2]
	400 ±3%	≈169	≈790	E50/27/15-3C81-E400[2]
	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
3C85	250 ±3%	≈106	≈1410	E50/27/15-3C85-E250[2]
	315 ±3%	≈133	≈1060	E50/27/15-3C85-E315[2]
	400 ±3%	≈169	≈790	E50/27/15-3C85-E400[2]
	630 ±5%	≈267	≈450	E50/27/15-3C85-A630
	1000 ±10%	≈424	≈250	E50/27/15-3C85-A1000
	4355 ±25%	≈1840	≈0	E50/27/15-3C85
3C90	4355 ±25%	≈1840	≈0	E50/27/15-3C90

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 40 ±20 N.

Properties of core sets under power conditions

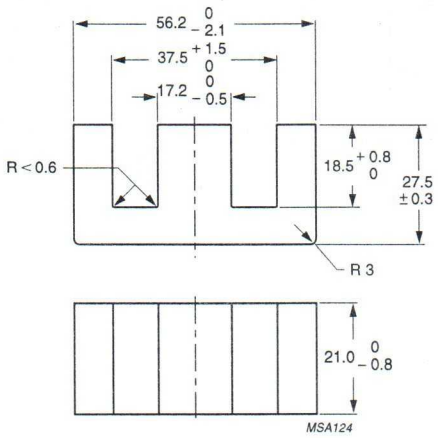
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤5.5	–	–
3C85	≥320	≤4.2	≤4.9	–
3C90	≥320	≤2.7	≤3.4	–

E cores and accessories E55/28/21

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	5700 ±25%	≈1600	≈0	E55/28/21-3C30
3C80	6300 ±25%	≈1750	≈0	E55/28/21-3C80
	≈2100	≈580	≈150	E55/28/21-3C80-G150
	≈940	≈260	≈450	E55/28/21-3C80-G450
	≈430	≈120	≈1200	E55/28/21-3C80-G1200
3C81	315 ±3%	≈88	≈1740	E55/28/21-3C81-E315(2)
	400 ±3%	≈112	≈1300	E55/28/21-3C81-E400(2)
	630 ±3%	≈176	≈750	E55/28/21-3C81-E630(2)
	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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	315 ±3%	≈88	≈1740	E55/28/21-3C85-E315[2]
	400 ±3%	≈112	≈1300	E55/28/21-3C85-E400[2]
	630 ±3%	≈176	≈750	E55/28/21-3C85-E630[2]
	1000 ±5%	≈280	≈430	E55/28/21-3C85-A1000
	1600 ±10%	≈448	≈230	E55/28/21-3C85-A1600
	6300 ±25%	≈1750	≈0	E55/28/21-3C85
	2100 ±25%	≈580	≈150	E55/28/21-3C85-G150
	≈940	≈260	≈450	E55/28/21-3C85-G450
	≈430	≈120	≈1200	E55/28/21-3C85-G1200
3C90	6400 ±25%	≈1780	≈0	E55/28/21-3C90
3F3	315 ±3%	≈88	≈1740	E55/28/21-3F3-E315[2]
	400 ±3%	≈112	≈1300	E55/28/21-3F3-E400[2]
	630 ±3%	≈176	≈750	E55/28/21-3F3-E630[2]
	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
	≈2000	≈550	≈150	E55/28/25-3F3-G150
	≈940	≈260	≈450	E55/28/25-3F3-G450
	≈430	≈120	≈1200	E55/28/25-3F3-G1200

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 40 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	12800 ±25%	≈3560	≈0	E55/28/21-3C11
3E25	15400 ±25%	≈4300	≈0	E55/28/21-3E25
3E27	15400 ±25%	≈4300	≈0	E55/28/21-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.

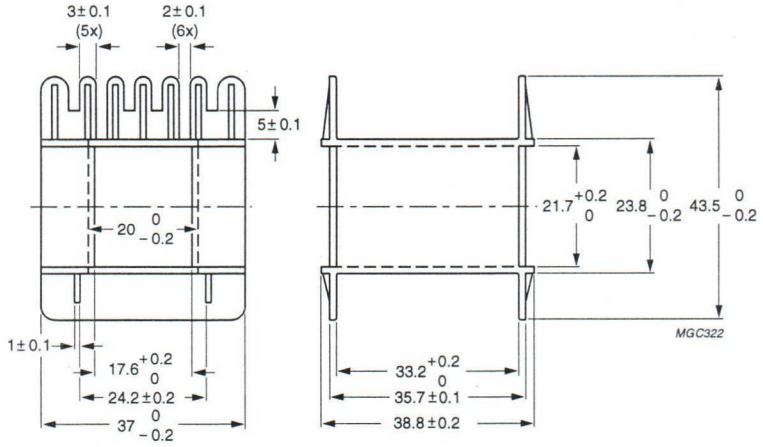
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥350	≤4.6	≤5.2	–
3C80	≥310	≤10.0	–	–
3C81	≥320	≤9.0	–	–
3C85	≥310	≤6.2	≤7.8	–
3C90	≥310	≤4.6	≤5.2	–
3F3	≥310	–	≤5.2	≤10.0

COIL FORMERS

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

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



Dimensions in mm.

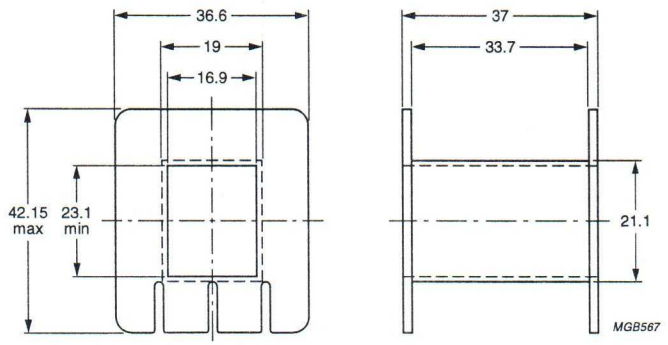
Fig.2 E55/28/21 coil former (E).

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

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

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

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E69578(M)
Maximum operating temperature	150 °C



Dimensions in mm.

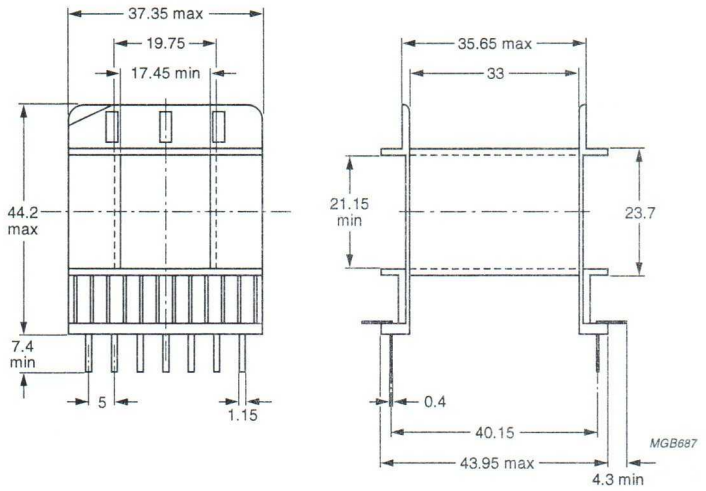
Fig.3 E55/28/21 coil former (A).

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

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E69578(M)
Maximum operating temperature	150 °C
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

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

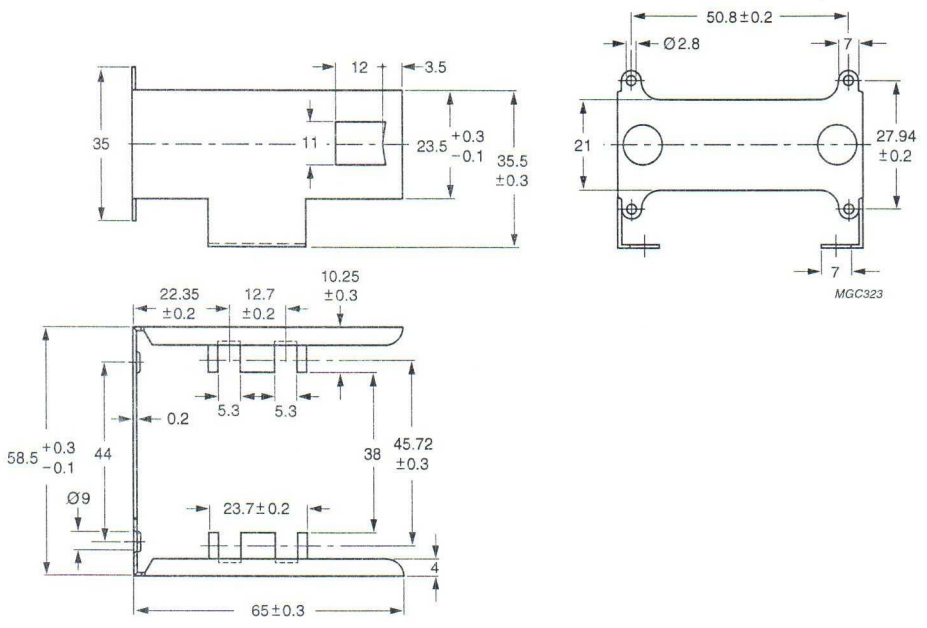
Winding data for 14-pins E55/28/21 coil former

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

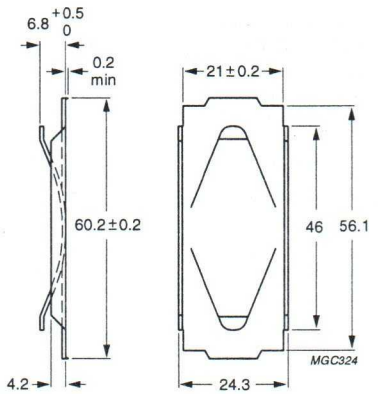
General data for mounting parts

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



Dimensions in mm.

Fig.5 E55/28/21 clasp.



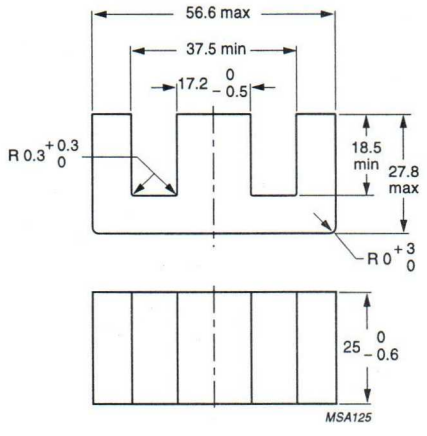
Dimensions in mm.

Fig.6 E55/28/21 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L(1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C30	6800 ±25%	≈1580	≈0	E55/28/25-3C30
3C80	7400 ±25%	≈1700	≈0	E55/28/25-3C80
	≈950	≈220	≈500	E55/28/25-3C80-G500
	≈410	≈100	≈1500	E55/28/25-3C80-G1500
	≈280	≈70	≈2500	E55/28/25-3C80-G2500
3C85	7400 ±25%	≈1700	≈0	E55/28/25-3C85
	≈950	≈220	≈500	E55/28/25-3C85-G500
	≈410	≈100	≈1500	E55/28/25-3C85-G1500
3C90	7400 ±25%	≈1580	≈0	E55/28/25-3C90
3F3	6700 ±25%	≈1540	≈0	E55/28/25-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. A_L values depend on grade and measuring coil.

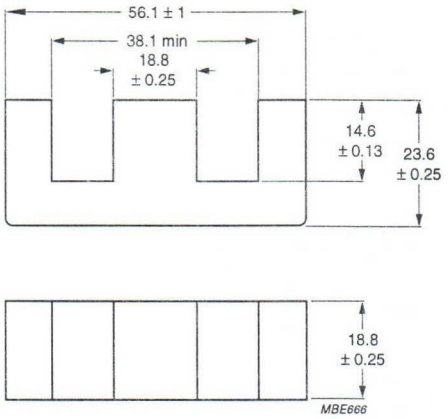
Properties of core sets under power conditions

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
3C30	≥350	≤5.7	≤6.3	–
3C80	≥320	≤11.5	–	–
3C85	≥320	≤6.8	≤9.6	–
3C90	≥330	≤5.7	≤6.3	–
3F3	≥310	–	≤6.3	≤12.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C80	≥5950	≥1510	≈0	E56/24/19-3C80
3C81	315 ±3%	≈79	≈1650	E56/24/19-3C81-E315(2)
	400 ±3%	≈101	≈1240	E56/24/19-3C81-E400(2)
	630 ±3%	≈158	≈720	E56/24/19-3C81-E630(2)
	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
3C85	315 ±3%	≈79	≈1650	E56/24/19-3C85-E315(2)
	400 ±3%	≈101	≈1240	E56/24/19-3C85-E400(2)
	630 ±3%	≈158	≈720	E56/24/19-3C85-E630(2)
	1000 ±5%	≈251	≈410	E56/24/19-3C85-A1000
	1600 ±10%	≈402	≈230	E56/24/19-3C85-A1600
	6900 ±25%	≈1730	≈0	E56/24/19-3C85
3C90	6900 ±25%	≈1730	≈0	E56/24/19-3C90

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.
2. Measured in combination with an Equal gapped core half, clamping force 60 ±20 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	14580 ±25%	≈3660	≈0	E56/24/19-3E25
3E27	14580 ±25%	≈3660	≈0	E56/24/19-3E27

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.

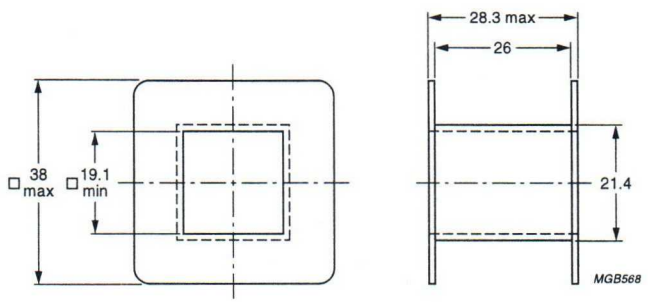
Properties of core sets under power conditions

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
3C80	≥320	≤8.2	–	–
3C81	≥320	≤7.4	–	–
3C85	≥320	≤5.6	≤6.5	–
3C90	≥320	≤3.6	≤4.8	–
3F3	≥320	–	≤4.0	≤6.8

COIL FORMERS

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

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	85 °C



Dimensions in mm.

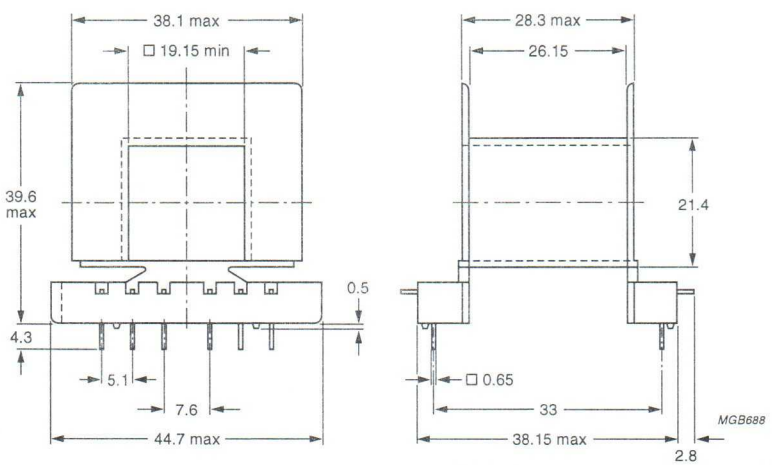
Fig.2 E56/24/19 coil former.

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

ITEM	SPECIFICATION
Coil former material	thermoplastic polyester, glass reinforced, flame retardant in accordance with UL 94V-0; UL file number E69578(M)
Maximum operating temperature	150 °C
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

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

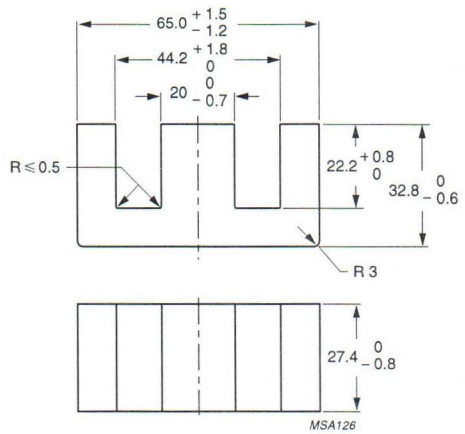
Winding data for 12-pins E56/24/19 coil former

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
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	7400 ±25%	≈1620	≈0	E65/32/27-3C30
3C80	8400 ±25%	≈1830	≈0	E65/32/27-3C80
	≈2900	≈630	150	E65/32/27-3C80-G150
	≈1300	≈280	450	E65/32/27-3C80-G450
	≈600	≈130	1250	E65/32/27-3C80-G1250
3C85	400 ±3%	≈88	≈2070	E65/32/27-3C85-E400(2)
	630 ±3%	≈138	≈1200	E65/32/27-3C85-E630(2)
	1000 ±3%	≈219	≈680	E65/32/27-3C85-E1000(2)
	1600 ±5%	≈350	≈380	E65/32/27-3C85-A1600
	2500 ±10%	≈547	≈210	E65/32/27-3C85-A2500
	8400 ±25%	≈1830	≈0	E65/32/27-3C85
	≈2900	≈630	150	E65/32/27-3C85-G150
	≈1300	≈280	450	E65/32/27-3C85-G450
	≈600	≈130	1250	E65/32/27-3C85-G1250
3C90	8400 ±25%	≈1830	≈0	E65/32/27-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	400 ±3%	≈88	≈2070	E65/32/27-3F3-E400[2]
	630 ±3%	≈138	≈1200	E65/32/27-3F3-E630[2]
	1000 ±3%	≈219	≈680	E65/32/27-3F3-E1000[2]
	1600 ±5%	≈350	≈380	E65/32/27-3F3-A1600
	2500 ±10%	≈547	≈210	E65/32/27-3F3-A2500
	7300 ±25%	≈1590	≈0	E65/32/27-3F3
	≈2800	≈610	150	E65/32/27-3F3-G150
	≈1300	≈280	450	E65/32/27-3F3-G450
	≈600	≈130	1250	E65/32/27-3F3-G1250

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.
2. Measured in combination with an Equal-gapped core half, clamping force 60 ±20 N.

Core halves of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	16700 ±25%	≈3650	≈0	E65/32/27-3C11

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.

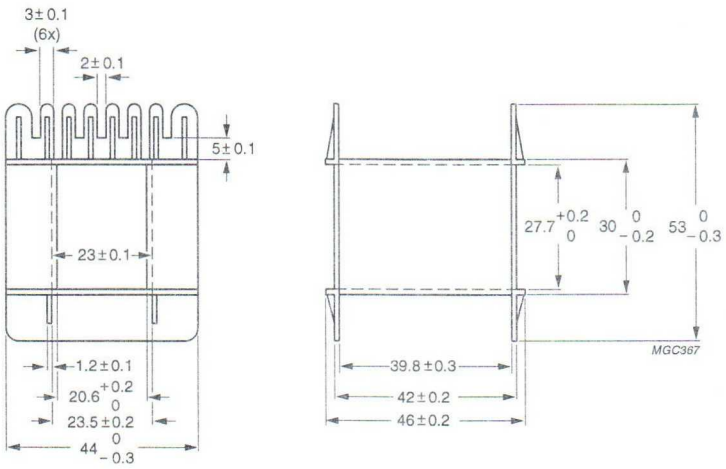
Properties of core sets under power conditions

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
3C30	≥350	≤8.8	≤9.8	–
3C80	≥320	≤17.0	–	–
3C85	≥320	≤12.0	≤14.0	–
3C90	≥330	≤8.8	≤9.8	–
3F3	≥310	–	≤9.8	≤20.1

COIL FORMER

General data for E65/32/27 coil former without pins

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with UL 94V-HB; UL file number E41613(M)
Maximum operating temperature	130 °C



Dimensions in mm.

Fig.2 E65/32/27 coil former.

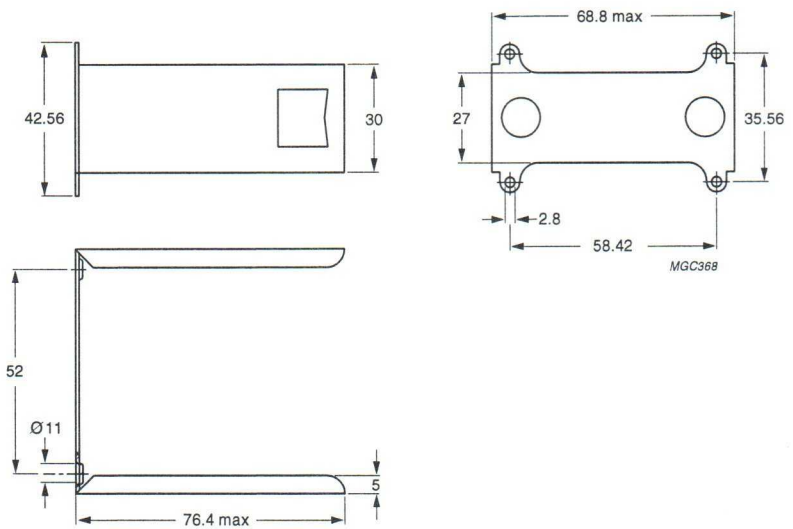
Winding data for E65/32/27 coil former without pins (E)

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

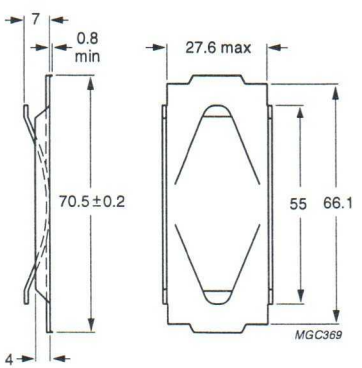
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	material: steel, zinc (Zn) plated	4	CLA-E65/32/27
Spring	material: steel, zinc (Zn) plated	5	SPR-E65/32/27



Dimensions in mm.

Fig.3 E65/32/27 clasp.



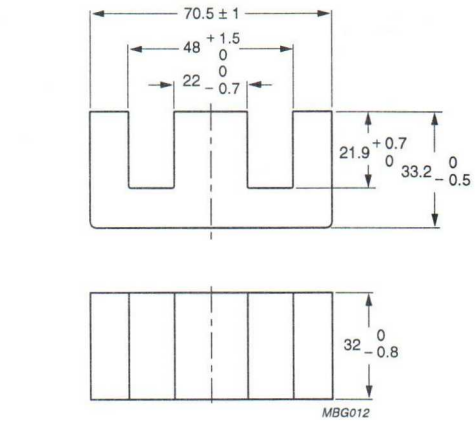
Dimensions in mm.

Fig.4 E65/32/27 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	8900 ±25%	≈1550	≈0	E71/33/32-3C30
3C80	9200 ±25%	≈1600	≈0	E71/33/32-3C80
3C85	9200 ±25%	≈1600	≈0	E71/33/32-3C85
3C90	9400 ±25%	≈1650	≈0	E71/33/32-3C90
3F3	8900 ±25%	≈1550	≈0	E71/33/32-3F3

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.

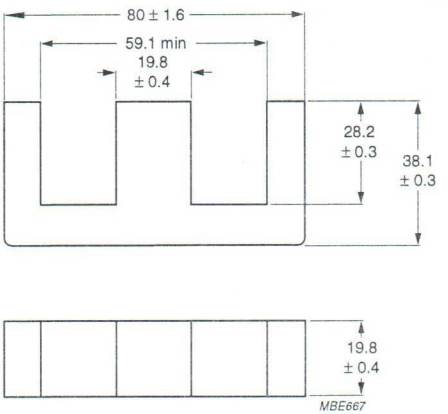
Properties of core sets under power conditions

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
3C30	≥350	≤11.0	≤16.0	–
3C80	≥320	≤21.4	–	–
3C85	≥320	≤14.5	≤22.0	–
3C90	≥330	≤11.0	≤16.0	–
3F3	≥310	–	≤16.0	≤24.6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈118	≈1980	E80/38/20-3C81-E315(2)
	400 ±3%	≈150	≈1460	E80/38/20-3C81-E400(2)
	630 ±3%	≈236	≈830	E80/38/20-3C81-E630(2)
	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
3C85	315 ±3%	≈118	≈1980	E80/38/20-3C85-E315(2)
	400 ±3%	≈150	≈1460	E80/38/20-3C85-E400(2)
	630 ±3%	≈236	≈830	E80/38/20-3C85-E630(2)
	1000 ±5%	≈374	≈460	E80/38/20-3C85-A1000
	1600 ±10%	≈598	≈240	E80/38/20-3C85-A1600
	5070 ±25%	≈1900	≈0	E80/38/20-3C85
3C90	5070 ±25%	≈1900	≈0	E80/38/20-3C90

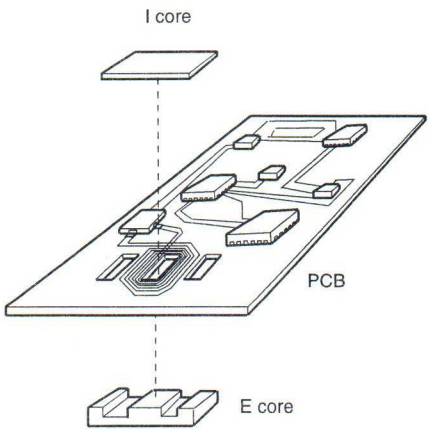
GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈118	≈1980	E80/38/20-3F3-E315[2]
	400 ±3%	≈150	≈1460	E80/38/20-3F3-E400[2]
	630 ±3%	≈236	≈830	E80/38/20-3F3-E630[2]
	1000 ±5%	≈374	≈460	E80/38/20-3F3-A1000
	1600 ±10%	≈598	≈240	E80/38/20-3F3-A1600
	4590 ±25%	≈1720	≈0	E80/38/20-3F3

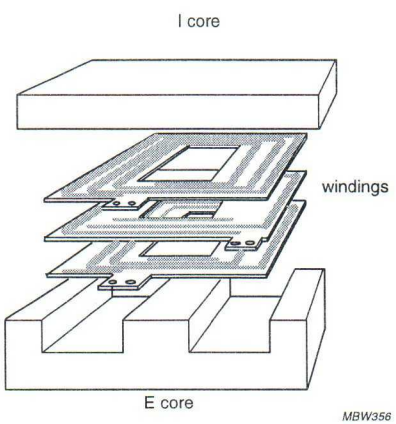
Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.
2. Measured in combination with an **E**qual -gapped core half, clamping force 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	–	–
3C85	≥320	≤11.2	≤13.0	–
3F3	≥320	–	≤8.0	≤13.8
3C90	≥320	≤7.2	≤10.0	–


I core
PCB
E core


I core
windings
E core
MBW356

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview planar E cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
E14/3.5/5	300	14.5	0.6
E18/4/10	960	39.5	2.4
E22/6/16	2550	78.5	6.5
E32/6/20	5380	129	13
E38/8/25	10200	194	25
E43/10/28	13900	225	35
E58/11/38	24600	305	62
E64/10/50	40700	511	100

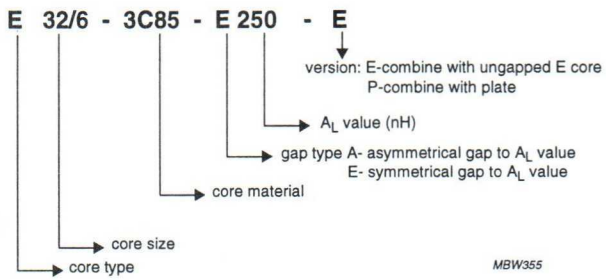
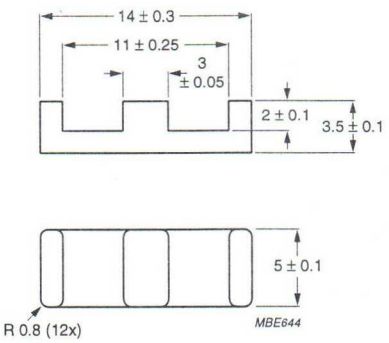


Fig.1 Type number structure for cores.

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of plate	≈0.6	g



Dimensions in mm.

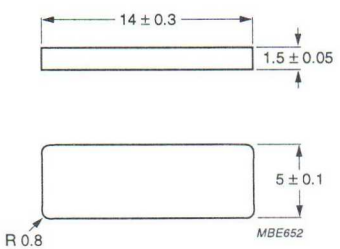
Fig.1 E14/3.5/5 core.

Effective core parameters of an E/PLT combination

GRADE	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈0.5	g

Ordering information for plates

SYMBOL	TYPE NUMBER
3F3	PLT14/5/1.5-3F3
3F4	PLT14/5/1.5-3F4



Dimensions in mm.

Fig.2 PLT 14/5/1.5.

Core halves for use in combination with an ungapped E core

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	25 ±3%	≈28	≈1400	E14/3.5-3F3-A25-E
	40 ±3%	≈46	≈750	E14/3.5-3F3-A40-E
	63 ±3%	≈72	≈400	E14/3.5-3F3-A63-E
	100 ±5%	≈114	≈220	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
3F4	25 ±3%	≈28	≈1400	E14/3.5-3F4-A25-E
	40 ±3%	≈46	≈750	E14/3.5-3F4-A40-E
	63 ±3%	≈72	≈400	E14/3.5-3F4-A63-E
	100 ±5%	≈114	≈220	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

Note

1. Measured in combination with a non gapped core half, clamping force 10 ±5 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	25 ±3%	≈23	≈1400	E14/3.5-3F3-A25-P
	40 ±3%	≈37	≈750	E14/3.5-3F3-A40-P
	63 ±3%	≈58	≈400	E14/3.5-3F3-A63-P
	100 ±5%	≈92	≈220	E14/3.5-3F3-A100-P
	160 ±8%	≈148	≈130	E14/3.5-3F3-A160-P
	1300 ±25%	≈1200	≈0	E14/3.5/5-3F3
3F4	25 ±3%	≈23	≈1400	E14/3.5-3F4-A25-P
	40 ±3%	≈37	≈750	E14/3.5-3F4-A40-P
	63 ±3%	≈58	≈400	E14/3.5-3F4-A63-P
	100 ±5%	≈92	≈220	E14/3.5-3F4-A100-P
	160 ±8%	≈148	≈130	E14/3.5-3F4-A160-P
	780 ±25%	≈720	≈0	E14/3.5/5-3F4

Note

1. Measured in combination with a plate (PLT) clamping force 10 ±5 N.

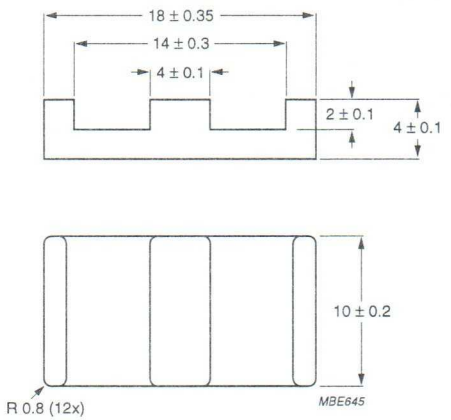
Properties of E core sets under power conditions

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 = 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
3F3	≥300	≤0.033	≤0.060	–	–
3F4	≥250	–	–	≤0.09	≤0.11

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈2.4	g



Dimensions in mm.

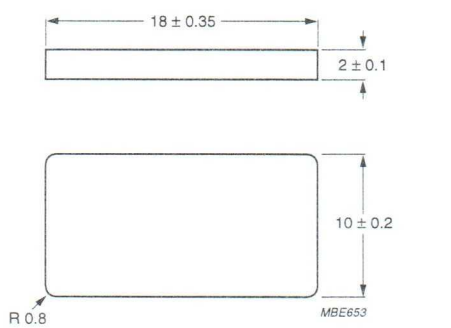
Fig.1 E18/4/10 core.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of plate	≈1.7	g

Ordering information for plates

GRADE	TYPE NUMBER
3F3	PLT18/10/2-3F3
3F4	PLT18/10/2-3F4



Dimensions in mm.

Fig.2 PLT 18/10/2..

Core halves for use in combination with an ungapped E core

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±3%	≈31	≈1200	E18/4-3F3-A63-E
	100 ±3%	≈49	≈690	E18/4-3F3-A100-E
	160 ±3%	≈78	≈380	E18/4-3F3-A160-E
	250 ±5%	≈123	≈220	E18/4-3F3-A1250-E
	315 ±8%	≈154	≈170	E18/4-3F3-A315-E
	2700 ±25%	≈1320	≈0	E18/4/10-3F3
3F4	63 ±3%	≈31	≈1200	E18/4-3F4-A63-E
	100 ±3%	≈49	≈690	E18/4-3F4-A100-E
	160 ±3%	≈78	≈380	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

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±3%	≈26	≈1200	E18/4-3F3-A63-P
	100 ±3%	≈41	≈690	E18/4-3F3-A100-P
	160 ±3%	≈65	≈380	E18/4-3F3-A160-P
	250 ±5%	≈102	≈220	E18/4-3F3-A250-P
	315 ±8%	≈129	≈170	E18/4-3F3-A315-P
	3100 ±25%	≈1270	≈0	E18/4/10-3F3
3F4	63 ±3%	≈26	≈1200	E18/4-3F4-A63-P
	100 ±3%	≈41	≈690	E18/4-3F4-A100-P
	160 ±3%	≈65	≈380	E18/4-3F4-A160-P
	250 ±5%	≈102	≈220	E18/4-3F4-A250-P
	315 ±8%	≈129	≈170	E18/4-3F4-A315-P
	1800 ±25%	≈740	≈0	E18/4/10-3F4

Note

1. Measured in combination with a plate (PLT), clamping force 20 ±10 N.

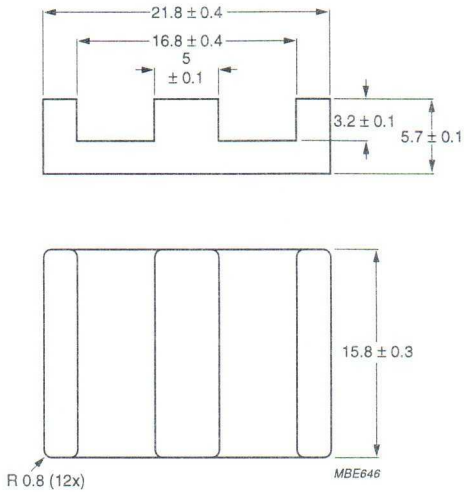
Properties of E core sets under power conditions

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 = 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
3F3	≥300	≤0.11	≤0.19	–	–
3F4	≥250	–	–	≤0.29	≤0.35

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of core half	≈6.5	g



Dimensions in mm.

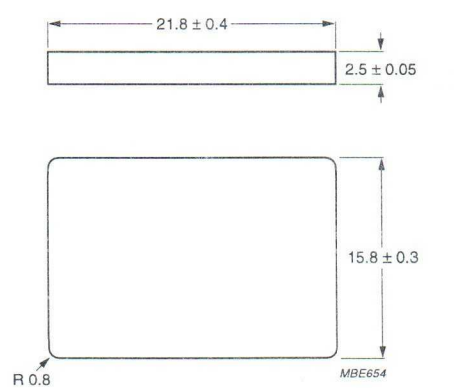
Fig.1 E22/6/16.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of plate	≈4	g

Ordering information for plates

GRADE	TYPE NUMBER
3F3	PLT22/16/2.5F3
3F4	PLT22/16/2.5-3F4



Dimensions in mm.

Fig.2 PLT22/16/2.5.

Core halves for use in combination with an E core

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈53	≈860	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
3F4	160 ±3%	≈53	≈860	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

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±10 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈42	≈860	E22/6-3F3-A160-P
	250 ±3%	≈66	≈490	E22/6-3F3-A250-P
	315 ±3%	≈83	≈360	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
3F4	160 ±3%	≈42	≈860	E22/6-3F4-A160-P
	250 ±3%	≈66	≈490	E22/6-3F4-A250-P
	315 ±3%	≈83	≈360	E22/6-3F4-A315-P
	400 ±5%	≈106	≈280	E22/6-3F4-A400-P
	630 ±8%	≈166	≈160	E22/6-3F4-A630-P
	290025%	≈770	≈0	E22/6/16-3F4

Note

1. Measured in combination with a plate (PLT), clamping force 20 ±10 N.

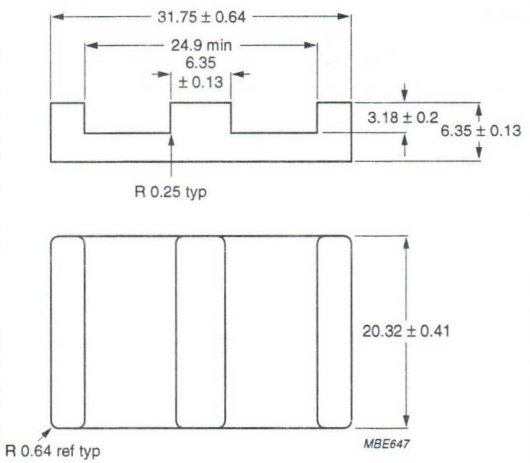
Properties of E core sets under power conditions

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 = 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
3F3	≥300	≤0.28	≤0.5	–	–
3F4	≥250	–	–	≤0.77	≤0.90

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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.

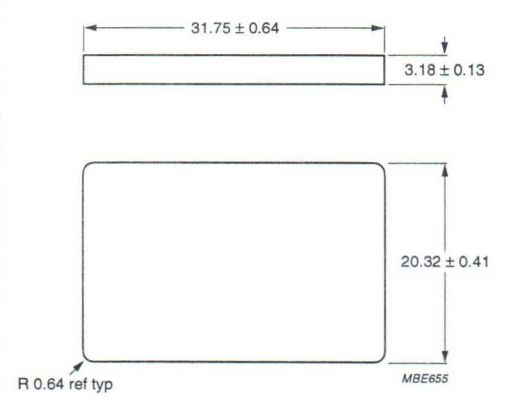
Fig.1 E32/6/20.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
3F3	PLT32/20/3-3F3
3F4	PLT32/20/3-3F4



Dimensions in mm.

Fig.2 PLT32/20/3.

Core halves for use in combination with an ungapped E core

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈41	≈1200	E32/6-3C85-E160-E[2]
	250 ±3%	≈64	≈700	E32/6-3C85-E250-E[2]
	315 ±3%	≈81	≈550	E32/6-3C85-A315-E
	400 ±3%	≈103	≈450	E32/6-3C85-A400-E
	630 ±3%	≈162	≈260	E32/6-3C85-A630-E
	6425 ±25%	≈1650	≈0	E32/6/20-3C85
3F3	160 ±3%	≈41	≈1200	E32/6-3F3-E160-E[2]
	250 ±3%	≈64	≈700	E32/6-3F3-E250-E[2]
	315 ±3%	≈81	≈550	E32/6-3F3-A315-E
	400 ±3%	≈103	≈450	E32/6-3F3-A400-E
	630 ±3%	≈162	≈260	E32/6-3F3-A630-E
	5900 ±25%	≈1520	≈0	E32/6/20-3F3
3F4	160 ±3%	≈41	≈1200	E32/6-3F4-E160-E[2]
	250 ±3%	≈64	≈700	E32/6-3F4-E250-E[2]
	315 ±3%	≈81	≈550	E32/6-3F4-A315-E
	400 ±3%	≈103	≈450	E32/6-3F4-A400-E
	630 ±3%	≈162	≈260	E32/6-3F4-A630-E
	3200 ±25%	≈820	≈0	E32/6/20-3F4

Note

1. Measured in combination with a non gapped core half, clamping force 30 ±10 N.
2. Measured in combination with an **E**qual-gapped E core half, clamping force 30 ±10 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈35	≈1200	E32/6-3C85-A160-P
	250 ±3%	≈55	≈700	E32/6-3C85-A250-P
	315 ±3%	≈69	≈550	E32/6-3C85-A315-P
	400 ±3%	≈87	≈450	E32/6-3C85-A400-P
	630 ±3%	≈138	≈260	E32/6-3C85-A630-P
	7350 ±25%	≈1610	≈0	E32/6/20-3C85
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 ±3%	≈87	≈450	E32/6-3F3-A400-P
	630 ±3%	≈138	≈260	E32/6-3F3-A630-P
	6780 ±25%	≈1490	≈0	E32/6/20-3F3

Planar E cores E32/6/20

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	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 ±3%	≈87	≈450	E32/6-3F4-A400-P
	630 ±3%	≈138	≈260	E32/6-3F4-A630-P
	3700 ±25%	≈810	≈0	E32/6/20-3F4

Note

1. Measured in combination with a plate (PLT), clamping force 30 ±10 N.

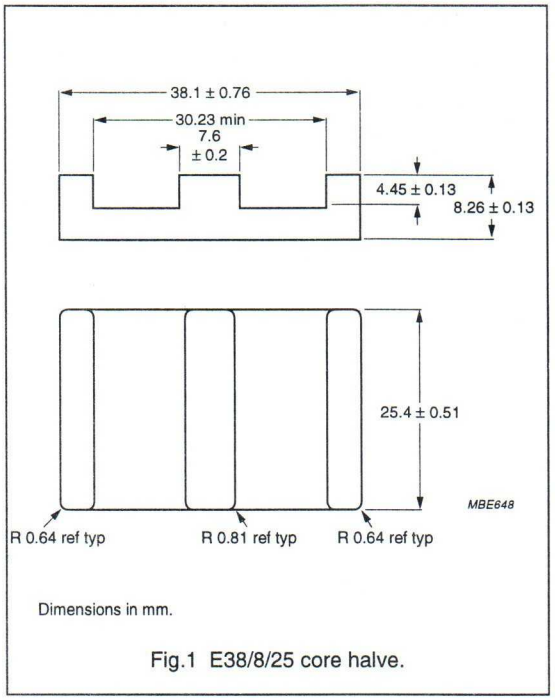
Properties of E core sets under power conditions

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
3C85	≥320	≤0.84	≤0.97	–	–	–
3F3	≥320	–	≤0.59	≤1.0	–	–
3F4	≥250	–	–	–	≤1.6	≤2.0

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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



Dimensions in mm.

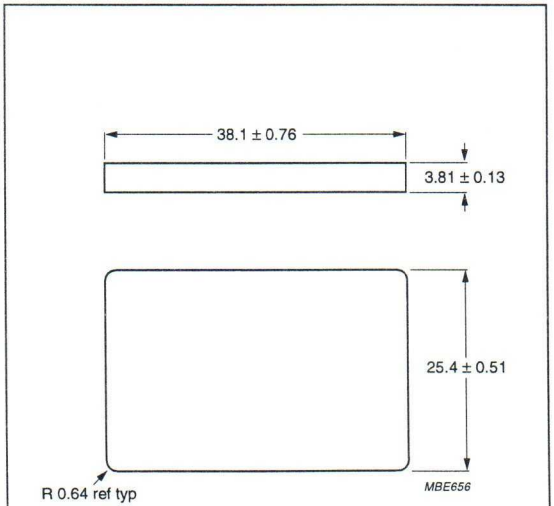
Fig.1 E38/8/25 core halve.

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	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
3C85	PLT38/25/4-3C85
3F3	PLT38/25/4-3F3
3F4	PLT38/25/4-3F4



Dimensions in mm.

Fig.2 PLT38/25/4.

Core halves for use in combination with an E core

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈54	≈1100	E38/8-3C85-E250-E[2]
	315 ±3%	≈68	≈850	E38/8-3C85-E315-E[2]
	400 ±3%	≈86	≈650	E38/8-3C85-E400-E[2]
	630 ±5%	≈136	≈400	E38/8-3C85-A630-E
	1000 ±10%	≈216	≈250	E38/8-3C85-A1000-E
	7940 ±25%	≈1720	≈0	E38/8/25-3C85
3F3	250 ±3%	≈54	≈1100	E38/8-3F3-E250-E[2]
	315 ±3%	≈68	≈850	E38/8-3F3-E315-E[2]
	400 ±3%	≈86	≈650	E38/8-3F3-E400-E[2]
	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	250 ±3%	≈54	≈1100	E38/8-3F4-E250-E[2]
	315 ±3%	≈68	≈850	E38/8-3F4-E315-E[2]
	400 ±3%	≈86	≈650	E38/8-3F4-E400-E[2]
	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 a non gapped core half, clamping force 40 ±15 N.
2. Measured in combination with an **E**qual-gapped E core half, clamping force 40 ±15 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈45	≈1100	E38/8-3C85-A250-P
	315 ±3%	≈57	≈850	E38/8-3C85-A315-P
	400 ±3%	≈72	≈650	E38/8-3C85-A400-P
	630 ±5%	≈113	≈400	E38/8-3C85-A630-P
	1000 ±10%	≈180	≈250	E38/8-3C85-A1000-P
	9290 ±25%	≈1670	≈0	E38/8/25-3C85
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

Planar E cores E38/8/25

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	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

Note

1. Measured in combination with a plate (PLT), clamping force 40 ±15 N.

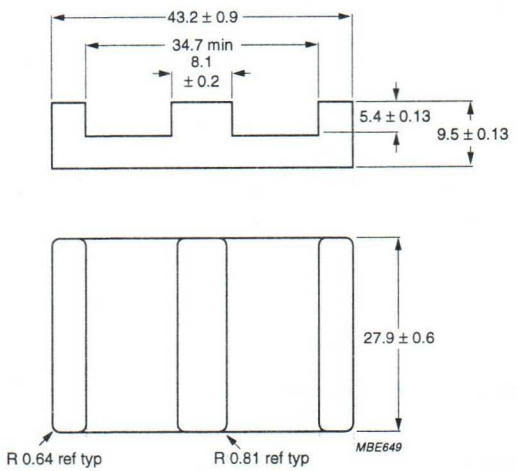
Properties of E core sets under power conditions

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
3C85	≥320	≤1.6	≤1.8	–	–	–
3F3	≥320	–	≤1.2	≤2.0	–	–
3F4	≥250	–	–	–	≤3.0	≤3.5

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.

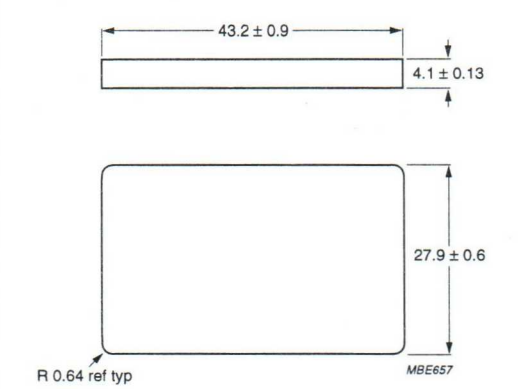
Fig.1 E43/10/28 core halve.

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
3C85	PLT43/28/4-3C85
3F3	PLT43/28/4-3F3
3F4	PLT43/28/4-3F4



Dimensions in mm.

Fig.2 PLT43/28/4.

Core halves for use in combination with an E core

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈55	≈1100	E43/10-3C85-E250-E(2)
	315 ±3%	≈69	≈800	E43/10-3C85-E315-E(2)
	400 ±3%	≈87	≈700	E43/10-3C85-E400-E(2)
	630 ±5%	≈138	≈400	E43/10-3C85-A630-E
	1000 ±10%	≈219	≈250	E43/10-3C85-A1000-E
	8030 ±25%	≈1710	≈0	E43/10/28-3C85
3F3	250 ±3%	≈55	≈1100	E43/10-3F3-E250-E(2)
	315 ±3%	≈69	≈800	E43/10-3F3-E315-E(2)
	400 ±3%	≈87	≈700	E43/10-3F3-E400-E(2)
	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	250 ±3%	≈55	≈1100	E43/10-3F4-E250-E(2)
	315 ±3%	≈69	≈800	E43/10-3F4-E315-E(2)
	400 ±3%	≈87	≈700	E43/10-3F4-E400-E(2)
	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 a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an **E**qual-gapped E core half core half, clamping force 40 ±20 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	250 ±3%	≈45	≈1100	E43/10-3C85-A250-P
	315 ±3%	≈57	≈800	E43/10-3C85-A315-P
	400 ±3%	≈72	≈700	E43/10-3C85-A400-P
	630 ±5%	≈113	≈400	E43/10-3C85-A630-P
	1000 ±10%	≈180	≈250	E43/10-3C85-A1000-P
	9250 ±25%	≈1710	≈0	E43/10/28-3C85
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[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	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

Note

1. Measured in combination with a plate (PLT).

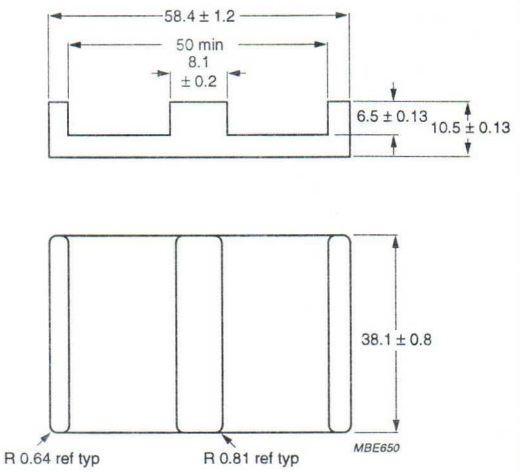
Properties of E core sets under power conditions

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 = 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
3C85	≥320	≤2.5	–	–	–
3F3	≥320	≤1.6	≤2.7	–	–
3F4	≥250	–	–	≤4.2	≤5.0

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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.

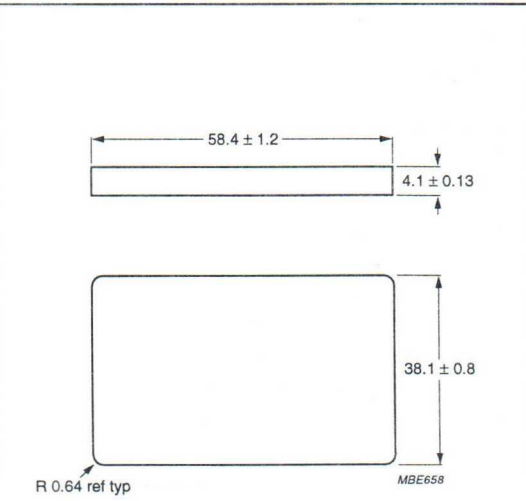
Fig.1 E58/11/38 core halve.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
3C85	PLT58/38/4-3C85
3F3	PLT58/38/4-3F3
3F4	PLT58/38/4-3F4



Dimensions in mm.

Fig.2 PLT 58/38/4

Core halves for use in combination with an E core

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	315 ±3%	≈67	≈1400	E58/11-3C85-E315-E[2]
	400 ±3%	≈85	≈1100	E58/11-3C85-E400-E[2]
	630 ±5%	≈134	≈650	E58/11-3C85-E630-E[2]
	1000 ±5%	≈213	≈400	E58/11-3C85-A1000-E
	1600 ±10%	≈341	≈200	E58/11-3C85-A1600-E
	8480 ±25%	≈1800	≈0	E58/11/38-3C85
3F3	315 ±3%	≈67	≈1400	E58/11-3F3-E315-E[2]
	400 ±3%	≈85	≈1100	E58/11-3F3-E400-E[2]
	630 ±5%	≈134	≈650	E58/11-3F3-E630-E[2]
	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	315 ±3%	≈67	≈1400	E58/11-3F4-E315-E[2]
	400 ±3%	≈85	≈1100	E58/11-3F4-E400-E[2]
	630 ±5%	≈134	≈650	E58/11-3F4-E630-E[2]
	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 a non gapped core half, clamping force 40 ±20 N.
2. Measured in combination with an **E**qual-gapped E core half, clamping force 40 ±20 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	315 ±3%	≈56	≈1400	E58/11-3C85-A315-P
	400 ±3%	≈71	≈1100	E58/11-3C85-A400-P
	630 ±5%	≈112	≈650	E58/11-3C85-A630-P
	1000 ±5%	≈178	≈400	E58/11-3C85-A1000-P
	1600 ±10%	≈285	≈200	E58/11-3C85-A1600-P
	9970 ±25%	≈780	≈0	E58/11/38-3C85
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 [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	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

Note

1. Measured in combination with a plate (PLT).

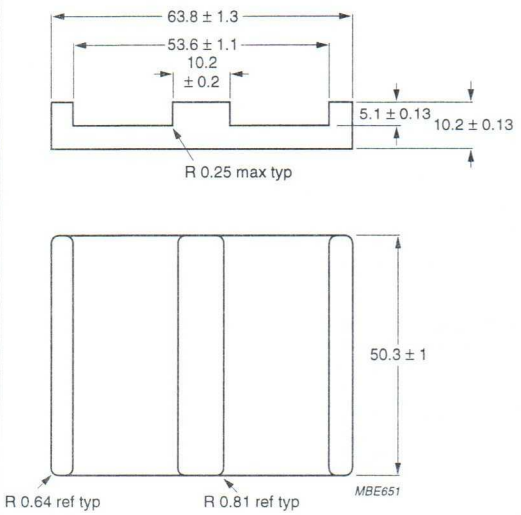
Properties of E core sets under power conditions

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 = 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
3C85	≥320	≤4.4	–	–	–
3F3	≥320	≤2.7	≤4.7	–	–
3F4	≥250	–	–	≤7.4	≤8.0

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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.

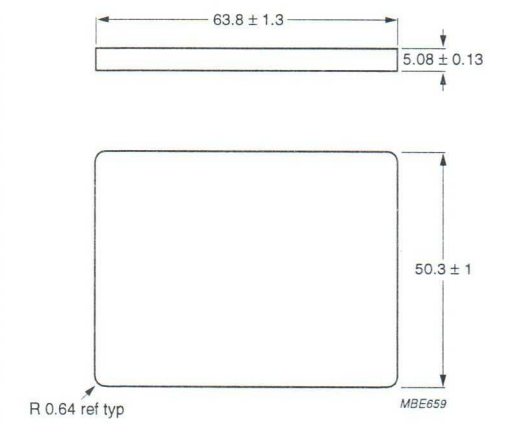
Fig.1 E64/10/50.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
3F3	PLT64/50/5-3F3
3F4	PLT64/50/5-3F4



Dimensions in mm.

Fig.2 PLT 64/50/5..

Core halves for use in combination with an E core

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	630 ±3%	≈78	≈1100	E64/10-3C85-E630-E[2]
	1000 ±3%	≈124	≈660	E64/10-3C85-E1000-E[2]
	1600 ±5%	≈199	≈385	E64/10-3C85-A1600-E
	2500 ±10%	≈310	≈225	E64/10-3C85-A2500-E
	3150 ±10%	≈391	≈170	E64/10-3C85-A3150-E
	14640 ±25%	≈1820	≈0	E64/10/50-3C85
3F3	630 ±3%	≈78	≈1100	E64/10-3F3-E630-E[2]
	1000 ±3%	≈124	≈660	E64/10-3F3-E1000-E[2]
	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	630 ±3%	≈78	≈1100	E64/10-3F4-E630-E[2]
	1000 ±3%	≈124	≈660	E64/10-3F4-E1000-E[2]
	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 a non gapped core half, clamping force 100 ±30 N.
2. Measured in combination with an Equal-gapped E core half, clamping force 100 ±30 N.

Core halves for use in combination with a plate (PLT)

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	630 ±3%	≈78	≈1100	E64/10-3C85-A-630-P
	1000 ±3%	≈124	≈660	E64/10-3C85-A-1000-P
	1600 ±5%	≈199	≈385	E64/10-3C85-A-1600-P
	2500 ±10%	≈310	≈225	E64/10-3C85-A-2500-P
	3150 ±10%	≈391	≈170	E64/10-3C85-A-3150-P
	16540 ±25%	≈1790	≈0	E64/10/50-3C85
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

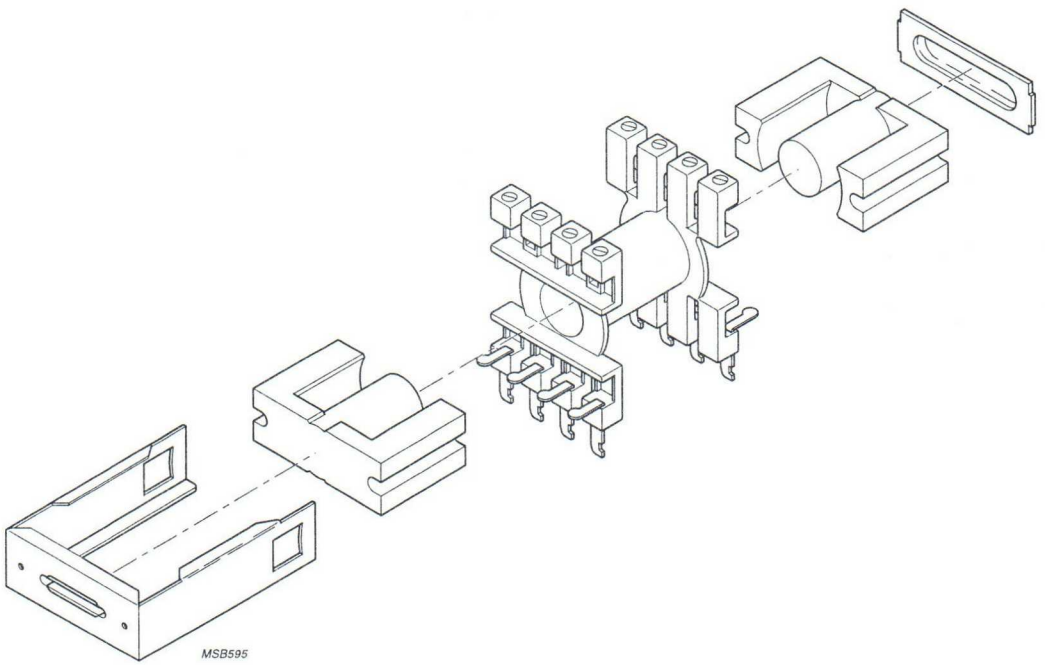
GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	630 ±3%	≈78	≈1100	E64/10-3F4-A-630-P
	1000 ±3%	≈124	≈660	E64/10-3F4-A-1000-P
	1600 ±5%	≈199	≈385	E64/10-3F4-A-1600-P
	2500 ±10%	≈310	≈225	E64/10-3F4-A-2500-P
	3150 ±10%	≈391	≈170	E64/10-3F4-A-3150-P
	7920 ±25%	≈860	≈0	E64/10/50-3F4

Note

1. Measured in combination with a plate (PLT), clamping force 100 ±30 N.

Properties of E 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 = 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
3C85	≥320	≤7.3	–	–	–
3F3	≥320	≤4.5	≤7.8	–	–
3F4	≥250	–	–	≤12	≤15


MSB595

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EC cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
EC35	6530	84.3	19
EC41	10800	121	30
EC52	18800	180	56
EC70	40100	279	127

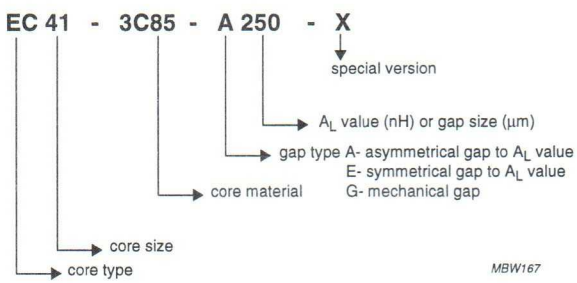


Fig.1 Type number structure for cores.

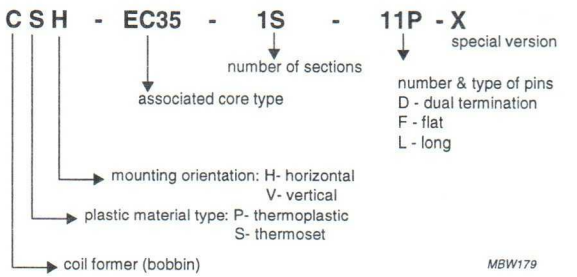
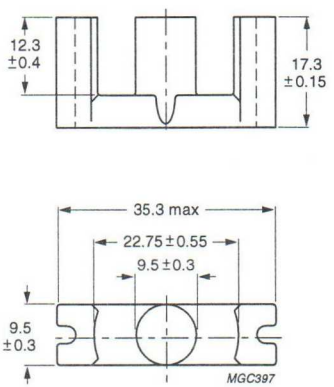


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.918	mm^{-1}
V_e	effective volume	6530	mm^3
l_e	effective length	77.4	mm
A_e	effective area	84.3	mm^2
A_{min}	minimum area	71	mm^2
m	mass of core half	≈19	g



Dimensions in mm.

Fig.1 EC35 core half.

Core halves

GRADE	A_L(1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C80	2100 ±25%	≈1530	≈0	EC35-3C80
3C81	100 ±3%	≈73	≈1470	EC35-3C81-E100(2)
	160 ±3%	≈117	≈820	EC35-3C81-E160(2)
	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
3C85	100 ±3%	≈73	≈1470	EC35-3C85-E100(2)
	160 ±3%	≈117	≈820	EC35-3C85-E160(2)
	250 ±3%	≈184	≈470	EC35-3C85-A250
	315 ±5%	≈231	≈350	EC35-3C85-A315
	400 ±10%	≈290	≈260	EC35-3C85-A400
	2100 ±25%	≈1530	≈0	EC35-3C85

Note

1. Measured in combination with an ungapped core half.
2. Measured in combination with an Equal-gapped core half (symmetrical air gap).

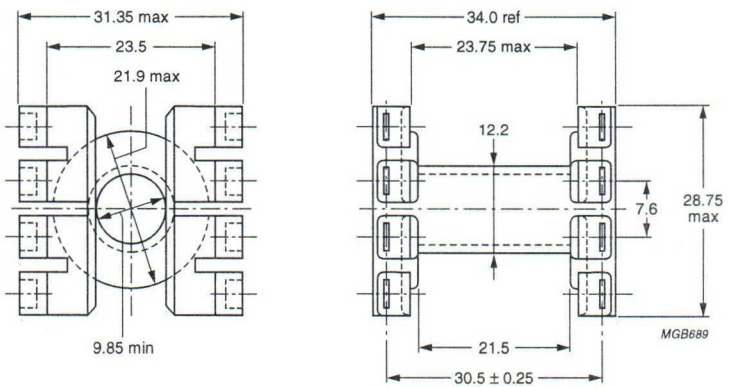
Properties of core sets under power conditions

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
3C80	≥320	≤1.5	–
3C81	≥320	≤1.4	–
3C85	≥320	≤1.0	≤1.2

COIL FORMERS

General data 8-slots EC35 coil former for insertable pins

ITEM	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	105 °C



Dimensions in mm.

Fig.2 EC35 coil former; 8-slots.

Winding data 8-slots EC35 coil former for insertable pins

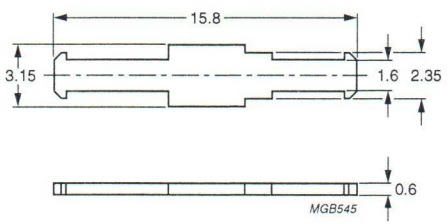
NUMBER OF SECTIONS	MINIMUM NWINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97.1	21.5	53.1	CP-EC35-1S

Coil formers with inserted pins are available upon request.

MOUNTING PARTS

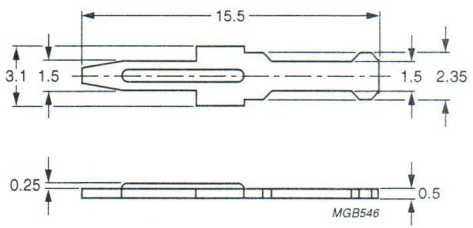
General data and ordering information

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	2	PIN-EC
		horizontal	3	PIN/H-EC
Base plate 2-holes	aluminium		4	BPL2-EC35
Base plate 4-holes	aluminium		5	BPL4-EC35
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC35



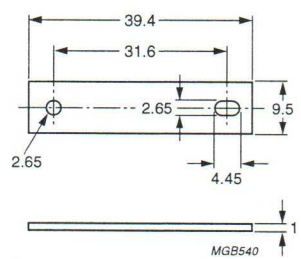
Dimensions in mm.

Fig.3 EC pin; general mount.



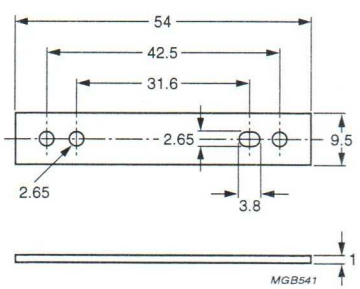
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



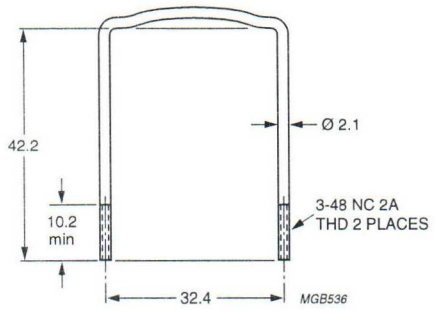
Dimensions in mm.

Fig.5 EC35 base plate; 2 holes.



Dimensions in mm.

Fig.6 EC35 base plate; 4 holes.



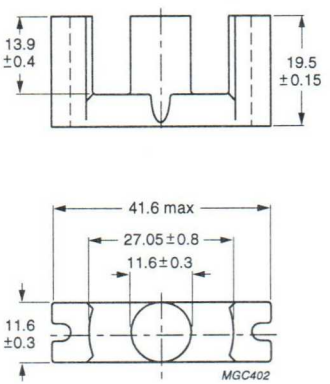
Dimensions in mm.

Fig.7 EC35 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.735	mm^{-1}
V_e	effective volume	10800	mm^3
l_e	effective length	89.3	mm
A_e	effective area	121	mm^2
A_{min}	minimum area	106	mm^2
m	mass of core half	≈30	g



Dimensions in mm.

Fig.1 EC41 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C80	2700 ±25%	≈1580	≈0	EC41-3C80
3C81	100 ±3%	≈59	≈2200	EC41-3C81-E100(2)
	160 ±3%	≈94	≈1220	EC41-3C81-E160(2)
	250 ±3%	≈147	≈705	EC41-3C81-E250(2)
	315 ±5%	≈186	≈530	EC41-3C81-A315
	400 ±5%	≈236	≈390	EC41-3C81-A400
	≥2800	≥1640	≈0	EC41-3C81
3C85	100 ±3%	≈59	≈2200	EC41-3C81-E100(2)
	160 ±3%	≈94	≈1220	EC41-3C81-E160(2)
	250 ±3%	≈147	≈705	EC41-3C81-E250(2)
	315 ±5%	≈186	≈530	EC41-3C81-A315
	400 ±5%	≈186	≈390	EC41-3C81-A400
	2700 ±25%	≈1580	≈0	EC41-3C85

Note

1. Measured in combination with an ungapped core half.
2. Measured in combination with an Equal-gapped core half (symmetrical air gap).

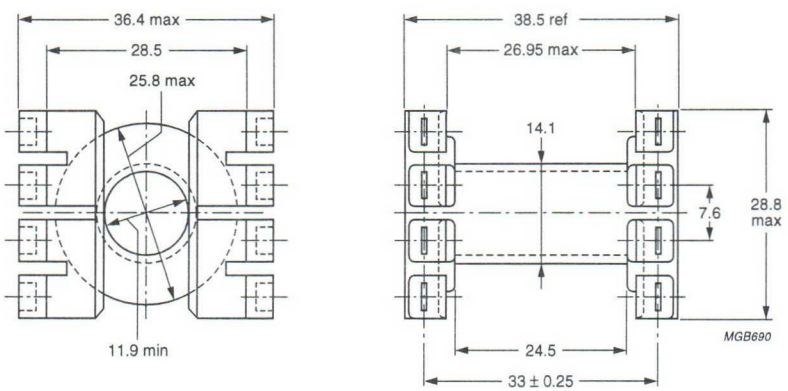
Properties of core sets under power conditions

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
3C80	≥320	≤2.4	–
3C81	≥320	≤2.2	–
3C85	≥320	≤1.7	≤2.0

COIL FORMERS

General data 8-slots EC41 coil former for insertable pins

ITEM	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	105 °C



Dimensions in mm.

Fig.2 EC41 coil former; 8-slots.

Winding data 8-slots EC41 coil former for insertable pins

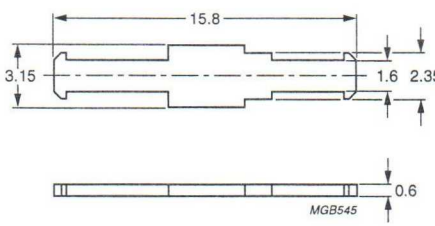
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	137.5	24.5	62.4	CP-EC41-1S

Coil formers with inserted pins are available upon request.

MOUNTING PARTS

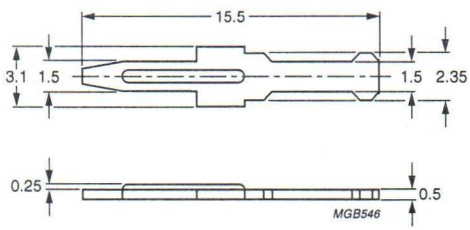
General data and ordering information

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-EC41
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC41
Base plate 4-holes	aluminium (Al)		7	BPL4-EC41



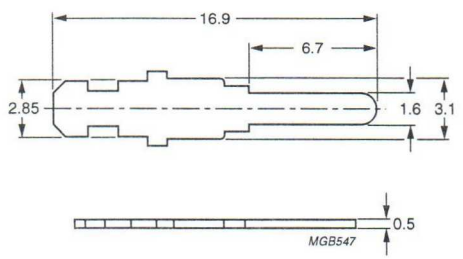
Dimensions in mm.

Fig.3 EC pin; general mount.



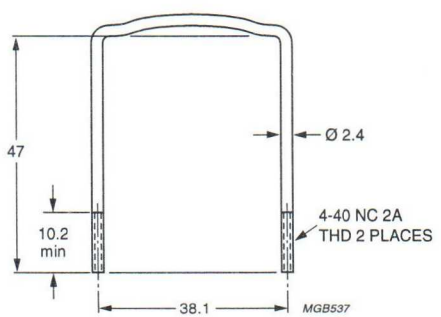
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



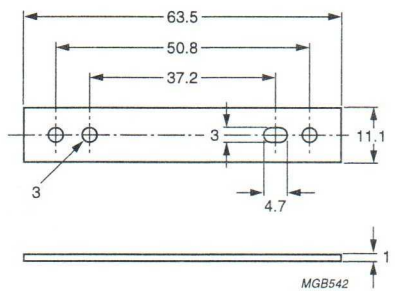
Dimensions in mm.

Fig.5 EC41 pin; vertical mount.



Dimensions in mm.

Fig.6 EC41 clamp.



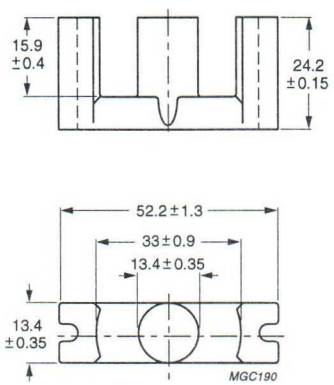
Dimensions in mm.

Fig.7 EC41 base plate; 4-holes.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.581	mm^{-1}
V_e	effective volume	18800	mm^3
l_e	effective length	105	mm
A_e	effective area	180	mm^2
A_{min}	minimum area	141	mm^2
m	mass of core half	≈56	g



Dimensions in mm.

Fig.1 EC52 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C80	3600 ±25%	≈1660	≈0	EC52-3C80
3C81	160 ±3%	≈74	≈1920	EC52-3C81-E160(2)
	250 ±3%	≈116	≈1100	EC52-3C81-E250(2)
	315 ±5%	≈147	≈830	EC52-3C81-E315(2)
	400 ±3%	≈185	≈620	EC52-3C81-A400
	630 ±5%	≈290	≈350	EC52-3C81-A630
	≥3550	≥1640	≈0	EC52-3C81
3C85	160 ±3%	≈74	≈1920	EC52-3C85-E160(2)
	250 ±3%	≈116	≈1100	EC52-3C85-E250(2)
	315 ±3%	≈147	≈830	EC52-3C85-E315(2)
	400 ±3%	≈185	≈620	EC52-3C85-A400
	630 ±5%	≈290	≈350	EC52-3C85-A630
	3600 ±25%	≈1660	≈0	EC52-3C85

Note

1. Measured in combination with an ungapped core half.
2. Measured in combination with an Equal-gapped core half (symmetrical air gap).

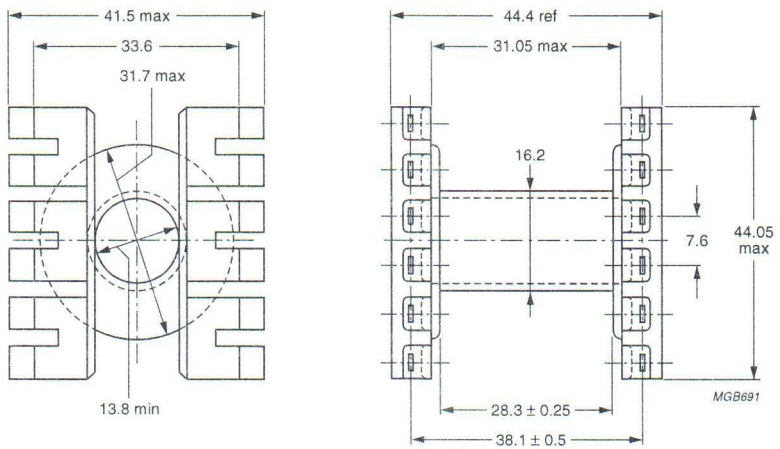
Properties of core sets under power conditions

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
3C80	≥320	≤4.2	–
3C81	≥320	≤3.8	–
3C85	≥320	≤2.9	≤3.4

COIL FORMERS

General data 12-slots EC52 coil former for insertable pins

ITEM	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	105 °C



Dimensions in mm.

Fig.2 EC52 coil former; 12-slots.

Winding data for 12-slots EC52 coil former for insertable pins

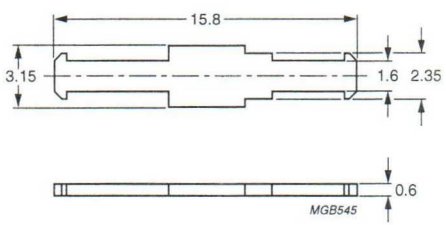
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	212	28.3	74.9	CP-EC52-1S

Coil formers with inserted pins are available upon request.

MOUNTING PARTS

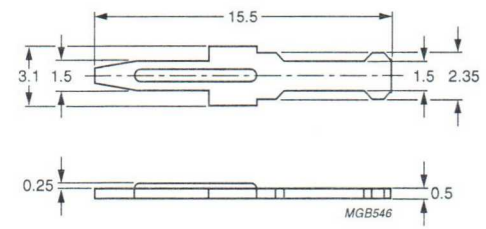
General data and ordering information

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-EC52
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC52
Base plate 4-holes	aluminium		7	BPL4-EC52



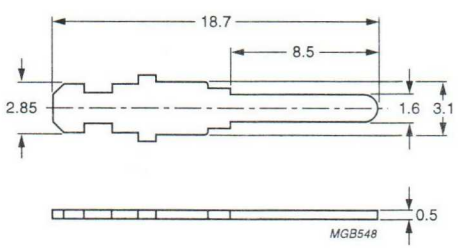
Dimensions in mm.

Fig.3 EC pin; general mount.



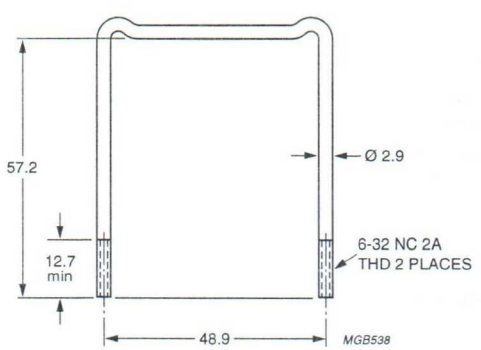
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



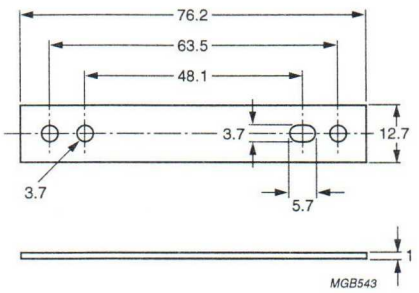
Dimensions in mm.

Fig.5 EC52 pin; vertical mount.



Dimensions in mm.

Fig.6 EC52 clamp.



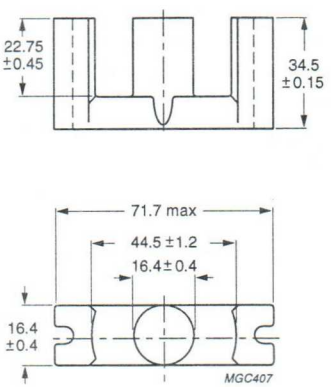
Dimensions in mm.

Fig.7 EC52 base plate; 4-holes.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.514	mm^{-1}
V_e	effective volume	40100	mm^3
l_e	effective length	144	mm
A_e	effective area	279	mm^2
A_{min}	minimum area	211	mm^2
m	mass of core half	≈127	g



Dimensions in mm.

Fig.1 EC70 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C80	3900 ±25%	≈1600	≈0	EC70-3C80
3C81	250 ±3%	≈102	≈1830	EC70-3C81-E250(2)
	315 ±3%	≈130	≈1370	EC70-3C81-E315(2)
	400 ±3%	≈165	≈1020	EC70-3C81-E400(2)
	630 ±5%	≈256	≈580	EC70-3C81-A630
	1000 ±10%	≈406	≈320	EC70-3C81-A1000
	≥4000	≥1620	≈0	EC70-3C81
3C85	250 ±3%	≈102	≈1830	EC70-3C85-E250(2)
	315 ±3%	≈130	≈1370	EC70-3C85-E315(2)
	400 ±3%	≈165	≈1020	EC70-3C85-E400(2)
	630 ±5%	≈256	≈580	EC70-3C85-A630
	1000 ±10%	≈406	≈320	EC70-3C85-A1000
	3900 ±25%	≈1580	≈0	EC70-3C85

Note

1. Measured in combination with an ungapped core half.
2. Measured in combination with an Equal-gapped core half (symmetrical air gap).

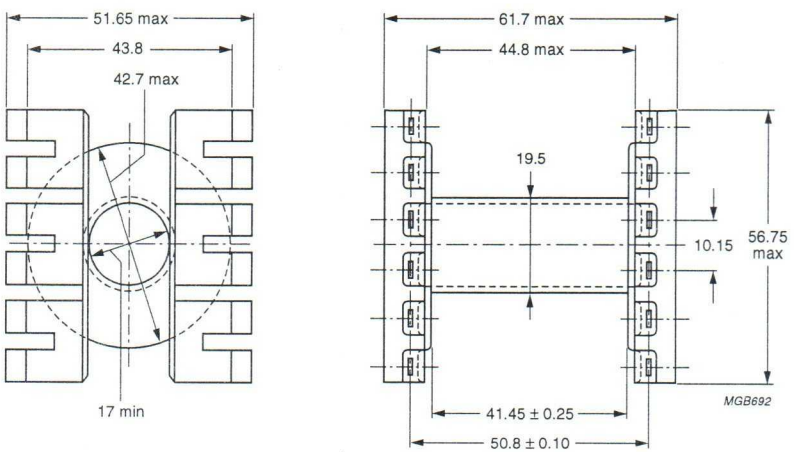
Properties of core sets under power conditions

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
3C80	≥330	≤8.8	–
3C81	≥330	≤8.2	–
3C85	≥330	≤6.2	≤7.3

COIL FORMERS

General data 8-slots EC70 coil former for insertable pins

ITEM	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	105 °C



Dimensions in mm.

Fig.2 EC70 coil former; 8-slots.

Winding data 8-slots EC70 coil former for insertable pins

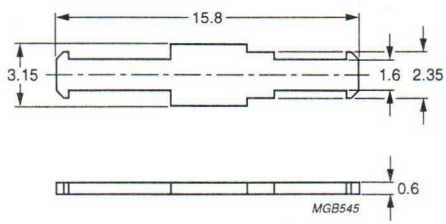
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	465	41.5	97.3	CP-EC70-1S

Coil formers with inserted pins are available upon request.

MOUNTING PARTS

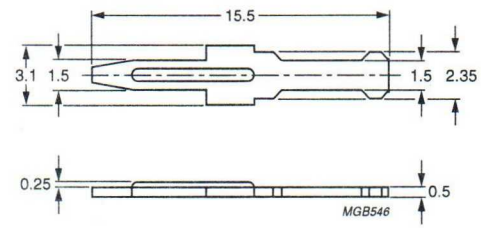
General data and ordering information

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



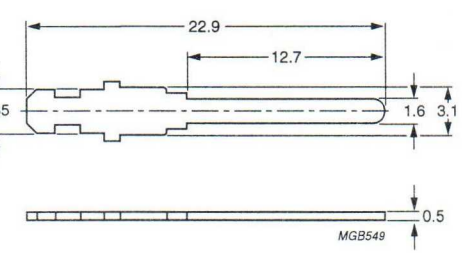
Dimensions in mm.

Fig.3 EC pin; general mount.



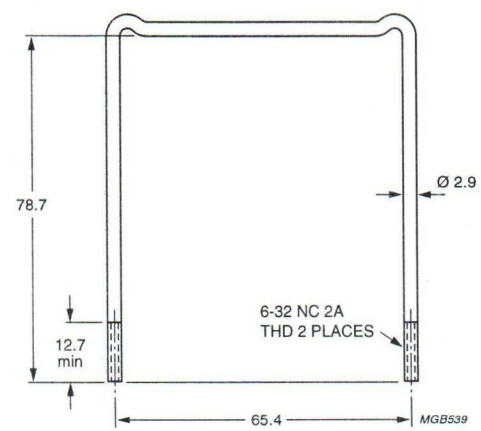
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



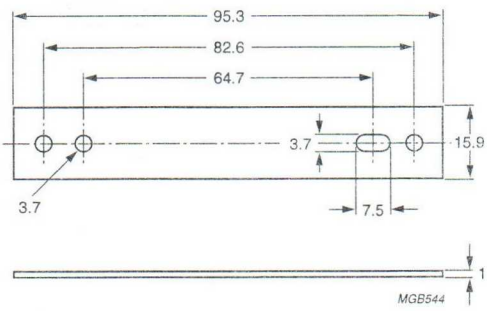
Dimensions in mm.

Fig.5 EC70 pin; vertical mount.



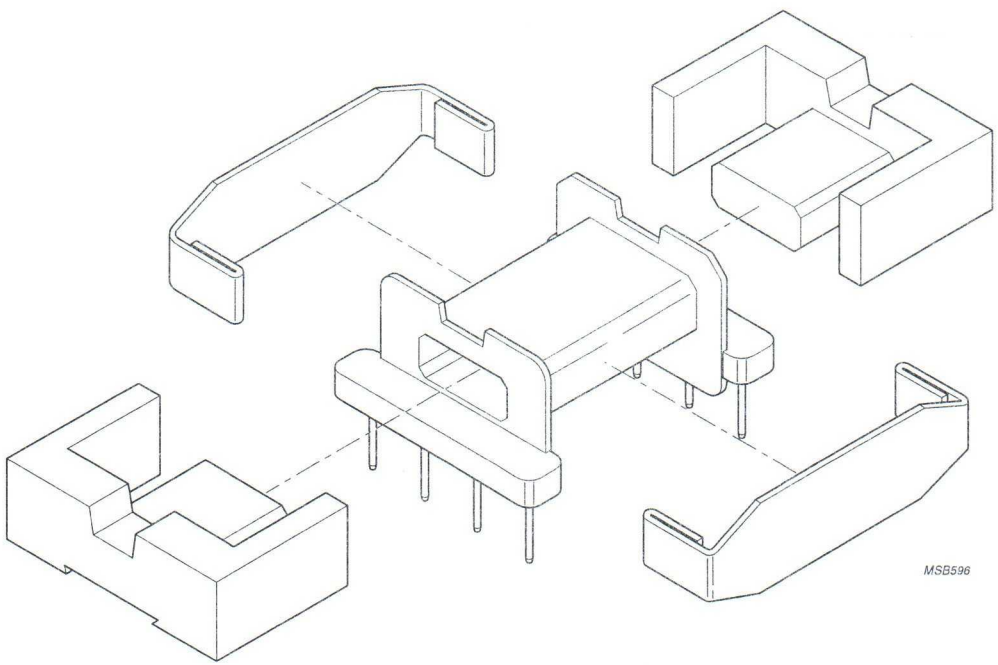
Dimensions in mm.

Fig.6 EC70 clamp.



Dimensions in mm.

Fig.7 EC70 base plate; 4-holes.


MSB596

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EFD cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
EFD10	171	7.2	0.9
EFD12	325	11.4	1.7
EFD15	510	15.0	2.8
EFD20	1460	31.0	7.0
EFD25	3300	58.0	7.0
EFD30	4700	69.0	24

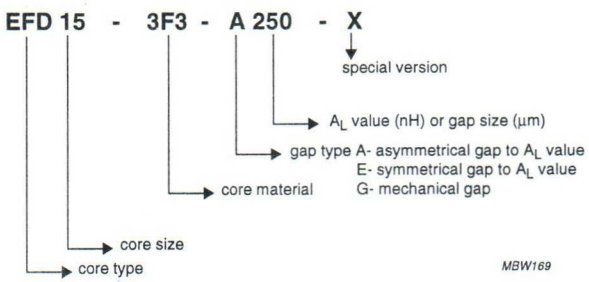


Fig.1 Type number structure for cores.

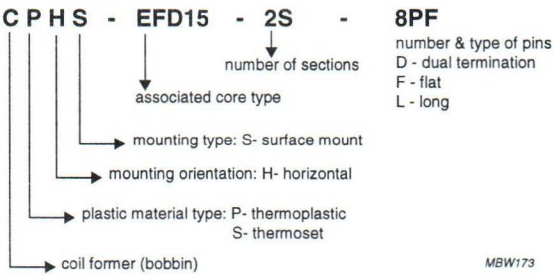
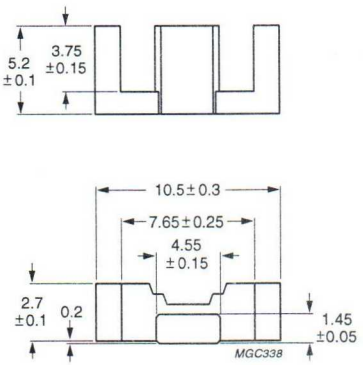


Fig.2 Type number structure for coil formers.

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 halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	25 ±5%	≈66	≈540	EFD10-3F3-A25
	40 ±8%	≈105	≈300	EFD10-3F3-A40
	63 ±10%	≈165	≈170	EFD10-3F3-A63
	500 ±25%	≈1290	≈0	EFD10-3F3
3F4	25 ±5%	≈66	≈520	EFD10-3F4-A25
	40 ±8%	≈105	≈280	EFD10-3F4-A40
	63 ±10%	≈165	≈150	EFD10-3F4-A63
	280 ±25%	≈730	≈0	EFD10-3F4
4F1	40 ±25%	≈100	≈0	EFD10-4F1

Note

1. Measured in combination with a non gapped core half, clamping force 10 ±5 N.

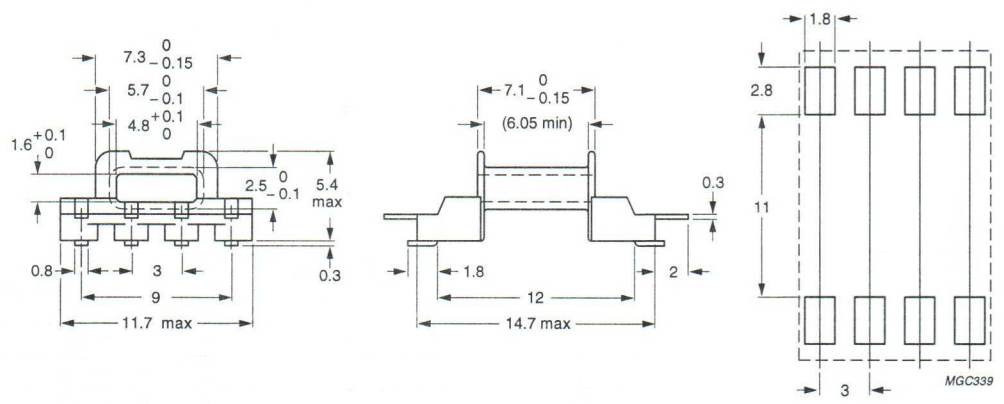
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 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
3F3	≥315	≤0.02	≤0.035	–	–
3F4	≥250	–	–	≤0.05	≤0.055
4F1	≈100	–	–	≤	≤0.035

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD10 coil former (SMD); 8-solder pads.

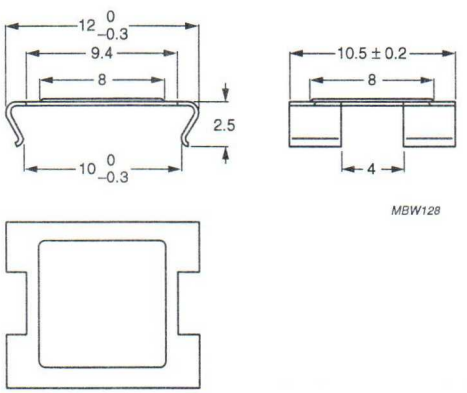
Winding data for EFD10 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.2	6.05	14.8	CPHS-EFD10-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈ 15 N	3	CLI-EFD10



Dimensions in mm.

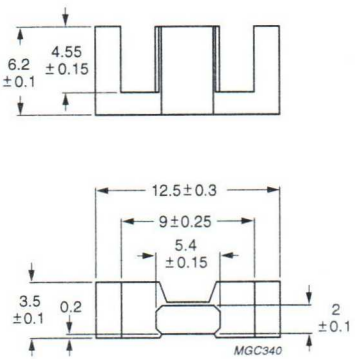
Fig.3 EFD10 mounting clip.

EFD cores and accessories EFD12

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.50	mm^{-1}
V_e	effective volume	325	mm^3
l_e	effective length	28.5	mm
A_e	effective area	11.4	mm^2
A_{min}	minimum area	10.7	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 EFD12 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	40 ±5%	≈80	≈490	EFD12-3F3-A40
	63 ±8%	≈125	≈280	EFD12-3F3-A63
	100 ±10%	≈200	≈160	EFD12-3F3-A100
	700 ±25%	≈1370	≈0	EFD12-3F3
3F4	40 ±5%	≈80	≈470	EFD12-3F4-A40
	63 ±8%	≈125	≈260	EFD12-3F4-A63
	100 ±10%	≈200	≈140	EFD12-3F4-A100
	380 ±25%	≈760	≈0	EFD12-3F4
4F1	50 ±25%	≈100	≈0	EFD12-4F1

Note

1. Measured in combination with a non gapped core half, clamping force 15 ±5 N.

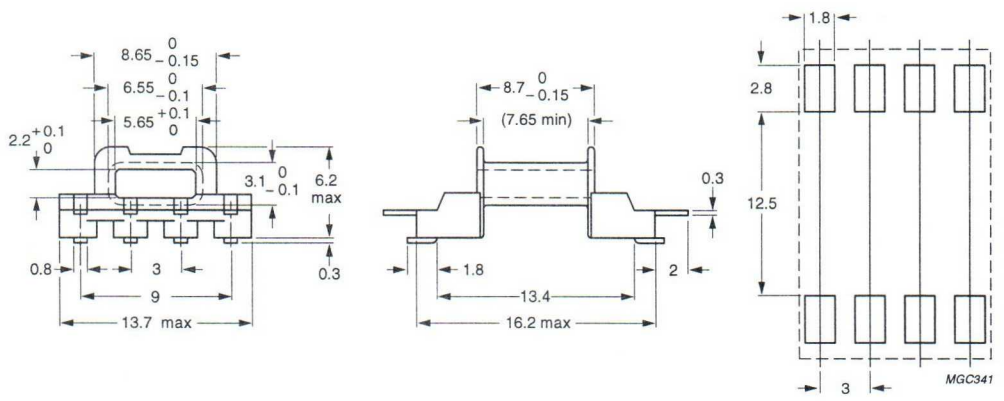
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 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
3F3	≥315	≤0.04	≤0.065	–	–
3F4	≥250	–	–	≤0.10	≤0.11
4F1	≈100	–	–	–	≤0.07

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD12 coil former (SMD); 8-solder pads.

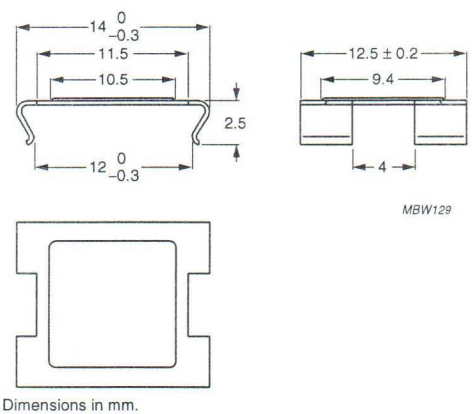
Winding data for EFD12 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6.5	7.65	18.6	CPHS-EFD12-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈ 20 N	3	CLI-EFD12



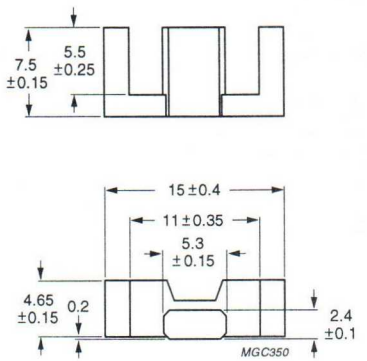
Dimensions in mm.

Fig.3 EFD12 mounting clip.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.27	mm^{-1}
V_e	effective volume	510	mm^3
l_e	effective length	34.0	mm
A_e	effective area	15.0	mm^2
A_{min}	minimum area	12.2	mm^2
m	mass of core half	≈1.4	g



Dimensions in mm.

Fig.1 EFD15 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%	≈115	≈350	EFD15-3F3-A63
	100 ±8%	≈180	≈170	EFD15-3F3-A100
	160 ±10%	≈290	≈100	EFD15-3F3-A160
	700 ±25%	≈1250	≈0	EFD15-3F3
3F4	63 ±5%	≈115	≈350	EFD15-3F4-A63
	100 ±8%	≈180	≈160	EFD15-3F4-A100
	160 ±10%	≈290	≈90	EFD15-3F4-A160
	400 ±25%	≈720	≈0	EFD15-3F4
4F1	55 ±25%	≈95	≈0	EFD15-4F1

Note

1. Measured in combination with a non gapped core half, clamping force 20 ±5 N.

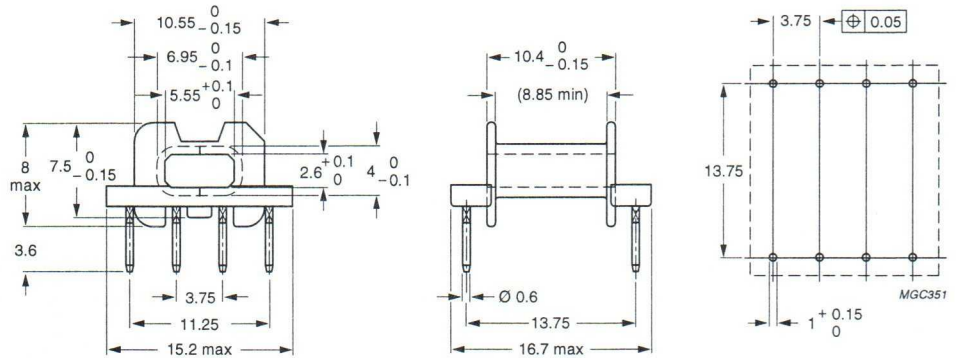
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 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
3F3	≥315	≤0.06	≤0.10	–	–
3F4	≥250	–	–	≤0.18	≤0.20
4F1	≈100	–	–	–	≤0.12

COIL FORMERS

General data

ITEM	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 85 class H
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD15 coil former; 8-pins.

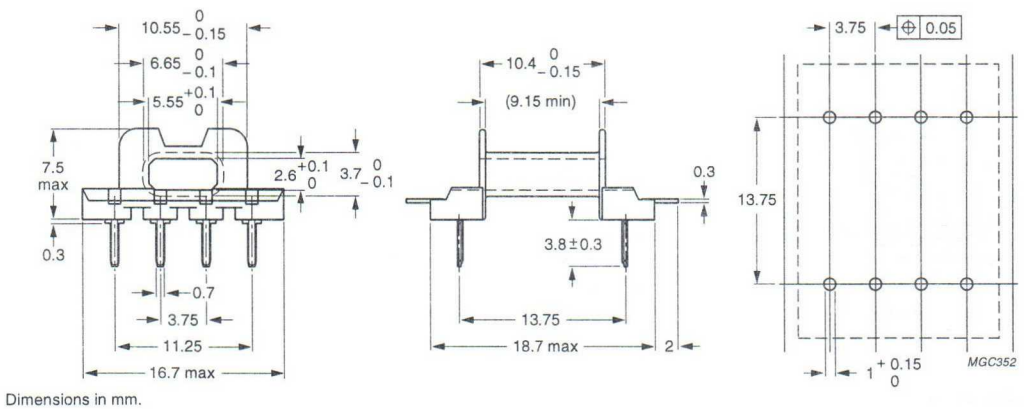
Winding data for 8-pins EFD15 coil former

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

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class H
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: 235 °C, 2 s



Dimensions in mm.

Fig.3 EFD15 coil former (PCB); 8-pins.

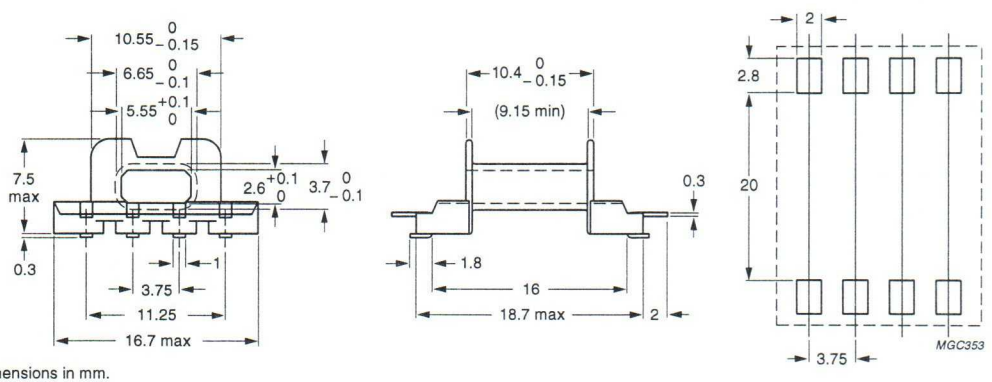
Winding data for 8-pins EFD15 coil former (PCB)

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

ITEM	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 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.4 EFD15 coil former (SMD); 8-solder pads.

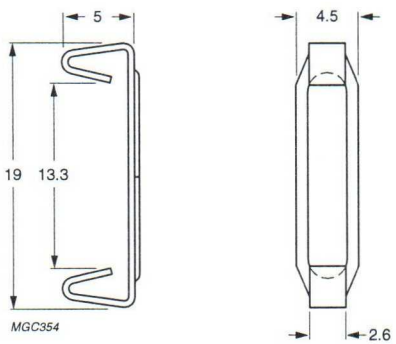
Winding data for EFD15 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.15	25.6	CPHS-EFD15-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈ 12.5 N	5	CLI-EFD15



Dimensions in mm.

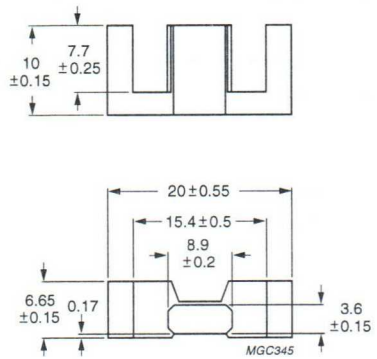
Fig.5 EFD15 mounting clip.

EFD cores and accessories EFD20

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1200 ±25%	≈1450	≈0	EFD20-3C30
3C85	1300 ±25%	≈1540	≈0	EFD20-3C85
3C90	1300 ±25%	≈1540	≈0	EFD20-C90
3F3	1200 ±25%	≈1450	≈0	EFD20-3F3
3F4	650 ±25%	≈700	≈0	EFD20-3F4

Note

1. Measured in combination with a non gapped core half, clamping force 40 ±10 N.

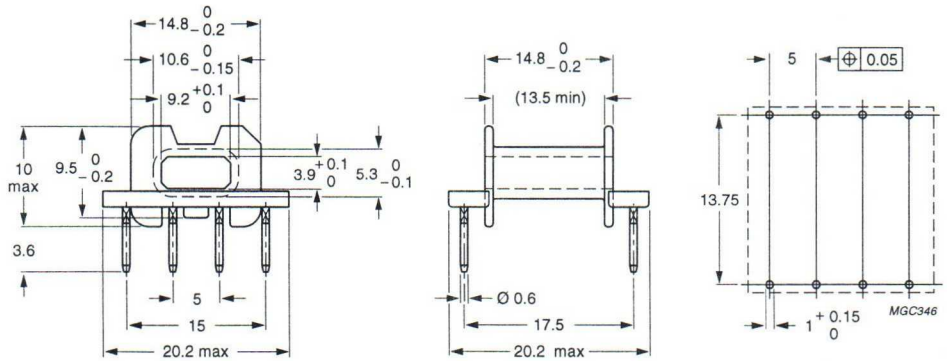
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C30	≥360	≤0.16	≤0.17	–	–	–
3C85	≥330	≤0.21	≤0.27	–	–	–
3C90	≥330	≤0.16	≤0.17	–	–	–
3F3	≥315	–	≤0.17	≤0.28	–	–
3F4	≥300	–	–	–	≤0.44	≤0.50

COIL FORMERS

General data

ITEM	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 85 class H
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD20 coil former; 8-pins.

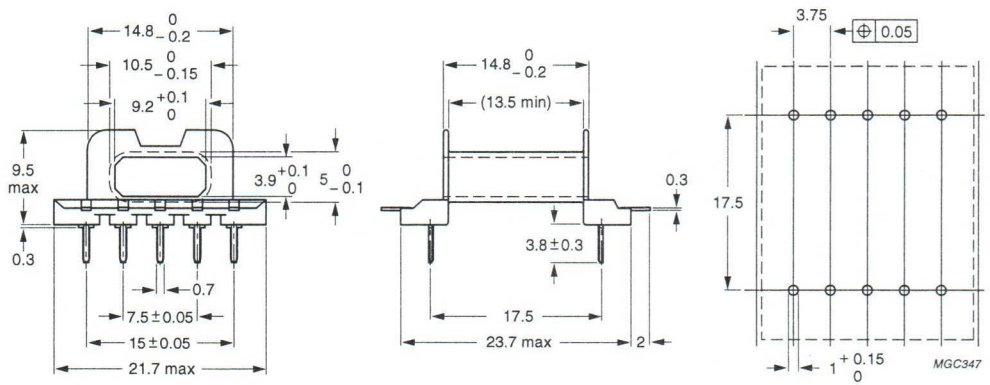
Winding data for 10-pins EFD20 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	26.4	13.2	36.5	CSH-EFD20-1S-8P

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.3 EFD20 coil former (PCB); 10-pins.

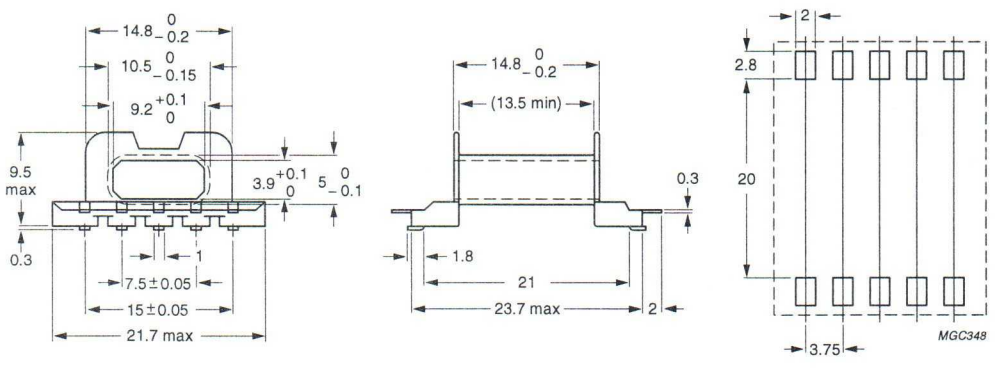
Winding data for 10-pins EFD20 coil former (PCB)

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	29.0	13.5	35.9	CPH-EFD20-1S-10P

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.4 EFD20 coil former (SMD); 10-solder pads.

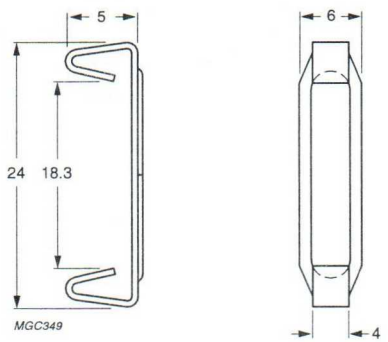
Winding data for EFD20 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	29.0	13.5	35.9	CPHS-EFD20-1S-10P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈ 20 N	5	CLI-EFD20



Dimensions in mm.

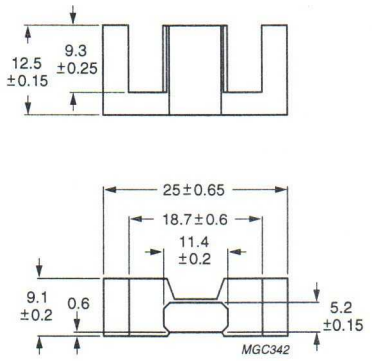
Fig.5 EFD20 mounting clip.

EFD cores and accessories EFD25

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.00	mm^{-1}
V_e	effective volume	3300	mm^3
l_e	effective length	57.0	mm
A_e	effective area	58.0	mm^2
A_{min}	minimum area	55	mm^2
m	mass of core half	≈8	g



Dimensions in mm.

Fig.1 EFD25 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1800 ±25%	≈1450	≈0	EFD25-3C30
3C85	2000 ±25%	≈1600	≈0	EFD25-3C85
3C90	2000 ±25%	≈1600	≈0	EFD25-3C90
3F3	1800 ±25%	≈1450	≈0	EFD25-3F3
3F4	1000 ±25%	≈780	≈0	EFD25-3F4

Note

1. Measured in combination with a non gapped core half, clamping force 60 ±20 N.

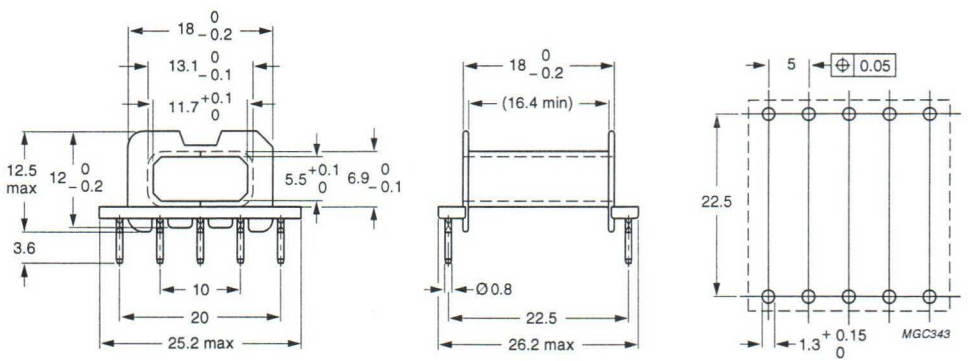
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C30	≥360	≤0.35	≤0.38	–	–	–
3C85	≥320	≤0.51	≤0.60	–	–	–
3C90	≥330	≤0.35	≤0.38	–	–	–
3F3	≥315	–	≤0.38	≤0.64	–	–
3F4	≥300	–	–	–	≤1.0	≤1.1

COIL FORMERS

General data

ITEM	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 85 class H
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 EFD25 coil former; 10-pins.

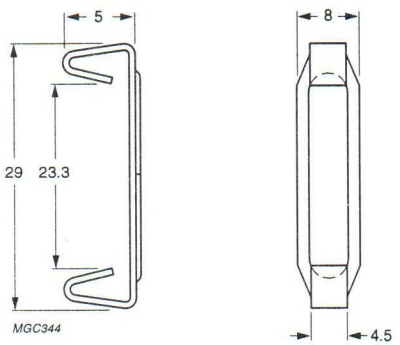
Winding data for 10-pins EFD25 coil former

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈ 30 N	3	CLI-EFD25



Dimensions in mm.

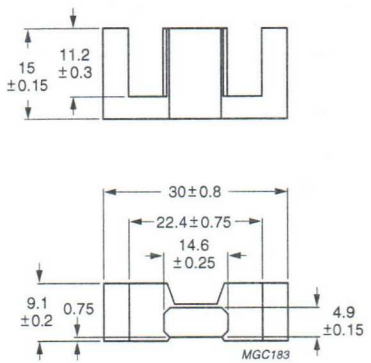
Fig.3 EFD25 mounting clip.

EFD cores and accessories EFD30

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.98	mm^{-1}
V_e	effective volume	4700	mm^3
l_e	effective length	68.0	mm
A_e	effective area	69.0	mm^2
A_{min}	minimum area	66.0	mm^2
m	mass of core half	≈12	g



Dimensions in mm.

Fig.1 EFD30 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	1900 ±25%	≈1500	≈0	EFD30-3C30
3C85	2100 ±25%	≈1650	≈0	EFD30-3C85
3C90	2100 ±25%	≈1650	≈0	EFD30-3C90
3F3	1900 ±25%	≈1500	≈0	EFD30-3F3
3F4	1050 ±25%	≈820	≈0	EFD30-3F4

Note

1. Measured in combination with a non gapped core half, clamping force 70 ±20 N.

Properties of core sets under power conditions

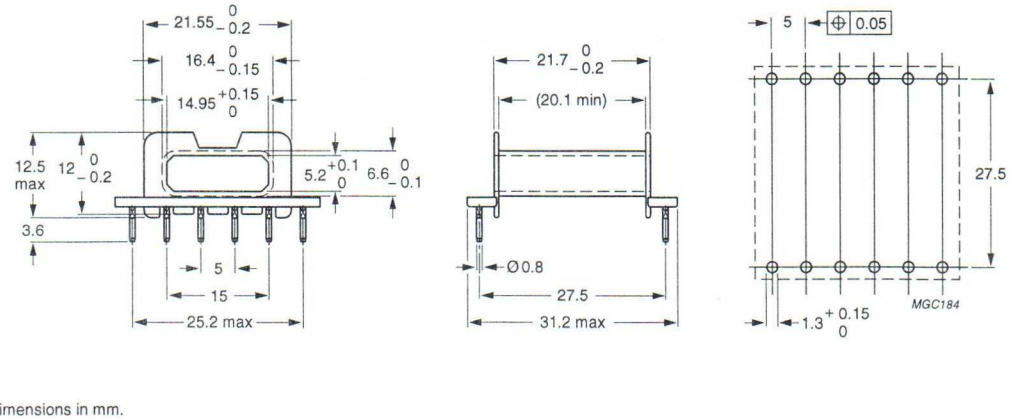
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 Mz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C30	≥360	≤0.50	≤0.54	–	–	–
3C85	≥320	≤0.74	≤0.86	–	–	–
3C90	≥330	≤0.50	≤0.54	–	–	–
3F3	≥315	–	≤0.54	≤0.91	–	–
3F4	≥300	–	–	–	≤1.41	≤1.50

EFD cores and accessories EFD30

COIL FORMERS

General data

ITEM	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 85 class H
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD30 coil former; 12-pins.

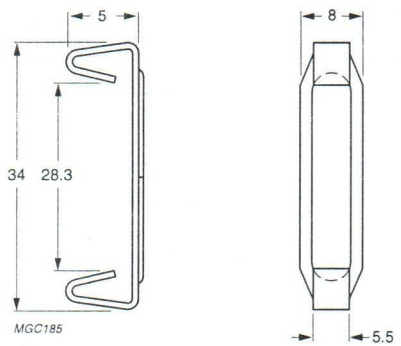
Winding data for 12-pins EFD30 coil former

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-10P

MOUNTING PARTS

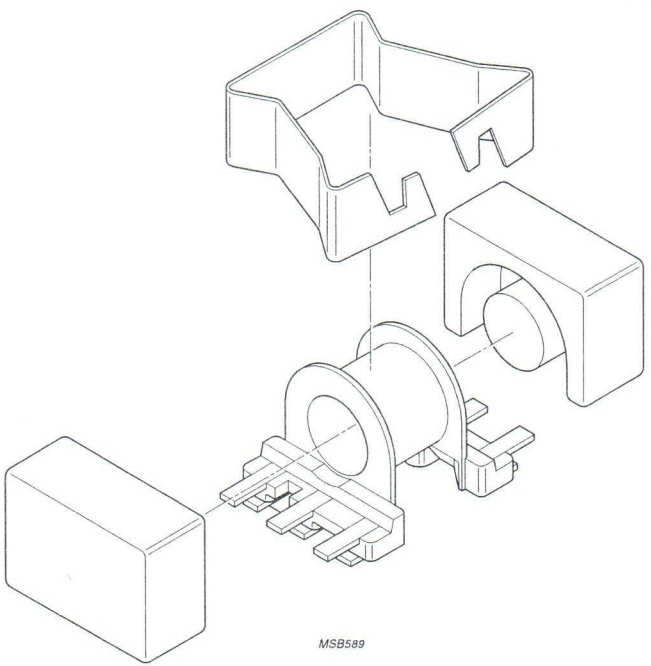
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless (CrNi) steel; clamping force ≈35 N	3	CLI-EFD30



Dimensions in mm.

Fig.3 EFD30 mounting clip.


MSB589

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EP cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
EP7	162	10.3	0.8
EP10	215	11.3	1.1
EP13	472	19.5	2.5
EP17	999	33.7	5
EP20	3230	78.7	16

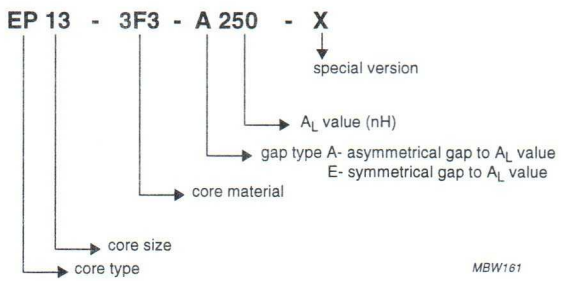


Fig.1 Type number structure for cores.

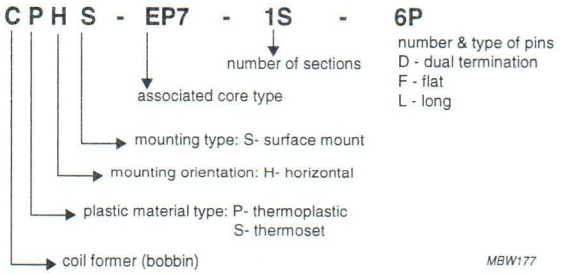
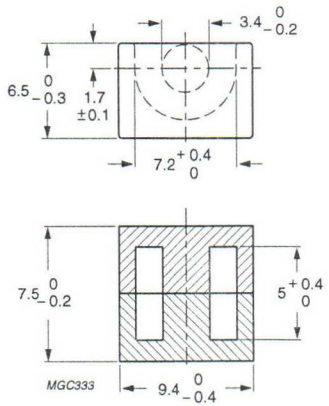


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	≈0.8	g



Dimensions in mm.

Fig.1 EP7 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3H1	63 ±3%	≈76	≈260	EP7-3H1-E63
	100 ±3%	≈121	≈150	EP7-3H1-A100
	160 ±5%	≈300	≈50	EP7-3H1-A160
	1200 ±25%	≈1450	≈0	EP7-3H1
3C81	25 ±3%	≈30	≈790	EP7-3C81-E25
	40 ±3%	≈48	≈440	EP7-3C81-A40
	63 ±3%	≈76	≈260	EP7-3C81-A63
	100 ±3%	≈121	≈150	EP7-3C81-A100
	160 ±5%	≈193	≈85	EP7-3C81-A160
	≥875	≥1060	≈0	EP7-3C81
3C85	25 ±3%	≈30	≈790	EP7-3C85-E25
	40 ±3%	≈48	≈440	EP7-3C85-A40
	63 ±3%	≈76	≈260	EP7-3C85-A63
	100 ±3%	≈121	≈150	EP7-3C85-A100
	160 ±5%	≈193	≈85	EP7-3C85-A160
	1120 ±25%	≈1350	≈0	EP7-3C85

GRADE	A_L (1) (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
3F4	100 ±3%	≈121	≈150	EP7-3F4-A100
	160 ±5%	≈193	≈85	EP7-3F4-A160
	600 ±25%	≈730	≈0	EP7-3F4

Note

1. Clamping force 20 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E1	2100 ±25%	≈2540	EP7-3E1
3E25	≥2500	≥3020	EP7-3E25
3E27	≥2500	≥3020	EP7-3E27
3E5	5200 +40/–30%	≈6290	EP7-3E5
3E6	5800 +40/–30%	≈7000	EP7-3E6

Note

1. Clamping force 20 ±10 N.

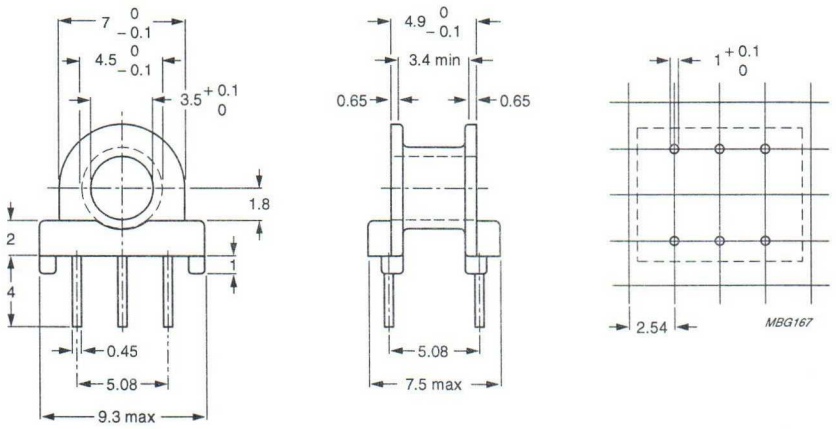
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	≤0.04	–	–	–	–
3C85	≥315	≤0.03	≤0.03	–	–	–
3F3	≥315	–	≤0.02	≤0.03	–	–
3F4	≥315	–	–	–	≤0.05	≤0.06

COIL FORMERS

General data CSH-EP7-1S-6P-E

ITEM	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E46770(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, IEC 85 class H
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, 235 °C, 2 s



Dimensions in mm.

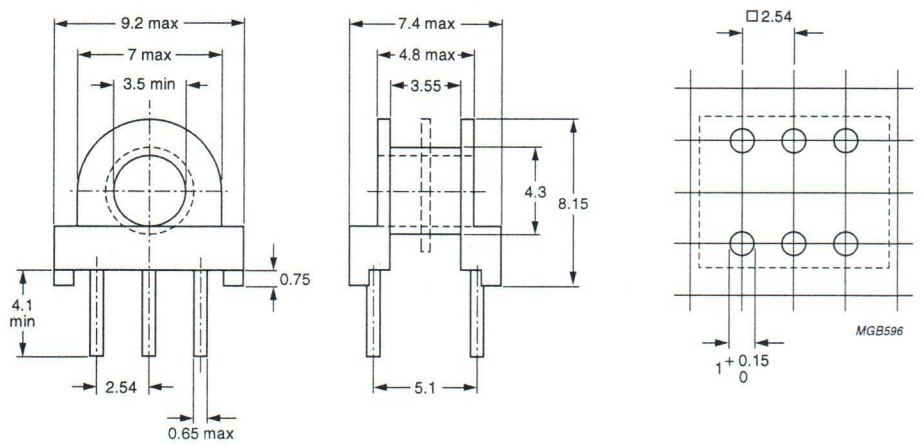
Fig.2 EP7 coil former: 6-pins (E).

Winding data for 6-pins EP7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.1	3.6	17.9	CSH-EP7-1S-6P-E

General data CSH-EP7-1S-6P-A

ITEM	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E123472(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, IEC 85 class H
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, 235 °C, 2 s



Dimensions in mm.

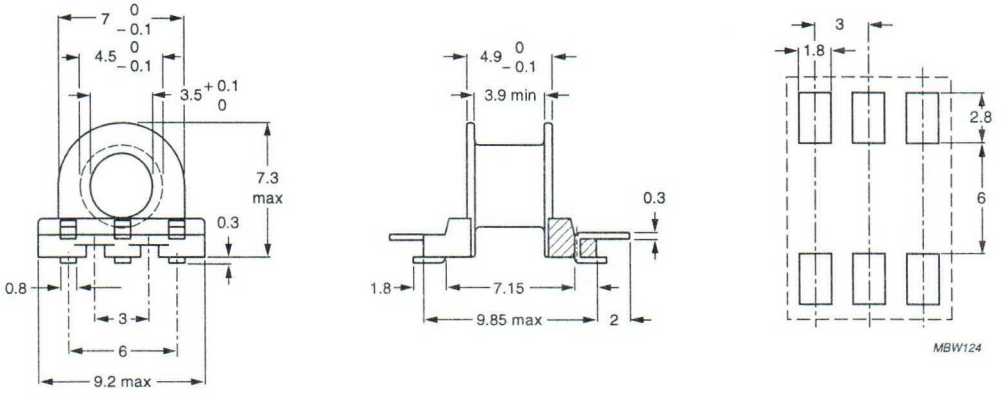
Fig.3 EP7 coil former: 6-pins (A).

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	3.87	3.6	18	CSH-EP7-1S-6P-A
2	2 × 1.55	2 × 1.5	18	CSH-EP7-2S-6P-A

General data for 6-pads SMD coil former

ITEM	SPECIFICATION
Coil former material	Liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with UL 94-0; UL file number: E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.4 Coil former CPHS-EP7-1S-6P: 6-pads.

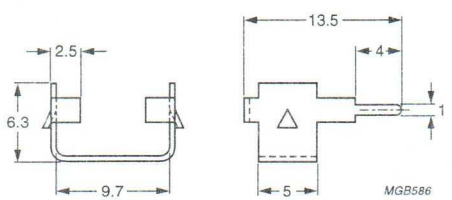
Winding data for 6-pads SMD coil former

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	CPHS-EP7-1S-6P

MOUNTING PARTS

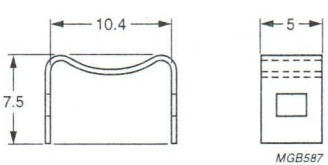
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clasp	copper-nickel-zinc alloy (nickel silver)	5	CLA-EP7
Mounting spring	copper-nickel-zinc alloy (nickel silver)	6	SPR-EP7
Mounting clip	CrNi-steel clamping force ≈22 N	7	CLI-EP7



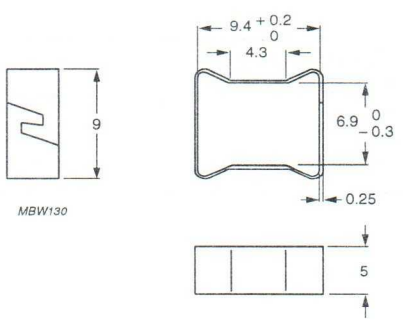
Dimensions in mm.

Fig.5 Mounting clasp CLA-EP7.



Dimensions in mm.

Fig.6 Mounting spring SPR-EP7.



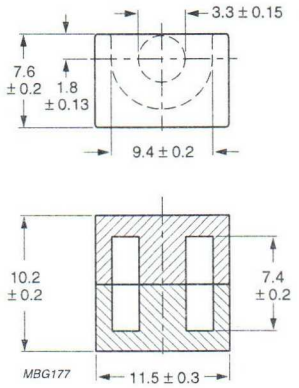
Dimensions in mm.

Fig.7 Mounting clip CLI-EP7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	≈1.1	g



Dimensions in mm.

Fig.1 EP10 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (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
3C85	25 ±3%	≈34	≈870	EP10-3C85-E25
	40 ±3%	≈54	≈480	EP10-3C85-A40
	63 ±3%	≈85	≈280	EP10-3C85-A63
	100 ±3%	≈135	≈160	EP10-3C85-A100
	160 ±5%	≈216	≈90	EP10-3C85-A160
	1025 ±25%	≈1380	≈0	EP10-3C85

EP core and accessories EP10

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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
	925 ±25%	≈1250	≈0	EP10-3F3
3F4	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

Note

1. Clamping force 30 ± 10N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E1	2000 +30/–20%	≈2700	≈0	EP10-3E1
3E4	3200 +40/–30%	≈4300	≈0	EP10-3E4
3E25	≥2500	≥3370	≈0	EP10-3E25
3E27	≥2500	≥3370	≈0	EP10-3E27
3E5	4800 +40/–30%	≈6500	≈0	EP10-3E5

Note

1. Clamping force 30 ±10 N.

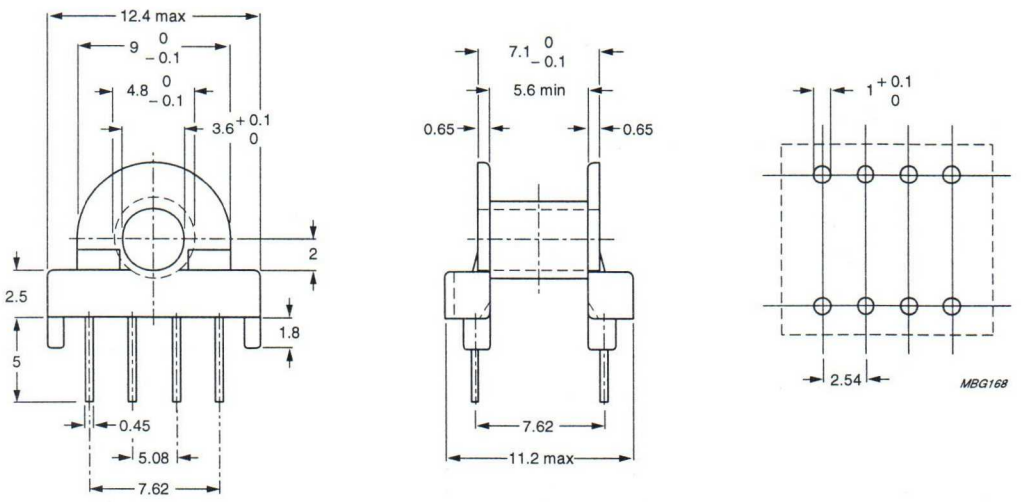
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	≤0.043	≤	–	–	–
3C85	≥315	≤0.032	≤0.040	–	–	–
3F3	≥315	–	≤0.025	≤0.045	–	–
3F4	≥250	–	–	–	≤0.065	≤0.075

COIL FORMER

General data CSH-EP10-1S-8P-E

ITEM	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 85 class H
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.

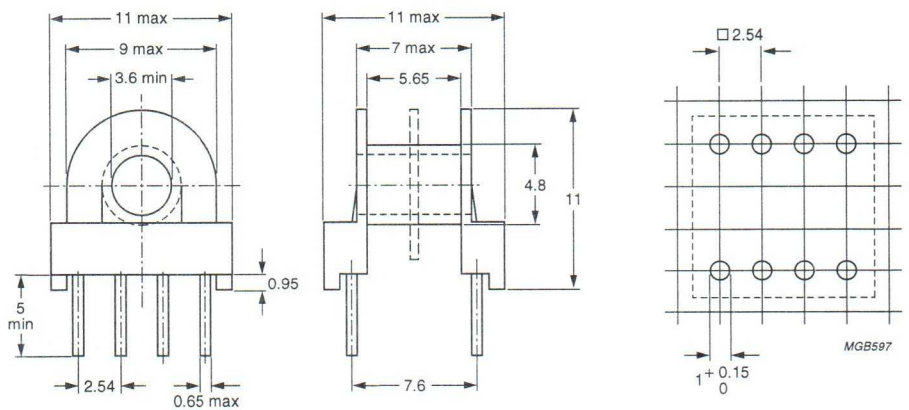
Fig.2 EP10 coil former: 8-pins (E).

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-E

General data CSH-EP10-1S-8P-A

ITEM	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E46770(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, IEC 85 class H
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.3 EP10 coil former: 8-pins (A).

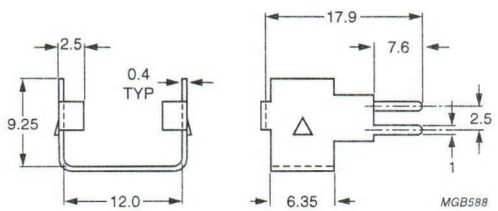
Winding data for 8-pins EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.4	5.7	21.5	CSH-EP10-1S-8P-A
2	2×4.77	2×2.6	21.5	CSH-EP10-2S-8P-A

MOUNTING PARTS

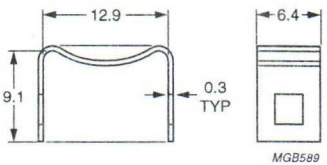
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clasp	copper-nickel-zinc alloy (nickel silver)	4	CLA-EP10
Mounting spring	copper-nickel-zinc alloy (nickel silver)	5	SPR-EP10
Mounting clip	stainless steel	6	CLI-EP10
	clamping force ≈27 N		



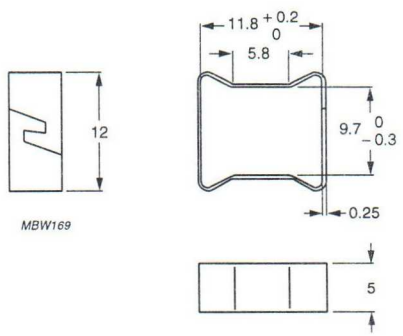
Dimensions in mm.

Fig.4 Mounting clasp CLA-EP10.



Dimensions in mm.

Fig.5 Mounting spring SPR-EP10.



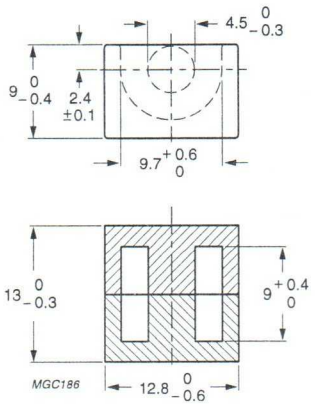
Dimensions in mm.

Fig.6 Mounting clip CLI-EP10.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	≈2.4	g



Dimensions in mm.

Fig.1 EP13 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	40 ±3%	≈39	≈880	EP13-3C81-E40
	63 ±5%	≈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	≈	EP13-3C81
3C85	40 ±3%	≈39	≈880	EP13-3C85-E40
	63 ±5%	≈62	≈500	EP13-3C85-A63
	100 ±3%	≈100	≈230	EP13-3C85-A100
	160 ±3%	≈160	≈130	EP13-3C85-A160
	250 ±5%	≈250	≈75	EP13-3C85-A250
	1475 ±25%	≈1460	≈0	EP13-3C85
3F3	40 ±3%	≈39	≈880	EP13-3F3-E40
	63 ±5%	≈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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	160 ±3%	≈160	≈150	EP13-3F4-A160
	250 ±5%	≈250	≈85	EP13-3F4-A250
	315 ±5%	≈315	≈50	EP13-3F4-A315
	680 ±25%	≈770	≈0	EP13-3F4

Note

1. Clamping force 30 ± 10N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	2600 ±25%	≈2560	EP13-3E1
3E25	≥3400	≥3350	EP13-3E25
3E27	≥3400	≥3350	EP13-3E27
3E4	4400 ±25%	≈4300	EP13-3E4
3E5	7000 +40/–30%	≈6900	EP13-3E5
3E6	10000 +40/–30%	≈9900	EP13-3E6

Note

1. Clamping force 30 ± 10N.

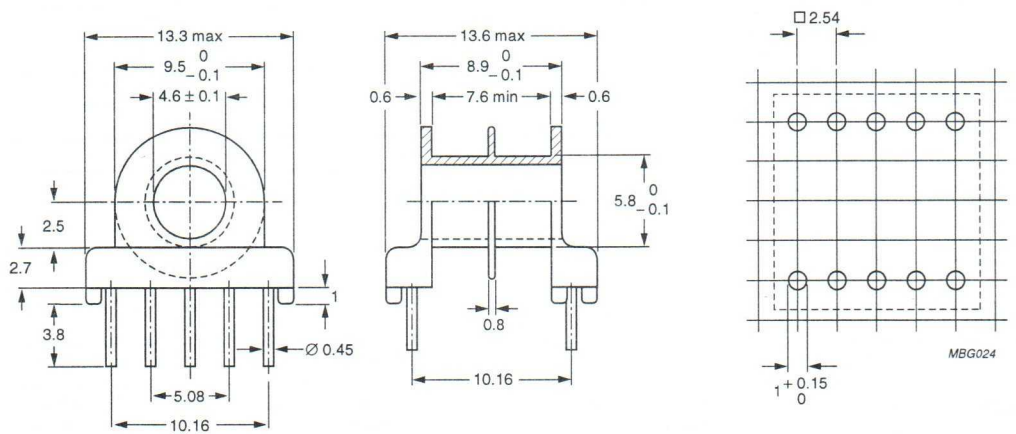
Properties of core sets under power conditionss

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
3C81	≥315	≤0.10	–	–	–	–
3C85	≥315	≤0.08	≤0.09	–	–	–
3F3	≥315	–	≤0.05	≤0.1	–	–
3F4	≥250	–	–	–	≤0.14	≤0.16

COIL FORMERS

General data CSH-EP13-10P

ITEM	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 85 class H
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 EP13 coil former; 10-pins.

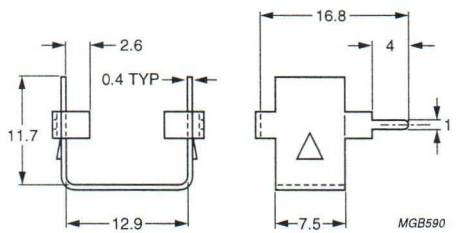
Winding data for 10-pins EP13 coil former

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

MOUNTING PARTS

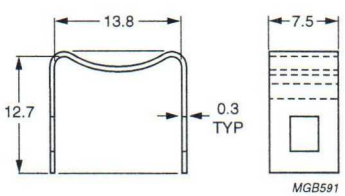
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP13
Mounting spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP13
Mounting clip	CrNi-steel clamping force ≈32 N	5	CLI-EP13



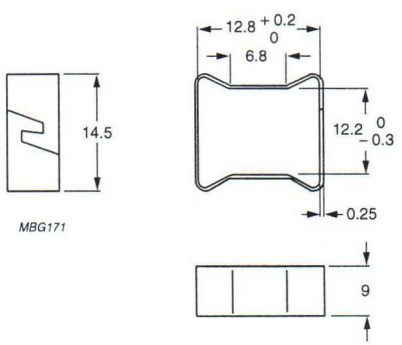
Dimensions in mm.

Fig.3 Mounting clasp CLA-EP13.



Dimensions in mm.

Fig.4 Mounting spring SPR-EP13.



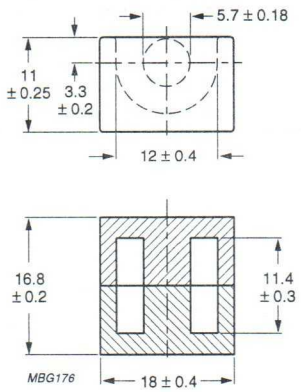
Dimensions in mm.

Fig.5 Mounting clip for CLI-EP13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of set	≈5	g



Dimensions in mm.

Fig.1 EP17 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈42	≈930	EP17-3C81-E63
	100 ±3%	≈67	≈530	EP17-3C81-A100
	160 ±3%	≈107	≈300	EP17-3C81-A160
	250 ±3%	≈167	≈180	EP17-3C81-A250
	315 ±5%	≈210	≈135	EP17-3C81-A315
	≥1950	≥1300	≈0	EP17-3C81
3C85	63 ±3%	≈42	≈930	EP17-3C85-E63
	100 ±3%	≈67	≈530	EP17-3C85-A100
	160 ±3%	≈107	≈300	EP17-3C85-A160
	250 ±3%	≈167	≈180	EP17-3C85-A250
	315 ±5%	≈210	≈135	EP17-3C85-A315
	2230 ±25%	≈1490	≈0	EP17-3C85

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±3%	≈42	≈930	EP17-3F3-E63
	100 ±3%	≈67	≈530	EP17-3F3-A100
	160 ±3%	≈107	≈300	EP17-3F3-A160
	250 ±3%	≈167	≈180	EP17-3F3-A250
	315 ±5%	≈210	≈135	EP17-3F3-A315
	2000 ±25%	≈1330	≈0	EP17-3F3

Note

1. Clamping force 40 ±10 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	≥5300	≥3530	≈0	EP17-3E25
3E27	≥5300	≥3530	≈0	EP17-3E27
3E5	≥8000	≥5530	≈0	EP17-3E5

Note

1. Clamping force 40 ±10 N.

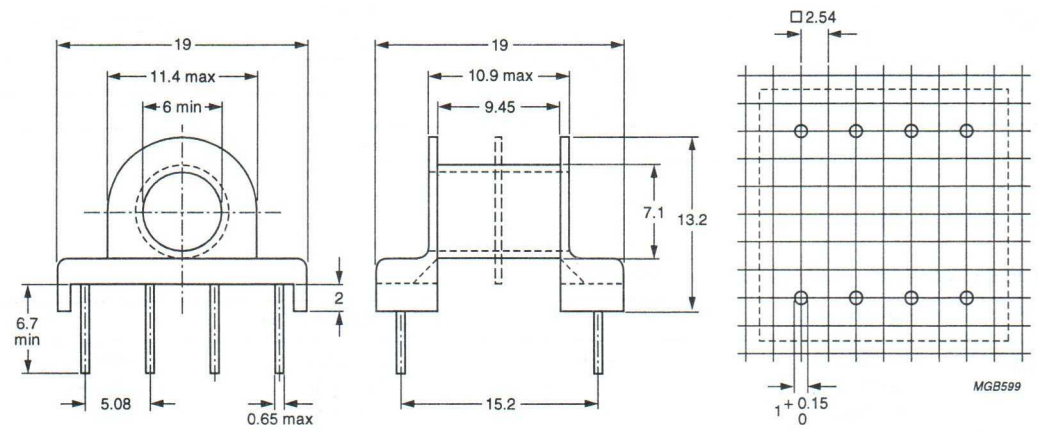
Properties of core sets under power conditions

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	≤0.21	–	–
3C85	≥320	≤0.16	≤0.18	–
3F3	≥320	–	≤0.11	≤0.19

COIL FORMER

General data

ITEM	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 85 class H
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 EP17 coil former: 8-pins.

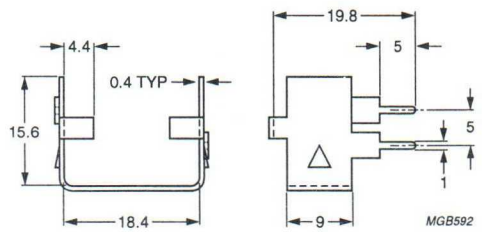
Winding data for 8-pins EP17 coil former

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

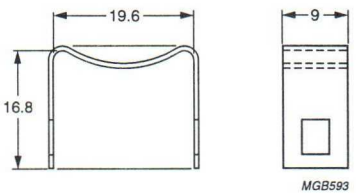
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP17
Mounting spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP17



Dimensions in mm.

Fig.3 Mounting clasp CLA-EP17.



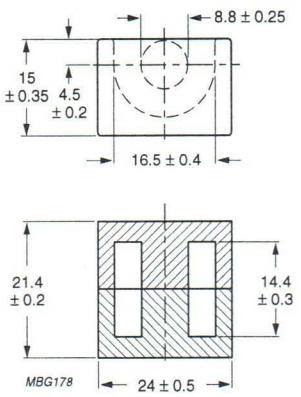
Dimensions in mm.

Fig.4 Mounting spring SPR-EP17.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
m	mass of set	≈16	g



Dimensions in mm.

Fig.1 EP20 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈65	≈740	EP20-3C81-E160
	250 ±3%	≈101	≈440	EP20-3C81-A250
	315 ±3%	≈127	≈340	EP20-3C81-A315
	400 ±3%	≈162	≈250	EP20-3C81-A400
	630 ±5%	≈255	≈150	EP20-3C81-A630
	≥3450	≥1400	≈0	EP20-3C81
3C85	160 ±3%	≈65	≈740	EP20-3C85-E160
	250 ±3%	≈101	≈440	EP20-3C85-A250
	315 ±3%	≈127	≈340	EP20-3C85-A315
	400 ±3%	≈162	≈250	EP20-3C85-A400
	630 ±5%	≈255	≈150	EP20-3C85-A630
	3950 ±25%	≈1600	≈0	EP20-3C85

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E25	≥8700	≥3520	≈0	EP20-3E25
3E27	≥8700	≥3520	≈0	EP20-3E27
3E5	≥13500	≥5580	≈0	EP20-3E5

Note

1. Clamping force 60 ±20 N.

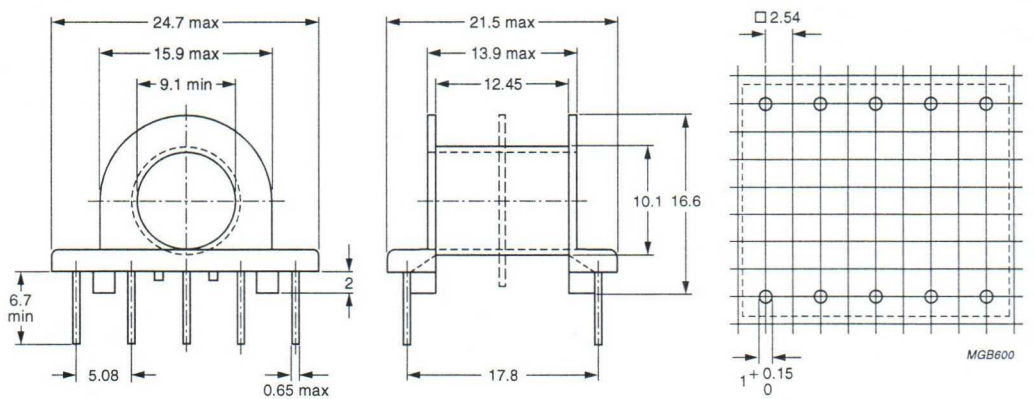
Properties of core sets under power conditions

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	≤0.66	–	–
3C85	≥320	≤0.50	≤0.58	–
3F3	≥320	–	≤0.36	≤0.62

COIL FORMER

General data

ITEM	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 85 class H
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, 235 °C, 2 s



Dimensions in mm.

Fig.2 EP20 coil former: 10-pins.

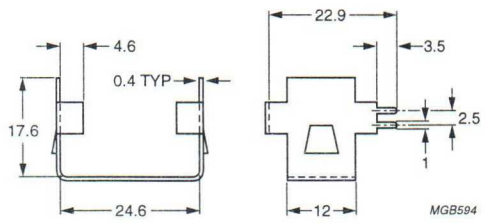
Winding data for 10-pins EP20 coil former

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

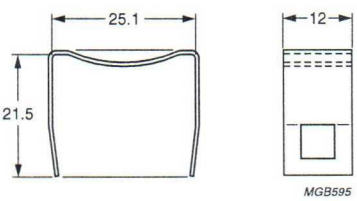
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP20
Mounting 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.

ER cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ER cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
ER9.5	120	8.47	0.35
ER11	174	11.9	0.5
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	47
ER48	25500	255	64
ER54	23000	250	61
ER54S	22300	250	59

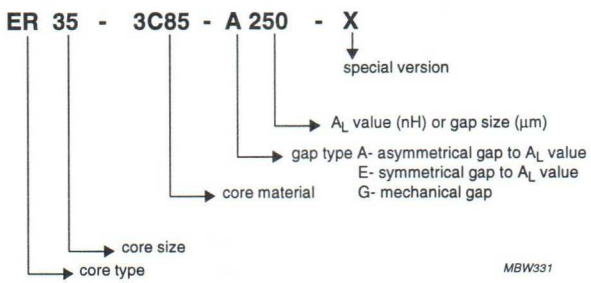
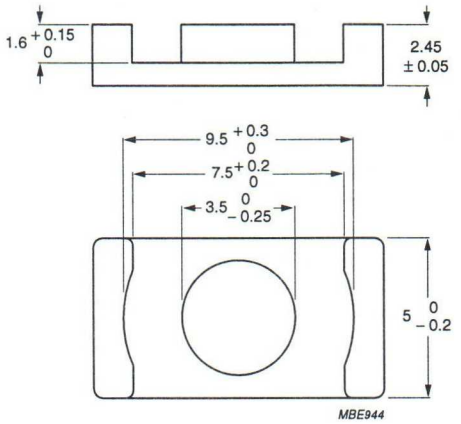


Fig.1 Type number structure for cores.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	7.6	mm^2
m	mass of core half	≈0.35	g



Dimensions in mm.

Fig.1 ER9.5 core half.

Core halves for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	850 ±25%	≈1130	≈0	ER9.5-3F3
3F4	525 ±25%	≈700	≈0	ER9.5-3F4

Note

1. Measured in combination with an ungapped core half, clamping force 10 ±5 N.

Core halves of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	3600 +40/–30%	≈4780	≈0	ER9.5-3E5
3E6	4800 +40/–30%	≈6380	≈0	ER9.5-3E6

Note

1. Clamping force 10 ±5 N, flux density $\hat{B} \leq 0.1$ mT.

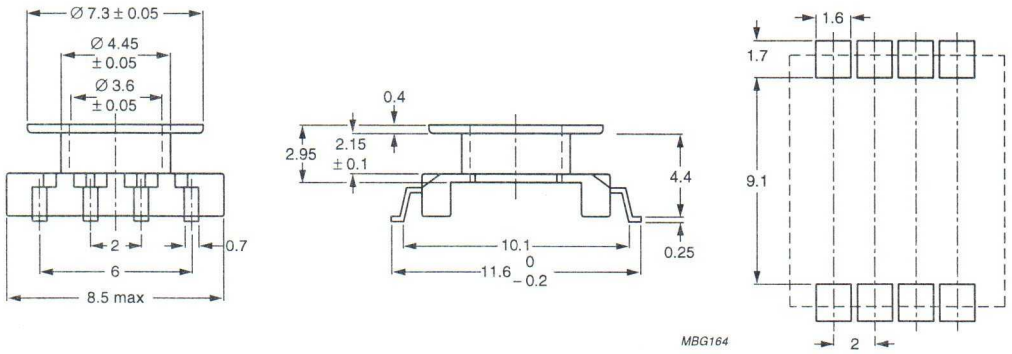
Properties of core sets under power conditions

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 = 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
3F3	≥300	≤0.015	≤0.025	–	–
3F4	≥250	–	–	≤0.035	≤0.040

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 E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 ER9.5 coil former (SMD); 8-solder pads.

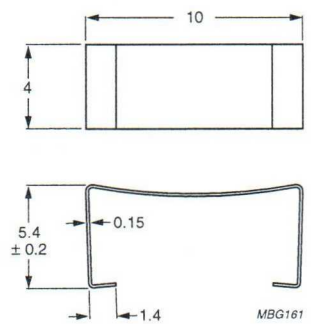
Winding data for ER9.5 coil former (SMD) with 8 solder pads

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
Spring	material: CrNi-steel	7	SPR-ER9.5



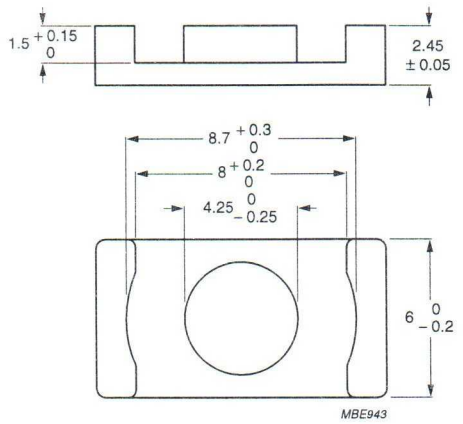
Dimensions in mm.

Fig.3 ER9.5 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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 halves for general purpose transformers and power applications

GRADE	A_L(1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3F3	1200 ±25%	≈1170	≈0	ER11-3F3
3F4	725 ±25%	≈710	≈0	ER11-3F4

Note

1. Measured in combination with an ungapped core half, clamping force 15 ±5 N.

Core halves of high permeability grades

GRADE	A_L(1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	5000 +40/−30%	≈4890	≈0	ER11-3E5
3E6	6700 +40/−30%	≈6560	≈0	ER11-3E6

Note

1. Clamping force 15 ±5 N, flux density $\hat{B} \leq 0.1$ mT.

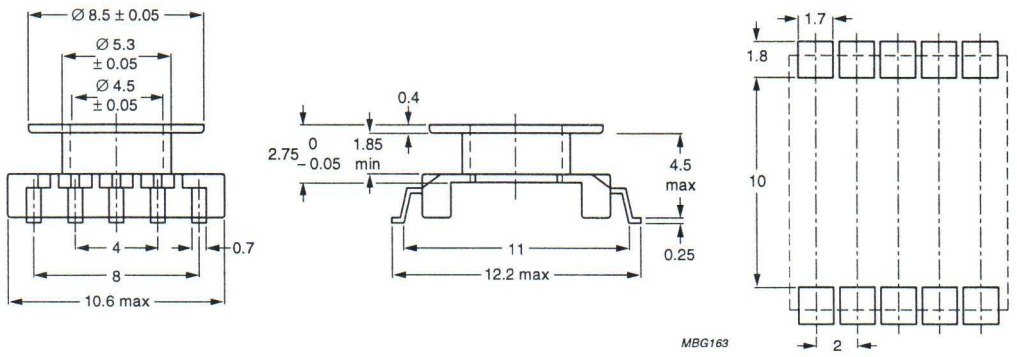
Properties of core sets under power conditions

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 = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥300	≤0.025	≤0.040	–	–
3F4	≥250	–	–	≤0.055	≤0.060

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 E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 ER11 coil former (SMD); 10-solder pads.

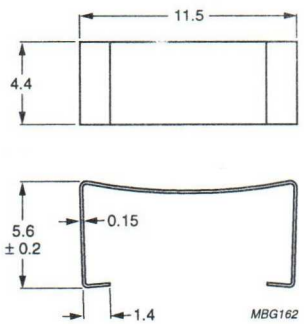
Winding data for ER11 coil former (SMD) with 10 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	1.8	21.6	CPVS-ER11-1S-10P

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Spring	material: CrNi-steel	7	SPR-ER11



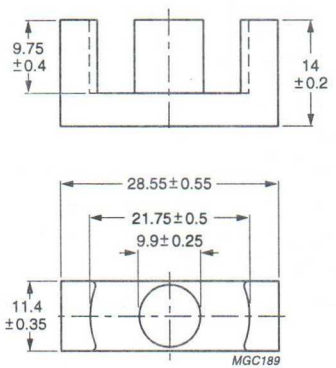
Dimensions in mm.

Fig.3 ER9.5 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.786	mm^{-1}
V_e	effective volume	5260	mm^3
l_e	effective length	64	mm
A_e	effective area	81.4	mm^2
A_{min}	minimum area	77	mm^2
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 ER28 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	2400 ±25%	≈1500	≈0	ER28-3C30
3C80	3100 ±25%	≈1940	≈0	ER28-3C80
3C85	3100 ±25%	≈1940	≈0	ER28-3C85
3C90	2700 ±25%	≈1690	≈0	ER28-3C90
3F3	2400 ±25%	≈1500	≈0	ER28-3F3
3F4	1300 ±25%	≈810	≈0	ER28-3F4

Note

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.

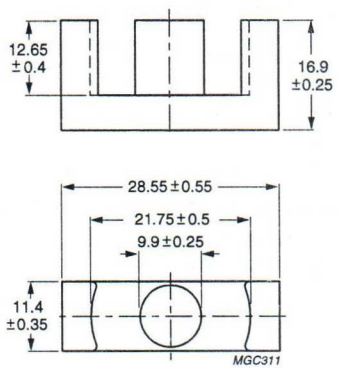
Properties of core sets under power conditions

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	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
3C30	≥360	≤0.55	≤0.60	–	–	–
3C80	≥320	≤1.2	–	–	–	–
3C85	≥320	≤0.9	≤1.1	–	–	–
3C90	≥320	≤0.55	≤0.60	–	–	–
3F3	≥320	–	≤0.60	≤1.1	–	–
3F4	≥300	–	–	–	≤1.6	≤1.8

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	2100 ±25%	≈1550	≈0	ER28L-3C30
3C80	2800 ±25%	≈2070	≈0	ER28L-3C80
3C85	2800 ±25%	≈2070	≈0	ER28L-3C85
3C90	2300 ±25%	≈1700	≈0	ER28L-3C90
3F3	2100 ±25%	≈1550	≈0	ER28L-3F3
3F4	1100 ±25%	≈810	≈0	ER28L-3F4

Notes

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.

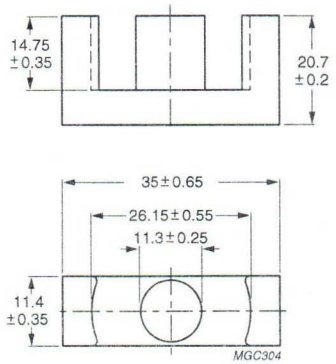
Properties of core sets under power conditions

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	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
3C30	≥360	≤0.65	≤0.70	–	–	–
3C80	≥320	≤1.4	–	–	–	–
3C85	≥320	≤1.0	≤1.3	–	–	–
3C90	≥320	≤0.65	≤0.70	–	–	–
3F3	≥320	–	≤0.70	≤1.20	–	–
3F4	≥300	–	–	–	≤2.0	≤2.2

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.849	mm^{-1}
V_e	effective volume	9710	mm^3
l_e	effective length	90.8	mm
A_e	effective area	107	mm^2
A_{min}	minimum area	100	mm^2
m	mass of core half	≈23	g



Dimensions in mm.

Fig.1 ER35 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	2300 ±25%	≈1550	≈0	ER35-3C30
3C80	2400 ±25%	≈1620	≈0	ER35-3C80
3C85	2400 ±25%	≈1620	≈0	ER35-3C85
3C90	2500 ±25%	≈1690	≈0	ER35-3C90
3F3	2300 ±25%	≈1550	≈0	ER35-3F3
3F4	1250 ±25%	≈840	≈0	ER35-3F4

Notes

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.

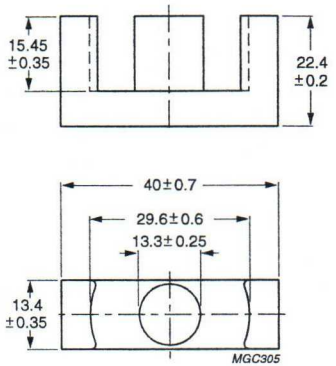
Properties of core sets under power conditions

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	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
3C30	≥360	≤1.0	≤1.1	–	–	–
3C80	≥320	≤2.0	–	–	–	–
3C85	≥320	≤1.4	≤1.6	–	–	–
3C90	≥320	≤1.0	≤1.1	–	–	–
3F3	≥320	–	≤1.1	≤1.9	–	–
3F4	≥300	–	–	–	≤3.0	≤3.3

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.658	mm^{-1}
V_e	effective volume	14600	mm^3
l_e	effective length	98	mm
A_e	effective area	149	mm^2
A_{min}	minimum area	139	mm^2
m	mass of core half	≈37	g



Dimensions in mm.

Fig.1 ER40 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3000 ±25%	≈1570	≈0	ER40-3C30
3C80	3170 ±25%	≈1660	≈0	ER40-3C80
3C85	3170 ±25%	≈1660	≈0	ER40-3C85
3C90	3300 ±25%	≈1730	≈0	ER40-3C90
3F3	3000 ±25%	≈1570	≈0	ER40-3F3
3F4	1600 ±25%	≈840	≈0	ER40-3F4

Notes

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.

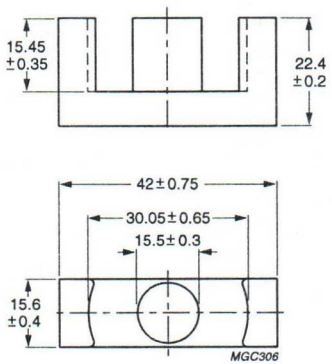
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C30	≥360	≤1.5	≤1.7	–	–	–
3C80	≥320	≤3.0	–	–	–	–
3C85	≥320	≤2.1	≤2.4	–	–	–
3C90	≥320	≤1.5	≤1.7	–	–	–
3F3	≥320	–	≤1.7	≤2.8	–	–
3F4	≥300	–	–	–	≤4.5	≤5.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.509	mm^{-1}
V_e	effective volume	19200	mm^3
l_e	effective length	98.8	mm
A_e	effective area	194	mm^2
A_{min}	minimum area	189	mm^2
m	mass of core half	≈48	g



Dimensions in mm.

Fig.1 ER42 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3850 ±25%	≈1550	≈0	ER42-3C30
3C80	4100 ±25%	≈1660	≈0	ER42-3C80
3C85	4100 ±25%	≈1660	≈0	ER42-3C85
3C90	4300 ±25%	≈1740	≈0	ER42-3C90
3F3	3850 ±25%	≈1550	≈0	ER42-3F3
3F4	2100 ±25%	≈850	≈0	ER42-3F4

Notes

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.

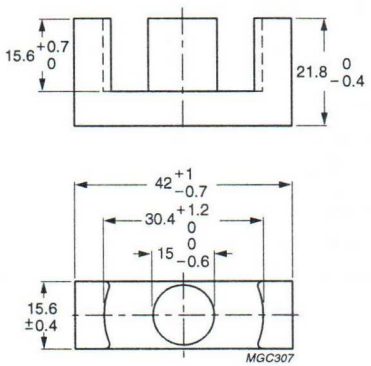
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C30	≥360	≤2.0	≤2.2	–	–	–
3C80	≥320	≤3.9	–	–	–	–
3C85	≥320	≤2.7	≤3.2	–	–	–
3C90	≥320	≤2.0	≤2.2	–	–	–
3F3	≥320	–	≤2.2	≤3.7	–	–
3F4	≥300	–	–	–	≤5.9	≤6.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.582	mm^{-1}
V_e	effective volume	16800	mm^3
l_e	effective length	99	mm
A_e	effective area	170	mm^2
A_{min}	minimum area	170	mm^2
m	mass of core half	≈47	g



Dimensions in mm.

Fig.1 ER42A core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	3400 ±25%	≈1570	≈0	ER42A-3C30
3C80	3500 ±25%	≈1620	≈0	ER42A-3C80
3C85	3500 ±25%	≈1620	≈0	ER42A-3C85
3C90	3700 ±25%	≈1710	≈0	ER42A-3C90
3F3	3400 ±25%	≈1570	≈0	ER42A-3F3
3F4	1800 ±25%	≈830	≈0	ER42A-3F4

Notes

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.

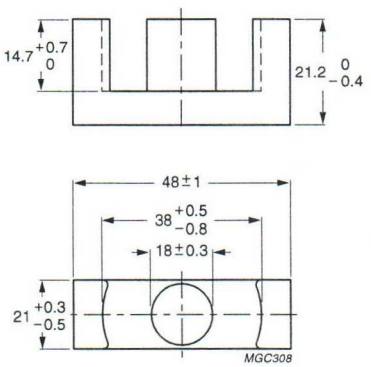
Properties of core sets under power conditions

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 50 mT; T = 100 °C
3C30	≥360	≤1.7	≤1.9	–	–	–
3C80	≥320	≤3.9	–	–	–	–
3C85	≥320	≤2.4	≤2.9	–	–	–
3C90	≥320	≤1.7	≤1.9	–	–	–
3F3	≥320	–	≤1.9	≤3.3	–	–
3F4	≥300	–	–	–	≤5.1	≤5.6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.392	mm^{-1}
V_e	effective volume	25500	mm^3
l_e	effective length	100	mm
A_e	effective area	255	mm^2
A_{min}	minimum area	248	mm^2
m	mass of core half	≈64	g



Dimensions in mm.

Fig.1 ER48 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	5000 ±25%	≈1560	≈0	ER48-3C30
3C80	5200 ±25%	≈1620	≈0	ER48-3C80
3C85	5200 ±25%	≈1620	≈0	ER48-3C85
3C90	5600 ±25%	≈1750	≈0	ER48-3C90
3F3	5000 ±25%	≈1560	≈0	ER48-3F3

Notes

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.

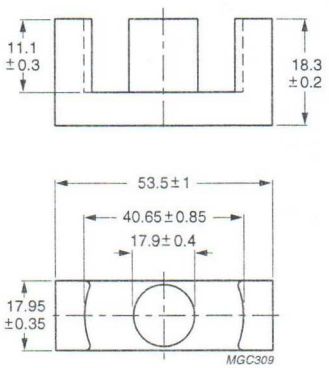
Properties of core sets under power conditions

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
3C30	≥360	≤2.6	≤3.2	–
3C80	≥320	≤5.0	–	–
3C85	≥320	≤3.6	≤4.6	–
3C90	≥320	≤2.6	≤3.2	–
3F3	≥320	–	≤3.2	≤5.0

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	5400 ±25%	≈1590	≈0	ER54-3C30
3C80	5600 ±25%	≈1650	≈0	ER54-3C80
3C85	5600 ±25%	≈1650	≈0	ER54-3C85
3C90	5900 ±25%	≈1740	≈0	ER54-3C90
3F3	5400 ±25%	≈1590	≈0	ER54-3F3

Notes

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.

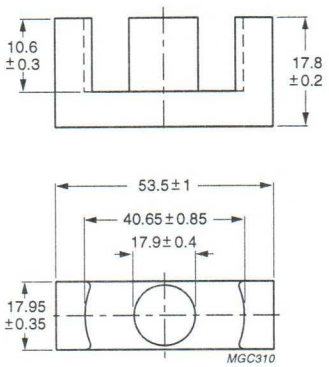
Properties of core sets under power conditions

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
3C30	≥360	≤2.6	≤2.9	–
3C80	≥320	≤4.8	–	–
3C85	≥320	≤3.2	≤3.8	–
3C90	≥320	≤2.6	≤2.9	–
3F3	≥320	–	≤2.9	≤4.4

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.360	mm^{-1}
V_e	effective volume	22300	mm^3
l_e	effective length	89	mm
A_e	effective area	250	mm^2
A_{min}	minimum area	240	mm^2
m	mass of core half	≈59	g



Dimensions in mm.

Fig.1 ER54S core half.

Core halves

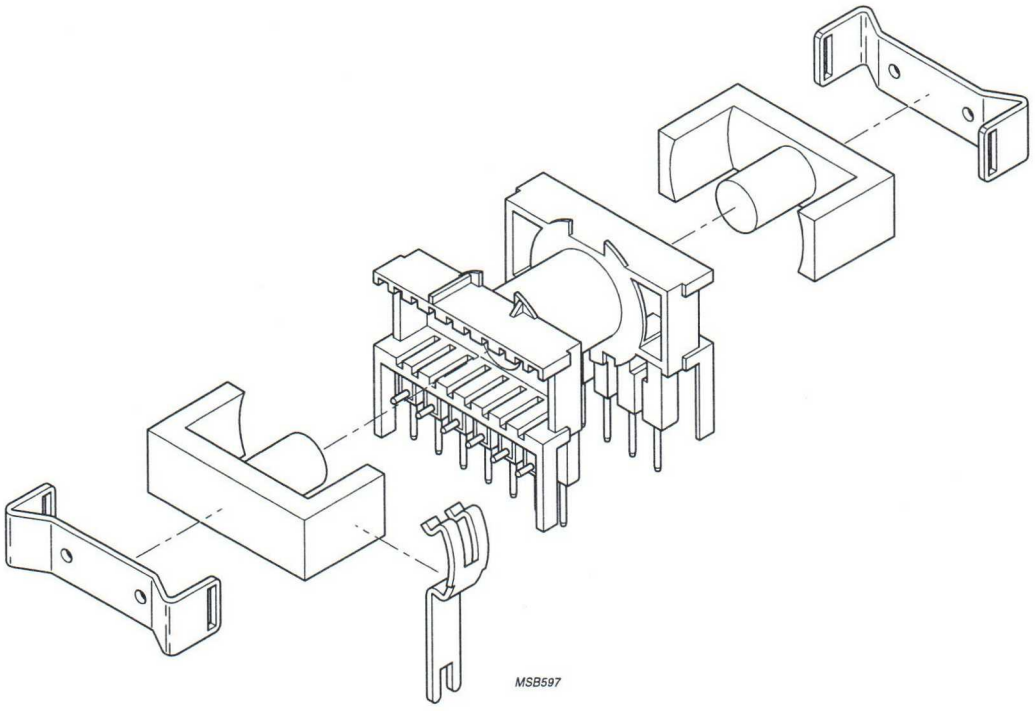
GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C30	5500 ±25%	≈1580	≈0	ER54S-3C30
3C80	5700 ±25%	≈1630	≈0	ER54S-3C80
3C85	5700 ±25%	≈1630	≈0	ER54S-3C85
3C90	6000 ±25%	≈1720	≈0	ER54S-3C90
3F3	5500 ±25%	≈1580	≈0	ER54S-3F3

Notes

1. Measured in combination with an ungapped core half, clamping force 50 ±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
3C30	≥360	≤2.3	≤2.8	–
3C80	≥320	≤4.8	–	–
3C85	≥320	≤3.2	≤3.8	–
3C90	≥320	≤2.3	≤2.8	–
3F3	≥320	–	≤2.8	≤4.3


MSB597

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ETD cores

Core type	V_e (mm^3)	V_e (mm^3)	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

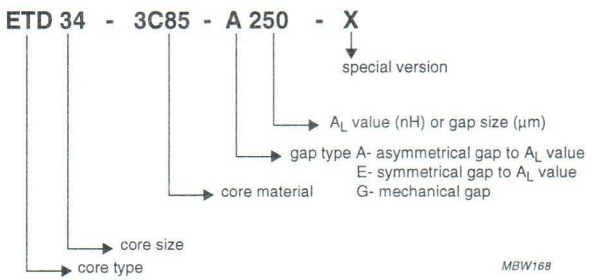


Fig.1 Type number structure for cores.

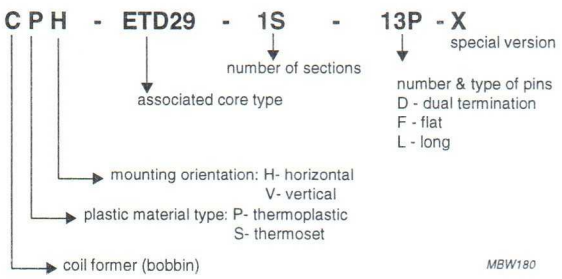
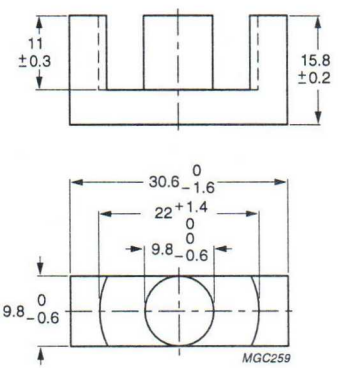


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.947	mm^{-1}
V_e	effective volume	5470	mm^3
l_e	effective length	72	mm
A_e	effective area	76	mm^2
A_{min}	minimum area	71	mm^2
m	mass of core half	≈14	g



Dimensions in mm.

Fig.1 ETD29 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	2000 ±25%	≈1500	≈0	ETD29-3C30
3C85	2100 ±25%	≈1580	≈0	ETD29-3C85
	≈1000	≈750	≈50	ETD29-3C85-G50
	≈490	≈370	≈150	ETD29-3C85-G150
	≈260	≈200	≈350	ETD29-3C85-G350
	≈120	≈90	≈1000	ETD29-3C85-G1000
3C90	2200 ±25%	≈1660	≈0	ETD29-3C90
3F3	1900 ±25%	≈1430	≈0	ETD29-3F3
	≈1000	≈720	≈50	ETD29-3F3-G50
	≈490	≈350	≈150	ETD29-3F3-G150
	≈260	≈200	≈350	ETD29-3F3-G350
	≈120	≈90	≈1000	ETD29-3F3-G1000
3C11	4200 ±25%	≈3150	≈0	ETD29-3C11

Note

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

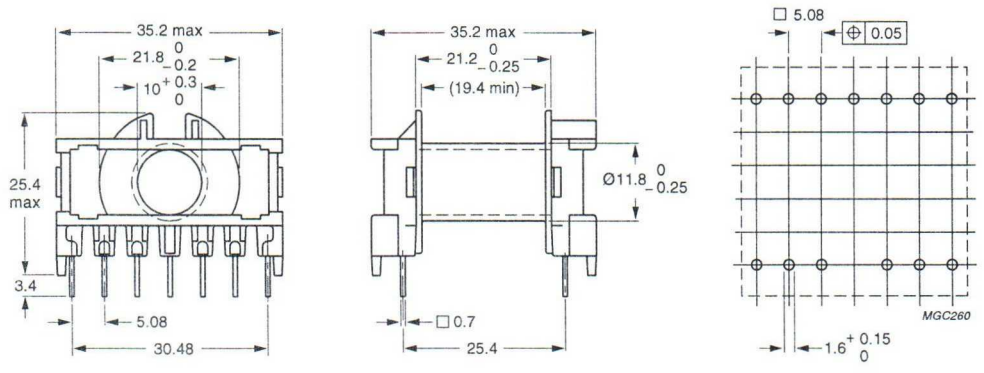
Properties of core sets under power conditions

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
3C30	≥360	≤0.55	≤0.60	–
3C85	≥320	≤0.80	≤0.90	–
3C90	≥330	≤0.55	≤0.60	–
3F3	≥320	–	≤0.60	≤1.0

COIL FORMER

General data 13-pins ETD29 coil former

ITEM	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 85 class F
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 ETD29 coil former; 13-pins.

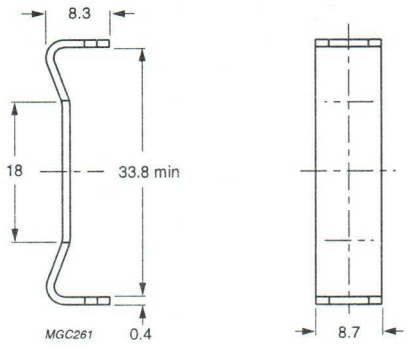
Winding data for 13-pins ETD29 coil former

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



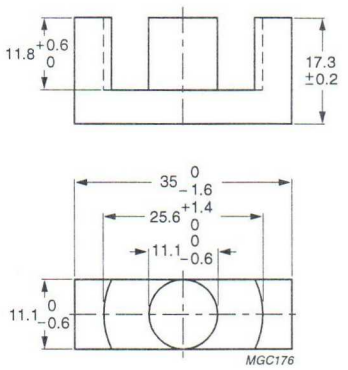
Dimensions in mm.

Fig.3 Mounting clip for ETD29.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.810	mm^{-1}
V_e	effective volume	7640	mm^3
l_e	effective length	78.6	mm
A_e	effective area	97.1	mm^2
A_{min}	minimum area	91.6	mm^2
m	mass of core half	≈20	g



Dimensions in mm.

Fig.1 ETD34 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	2350 ±25%	≈1500	≈0	ETD34-3C30
3C80	2500 ±25%	≈1600	≈0	ETD34-3C80
	≈800	≈520	≈100	ETD34-3C80-G100
	≈530	≈340	≈200	ETD34-3C80-G200
	≈230	≈150	≈500	ETD34-3C80-G500
	≈170	≈110	≈800	ETD34-3C80-G800
3C85	2500 ±25%	≈1600	≈0	ETD34-3C85
	≈800	≈520	≈100	ETD34-3C85-G100
	≈530	≈340	≈200	ETD34-3C85-G200
	≈230	≈150	≈500	ETD34-3C85-G500
	≈170	≈110	≈800	ETD34-3C85-G800
3C90	2600 ±25%	≈1670	≈0	ETD34-3C90
3F3	2300 ±25%	≈1480	≈0	ETD34-3F3
	≈780	≈500	≈100	ETD34-3F3-G100
	≈520	≈330	≈200	ETD34-3F3-G200
	≈230	≈150	≈500	ETD34-3F3-G500
	≈170	≈110	≈800	ETD34-3F3-G800

Note

1. Measured in combination with an ungapped core half, clamping force 40 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

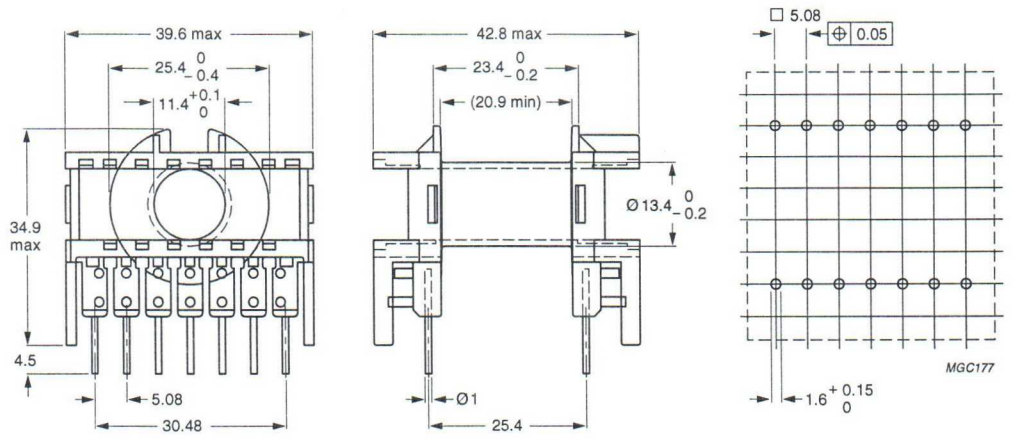
Properties of core sets under power conditions

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
3C30	≥360	≤0.80	≤0.90	–
3C80	≥320	≤1.60	–	–
3C85	≥320	≤1.10	≤1.30	–
3C90	≥330	≤0.80	≤0.90	–
3F3	≥320	–	≤0.85	≤1.5

COIL FORMERS

General data 14-pins ETD34 coil former

ITEM	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 85 class F
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.

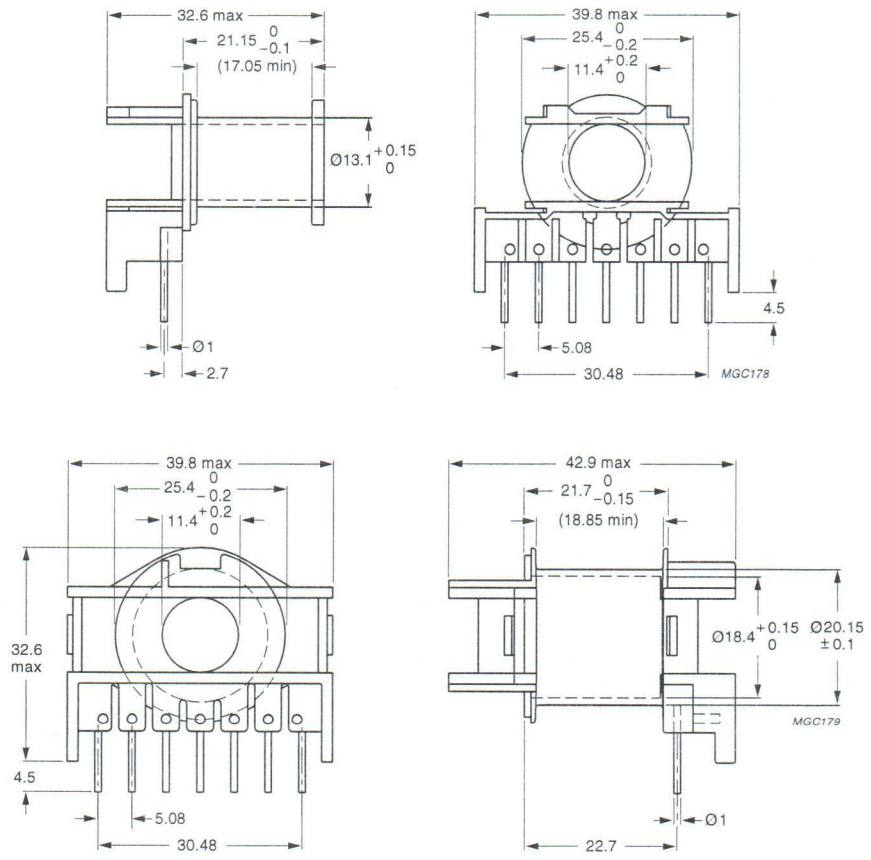
Fig.2 ETD34 coil former; 14-pins.

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

General data 7-pins coaxial ETD34 coil former

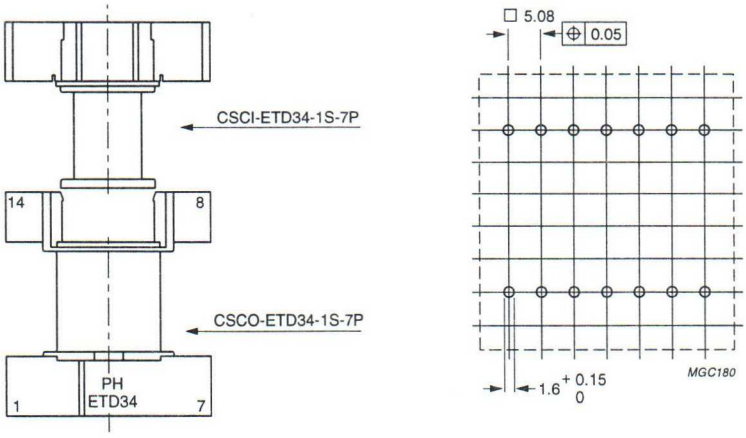
ITEM	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E63312(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, IEC 85 class H
Resistance to soldering heat	*"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.

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

Fig.3 Coaxial ETD34 coil former; 7-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.

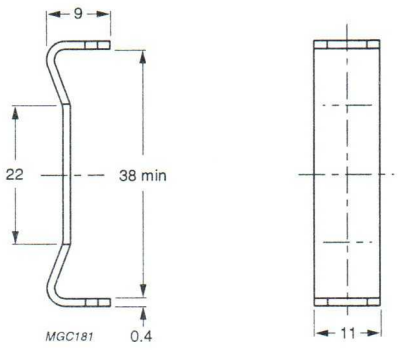
Winding data for coaxial ETD34 coil former

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



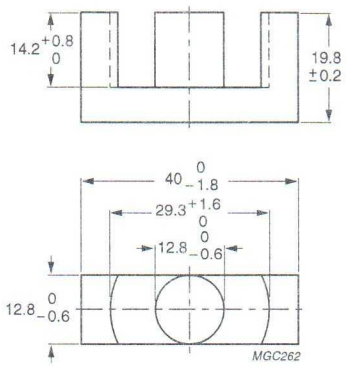
Dimensions in mm.

Fig.5 Mounting clip for ETD34.

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	2650 ±25%	≈1560	≈0	ETD39-3C30
3C80	2800 ±25%	≈1650	≈0	ETD39-3C80
	≈1000	≈590	≈100	ETD39-3C80-G100
	≈660	≈390	≈200	ETD39-3C80-G200
	≈340	≈200	≈500	ETD39-3C80-G500
	≈220	≈130	≈800	ETD39-3C80-G800
3C85	2800 ±25%	≈1650	≈0	ETD39-3C80
	≈1000	≈590	≈100	ETD39-3C85-G100
	≈660	≈390	≈200	ETD39-3C85-G200
	≈340	≈200	≈500	ETD39-3C85-G500
	≈220	≈130	≈800	ETD39-3C85-G800
3C90	2900 ±25%	≈1700	≈0	ETD39-3C90
3F3	2600 ±25%	≈1500	≈0	ETD39-3F3
	≈970	≈570	≈100	ETD39-3F3-G100
	≈650	≈380	≈200	ETD39-3F3-G200
	≈340	≈200	≈500	ETD39-3F3-G500
	≈220	≈130	≈800	ETD39-3F3-G800

Note

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

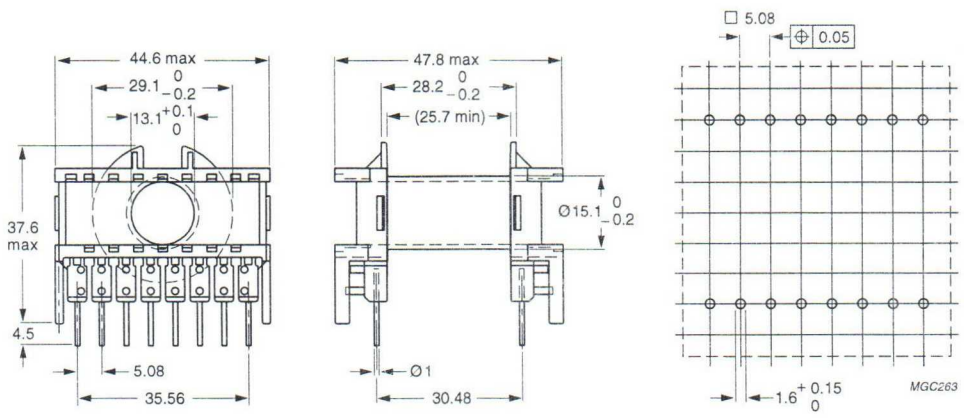
Properties of core sets under power conditions

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
3C30	≥360	≤1.2	≤1.3	–
3C80	≥320	≤2.2	–	–
3C85	≥320	≤1.6	≤1.9	–
3C90	≥330	≤1.2	≤1.3	–
3F3	≥320	–	≤1.3	≤2.3

COIL FORMER

General data 16-pins ETD39 coil former

ITEM	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 85 class F
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 ETD39 coil former; 16-pins.

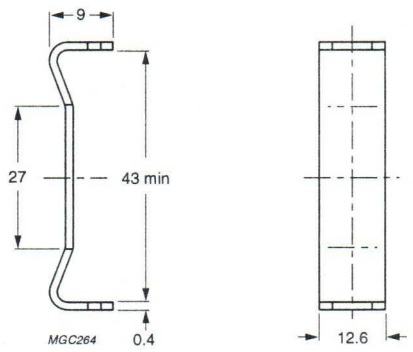
Winding data for 16-pins ETD39 coil former

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD39



Dimensions in mm.

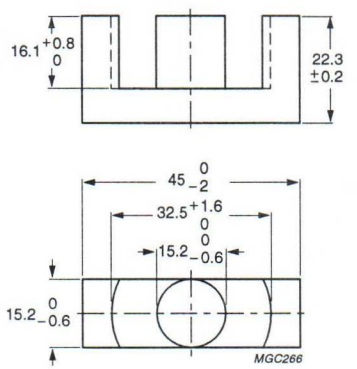
Fig.3 Mounting clip for ETD39.

ETD cores and accessories ETD44

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (2) (μm)	TYPE NUMBER
3C30	3250 ±25%	≈1550	≈0	ETD44-3C30
3C80	3500 ±25%	≈1650	≈0	ETD44-3C80
	≈1400	≈660	≈100	ETD44-3C80-G100
	≈900	≈425	≈200	ETD44-3C80-G200
	≈460	≈220	≈500	ETD44-3C80-G500
	≈320	≈150	≈800	ETD44-3C80-G800
3C85	3500 ±25%	≈1650	≈0	ETD44-3C85
	≈1400	≈660	≈100	ETD44-3C85-G100
	≈900	≈425	≈200	ETD44-3C85-G200
	≈460	≈220	≈500	ETD44-3C85-G500
	≈320	≈150	≈800	ETD44-3C85-G800
3C90	3700 ±25%	≈1750	≈0	ETD44-3C90
3F3	3200 ±25%	≈1500	≈0	ETD44-3F3
	≈1350	≈640	≈100	ETD44-3F3-G100
	≈900	≈425	≈200	ETD44-3F3-G200
	≈460	≈220	≈500	ETD44-3F3-G500
	≈320	≈150	≈800	ETD44-3F3-G800

Note

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

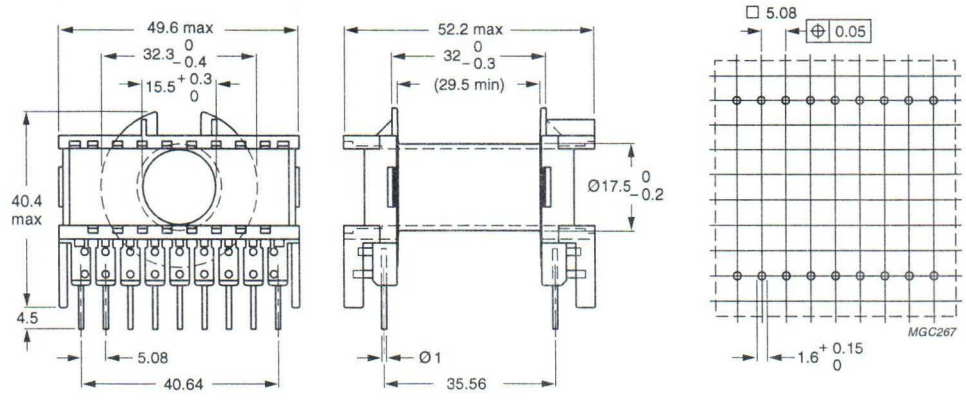
Properties of core sets under power conditions

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
3C30	≥360	≤1.8	≤2.0	–
3C80	≥320	≤3.6	–	–
3C85	≥320	≤2.5	≤3.0	–
3C90	≥330	≤1.8	≤2.0	≤
3F3	≥320	–	≤2.0	≤ 3.7

COIL FORMERS

General data 18-pins ETD44 coil former

ITEM	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 85 class F
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 ETD44 coil former; 18-pins.

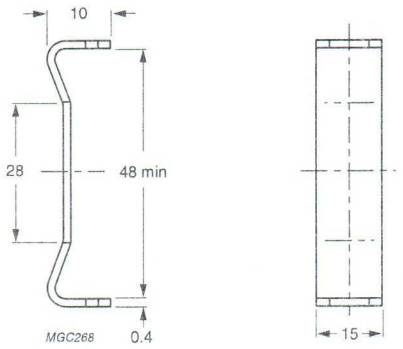
Winding data for 18-pins ETD44 coil former

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD44



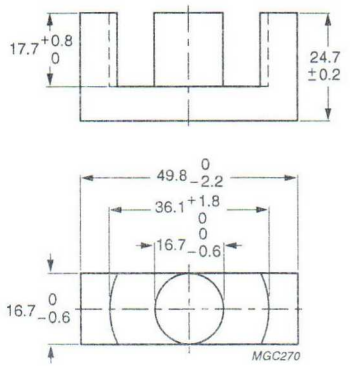
Dimensions in mm.

Fig.3 Mounting clip for ETD44.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.534	mm^{-1}
V_e	effective volume	24000	mm^3
l_e	effective length	114	mm
A_e	effective area	211	mm^2
A_{min}	minimum area	209	mm^2
m	mass of core half	≈62	g



Dimensions in mm.

Fig.1 ETD49 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	AIR GAP(2) (μm)	TYPE NUMBER
3C30	3700 ±25%	≈1550	≈0	ETD49-3C30
3C80	4000 ±25%	≈1700	≈0	ETD49-3C80
	≈1600	≈690	≈100	ETD49-3C80-G100
	≈1100	≈470	≈200	ETD49-3C80-G200
	≈540	≈230	≈500	ETD49-3C80-G500
	≈380	≈160	≈800	ETD49-3C80-G800
	≈250	≈110	≈1400	ETD49-3C80-G1400
3C85	4000 ±25%	≈1700	≈0	ETD49-3C85
	≈1600	≈690	≈100	ETD49-3C85-G100
	≈1100	≈470	≈200	ETD49-3C85-G200
	≈540	≈230	≈500	ETD49-3C85-G500
	≈380	≈160	≈800	ETD49-3C85-G800
	≈250	≈110	≈1400	ETD49-3C85-G1400
3C90	4200 ±25%	≈1750	≈0	ETD49-3C90
3F3	3600 ±25%	≈1550	≈0	ETD49-3F3
	≈1550	≈670	≈100	ETD49-3F3-G100
	≈1100	≈470	≈200	ETD49-3F3-G200
	≈540	≈230	≈500	ETD49-3F3-G500
	≈380	≈160	≈800	ETD49-3F3-G800
	≈250	≈110	≈1400	ETD49-3F3-G1400

Note

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

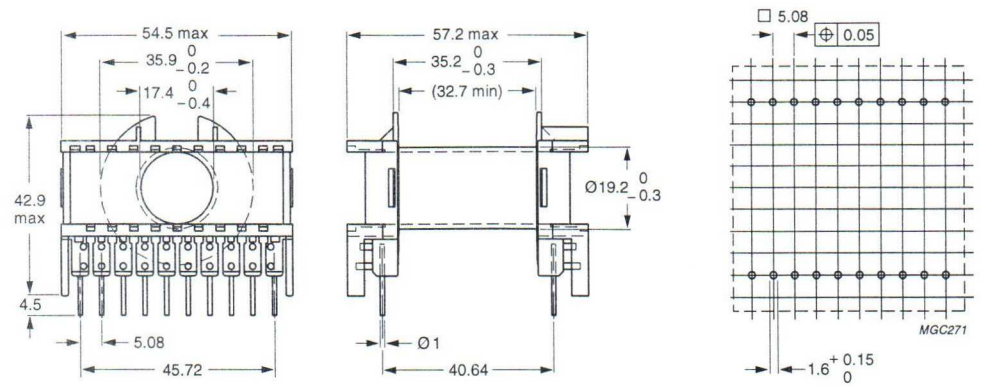
Properties of core sets under power conditions

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
3C30	≥360	≤2.4	≤2.7	–
3C80	≥320	≤4.6	–	–
3C85	≥320	≤3.4	≤4.0	–
3C90	≥330	≤2.4	≤2.7	–
3F3	≥320	–	≤2.6	≤ 5.2

COIL FORMERS

General data 20-pins ETD49 coil former

ITEM	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 85 class F
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 ETD49 coil former; 20-pins.

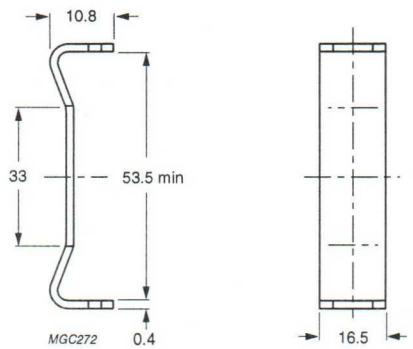
Winding data for 20-pins ETD49 coil former

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD49



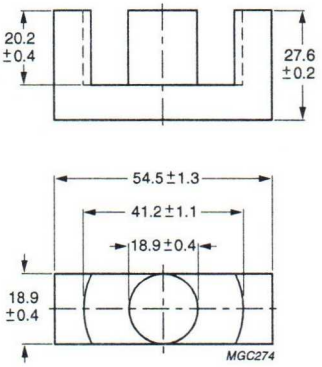
Dimensions in mm.

Fig.3 Mounting clip for ETD49.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.454	mm^{-1}
V_e	effective volume	35500	mm^3
l_e	effective length	127	mm
A_e	effective area	280	mm^2
A_{min}	minimum area	280	mm^2
m	mass of core half	≈90	g



Dimensions in mm.

Fig.1 ETD54 core half.

Core halves

GRADE	A_L[1] (nH)	μ_e	AIR GAP[2] (μm)	TYPE NUMBER
3C30	4550 ±25%	≈1650	≈0	ETD54-3C30
3C85	4800 ±25%	≈1730	≈0	ETD54-3C85
3C90	5000 ±25%	≈1800	≈0	ETD54-3C90
3F3	4400 ±25%	≈1590	≈0	ETD54-3F3

Note

1. Measured in combination with an ungapped core half, clamping force 50 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

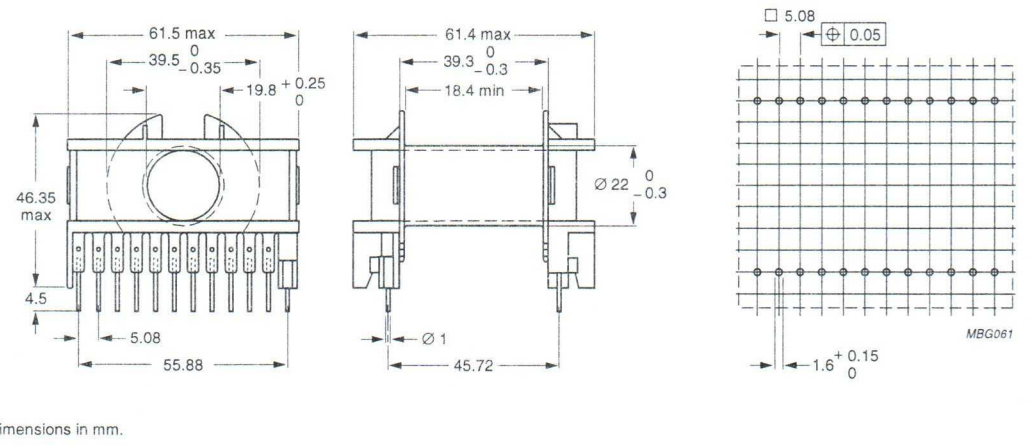
Properties of core sets under power conditions

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
3C30	≥360	≤3.6	≤4.5	–
3C85	≥320	≤5.0	≤5.9	–
3C90	≥330	≤3.6	≤4.5	–
3F3	≥320	–	≤4.0	≤8.1

COIL FORMERS

General data 18-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 85 class F
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 ETD54 coil former; 18-pins.

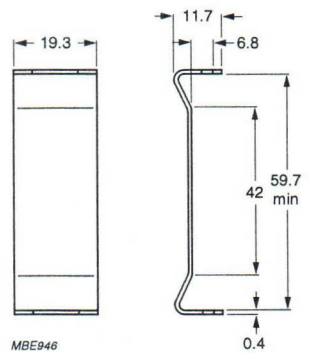
Winding data for 18-pins ETD54 coil former

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



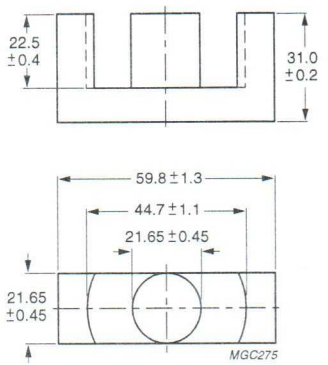
Dimensions in mm.

Fig.3 Mounting clip for ETD54.

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	368	mm^2
m	mass of core half	≈130	g



Dimensions in mm.

Fig.1 ETD59 core half.

Core halves

GRADE	A_L[1] (nH)	μ_e	AIR GAP[2] (μm)	TYPE NUMBER
3C30	5500 ±25%	≈1650	≈0	ETD59-3C30
3C85	5800 ±25%	≈1740	≈0	ETD59-3C85
3C90	6000 ±25%	≈1820	≈0	ETD59-3C90
3F3	5400 ±25%	≈1620	≈0	ETD59-3F3

Note

1. Measured in combination with an ungapped core half, clamping force 70 ±20 N.
2. Cores are marked with nominal air gap length. If required, a guaranteed A_L specification can be agreed upon. Nominal A_L depends on grade and measuring coil.

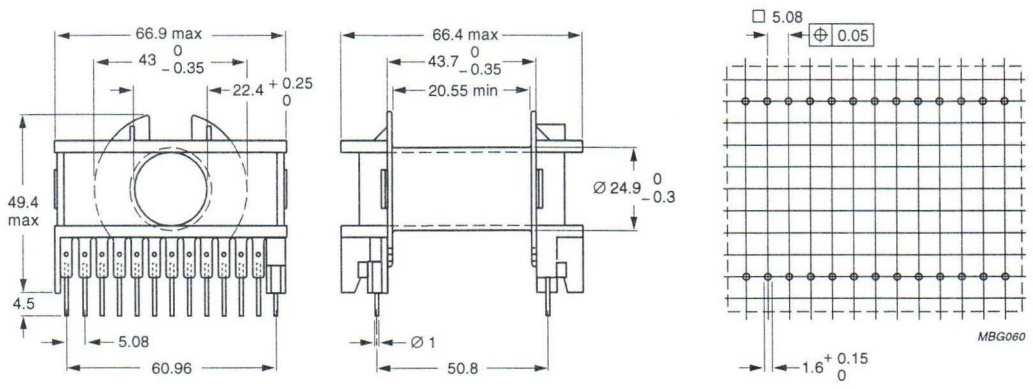
Properties of core sets under power conditions

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
3C30	≥360	≤5.2	≤6.7	–
3C85	≥320	≤7.2	≤8.5	–
3C90	≥330	≤5.2	≤6.7	–
3F3	≥320	–	≤5.7	≤12.5

COIL FORMER

General data 16-pins ETD59 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 85 class F
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 ETD59 coil former; 16-pins.

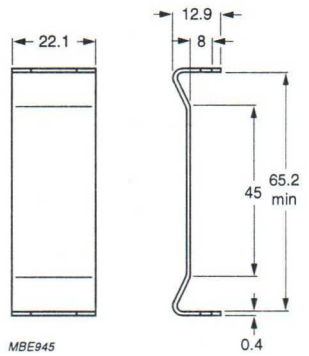
Winding data for 16-pins ETD59 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	366	41.2	106	CPH-ETD59-1S-24P

MOUNTING PARTS

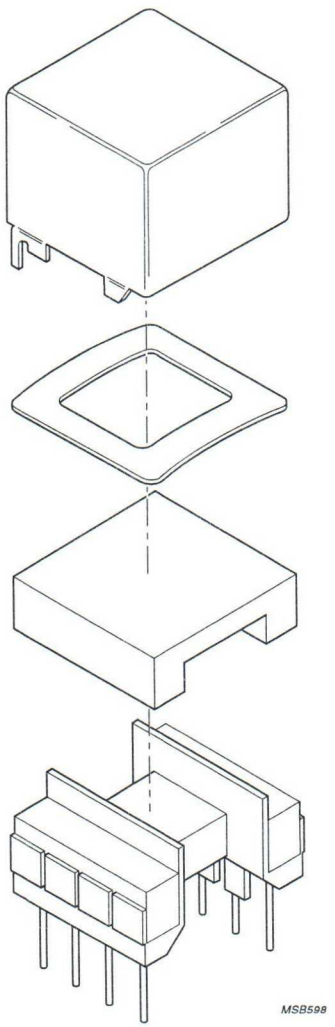
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD59



Dimensions in mm.

Fig.3 Mounting clip for ETD59.


MSB598

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview H cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
H7	57	3.3	0.8
H10	170	7.5	2
H16	1240	34.9	9.5
H20	1930	47	15

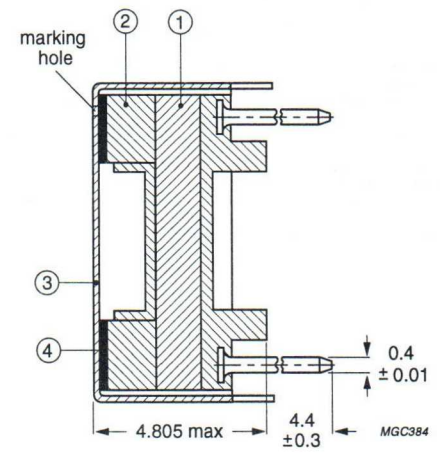
H CORES

Effective core parameters

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

A complete H7-set consists of:

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



Dimensions in mm.

Fig.1 H7 core set.

Core sets

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E25	≥700	≥3000	H7-3E25

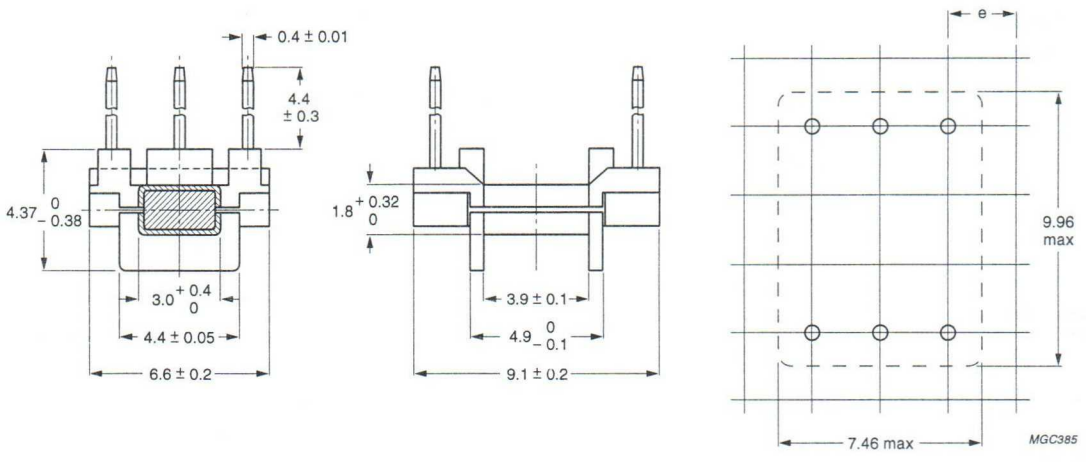
Notes

1. Clamping force = 1.5 N; $\hat{B}$ = 1 mT.

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	120 °C
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, 235 °C, 2 s



Dimensions in mm.

Fig.2 H7 coil former; 6-pins.

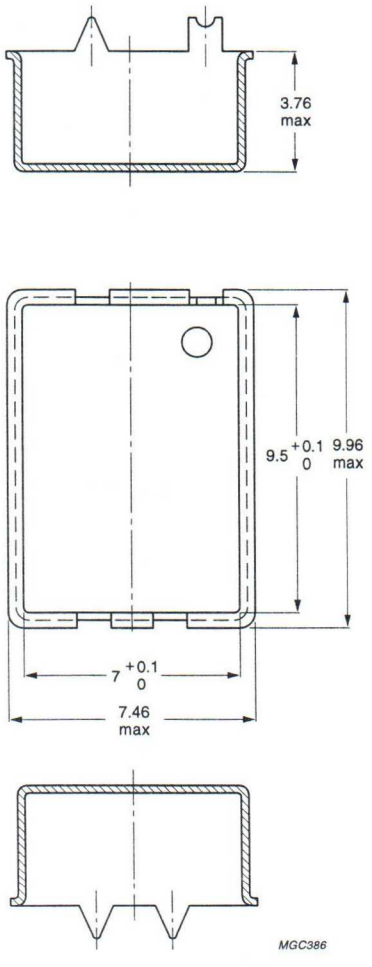
Winding data for 6-pins H7 coil former

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

MOUNTING PARTS

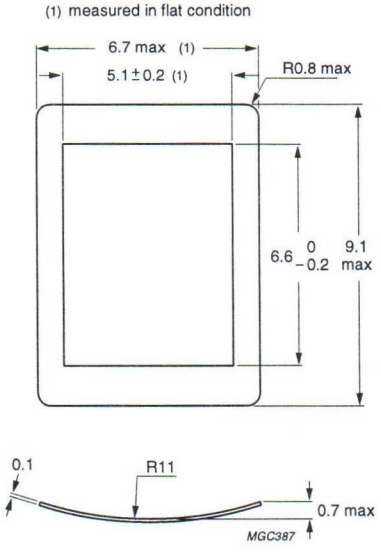
General data

ITEM	REMARKS	FIGURE
Container	material; nickel plated brass	3
Spring	material; nickel plated phosphor bronze	4



Dimensions in mm.

Fig.3 H7 container.



Dimensions in mm.

Fig.4 H7 spring.

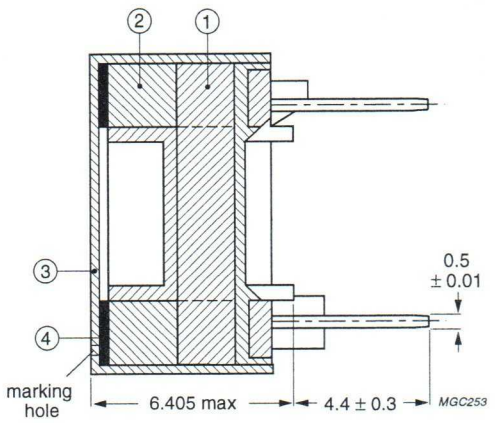
H CORES

Effective core parameters

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

A complete H10-set consists of:

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



Dimensions in mm.

Fig.1 H10 core set.

Core sets

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E25	≥1600	≥3800	H10-3E25

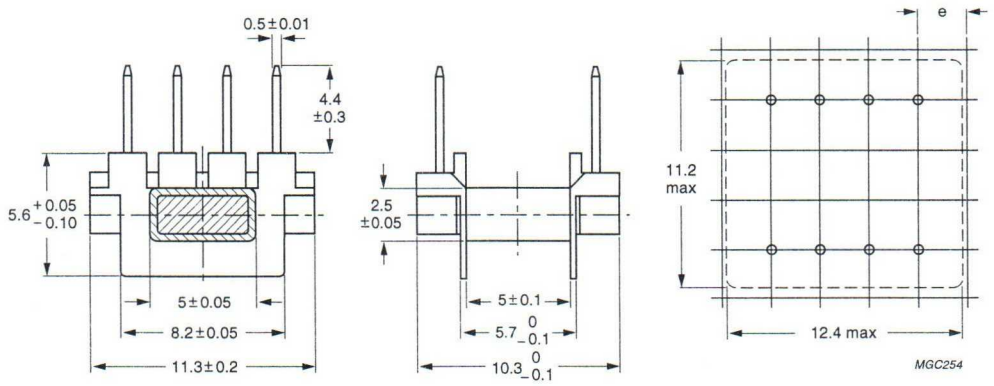
Notes

1. Clamping force = 1.5 N; $\hat{B}$ = 1 mT.

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6) , glass-reinforced, flame retardant in accordance with UL 94V-HB, UL file number E41871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, IEC 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, 235 °C, 2 s



Dimensions in mm.

Fig.2 H10 coil former; 8-pins.

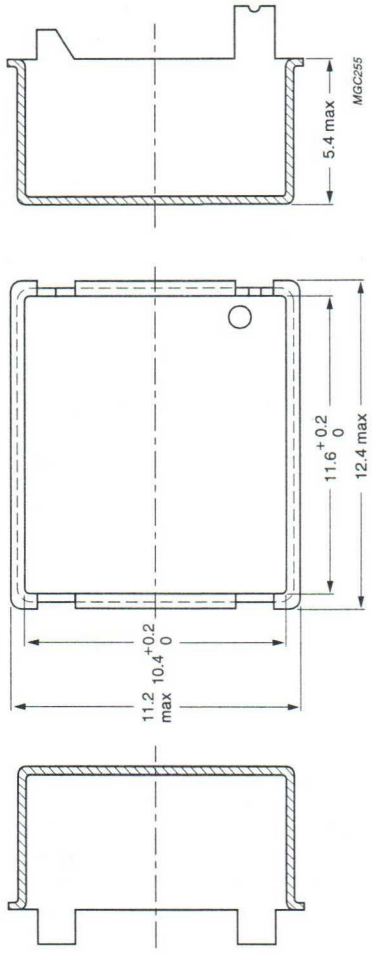
Winding data for 8-pins H10 coil former

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

MOUNTING PARTS

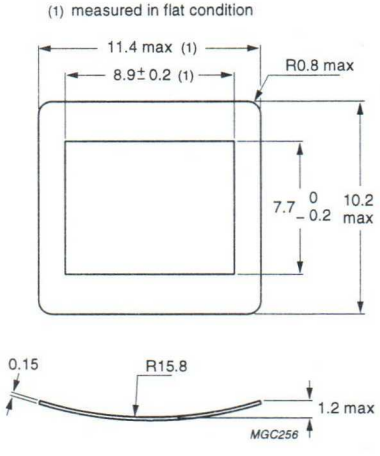
General data

ITEM	REMARKS	FIGURE
Container	material: nickel-plated brass	3
Spring	material: nickel-plated phosphor-bronze	4



Dimensions in mm.

Fig.3 H10 container.



Dimensions in mm.

Fig.4 H10 spring.

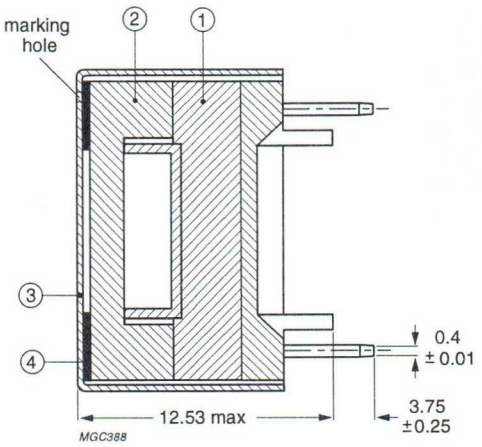
H CORES

Effective core parameters

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

A complete H16-set consists of:

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



Dimensions in mm.

Fig.1 H core set.

Core sets

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E25	≥4500	≥3650	H16-3E25

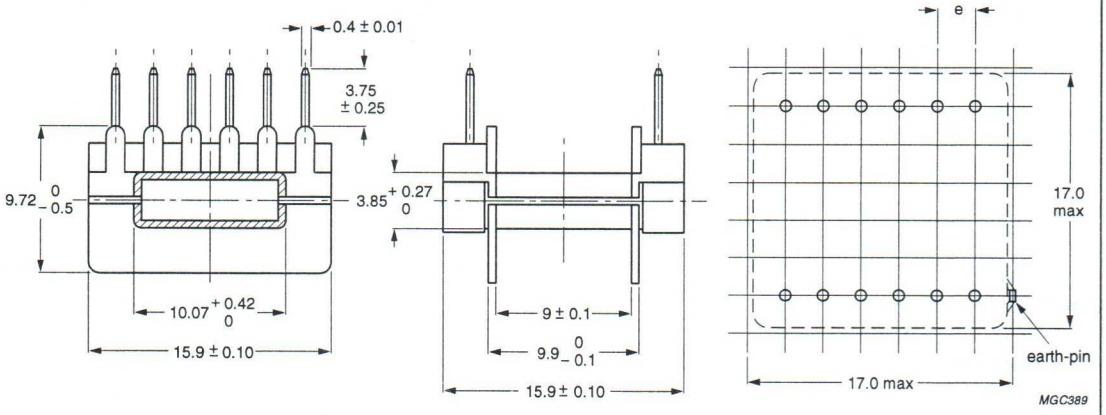
Notes

1. Clamping force = 1.5 N; $\hat{B}$ = 1 mT.

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	120 °C
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, 235 °C, 2 s



Dimensions in mm.

Fig.2 H16 coil former; 12-pins.

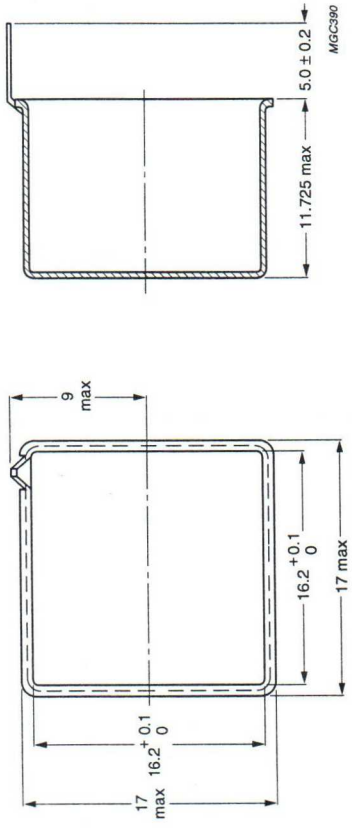
Winding data for 12-pins H16 coil former

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

MOUNTING PARTS

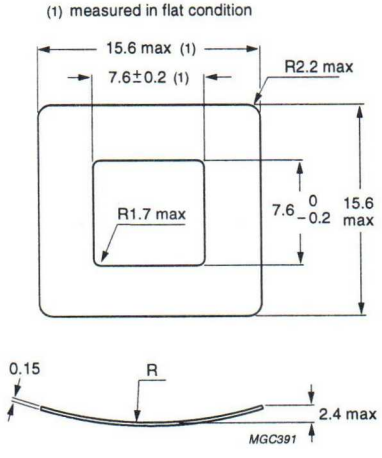
General data

ITEM	REMARKS	FIGURE
Container	material: nickel-plated brass	3
Spring	material: nickel-plated phosphor-bronze	4



Dimensions in mm.

Fig.3 H16 container.



Dimensions in mm.

Fig.4 H16 spring.

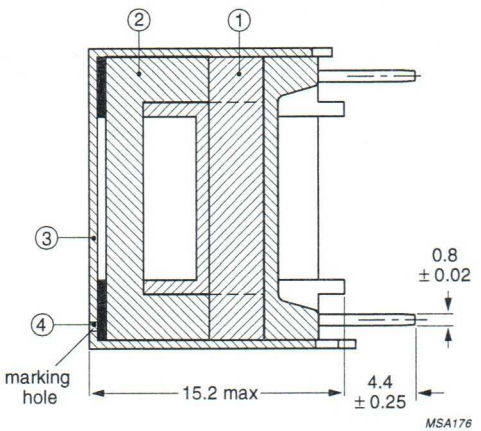
H CORES

Effective core parameters

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

A complete H20-set consists of:

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



Dimensions in mm.

Fig.1 H20 core set.

Core sets

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E25	≥5500	≥3850	H20-3E25

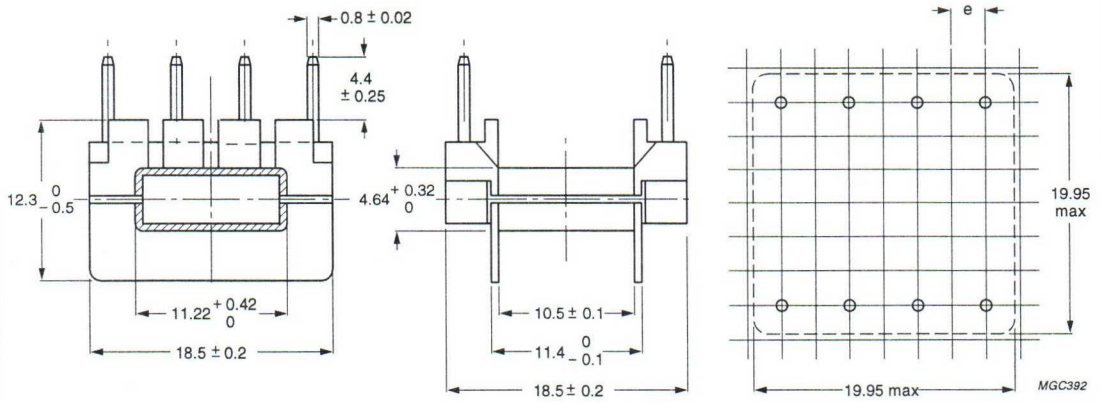
Notes

1. Clamping force = 1.5 N; $\hat{B}$ = 1 mT.

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	120 °C
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, 235 °C, 2 s



Dimensions in mm.

Fig.2 H20 coil former; 8-pins.

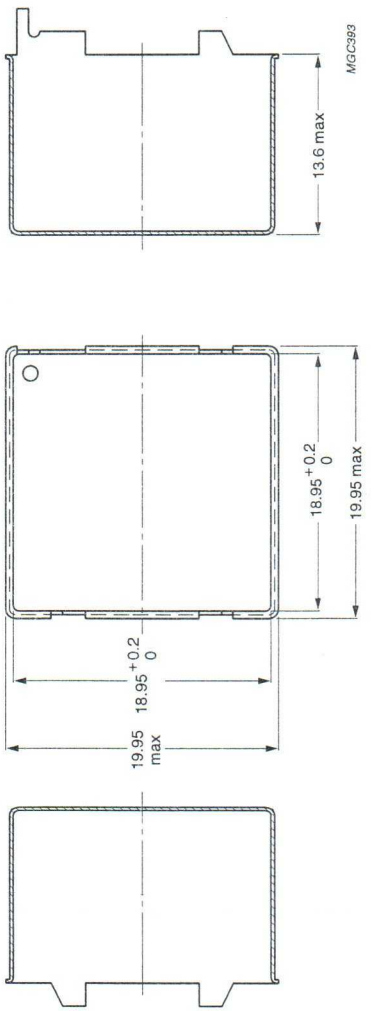
Winding data for 8-pins H20 coil former

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

MOUNTING PARTS

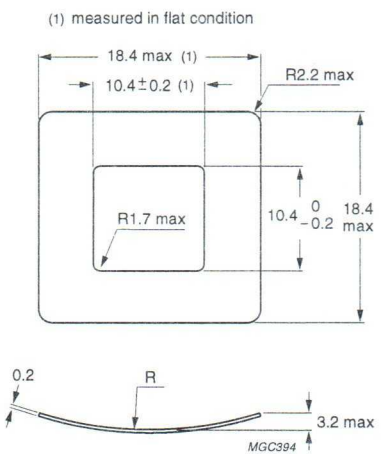
General data

ITEM	REMARKS	FIGURE
Container	material: nickel-plated brass	3
Spring	material: nickel-plated phosphor-bronze	4



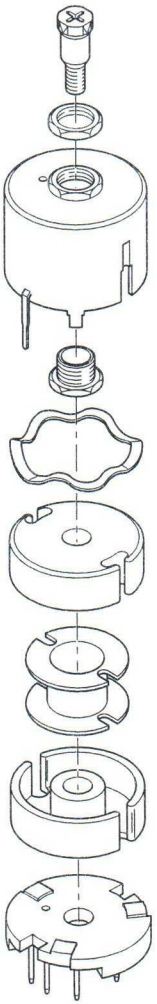
Dimensions in mm.

Fig.3 H20 container.



Dimensions in mm.

Fig.4 H20 spring.



MSB599

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview P, P/I, PT, PTS cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
P7/4	70	7.0	0.5
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
P14/8/I	628	29.9	3.5
PT14/8	492	23.3	2.8
PTS14/8	495	22.0	2.5
P18/11	1120	43.3	6.0
P18/11/I	1270	47.5	7
PT18/11	1110	40.6	6
PTS18/11	1070	37.2	5
P22/13	2000	63.4	12
P22/13/I	2460	73.4	13
PT23/11	1740	61.0	10.5
PTS23/11	1810	57.2	9
PT23/18	2590	62.2	14
PTS23/18	2630	58.3	13
P26/16	3530	93.9	20
P26/16/I	4370	110	21
P30/19	6190	137	34
PT30/19	5700	132	31
PTS30/19	55700	111	30
P36/22	10700	202	54
P42/29	18200	265	104
P66/56	88300	717	550

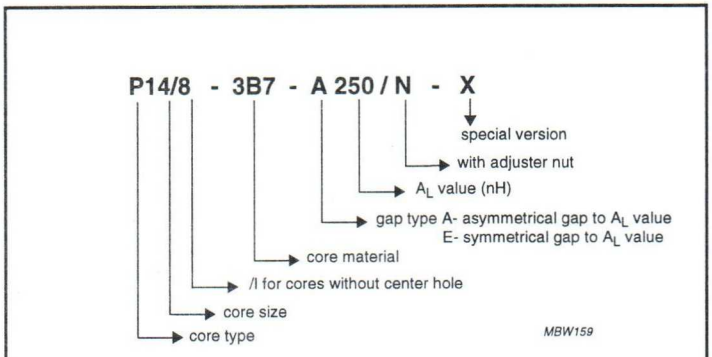


Fig.1 Type number structure for cores.

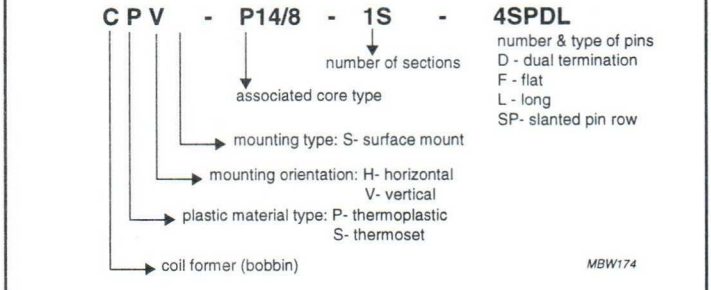


Fig.2 Type number structure for coil formers.

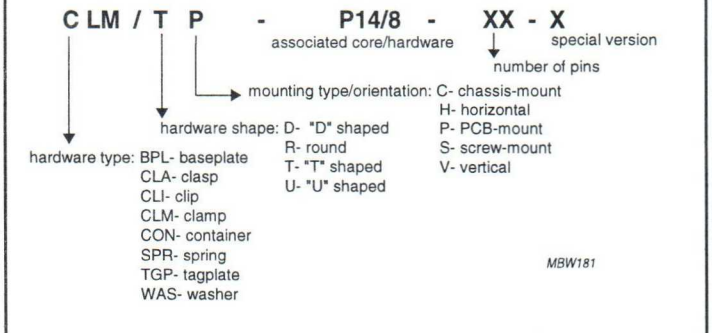


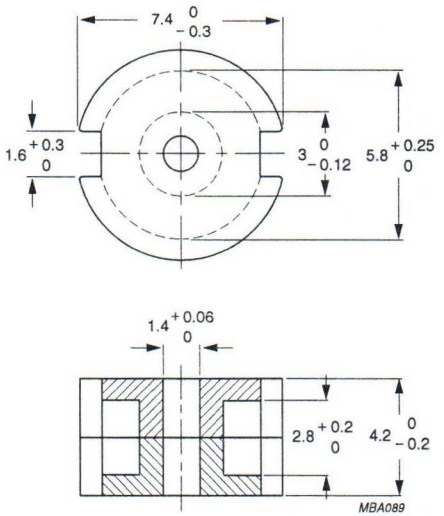
Fig.3 Type number structure for hardware.

P cores and accessories P7/4

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P7/4 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	480 ±25%	≈550	≈0	–	P7/4-3D3
3E5	≥3000	≥3414	≈0	–	P7/4-3E5
3H1	63 ±3%	≈70	≈200	–	P7/4-3H1-A63
	100 ±3%	≈114	≈95	–	P7/4-3H1-A100
	970 ±25%	≈1100	≈0	–	P7/4-3H1
3B7	100 ±5%	≈114	≈95	–	P7/4-3B7-A100
	160 ±5%	≈183	≈55	–	P7/4-3B7-A160
	1150 ±25%	≈1300	≈0	–	P7/4-3B7
3B9	100 ±5%	≈114	≈95	–	P7/4-3B9-A100
	160 ±5%	≈183	≈55	–	P7/4-3B9-A160
	1000 ±25%	≈1140	≈0	–	P7/4-3B9

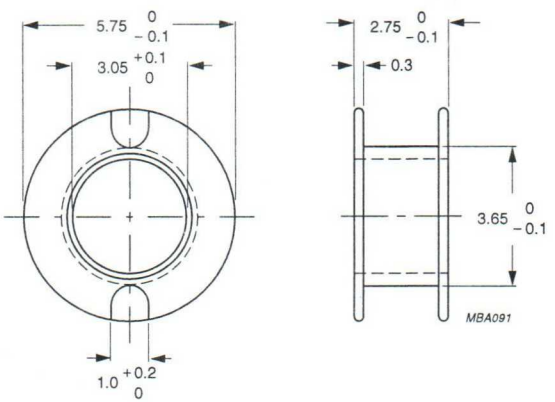
Note

1. Clamping force 20 ±5 N.

COIL FORMERS

General data for coil former CP-P7/4-1S-E

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass reinforced, flame retardant in accordance with UL 94V-1; UL file number E41613(M)
Maximum operating temperature	130 °C, IEC 85 class B



Dimensions in mm.

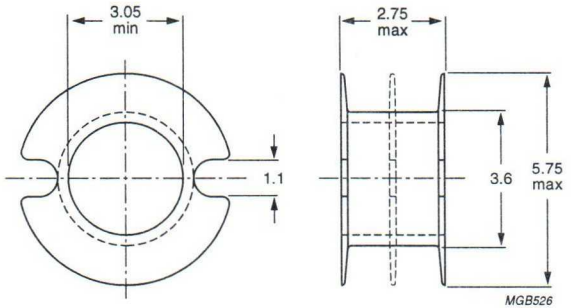
Fig.2 Coil former: CP-P7/4-1S-E.

Winding data for coil former CP-P7/4-1S-E

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.15	1.95	14.6	CP-P7/4-1S-E

General data for coil former CP-P7/4-1S-A

ITEM	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 85 class B



Dimensions in mm.

Fig.3 Coil former: CP-P7/4-1S-A.

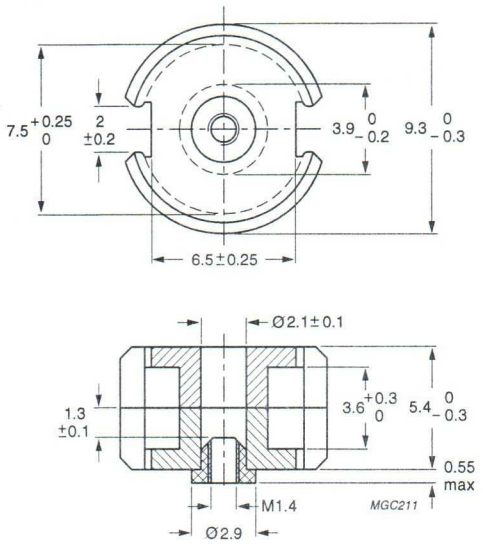
Winding data for CP-P7/4-1S-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.94	2.1	14.4	CP-P7/4-1S-A

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P9/5 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	16 ±3%	≈16	≈1100	P9/5-4C6-E16/N	P9/5-4C6-E16
	25 ±3%	≈25	≈500	P9/5-4C6-E25N	P9/5-4C6-E25
	40 ±3%	≈40	≈300	P9/5-4C6-E40/N	P9/5-4C6-E40
	100 ±25%	≈100	≈0	–	P9/5-4C6
3D3	40 ±3%	≈40	≈400	P9/5-3D3-E40/N	P9/5-3D3-E40
	63 ±3%	≈63	≈200	P9/5-3D3-E63/N	P9/5-3D3-E63
	630 ±25%	≈630	≈0	–	P9/5-3D3
3E5	≥4220	≥4166	≈0	–	P9/5-3E5
3H1	63 ±3%	≈63	≈200	P9/5-3H1-A63/N	P9/5-3H1-A63
	100 ±3%	≈100	≈120	P9/5-3H1-A100N	P9/5-3H1-A100
	160 ±3%	≈160	≈70	P9/5-3H1-A160/N	P9/5-3H1-A160
	250 ±10%	≈250	≈40	P9/5-3H1-A250/N	P9/5-3H1-A250
	1260 ±25%	≈1260	≈0	–	P9/5-3H1

P cores and accessories P9/5

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	63 ±3%	≈63	≈200	P9/5-3B7-A63/N	P9/5-3B7-A63
	100 ±3%	≈100	≈120	P9/5-3B7-A100N	P9/5-3B7-A100
	160 ±3%	≈160	≈70	P9/5-3B7-A160/N	P9/5-3B7-A160
	1230 ±25%	≈1230	≈0	–	P9/5-3B7
3B9	63 ±3%	≈63	≈200	P9/5-3B9-A63/N	P9/5-3B9-A63
	100 ±3%	≈100	≈120	P9/5-3B9-A100N	P9/5-3B9-A100
	160 ±3%	≈160	≈70	P9/5-3B9-A160/N	P9/5-3B9-A160
	1150 ±25%	≈1150	≈0	–	P9/5-3B9

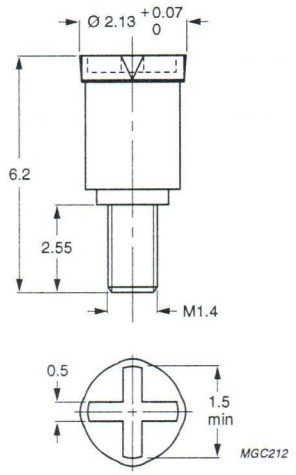
Note

1. Clamping force 25 ±5 N.

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

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L^{(1)}$
3H1; 3B7; 3B9	63	–	–	ADJ-P9/P11-YELLOW	18	ADJ-P9/P11-BROWN	35
	100	–	–	ADJ-P9/P11-YELLOW	11	ADJ-P9/P11-BROWN	22
	160	ADJ-P9/P11-YELLOW	9	ADJ-P9/P11-BROWN	14	ADJ-P9/P11-GREY	15
	250	ADJ-P9/P11-YELLOW	6	ADJ-P9/P11-GREY	10	–	–
4C6	16	–	–	–	–	ADJ-P9/P11-YELLOW	27
	25	–	–	–	–	ADJ-P9/P11-YELLOW	27
	40	–	–	ADJ-P9/P11-YELLOW	11	–	–

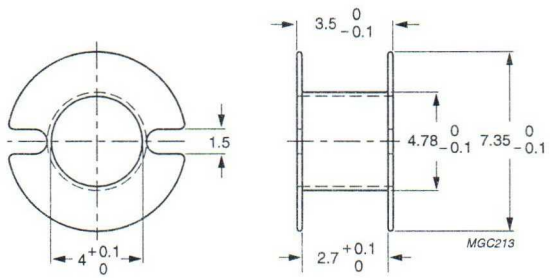
Note

1. Maximum adjustment range.

COIL FORMERS

General data for coil former CP-P9/5-1S-E

ITEM	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.

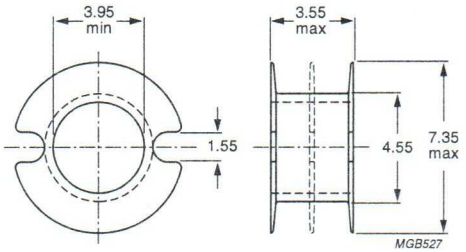
Fig.3 Coil former: CP-P9/5-1S-E.

Winding data for coil former CP-P9/5-1S-E

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.4	2.7	19	CP-P9/5-1S-E

General data for coil former CP-P9/5-1S-A

ITEM	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 85 class B



Dimensions in mm.

Fig.4 Coil former: CP-P9/5-1S-A.

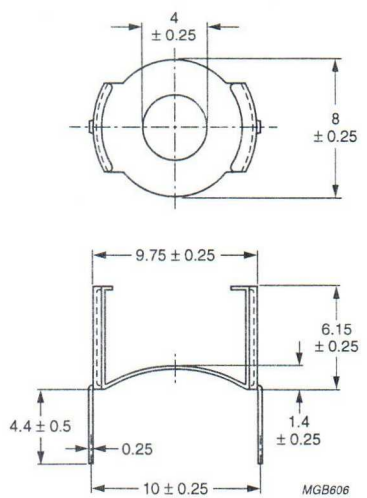
Winding data for CP-P9/5-1S-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.42	2.8	18.4	CP-P9/5-1S-A

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	spring steel, tin plated	5	CLM/TP-P9/5



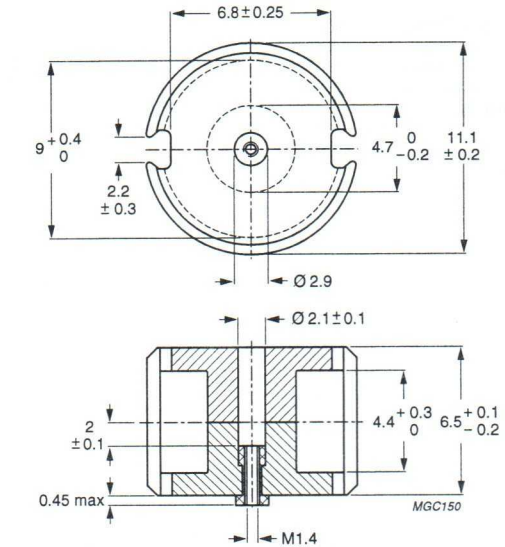
Dimensions in mm.

Fig.5 Clamp: CLM/TP-P9/5.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P11/7 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈19	≈1000	P11/7-4C6-E25/N	P11/7-4C6-E25
	40 ±3%	≈31	≈400	P11/7-4C6-E40/N	P11/7-4C6-E40
	120 ±25%	≈100	≈0	–	P11/7-4C6
3D3	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	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
3H1	100 ±3%	≈76	≈200	P11/7-3H1-A100/N	P11/7-3H1-A100
	160 ±3%	≈122	≈110	P11/7-3H1-A160/N	P11/7-3H1-A160
	250 ±3%	≈190	≈70	P11/7-3H1-A250/N	P11/7-3H1-A250
	1800 ±25%	≈1370	≈0	–	P11/7-3H1

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	100 ±3%	≈76	≈200	P11/7-3B7-A100/N	P11/7-3B7-A100
	160 ±3%	≈122	≈110	P11/7-3B7-A160/N	P11/7-3B7-A160
	250 ±3%	≈184	≈70	P11/7-3B7-A250/N	P11/7-3B7-A250
	1800 ±25%	≈1370	≈0	–	P11/7-3B7
3B9	100 ±3%	≈76	≈200	P11/7-3B9-A100/N	P11/7-3B9-A100
	160 ±3%	≈122	≈110	P11/7-3B9-A160/N	P11/7-3B9-A160
	250 ±5%	≈184	≈70	P11/7-3B9-A250/N	P11/7-3B9-A250
	1560 ±25%	≈1190	≈0	–	P11/7-3B9

Note

1. Clamping force 35 ±10 N.

Core sets for general purpose transformers and power applications

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	100 ±3%	≈76	≈200	P11/7-3B8-A100
	160 ±3%	≈122	≈110	P11/7-3B8-A160
	250 ±3%	≈190	≈70	P11/7-3B8-A250
	1800 ±25%	≈1370	≈0	P11/7-3B8
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	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

Note

1. Clamping force 35 ±10 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E4	4100 +40/–30%	≈3100	≈0	P11/7-3E4
3E5	≥5150	≥4314	≈0	P11/7-3E5

Note

1. Clamping force 35 ±10 N.

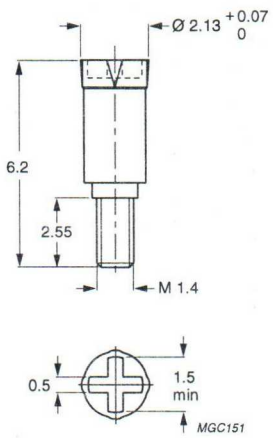
Properties of core sets under power conditions

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
3B8	≥315	≤0.07	–	–
3C81	≥315	≤0.05	–	–
3F3	≥315	–	≤0.03	≤0.05

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 P11/7 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L^{(1)}$
3H1; 3H3; 3B7; 3B9	100	–	–	ADJ-P9/P11-YELLOW	13	ADJ-P9/P11-BROWN	24
	160	ADJ-P9/P11-YELLOW	7	ADJ-P9/P11-BROWN	15	ADJ-P9/P11-GREY	22
	250	ADJ-P9/P11-BROWN	10	ADJ-P9/P11-GREY	14	–	–
3D3	16	–	–	ADJ-P9/P11-YELLOW	19	–	–
	25	–	–	–	–	ADJ-P9/P11-YELLOW	27
	40	–	–	–	–	ADJ-P9/P11-YELLOW	24
	63	–	–	ADJ-P9/P11-YELLOW	18	–	–
	100	–	–	ADJ-P9/P11-YELLOW	11	–	–
4C6	16	–	–	–	–	ADJ-P9/P11-YELLOW	19
	25	–	–	–	–	ADJ-P9/P11-YELLOW	22
	40	–	–	ADJ-P9/P11-YELLOW	16	–	–

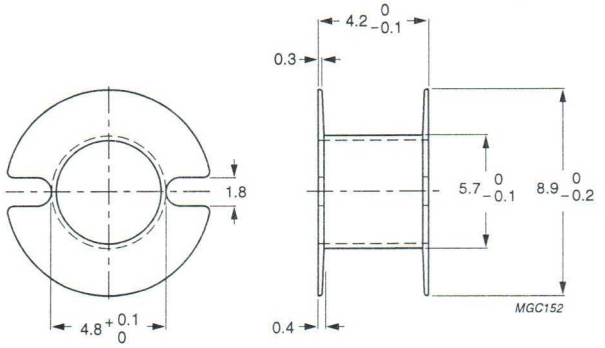
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P11/7-1S-E coil former

ITEM	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.

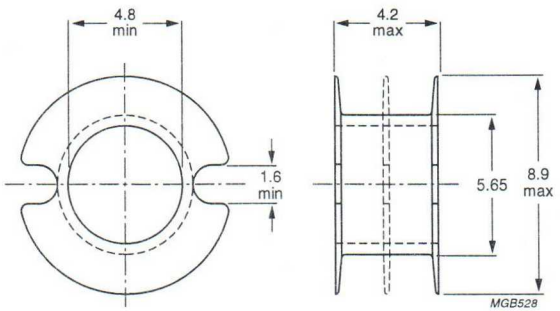
Fig.3 Coil former: CP-P11/7-1S-E.

Winding data for CP-P11/7-1S-E coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.5	3.2	23	CP-P11/7-1S-E

General data for CP-P11/7-A coil former

ITEM	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
1	4.77	3.43	22.7	CP-P11/7-1S-A
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]

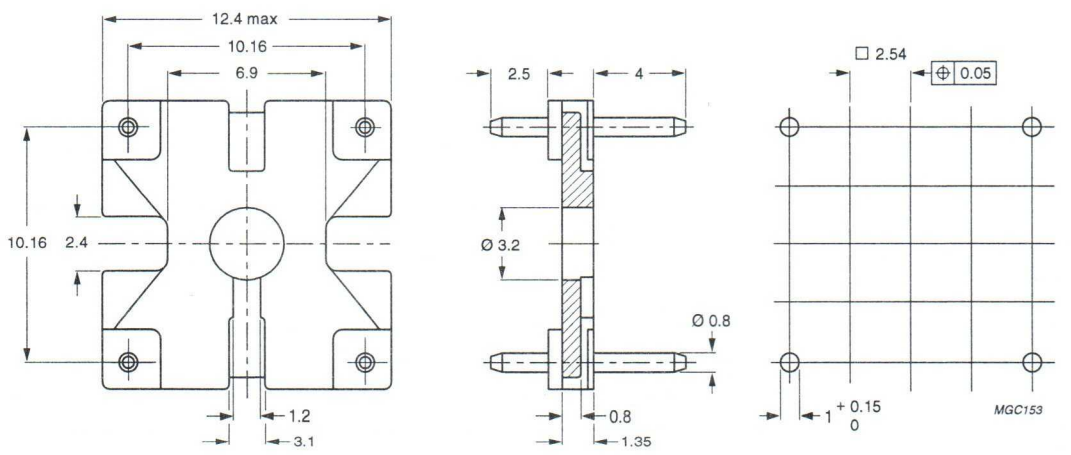
Note

1. UL file number E93370(M).

MOUNTING PARTS

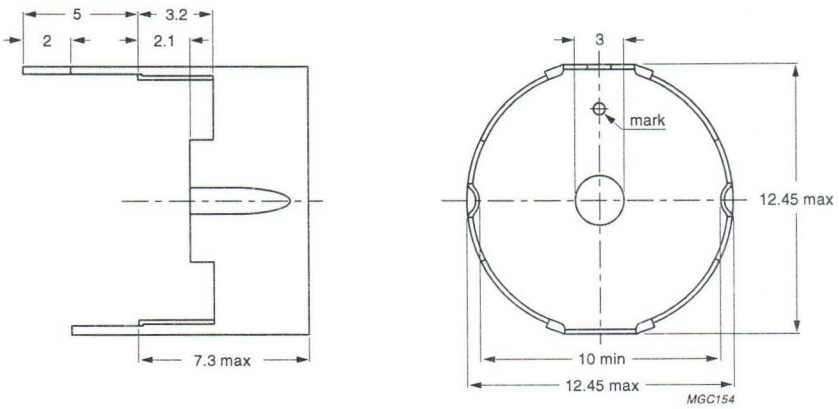
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P11/7-4P
	flame retardant: in accordance with UL94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-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



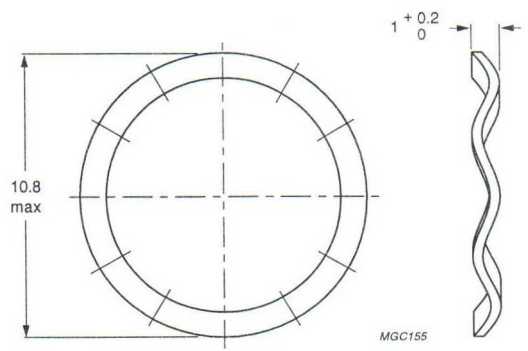
Dimensions in mm.

Fig.5 P11/7 tag plate.



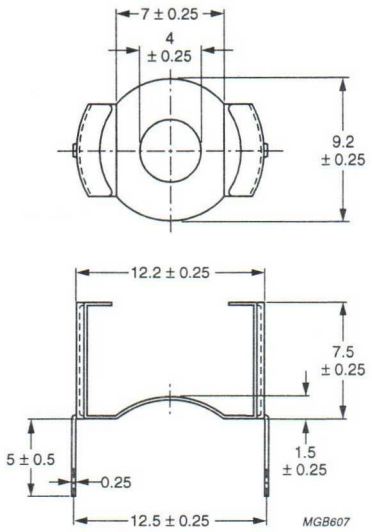
Dimensions in mm.

Fig.6 Container: CON-P11/7.



Dimensions in mm.

Fig.7 Spring: SPR-P11/7.



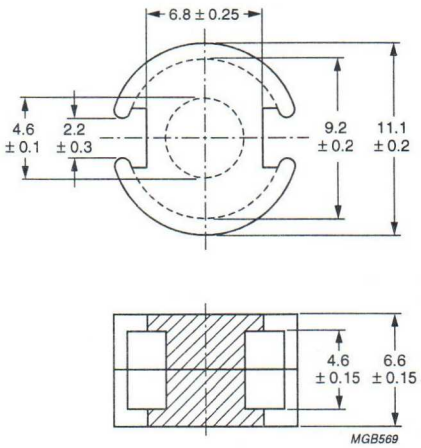
Dimensions in mm.

Fig.8 Clamp: CLM/TP-P11/7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	63 ±3%	≈43	≈475	P11/7/I-3C85-A63
	100 ±3%	≈68	≈277	P11/7/I-3C85-A100
	160 ±3%	≈109	≈160	P11/7/I-3C85-A160
	250 ±5%	≈170	≈97	P11/7/I-3C85-A250
	315 ±5%	≈215	≈74	P11/7/I-3C85-A315
	1750 ±25%	≈1200	≈0	P11/7/I-3C85

P cores and accessories P11/7/I

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 10 ±5 N.

Properties of core sets under power conditions

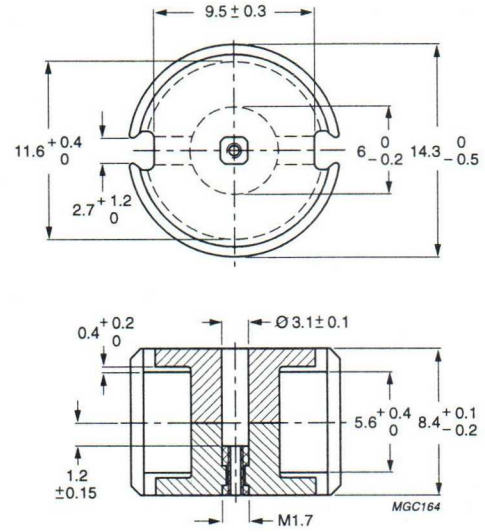
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.06	–	–
3C85	≥320	≤0.05	≤0.06	–
3F3	≥320	–	≤0.04	≤0.06

For coil former and winding data, see *"Data sheet of P11/7"*.

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈16	≈1700	P14/8-4C6-E25/N	P14/8-4C6-E25
	40 ±3%	≈25	≈800	P14/8-4C6-E40/N	P14/8-4C6-E40
	63 ±3%	≈40	≈350	P14/8-4C6-E63/N	P14/8-4C6-E63
	160 ±25%	≈100	≈0	–	P14/8-4C6
3D3	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	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	160 ±3%	≈100	≈180	P14/8-3H1-A160/N	P14/8-3H1-A160
	250 ±3%	≈157	≈110	P14/8-3H1-A250/N	P14/8-3H1-A250
	315 ±3%	≈198	≈80	P14/8-3H1-A315/N	P14/8-3H1-A315
	400 ±3%	≈252	≈60	P14/8-3H1-A400/N	P14/8-3H1-A400
	630 ±5%	≈395	≈40	P14/8-3H1-A630/N	P14/8-3H1-A630
	2350 ±25%	≈1480	≈0	–	P14/8-3H1
3B7	63 ±3%	≈40	≈650	P14/8-3B7-E63/N	P14/8-3B7-E63
	100 ±3%	≈63	≈380	P14/8-3B7-E100/N	P14/8-3B7-E100
	160 ±3%	≈100	≈180	P14/8-3B7-A160/N	P14/8-3B7-A160
	250 ±3%	≈156	≈110	P14/8-3B7-A250/N	P14/8-3B7-A250
	315 ±3%	≈198	≈80	P14/8-3B7-A315/N	P14/8-3B7-A315
	2240 ±25%	≈1410	≈0	–	P14/8-3B7
3B9	63 ±3%	≈40	≈650	P14/8-3B9-E63/N	P14/8-3B9-E63
	100 ±3%	≈63	≈380	P14/8-3B9-E100/N	P14/8-3B9-E100
	160 ±3%	≈100	≈180	P14/8-3B9-A160/N	P14/8-3B9-A160
	250 ±3%	≈156	≈110	P14/8-3B9-A250/N	P14/8-3B9-A250
	315 ±3%	≈198	≈80	P14/8-3B9-A315/N	P14/8-3B9-A315
	1910 ±25%	≈1200	≈0	–	P14/8-3B9

Note

1. Clamping force 60 ±20 N.

Core sets for general purpose transformers and power applications

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈100	≈180	P14/8-3B8-A160
	250 ±3%	≈157	≈110	P14/8-3B8-A250
	315 ±3%	≈198	≈80	P14/8-3B8-A315
	400 ±3%	≈252	≈60	P14/8-3B8-A400
	630 ±5%	≈395	≈40	P14/8-3B8-A630
	2350 ±25%	≈1480	≈0	P14/8-3B8
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
3C85	63 ±3%	≈40	≈650	P14/8-3C85-E63
	100 ±3%	≈63	≈380	P14/8-3C85-A100
	160 ±3%	≈100	≈180	P14/8-3C85-A160
	250 ±3%	≈157	≈110	P14/8-3C85-A250
	315 ±3%	≈198	≈80	P14/8-3C85-A315
	2150 ±25%	≈1350	≈0	P14/8-3C85
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
3F4	160 ±3%	≈100	≈170	P14/8-3F4-A160
	250 ±3%	≈157	≈100	P14/8-3F4-A250
	315 ±3%	≈198	≈70	P14/8-3F4-A315
	1200 ±25%	≈760	≈0	P14/8-3F4

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	TYPE NUMBER
3E1	3700 ±25%	≈2350	P14/8-3E1
3E4	5300 +40/–30%	≈3300	P14/8-3E4
3E25	5750 ±25%	≈3610	P14/8-3E25
3E27	5750 ±25%	≈3610	P14/8-3E27
3E5	≥6300	≥3950	P14/8-3E5

Note

1. Clamping force 60 ±20 N.

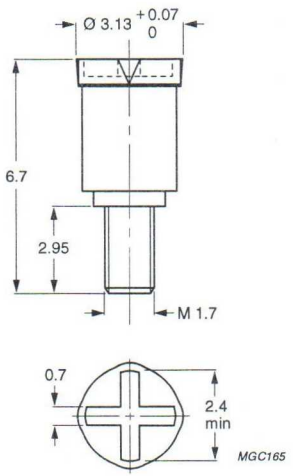
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3B8	≥315	≤0.15	–	–	–	–
3C81	≥315	≤0.10	–	–	–	–
3C85	≥315	≤0.08	≤0.10	–	–	–
3F3	≥315	–	≤0.06	≤0.10	–	–
3F4	≥250	–	–	–	≤0.15	≤0.17

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 P14/8 inductance adjuster.

Inductance adjuster selection chart

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)
3H1; 3H3; 3B7; 3B9	100	–	–	ADJ-P14-ORANGE	14	–	–
	160	–	–	ADJ-P14-WHITE	17	ADJ-P14-BROWN	23
	250	ADJ-P14-WHITE	11	ADJ-P14-BROWN	15	–	–
	315	ADJ-P14-WHITE	9	–	–	ADJ-P14-GREY	19
	400	ADJ-P14-BROWN	9	–	–	–	–
	630	ADJ-P14-BROWN	6	–	–	–	–
3D3	40	–	–	–	–	ADJ-P14-ORANGE	24
	63	–	–	–	–	ADJ-P14-ORANGE	20
	100	ADJ-P14-ORANGE	11	–	–	–	–
4C6	25	–	–	–	–	ADJ-P14-ORANGE	20
	40	–	–	ADJ-P14-ORANGE	18	–	–
	63	ADJ-P14-ORANGE	10	–	–	–	–

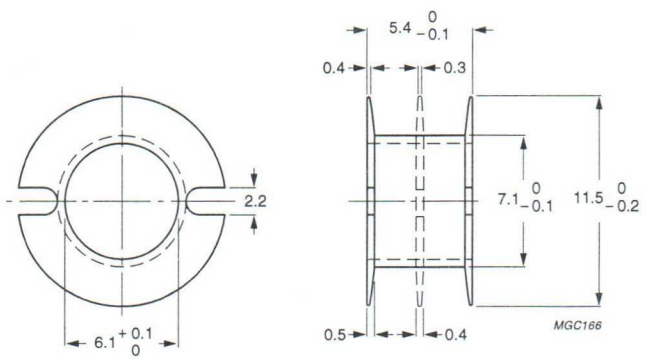
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P14/8-E coil former

ITEM	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.

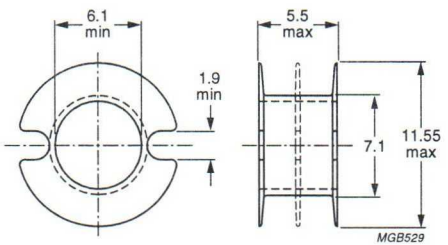
Fig.3 Coil former CP-P14/8-E.

Winding data for CP-P14/8-E coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	9.7	4.2	29	CP-P14/8-1S-E
2	2 × 4.5	2 × 1.9	29	CP-P14/8-2S-E

General data for CP-P14/8-A coil former

ITEM	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.

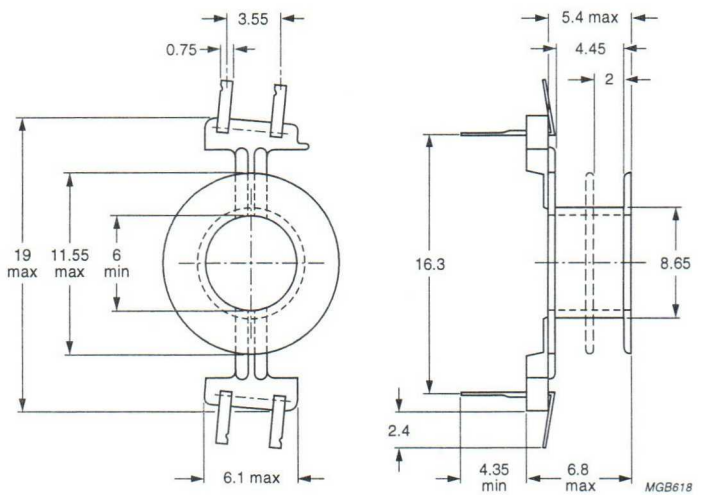
Fig.4 Coil former CP-P14/8-A.

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
1	8.65	4.5	29.3	CP-P14/8-1S-A
2	2 × 3.81	2 × 2.2	29.3	CP-P14/8-2S-A
3	3 × 2.19	3 × 1.2	29.3	CP-P14/8-3S-A

General data 4-pins P14/8 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

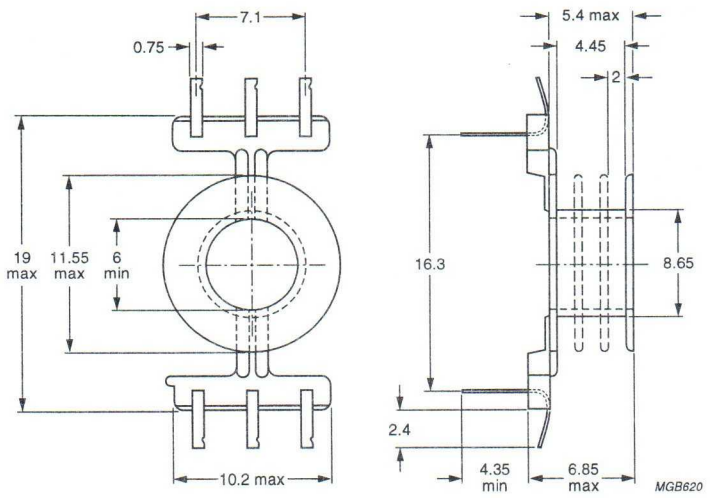
Fig.5 P14/8 coil former for PCB mounting; 4-pins.

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

General data 6-pins P14/8 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

Fig.6 P14/8 coil former for PCB mounting; 6-pins.

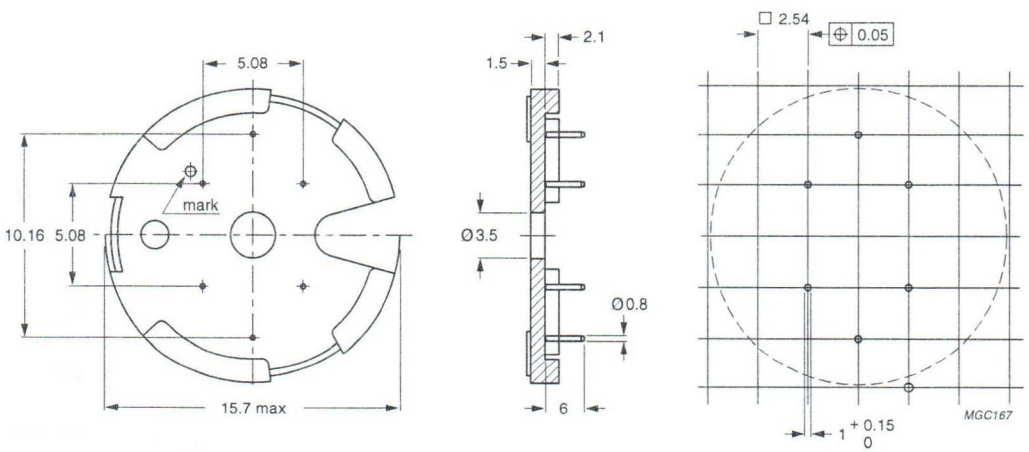
Data for 6-pins P14/8 coil former for PCB mounting

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 E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-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



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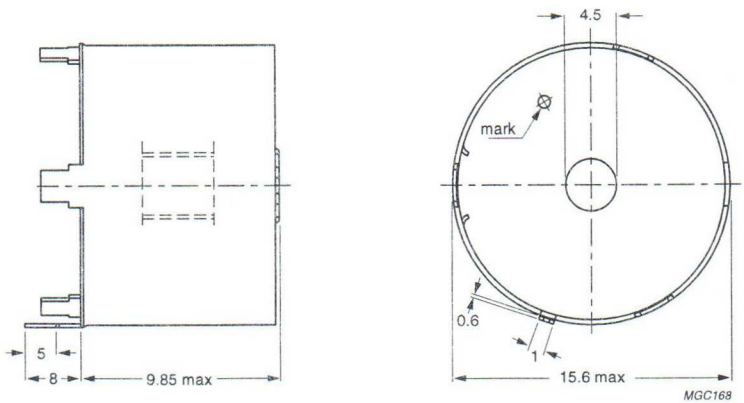
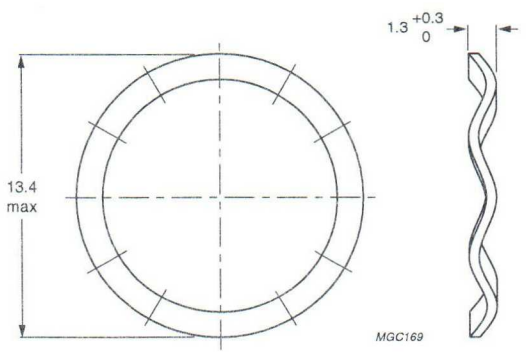
Dimensions in mm.

Fig.7 Tag plate: TGP-P14/8.



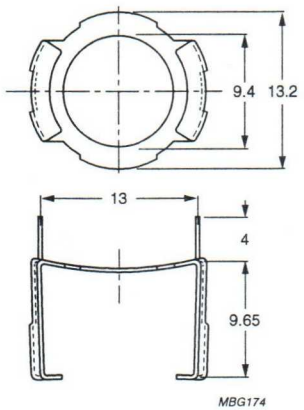
Dimensions in mm.

Fig.8 Container: CON-P14/8.



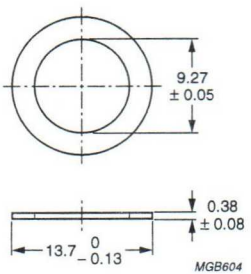
Dimensions in mm.

Fig.9 Spring: SPR-P14/8.



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P14/8.



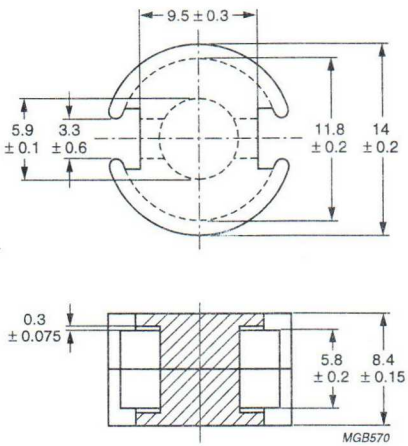
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TP-P14/8.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	100 ±3%	≈56	≈455	P14/8/I-3C85-A100
	160 ±3%	≈89	≈264	P14/8/I-3C85-A160
	250 ±3%	≈139	≈157	P14/8/I-3C85-A250
	315 ±5%	≈175	≈119	P14/8/I-3C85-A315
	400 ±5%	≈223	≈92	P14/8/I-3C85-A400
	2400 ±25%	≈1330	≈0	P14/8/I-3C85

P cores and accessories P14/8/I

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 15 ±5 N.

Properties of core sets under power conditions

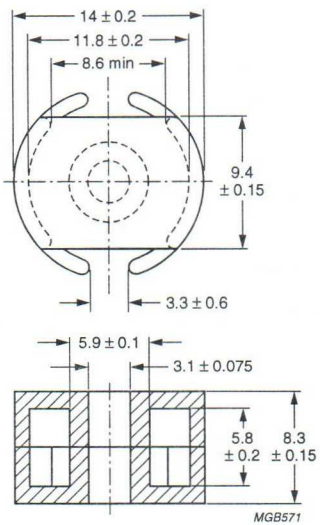
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.13	–	–
3C85	≥320	≤0.10	≤0.12	–
3F3	≥320	–	≤0.07	≤0.12

For coil former and winding data, see *"Data sheet of P14/8"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	63 ±3%	≈45	≈594	PT14/8-3B7-E63
	100 ±3%	≈72	≈345	PT14/8-3B7-A100
	160 ±3%	≈115	≈201	PT14/8-3B7-A160
	250 ±3%	≈180	≈119	PT14/8-3B7-A250
	315 ±5%	≈227	≈89	PT14/8-3B7-A315
	2000 ±25%	≈1440	≈0	PT14/8-3B7
3B9	63 ±3%	≈45	≈594	PT14/8-3B9-E63
	100 ±3%	≈72	≈345	PT14/8-3B9-A100
	160 ±3%	≈115	≈201	PT14/8-3B9-A160
	250 ±3%	≈180	≈119	PT14/8-3B9-A250
	315 ±5%	≈227	≈89	PT14/8-3B9-A315
	1615 ±25%	≈1160	≈0	PT14/8-3B9

GRADE	A_L [1] (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
3C85	63 ±3%	≈45	≈594	PT14/8-3C85-A63
	100 ±3%	≈72	≈345	PT14/8-3C85-A100
	160 ±3%	≈115	≈201	PT14/8-3C85-A160
	250 ±3%	≈180	≈119	PT14/8-3C85-A250
	315 ±5%	≈227	≈89	PT14/8-3C85-A315
	1800 ±25%	≈1300	≈0	PT14/8-3C85
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

Note

1. Clamping force 15 ±15 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥5350	≥3874	≈0	PTS14/8-3E5
3E27	4500 ±25%	≈3240	≈0	PTS14/8-3E27

Note

1. Clamping force 15 ±5 N.

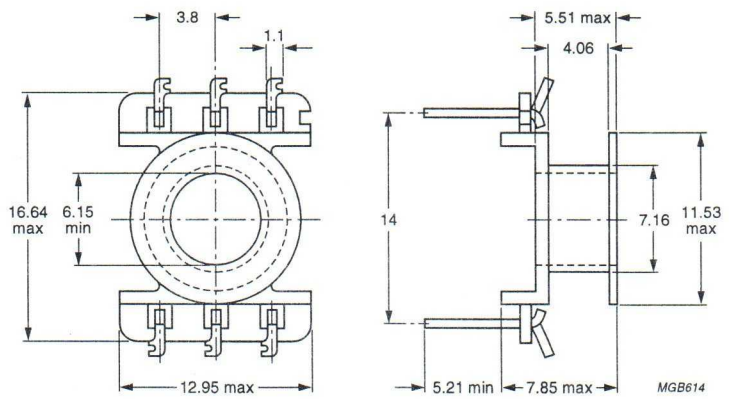
Properties of core sets under power conditions

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	≤0.10	–	–
3C85	≥320	≤0.08	≤0.09	–
3F3	≥320	–	≤0.06	≤0.10

COIL FORMERS

General data 6-pins PT14/8 coil former

ITEM	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
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 PT14/8 coil former; 6-pins.

Winding data for 6-pins PT14/8 coil former

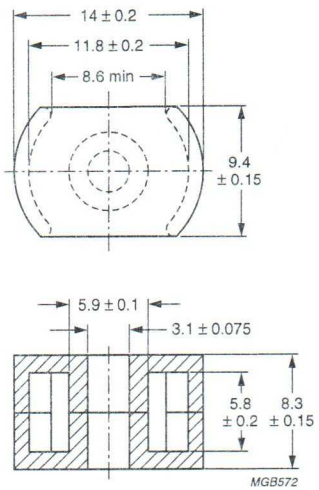
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	7.9	4.1	29.2	CPV-PT14/8-1S-6P

For more coil formers and mounting parts , see *"Data sheet of P14/8".*

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	495	mm^3
l_e	effective length	22.5	mm
A_e	effective area	22.0	mm^2
A_{min}	minimum area	19.9	mm^2
m	mass of set	≈2.5	g



Dimensions in mm.

Fig.1 PTS14/8 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	63 ±3%	≈51	≈559	PTS14/8-3B7-A63
	100 ±3%	≈81	≈323	PTS14/8-3B7-A100
	160 ±3%	≈130	≈188	PTS14/8-3B7-A160
	250 ±3%	≈204	≈109	PTS14/8-3B7-A250
	315 ±5%	≈257	≈84	PTS14/8-3B7-A315
	1945 ±25%	≈1580	≈0	PTS14/8-3B7
3B9	63 ±3%	≈51	≈559	PTS14/8-3B9-A63
	100 ±3%	≈81	≈323	PTS14/8-3B9-A100
	160 ±3%	≈130	≈188	PTS14/8-3B9-A160
	250 ±3%	≈204	≈109	PTS14/8-3B9-A250
	315 ±5%	≈257	≈84	PTS14/8-3B9-A315
	1555 ±25%	≈1260	≈0	PTS14/8-3B9

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈51	≈559	PTS14/8-3C81-A63
	100 ±3%	≈81	≈323	PTS14/8-3C81-A100
	160 ±3%	≈130	≈188	PTS14/8-3C81-A160
	250 ±3%	≈204	≈109	PTS14/8-3C81-A250
	315 ±5%	≈257	≈84	PTS14/8-3C81-A315
	2330 ±25%	≈1890	≈0	PTS14/8-3C81
3C85	63 ±3%	≈51	≈559	PTS14/8-3C85-A63
	100 ±3%	≈81	≈323	PTS14/8-3C85-A100
	160 ±3%	≈130	≈188	PTS14/8-3C85-A160
	250 ±3%	≈204	≈109	PTS14/8-3C85-A250
	315 ±5%	≈257	≈84	PTS14/8-3C85-A315
	1750 ±25%	≈1420	≈0	PTS14/8-3C85
3F3	63 ±3%	≈51	≈323	PTS14/8-3F3-A63
	100 ±3%	≈81	≈188	PTS14/8-3F3-A100
	160 ±3%	≈130	≈109	PTS14/8-3F3-A160
	250 ±3%	≈204	≈0	PTS14/8-3F3-A250
	315 ±5%	≈257	≈84	PTS14/8-3F3-A315
	1625 ±25%	≈1320	≈559	PTS14/8-3F3

Note

1. Clamping force 15 ±5 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥4800	≥3900	≈0	PTS14/8-3E5
3E27	4370 ±25%	≈3540	≈0	PTS14/8-3E25

Note

1. Clamping force 15 ±5 N.

Properties of core sets under power conditions

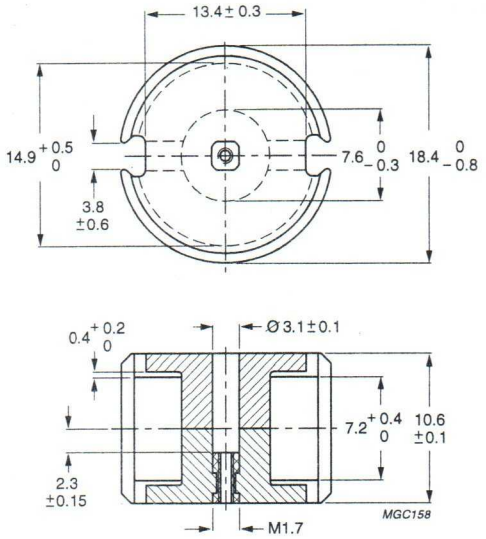
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.10	–	–
3C85	≥320	≤0.077	≤0.089	–
3F3	≥320	–	≤0.054	≤0.94

For coil formers and mounting parts, see *"Data sheet PT14/8".*

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P18/11 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈12	≈3500	P18/11-4C6-E25/N	P18/11-4C6-E25
	40 ±3%	≈19	≈1800	P18/11-4C6-E40/N	P18/11-4C6-E40
	63 ±3%	≈30	≈750	P18/11-4C6-E63/N	P18/11-4C6-E63
	210 ±25%	≈100	≈0	–	P18/11-4C6
3D3	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	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
3H1	160 ±3%	≈76	≈350	P18/11-3H1-E160/N	P18/11-3H1-E160
	250 ±3%	≈119	≈200	P18/11-3H1-A250/N	P18/11-3H1-A250
	315 ±3%	≈149	≈150	P18/11-3H1-A315/N	P18/11-3H1-A315
	400 ±3%	≈190	≈120	P18/11-3H1-A400/N	P18/11-3H1-A400
	630 ±5%	≈300	≈80	P18/11-3H1-A630/N	P18/11-3H1-A630
	3400 ±25%	≈1620	≈0	–	P18/11-3H1

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	100 ±3%	≈46	≈680	P18/11-3B7-E100/N	P18/11-3B7-E100
	160 ±3%	≈76	≈350	P18/11-3B7-E160/N	P18/11-3B7-E160
	250 ±3%	≈119	≈200	P18/11-3B7-A250/N	P18/11-3B7-A250
	315 ±3%	≈150	≈150	P18/11-3B7-A315/N	P18/11-3B7-A315
	400 ±3%	≈190	≈120	P18/11-3B7-A400/N	P18/11-3B7-A400
	3680 ±3%	≈1750	≈0	–	P18/11-3B7
3B9	100 ±3%	≈46	≈680	P18/11-3B9-E100/N	P18/11-3B9-E100
	160 ±3%	≈76	≈350	P18/11-3B9-E160/N	P18/11-3B9-E160
	250 ±3%	≈119	≈200	P18/11-3B9-A250/N	P18/11-3B9-A250
	315 ±3%	≈150	≈150	P18/11-3B9-A315/N	P18/11-3B9-A315
	400 ±3%	≈190	≈120	P18/11-3B9-A400/N	P18/11-3B9-A400
	2630 ±3%	≈1250	≈0	–	P18/11-3B9

Note

1. Clamping force 80 ±20 N.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈76	≈350	P18/11-3B8-A160
	250 ±3%	≈119	≈200	P18/11-3B8-A250
	315 ±3%	≈149	≈150	P18/11-3B8-A315
	630 ±5%	≈300	≈80	P18/11-3B8-A400
	400 ±3%	≈190	≈120	P18/11-3B8-A400
	630 ±5%	≈300	≈80	P18/11-3B8-A630
	3400 ±25%	≈1620	≈0	P18/11-3B8
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
3C85	100 ±3%	≈46	≈680	P18/11-3C85-E100
	160 ±3%	≈76	≈350	P18/11-3C85-A160
	250 ±3%	≈119	≈200	P18/11-3C85-A250
	315 ±3%	≈149	≈150	P18/11-3C85-A315
	400 ±3%	≈190	≈120	P18/11-3C85-A400
	3100 ±25%	≈1470	≈0	P18/11-3C85

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	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
3F4	160 ±3%	≈76	≈340	P18/11-3F4-A160
	250 ±3%	≈119	≈190	P18/11-3F4-A250
	315 ±3%	≈149	≈140	P18/11-3F4-A315
	400 ±3%	≈190	≈110	P18/11-3F4-A400
	1600 ±25%	≈765	≈0	P18/11-3F4

Note

1. Clamping force 80 ±20 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	5400 +40/-30%	≈2560	P18/11-3E1
3E25	7500 ±25%	≈3560	P18/11-3E25
3E27	7500 ±25%	≈3560	P18/11-3E27
3E4	7550 +40/-30%	≈3580	P18/11-3E4
3E5	≥8400	≥3990	P18/11-3E5

Note

1. Clamping force 60 ±20 N.

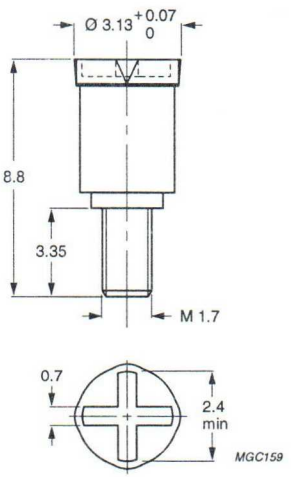
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3B8	≥315	≤0.35	–	–	–	–
3C81	≥315	≤0.23	–	–	–	–
3C85	≥315	≤0.18	≤0.22	–	–	–
3F3	≥315	–	≤0.13	≤0.22	–	–
3F4	≥250	–	–	–	≤0.35	≤0.40

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

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)
3H1; 3H3; 3B7; 3B9	63	–	–	ADJ-P18-YELLOW	17	–	–
	100	–	–	–	–	ADJ-P18-BROWN	29
	160	ADJ-P18-YELLOW	9	ADJ-P18-RED	18	ADJ-P18-BROWN	28
	250	ADJ-P18-RED	12	ADJ-P18-WHITE	14	ADJ-P18-BROWN	18
	315	ADJ-P18-RED	9	ADJ-P18-BROWN	14	ADJ-P18-VIOLET	20
	400	ADJ-P18-WHITE	9	ADJ-P18-VIOLET	16	–	–
	630	ADJ-P18-VIOLET	10	–	–	–	–
	1000	ADJ-P18-VIOLET	6	–	–	–	–
	1250	–	–	–	–	–	–
3D3	40	–	–	–	–	ADJ-P18-YELLOW	20
	63	–	–	ADJ-P18-YELLOW	17	–	–
	100	–	–	–	–	ADJ-P18-RED	24
	160	–	–	ADJ-P18-RED	15	–	–
4C6	25	–	–	ADJ-P18-YELLOW	15	–	–
	40	–	–	ADJ-P18-YELLOW	17	–	–
	63	–	–	–	–	–	–

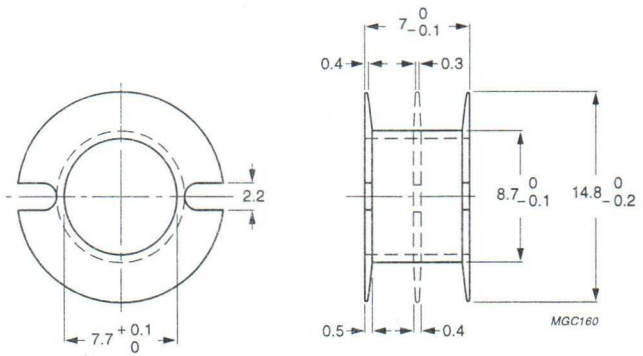
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P18/11-E

ITEM	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.

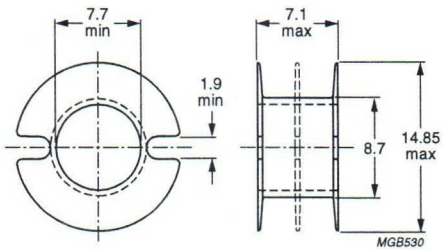
Fig.3 CP-P18/11-E coil former.

Winding data for CP-P18/11-E coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	18	5.8	37	CP-P18/11-1S-E
2	2 × 8.7	2 × 2.6	37	CP-P18/11-2S-E
3	3 × 5.4	3 × 1.6	37	CP-P18/11-3S-E

General data for CP-P18/11-A coil former

ITEM	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.

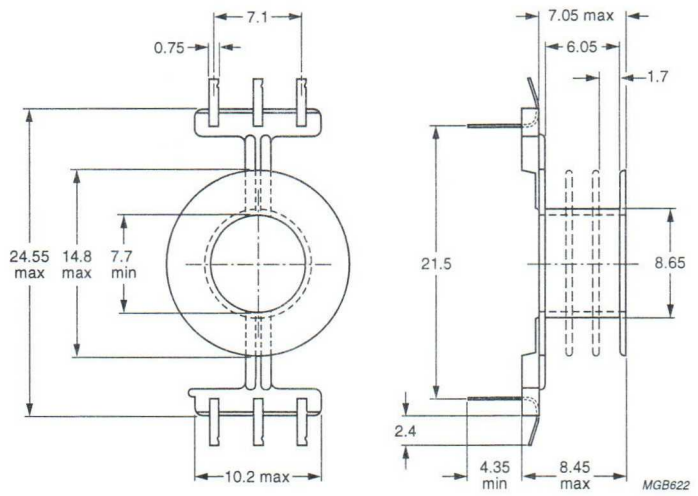
Fig.4 CP-P18/11-A coil former.

Winding data for CP-P18/11-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.85	6.1	37.0	CP-P18/11-1S-A
2	2 × 7.48	2 × 2.8	37.0	CP-P18/11-2S-A
3	3 × 4.45	3 × 1.7	37.0	CP-P18/11-3S-A

General data 6-pins P18/11 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

Fig.5 P18/11 coil former for PCB mounting; 6-pins.

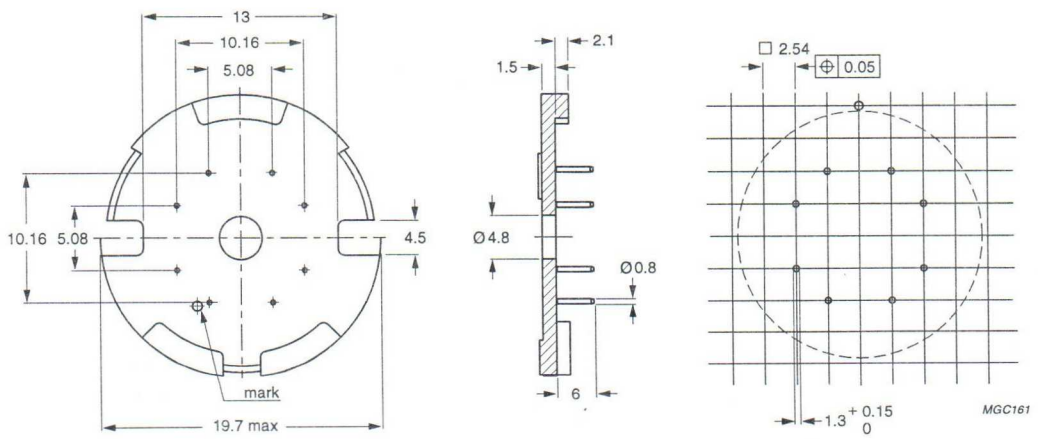
Data for 6-pins P18/11 coil former for PCB mounting

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

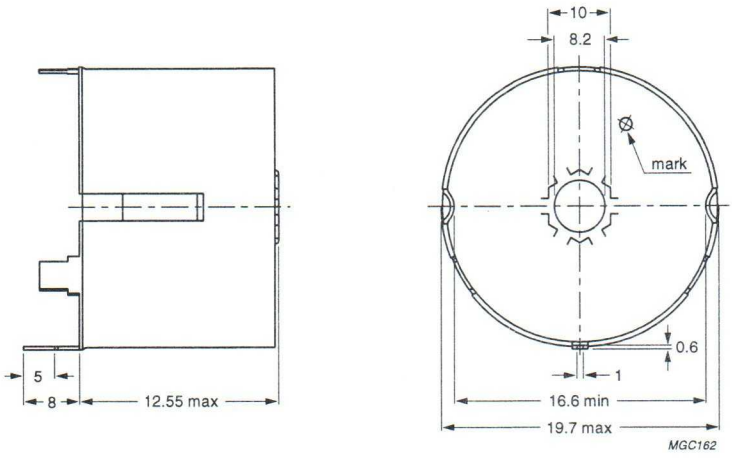
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	6	TGP-P18/11-8P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-plated	7	CON-P18/11
	earth pins: presoldered		
Spring	CrNi-steel	8	SPR-P18/11
	spring force: ≈100 N when mounted		
Nut	copper-zinc alloy, nickel-plated	9	NUT
Bush	nickel-plated copper-zinc alloy	10	FIB
Clamp	spring steel, tin-plated	11	CLM/TP-P18/11
Washer	phenolformaldehyde (PF)	12	WAS-CLM/TP-P18/11



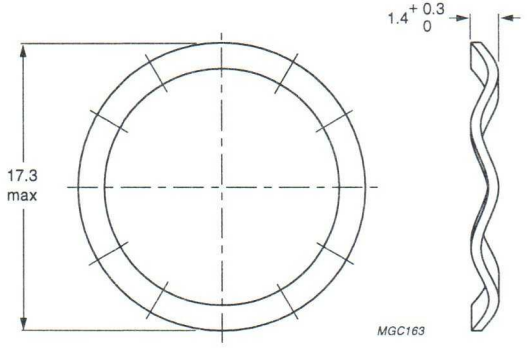
Dimensions in mm.

Fig.6 Tag plate: TGP-P18/11-8P.



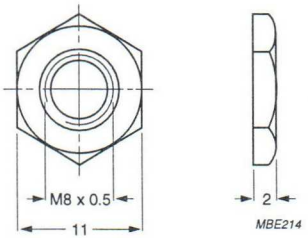
Dimensions in mm.

Fig.7 Container: CON-P18/11.



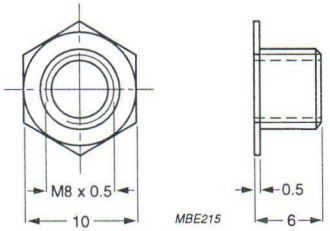
Dimensions in mm.

Fig.8 Spring: SPR-P18/11.



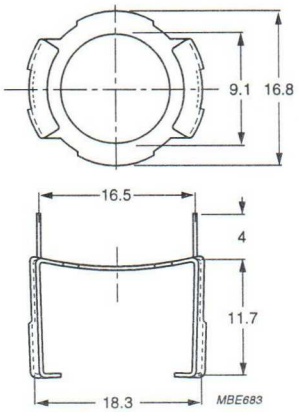
Dimensions in mm.

Fig.9 P18/11 nut: NUT.



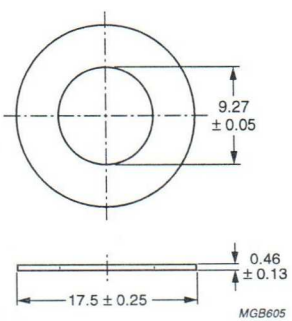
Dimensions in mm.

Fig.10 P18/11 bush: FIB.



Dimensions in mm.

Fig.11 Clamp: CLM/TP-P18/11.



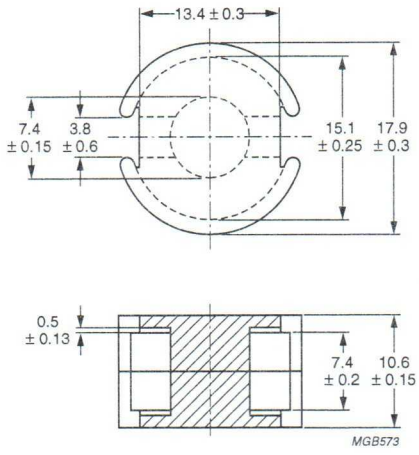
Dimensions in mm.

Fig.12 Washer: WAS-CLM/TP-P18/11.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	32.9	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

GRADE	A_L (1) (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
3C85	160 ±3%	≈72	≈432	P18/11/I-3C85-A160
	250 ±3%	≈112	≈259	P18/11/I-3C85-A250
	315 ±3%	≈141	≈198	P18/11/I-3C85-A315
	400 ±3%	≈179	≈150	P18/11/I-3C85-A400
	630 ±5%	≈282	≈86	P18/11/I-3C85-A630
	3370 ±25%	≈1500	≈0	P18/11/I-3C85

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 30 ±10 N.

Properties of core sets under power conditions

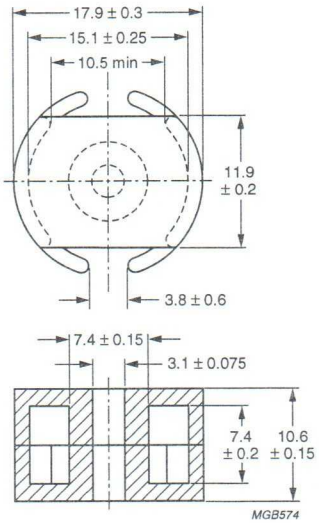
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.26	–	–
3C85	≥320	≤0.20	≤0.23	–
3F3	≥320	–	≤0.14	≤0.24

For coil former and winding data, see *"Data sheet of P18/11"*.

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	100 ±3%	≈53	≈632	PT18/11-3B7-E100
	160 ±3%	≈85	≈366	PT18/11-3B7-E160
	250 ±3%	≈133	≈216	PT18/11-3B7-A250
	315 ±3%	≈168	≈165	PT18/11-3B7-A315
	400 ±5%	≈213	≈124	PT18/11-3B7-A400
	3020 ±25%	≈1609	≈0	PT18/11-3B7
3B9	100 ±3%	≈53	≈632	PT18/11-3B9-E100
	160 ±3%	≈85	≈366	PT18/11-3B9-E160
	250 ±3%	≈133	≈216	PT18/11-3B9-A250
	315 ±3%	≈168	≈165	PT18/11-3B9-A315
	400 ±5%	≈213	≈124	PT18/11-3B9-A400
	2525 ±25%	≈1347	≈0	PT18/11-3B9

P cores and accessories

PT18/11 (1811TS)

GRADE	A_L[1] (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
3C85	100 ±3%	≈53	≈632	PT18/11-3C85-A100
	160 ±3%	≈85	≈366	PT18/11-3C85-A160
	250 ±3%	≈133	≈216	PT18/11-3C85-A250
	315 ±3%	≈168	≈165	PT18/11-3C85-A315
	400 ±5%	≈213	≈124	PT18/11-3C85-A400
	2850 ±25%	≈1340	≈0	PT18/11-3C85
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

Note

1. Clamping force 20 ±5 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥7940	≥4230	≈0	PT18/11-3E5
3E27	5760 ±25%	≈3075	≈0	PT18/11-3E27

Note

1. Clamping force 15 ±5 N.

Properties of core sets under power conditions

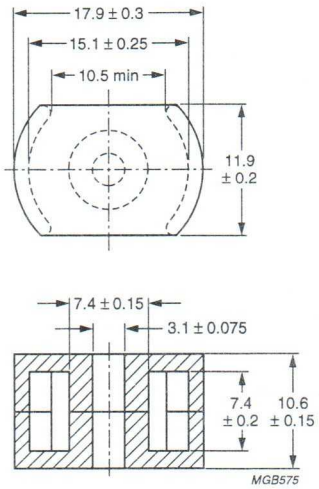
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.23	–	–
3C85	≥320	≤0.17	≤0.20	–
3F3	≥320	–	≤0.12	≤0.21

For coil formers and mounting parts , see *"Data sheet of P18/11"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.770	mm^{-1}
V_e	effective volume	1070	mm^3
l_e	effective length	28.7	mm
A_e	effective area	37.2	mm^2
m	mass of set	≈5	g



Dimensions in mm.

Fig.1 PTS18/11 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	100 ±3%	≈61	≈570	PTS18/11-3B7-E100
	160 ±3%	≈98	≈350	PTS18/11-3B7-E160
	250 ±3%	≈153	≈200	PTS18/11-3B7-A250
	315 ±3%	≈193	≈150	PTS18/11-3B7-A315
	400 ±5%	≈245	≈110	PTS18/11-3B7-A400
	2780 ±25%	≈1710	≈0	PTS18/11-3B7
3B9	100 ±3%	≈61	≈570	PTS18/11-3B9-E100
	160 ±3%	≈98	≈350	PTS18/11-3B9-E160
	250 ±3%	≈153	≈200	PTS18/11-3B9-A250
	315 ±3%	≈193	≈150	PTS18/11-3B9-A315
	400 ±5%	≈245	≈110	PTS18/11-3B9-A400
	2300 ±25%	≈1410	≈0	PTS18/11-3B9

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈61	≈570	PTS18/11-3C81-A100
	160 ±3%	≈98	≈350	PTS18/11-3C81-A160
	250 ±3%	≈153	≈200	PTS18/11-3C81-A250
	315 ±3%	≈193	≈150	PTS18/11-3C81-A315
	400 ±5%	≈245	≈110	PTS18/11-3C81-A400
	3000 ±25%	≈1830	≈0	PTS18/11-3C81
3C85	100 ±3%	≈61	≈570	PTS18/11-3C85-A100
	160 ±3%	≈98	≈350	PTS18/11-3C85-A160
	250 ±3%	≈153	≈200	PTS18/11-3C85-A250
	315 ±3%	≈193	≈150	PTS18/11-3C85-A315
	400 ±5%	≈245	≈110	PTS18/11-3C85-A400
	2400 ±25%	≈1480	≈0	PTS18/11-3C85
3F3	100 ±3%	≈61	≈570	PTS18/11-3F3-A100
	160 ±3%	≈98	≈350	PTS18/11-3F3-A160
	250 ±3%	≈153	≈200	PTS18/11-3F3-A250
	315 ±3%	≈193	≈150	PTS18/11-3F3-A315
	400 ±5%	≈245	≈110	PTS18/11-3F3-A400
	2225 ±25%	≈1365	≈0	PTS18/11-3F3

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥7045	≥4320	≈0	PTS18/11-3E5
3E27	5140 ±25%	≈3150	≈0	PTS18/11-3E27

Note

1. Clamping force 30 ±10 N.

Properties of core sets under power conditions

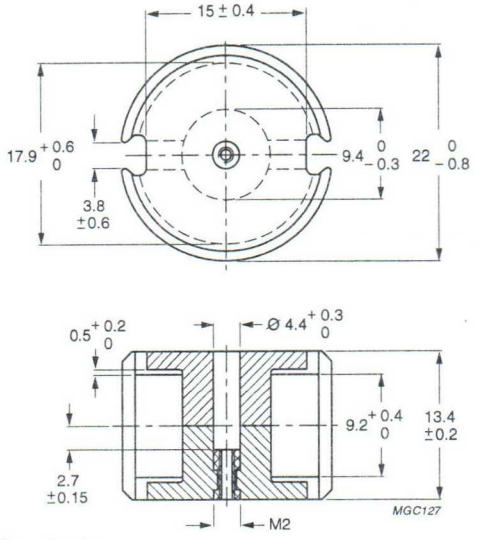
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.22	–	–
3C85	≥320	≤0.17	≤0.19	–
3F3	≥320	–	≤0.12	≤0.20

For coil former and mounting data, see *"Data sheet of P18/11".*

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P22/13 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈10	≈5600	P22/13-4C6-E25/N	P22/13-4C6-E25
	40 ±3%	≈16	≈2900	P22/13-4C6-E40/N	P22/13-4C6-E40
	63 ±3%	≈25	≈1400	P22/13-4C6-E63/N	P22/13-4C6-E63
	250 ±25%	≈100	≈0	–	P22/13-4C6
3D3	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	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
3H1	160 ±3%	≈64	≈500	P22/13-3H1-E160/N	P22/13-3H1-E160
	250 ±3%	≈99	≈300	P22/13-3H1-E250/N	P22/13-3H1-E250
	315 ±3%	≈125	≈250	P22/13-3H1-A315/N	P22/13-3H1-A315
	400 ±3%	≈158	≈170	P22/13-3H1-A400/N	P22/13-3H1-A400
	630 ±3%	≈249	≈100	P22/13-3H1-A630/N	P22/13-3H1-A630
	4300 ±25%	≈1700	≈0	–	P22/13-3H1

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	160 ±3%	≈63	≈500	P22/13-3B7-E160/N	P22/13-3B7-E160
	250 ±3%	≈99	≈300	P22/13-3B7-E250/N	P22/13-3B7-E250
	315 ±3%	≈125	≈250	P22/13-3B7-A315/N	P22/13-3B7-A315
	400 ±3%	≈157	≈170	P22/13-3B7-A400/N	P22/13-3B7-A400
	630 ±3%	≈249	≈100	P22/13-3B7-A630/N	P22/13-3B7-A630
	4650 ±25%	≈1840	≈0	–	P22/13-3B7
3B9	160 ±3%	≈64	≈500	P22/13-3B9-E160/N	P22/13-3B9-E160
	250 ±3%	≈99	≈300	P22/13-3B9-E250/N	P22/13-3B9-E250
	315 ±3%	≈125	≈250	P22/13-3B9-A315/N	P22/13-3B9-A315
	400 ±3%	≈157	≈170	P22/13-3B9-A400/N	P22/13-3B9-A400
	630 ±3%	≈249	≈100	P22/13-3B9-A630/N	P22/13-3B9-A630
	3250 ±25%	≈1280	≈0	–	P22/13-3B9

Note

1. Clamping force 140 ±30 N.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈64	≈500	P22/13-3B8-A160
	250 ±3%	≈99	≈300	P22/13-3B8-A250
	315 ±3%	≈125	≈250	P22/13-3B8-A315
	400 ±3%	≈158	≈170	P22/13-3B8-A400
	630 ±3%	≈249	≈100	P22/13-3B8-A630
	4300 ±25%	≈1700	≈0	P22/13-3B8
3C81	160 ±3%	≈64	≈500	P22/13-3B8-A160
	250 ±3%	≈99	≈300	P22/13-3B8-A250
	315 ±3%	≈125	≈250	P22/13-3B8-A315
	400 ±3%	≈158	≈170	P22/13-3B8-A400
	630 ±3%	≈249	≈100	P22/13-3B8-A630
	5200 ±25%	≈2060	≈0	P22/13-3C81
3C85	160 ±3%	≈64	≈500	P22/13-3C85-A160
	250 ±3%	≈99	≈300	P22/13-3C85-A250
	315 ±3%	≈125	≈250	P22/13-3C85-A315
	400 ±3%	≈158	≈170	P22/13-3C85-A400
	630 ±3%	≈249	≈100	P22/13-3C85-A630
	3900 ±25%	≈1540	≈0	P22/13-3C85

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	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
3F4	160 ±3%	≈64	≈500	P22/13-3F4-A160
	250 ±3%	≈99	≈300	P22/13-3F4-A250
	315 ±3%	≈125	≈250	P22/13-3F4-A315
	400 ±3%	≈158	≈170	P22/13-3F4-A400
	630 ±3%	≈249	≈100	P22/13-3F4-A630
	2000 ±25%	≈800	≈0	P22/13-3F4

Note

1. Clamping force 140 ±30 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E1	6900 ±25%	≈2730	P22/13-3E1
3E5	≥11200	≥4430	P22/13-3E5
3E25	9250 ±25%	≈3660	P22/13-3E25
3E27	9250 ±25%	≈3660	P22/13-3E27
3E4	9450 +40/–30%	≈3740	P22/13-3E4

Note

1. Clamping force 140 ±30 N.

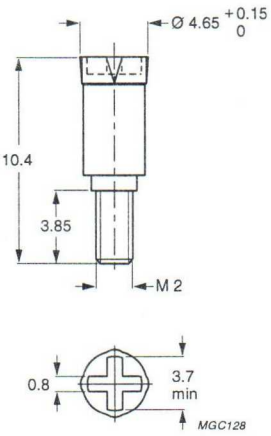
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3B8	≥315	≤0.56	–	–	–	–
3C81	≥315	≤0.41	–	–	–	–
3C85	≥315	≤0.32	≤0.38	–	–	–
3F3	≥315	–	≤0.22	≤0.40	–	–
3F4	≥250	–	–	–	≤0.60	≤0.65

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 P22/13 inductance adjuster.

Inductance adjuster selection chart

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)
3H1; 3H3; 3B7; 3B9	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	28
	250	ADJ-P22/RM8-YELLOW	11	ADJ-P22/RM8-WHITE	18	–	–
	315	ADJ-P22/RM8-YELLOW	9	–	–	ADJ-P22/RM8-BROWN	22
	400	ADJ-P22/RM8-WHITE	12	ADJ-P22/RM8-BROWN	17	ADJ-P22/RM8-BLACK	28
	630	ADJ-P22/RM8-BROWN	11	ADJ-P22/RM8-BLACK	18	–	–
	1000	ADJ-P22/RM8-BROWN	7	ADJ-P22/RM8-BLACK	11	–	–
	1250	ADJ-P22/RM8-BROWN	5	ADJ-P22/RM8-BLACK	9	–	–
3D3	40	–	–	–	–	ADJ-P22/RM8-ORANGE	27
	63	–	–	–	–	ADJ-P22/RM8-ORANGE	25
	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	–	–	–	–	–
4C6	25	ADJ-P22/RM8-GREEN	14	ADJ-P22/RM8-RED	16	–	–
	40	–	–	–	–	ADJ-P22/RM8-ORANGE	24
	63	–	–	ADJ-P22/RM8-RED	15	ADJ-P22/RM8-ORANGE	19
	100	–	–	ADJ-P22/RM8-ORANGE	10	ADJ-P22/RM8-WHITE	20

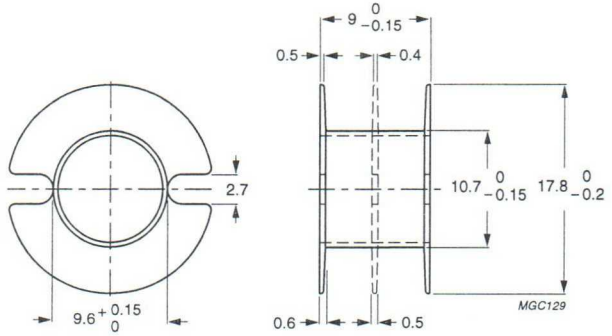
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P22/13-E coil former

ITEM	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.

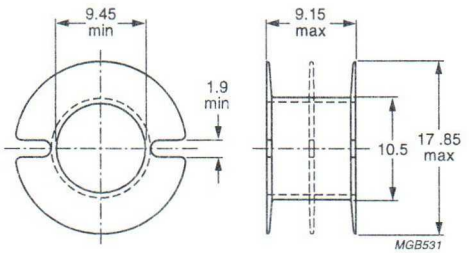
Fig.3 Coil former: CP-P22/13-E.

Winding data for CP-P22/13-E coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	18	7.5	44	CP-P22/13-1S-E
2	2 × 13	2 × 3.5	44	CP-P22/13-2S-E
3	3 × 8.2	3 × 2.1	44	CP-P22/13-3S-E

General data for CP-P22/13-A coil former

ITEM	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-P22/13-A.

Winding data for CP-P22/13-A coil former

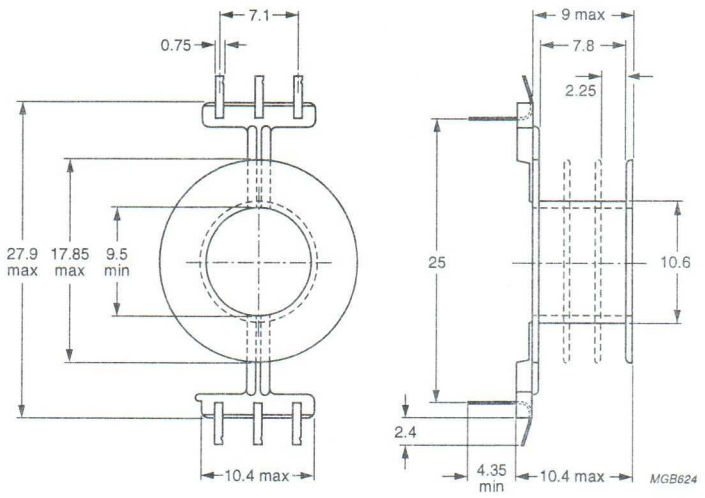
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.5	8.1	44.3	CP-P22/13-1S-A
2	2 × 12.9	2 × 3.9	44.3	CP-P22/13-2S-A
3	3 × 8.01	3 × 2.4	44.3	CP-P22/13-3S-A[1]

Note

1. In accordance with UL 94-HB.

General data 6-pins P22/13 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

Fig.5 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)

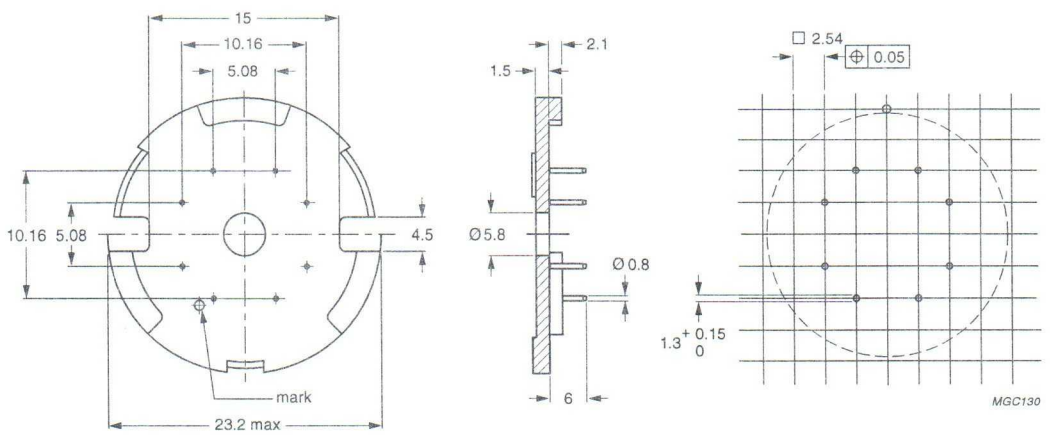
Note

1. In accordance with UL 94-HB.

MOUNTING PARTS

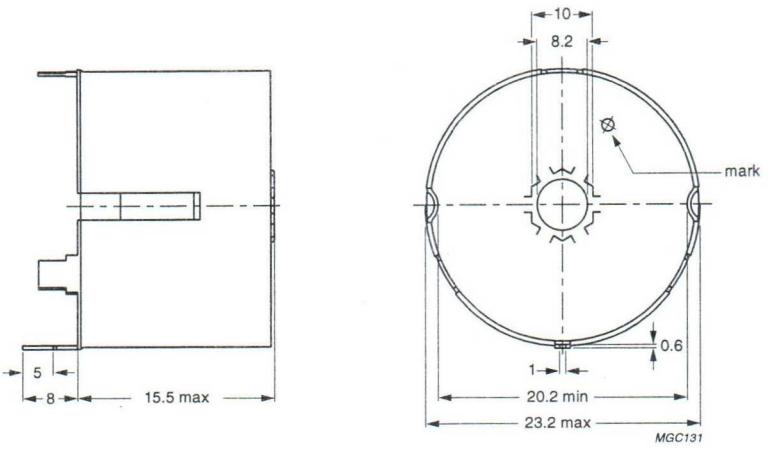
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	6	TGP-P22/13-8P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-plated	7	CON-P22/13
	earth pins: presoldered		
Spring	CrNi-steel	8	SPR-P22/13
	spring force: ≈140 N when mounted		
Nut	copper-zinc alloy, nickel-plated	9	NUT
Bush	copper-zinc alloy, nickel-plated	10	FIB
Clamp	spring steel, tin-plated	11	CLM/TS-P22/13
Washer	phenolformaldehyde (PF)	12	WAS-CLM/TS-P22/13



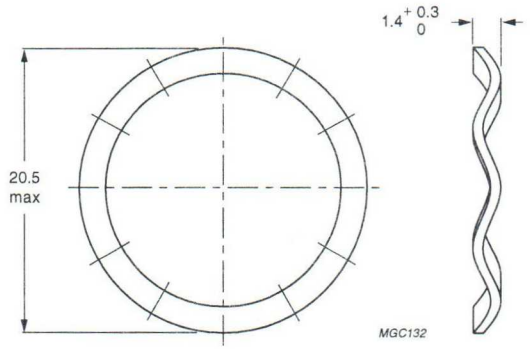
Dimensions in mm.

Fig.6 Tag plate: TGP-P22/13-8P.



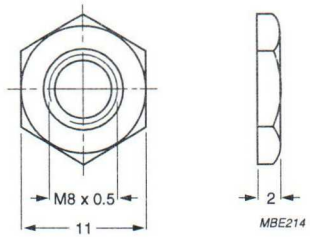
Dimensions in mm.

Fig.7 Container: CON-P22/13.



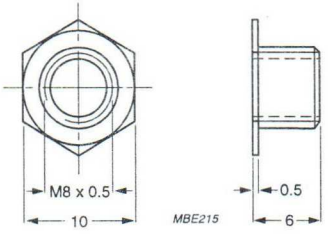
Dimensions in mm.

Fig.8 Spring: SPR-P22/13.



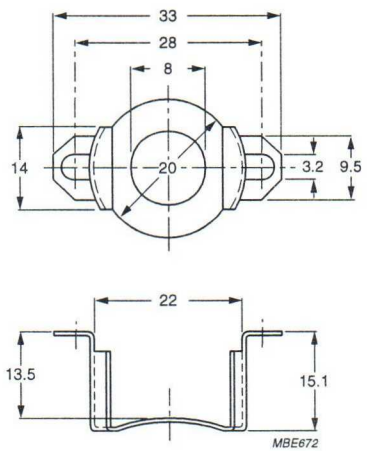
Dimensions in mm.

Fig.9 P22/13 nut: NUT



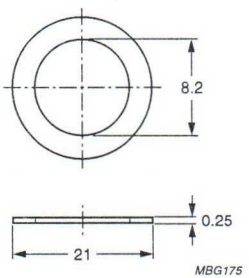
Dimensions in mm.

Fig.10 P22/13 bush: FIB.



Dimensions in mm.

Fig.11 Clamp: CLM/TS-P22/13.



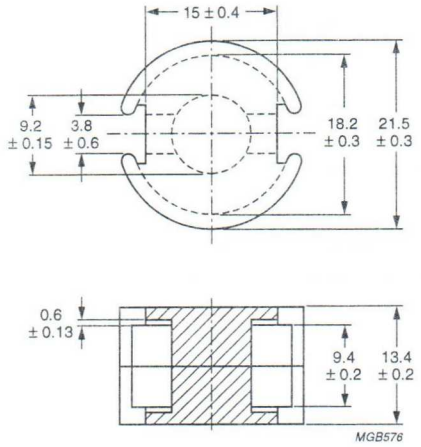
Dimensions in mm.

Fig.12 Washer: WAS-CLM/TS-P22/13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	250 ±3%	≈90	≈417	P22/13/I-3C85-A250
	315 ±3%	≈113	≈320	P22/13/I-3C85-A315
	400 ±3%	≈143	≈241	P22/13/I-3C85-A400
	630 ±3%	≈225	≈142	P22/13/I-3C85-A630
	1000 ±5%	≈358	≈81	P22/13/I-3C85-A1000
	4250 ±25%	≈1520	≈0	P22/13/I-3C85

P cores and accessories P22/13/I

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 40 ±10 N.

Properties of core sets under power conditions

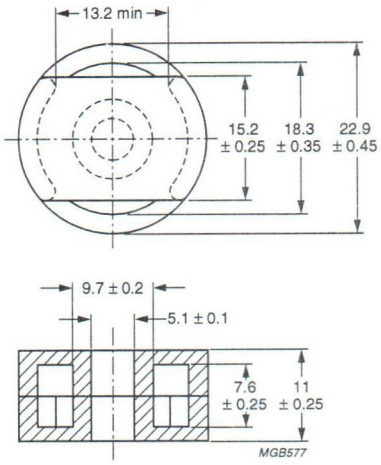
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.50	–	–
3C85	≥320	≤0.38	≤0.44	–
3F3	≥320	–	≤0.27	≤0.47

For coil former and winding data, see *"Data sheet of P22/13"*.

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



Dimensions in mm.

Fig.1 PT23/11 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B9	160 ±3%	≈59	≈564	PT23/11-3B9-A160
	250 ±3%	≈93	≈338	PT23/11-3B9-A250
	315 ±3%	≈117	≈259	PT23/11-3B9-A315
	400 ±3%	≈149	≈196	PT23/11-3B9-A400
	630 ±5%	≈235	≈114	PT23/11-3B9-A630
	4400 ±25%	≈1640	≈0	PT23/11-3B9
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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈59	≈564	PT23/11-3C85-A160
	250 ±3%	≈93	≈338	PT23/11-3C85-A250
	315 ±3%	≈117	≈259	PT23/11-3C85-A315
	400 ±3%	≈149	≈196	PT23/11-3C85-A400
	630 ±5%	≈235	≈114	PT23/11-3C85-A630
	4155 ±25%	≈1550	≈0	PT23/11-3C85
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

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥11300	≥4230	≈0	PT23/11-3E5
3E27	8400 ±25%	≈3134	≈0	PT23/11-3E27

Note

1. Clamping force 30 ±10 N.

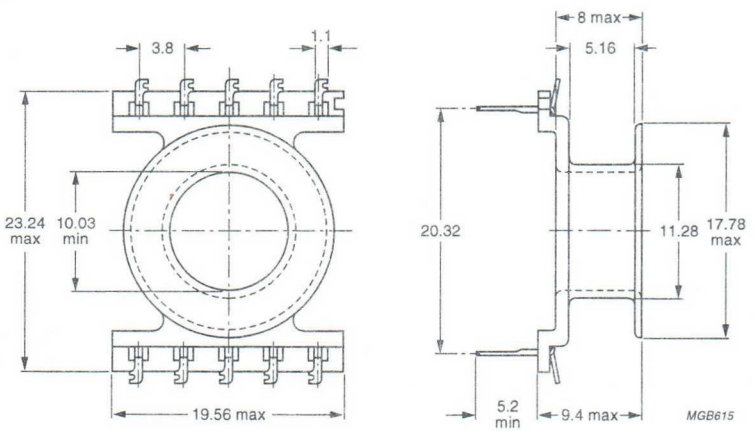
Properties of core sets under power conditions

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	≤0.36	–	–
3C85	≥320	≤0.27	≤0.32	–
3F3	≥320	–	≤0.19	≤0.33

COIL FORMERS

General data 10-pins PT23/11 coil former

ITEM	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
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.

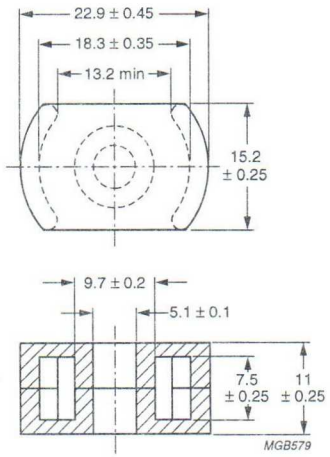
Winding data for 10-pins PT23/11 coil former

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)	0.550	mm^{-1}
V_e	effective volume	1810	mm^3
l_e	effective length	31.6	mm
A_e	effective area	57.2	mm^2
A_{min}	minimum area	53.6	mm^2
m	mass of set	≈9	g



Dimensions in mm.

Fig.1 PTS23/11 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B9	3180 ±25%	≈1400	≈0	PTS23/11-3B9
3C81	160 ±3%	≈70	≈526	PTS23/11-3C81-A160
	250 ±3%	≈110	≈315	PTS23/11-3C81-A250
	315 ±3%	≈138	≈241	PTS23/11-3C81-A315
	400 ±3%	≈175	≈183	PTS23/11-3C81-A400
	630 ±5%	≈276	≈107	PTS23/11-3C81-A630
	4890 ±25%	≈2150	≈0	PTS23/11-3C81
3C85	160 ±3%	≈70	≈526	PTS23/11-3C85-A160
	250 ±3%	≈110	≈315	PTS23/11-3C85-A250
	315 ±3%	≈138	≈241	PTS23/11-3C85-A315
	400 ±3%	≈175	≈183	PTS23/11-3C85-A400
	630 ±5%	≈276	≈107	PTS23/11-3C85-A630
	3560 ±25%	≈1570	≈0	PTS23/11-3C85

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈70	≈526	PTS23/11-3F3-A160
	250 ±3%	≈110	≈315	PTS23/11-3F3-A250
	315 ±3%	≈138	≈241	PTS23/11-3F3-A315
	400 ±3%	≈175	≈183	PTS23/11-3F3-A400
	630 ±5%	≈276	≈107	PTS23/11-3F3-A630
	3280 ±25%	≈1510	≈0	PTS23/11-3F3

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥10220	≥4470	≈0	PTS23/11-3E5
3E27	7250 ±25%	≈3190	≈0	PTS23/11-3E27

Note

1. Clamping force 30 ±10 N.

Properties of core sets under power conditions

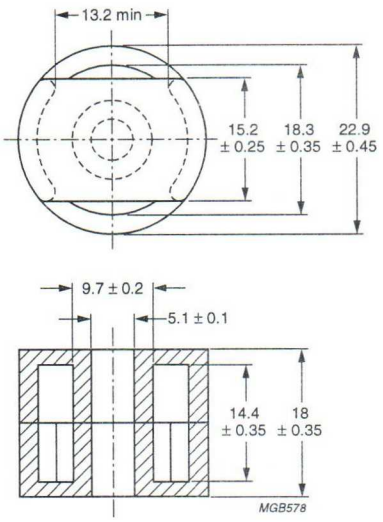
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.37	–	–
3C85	≥320	≤0.28	≤0.33	–
3F3	≥320	–	≤0.20	≤0.35

For coil former data, see *"Data sheet of PT23/11".*

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B9	160 ±3%	≈85	≈581	PT23/18-3B9-A160
	250 ±3%	≈133	≈345	PT23/18-3B9-A250
	315 ±3%	≈168	≈262	PT23/18-3B9-A315
	400 ±3%	≈213	≈196	PT23/18-3B9-A400
	630 ±5%	≈335	≈112	PT23/18-3B9-A630
	3100 ±25%	≈1650	≈0	PT23/18-3B9
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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈85	≈581	PT23/18-3C85-A160
	250 ±3%	≈133	≈345	PT23/18-3C85-A250
	315 ±3%	≈168	≈262	PT23/18-3C85-A315
	400 ±3%	≈213	≈196	PT23/18-3C85-A400
	630 ±5%	≈335	≈112	PT23/18-3B9-A630
	3000 ±25%	≈1600	≈0	PT23/18-3C85
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

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥8500	≥4530	≈0	PT23/18-3E5
3E27	6400 ±25%	≈3410	≈0	PT23/18-3E27

Note

1. Clamping force 30 ±10 N.

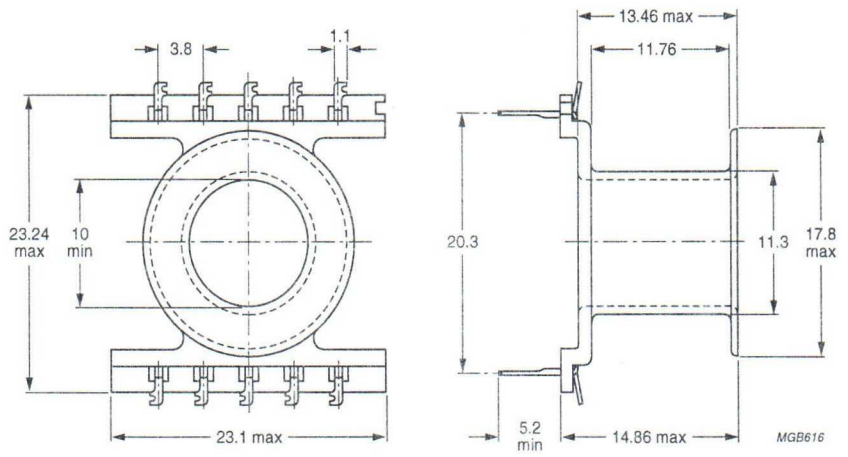
Properties of core sets under power conditions

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	≤0.53	–	–
3C85	≥320	≤0.40	≤0.47	–
3F3	≥320	–	≤0.29	≤0.49

COIL FORMER

General data 10-pins PT23/18 coil former

ITEM	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
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 PT23/18 coil former; 10-pins.

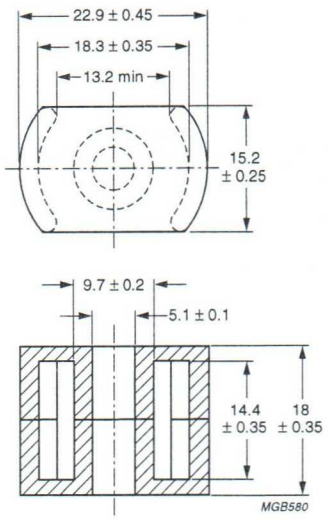
Winding data for 10-pins PT23/18 coil former

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
$\Sigma(l/A)$	core factor (C1)	0.770	mm^{-1}
V_e	effective volume	2630	mm^3
l_e	effective length	45.1	mm
A_e	effective area	58.3	mm^2
A_{min}	minimum area	53.6	mm^2
m	mass of set	≈13	g



Dimensions in mm.

Fig.1 PTS23/18 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B9	2430 ±25%	≈1500	≈0	PTS23/18-3B9
3C81	160 ±3%	≈98	≈546	PTS23/18-3C81-A160
	250 ±3%	≈154	≈320	PTS23/18-3C81-A250
	315 ±3%	≈194	≈241	PTS23/18-3C81-A315
	400 ±3%	≈246	≈180	PTS23/18-3C81-A400
	630 ±5%	≈387	≈102	PTS23/18-3C81-A630
	3800 ±25%	≈2320	≈0	PTS23/18-3C81
3C85	160 ±3%	≈98	≈546	PTS23/18-3C85-A160
	250 ±3%	≈154	≈320	PTS23/18-3C85-A250
	315 ±3%	≈194	≈241	PTS23/18-3C85-A315
	400 ±3%	≈246	≈180	PTS23/18-3C85-A400
	630 ±5%	≈387	≈102	PTS23/18-3C85-A630
	2900 ±25%	≈1770	≈0	PTS23/18-3C85

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈98	≈546	PTS23/18-3F3-A160
	250 ±3%	≈154	≈320	PTS23/18-3F3-A250
	315 ±3%	≈194	≈241	PTS23/18-3F3-A315
	400 ±3%	≈246	≈180	PTS23/18-3F3-A400
	630 ±5%	≈387	≈102	PTS23/18-3F3-A630
	2500 ±25%	≈1500	≈0	PTS23/18-3F3

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥8170	≥5000	≈0	PTS23/18-3E5
3E27	5945 ±25%	≈3630	≈0	PTS23/18-3E27

Note

1. Clamping force 30 ±10 N.

Properties of core sets under power conditions

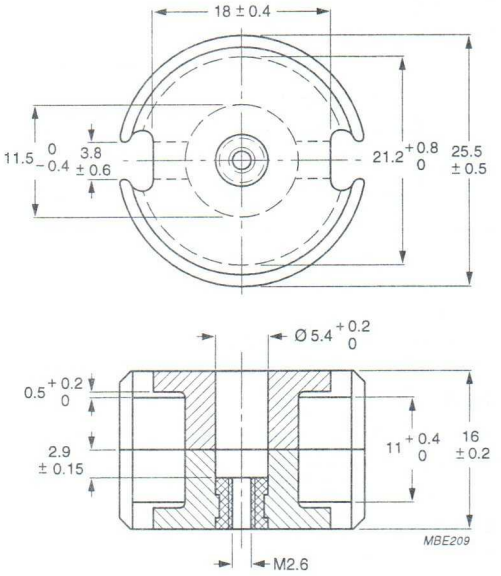
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.54	–	–
3C85	≥320	≤0.41	≤0.48	–
3F3	≥320	–	≤0.29	≤0.50

For coil former data, see *"Data sheet of PT23/18".*

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	63 ±3%	≈20	≈2500	P26/16-4C6-E63/N	P26/16-4C6-E63
	100 ±3%	≈32	≈1100	P26/16-4C6-E100/N	P26/16-4C6-E100
	310 ±25%	≈100	≈0	–	P26/16-4C6
3D3	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	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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	160 ±3%	≈51	≈900	P26/16-3H1-E160/N	P26/16-3H1-E160
	250 ±3%	≈80	≈500	P26/16-3H1-E250/N	P26/16-3H1-E250
	315 ±3%	≈100	≈370	P26/16-3H1-E315/N	P26/16-3H1-E315
	400 ±3%	≈127	≈260	P26/16-3H1-E400/N	P26/16-3H1-E400
	630 ±3%	≈200	≈150	P26/16-3H1-A630/N	P26/16-3H1-A630
	5550 ±25%	≈1760	≈0	–	P26/16-3H1
3B7	160 ±3%	≈51	≈900	P26/16-3B7-E160/N	P26/16-3B7-E160
	250 ±3%	≈80	≈500	P26/16-3B7-E250/N	P26/16-3B7-E250
	315 ±3%	≈100	≈370	P26/16-3B7-E315/N	P26/16-3B7-E315
	400 ±3%	≈127	≈260	P26/16-3B7-E400/N	P26/16-3B7-E400
	630 ±3%	≈200	≈150	P26/16-3B7-A630/N	P26/16-3B7-A630
	6000 ±25%	≈1900	≈0	–	P26/16-3B7
3B9	160 ±3%	≈51	≈900	P26/16-3B9-E160/N	P26/16-3B9-E160
	250 ±3%	≈80	≈500	P26/16-3B9-E250/N	P26/16-3B9-E250
	315 ±3%	≈100	≈370	P26/16-3B9-E315/N	P26/16-3B9-E315
	400 ±3%	≈127	≈260	P26/16-3B9-A400/N	P26/16-3B9-A400
	630 ±3%	≈200	≈150	P26/16-3B9-A630/N	P26/16-3B9-A630
	4390 ±25%	≈1390	≈0	–	P26/16-3B9

Note

1. Clamping force 200 ±50 N.

Core sets for general purpose transformers and power applications

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	250 ±3%	≈80	≈500	P26/16-3B8-A250
	315 ±3%	≈100	≈370	P26/16-3B8-A315
	400 ±3%	≈127	≈260	P26/16-3B8-A400
	630 ±3%	≈200	≈150	P26/16-3B8-A630
	5550 ±25%	≈1760	≈0	P26/16-3B8
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

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	160 ±3%	≈51	≈90	P26/16-3C85-E160
	250 ±3%	≈80	≈500	P26/16-3C85-A250
	315 ±3%	≈100	≈370	P26/16-3C85-A315
	400 ±3%	≈127	≈260	P26/16-3C85-A400
	630 ±3%	≈200	≈150	P26/16-3C85-A630
	5000 ±25%	≈1590	≈0	P26/16-3C85
3F3	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

Note

1. Clamping force 200 ±50 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	TYPE NUMBER
3E1	9000 ±25%	≈2860	P26/16-3E1
3E25	12000 ±25%	≈3810	P26/16-3E25
3E27	12000 ±25%	≈3810	P26/16-3E27
3E4	12100 +40/-30%	≈3850	P26/16-3E4
3E5	≥14000	≥4460	P26/16-3E5

Note

1. Clamping force 200 ±50 N.

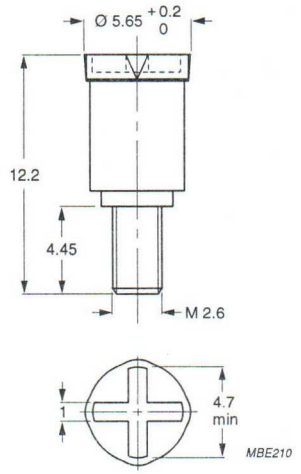
Properties of core sets under power conditions

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
3B8	≥315	≤1.00	–	–
3C81	≥315	≤0.72	–	–
3C85	≥315	≤0.56	≤0.67	–
3F3	≥315	–	≤0.40	≤0.65

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 P26/16 inductance adjuster.

Inductance adjuster selection chart

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)
3H1; 3H3; 3B7; 3B9	63	–	–	–	–	ADJ-P26-RED	25
	100	–	–	–	–	ADJ-P26-RED	22
	160	–	–	ADJ-P26-RED	15	ADJ-P26-WHITE	28
	250	ADJ-P26-RED	11	ADJ-P26-WHITE	18	ADJ-P26-BROWN	21
	315	ADJ-P26-RED	9	ADJ-P26-WHITE	14	ADJ-P26-BROWN	17
	400	ADJ-P26-RED	7	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	6	–	–
3D3	100	–	–	–	–	ADJ-P26-RED	21
	160	–	–	ADJ-P26-RED	14	ADJ-P26-WHITE	23
	250	ADJ-P26-RED	9	ADJ-P26-WHITE	15	ADJ-P26-GREY	27
	400	ADJ-P26-WHITE	9	ADJ-P26-GREY	17	–	–
4C6	63	–	–	–	–	ADJ-P26-RED	21
	100	–	10	ADJ-P26-RED	15	–	–

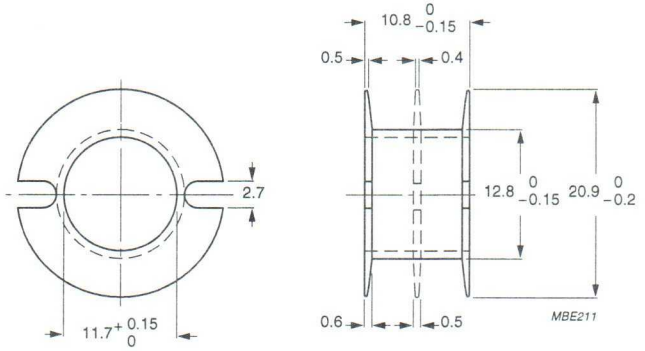
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P26/16-E coil former

ITEM	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.

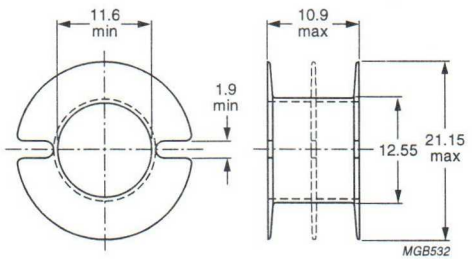
Fig.3 Coil former CP-P26/16-E.

Winding data for CP-P26/16-E coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	39	9.3	53	CP-P26/16-1S-E
2	2 × 19	2 × 4.4	53	CP-P26/16-2S-E
3	3 × 12	3 × 2.7	53	CP-P26/16-3S-E

General data for CP-P26/16-A coil former

ITEM	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.

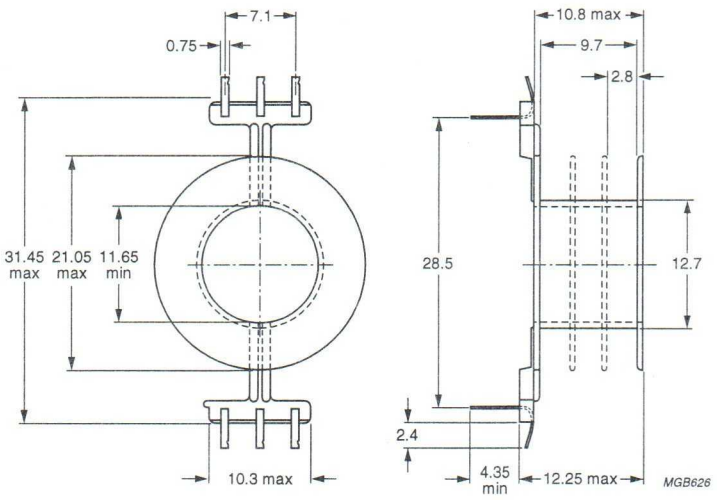
Fig.4 Coil former CP-P26/16-A.

Winding data for CP-P26/16-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	38.4	9.7	52.7	CP-P26/16-1S-A
2	2 × 19.2	2 × 4.6	52.7	CP-P26/16-2S-A
3	3 × 11.1	3 × 2.8	52.7	CP-P26/16-3S-A

General data 6-pins P26/16 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
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, 235 °C, 2 s



Dimensions in mm.

Fig.5 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)

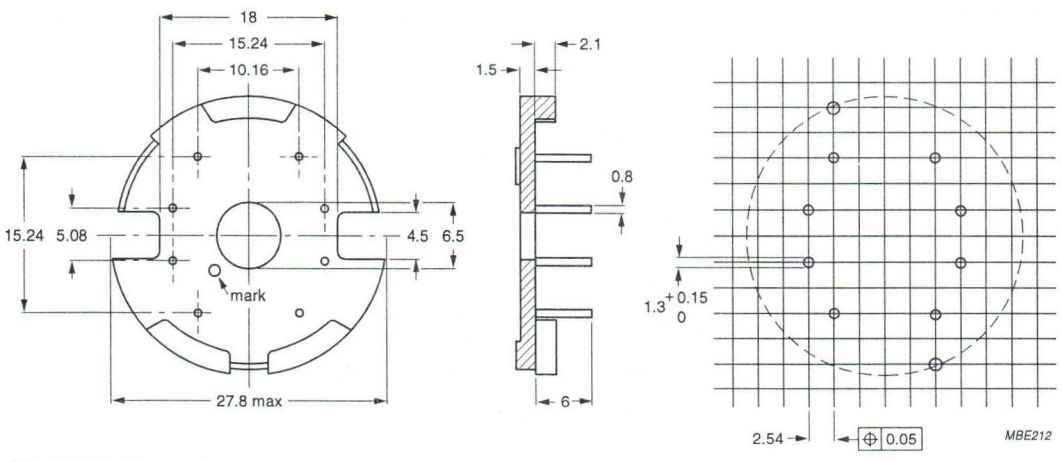
Note

1. In accordance with UL 94-HB.

MOUNTING PARTS

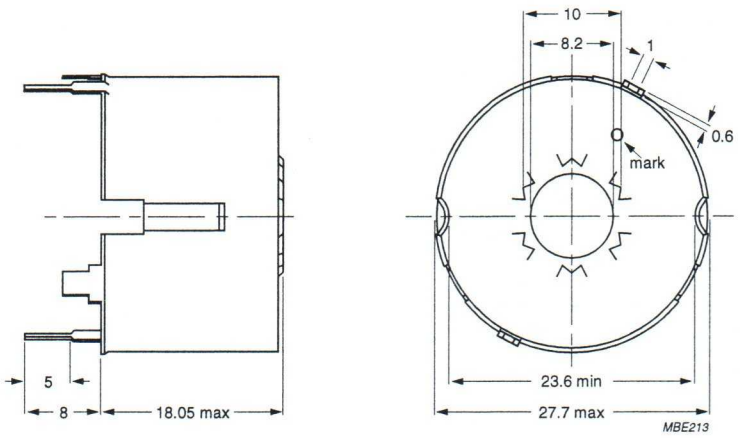
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	6	TGP-P26/16-8P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy, nickel-plated	7	CON-P26/16
	earth pins: presoldered		
Spring	CrNi-steel	8	SPR-P26/16
	spring force: ≈200 N when mounted		
Nut	copper-zinc alloy, nickel-plated	9	NUT
Bush	copper-zinc alloy, nickel-plated	10	FIB
Clamp	spring steel, tin-plated	11	CLM/TP-P26/16



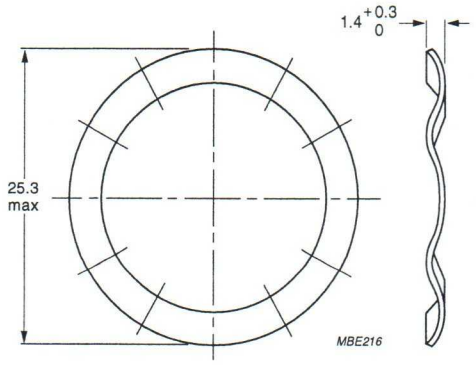
Dimensions in mm.

Fig.6 P26/16 tag plate.



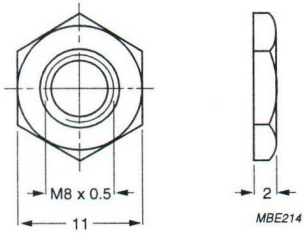
Dimensions in mm.

Fig.7 P26/16 container.



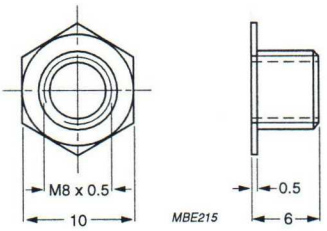
Dimensions in mm.

Fig.8 P26/16 spring.



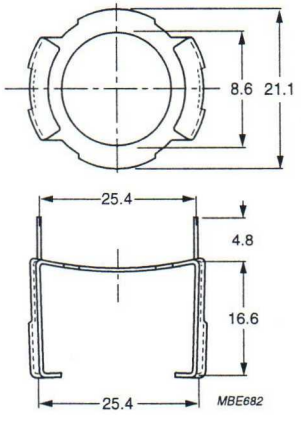
Dimensions in mm.

Fig.9 P26/16 nut.



Dimensions in mm.

Fig.10 P26/16 bush.



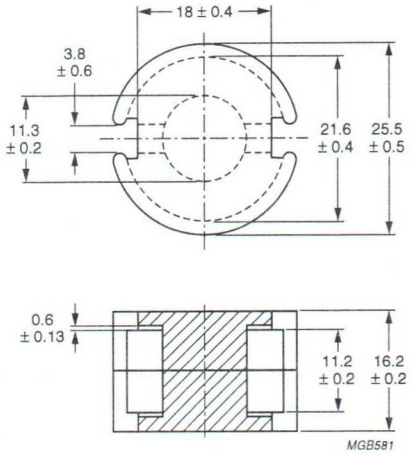
Dimensions in mm.

Fig.11 Clamp: CLM/TP-P26/16.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈72	≈638	P26/16/I-3C81-A250
	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
3C85	250 ±3%	≈72	≈638	P26/16/I-3C85-A250
	315 ±3%	≈90	≈488	P26/16/I-3C85-A315
	400 ±3%	≈115	≈371	P26/16/I-3C85-A400
	630 ±3%	≈181	≈218	P26/16/I-3C85-A630
	1000 ±3%	≈287	≈127	P26/16/I-3C85-A1000
	5550 ±25%	≈1600	≈0	P26/16/I-3C85

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%	≈72	≈638	P26/16/I-3F3-A250
	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

Note

1. Clamping force 50 ±20 N.

Properties of core sets under power conditions

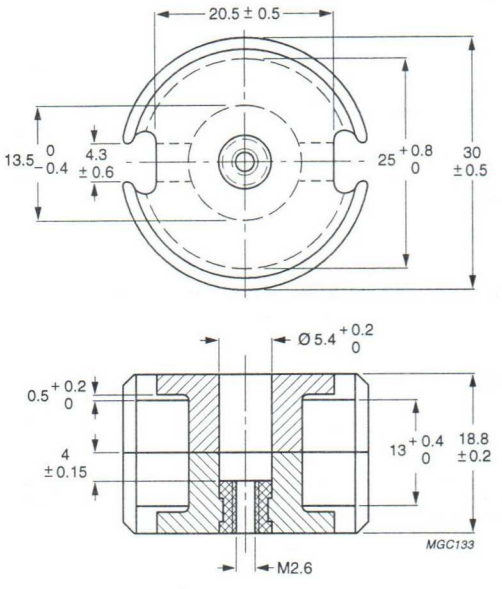
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.89	–	–
3C85	≥320	≤0.68	≤0.79	–
3F3	≥320	–	≤0.48	≤0.83

For coil former and winding data, see *"Data sheet of P26/16"*.

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 filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	250 ±3%	≈66	≈700	P30/19-3H1-E250/N	P30/19-3H1-E250
	315 ±3%	≈83	≈550	P30/19-3H1-E315/N	P30/19-3H1-E315
	400 ±3%	≈105	≈400	P30/19-3H1-E400/N	P30/19-3H1-E400
	630 ±3%	≈165	≈250	P30/19-3H1-A630/N	P30/19-3H1-A630
	1600 ±5%	≈420	≈80	P30/19-3H1-A1600/N	P30/19-3H1-A1600
	7050 ±25%	≈1850	≈0	–	P30/19-3H1
3B7	250 ±3%	≈66	≈700	P30/19-3B7-E250/N	P30/19-3B7-E250
	315 ±3%	≈83	≈550	P30/19-3B7-E315/N	P30/19-3B7-E315
	400 ±3%	≈105	≈400	P30/19-3B7-E400/N	P30/19-3B7-E400
	630 ±3%	≈165	≈250	P30/19-3B7-A630/N	P30/19-3B7-A630
	1000 ±3%	≈263	≈160	P30/19-3B7-A1000/N	P30/19-3B7-A1000
	7850 ±25%	≈1990	≈0	–	P30/19-3B7

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B9	250 ±3%	≈66	≈700	P30/19-3B9-E250/N	P30/19-3B9-E250
	315 ±3%	≈83	≈550	P30/19-3B9-E315/N	P30/19-3B9-E315
	400 ±3%	≈105	≈400	P30/19-3B9-E400/N	P30/19-3B9-E400
	630 ±3%	≈165	≈250	P30/19-3B9-A630/N	P30/19-3B9-A630
	1000 ±3%	≈263	≈160	P30/19-3B9-A1000/N	P30/19-3B9-A1000
	5400 ±25%	≈1410	≈0	–	P30/19-3B9

Note

1. Clamping force 250 ±50 N.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	250 ±3%	≈66	≈700	P30/19-3B8-A250
	315 ±3%	≈83	≈550	P30/19-3B8-A315
	400 ±3%	≈105	≈400	P30/19-3B8-A400
	630 ±3%	≈165	≈250	P30/19-3B8-A630
	7050 ±25%	≈1850	≈0	P30/19-3B8
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
3C85	250 ±3%	≈66	≈700	P30/19-3C85-E250
	315 ±3%	≈83	≈550	P30/19-3C85-A315
	400 ±3%	≈105	≈400	P30/19-3C85-A400
	630 ±3%	≈165	≈250	P30/19-3C85-A630
	1000 ±3%	≈263	≈160	P30/19-3C85-A1000
	6300 ±25%	≈1650	≈0	P30/19-3C85

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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

Note

1. Clamping force 250 ±50 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	10300 ±25%	≈2700	P30/19-3E1
3E25	14000 ±25%	≈3650	P30/19-3E25
3E27	14000 ±25%	≈3650	P30/19-3E27
3E4	15100 +40/-30%	≈3960	P30/19-3E4
3E5	≥18750	≥4920	P30/19-3E5

Note

1. Clamping force 250 ±50 N.

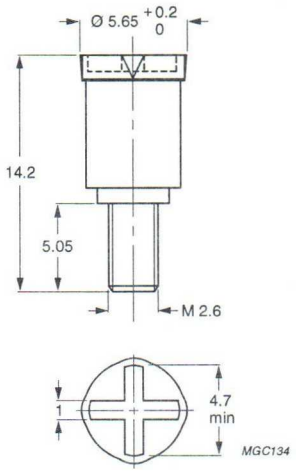
Properties of core sets under power conditions

GRADE[1]	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
3B8	≥315	≤1.75	–	–
3C81	≥315	≤1.26	–	–
3C85	≥315	≤1.00	≤1.20	–
3F3	≥315	–	≤0.70	≤1.20

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 P30/19 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)
3H1; 3H3; 3B7; 3B9	250	–	–	ADJ-P30/RM10-YELLOW	16	–	–
	–	–	–	–	–	–	–
	630	ADJ-P30/RM10-YELLOW	6	–	–	ADJ-P30/RM10-GREY	21
	1000	–	–	ADJ-P30/RM10-GREY	13	–	–
	1600	–	–	ADJ-P30/RM10-GREY	8	–	–
	2500	–	–	–	–	–	–

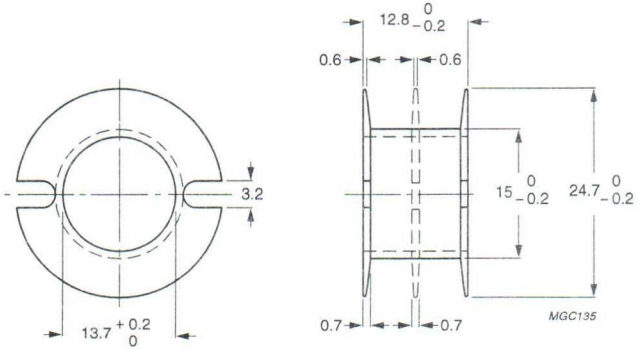
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P30/19-E coil former

ITEM	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.

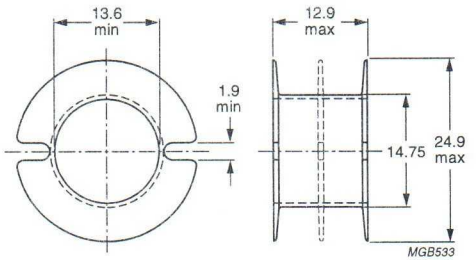
Fig.3 Coil former: CP-P30/19-E.

Winding data for P30/19-E coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	55	11	62	CP-P30/19-1S-E
2	2 × 26	2 × 5.1	62	CP-P30/19-2S-E
3	3 × 16	3 × 3.2	62	CP-P30/19-3S-E

General data CP-P30/19-A coil former

ITEM	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.

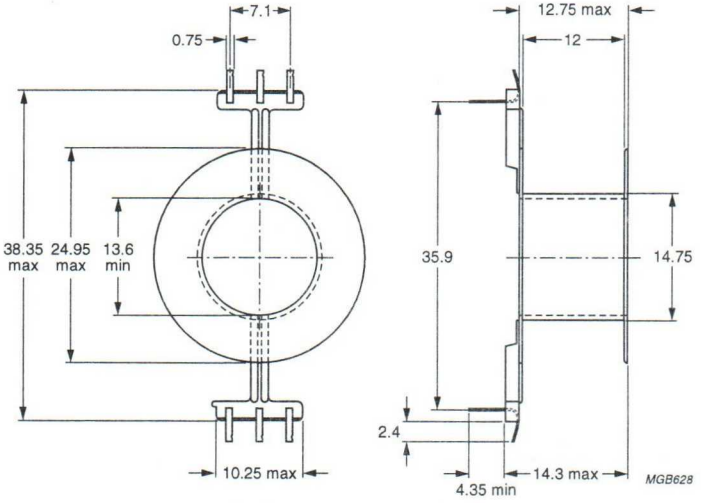
Fig.4 Coil former: CP-P30/19-A.

Winding data for P30/19-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	57.6	11.7	62.1	CP-P30/19-1S-A
2	2 × 27.3	2 × 5.5	62.1	CP-P30/19-2S-A
3	3 × 15.6	3 × 5.5	62.1	CP-P30/19-3S-A

General data 6-pins P30/19 coil former for PCB mounting

ITEM	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
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 68-2-20"*, Part 1, Test Tb, method 1B, 350 °C, 3.5 s. For connection of wire to pins: 430 °C, 2 seconds
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.5 P30/19 coil former for PCB mounting; 6-pins.

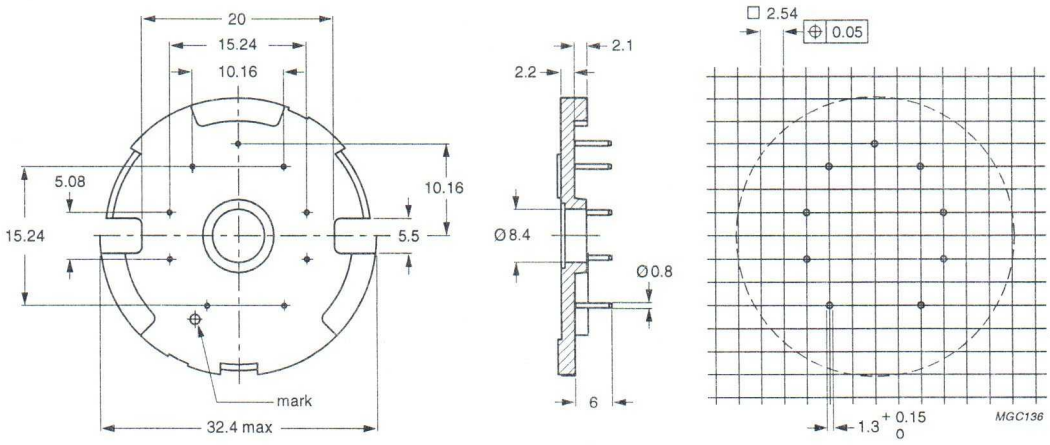
Data for 6-pins P30/19 coil former for PCB mounting

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

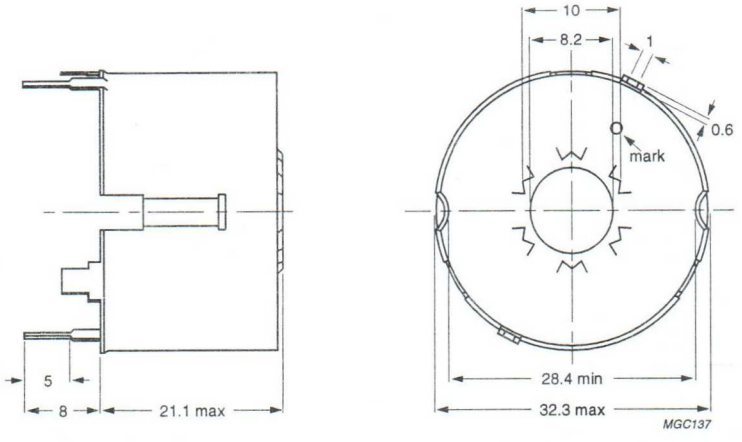
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	6	TGP-P30/19-9P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-plated	7	CON-P30/19
	earth pins: presoldered		
Spring	CrNi-steel	8	SPR-P30/19
	spring force: ≈250 N when mounted		
Nut	copper-zinc alloy, nickel-plated	9	NUT
Bush	copper-zinc alloy, nickel-plated	10	FIB
Clamp	spring steel, tin-plated	11	CLM/TS-P30/19



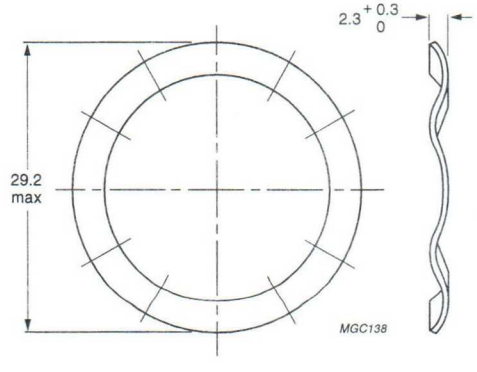
Dimensions in mm.

Fig.6 P30/19 tag plate.



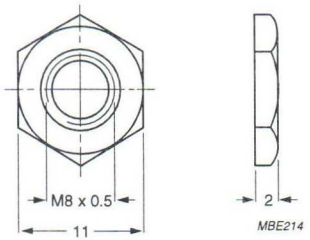
Dimensions in mm.

Fig.7 P30/19 container.



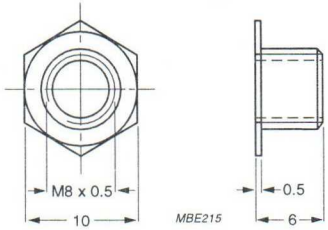
Dimensions in mm.

Fig.8 P30/19 spring.



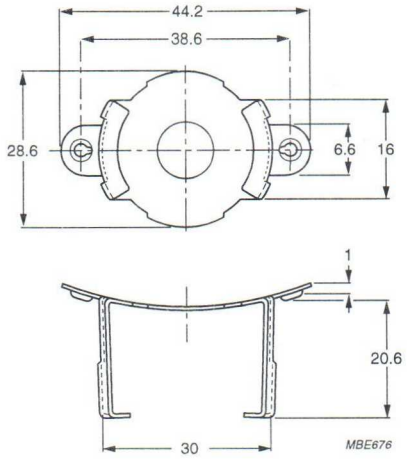
Dimensions in mm.

Fig.9 P30/19 nut.



Dimensions in mm.

Fig.10 P30/19 bush.



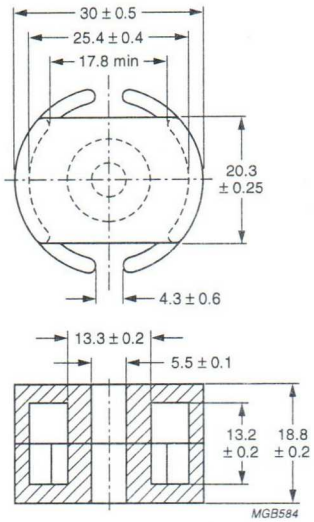
Dimensions in mm.

Fig.11 Clamp CLM/TS-P30/19.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.390	mm^{-1}
V_e	effective volume	5700	mm^3
l_e	effective length	47.1	mm
A_e	effective area	132	mm^2
A_{min}	minimum area	111	mm^2
m	mass of set	≈31	g



Dimensions in mm.

Fig.1 PT30/19 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	315 ±3%	≈98	≈536	PT30/19-3B7-E315
	400 ±3%	≈124	≈406	PT30/19-3B7-E400
	630 ±3%	≈195	≈239	PT30/19-3B7-A630
	1000 ±3%	≈310	≈137	PT30/19-3B7-A1000
	1600 ±5%	≈454	≈84	PT30/19-3B7-A1600
	5480 ±25%	≈1700	≈0	PT30/19-3B7
3B9	315 ±3%	≈98	≈536	PT30/19-3B9-E315
	400 ±3%	≈124	≈406	PT30/19-3B9-E400
	630 ±3%	≈195	≈239	PT30/19-3B9-A630
	1000 ±3%	≈310	≈137	PT30/19-3B9-A1000
	1600 ±5%	≈454	≈84	PT30/19-3B9-A1600
	4010 ±25%	≈1240	≈0	PT30/19-3B9

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈98	≈536	PT30/19-3C81-A315
	400 ±3%	≈124	≈406	PT30/19-3C81-A400
	630 ±3%	≈195	≈239	PT30/19-3C81-A630
	1000 ±3%	≈310	≈137	PT30/19-3C81-A1000
	1600 ±5%	≈454	≈84	PT30/19-3C81-A1600
	5910 ±25%	≈1830	≈0	PT30/19-3C81
3C85	315 ±3%	≈98	≈536	PT30/19-3C85-A315
	400 ±3%	≈124	≈406	PT30/19-3C85-A400
	630 ±3%	≈195	≈239	PT30/19-3C85-A630
	1000 ±3%	≈310	≈137	PT30/19-3C85-A1000
	1600 ±5%	≈454	≈84	PT30/19-3C85-A1600
	4350 ±25%	≈1350	≈0	PT30/19-3C85
3F3	315 ±3%	≈98	≈536	PT30/19-3F3-A315
	400 ±3%	≈124	≈406	PT30/19-3F3-A400
	630 ±3%	≈195	≈239	PT30/19-3F3-A630
	1000 ±3%	≈310	≈137	PT30/19-3F3-A1000
	1600 ±5%	≈454	≈84	PT30/19-3F3-A1600
	4075 ±25%	≈1150	≈0	PT30/19-3F3

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥17500	≥5430	≈0	PT30/19-3E5
3E27	11150 ±25%	≈3470	≈0	PT30/19-3E27

Note

1. Clamping force 60 ±20 N.

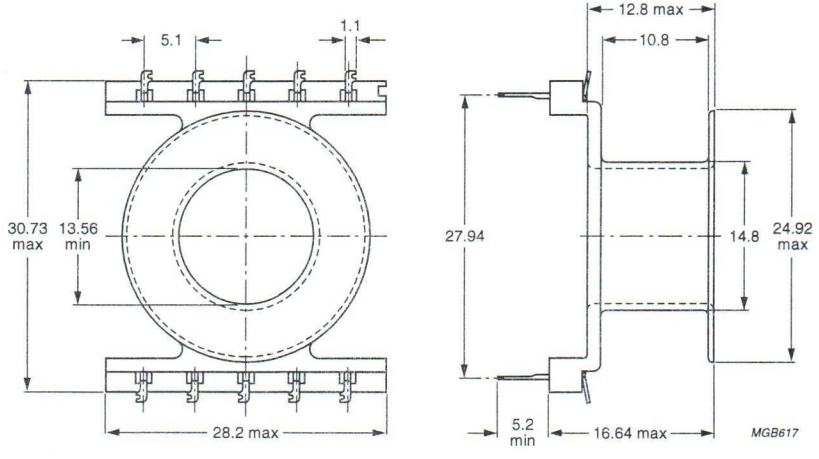
Properties of core sets under power conditions

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	≤1.2	–	–
3C85	≥320	≤0.88	≤1.0	–
3F3	≥320	–	≤0.63	≤1.1

COIL FORMER

General data 10-pins PT30/19 coil former

ITEM	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
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 PT30/19 coil former; 10-pins.

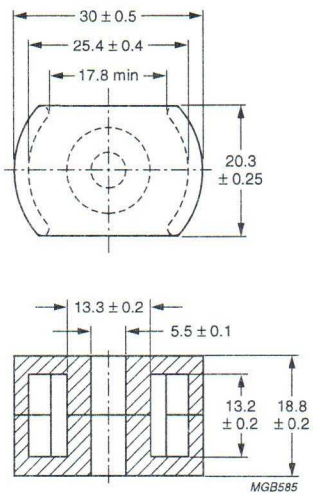
Winding data for 10-pins PT30/19 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	51.9	10.8	62.2	CPV-PT30/19-1S-10P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.450	mm^{-1}
V_e	effective volume	5570	mm^3
l_e	effective length	50.2	mm
A_e	effective area	111	mm^2
A_{min}	minimum area	111	mm^2
m	mass of set	≈30	g



Dimensions in mm.

Fig.1 PTS30/19 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B7	315 ±3%	≈114	≈490	PTS30/19-3B7-E315
	400 ±3%	≈144	≈371	PTS30/19-3B7-E400
	630 ±3%	≈227	≈216	PTS30/19-3B7-A630
	1000 ±3%	≈361	≈122	PTS30/19-3B7-A1000
	1600 ±5%	≈577	≈66	PTS30/19-3B7-A1600
	4955 ±25%	≈1780	≈0	PTS30/19-3B7
3B9	315 ±3%	≈114	≈490	PTS30/19-3B9-E315
	400 ±3%	≈144	≈371	PTS30/19-3B9-E400
	630 ±3%	≈227	≈216	PTS30/19-3B9-A630
	1000 ±5%	≈361	≈122	PTS30/19-3B9-A1000
	1600 ±5%	≈577	≈66	PTS30/19-3B9-A1600
	3925 ±25%	≈1410	≈0	PTS30/19-3B9

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈114	≈490	PTS30/19-3C81-A315
	400 ±3%	≈144	≈371	PTS30/19-3C81-A400
	630 ±3%	≈227	≈216	PTS30/19-3C81-A630
	1000 ±3%	≈361	≈122	PTS30/19-3C81-A1000
	1600 ±5%	≈577	≈66	PTS30/19-3C81-A1600
	5350 ±25%	≈1930	≈0	PTS30/19-3C81
3C85	315 ±3%	≈114	≈490	PTS30/19-3C85-A315
	400 ±3%	≈144	≈371	PTS30/19-3C85-A400
	630 ±3%	≈227	≈216	PTS30/19-3C85-A630
	1000 ±3%	≈361	≈122	PTS30/19-3C85-A1000
	1600 ±5%	≈577	≈66	PTS30/19-3C85-A1600
	4140 ±25%	≈1490	≈0	PTS30/19-3C85
3F3	315 ±3%	≈114	≈490	PTS30/19-3F3-A315
	400 ±3%	≈144	≈371	PTS30/19-3F3-A400
	630 ±3%	≈227	≈216	PTS30/19-3F3-A630
	1000 ±3%	≈361	≈122	PTS30/19-3F3-A1000
	1600 ±5%	≈577	≈66	PTS30/19-3F3-A1600
	4335 ±25%	≈1550	≈0	PTS30/19-3F3

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	≥14000	≥5000	≈0	PTS30/19-3E5
3E27	10800 ±25%	≈3890	≈0	PTS30/19-3E27

Note

1. Clamping force 60 ±20 N.

Properties of core sets under power conditions

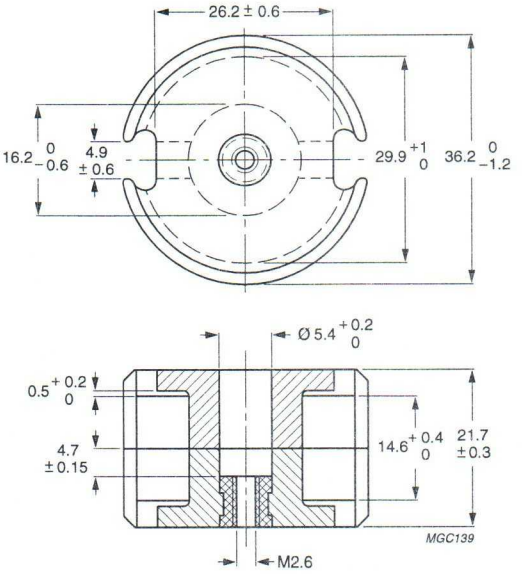
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤1.2	–	–
3C85	≥320	≤0.87	≤1.0	–
3F3	≥320	–	≤0.62	≤1.1

For coil former data, see *"Data sheet of PT30/19".*

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P36/22 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	400 ±3%	≈84	≈640	P36/22-3H1-E400/N	P36/22-3H1-E400
	630 ±3%	≈132	≈380	P36/22-3H1-E630/N	P36/22-3H1-E630
	1600 ±5%	≈336	≈110	P36/22-3H1-A1600/N	P36/22-3H1-A1600
	9000 ±25%	≈1890	≈0	–	P36/22-3H1
3B7	315 ±3%	≈66	≈940	P36/22-3B7-E315/N	P36/22-3B7-E315
	400 ±3%	≈84	≈640	P36/22-3B7-E400/N	P36/22-3B7-E400
	630 ±3%	≈132	≈380	P36/22-3B7-E630/N	P36/22-3B7-E630
	1000 ±3%	≈210	≈200	P36/22-3B7-A1000/N	P36/22-3B7-A1000
	1600 ±5%	≈336	≈110	P36/22-3B7-A1600/N	P36/22-3B7-A1600
	9660 ±25%	2020≈	≈0	–	P36/22-3B7
3B9	315±3%	≈66	≈940	P36/22-3B9-E315/N	P36/22-3B9-E315
	400 ±3%	≈84	≈640	P36/22-3B9-E400/N	P36/22-3B9-E400
	630 ±3%	≈132	≈380	P36/22-3B9-E630/N	P36/22-3B9-E630
	1000 ±3%	≈210	≈200	P36/22-3B9-A1000/N	P36/22-3B9-A1000
	1600 ±5%	≈336	≈110	P36/22-3B9-A1600/N	P36/22-3B9-A1600
	7050 ±25%	≈1480	≈0	–	P36/22-3B9

Note

1. Clamping force 350 ±50 N.

Core sets for general purpose transformers and power applications

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	250 ±3%	≈53	≈1100	P36/22-3B8-A250
	315 ±3%	≈66	≈800	P36/22-3B8-A315
	400 ±3%	≈84	≈600	P36/22-3B8-A400
	630 ±3%	≈132	≈400	P36/22-3B8-A630
	9000 ±25%	≈1890	≈0	P36/22-3B8
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 ±25%	≈336	≈160	P36/22-3C81-A1600
	10800 ±25%	≈2260	≈0	P36/22-3C81
3C85	250 ±3%	≈53	≈1100	P36/22-3C85-E250
	315 ±3%	≈66	≈800	P36/22-3C85-E315
	400 ±3%	≈84	≈600	P36/22-3C85-E400
	630 ±3%	≈132	≈400	P36/22-3C85-A630
	1000 ±3%	≈210	≈200	P36/22-3C85-A1000
	1600 ±25%	≈336	≈160	P36/22-3C85-A1600
	8000 ±25%	≈1680	≈0	P36/22-3C85
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 ±25%	≈336	≈160	P36/22-3F3-A1600
	7350 ±25%	≈1540	≈0	P36/22-3F3

Note

1. Clamping force 350 ±50 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	13300 ±25%	≈2800	P36/22-3E1
3E25	17500 ±25%	≈3670	P36/22-3E25
3E27	17500 ±25%	≈3670	P36/22-3E27
3E4	19300 +40/-30%	≈4050	P36/22-3E4
3E5	≥24500	≥5130	P36/22-3E5

Note

1. Clamping force 350 ±50 N.

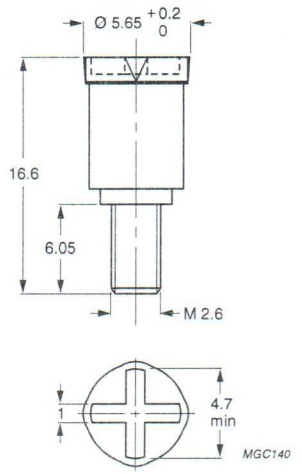
Properties of core sets under power conditions

GRADE[1]	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
3B8	≥315	≤3.0	–	–
3C81	≥315	≤2.2	–	–
3C85	≥315	≤1.7	≤2.0	–
3F3	≥315	–	≤1.2	≤2.0

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 P36/22 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L^{(1)}$
3H1; 3B7; 3B9	100	–	–	–	–	ADJ-P36/42-WHITE	28
	160	–	–	–	–	ADJ-P36/42-WHITE	24
	250	–	–	–	–	ADJ-P36/42-WHITE	18
	400	–	–	ADJ-P36/42-WHITE	12	–	–
	630	–	–	ADJ-P36/42-WHITE	8	–	–
	1000	ADJ-P36/42-WHITE	5	ADJ-P36/42-GREY	20	–	–
	1250	–	–	ADJ-P36/42-GREY	17	–	–
	1600	–	–	ADJ-P36/42-GREY	12	–	–
	2500	–	–	ADJ-P36/42-GREY	8	–	–

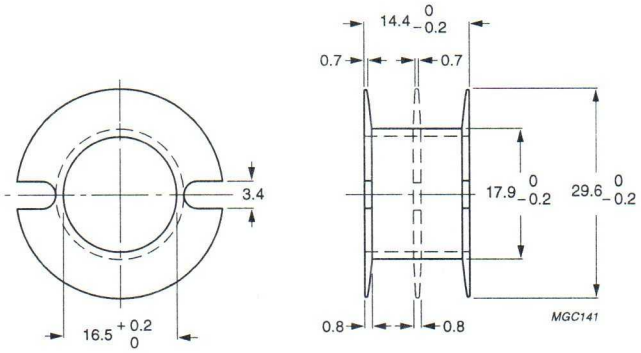
Note

1. Maximum adjustment range.

COIL FORMERS

General data for coil former CP-P36/22-E

ITEM	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.

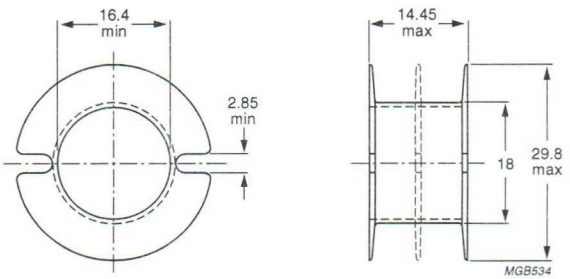
Fig.3 Coil former CP-P36/22-E.

Winding data for coil former CP-P36/22-E

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	75	12.5	74	CP-P36/22-1S-E
2	2 × 35	2 × 5.8	74	CP-P36/22-2S-E
3	3 × 22	3 × 3.6	74	CP-P36/22-3S-E

General data for coil former CP-P36/22-A

ITEM	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-P36/22-A.

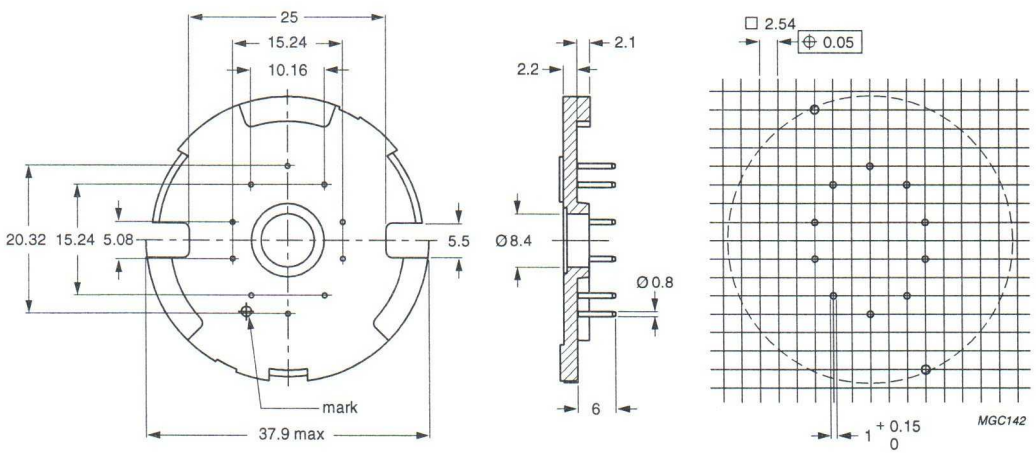
Winding data for coil former CP-P36/22-A

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	71.2	13.2	74.9	CP-P36/22-1S-A
2	2 × 33.7	2 × 6.2	74.9	CP-P36/22-2S-A
3	3 × 21.1	3 × 3.8	74.9	CP-P36/22-3S-A

MOUNTING PARTS

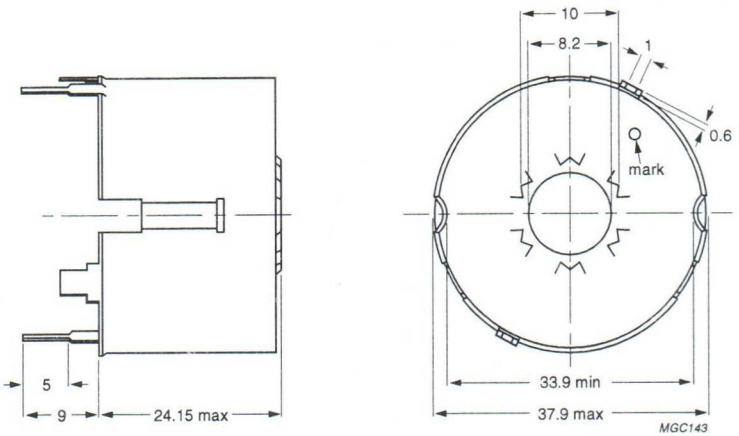
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P36/22-10P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-plated	6	CON-P36/22
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P36/22
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB



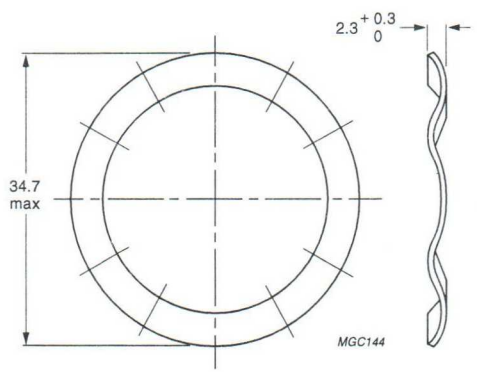
Dimensions in mm.

Fig.5 P36/22 tag plate.



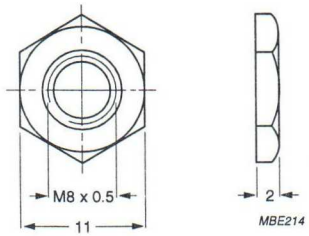
Dimensions in mm.

Fig.6 P36/22 container.



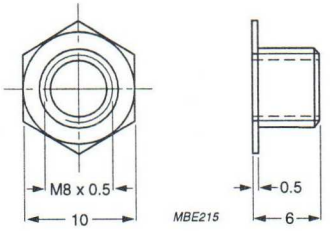
Dimensions in mm.

Fig.7 P36/22 spring.



Dimensions in mm.

Fig.8 P36/22 nut.



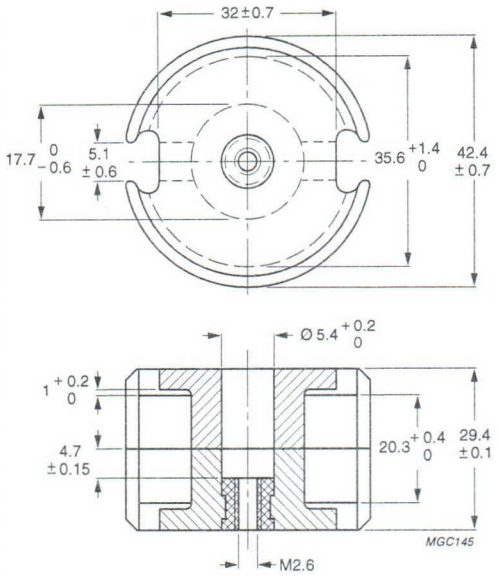
Dimensions in mm.

Fig.9 P36/22 bush.

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 filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	315 ±3%	≈65	≈1100	P42/29-3H1-E315/N	P42/29-3H1-E315
	400 ±3%	≈81	≈830	P42/29-3H1-E400/N	P42/29-3H1-E400
	630 ±3%	≈130	≈450	P42/29-3H1-A630/N	P42/29-3H1-A630
	1600 ±5%	≈325	≈150	P42/29-3H1-A1600/N	P42/29-3H1-A1600
	9500 ±25%	≈1930	≈0	–	P42/29-3H1
3B7	315 ±3%	≈65	≈1100	P42/29-3B7-E315/N	P42/29-3B7-E315
	400 ±3%	≈81	≈830	P42/29-3B7-E400/N	P42/29-3B7-E400
	630 ±3%	≈130	≈450	P42/29-3B7-E630/N	P42/29-3B7-E630
	1000 ±3%	≈205	≈270	P42/29-3B7-A1000/N	P42/29-3B7-A1000
	1600 ±5%	≈325	≈150	P42/29-3B7-A1600/N	P42/29-3B7-A1600
	10300 ±25%	≈2090	≈0	–	P42/29-3B7

Note

1. Clamping force 550 ±100 N.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (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
3C85	315 ±3%	≈65	≈1100	P42/29-3C85-E315
	400 ±3%	≈81	≈800	P42/29-3C85-E400
	630 ±3%	≈130	≈500	P42/29-3C85-A630
	1000 ±3%	≈205	≈270	P42/29-3C85-A1000
	1600 ±5%	≈325	≈150	P42/29-3C85-A1600
	8500 ±25%	≈1750	≈0	P42/29-3C85
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

Note

1. Clamping force 550 ±100 N.

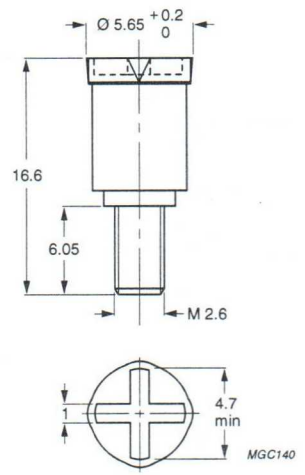
Properties of core sets under power conditions

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	≥315	≤3.7	≤	–
3C85	≥315	≤2.9	≤3.4	–
3F3	≥315	–	≤2.0	≤3.5

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 P42/29 inductance adjuster.

Inductance adjuster selection chart

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)
3H1; 3B7	100	–	–	–	–	ADJ-P36/P42-WHITE	23
	250	–	–	–	–	ADJ-P36/P42-WHITE	16
	400	ADJ-P36/P42-WHITE	7	ADJ-P36/P42-WHITE	11	–	–
	630	–	–	ADJ-P36/P42-WHITE	7	ADJ-P36/P42-GREY	28
	1000	–	–	ADJ-P36/P42-GREY	18	–	–
	1600	–	–	ADJ-P36/P42-GREY	11	–	–

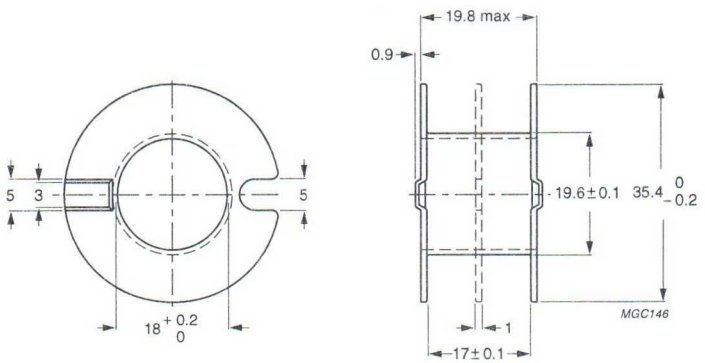
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P11/7-E coil former

ITEM	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.

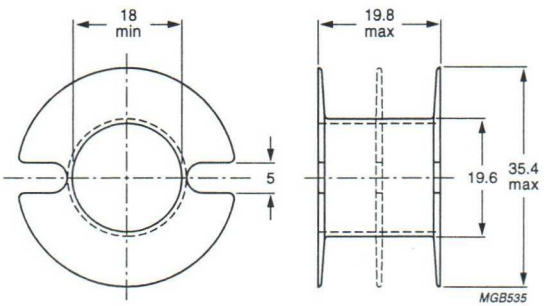
Fig.3 Coil former: CP-P11/7-E.

Winding data for CP-P11/7-E 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-E
2	2 × 63	2 × 8	86	CP-P42/29-2S-E

General data for CP-P42/29-A coil former

ITEM	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-P42/29-A.

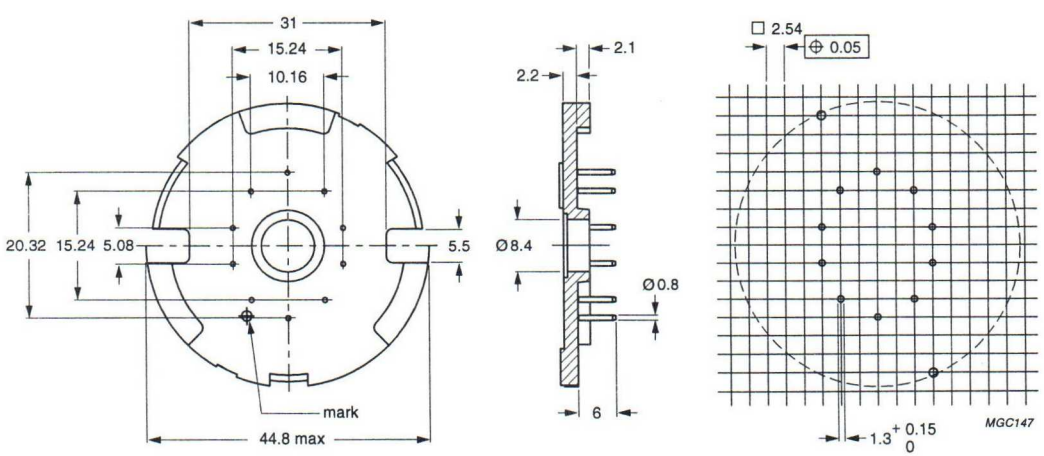
Winding data for CP-P42/29-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	137	17.8	86.3	CP-P42/29-1S-A
2	2×65	2×8.4	86.3	CP-P42/29-2S-A

MOUNTING PARTS

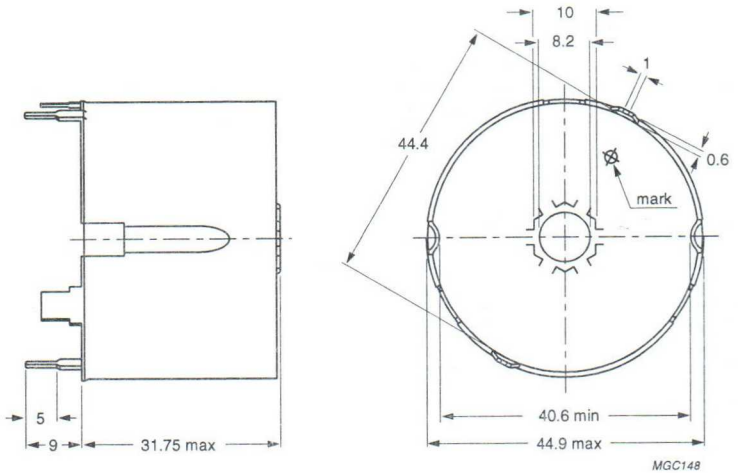
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P42/29-10P
	flame retardant: in accordance with UL 94V-0; UL file number E63312(M)		
	maximum operating temperature: 180 °C, IEC 85 class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 68-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 68-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), nickel-plated	6	CON-P42/29
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P42/29
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB



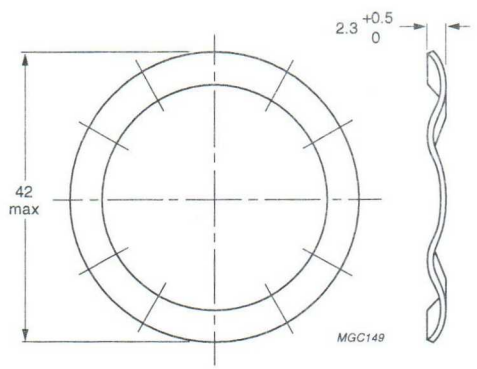
Dimensions in mm.

Fig.5 P42/29 tag plate.



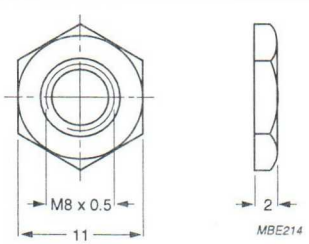
Dimensions in mm.

Fig.6 P42/29 container.



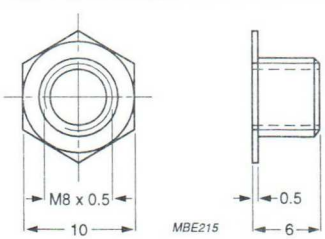
Dimensions in mm.

Fig.7 P42/29 spring.



Dimensions in mm.

Fig.8 P42/29 nut.



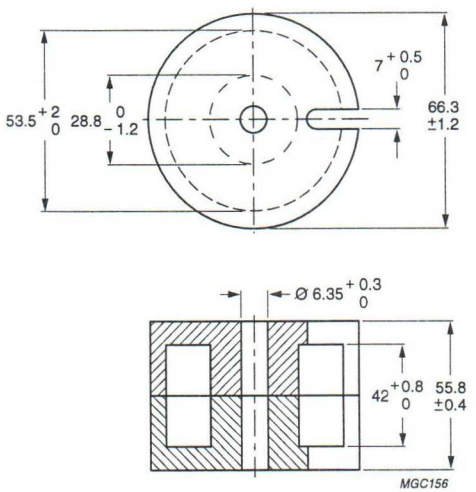
Dimensions in mm.

Fig.9 P42/29 bush.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P66/56 core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	18200 ±25%	≈2490	≈0	P66/56-3C81
3E1	≥14000	≥1910	≈0	P66/56-3E1
3F3	≥9250	≥1260	≈0	P66/56-3F3

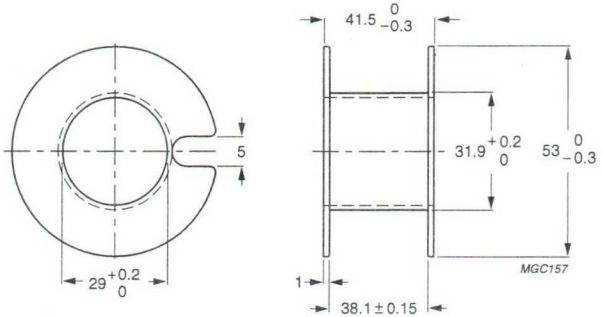
Note

1. Clamping force 1000 ±300 N.

COIL FORMER

General data

ITEM	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

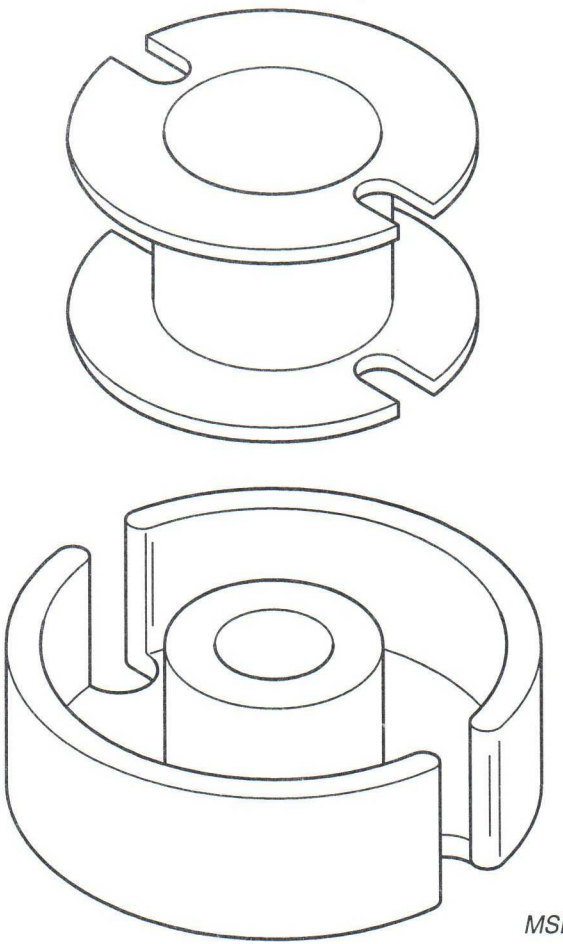


Dimensions in mm.

Fig.2 P66/56 coil former.

Winding data for P66/56 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	400	37.9	130	CP-P66/56-1S



MSB605

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PH cores

CORE TYPE
PH5.6/3.6
PH7.4/3.9
PH9.4/4.8
PH14/7.5
PH26/9.2

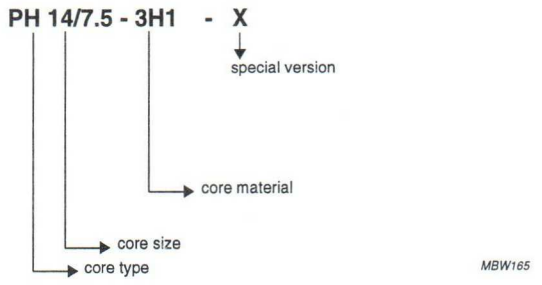


Fig.1 Type number structure for cores.

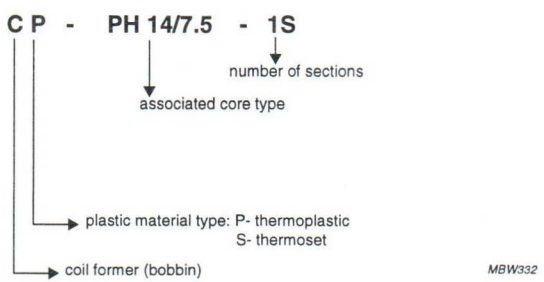


Fig.2 Type number structure for coil formers.

CORE HALF

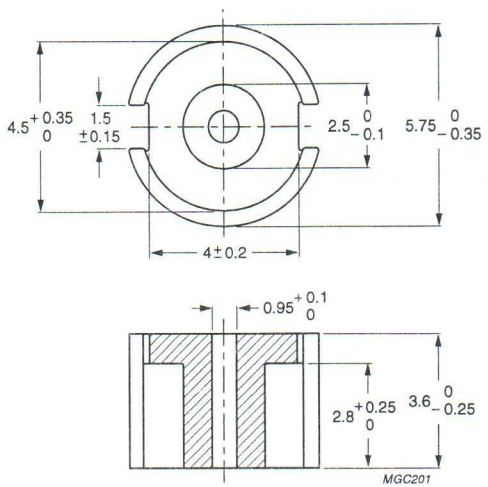
Ordering information

GRADE	TYPE NUMBER
3D3	PH5.6/3.6-3D3

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with UL 94V-1, UL file number E41938(M)
Maximum operating temperature	130 °C, IEC 85 class B

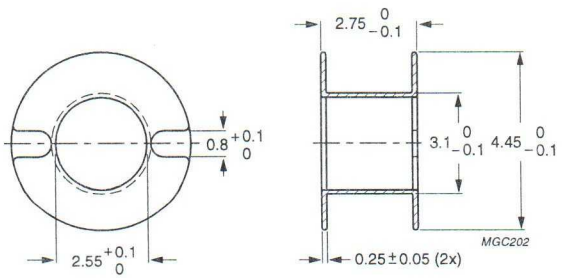


Dimensions in mm.

Fig.1 PH5.6/3.6 core half.

Winding data for PH5.6/3.6 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.9	2.05	11.7	CP-PH5.6/3.6-1S



Dimensions in mm.

Fig.2 PH5.6/3.6 coil former.

CORE HALF

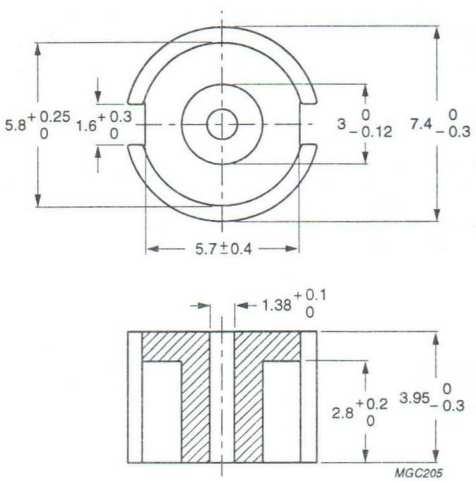
Ordering information

GRADE	TYPE NUMBER
3D3	PH7.4/3.9-3D3

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with UL 94V-1 UL file number E41938(M)
Maximum operating temperature	130 °C, IEC 85 class B

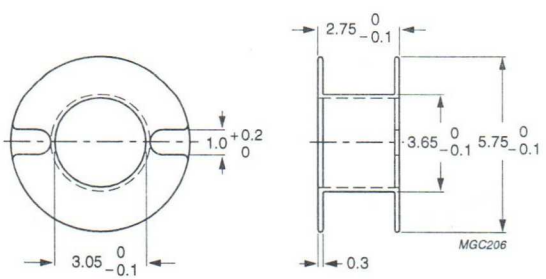


Dimensions in mm.

Fig.1 PH7.4/3.9 core half.

Winding data for PH7.4/3.9 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.2	2.0	14.6	CP-PH7.4/3.9-1S



Dimensions in mm.

Fig.2 PH7.4/3.9 coil former.

CORE HALF

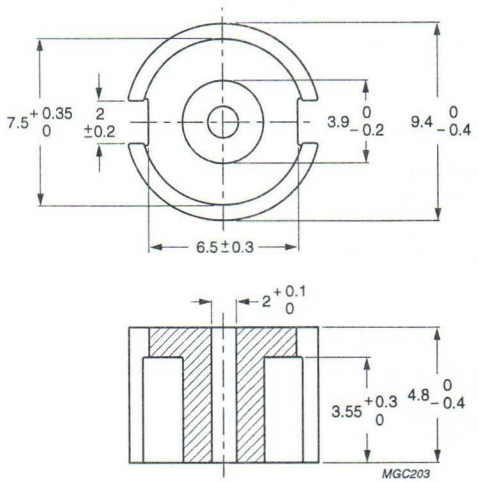
Ordering information

GRADE	TYPE NUMBER
3D3	PH9.4/4.8-3D3

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-2, UL file number E41613(M)
Maximum operating temperature	130 °C, IEC 85 class B

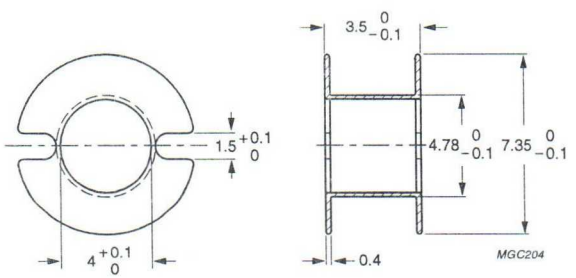


Dimensions in mm.

Fig.1 PH9.4/4.8 core half.

Winding data for PH9.4/4.8 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.4	2.7	19	CP-PH9.4/4.8-1S



Dimensions in mm.

Fig.2 PH9.4/4.8 coil former.

CORE HALF

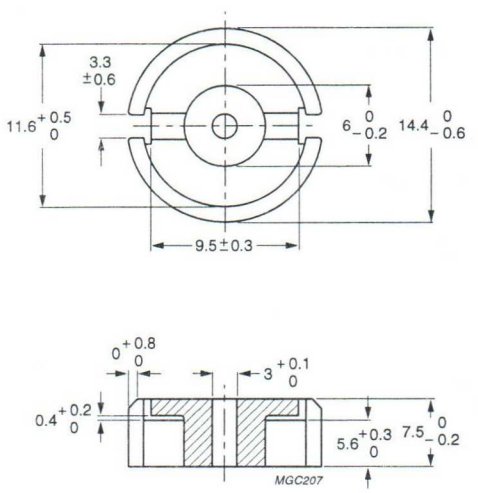
Ordering information

GRADE	TYPE NUMBER
3H1	PH14/7.5-3H1

COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-2, UL file number E41613(M)
Maximum operating temperature	130 °C, IEC 85 class B

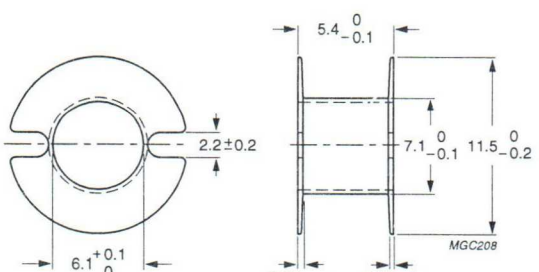


Dimensions in mm.

Fig.1 PH14/7.5 core half.

Winding data for PH14/7.5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	9.7	4.2	29	CP-PH14/7.5-1S



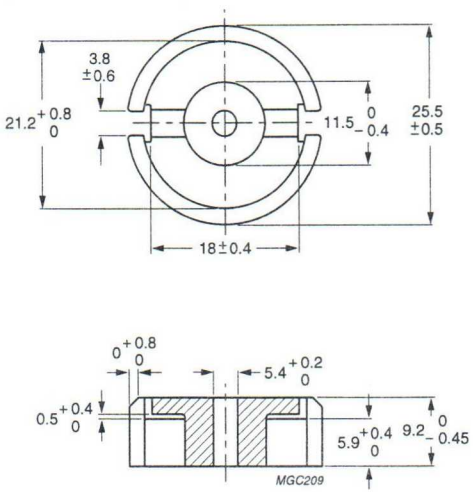
Dimensions in mm.

Fig.2 PH14/7.5 coil former.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3H1	PH26/9.2-3H1



Dimensions in mm.

Fig.1 PH26/9.2 core half.

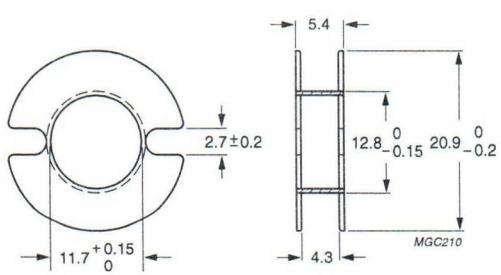
COIL FORMER

General data

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-2, UL file number E41613(M)
Maximum operating temperature	130 °C, IEC 85 class B

Winding data for PH26/9.2 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	22	4.3	14.6	CP-PH26/9.2-1S



Dimensions in mm.

Fig.2 PH26/9.2 coil former.

PQ cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PQ cores

Core type	V_e (mm^3)	V_e (mm^3)	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

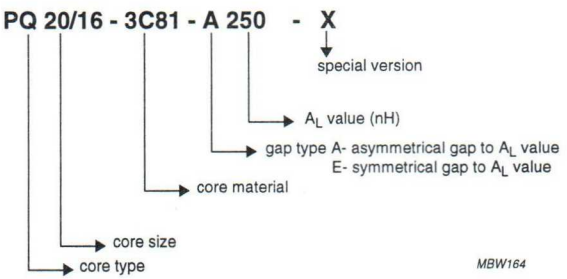


Fig.1 Type number structure for cores.

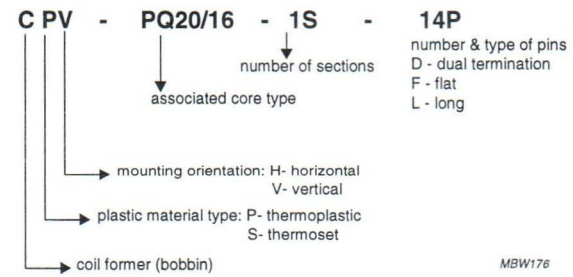
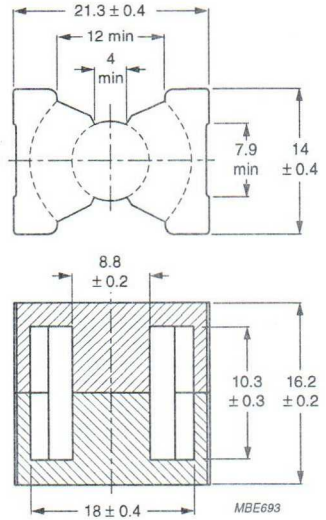


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	160 ±3%	≈78	≈577	PQ20/16-3C85-A160
	250 ±3%	≈121	≈340	PQ20/16-3C85-A250
	315 ±3%	≈153	≈262	PQ20/16-3C85-A315
	400 ±3%	≈194	≈196	PQ20/16-3C85-A400
	630 ±5%	≈305	≈114	PQ20/16-3C85-A630
	3250 ±25%	≈1580	≈0	PQ20/16-3C85

GRADE	A_L [1] (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

Note

1. Clamping force 30 ±10 N.

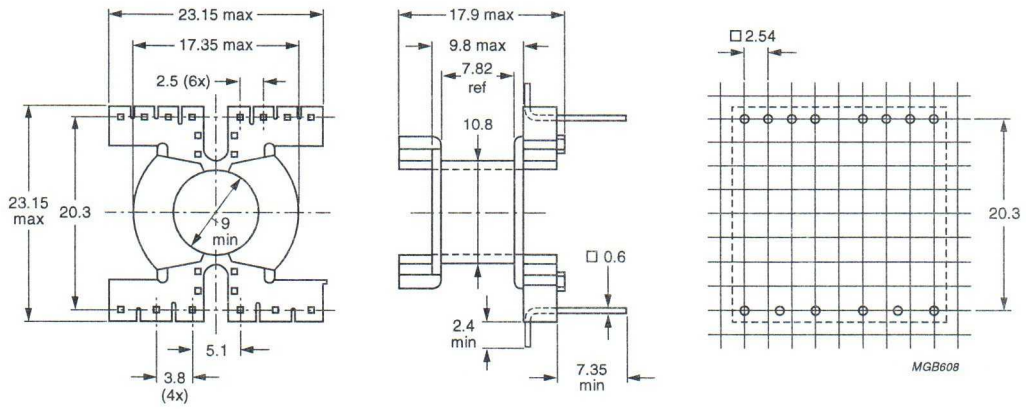
Properties of core sets under power conditions

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	≤0.48	–	–
3C85	≥320	≤0.36	≤0.42	–
3F3	≥320	–	≤0.26	≤0.44

COIL FORMER

General data 14-pins PQ20/16 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	150 °C, IEC 85 class F
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 PQ20/16 coil former; 14-pins.

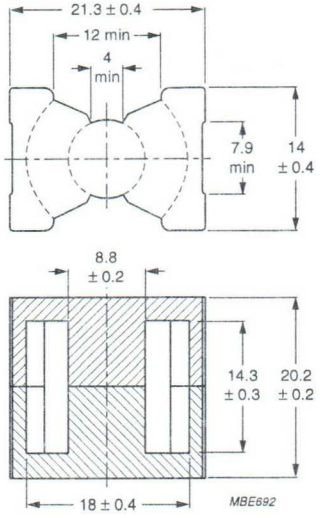
Winding data for 14-pins PQ20/16 coil former

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	CP-PQ20/16-1S-14P
1	23.5	7.95	44.0	CP-PQ20/16-1S-14PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	160 ±3%	≈93	≈582	PQ20/20-3C85-A160
	250 ±3%	≈145	≈340	PQ20/20-3C85-A250
	315 ±3%	≈183	≈259	PQ20/20-3C85-A315
	400 ±3%	≈232	≈193	PQ20/20-3C85-A400
	630 ±5%	≈365	≈109	PQ20/20-3C85-A630
	2820 ±25%	≈2080	≈0	PQ20/20-3C85

GRADE	A_L (1) (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

Note

1. Clamping force 30 ±10 N.

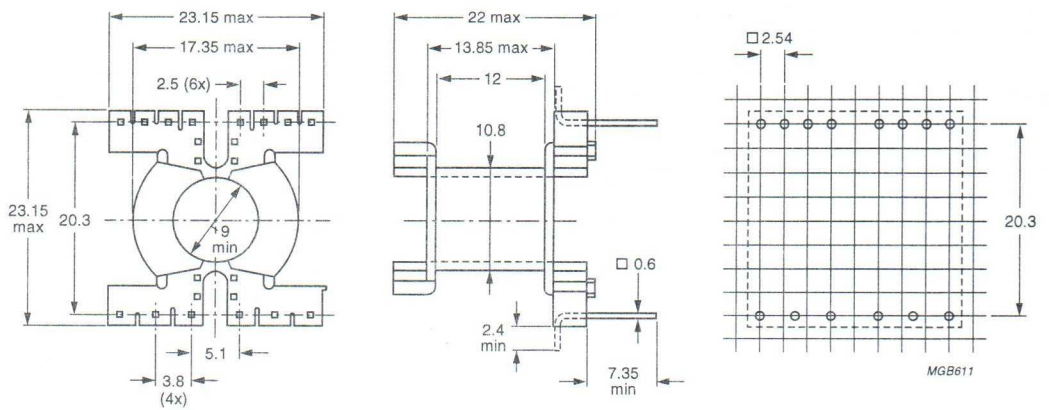
Properties of core sets under power conditions

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	≤0.58	–	–
3C85	≥320	≤0.44	≤0.51	–
3F3	≥320	–	≤0.31	≤0.54

COIL FORMER

General data 14-pins PQ20/20 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	150 °C, IEC 85 class F
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 PQ20/20 coil former; 14-pins.

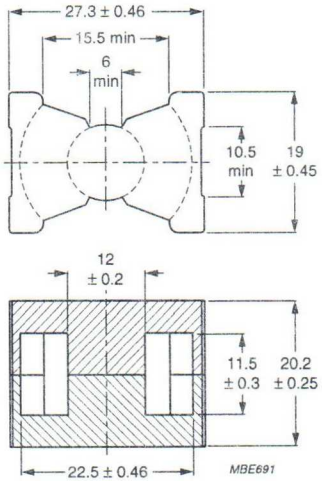
Winding data for 14-pins PQ20/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	36.0	12.0	44.0	CP-PQ20/20-1S-14P
1	36.0	12.0	44.0	CP-PQ20/20-1S-14PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.398	mm^{-1}
V_e	effective volume	5850	mm^3
l_e	effective length	48.3	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

GRADE	A_L (1) (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
3C85	250 ±3%	≈74	≈704	PQ26/20-3C85-E250
	315 ±3%	≈93	≈539	PQ26/20-3C85-A315
	400 ±3%	≈118	≈406	PQ26/20-3C85-A400
	630 ±3%	≈186	≈241	PQ26/20-3C85-A630
	1000 ±5%	≈259	≈137	PQ26/20-3C81-A1000
	5530 ±25%	≈1630	≈0	PQ26/20-3C85

PQ cores and accessories PQ26/20

GRADE	A_L [1] (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

Note

1. Clamping force 60 ±15 N.

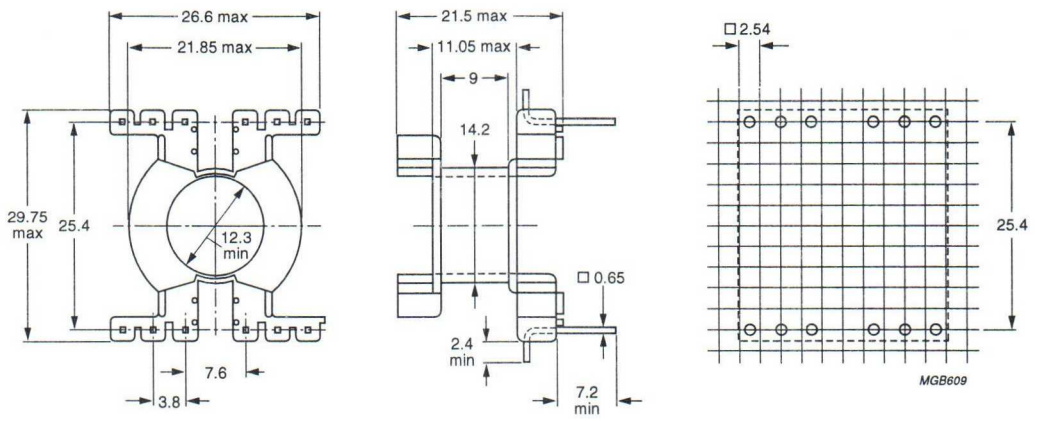
Properties of core sets under power conditions

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	≤1.2	–	–
3C85	≥320	≤0.91	≤1.1	–
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	150 °C, IEC 85 class F
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 PQ26/20 coil former; 12-pins.

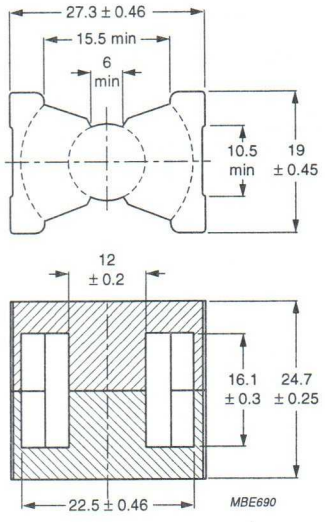
Winding data for 12-pins PQ26/20 coil former

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	CP-PQ26/20-1S-12P
1	31.1	9.0	56.4	CP-PQ26/20-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	250 ±3%	≈90	≈701	PQ26/25-3C85-E250
	315 ±3%	≈113	≈533	PQ26/25-3C85-A315
	400 ±3%	≈143	≈401	PQ26/25-3C85-A400
	630 ±3%	≈226	≈234	PQ26/25-3C85-A630
	1000 ±5%	≈359	≈132	PQ26/25-3C85-A1000
	4700 ±25%	≈1690	≈0	PQ26/25-3C85

GRADE	A_L [1] (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

Note

1. Clamping force 60 ±15 N.

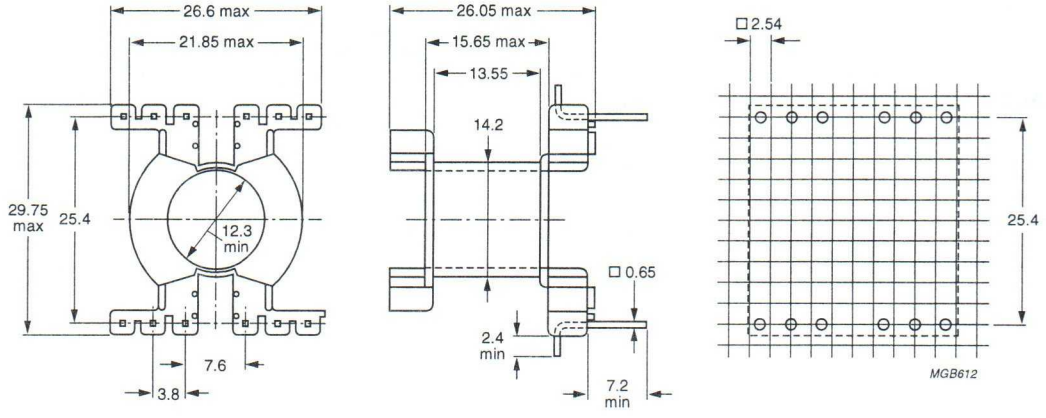
Properties of core sets under power conditions

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	≤1.3	–	–
3C85	≥320	≤1.0	≤1.2	–
3F3	≥320	–	≤0.72	≤1.2

COIL FORMER

General data 12-pins PQ26/25 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	150 °C, IEC 85 class F
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 PQ26/25 coil former; 12-pins.

Winding data for 12-pins PQ26/25 coil former

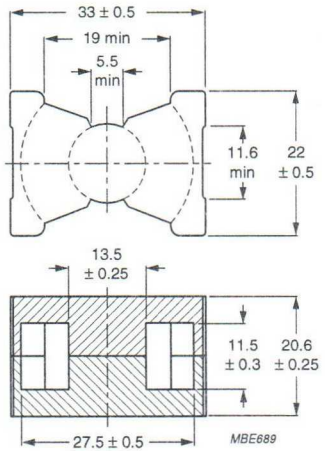
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	47.5	13.6	56.4	CP-PQ26/25-1S-12P
1	47.5	13.6	56.4	CP-PQ26/25-1S-12PD

PQ cores and accessories PQ32/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L(1) (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
3C85	315 ±3%	≈83	≈765	PQ32/20-3C85-E315
	400 ±3%	≈105	≈582	PQ32/20-3C85-A400
	630 ±3%	≈166	≈343	PQ32/20-3C85-A630
	1000 ±3%	≈263	≈198	PQ32/20-3C85-A1000
	1600 ±5%	≈421	≈109	PQ32/20-3C81-A1600
	6000 ±25%	≈1580	≈0	PQ32/20-3C85

GRADE	A_L [1] (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

Note

1. Clamping force 80 ±20 N.

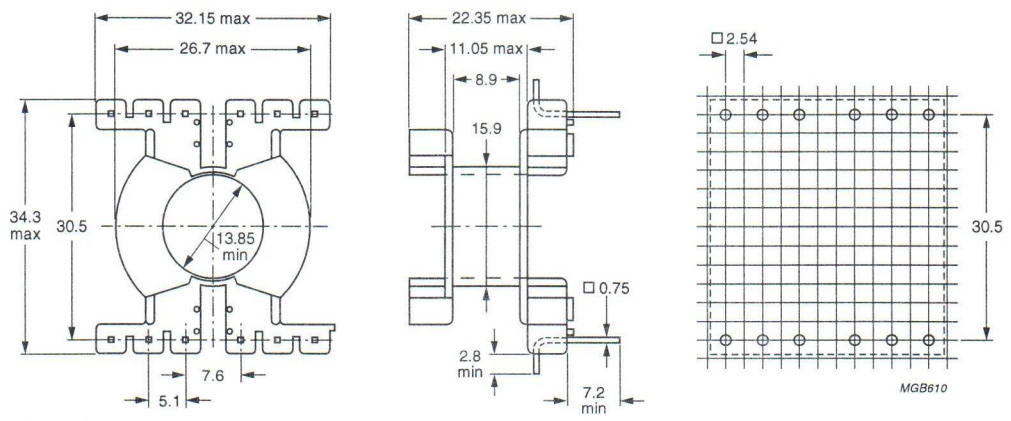
Properties of core sets under power conditions

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	≤1.9	–	–
3C85	≥320	≤1.5	≤1.7	–
3F3	≥320	–	≤1.0	≤1.8

COIL FORMER

General data 12-pins PQ32/20 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	150 °C, IEC 85 class F
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 PQ32/20 coil former; 12-pins.

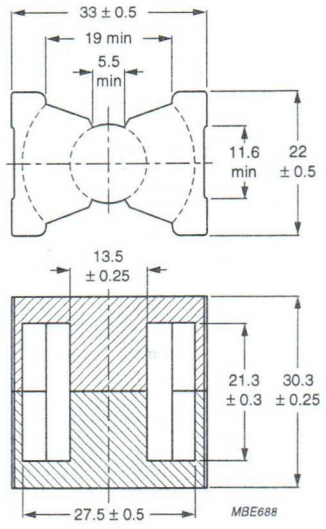
Winding data for 12-pins PQ32/20 coil former

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	CP-PQ32/20-1S-12P
1	44.8	8.9	66.7	CP-PQ32/20-1S-12PD

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (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
3C85	315 ±3%	≈112	≈766	PQ32/30-3C85-E315
	400 ±3%	≈142	≈576	PQ32/30-3C85-A400
	630 ±3%	≈224	≈334	PQ32/30-3C85-A630
	1000 ±3%	≈356	≈188	PQ32/30-3C85-A1000
	1600 ±5%	≈569	≈99	PQ32/30-3C81-A1600
	5040 ±25%	≈1790	≈0	PQ32/30-3C85

PQ cores and accessories PQ32/30

GRADE	A_L[1] (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

Note

1. Clamping force 80 ±20 N.

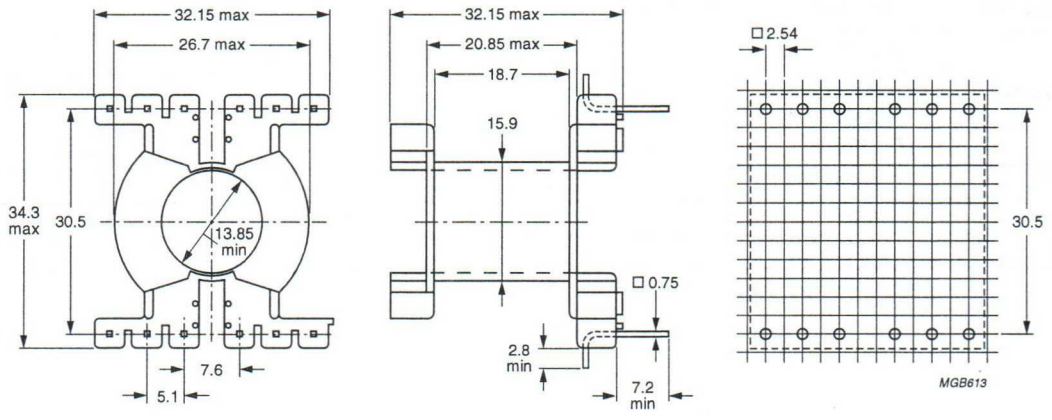
Properties of core sets under power conditions

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	≤2.6	–	–
3C85	≥320	≤1.9	≤2.3	–
3F3	≥320	–	≤1.4	≤2.4

COIL FORMER

General data 14-pins PQ32/30 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	150 °C, IEC 85 class F
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 PQ32/30 coil former; 12-pins.

Winding data for 12-pins PQ32/30 coil former

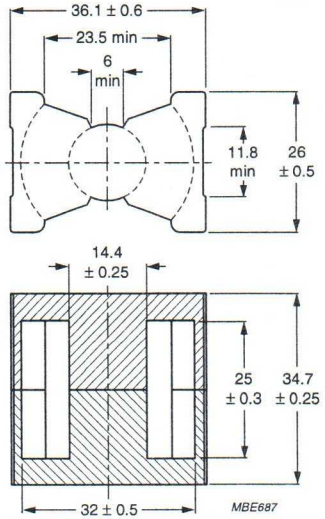
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	53.0	18.7	66.7	CP-PQ32/30-1S-12P
1	53.0	18.7	66.7	CPH-PQ32/30-1S-12PD

PQ cores and accessories PQ35/35

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈114	≈880	PQ35/35-3C81-E315
	400 ±3%	≈145	≈660	PQ35/35-3C81-A400
	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
3C85	315 ±3%	≈114	≈880	PQ35/35-3C85-E315
	400 ±3%	≈145	≈660	PQ35/35-3C85-A400
	630 ±3%	≈228	≈381	PQ35/35-3C85-A630
	1000 ±3%	≈361	≈214	PQ35/35-3C85-A1000
	1600 ±5%	≈578	≈112	PQ35/35-3C85-A1600
	4300 ±25%	≈1550	≈0	PQ35/35-3C85

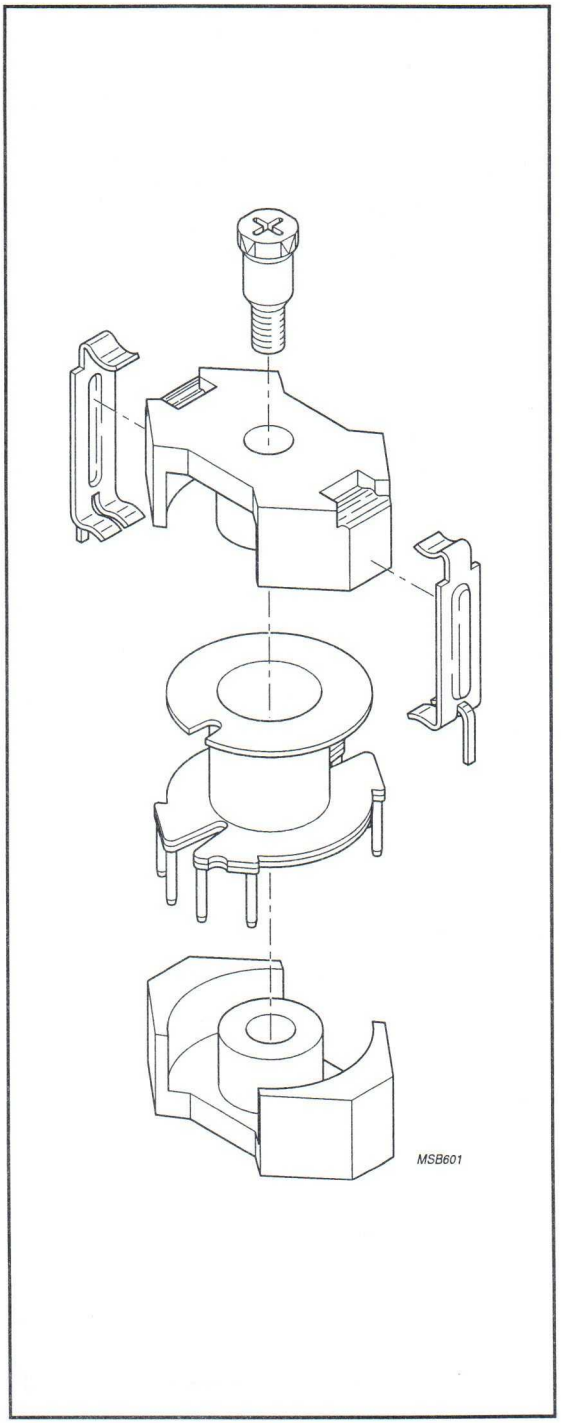
GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈114	≈880	PQ35/35-3F3-E315
	400 ±3%	≈145	≈660	PQ35/35-3F3-A400
	630 ±3%	≈228	≈381	PQ35/35-3F3-A630
	1000 ±3%	≈361	≈214	PQ35/35-3F3-A1000
	1600 ±5%	≈578	≈112	PQ35/35-3F3-A1600
	4570 ±25%	≈1650	≈0	PQ35/35-3F3

Note

1. Clamping force 80 ±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	≤3.3	–	–
3C85	≥320	≤2.5	≤2.9	–
3F3	≥320	–	≤1.8	≤3.1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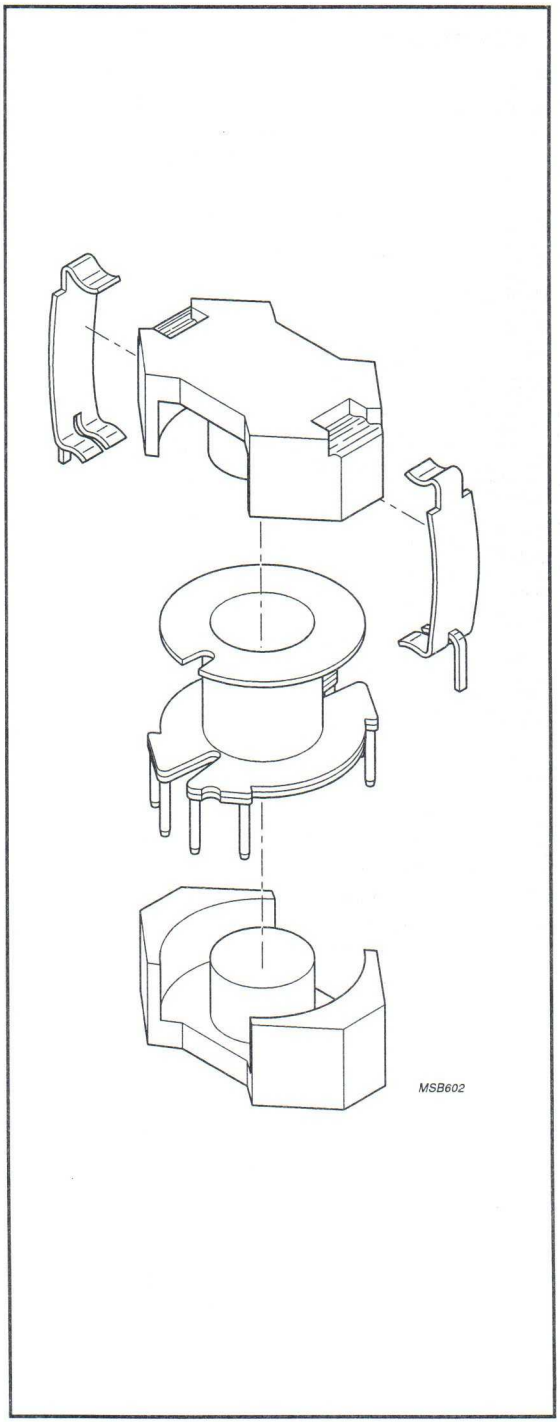
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PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview RM, RM/I, RM/I-LP cores

Core type	V_e (mm^3)	V_e (mm^3)	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
RM8/ILP	1860	64.9	10
RM10	3470	83.2	20
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

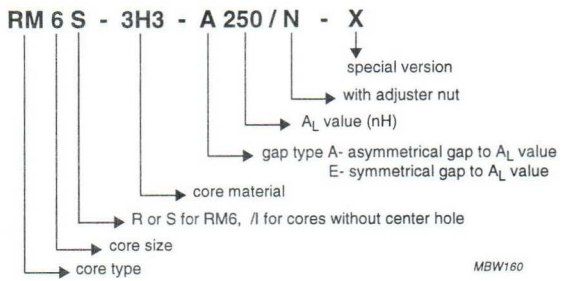


Fig.1 Type number structure for cores.

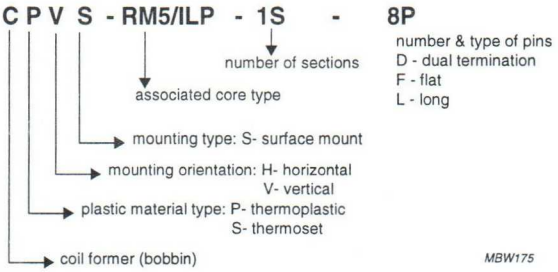
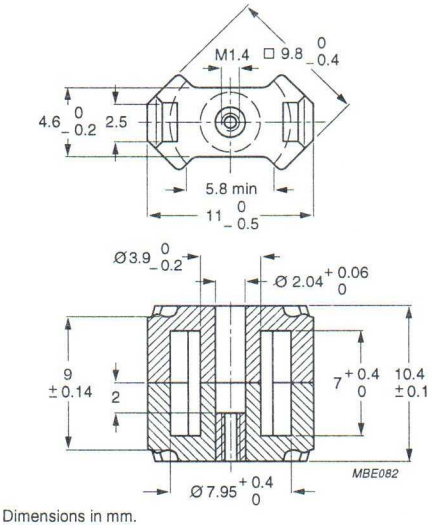


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.94	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	21.3	mm
A_e	effective area	11.0	mm^2
A_{min}	minimum area	8.1	mm^2
m	mass of set	≈1.4	g



Dimensions in mm.

Fig.1 RM4 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	16 ±3%	≈24	≈1500	RM4-4C6-E16/N	RM4-4C6-E16
	25 ±3%	≈38	≈700	RM4-4C6-E25/N	RM4-4C6-E25
	40 ±3%	≈62	≈130	RM4-4C6-A40/N	RM4-4C6-A40
	65 ±25%	≈100	≈0	–	RM4-4C6
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
3H1	40 ±3%	≈62	≈350	RM4-3H1-E40/N	RM4-3H1-E40
	63 ±3%	≈96	≈200	RM4-3H1-A63/N	RM4-3H1-A63
	100 ±3%	≈152	≈120	RM4-3H1-A100/N	RM4-3H1-A100
	160 ±3%	≈242	≈80	RM4-3H1-A160/N	RM4-3H1-A160
	250 ±8%	≈380	≈50	RM4-3H1-A250/N	RM4-3H1-A250
	950 ±25%	≈1440	≈0	–	RM4-3H1

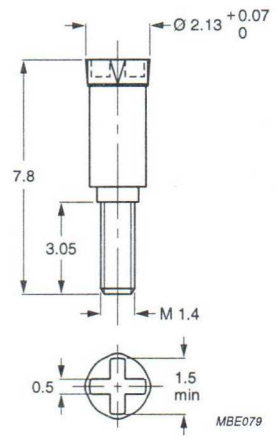
Note

1. Clamping force 20 ±10 N.

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 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)
3H1; 3H3	63	–	–	–	–	ADJ-RM4/RM5-RED	27
	100	–	–	ADJ-RM4/RM5-RED	17	ADJ-RM4/RM5-BROWN	22
	160	ADJ-RM4/RM5-RED	11	ADJ-RM4/RM5-BROWN	14	ADJ-RM4/RM5-GREY	19
	250	ADJ-RM4/RM5-RED	7	ADJ-RM4/RM5-GREY	12	ADJ-RM4/RM5-BLACK	17

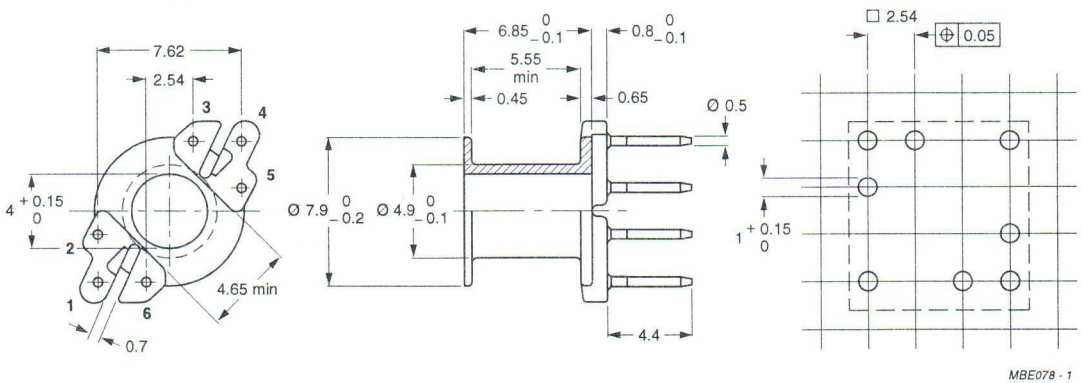
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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.3 RM4 coil former.

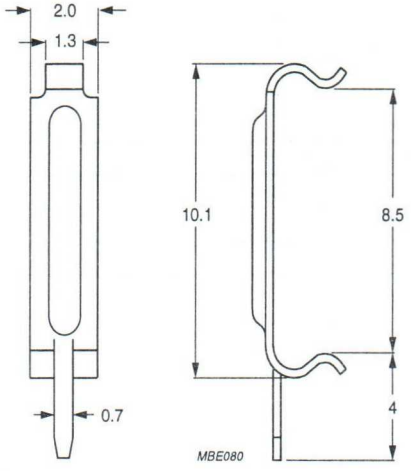
Winding data for RM4 coil former

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

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N each
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



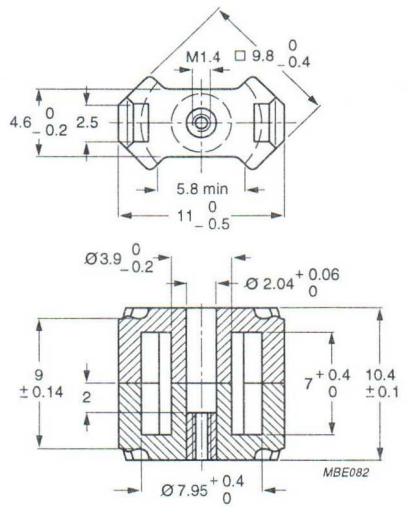
Dimensions in mm.

Fig.4 Mounting clip for RM4.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.94	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	21.3	mm
A_e	effective area	11.0	mm^2
A_{min}	minimum area	8.1	mm^2
m	mass of set	≈1.4	g



Dimensions in mm.

Fig.1 RM4 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	16 ±3%	≈24	≈1500	RM4-4C6-E16/N	RM4-4C6-E16
	25 ±3%	≈38	≈700	RM4-4C6-E25/N	RM4-4C6-E25
	40 ±3%	≈62	≈130	RM4-4C6-A40/N	RM4-4C6-A40
	65 ±25%	≈100	≈0	–	RM4-4C6
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
3H1	40 ±3%	≈62	≈350	RM4-3H1-E40/N	RM4-3H1-E40
	63 ±3%	≈96	≈200	RM4-3H1-A63/N	RM4-3H1-A63
	100 ±3%	≈152	≈120	RM4-3H1-A100/N	RM4-3H1-A100
	160 ±3%	≈242	≈80	RM4-3H1-A160/N	RM4-3H1-A160
	250 ±8%	≈380	≈50	RM4-3H1-A250/N	RM4-3H1-A250
	950 ±25%	≈1440	≈0	–	RM4-3H1

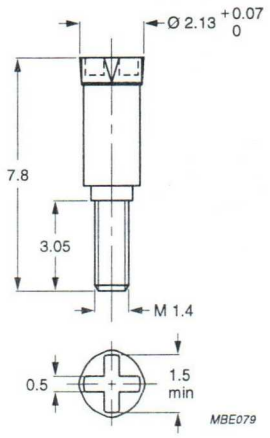
Note

1. Clamping force 20 ±10 N.

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 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)
3H1; 3H3	63	–	–	–	–	ADJ-RM4/RM5-RED	27
	100	–	–	ADJ-RM4/RM5-RED	17	ADJ-RM4/RM5-BROWN	22
	160	ADJ-RM4/RM5-RED	11	ADJ-RM4/RM5-BROWN	14	ADJ-RM4/RM5-GREY	19
	250	ADJ-RM4/RM5-RED	7	ADJ-RM4/RM5-GREY	12	ADJ-RM4/RM5-BLACK	17

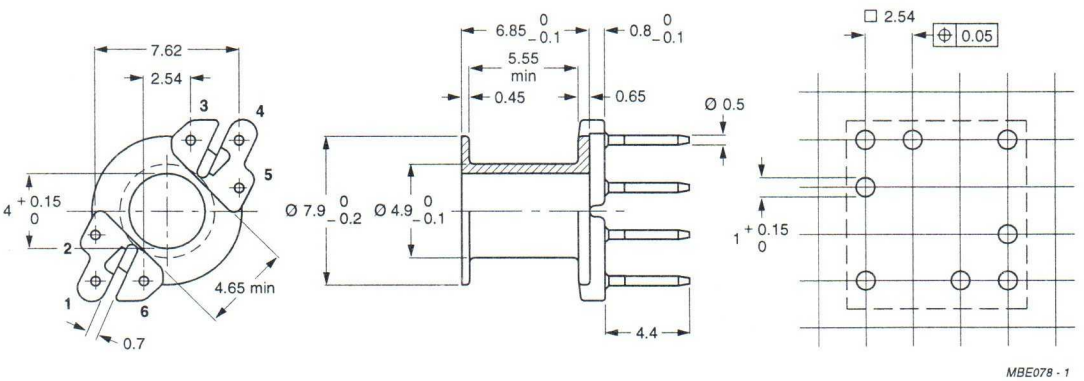
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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.3 RM4 coil former.

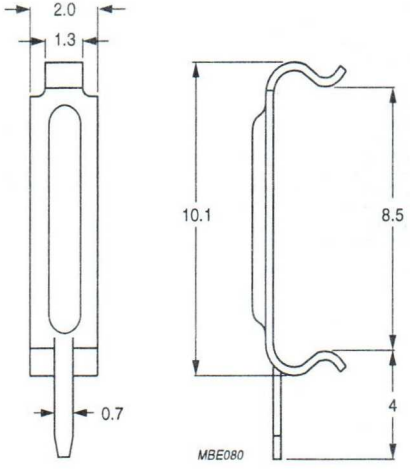
Winding data for RM4 coil former

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

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N each
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



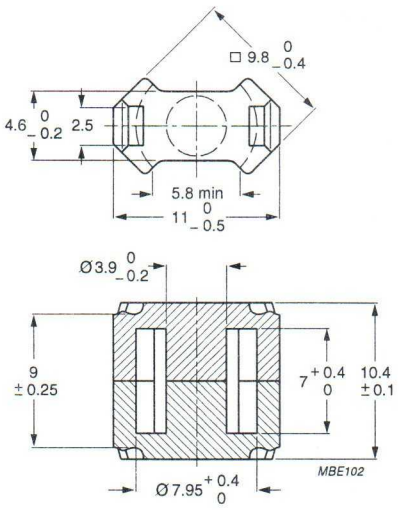
Dimensions in mm.

Fig.4 Mounting clip for RM4.

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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
3F4	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

Note

1. Clamping force 10 ±5 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	1800 ±25%	≈2400	RM4/I-3E1
3E4	2500 +40/–30%	≈3360	RM4/I-3E4
3E5	3500 +40/–30%	≈4700	RM4/I-3E5

Note

1. Clamping force 10 ±5 N.

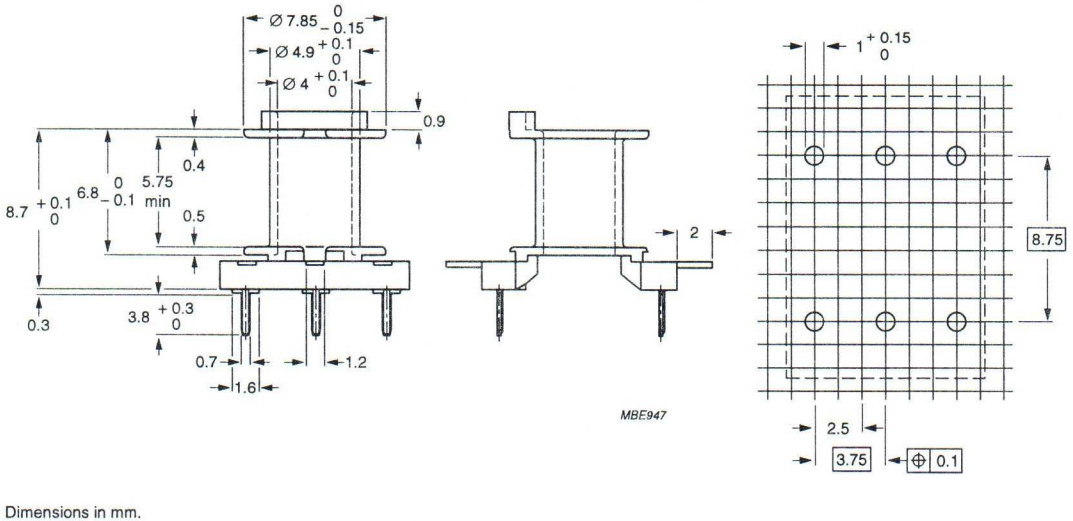
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3F3	≥315	–	≤0.05	≤0.07	–	–
3F4	≥250	–	–	–	≤0.1	≤0.12

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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.

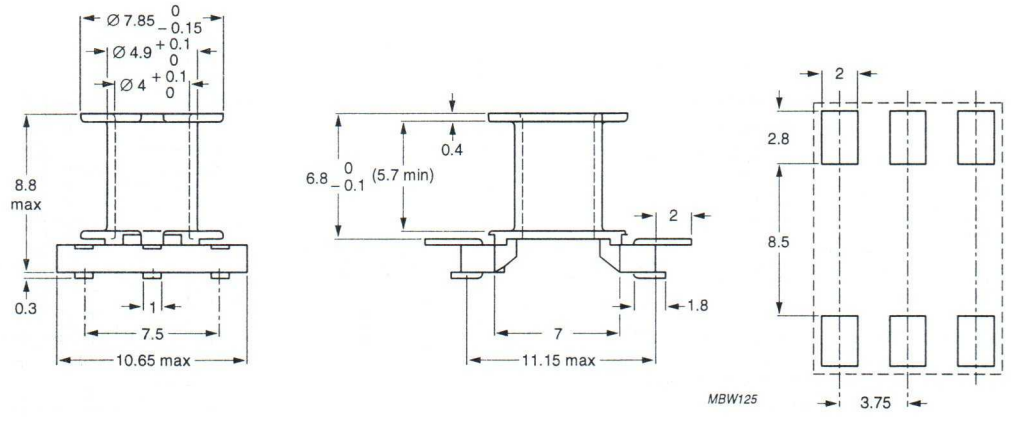
Fig.2 RM4/I coil former.

Winding data for RM4 coil former

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	19.8	8.4	5.75	CPV-RM4-1S-6P

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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.3 SMD coil former for RM4/I.

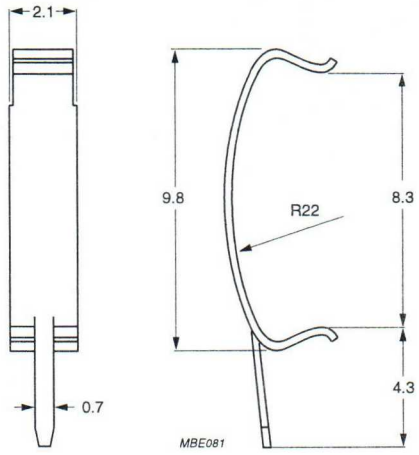
Winding data for RM4 coil former (SMD)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	19.8	8.4	5.75	CPVS-RM4-1S-6P

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N each
Clip material	CrNi steel
Clip plating	lead tin alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

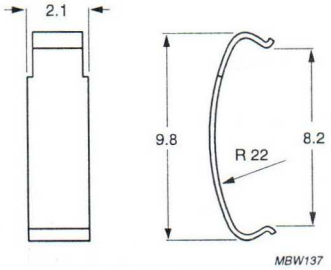


Dimensions in mm.

Fig.4 Mounting clip CLI/P-RM4/5/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N each
Clip material	CrNi steel
Type number	CLI-RM4/5



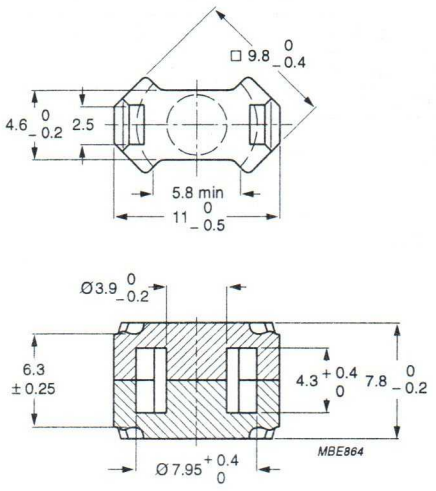
Dimensions in mm.

Fig.5 Mounting clip CLI-RM4/5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.20	mm^{-1}
V_e	effective volume	250	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	1300 ±25%	≈1240	≈0	RM4/ILP-3C85
3C90	1300 ±25%	≈1240	≈0	RM4/ILP-3C90
3F3	1200 ±25%	≈1150	≈0	RM4/ILP-3F3
3F4	750 ±25%	≈720	≈0	RM4/ILP-3F4

Note

1. Clamping force 10 ±5 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	5000 +40/–30%	≈4800	RM4/ILP-3E5
3E6	6700 +40/–30%	≈6400	RM4/ILP-3E6

Note

1. Clamping force 10 ±5 N.

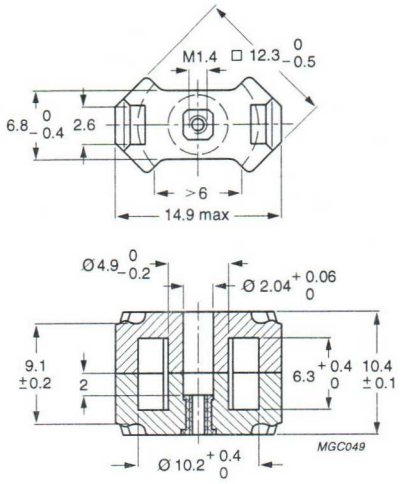
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.05	≤0.06	–	–	–
3C90	≥315	≤0.04	≤0.04	–	–	–
3F3	≥300	–	≤0.04	≤0.06	–	–
3F4	≥250	–	–	–	≤0.08	≤0.10

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	16 ±3%	≈13	≈2000	RM5-4C6-E16/N	RM5-4C6-E16
	25 ±3%	≈20	≈1200	RM5-4C6-E25/N	RM5-4C6-E25
	40 ±3%	≈33	≈500	RM5-4C6-E40/N	RM5-4C6-E40
	63 ±3%	≈50	≈200	RM5-4C6-E63/N	RM5-4C6-E63
	120 ±25%	≈95	≈0	–	RM5-4C6
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	≈210	RM5-3D3-E100/N	RM5-3D3-E100
	800 ±25%	≈630	≈0	–	RM5-3D3
3H3	160 ±3%	≈130	≈130	RM5-3H3-A160/N	RM5-3H3-A160
	250 ±3%	≈200	≈70	RM5-3H3-A250/N	RM5-3H3-A250
	315 ±3%	≈250	≈50	RM5-3H3-A315/N	RM5-3H3-A315
	400 ±5%	≈320	≈60	RM5-3H3-A400/N	RM5-3H3-A400
	1650 ±25%	≈1310	≈0	–	RM5-3H3

RM cores and accessories RM5

GRADE	A_L [1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	160 ±3%	≈130	≈130	RM5-3H1-A160/N	RM5-3H1-A160
	250 ±3%	≈200	≈70	RM5-3H1-A250/N	RM5-3H1-A250
	315 ±3%	≈250	≈50	RM5-3H1-A315/N	RM5-3H1-A315
	1800 ±25%	≈1430	≈0	–	RM5-3H1
3B7	63 ±3%	≈50	≈540	RM5-3B7-E63/N	RM5-3B7-E63
	100 ±3%	≈80	≈310	RM5-3B7-E100/N	RM5-3B7-E100
	160 ±3%	≈130	≈130	RM5-3B7-A160/N	RM5-3B7-A160
	250 ±3%	≈200	≈70	RM5-3B7-A250/N	RM5-3B7-A250
	315 ±3%	≈250	≈50	RM5-3B7-A315/N	RM5-3B7-A315
	1960 ±25%	≈1550	≈0	–	RM5-3B7
3B9	63 ±3%	≈50	≈540	RM5-3B9-E63/N	RM5-3B9-E63
	100 ±3%	≈80	≈310	RM5-3B9-E100/N	RM5-3B9-E100
	160 ±3%	≈130	≈130	RM5-3B9-A160/N	RM5-3B9-A160
	250 ±3%	≈200	≈70	RM5-3B9-A250/N	RM5-3B9-A250
	315 ±3%	≈250	≈50	RM5-3B9-A315/N	RM5-3B9-A315
	1700 ±25%	≈1350	≈0	–	RM5-3B9

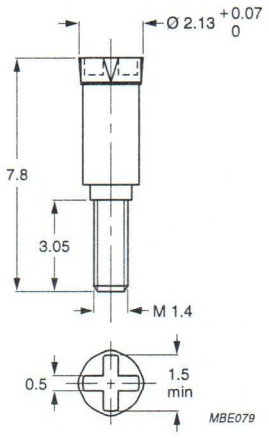
Note

1. Clamping force 25 ±10 N.

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 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)
3H1; 3H3; 3B7; 3B9	63	–	–	–	–	ADJ-RM4/RM5-RED	23
	100	–	–	ADJ-RM4/RM5-RED	15	ADJ-RM4/RM5-BROWN	24
	160	ADJ-RM4/RM5-RED	9	ADJ-RM4/RM5-BROWN	15	ADJ-RM4/RM5-GREY	27
	250	ADJ-RM4/RM5-RED	6	ADJ-RM4/RM5-BROWN	10	ADJ-RM4/RM5-GREY	17
	315	ADJ-RM4/RM5-BROWN	8	ADJ-RM4/RM5-GREY	14	–	–
	400	ADJ-RM4/RM5-BROWN	6	ADJ-RM4/RM5-BLACK	13	–	–
3D3	63	–	–	–	–	ADJ-RM4/RM5-RED	20
	100	–	–	ADJ-RM4/RM5-RED	16	–	–
4C6	40	–	–	–	–	ADJ-RM4/RM5-RED	17
	63	–	–	ADJ-RM4/RM5-RED	8	–	–

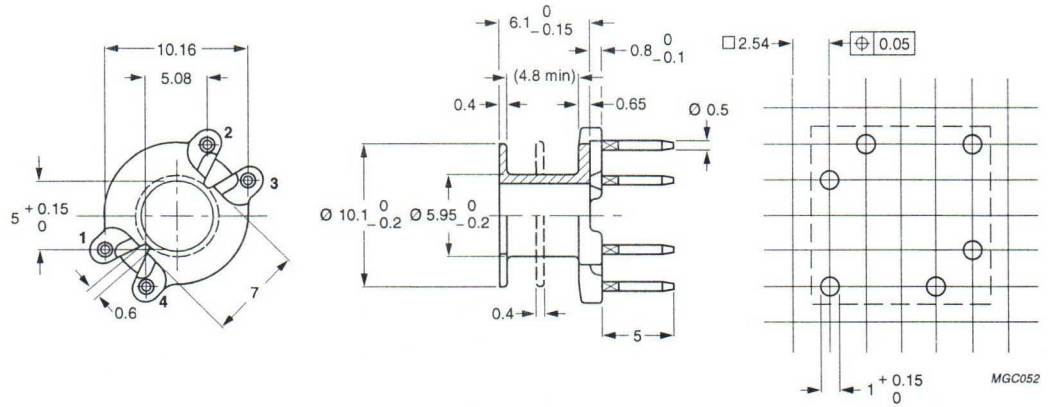
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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

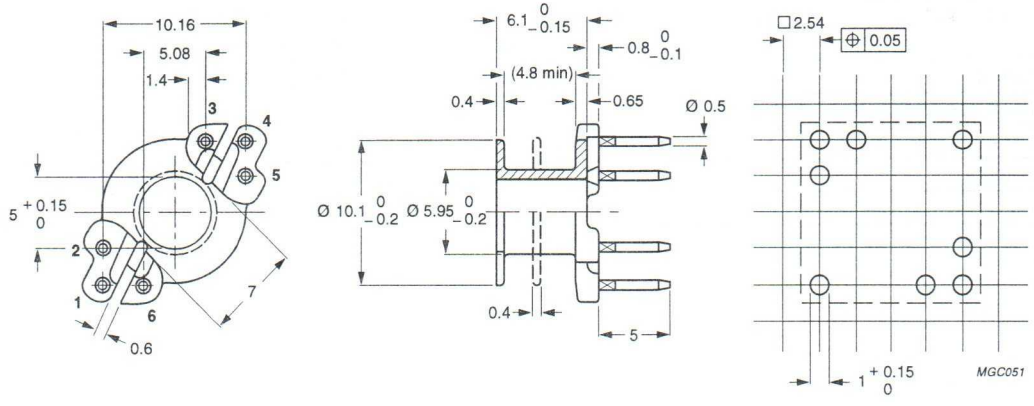


Dimensions in mm.

Fig.3 RM5 coil former; 4-pins.

Winding data for 4-pins RM5 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	25	9.5	4.8	CSV-RM5-1S-4P
2	4	all	25	2×4.35	2×2.2	CSV-RM5-2S-4P



Dimensions in mm.

Fig.4 RM5 coil former; 6-pins

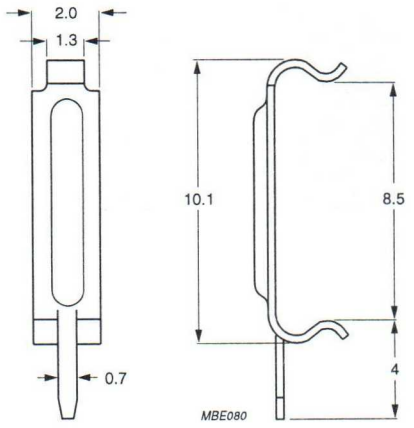
Winding data for 6-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	5	1, 2, 3, 5, 6	25	9.5	4.8	CSV-RM5-1S-5P
1	6	all	25	9.5	4.8	CSV-RM5-1S-6P
2	5	1, 2, 3, 5, 6	25	2 × 4.35	2 × 2.2	CSV-RM5-2S-5P
2	6	all	25	2 × 4.35	2 × 2.2	CSV-RM5-2S-6P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈12 N each
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



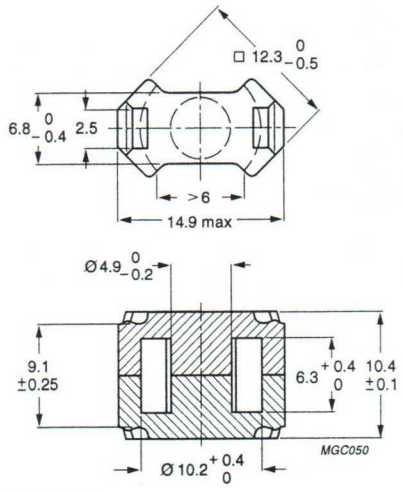
Dimensions in mm.

Fig.5 Mounting clip for RM5.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM5/I core set.

Core sets for general purpose

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	100 ±3%	≈74	≈300	RM5/I-3B8-A100
	160 ±3%	≈119	≈160	RM5/I-3B8-A160
	250 ±3%	≈186	≈90	RM5/I-3B8-A250
	2000 ±25%	≈1490	≈0	RM5/I-3B8
3C85	63 ±3%	≈47	≈640	RM5/I-3C85-A63
	100 ±3%	≈74	≈300	RM5/I-3C85-A100
	160 ±3%	≈119	≈160	RM5/I-3C85-A160
	250 ±3%	≈186	≈90	RM5/I-3C85-A250
	315 ±3%	≈234	≈100	RM5/I-3C85-A315
	1800 ±25%	≈1340	≈0	RM5/I-3C85
3C90	1800 ±25%	≈1340	≈0	RM5/I-3C90
3F3	63 ±3%	≈47	≈640	RM5/I-3F3-A63
	100 ±3%	≈74	≈300	RM5/I-3F3-A100
	160 ±3%	≈119	≈160	RM5/I-3F3-A160
	250 ±3%	≈186	≈90	RM5/I-3F3-A250
	315 ±3%	≈234	≈100	RM5/I-3F3-A315
	1700 ±25%	≈1270	≈0	RM5/I-3F3

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F4	100 ±3%	≈74	≈300	RM5/I-3F3-A100
	160 ±3%	≈119	≈160	RM5/I-3F3-A160
	250 ±3%	≈186	≈90	RM5/I-3F3-A250
	1000 ±25%	≈750	≈0	RM5/I-3F3

Note

1. Clamping force 12 ±5 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E1	3150 ±25%	≈2350	RM5/I-3E1
3E4	4500 +40/–30%	≈3350	RM5/I-3E4
3E25	4975 ±25%	≈3700	RM5/I-3E25
3E27	4975 ±25%	≈3700	RM5/I-3E27
3E5	6700 +40/–30%	≈4980	RM5/I-3E5
3E6	9500 +40/–30%	≈7050	RM5/I-3E6

Note

1. Clamping force 12 ±5 N.

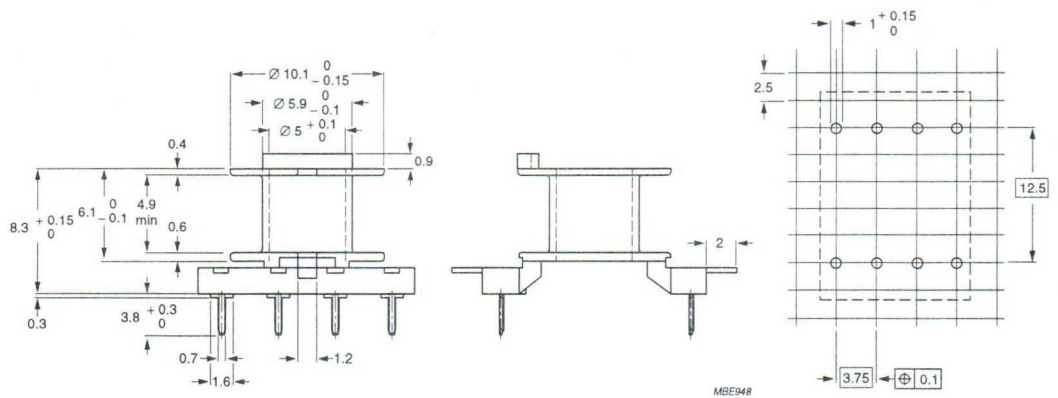
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ =10 mT; T = 100 °C
3B8	≥315	≤0.16	–	–	–	–
3C85	≥315	≤0.09	≤0.11	–	–	–
3C90	≥315	≤0.06	≤0.08	–	–	–
3F3	≥315	–	≤0.08	≤0.11	–	–
3F4	≥250	–	–	–	≤0.18	≤0.20

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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.

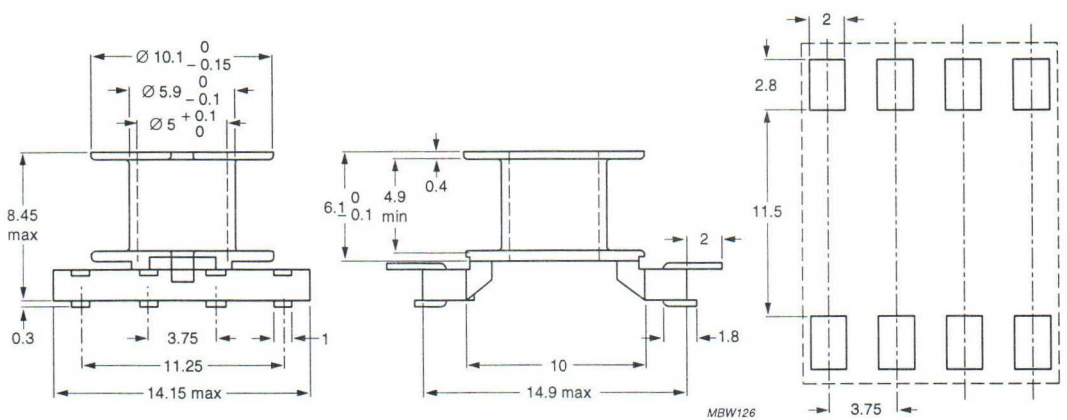
Fig.2 RM5/I coil former.

Winding data for RM5/I coil former

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	24.9	9.8	4.9	CPV-RM4-1S-8P

General data SMD coil former

ITEM	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 85 class F
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.3 SMD coil former for RM5/I.

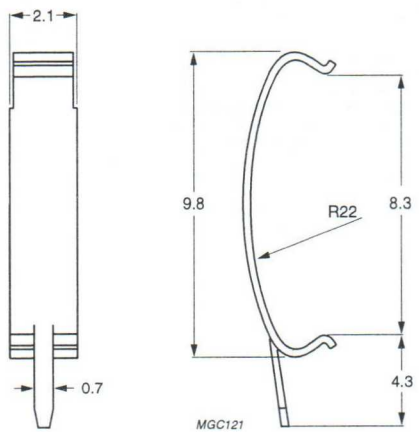
Winding data for RM5/I coil former (SMD)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	24.9	9.8	4.9	CPVS-RM4-1S-8P

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈6 N
Clip material	CrNi steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

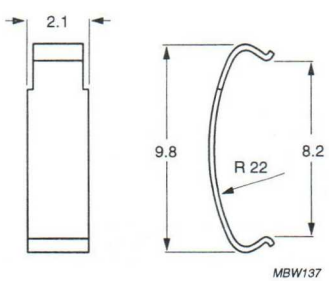


Dimensions in mm.

Fig.4 Mounting clip CLI/P-RM4/5/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	CrNi steel
Type number	CLI-RM4/5



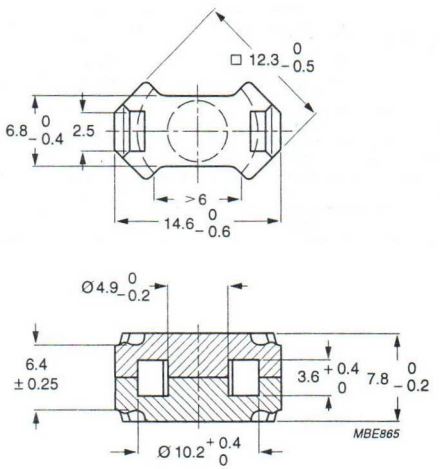
Dimensions in mm.

Fig.5 Mounting clip CLI-RM4/5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	2200 ±25%	≈1240	≈0	RM5/ILP-3C85
3C90	2200 ±25%	≈1240	≈0	RM5/ILP-3C90
3F3	2000 ±25%	≈1130	≈0	RM5/ILP-3F3
3F4	1250 ±25%	≈710	≈0	RM5/ILP-3F4

Note

1. Clamping force 20 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	8500 +40/–30%	≈4800	RM5/ILP-3E5
3E6	11500 +40/–30%	≈6500	RM5/ILP-3E6

Note

1. Clamping force 20 ±10 N.

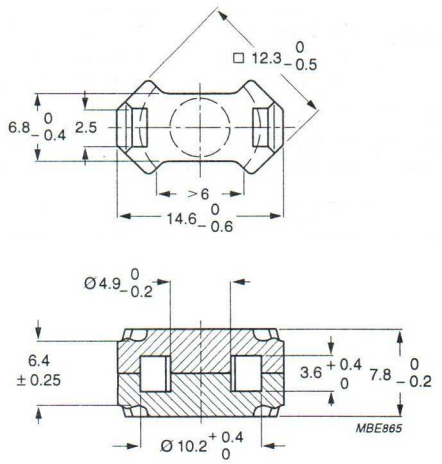
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.07	≤0.08	–	–	–
3C90	≥315	≤0.06	≤0.06	–	–	–
3F3	≥300	–	≤0.06	≤0.08	–	–
3F4	≥250	–	–	–	≤0.14	≤0.16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	2200 ±25%	≈1240	≈0	RM5/ILP-3C85
3C90	2200 ±25%	≈1240	≈0	RM5/ILP-3C90
3F3	2000 ±25%	≈1130	≈0	RM5/ILP-3F3
3F4	1250 ±25%	≈710	≈0	RM5/ILP-3F4

Note

1. Clamping force 20 ±10 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E5	8500 +40/–30%	≈4800	RM5/ILP-3E5
3E6	11500 +40/–30%	≈6500	RM5/ILP-3E6

Note

1. Clamping force 20 ±10 N.

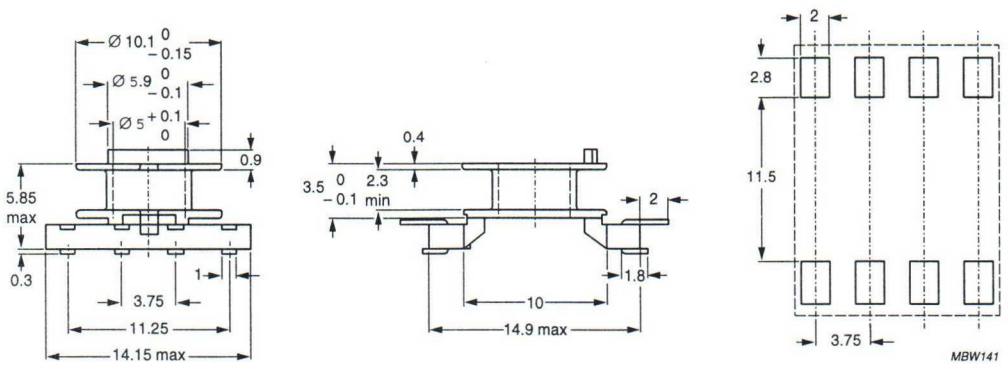
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.07	≤0.08	–	–	–
3C90	≥315	≤0.06	≤0.06	–	–	–
3F3	≥300	–	≤0.06	≤0.08	–	–
3F4	≥250	–	–	–	≤0.14	≤0.16

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)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 RM5/ILP SMD coil former

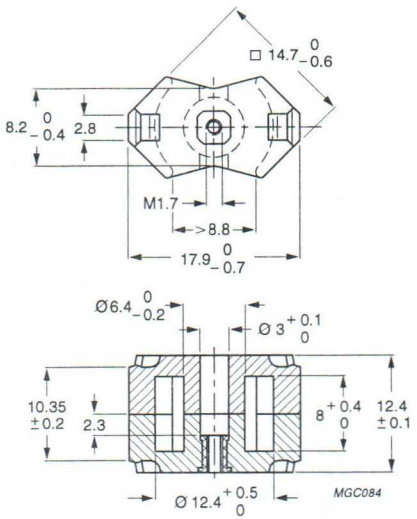
Winding data for 8-pads RM5/ILP SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.65	2.3	24.9	CPVS-RM5/ILP-1S-8P

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM6S core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈17	≈2000	RM6S-4C6-E25/N	RM6S-4C6-E25
	40 ±3%	≈27	≈1000	RM6S-4C6-E40/N	RM6S-4C6-E40
	63 ±3%	≈43	≈400	RM6S-4C6-E63/N	RM6S-4C6-E63
	140 ±25%	≈96	≈0	–	RM6S-4C6
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
3H1	160 ±3%	≈110	≈230	RM6S-3H1-A160/N	RM6S-3H1-A160
	250 ±3%	≈171	≈110	RM6S-3H1-A250/N	RM6S-3H1-A250
	315 ±3%	≈216	≈90	RM6S-3H1-A315/N	RM6S-3H1-A315
	400 ±3%	≈274	≈70	RM6S-3H1-A400/N	RM6S-3H1-A400
	630 ±5%	≈430	≈50	RM6S-3H1-A630/N	RM6S-3H1-A630
	1250 ±10%	≈860	≈20	RM6S-3H1-A1250/N	RM6S-3H1-A1250
	2300 ±25%	≈1580	≈0	–	RM6S-3H1

RM cores and accessories RM6S

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	160 ±3%	≈110	≈230	RM6S-3B7-A160/N	RM6S-3B7-A160
	250 ±3%	≈171	≈110	RM6S-3B7-A250/N	RM6S-3B7-A250
	315 ±3%	≈216	≈90	RM6S-3B7-A315/N	RM6S-3B7-A315
	400 ±3%	≈274	≈70	RM6S-3B7-A400/N	RM6S-3B7-A400
	630 ±5%	≈430	≈50	RM6S-3B7-A630/N	RM6S-3B7-A630
	1250 ±10%	≈860	≈20	RM6S-3B7-A1250/N	RM6S-3B7-A1250
	2700 ±25%	≈1580	≈0	–	RM6S-3B7

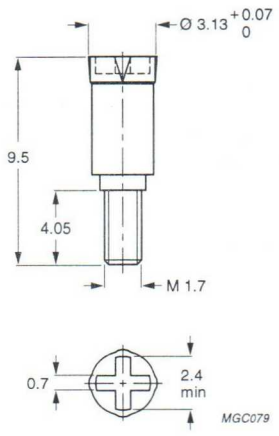
Note

1. Clamping force 40 ±20 N.

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 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)
3H1; 3H3; 3B7	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	8	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	18
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	19
	315	ADJ-RM6-WHITE	10	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	20
	400	ADJ-RM6-VIOLET	9	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	24
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	27
	160	ADJ-RM6-RED	10	ADJ-RM6-WHITE	17	–	–
4C6	25	–	–	–	–	ADJ-RM6-GREEN	20
	40	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	20
	63	ADJ-RM6-GREEN	8	ADJ-RM6-RED	12	–	–

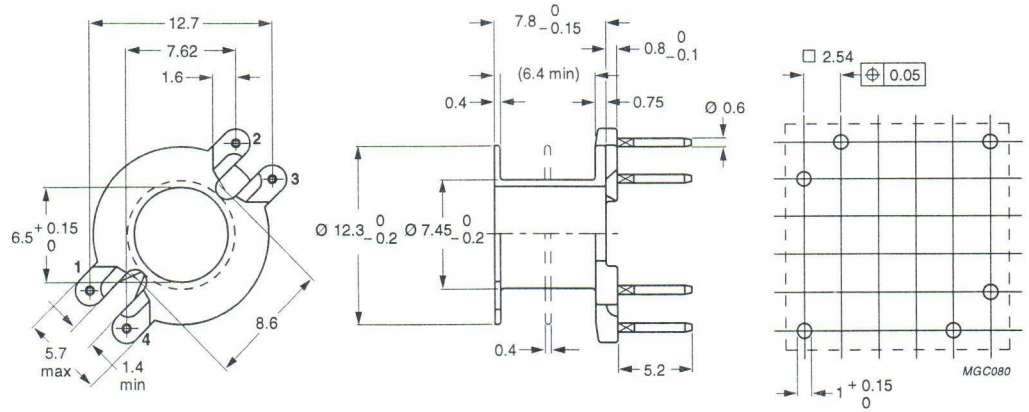
Note

1. Maximum adjustment range.

COIL FORMERS

General data

ITEM	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 85 class H
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

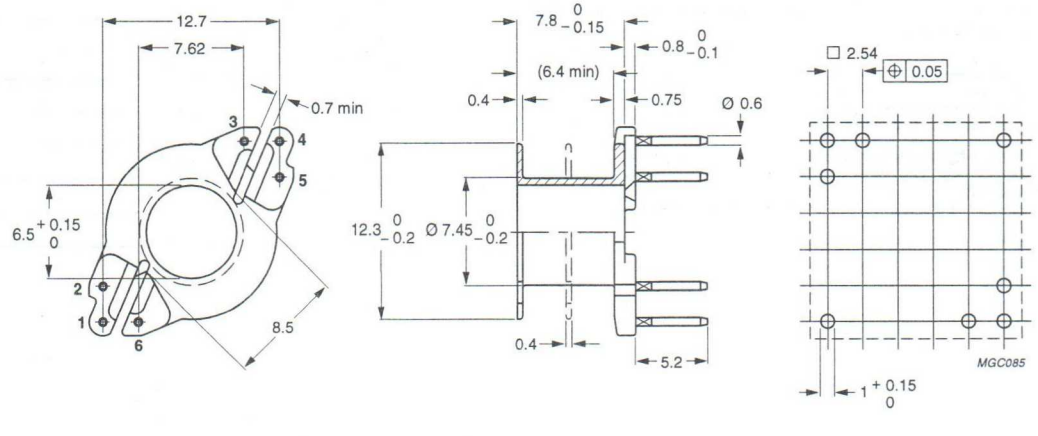


Dimensions in mm.

Fig.3 RM6S coil former; 4-pins.

Winding data for 4-pins RM6S 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 RM6S coil former; 6-pins.

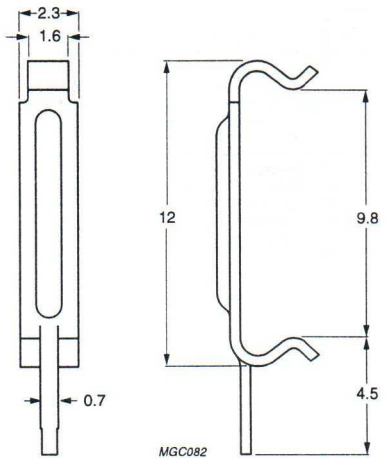
Winding data for 6-pins RM6S coil former

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-RM6S-1S-6P
2	6	all	30	2×7.0	2×3.0	CSV-RM6S-2S-6P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N each
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



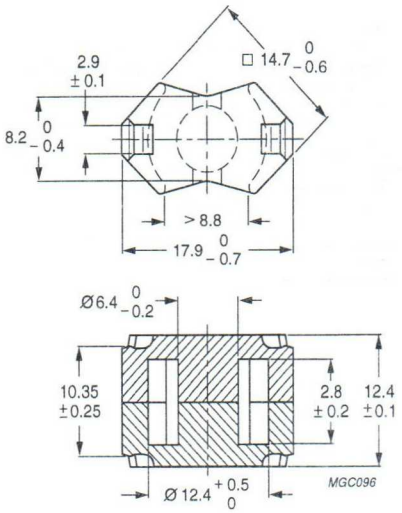
Dimensions in mm.

Fig.5 Mounting clip for RM6S.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	63 ±3%	≈39	≈950	RM6S/I-3B8-A63
	100 ±3%	≈62	≈500	RM6S/I-3B8-A100
	160 ±3%	≈100	≈160	RM6S/I-3B8-A160
	250 ±3%	≈156	≈150	RM6S/I-3B8-A250
	2600 ±25%	≈1620	≈0	RM6S/I-3B8
3C81	63 ±3%	≈39	≈950	RM6S/I-3C81-E63
	100 ±3%	≈62	≈500	RM6S/I-3C81-A100
	160 ±3%	≈100	≈160	RM6S/I-3C81-A160
	250 ±3%	≈156	≈150	RM6S/I-3C81-A250
	315 ±3%	≈197	≈0	RM6S/I-3C81-A315
	3000 ±25%	≈1870	≈0	RM6S/I-3C81
3C85	63 ±3%	≈39	≈950	RM6S/I-3C85-A63
	100 ±3%	≈62	≈500	RM6S/I-3C85-A100
	160 ±3%	≈100	≈300	RM6S/I-3C85-A160
	250 ±3%	≈156	≈150	RM6S/I-3C85-A250
	315 ±3%	≈197	≈80	RM6S/I-3C85-A315
	400 ±3%	≈250	≈50	RM6S/I-3C85-A400
	630 ±5%	≈390	≈30	RM6S/I-3C85-A630
	2350 ±25%	≈1470	≈0	RM6S/I-3C85
3C90	2350 ±25%	≈1470	≈0	RM6S/I-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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	≈150	RM6S/I-3F3-A250
	315 ±3%	≈197	≈80	RM6S/I-3F3-A315
	2150 ±25%	≈1350	≈0	RM6S/I-3F3
3F4	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	≈150	RM6S/I-3F4-A250
	315 ±3%	≈197	≈80	RM6S/I-3F4-A315
	1250 ±25%	≈780	≈0	RM6S/I-3F4

Note

1. Clamping force 20 ±10 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	4100 ±25%	≈2600	RM6S/I-3E1
3E25	6000 ±25%	≈3800	RM6S/I-3E25
3E27	6000 ±25%	≈3800	RM6S/I-3E27
3E4	5750 +40/–30%	≈3590	RM6S/I-3E4
3E5	8600 +40/–30%	≈5370	RM6S/I-3E5
3E6	12500 +40/–30%	≈6200	RM6S/I-3E6

Note

1. Clamping force 20 ±10 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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3B8	≥315	≤0.30	–	–	–	–
3C81	≥315	≤0.22	–	–	–	–
3C85	≥315	≤0.17	≤0.20	–	–	–
3C90	≥315	≤0.12	≤0.14	–	–	–
3F3	≥315	–	≤0.14	≤0.20	–	–
3F4	≥250	–	–	–	≤0.35	≤0.40

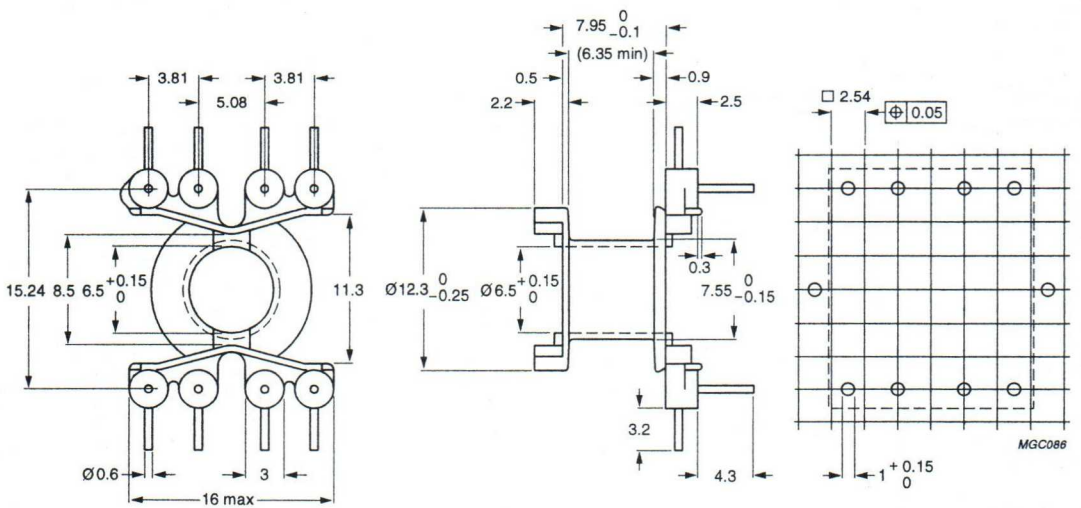
COIL FORMERS

General data; note 1

PARAMETER	DESCRIPTION
Coil former material	polybutyleneterephthalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, IEC 85 class F
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

Note

1. For the information on other coil formers suitable for RM6S/I, see *"Data sheet of RM6S"*.



Dimensions in mm.

Fig.2 RM6S/I coil former; 8-pins (DIL).

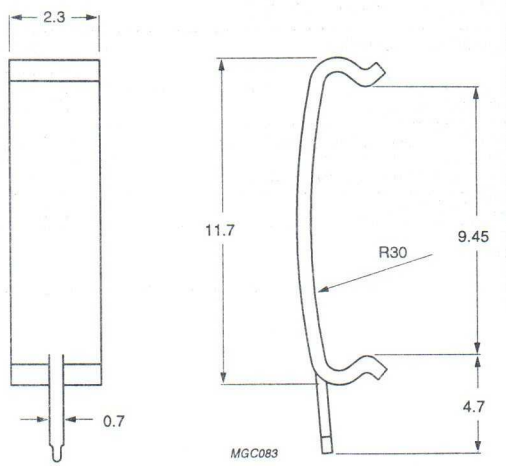
Winding data for 8-pins RM6S/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	31	15.7	6.2	CPV-RM6S/I-1S-8PD

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6/I



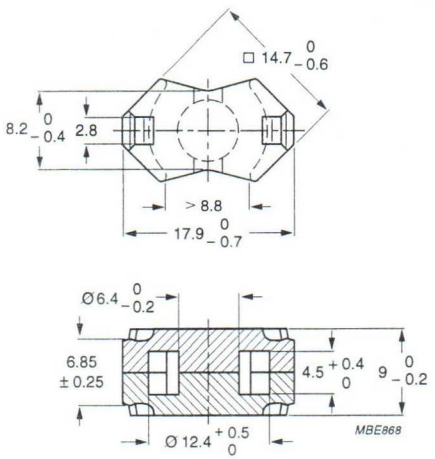
Dimensions in mm.

Fig.3 Mounting clip for RM6S/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	2900 ±25%	≈1340	≈0	RM6S/ILP-3C85
3C90	2900 ±25%	≈1340	≈0	RM6SILP-3C90
3F3	2700 ±25%	≈1250	≈0	RM6S/ILP-3F3
3F4	1600 ±25%	≈740	≈0	RM6S/ILP-3F4

Note

1. Clamping force 20 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	10500 +40/–30%	≈4850	RM6S/ILP-3E5
3E6	15000 +40/–30%	≈6930	RM6S/ILP-3E6

Note

1. Clamping force 20 ±10 N.

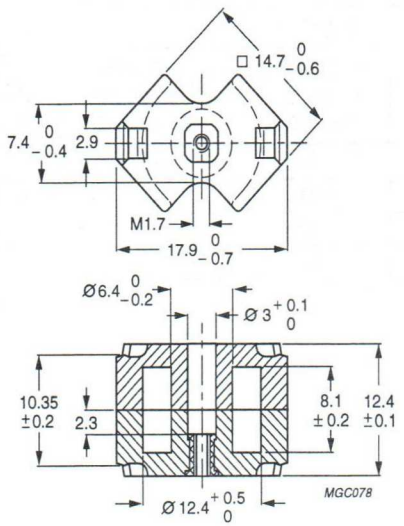
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.13	≤0.15	–	–	–
3C90	≥315	≤0.10	≤0.10	–	–	–
3F3	≥300	–	≤0.10	≤0.15	–	–
3F4	≥250	–	–	–	≤0.26	≤0.30

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM6R core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	25 ±3%	≈16	≈2500	RM6R-4C6-E25/N	RM6R-4C6-E25
	40 ±3%	≈26	≈1000	RM6R-4C6-E40/N	RM6R-4C6-E40
	63 ±3%	≈41	≈400	RM6R-4C6-E63/N	RM6R-4C6-E63
	150 ±25%	≈97	≈0	–	RM6R-4C6
3D3	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	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
3H1	160 ±3%	≈103	≈230	RM6R-3H1-A160/N	RM6R-3H1-A160
	250 ±3%	≈161	≈110	RM6R-3H1-A250/N	RM6R-3H1-A250
	315 ±3%	≈203	≈90	RM6R-3H1-A315/N	RM6R-3H1-A315
	400 ±3%	≈258	≈70	RM6R-3H1-A400/N	RM6R-3H1-A400
	630 ±5%	≈406	≈50	RM6R-3H1-A630/N	RM6R-3H1-A630
	1250 ±10%	≈805	≈20	RM6R-3H1-A1250/N	RM6R-3H1-A1250
	2450 ±25%	≈1580	≈0	–	RM6R-3H1

RM cores and accessories RM6R

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	100 ±3%	≈63	≈490	RM6R-3B7-E100/N	RM6R-3B7-E100
	160 ±3%	≈103	≈230	RM6R-3B7-A160/N	RM6R-3B7-A160
	250 ±3%	≈161	≈110	RM6R-3B7-A250/N	RM6R-3B7-A250
	315 ±3%	≈203	≈90	RM6R-3B7-A315/N	RM6R-3B7-A315
	400 ±3%	≈258	≈70	RM6R-3B7-A400/N	RM6R-3B7-A400
	2700 ±25%	≈1740	≈0	–	RM6R-3B7
3B9	100 ±3%	≈63	≈490	RM6R-3B9-E100/N	RM6R-3B9-E100
	160 ±3%	≈103	≈103	RM6R-3B9-A160/N	RM6R-3B9-A160
	250 ±3%	≈161	≈161	RM6R-3B9-A250/N	RM6R-3B9-A250
	315 ±3%	≈203	≈203	RM6R-3B9-A315/N	RM6R-3B9-A315
	400 ±3%	≈258	≈258	RM6R-3B9-A400/N	RM6R-3B9-A400
	2000 ±25%	≈1290	≈0	–	RM6R-3B9

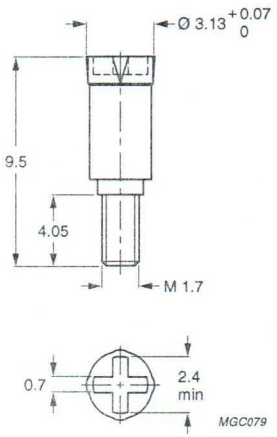
Note

1. Clamping force 40 ±20 N.

INDUCTANCE ADJUSTER

General data

ITEM	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

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)
3H1; 3H3; 3B7; 3B9	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	8	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	18
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	19
	315	ADJ-RM6-WHITE	10	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	20
	400	ADJ-RM6-VIOLET	9	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	24
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	27
	160	ADJ-RM6-RED	10	ADJ-RM6-WHITE	17	–	–
4C6	25	–	–	–	–	ADJ-RM6-GREEN	20
	40	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	20
	63	ADJ-RM6-GREEN	8	ADJ-RM6-RED	12	–	–

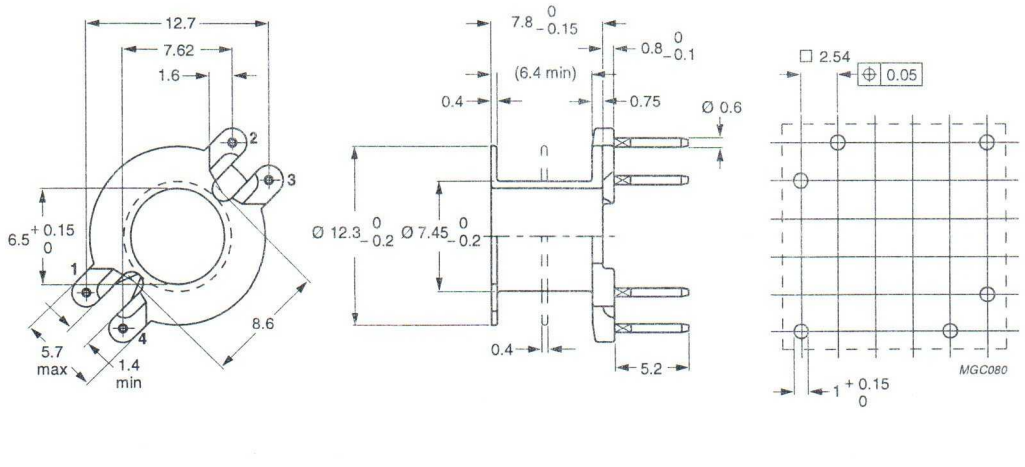
Note

1. Maximum adjustment range.

COIL FORMERS

General data

ITEM	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 85 class H
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

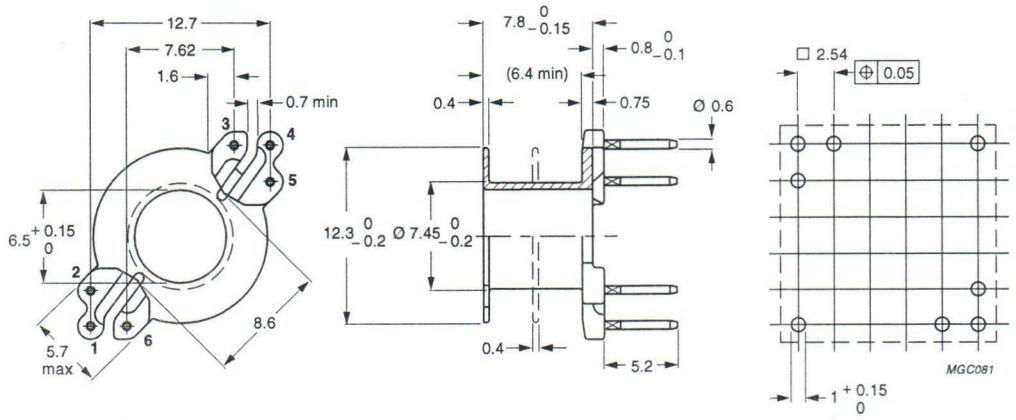


Dimensions in mm.

Fig.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	25	15	6.4	CSV-RM6S/R-1S-4P
2	4	all	25	2 × 7.0	2 × 3.0	CSV-RM6S/R-2S-4P



Dimensions in mm.

Fig.4 RM6R coil former; 6-pins.

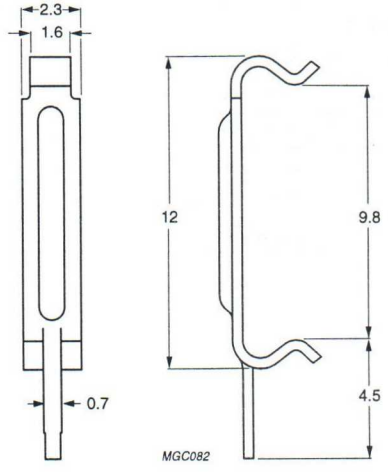
Winding data for 6-pins RM6R coil former

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	25	15	6.4	CSV-RM6R-1S-6P
2	6	all	25	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 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



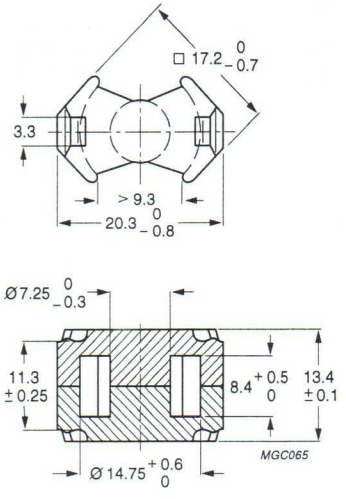
Dimensions in mm.

Fig.5 Mounting clip for RM6R.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈89	≈400	RM7/I-3B8-A160
	250 ±3%	≈139	≈200	RM7/I-3B8-A250
	3000 ±25%	≈1670	≈0	RM7/I-3B8
3C85	100 ±3%	≈56	≈800	RM7/I-3C85-A100
	160 ±3%	≈89	≈400	RM7/I-3C85-A160
	250 ±3%	≈139	≈200	RM7/I-3C85-A250
	2700 ±25%	≈1500	≈0	RM7/I-3C85
3C90	2700 ±25%	≈1500	≈0	RM7/I-3C90
3F3	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

Note

1. Clamping force 40 ±20 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	4750 ±25%	≈2570	RM7/I-3E1
3E4	6600 +40/–30%	≈3590	RM7/I-3E4
3E5	10000 +40/–30%	≈5370	RM7/I-3E5

Note

1. Clamping force 25 ±10 N.

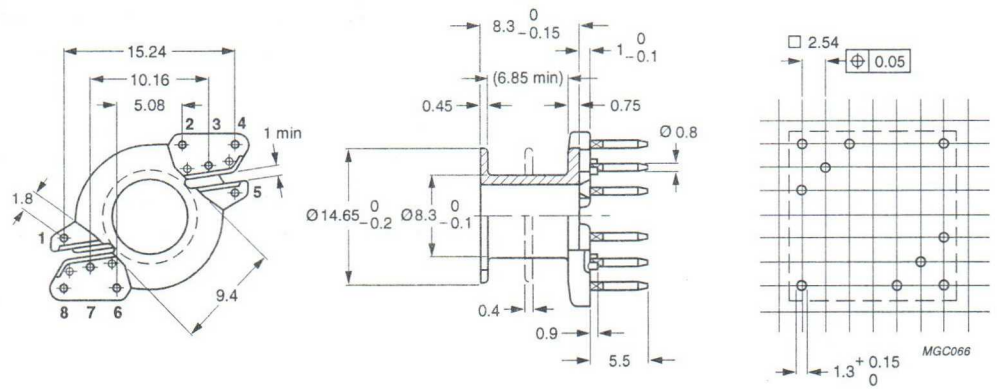
Properties of core sets under power conditions

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
3B8	≥315	≤0.40	–	–
3C85	≥315	≤0.20	≤0.24	–
3C90	≥315	≤0.15	≤0.15	–
3F3	≥315	–	≤0.15	≤0.25

COIL FORMER

General data

ITEM	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 85 class H
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 RM7 coil former.

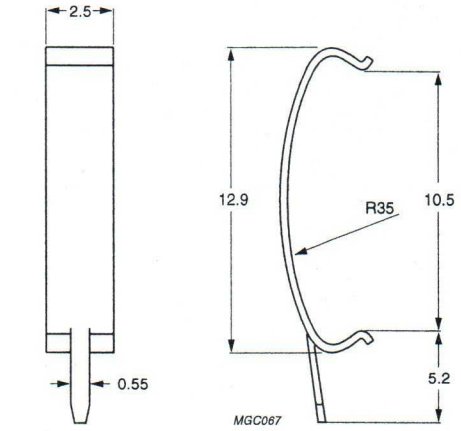
Winding data for RM7/I coil former

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 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM7



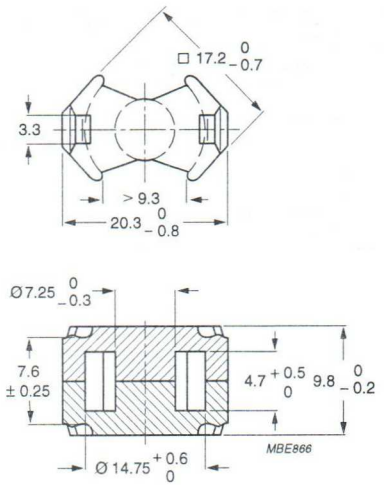
Dimensions in mm.

Fig.3 Mounting clip for RM7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	3400 ±25%	≈1410	≈0	RM7/ILP-3C85
3C90	3400 ±25%	≈1410	≈0	RM7/ILP-3C90
3F3	3100 ±25%	≈1280	≈0	RM7/ILP-3F3
3F4	1800 ±25%	≈740	≈0	RM7/ILP-3F4

Note

1. Clamping force 40 ±20 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	13000 +40/–30%	≈5380	RM7/ILP-3E5
3E6	18000 +40/–30%	≈7450	RM7/ILP-3E6

Note

1. Clamping force 40 ±20 N.

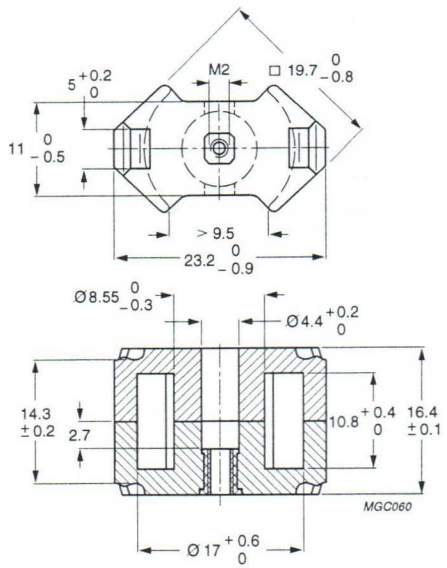
Properties of core sets under power conditions

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	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
3C85	≥315	≤0.16	≤0.19	–	–	–
3C90	≥315	≤0.12	≤0.12	–	–	–
3F3	≥300	–	≤0.12	≤0.20	–	–
3F4	≥250	–	–	–	≤0.32	≤0.35

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM8 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
4C6	40 ±3%	≈22	≈2700	RM8-4C6-E40/N	RM8-4C6-E40
	63 ±3%	≈34	≈1200	RM8-4C6-E63/N	RM8-4C6-E63
	180 ±25%	≈97	≈0	–	RM8-4C6
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
3H1	250 ±3%	≈135	≈210	RM8-3H1-E250/N	RM8-3H1-E250
	315 ±3%	≈170	≈160	RM8-3H1-A315/N	RM8-3H1-A315
	400 ±3%	≈220	≈130	RM8-3H1-A400/N	RM8-3H1-A400
	630 ±5%	≈340	≈100	RM8-3H1-A630/N	RM8-3H1-A630
	3150 ±25%	≈1700	≈0	–	RM8-3H1

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3B7	160 ±3%	≈90	≈480	RM8-3B7-E160/N	RM8-3B7-E160
	250 ±3%	≈135	≈210	RM8-3B7-E250/N	RM8-3B7-E250
	315 ±3%	≈170	≈160	RM8-3B7-A315/N	RM8-3B7-A315
	400 ±3%	≈220	≈130	RM8-3B7-A400/N	RM8-3B7-A400
	630 ±5%	≈340	≈100	RM8-3B7-A630/N	RM8-3B7-A630
	3400 ±25%	≈1830	≈0	–	RM8-3B7
3B9	160 ±3%	≈90	≈480	RM8-3B9-E160/N	RM8-3B9-E160
	250 ±3%	≈135	≈210	RM8-3B9-A250/N	RM8-3B9-A250
	315 ±3%	≈170	≈160	RM8-3B9-A315/N	RM8-3B9-A315
	400 ±3%	≈220	≈130	RM8-3B9-A400/N	RM8-3B9-A400
	630 ±5%	≈340	≈100	RM8-3B9-A630/N	RM8-3B9-A630
	2400 ±25%	≈1300	≈0	–	RM8-3B9

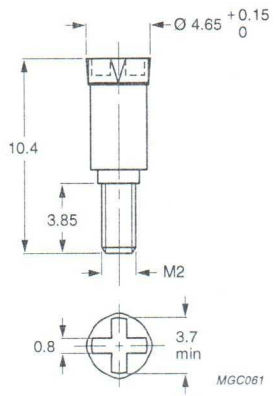
Note

1. Clamping force 60 ±30 N.

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 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)
3H1; 3H3; 3B7; 3B9	63	–	–	–	–	ADJ-P22/RM8-RED	25
	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	15	ADJ-P22/RM8-BROWN	19
	400	ADJ-P22/RM8-YELLOW	7	ADJ-P22/RM8-WHITE	12	ADJ-P22/RM8-BROWN	15
	630	ADJ-P22/RM8-YELLOW	5	ADJ-P22/RM8-BROWN	10	ADJ-P22/RM8-BLACK	16
3D3	63	–	–	–	–	ADJ-P22/RM8-RED	24
	100	–	–	ADJ-P22/RM8-RED	15	ADJ-P22/RM8-ORANGE	20
	160	–	–	ADJ-P22/RM8-ORANGE	13	ADJ-P22/RM8-YELLOW	17
4C6	40	–	–	–	–	ADJ-P22/RM8-RED	23
	63	–	–	ADJ-P22/RM8-RED	16	ADJ-P22/RM8-ORANGE	20
	100	–	–	ADJ-P22/RM8-ORANGE	11	ADJ-P22/RM8-WHITE	19
	160	ADJ-P22/RM8-ORANGE	7	ADJ-P22/RM8-WHITE	12	–	–

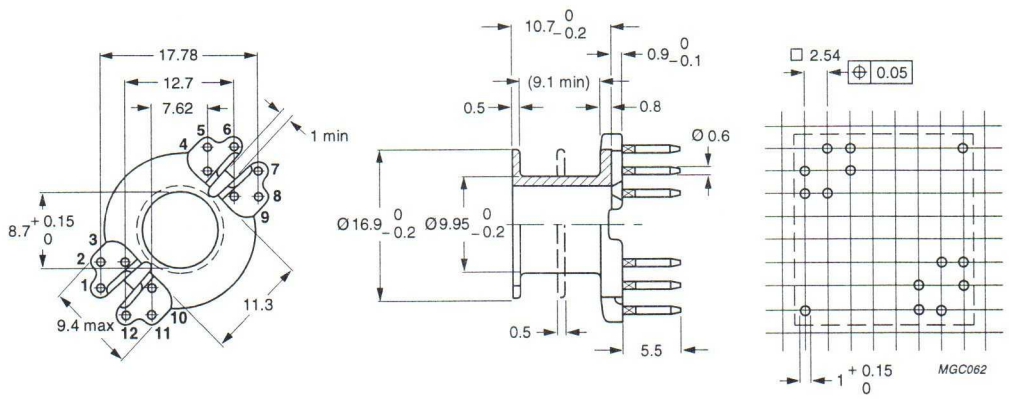
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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.3 RM8 coil former.

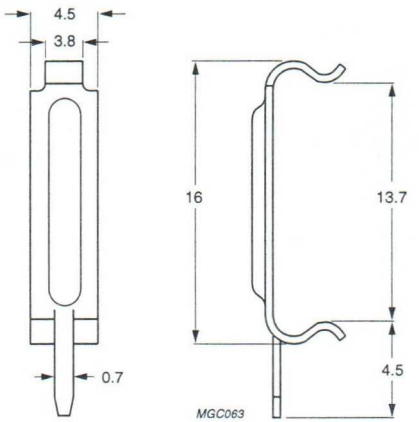
Winding data for RM8 coil former

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	31	9.1	CSV-RM8-1S-8P
1	12	all	42	31	9.1	CSV-RM8-1S-12P
2	8	1, 2, 5, 6, 7, 8, 11, 12	42	2 × 14.5	2 × 4.3	CSV-RM8-2S-8P
2	12	all	42	2 × 14.5	2 × 4.3	CSV-RM8-2S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N each
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8



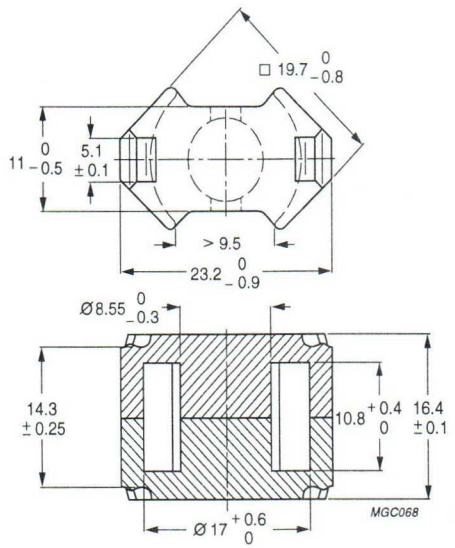
Dimensions in mm.

Fig.4 Mounting clip for RM8.

CORE SETS

Effective core parameters

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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈77	≈550	RM8/I-3B8-A160
	250 ±3%	≈120	≈300	RM8/I-3B8-A250
	315 ±3%	≈151	≈250	RM8/I-3B8-A315
	400 ±3%	≈192	≈180	RM8/I-3B8-A400
	3600 ±25%	≈1730	≈0	RM8/I-3B8
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
3C85	100 ±3%	≈50	≈1100	RM8/I-3C85-A100
	160 ±3%	≈77	≈550	RM8/I-3C85-A160
	250 ±3%	≈120	≈300	RM8/I-3C85-A250
	315 ±3%	≈151	≈250	RM8/I-3C85-A315
	400 ±3%	≈192	≈180	RM8/I-3C85-A400
	3250 ±25%	≈1560	≈0	RM8/I-3C85
3C90	3250 ±3%	≈1560	≈0	RM8/I-3C90

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
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
3F4	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

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E1	5800 ±25%	≈2800	RM8/I-3E1
3E25	8000 ±25%	≈3800	RM8/I-3E25
3E27	8000 ±25%	≈3800	RM8/I-3E27
3E4	8000 +40/–30%	≈3800	RM8/I-3E4
3E5	12500 +40/–30%	≈6000	RM8/I-3E5
3E6	18000 +40/–30%	≈7200	RM8/I-3E6

Note

1. Clamping force 30 ±10 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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3B8	≥315	≤0.70	–	–	–	–
3C81	≥315	≤0.50	–	–	–	–
3C85	≥315	≤0.40	≤0.45	–	–	–
3C90	≥315	≤0.27	≤0.27	–	–	–
3F3	≥315	–	≤0.27	≤0.47	–	–
3F4	≥250	–	–	–	≤0.75	≤0.85

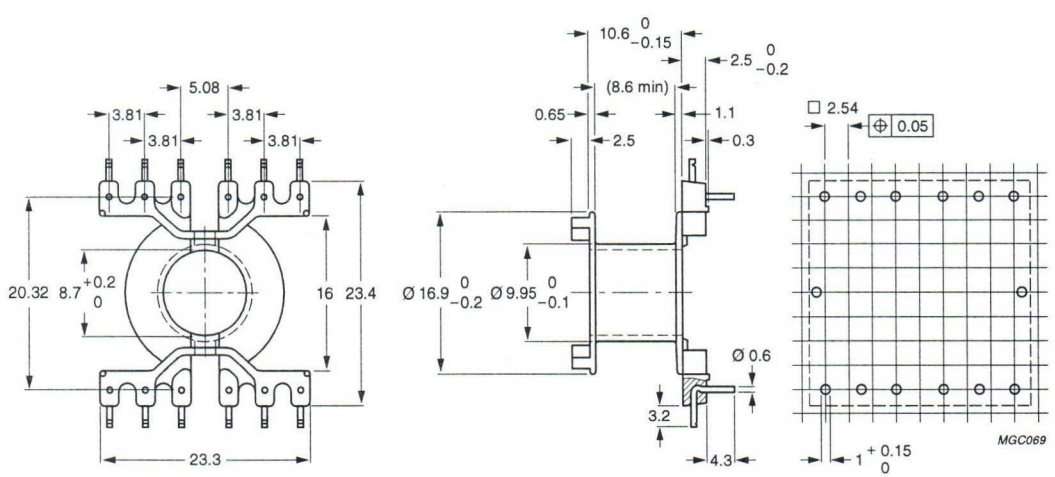
COIL FORMER

General data; note 1

ITEM	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 85 class F
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

Note

1. For the information on another coil former suitable for RM8/I, see *"Data sheet of RM8"*.



Dimensions in mm.

Fig.2 RM8/I coil former (DIL).

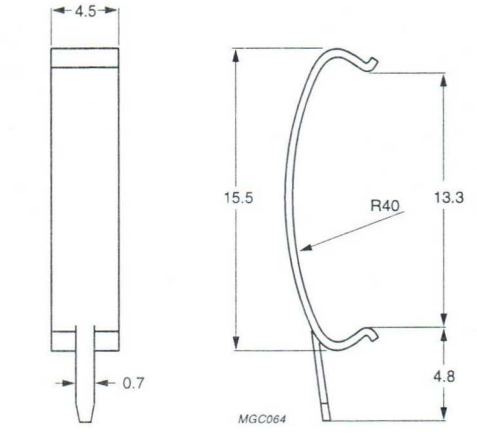
Winding data for RM8/I coil former (DIL)

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 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8/I



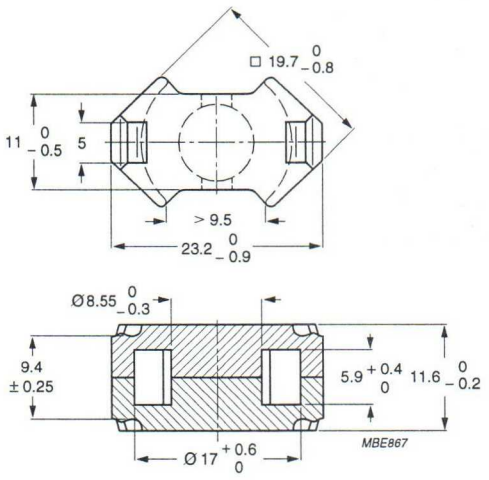
Dimensions in mm.

Fig.3 Mounting clip for RM8/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	4100 ±25%	≈1440	≈0	RM8/ILP-3C85
3C90	4100 ±25%	≈1440	≈0	RM8/ILP-3C90
3F3	3800 ±25%	≈1330	≈0	RM8/ILP-3F3
3F4	2200 ±25%	≈770	≈0	RM8/ILP-3F4

Note

1. Clamping force 30 ±10 N.

Core sets of high permeability grades

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	16000 +40/–30%	≈5600	RM8/ILP-3E5
3E6	23000 +40/–30%	≈8050	RM8/ILP-3E6

Note

1. Clamping force 30 ±10 N.

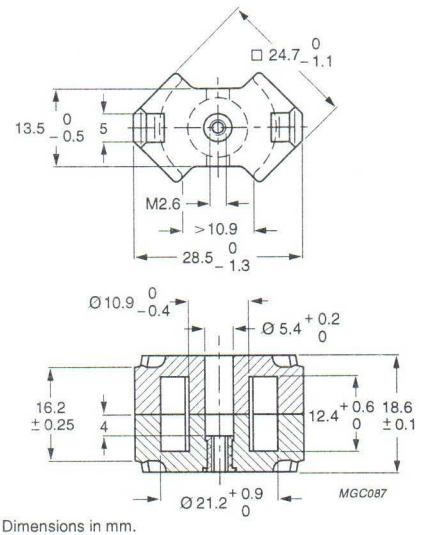
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.30	≤0.34	–	–	–
3C90	≥315	≤0.21	≤0.21	–	–	–
3F3	≥300	–	≤0.21	≤0.36	–	–
3F4	≥250	–	–	–	≤0.57	≤0.65

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM10 core set.

Core sets for filter applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	250 ±3%	≈100	≈400	RM10-3H1-A250/N	RM10-3H1-A250
	315 ±3%	≈126	≈300	RM10-3H1-A315/N	RM10-3H1-A315
	400 ±3%	≈160	≈230	RM10-3H1-A400/N	RM10-3H1-A400
	630 ±3%	≈251	≈130	RM10-3H1-A630/N	RM10-3H1-A630
	4500 ±25%	≈1800	≈0	–	RM10-3H1
3B7	250 ±3%	≈100	≈400	RM10-3B7-E250/N	RM10-3B7-E250
	315 ±3%	≈126	≈300	RM10-3B7-E315/N	RM10-3B7-E315
	400 ±3%	≈160	≈230	RM10-3B7-A400/N	RM10-3B7-A400
	630 ±3%	≈251	≈130	RM10-3B7-A630/N	RM10-3B7-A630
	1000 ±5%	≈400	≈90	–	RM10-3B7-A1000
	4765 ±25%	≈1900	≈0	–	RM10-3B7
3B9	250 ±3%	≈100	≈400	RM10-3B9-E250/N	RM10-3B9-E250
	315 ±3%	≈126	≈300	RM10-3B9-E315/N	RM10-3B9-E315
	400 ±3%	≈160	≈230	RM10-3B9-A400/N	RM10-3B9-A400
	630 ±3%	≈251	≈130	RM10-3B9-A630/N	RM10-3B9-A630
	1000 ±5%	≈400	≈90	–	RM10-3B9-A1000
	3525 ±25%	≈1400	≈0	–	RM10-3B9

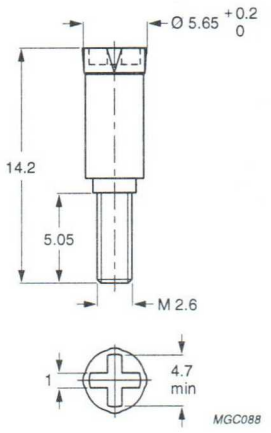
Note

1. Clamping force 60 ±20 N.

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 RM10 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)
3H1	160	–	–	–	–	ADJ-P30/RM10-YELLOW	26
	250	–	–	ADJ-P30/RM10-YELLOW	16	–	–
	315	–	–	ADJ-P30/RM10-YELLOW	14	–	–
	400	–	–	ADJ-P30/RM10-YELLOW	10	–	–
	630	ADJ-P30/RM10-YELLOW	6	–	–	ADJ-P30/RM10-GREY	20

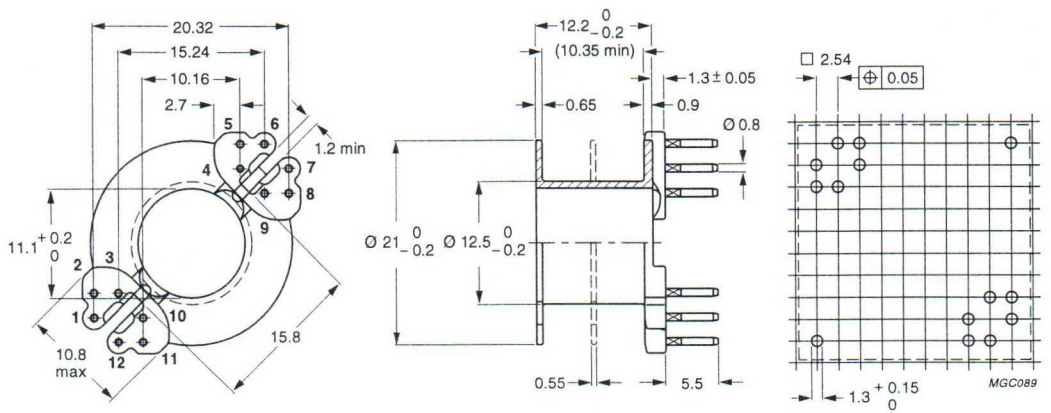
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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.3 RM10 coil former.

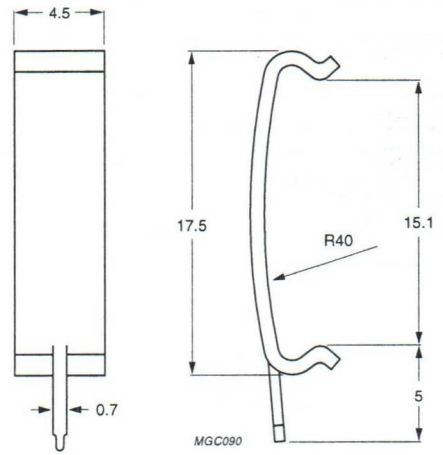
Winding data for RM10 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	5	3, 4, 6, 9, 10	52	43	10.4	CSV-RM10-1S-5P
1	8	1, 3, 4, 6, 7, 9, 10, 12	52	43	10.4	CSV-RM10-1S-8P
1	12	all	52	43	10.4	CSV-RM10-1S-12P
2	5	3, 4, 6, 9, 10	52	2 × 20.5	2 × 4.9	CSV-RM10-2S-5P
2	8	1, 3, 4, 6, 7, 9, 10, 12	52	2 × 20.5	2 × 4.9	CSV-RM10-2S-8P
2	12	all	52	2 × 20.5	2 × 4.9	CSV-RM10-2S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/I



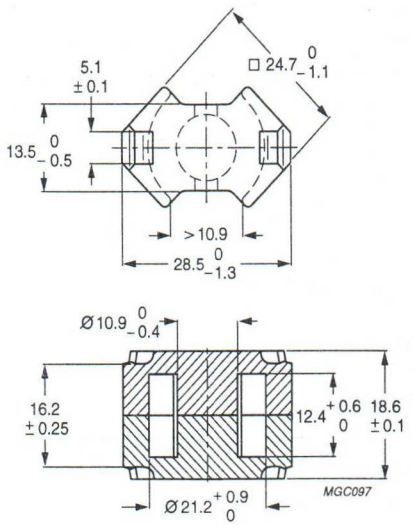
Dimensions in mm.

Fig.4 Mounting clip for RM10.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM10/I core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈59	≈900	RM10/I-3B8-A160
	250 ±3%	≈92	≈500	RM10/I-3B8-A250
	315 ±3%	≈116	≈400	RM10/I-3B8-A315
	400 ±3%	≈147	≈300	RM10/I-3B8-A400
	630 ±3%	≈232	≈150	RM10/I-3B8-A630
	4950 ±25%	≈1820	≈0	RM10/I-3B8
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
3C85	160 ±3%	≈59	≈900	RM10/I-3C85-A160
	250 ±3%	≈92	≈500	RM10/I-3C85-A250
	315 ±3%	≈116	≈400	RM10/I-3C85-A315
	400 ±3%	≈147	≈300	RM10/I-3C85-A400
	630 ±3%	≈232	≈150	RM10/I-3C85-A630
	4400 ±25%	≈1620	≈0	RM10/I-3C85
3C90	4400 ±25%	≈1620	≈0	RM10/I-3C90

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	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

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E1	8000 ±25%	≈2900	RM10/I-3E1
3E25	10700 ±25%	≈3880	RM10/I-3E25
3E27	10700 ±25%	≈3880	RM10/I-3E27
3E4	11000 +40/–30%	≈4040	RM10/I-3E4
3E5	16000 +40/–30%	≈5900	RM10/I-3E5

Note

1. Clamping force 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
3B8	≥315	≤1.20	–	–
3C81	≥315	≤0.88	–	–
3C85	≥315	≤0.65	≤0.80	–
3C90	≥315	≤0.50	≤0.48	–
3F3	≥315	–	≤0.48	≤0.82

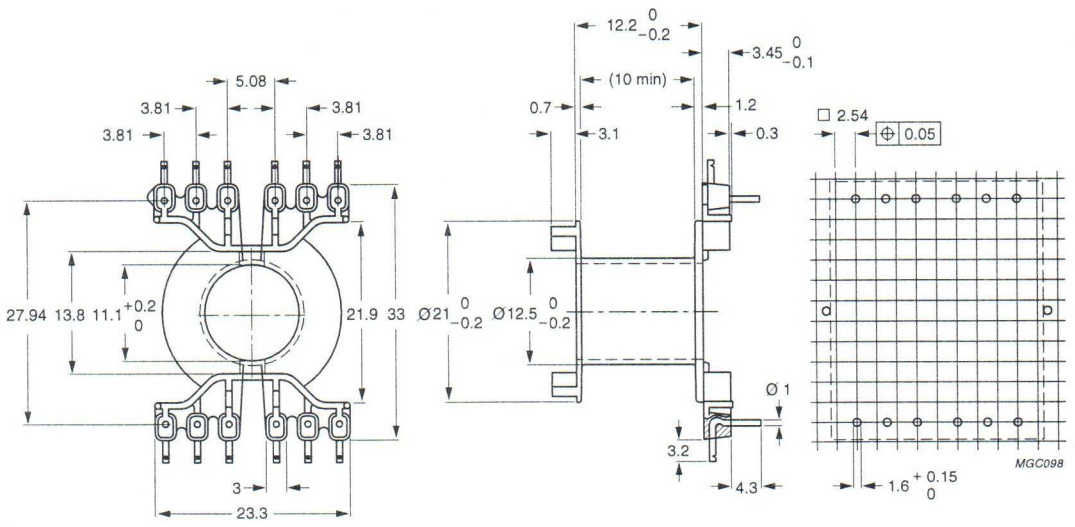
COIL FORMER

General data; note 1

ITEM	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 85 class F
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

Note

1. For the information on another coil former suitable for RM10/I, see *"Data sheet of RM10"*.



Dimensions in mm.

Fig.2 RM10/I coil former (DIL).

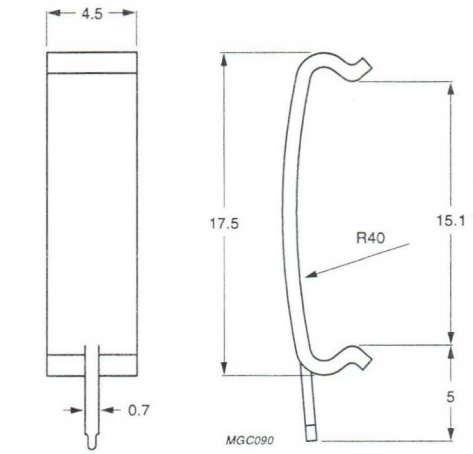
Winding data for RM10/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	52	44.2	10.0	CPV-RM10/I-1S-12PD

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/I



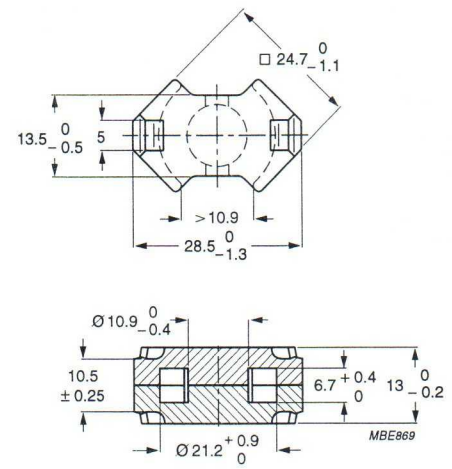
Dimensions in mm.

Fig.3 Mounting clip for RM10/I.

CORE SETS

Effective core parametersRM10/ILP

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	80.9	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

GRADE	A_L[1] (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	5600 ±25%	≈1510	≈0	RM10/ILP-3C85
3C90	5600 ±25%	≈1510	≈0	RM10/ILP-3C90
3F3	5200 ±25%	≈1410	≈0	RM10/ILP-3F3
3F4	3000 ±25%	≈810	≈0	RM10/ILP-3F4

Note

1. Clamping force 60 ±20 N.

Core sets of high permeability grades

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3E5	22000 +40/–30%	≈5950	RM10/ILP-3E5
3E6	32000 +40/–30%	≈8660	RM10/ILP-3E6

Note

1. Clamping force 60 ±20 N.

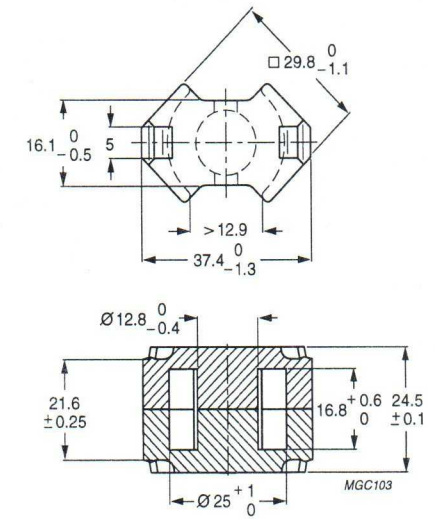
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.51	≤0.62	–	–	–
3C90	≥315	≤0.37	≤0.37	–	–	–
3F3	≥300	–	≤0.37	≤0.64	–	–
3F4	≥250	–	–	–	≤1.0	≤1.1

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	160 ±3%	≈49	≈1400	RM12/I-3B8-A160
	250 ±3%	≈77	≈800	RM12/I-3B8-A250
	315 ±5%	≈97	≈550	RM12/I-3B8-A315
	400 ±5%	≈123	≈450	RM12/I-3B8-A400
	6200 ±25%	≈1910	≈0	RM12/I-3B8
3C85	160 ±3%	≈49	≈1400	RM12/I-3C85-A160
	250 ±3%	≈77	≈800	RM12/I-3C85-A250
	315 ±5%	≈97	≈550	RM12/I-3C85-A315
	400 ±5%	≈123	≈450	RM12/I-3C85-A400
	630 ±5%	≈196	≈300	RM12/I-3C85-A630
	5500 ±25%	≈1700	≈0	RM12/I-3C85
3C90	5500 ±25%	≈1700	≈0	RM12/I-3C90
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

Note

1. Clamping force 70 ±20 N.

Core sets of high permeability grades

GRADE	A_L [1] (nH)	μ_e	TYPE NUMBER
3E1	9200 ±25%	≈2850	RM12/I-3E
3E4	13300 +40/–30%	≈4100	RM12/I-3E4

Note

1. Clamping force 70 ±20 N.

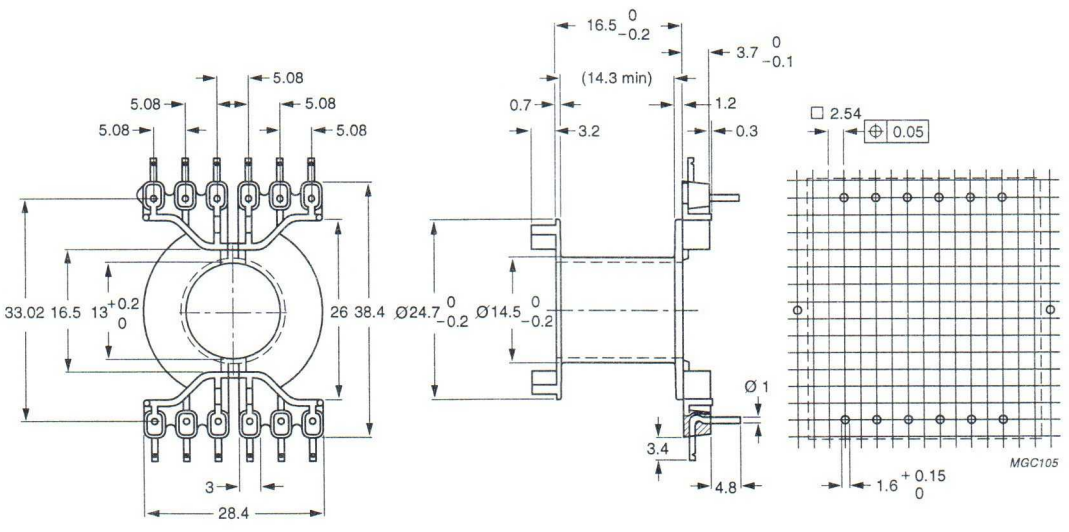
Properties of core sets under power conditions

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
3B8	≥315	≤2.35	–	–
3C85	≥315	≤1.30	≤1.50	–
3C90	≥315	≤0.92	≤0.92	–
3F3	≥315	–	≤0.92	≤1.60

COIL FORMER

General data

ITEM	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 85 class F
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 RM12/I coil former (DIL).

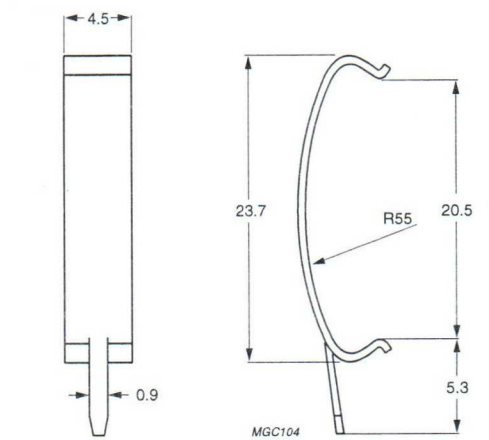
Winding data for RM12/I coil former (DIL)

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

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈35 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM12/I



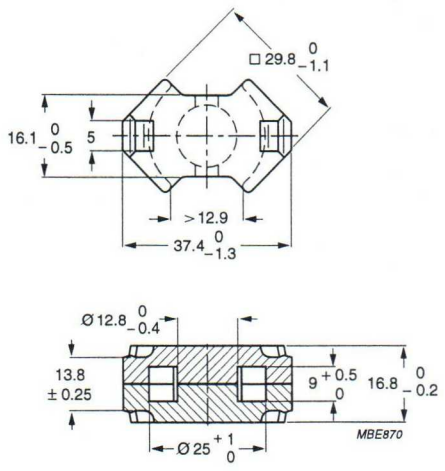
Dimensions in mm.

Fig.3 Mounting clip for RM12/I.

CORE SETS

Effective core parametersRM12/ILP

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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



Dimensions in mm.

Fig.1 RM12/ILP core set.

Core sets for general purpose transformers and power applications

GRADE	A_L(1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	7300 ±25%	≈1630	≈0	RM12/ILP-3C85
3C90	7300 ±25%	≈1630	≈0	RM12/ILP-3C90
3F3	6700 ±25%	≈1490	≈0	RM12/ILP-3F3
3F4	3600 ±25%	≈800	≈0	RM12/ILP-3F4

Note

1. Clamping force 70 ±20 N.

Core sets of high permeability grades

GRADE	A_L(1) (nH)	μ_e	TYPE NUMBER
3E5	28000 +40/–30%	≈6240	RM12/ILP-3E5
3E6	42000 +40/–30%	≈9360	RM12/ILP-3E6

Note

1. Clamping force 70 ±20 N.

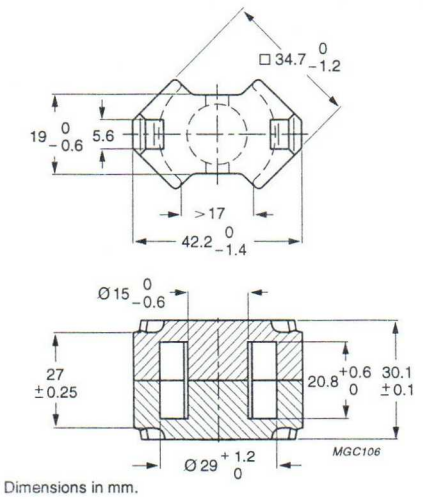
Properties of core sets under power conditions

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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤0.97	≤1.1	–	–	–
3C90	≥315	≤0.68	≤0.68	–	–	–
3F3	≥300	–	≤0.68	≤1.2	–	–
3F4	≥250	–	–	–	≤1.9	≤2.1

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM14/I core set.

Core sets for general purpose transformers and power applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3B8	250 ±3%	≈70	≈950	RM14/I-3B8-A250
	315 ±3%	≈88	≈700	RM14/I-3B8-A315
	400 ±3%	112	≈550	RM14/I-3B8-A400
	630 ±5%	≈177	≈250	RM14/I-3B8-A630
	1000 ±5%	≈281	≈150	RM14/I-3B8-A1000
	7100 ±25%	≈1990	≈0	RM14/I-3B8
3C85	250 ±3%	≈70	≈950	RM14/I-3C85-A250
	315 ±3%	≈88	≈700	RM14/I-3C85-A315
	400 ±3%	112	≈550	RM14/I-3C85-A400
	630 ±5%	≈177	≈250	RM14/I-3C85-A630
	1000 ±5%	≈281	≈150	RM14/I-3C85-A1000
	6250 ±25%	≈1750	≈0	RM14/I-3C85
3C90	6250 ±25%	≈1750	≈0	RM14/I-3C90
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

Note

1. Clamping force 80 ±20 N.

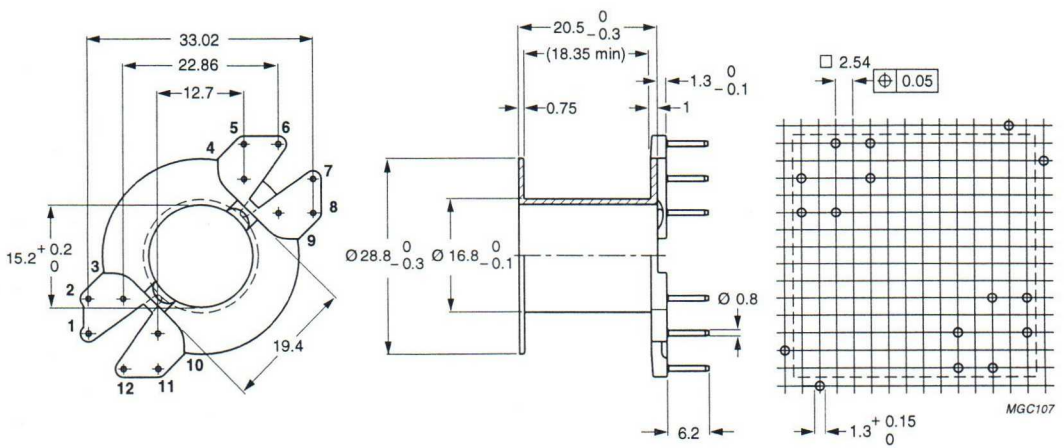
Properties of core sets under power conditions

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
3B8	≥315	≤3.90	–	–
3C85	≥315	≤2.15	≤2.50	–
3C90	≥315	≤1.55	≤1.55	–
3F3	≥315	–	≤1.55	≤2.65

COIL FORMERS

General data

ITEM	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 85 class H
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.

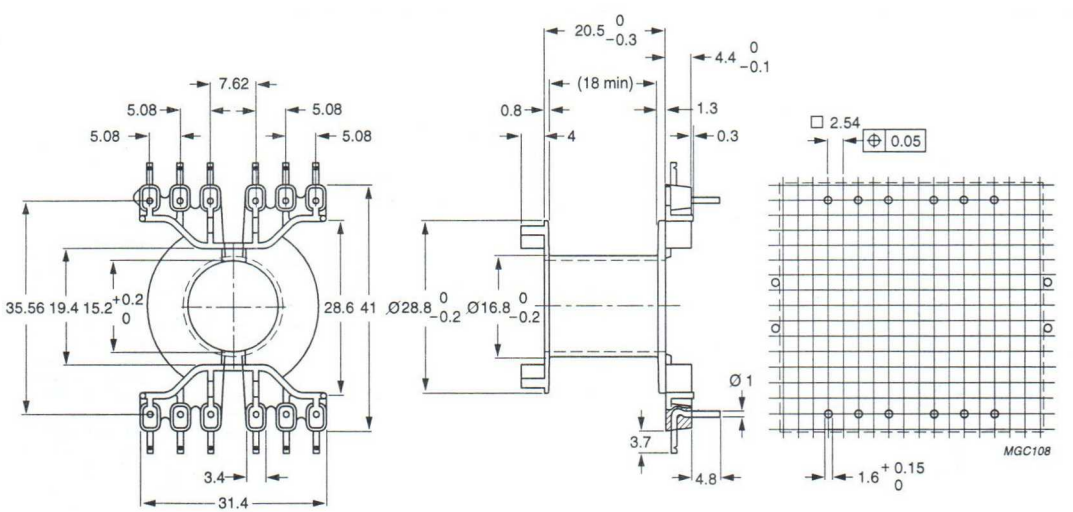
Fig.2 RM14/I coil former; 12-pins.

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

ITEM	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 85 class F
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.3 RM14/I coil former; 12-pins (DIL).

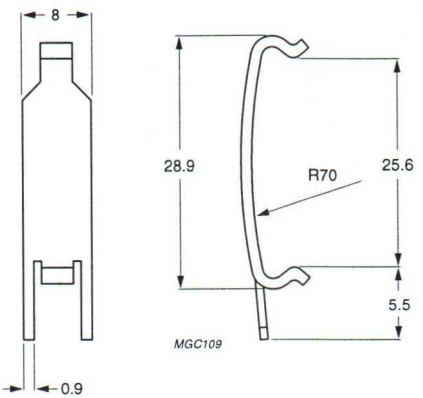
Winding data for 12-pins RM14/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	71	111.0	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 68-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM14/I



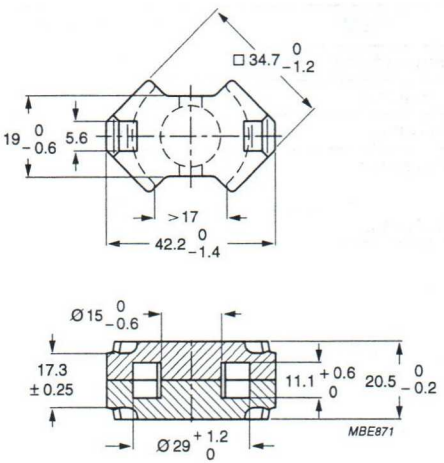
Dimensions in mm.

Fig.4 Mounting clip for RM14/I.

CORE SETS

Effective core parametersRM14/ILP

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C85	8400 ±25%	≈1670	≈0	RM14/ILP-3C85
3C90	8400 ±25%	≈1670	≈0	RM14/ILP-3C90
3F3	7700 ±25%	≈1530	≈0	RM14/ILP-3F3
3F4	4200 ±25%	≈840	≈0	RM14/ILP-3F4

Note

1. Clamping force 80 ±20 N.

Core sets of high permeability grades

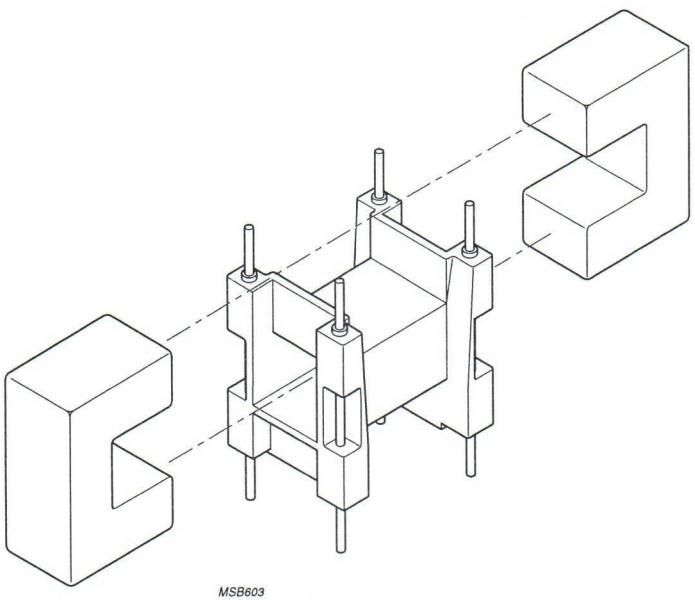
GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3E5	32000 +40/–30%	≈6360	RM14/ILP-3E5
3E6	48000 +40/–30%	≈9550	RM14/ILP-3E6

Note

1. Clamping force 80 ±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	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C85	≥315	≤1.6	≤1.8	–	–	–
3C90	≥315	≤1.2	≤1.2	–	–	–
3F3	≥300	–	≤1.2	≤2.0	–	–
3F4	≥250	–	–	–	≤3.1	≤3.4



MSB603

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview U, I cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
U10/8/3	323	8.4	0.9
U15/11/6	1680	32.3	4
I15/3/3			0.6
U20/16/7	3800	56.0	9.0
I20/6/5			3
U25/16/6	3380	40.3	8
I25/6/6			4.5
U25/20/13	8600	100	21
I25/7/7			6
U30/25/16	17900	161	43
U33/22/9	9490	86.5	23
U67/27/14	35200	204	85
U93/76/16	159000	448	400
I93/28/16			200
U93/52/30	217000	840	560
U93/76/30	297000	840	760
I93/28/30			370
U100/48/25	174000	645	450
I100/25/25			300
U100/57/25	199000	645	500

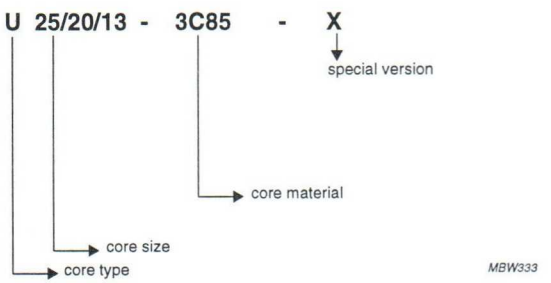


Fig.1 Type number structure for cores.

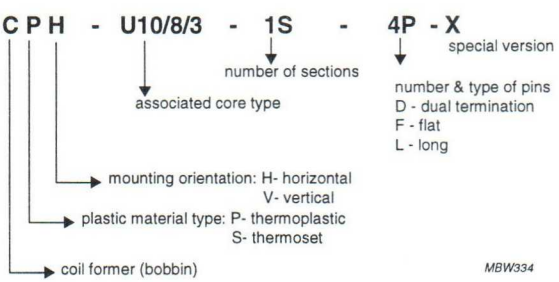
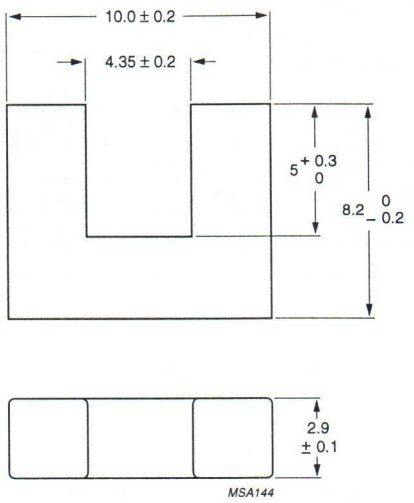


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.75	mm^{-1}
V_e	effective volume	323	mm^3
l_e	effective length	38.4	mm
A_e	effective area	8.4	mm^2
m	mass of core half	≈0.9	g



Dimensions in mm.

Fig.1 U10/8/3 core half.

Core halves

GRADE	A_L(1) (nH)	μ_e	TYPE NUMBER
3C80	540 ±25%	≈1900	U10/8/3-3C80
3C85	540 ±25%	≈1900	U10/8/3-3C85

Note

1. Measured in combination with a non-gapped core halve.

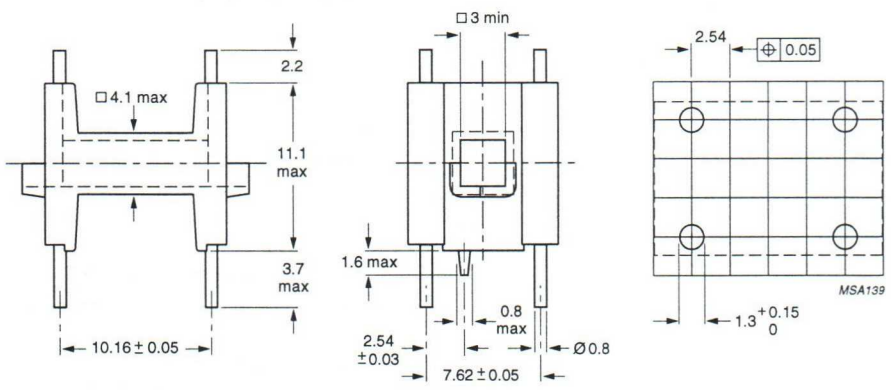
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥320	≤0.05	–	–
3C85	≥320	–	≤0.05	≤0.06

COIL FORMERS

General data 4-pins U10/8/3 coil former

ITEM	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 85 class F
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: 235 °C, 2 s



Dimensions in mm.

Fig.2 U10/8/3 coil former; 4-pins.

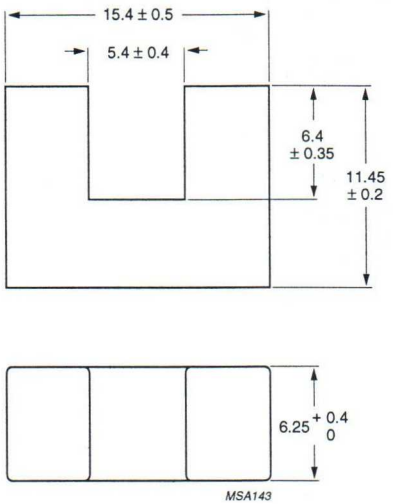
Winding data for 4-pins U10/8/3 coil former

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

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

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	1250 +30-20%	≈1550	U15/11/6-3C80
3C85	1250 ±25%	≈1550	U15/11/6-3C85
3C11	2350 ±25%	≈3000	U15/11/6-3C11
3E25	3400 ±25%	≈4300	U15/11/6-3E25
2P90(2)	72 ±10%	≈90	U15/11/6-3P90

Notes

1. Measured in combination with a non gapped core halve.
2. U15/11/6-2P90 is very suitable for output chokes or uncompensated input filters. The core is isolated with polyurethane lacquer except for the mating faces. Its density is higher than the ferrite cores (mass ≈ 7 g).

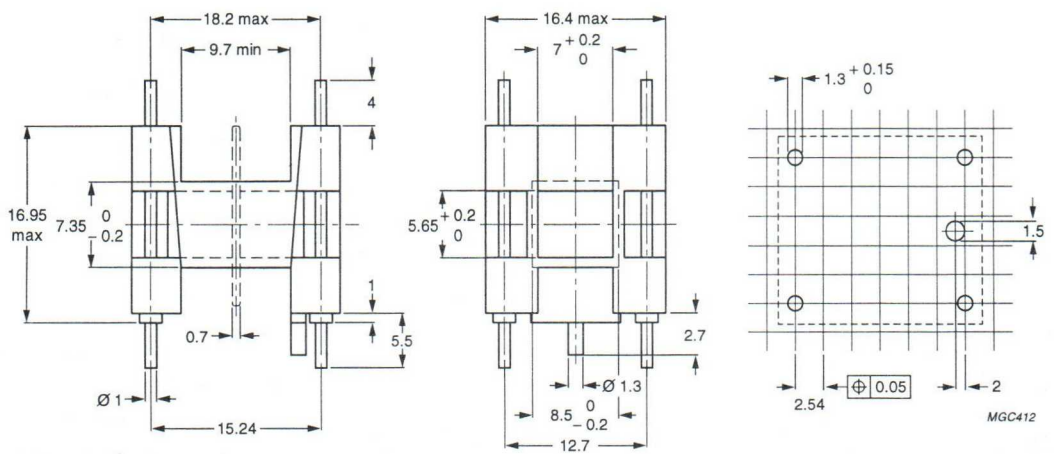
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥320	≤0.18	–	–
3C85	≥320	–	≤0.24	≤0.28

COIL FORMERS

General data 4-pins U15/11/6 coil former

ITEM	SPECIFICATION
Coil former material	polyamide 6.6, glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E44716(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, IEC 85 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: 235 °C, 2 s



Dimensions in mm.

Fig.2 U15/11/6 coil former; 4-pins.

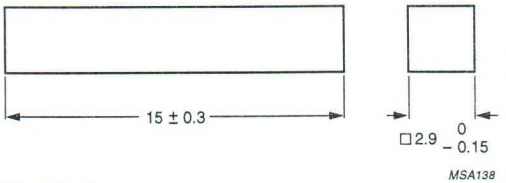
Winding data for 4-pins U15/11/6 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	38.7		46.6	CPH-U15/11/6-1S-4P
2	2 × 17.9	2 × 4.45	46.6	CPH-U15/11/6-2S-4P

CORE

Ordering information

GRADE	TYPE NUMBER
3C80	I15/3/3-3C80



Dimensions in mm.

Fig.1 I15/3/3 core.

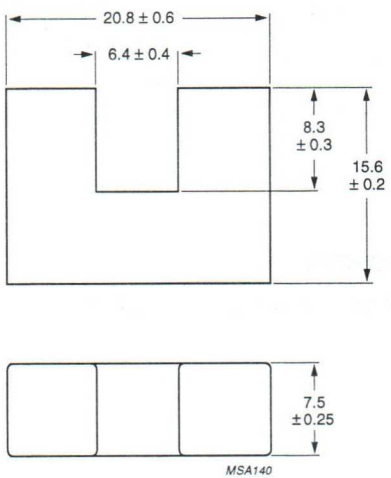
COIL FORMER

For coil former data, see *"Data sheet of U10/8/3".*

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.21	mm^{-1}
V_e	effective volume	3800	mm^3
l_e	effective length	68	mm
A_e	effective area	56	mm^2
m	mass of core half	≈9	g



Dimensions in mm.

Fig.1 U20/16/7 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	1700 ±25%	≈1650	U20/16/7-3C80
3C85	1700 ±25%	≈1650	U20/16/7-3C85
3C11	3400 ±25%	≈3250	U20/16/7-3C11
3E25	4800 ±25%	≈4600	U20/16/7-3E25
2P90(2)	93 ±25%	≈900	U20/16/7-3P90

Notes

1. Measured in combination with a non gapped core halve.
2. U20/16/7-2P90 is very suitable for output chokes or uncompensated input filters. The core is isolated with polyurethane lacquer except for the mating faces. Its density is higher than the ferrite cores (mass ≈ 12 g).

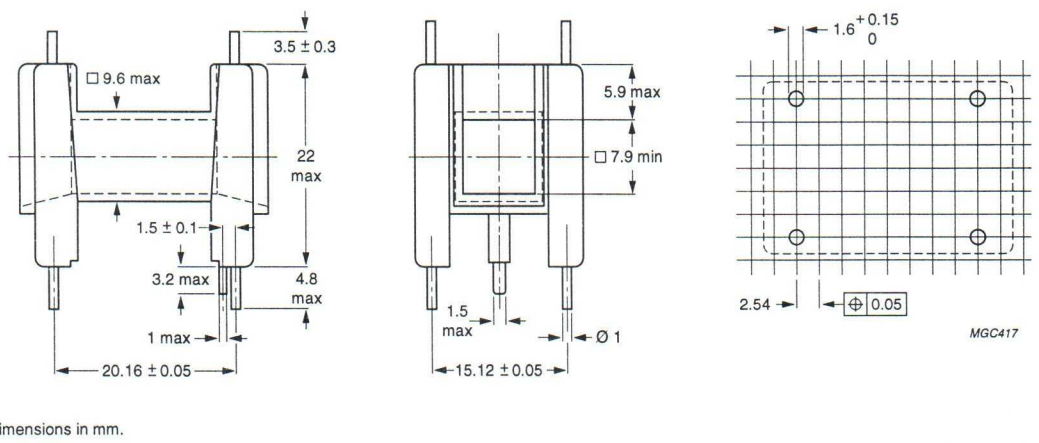
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥320	≤0.45	–	–
3C85	≥320	–	≤0.53	≤0.63

COIL FORMERS

General data 4-pins U20/16/7 coil former

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-1; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, IEC 85 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: 235 °C, 2 s



Dimensions in mm.

Fig.2 U20/16/7 coil former; 4-pins.

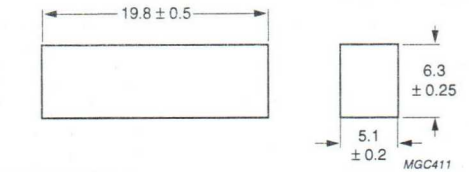
Winding data for 4-pins U20/16/7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	73	14.5	54	CPH-U20/16/7-1S-4P

CORE

Ordering information

GRADE	TYPE NUMBER
3C80	I20/6/5-3C80



Dimensions in mm.

Fig.1 I20/6/5 core.

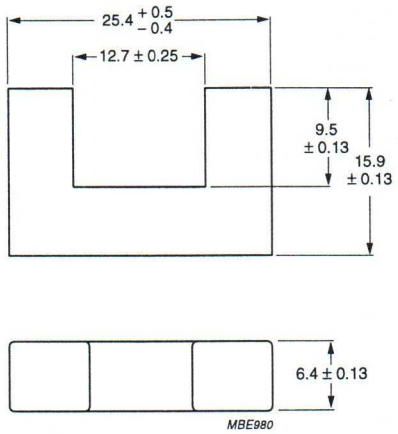
COIL FORMER

For coil former data, see *"Data sheet of U15/11/6".*

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

GRADE	A_L(1) (nH)	μ_e	TYPE NUMBER
3C81	1400 ±25%	≈2300	U25/16/6-3C81
3E25	2320 ±25%	≈3800	U25/16/6-3E25
3E27	2320 ±25%	≈3800	U25/16/6-3E27

Note

1. Measured in combination with a non-gapped core halve.

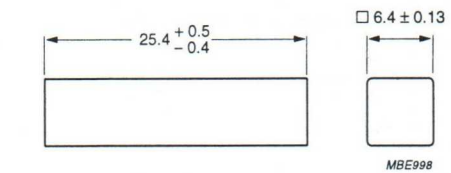
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 160 mT; 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	≤0.40	–	–

CORE SETS

Effective core parameters measured in combination with U25/16/6

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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 data

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C81	1750 ±25%	≈2250	I25/6/6-3C81
3E25	2500 ±25%	≈3200	I25/6/6-3E25
3E27	2500 ±25%	≈3200	I25/6/6-3E27

Note

1. Measured in combination with U25/16/6.

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; $\hat{B}$ = 160 mT; T = 100 °C
3C81	≥330	≤0.53

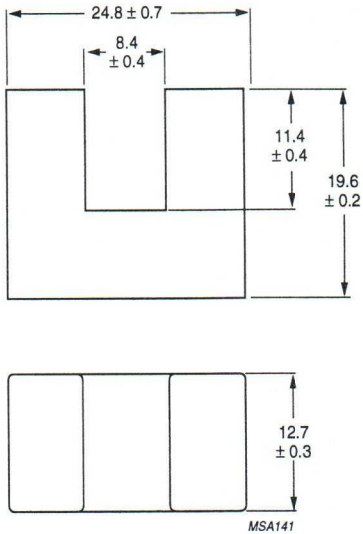
Note

1. Measured in combination with U25/16/6.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	2500 ±25%	≈1700	U25/20/13-3C80
3C85	2500 ±25%	≈1700	U25/20/13-3C85
3C11	5100 ±25%	≈3450	U25/20/13-3C11
3E25	6300 ±25%	≈4300	U25/20/13-3E25

Notes

1. Measured in combination with a non gapped core halve.

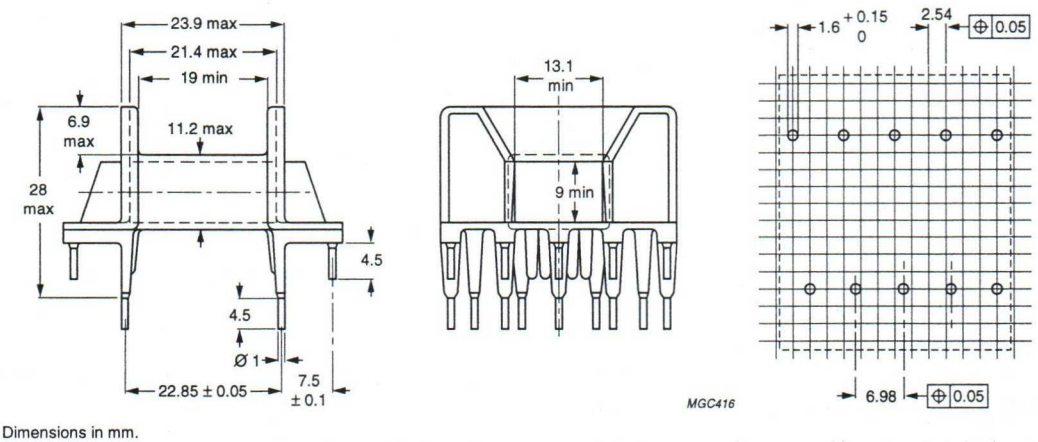
Properties of core sets under power conditions

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 = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥330	≤1.00	–	–
3C85	≥330	–	≤1.30	≤1.60

COIL FORMERS

General data 9-pins U25/20/13 coil former

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-1; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, IEC 85 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: 235 °C, 2 s



Dimensions in mm.

Fig.2 U25/20/13 coil former; 10-pins.

Winding data for 9-pins U25/20/13 coil former

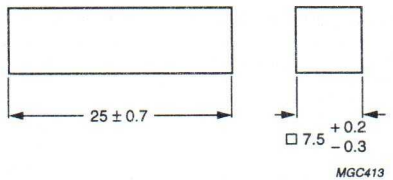
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	131	19	73	CPH-U25/20/13-1S-10P

I cores and accessories I25/7/7

CORE

Ordering information

GRADE	TYPE NUMBER
3C80	I25/7/7-3C80



Dimensions in mm.

Fig.1 I25/7/7 core.

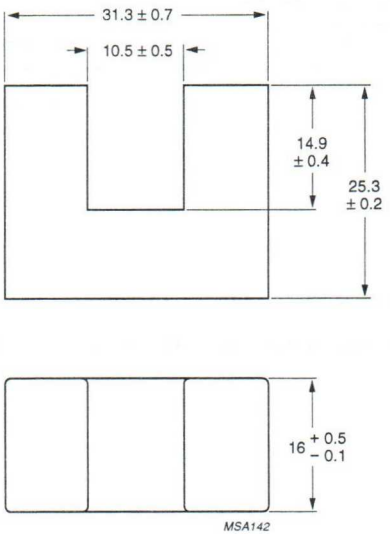
COIL FORMER

For coil former data, see *"Data sheet of U20/16/7"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	3300 ±25%	≈1800	U30/25/16-3C80
3C85	3300 ±25%	≈1800	U30/25/16-3C85
3C11	6500 ±25%	≈3600	U30/25/16-3C11

Notes

1. Measured in combination with a non gapped core halve.

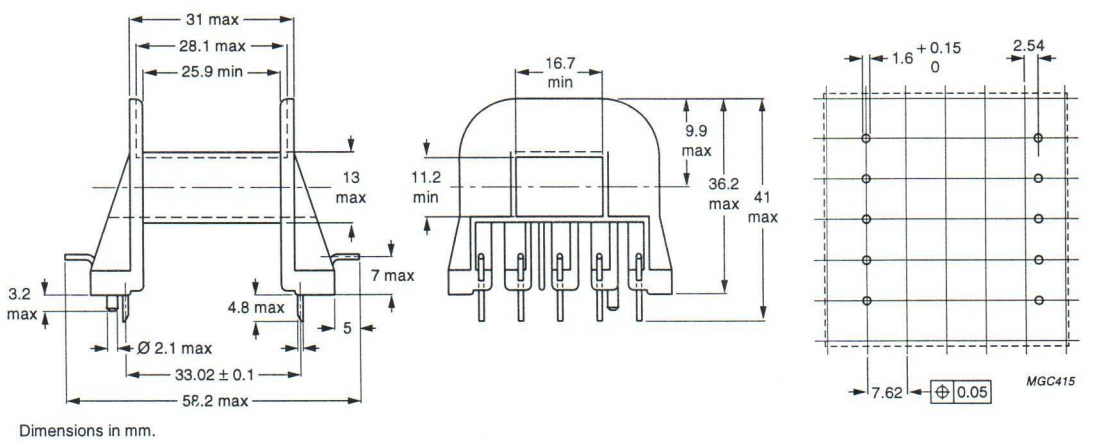
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C80	≥330	≤2.00	–	–
3C85	≥330	–	≤2.70	≤3.20

COIL FORMERS

General data 10-pins U30/25/16 coil former

ITEM	SPECIFICATION
Coil former material	polycarbonate (PC), glass-reinforced, flame retardant in accordance with UL 94V-1; UL file number E41613(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, IEC 85 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: 235 °C, 2 s



Dimensions in mm.

Fig.2 U30/25/16 coil former; 10-pins.

Winding data for 10-pins U30/25/16 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	230	25.9	97	CPH-U30/25/16-1S-10P

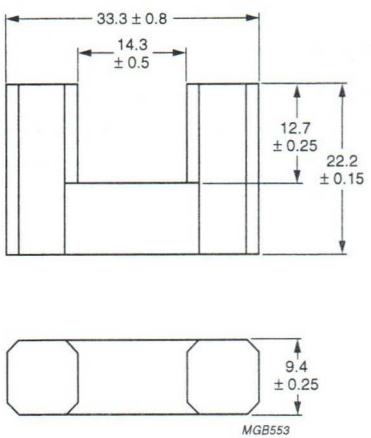
U cores and accessories

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 halves

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C81	2300 ±25%	≈2320	U33/22/9-3C81

Note

1. Measured in combination with a non-gapped core halve.

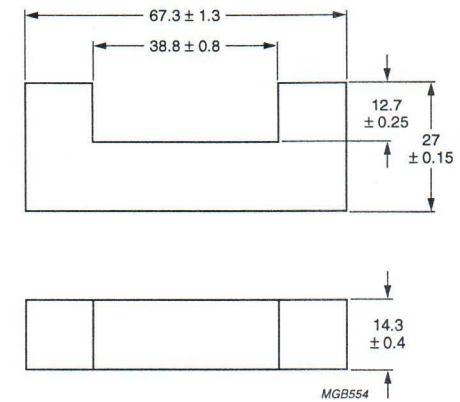
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 160 mT; 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	≤1.1	–	–

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 halves

GRADE	A_L[1] (nH)	μ_e	TYPE NUMBER
3C81	3800 ±25%	≈2570	U67/27/14 -3C81

Note

1. Measured in combination with a ungapped core halve

Properties of core sets under power conditions

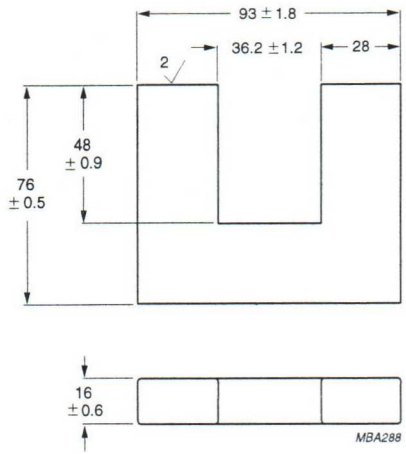
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥330	≤7.1	–	–

U cores and accessories U93/76/16

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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 halves

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	2700 ±25%	≈1700	U93/76/16-3C80

Note

1. Measured on a combination of two U-cores.

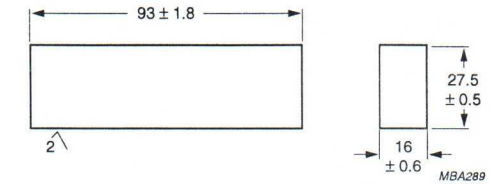
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤17.6

CORE SETS

Effective core parameters in combination with U93/76/16

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	3800 ±25%	≈1750	I93/28/16-3C80

Note

1. Measured in combination with U93/76/16.

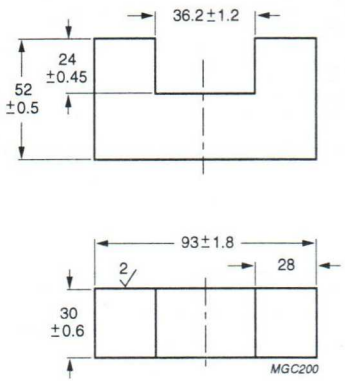
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤12.6

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 U10/8/3 core half.

Core halves

GRADE	A_L(1) (nH)	μ_e	TYPE NUMBER
3C80	7000 ±25%	≈1700	U93/52/30-3C80

Note

1. Measured on a combination of two U-cores.

Properties of core sets under power conditions

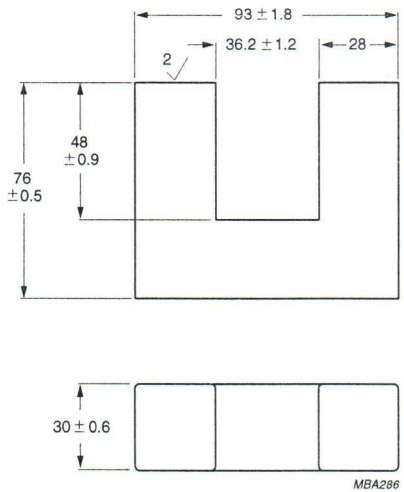
GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤23.4

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

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	5100 ±25%	≈1700	U93/76/30-3C80

Note

1. Measured on a combination of two U-cores.

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 = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤30

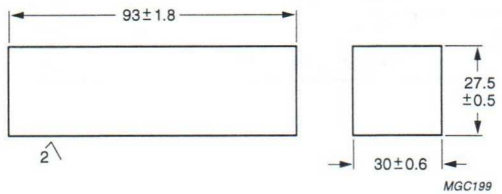
CORE SETS

Effective core parameters in combination with U93/52/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
$\Sigma(l/A)$	core factor (C1)	0.307	mm^{-1}
V_e	effective volume	216000	mm^3
l_e	effective length	258	mm
A_e	effective area	838	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
3C80	8600 ±25%(1)	≈1800	I93/28/30-3C80
	7100 ±25%(2)	≈1750	

Note

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 = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤19.0(1)
	≥330	≤23.5(2)

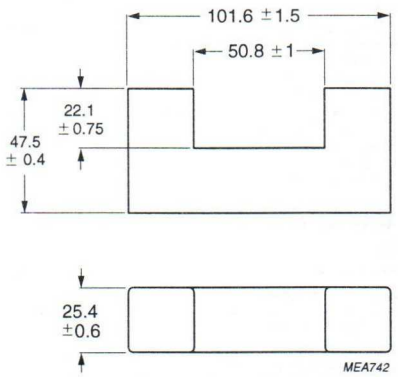
Note

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
$\Sigma(l/A)$	core factor (C1)	0.418	mm^{-1}
V_e	effective volume	174000	mm^3
l_e	effective length	270	mm
A_e	effective area	645	mm^2
m	mass of core half	≈450	g



Dimensions in mm.

Fig.1 U100/48/25 core half.

Core halves

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	5100 ±25%	≈1700	U100/48/25-3C80

Note

1. Measured on a combination of two U-cores.

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 = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤19.6

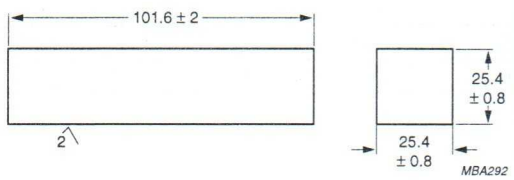
CORE SETS

Effective core parameters in combination with U100/57/25

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

Effective core parameters in combination with U100/48/25

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.350	mm^{-1}
V_e	effective volume	146000	mm^3
l_e	effective length	226	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

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C80	5600 ±25%(1)	≈1700	I100/25/25-3C80
	6100 ±25%(2)	≈1700	

Note

1. Measured in combination with U100/57/25.
2. Measured in combination with U100/48/25.

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 = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤17.4(1)
3C80	≥330	≤16.2(2)

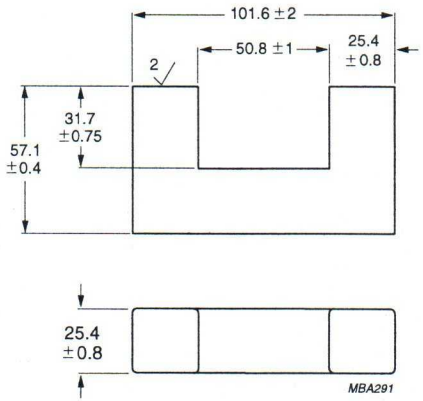
Note

1. Measured in combination with U100/57/25.
2. Measured in combination with U100/48/25.

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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 halves

GRADE	A_L (1) (nH)	μ_e	TYPE NUMBER
3C80	4500 ±25%	≈1700	U100/57/25-3C80

Note

1. Measured on a combination of two U-cores.

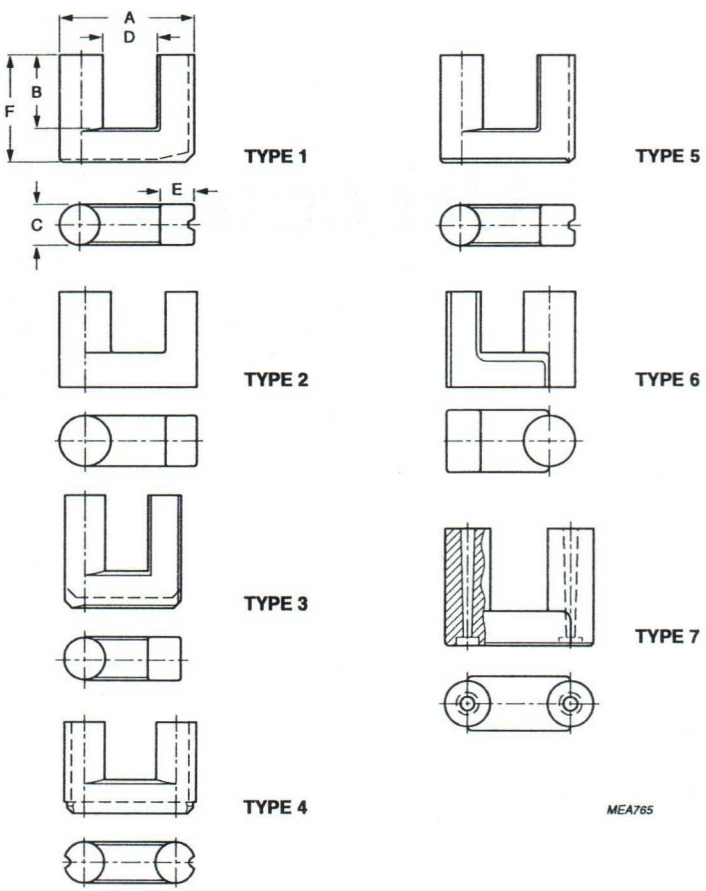
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 16 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C80	≥330	≤22

UR cores

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.

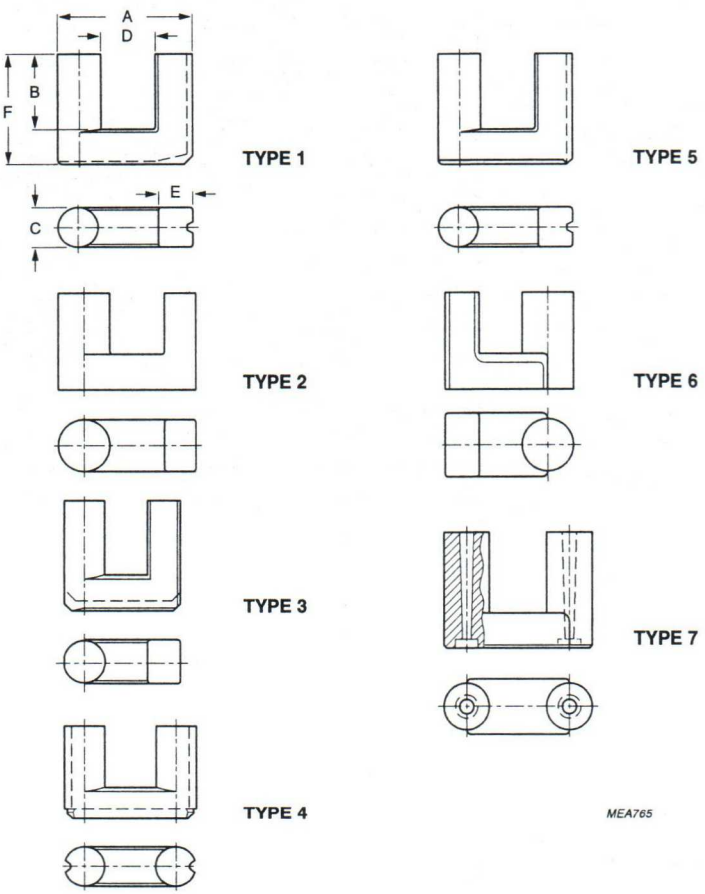


For dimensions see Table 1.

Fig.1 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^3)	MASS (g)
UR28/20/13	6	28.3	13.0	11.2	8.5	13.6	20.4	0.890	9460	87	98	25
UR34/26/9	2	33.5	19.1	9.3	15.1	8.5	26.0	1.886	9240	132	70	24
UR35/28/13	3	35.05	18.0	12.7	13.05	9.3	28.3	1.100	15840	132	120	42
UR35/34/13	3	35.35	24.0	12.7	13.1	9.3	34.3	1.300	18720	156	120	47
UR37/25/18	6	36.9	16.8	14.7	13.9	18.0	25.7	0.847	19050	127	150	51
UR37/29/13	1	37.2	18.85	13.0	13.2	10.5	29.35	1.045	18080	138	132	46
UR37/34/13	1	37.2	23.7	13.0	13.2	10.5	34.2	1.197	20850	158	132	51
UR39/35/15	3	38.7	24.8	15.0	15.0	9.1	35.2	1.102	23800	162	147	60
UR41/34/13	5	41.3	23.1	13.0	16.3	11.3	34.4	1.206	22900	164	136	60
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	19.8	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	43.75	24.2	14.65	16.65	11.8	35.9	1.006	28700	170	169	71
UR48/39/17	5	48.0	26.4	17.0	17.4	13.0	39.4	0.865	39990	186	215	99
UR50/37/16	4	50.25	24.75	15.9	19.15	15.9	36.75	0.973	33300	180	185	84
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	20.05	23.55	24.0	40.5	0.724	61000	210	290	160
UR64/40/24	7	64.0	26.5	20.0	23.2	24.0	40.5	0.720	61000	210	290	160

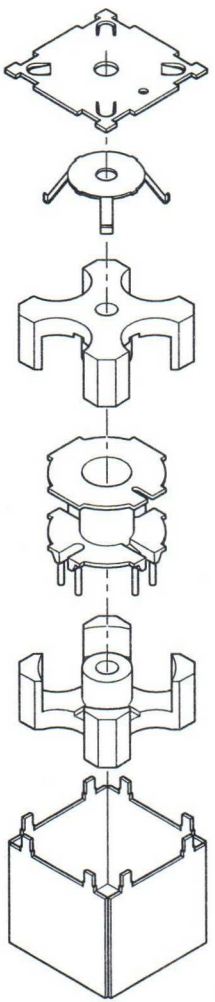


For type numbers see Table 2.

Fig.2 UR cores for line output transformers.

Table 2 Type numbers

SHAPE	TYPE NUMBERS				
	MATERIAL GRADE				
	3C80	3C81/3C85	3C10	3C15	3C30
6	UR28/20/13-3C80	UR28/20/13-3C85	–	–	UR28/20/13-3C30
2	UR34/26/9-3C80	–	–	–	–
3	–	–	UR35/28/13-3C10	UR35/28/13-3C15	UR35/28/13-3C30
3	–	–	UR35/34/13-3C10	UR35/34/13-3C15	UR35/34/13-3C30
6	–	UR37/25/18-3C85	–	–	–
1	–	–	UR37/29/13-3C10	–	–
1	–	UR37/34/13-3C85	–	–	–
3	UR39/35/15-3C80	–	–	UR39/35/15-3C15	UR39/35/15-3C30
5	–	–	–	UR41/34/13-3C15	UR41/34/13-3C30
4	UR42/21/12-3C80	UR42/21/12-3C81	–	–	–
5	UR42/32/15-3C80	–	–	–	–
2	UR43/34/16-3C80	–	–	–	–
1	–	–	UR44/36/15-3C10	UR44/36/15-3C15	UR44/36/15-3C30
5	–	–	UR48/39/17-3C10	UR48/39/17-3C15	UR48/39/17-3C30
4	UR50/37/16-3C80	–	–	–	–
4	UR64/29/14-3C80	UR64/29/14-3C81	–	–	–
7	UR64/40/20-3C80	–	–	–	–
7	UR64/40/24-3C80	–	–	–	–


MSB604

SOFT FERRITES PRODUCTS

Product overview X cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
X22	2510	66	12
X30	6360	114	38
X35	11000	164	58

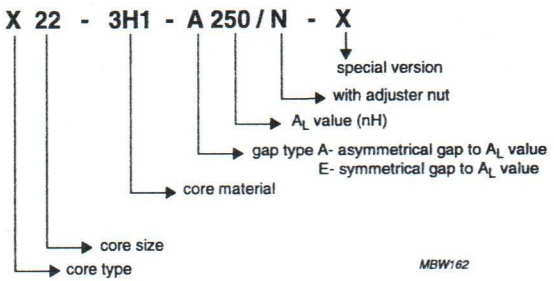


Fig.1 Type number structure for cores.

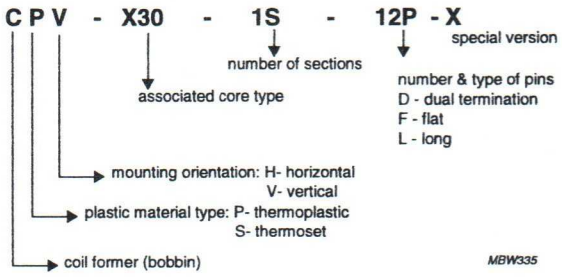
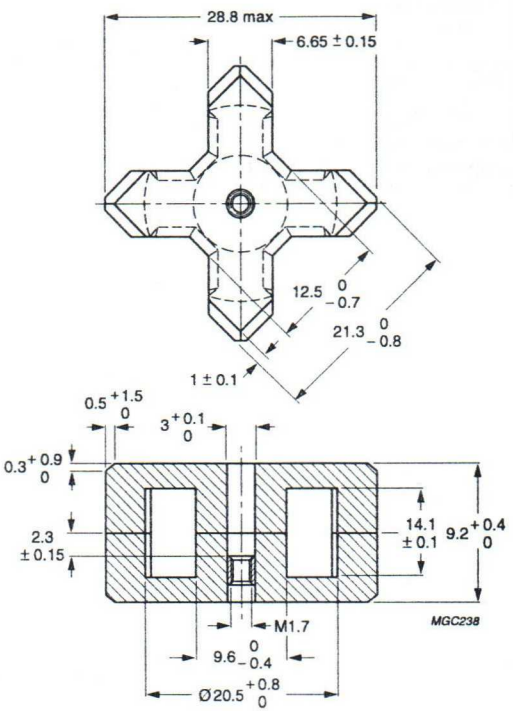


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

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



Dimensions in mm

Fig.1 X22 core set.

Core sets for filter and transformer applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	400 ±3%	≈180	≈200	X22-3H1-A400/N	X22-3H1-A400
	630 ±3%	≈290	≈120	X22-3H1-A630/N	X22-3H1-A630
	1000 ±10%	≈460	≈60	X22-3H1-A1000/N	X22-3H1-A1000
	3900 ±25%	≈1760	≈0	–	X22-3H1
4C6	220 ±25%	≈100	≈0	–	X22-4C6
3D3	1500 ±25%	≈680	≈0	–	X22-3D3
3B8	3900 ±25%	≈1760	≈0	–	X22-3B8

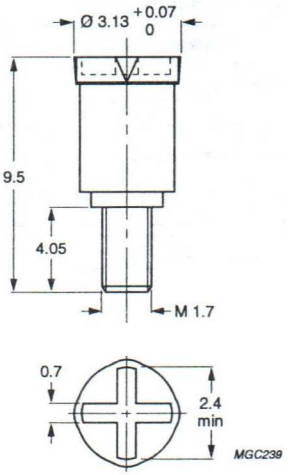
Note

1. Clamping force 100 ±30 N.

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 X22 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)
3H1	160	–	–	ADJ-RM6-WHITE	20	–	–
	250	ADJ-RM6-WHITE	13	ADJ-RM6-VIOLET	15	ADJ-RM6-BROWN	21
	400	ADJ-RM6-WHITE	8	ADJ-RM6-BROWN	13	ADJ-RM6-BLACK	20
	630	ADJ-RM6-BROWN	8	ADJ-RM6-BLACK	13	ADJ-RM6-GREY	17

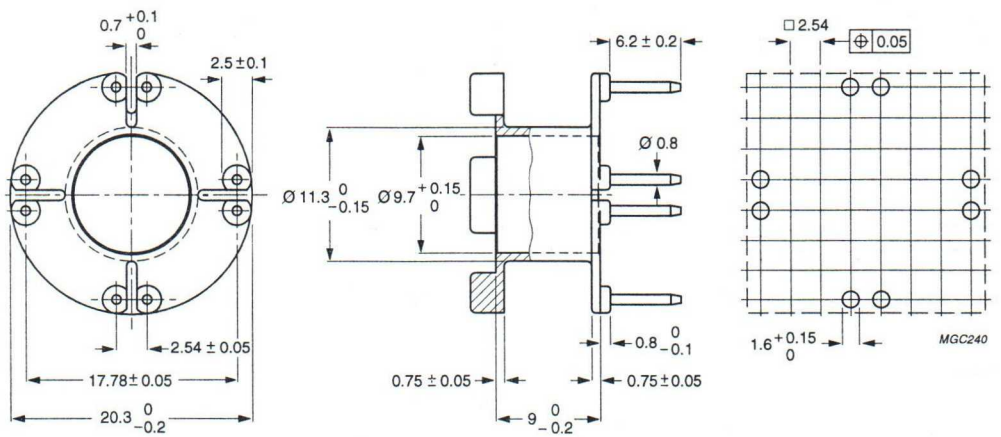
Note

1. Maximum adjustment range.

COIL FORMER

General data

ITEM	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 85 class H
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, 235 °C, 2 s



Dimensions in mm.

Fig.3 X22 coil former; 8-pins.

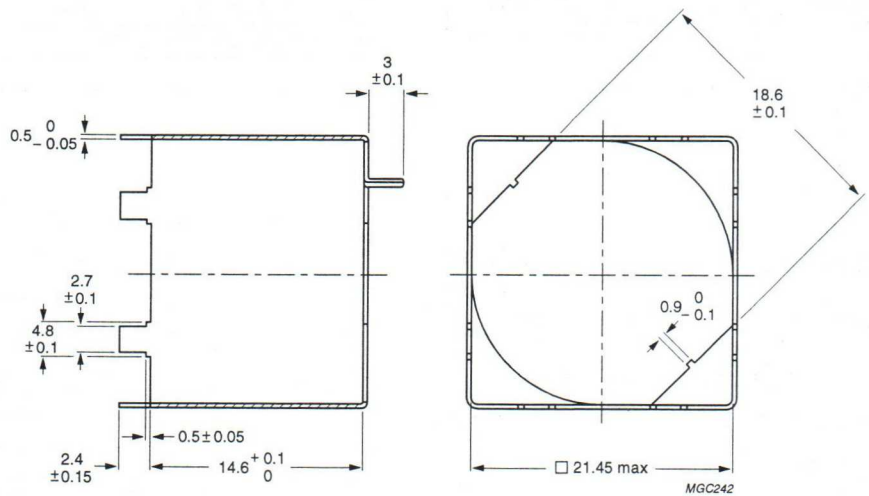
Winding data for X22 coil former

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	all	49	33.9	7.2	CSV-X22-1S-8P

MOUNTING PARTS

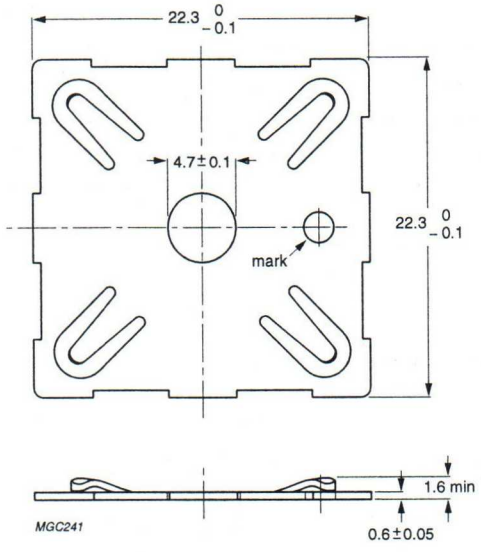
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Container	copper zinc alloy (CuZn), Ni-plated	4	CON-X22
Cover	copper tin alloy (CuSn), Ni-plated	5	COV-X22



Dimensions in mm.

Fig.4 X22 container.



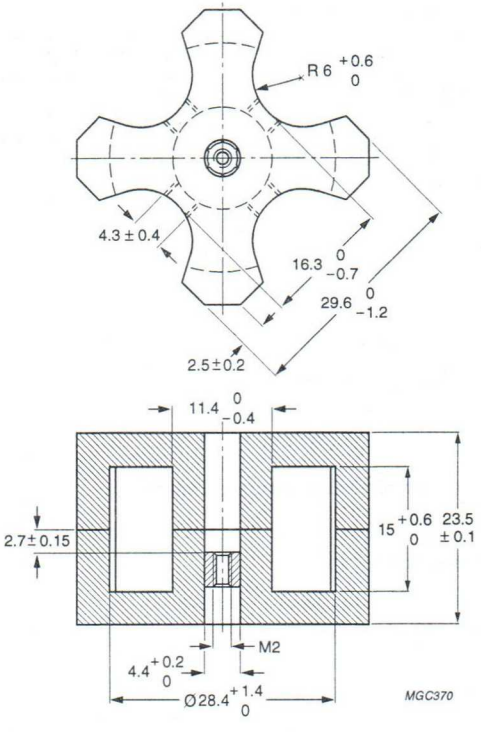
Dimensions in mm.

Fig.5 X22 cover.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.490	mm^{-1}
V_e	effective volume	6360	mm^3
l_e	effective length	55.8	mm
A_e	effective area	114	mm^2
A_{min}	minimum area	82.6	mm^2
m	mass of set	≈38	g



Dimensions in mm.

Fig.1 X30 core set.

Core sets for filter and transformer applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	400 ±3%	≈150	≈250	X30-3H1-A400/N	X30-3H1-A400
	630 ±3%	≈250	≈170	X30-3H1-A630/N	X30-3H1-A630
	1000 ±10%	≈400	≈100	X30-3H1-A1000/N	X30-3H1-A1000
	1600 ±10%	≈625	≈50	X30-3H1-A1600/N	X30-3H1-A1600
	4900 ±25%	≈1960	≈0	–	X30-3H1
3B8	4900 ±25%	≈1960	≈0	–	X30-3B8

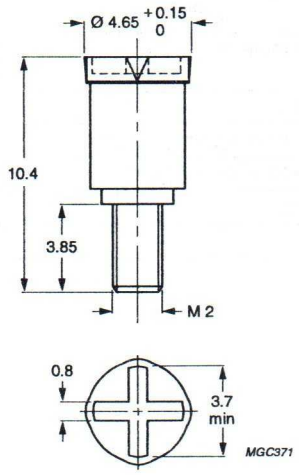
Note

1. Clamping force 200 ±50 N.

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 X30 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)
3H1	315	ADJ-P22/RM8-ORANGE	7	–	–	ADJ-P22/RM8-BROWN	20
	400	ADJ-P22/RM8-ORANGE	6	–	–	ADJ-P22/RM8-BROWN	16
	630	–		ADJ-P22/RM8-BROWN	10	ADJ-P22/RM8-BLACK	19
	1000	ADJ-P22/RM8-BROWN	6	ADJ-P22/RM8-BLACK	9	–	–
	1600	–		ADJ-P22/RM8-BLACK	5	–	–

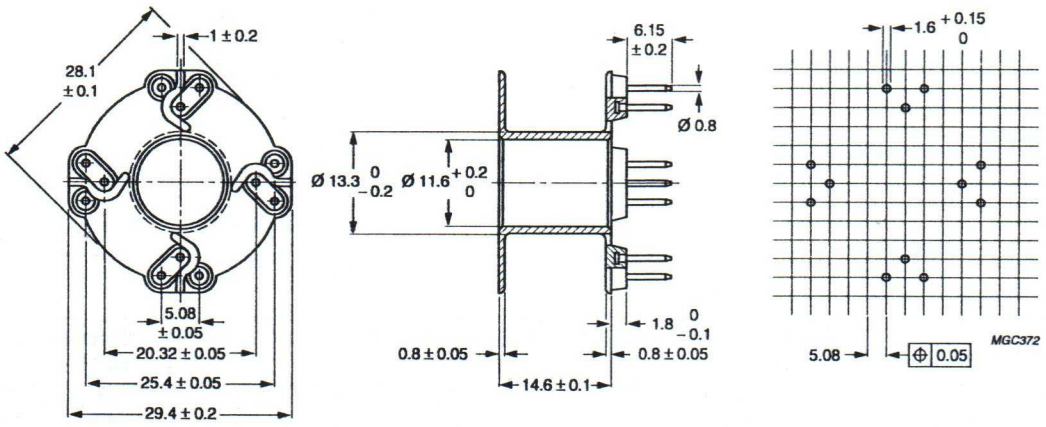
Note

1. Maximum adjustment range.

COIL FORMER

General data for 12-pins X30 coil former

ITEM	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 85 class H
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, 235 °C, 2 s



Dimensions in mm.

Fig.3 X30 coil former; 12-pins.

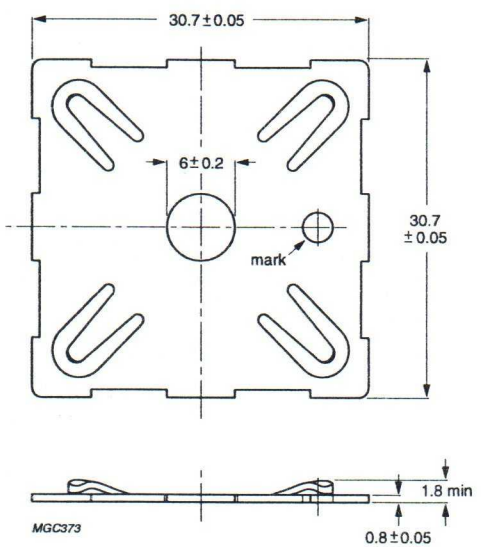
Winding data for 12-pins X30 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE DESCRIPTION
1	97	12.8	65	CSV-X30-1S-12P

MOUNTING PARTS

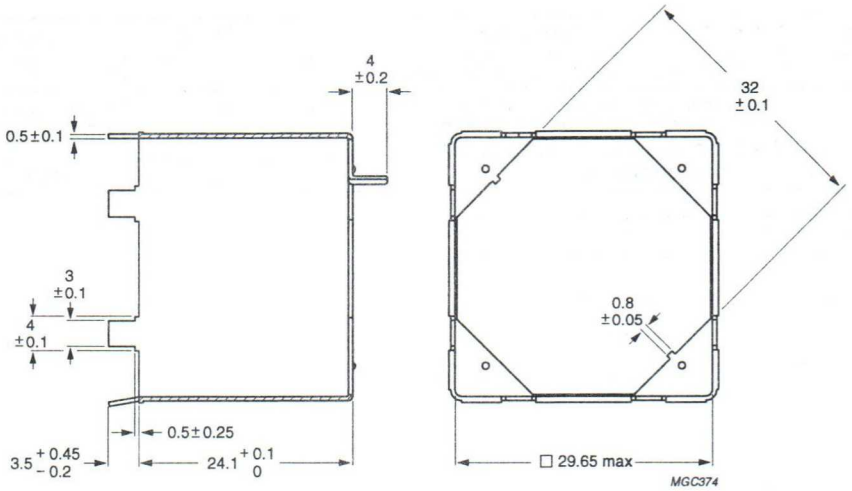
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	copper tin alloy (CuSn), nickel plated	4	COV-X30
Container	copper zinc alloy (CuZn), nickel plated	5	CON-X30-A
Container	copper zinc alloy (CuZn), nickel plated	6	CON-X30-B
Spring	copper tin alloy (CuSn)	7	SPR-X30



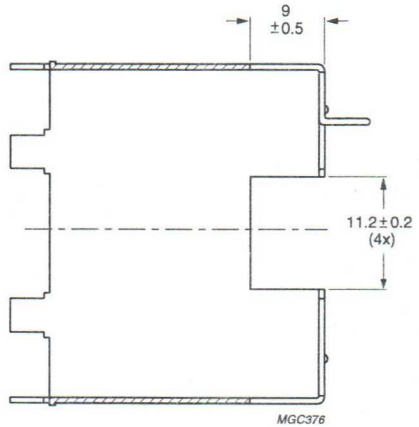
Dimensions in mm.

Fig.4 Cover for X30.



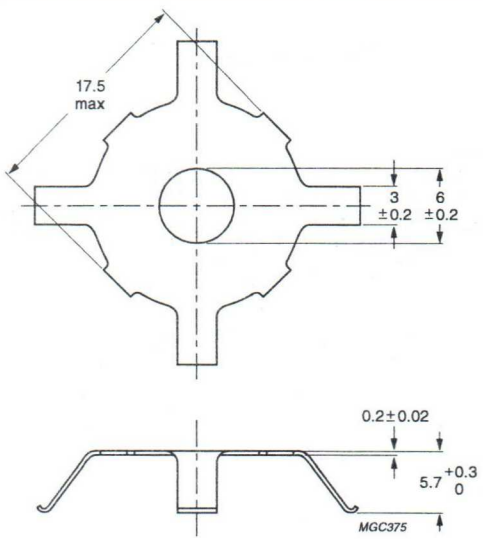
Dimensions in mm.

Fig.5 Container for X30: CON-X30-A.



Dimensions in mm.

Fig.6 Container for X30: CON-X30-B.



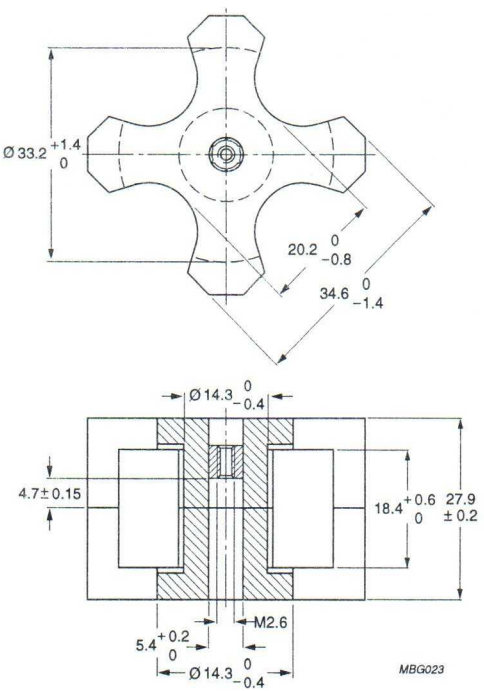
Dimensions in mm.

Fig.7 Spring for X30.

CORE SETS

Effective core parameters;

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.410	mm^{-1}
V_e	effective volume	11000	mm^3
l_e	effective length	67.3	mm
A_e	effective area	164	mm^2
A_{min}	minimum area	132	mm^2
m	mass of set	≈58	g



Dimensions in mm.

Fig.1 X35 core set.

Core sets for filter and transformer applications

GRADE	A_L (1) (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3H1	400 ±3%	≈130	≈500	X35-3H1-A400/N	X35-3H1-A400
	630 ±3%	≈200	≈300	X35-3H1-A630/N	X35-3H1-A630
	1000 ±3%	≈325	≈150	X35-3H1-A1000/N	X35-3H1-A1000
	1600 ±5%	≈500	≈80	X35-3H1-A1600/N	X35-3H1-A1600
	6050 ±25%	≈2000	≈0	–	X35-3H1
3B8	6050 ±25%	≈2000	≈0	–	X35-3B8

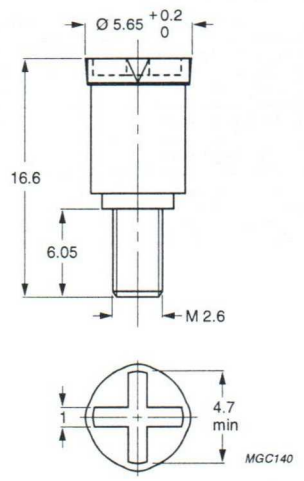
Note

1. Clamping force 200 ±50 N.

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 X35 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)
3H1	315	–	–	ADJ-P36/P42-WHITE	15	–	–
	400	–	–	ADJ-P36/P42-WHITE	12	–	–
	630	–	–	ADJ-P36/P42-WHITE	7	ADJ-P36/P42-GREY	27
	1000	–	–	ADJ-P36/P42-GREY	17	–	–
	1600	–	–	ADJ-P36/P42-GREY	9	–	–

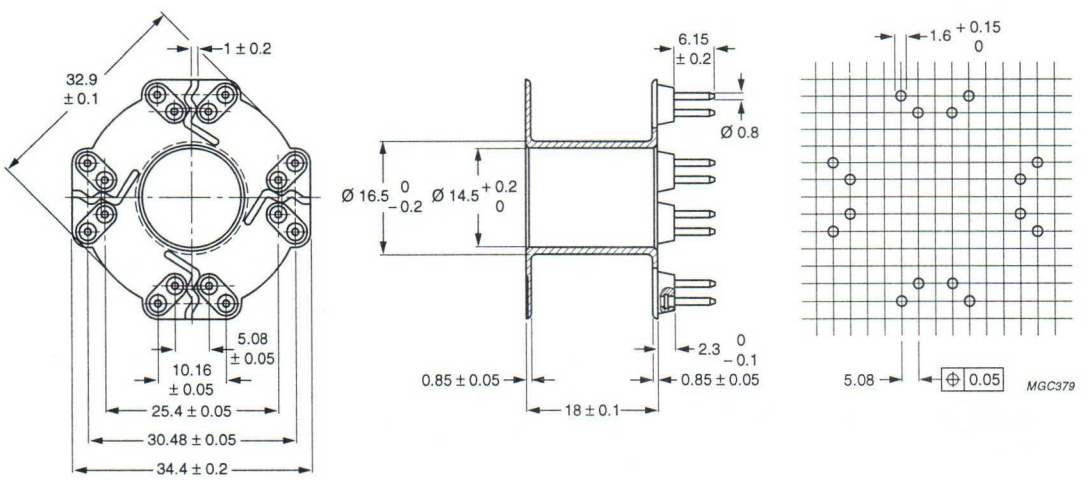
Note

1. Maximum adjustment range.

COIL FORMER

General data for 16-pins X35 coil former

ITEM	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 85 class H
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, 235 °C, 2 s



Dimensions in mm.

Fig.3 X35 coil former; 16-pins.

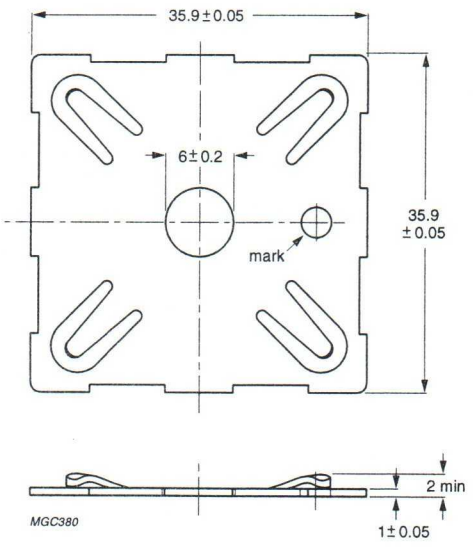
Winding data for 16-pins X35 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE DESCRIPTION
1	135	16.1	77	CSV-X35-1S-16P

MOUNTING PARTS

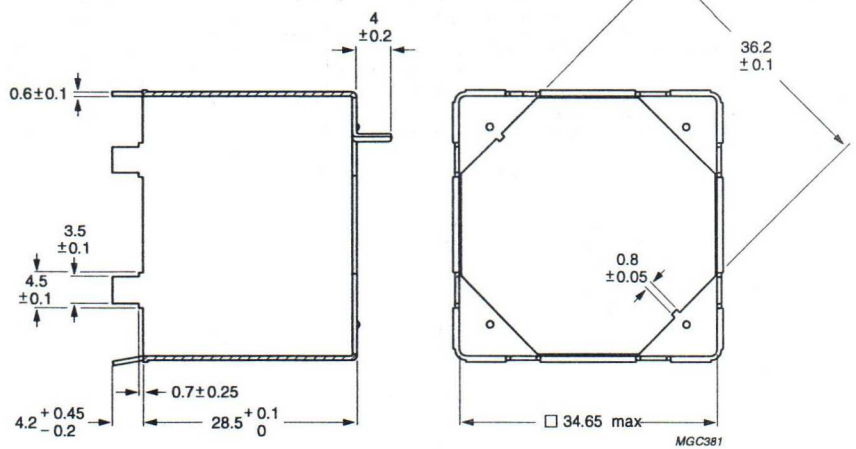
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	copper tin alloy (CuSn), nickel plated	4	COV-X35
Container	copper zinc alloy (CuZn), nickel plated	5	CON-X35-A
Container	copper zinc alloy (CuZn), nickel plated	6	CON-X35-B
Spring	copper tin alloy (CuSn)	7	SPR-X35



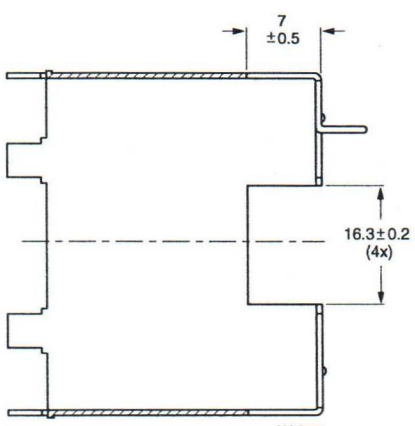
Dimensions in mm.

Fig.4 Cover for X35.



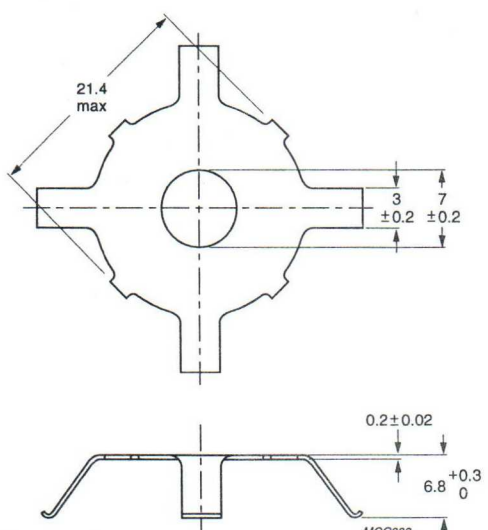
Dimensions in mm.

Fig.5 Container for X35: CON-X35-A.



Dimensions in mm.

Fig.6 Container for X35: CON-X35-B.

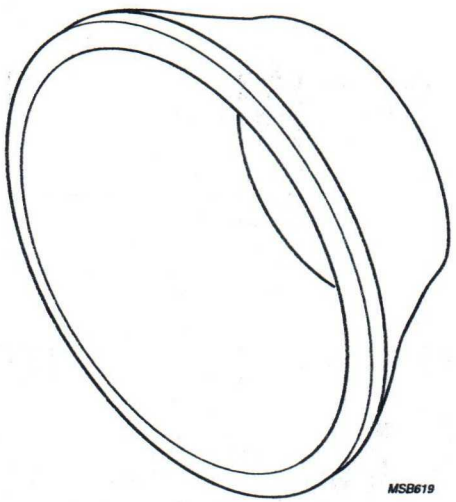


Dimensions in mm.

Fig.7 Spring for X35.

Soft Ferrites

Yoke rings

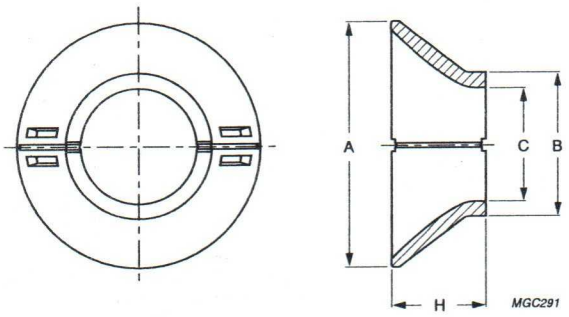


Yoke rings

Hybrid range

FEATURES

- Yoke rings are manufactured to specific customer requirements
- Tolerances are ±1% for normal applications
- Tolerances of ≤1% for special applications can be achieved
- Winding technology is direct
- Material grades 2A2 and 2B1.



For dimensions see Table 1.

Fig.1 Hybrid type.

Table 1 Product dimensions

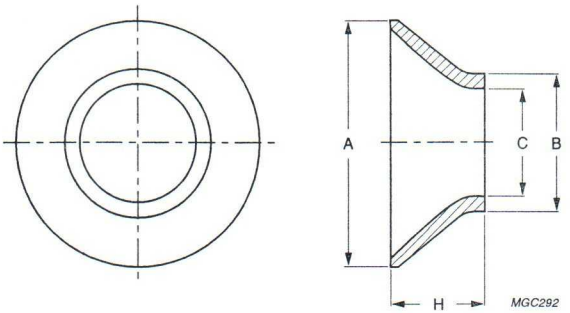
YOKE RING	DIMENSIONS (mm)			
	FLARE (A)	NECK (B)	BORE (C)	HEIGHT (H)
YR38/37	78.8	54.0	38.0	37.0
YR45/30	82.55	58.93	45.62	30.48
YR45/35	80.26	58.0	45.52	35.56
YR46/42-A	90.0	52.5	46.5	42.0
YR46/42-B	89.0	60.0	46.5	42.0
YR48/42-A	92.0	60.0	48.0	42.0
YR48/42-B	90.0	54.0	48.0	42.0
YR48/42-C	88.25	62.0	48.0	42.0
YR48/44	100.0	62.0	48.0	44.5
YR48/46	87.24	60.0	48.0	46.0
YR49/35	88.0	62.0	49.9	35.5
YR50/39-A	102.31	66.5	50.52	38.86
YR50/39-B	102.3	64.26	50.52	38.95
YR51/35	108.0	70.0	51.0	35.0
YR51/36-A	88.25	66.0	51.35	36.0
YR51/36-B	92.0	66.0	51.38	36.0
YR51/38	108.0	70.0	51.0	38.0
YR51/42	102.3	64.26	51.5	42.0
YR52/29	95.76	64.77	52.02	29.21
YR52/42	108.85	65.0	52.0	42.0

This list indicates the manufacturing capability to provide products for specific customer needs.

Yoke rings Large consumer range

FEATURES

- Yoke rings are manufactured to specific customer requirements
- The product range capabilities are indicated in Table
- Tolerances are ±1% for normal applications
- Tolerances of ≤1% for special applications can be achieved
- Winding technology is direct
- Material grade usually 3C2.



For dimensions see Table 1.

Fig.1 Large consumer type.

Table 1 Product dim1ensions

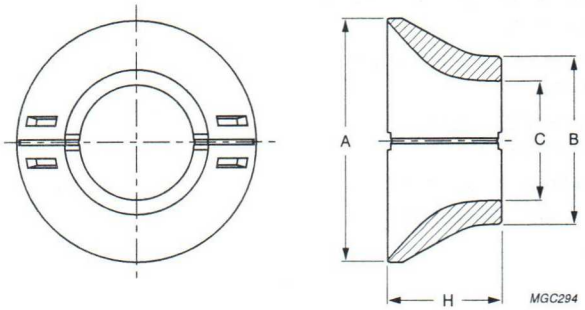
YOKE RING	DIMENSIONS (mm)			
	FLARE (A)	NECK (B)	BORE (C)	HEIGHT (H)
YR49/44-A	114.0	57.72	49.5	44.8
YR49/44-A	114.0	65.5	49.5	44.8
YR49/44-A	113.0	57.5	49.75	44.8
YR49/44-A	109.5	65.5	49.5	44.8
YR49/45	112.32	57.72	49.86	45.0
YR50/45	112.32	57.72	50.24	45.0
YR54/51	124.0	69.76	54.2	51.1
YR58/47	135.2	77.6	58.3	47.6
YR59/57	138.0	73.5	59.75	57.6
YR60/46	141.5	79.0	60.46	46.8

This list indicates the manufacturing capability to provide products for specific customer needs.

Yoke rings Minineck range

FEATURES

- Yoke rings are manufactured to specific customer requirements
- The product range capabilities are indicated in Table
- Tolerances are ±1% for normal applications
- Tolerances of ≤1% for special applications can be achieved
- Winding technology is direct
- Material grade usually 2A2 and 2B1.



For dimensions see Table 1.

Fig.1 Minineck type.

Table 1 Product dim1ensions

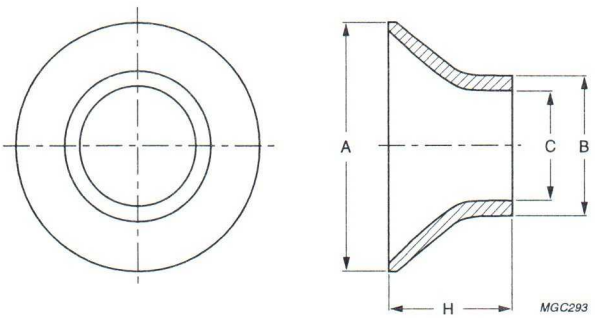
YOKE RING	DIMENSIONS (mm)			
	FLARE (A)	NECK (B)	BORE (C)	HEIGHT (H)
YR40/33-A	76.0	46.4	40.4	33.0
YR40/33-B	76.0	52.0	40.4	33.0
YR40/35	76.0	52.0	40.4	35.5
YR40/37-A	74.0	52.85	40.8	37.0
YR40/37-B	74.0	52.0	40.0	37.0
YR40/37-C	73.8	51.8	40.0	37.0
YR41/37	74.0	53.0	414.0	37.0

This list indicates the manufacturing capability to provide products for specific customer needs.

Yoke rings Monitor range

FEATURES

- Yoke rings are manufactured to specific customer requirements
- The product range capabilities are indicated in Table
- Tolerances are ±1% for normal applications
- Tolerances of ≤1% for special applications can be achieved
- Winding technology is direct
- Material grades usually C2 or 2B1.



For dimensions see Table 1.

Fig.1 Minineck type.

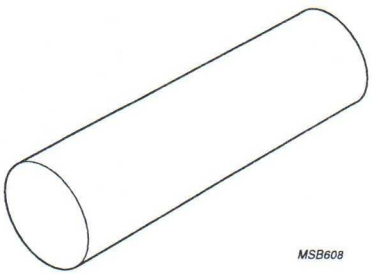
Table 1 Product dim1ensions

YOKE RING	DIMENSIONS (mm)			
	FLARE (A)	NECK (B)	BORE (C)	HEIGHT (H)
YR46/54-A	94.0	58.0	46.0	54.0
YR46/54-B	92.5	54.0	46.0	54.0
YR46/56	108.0	61.0	46.4	56.0
YR48/46	91.0	64.0	48.0	46.5
YR48/54	92.5	60.0	48.63	54.0
YR51/48	92.0	67.2	51.85	48.0

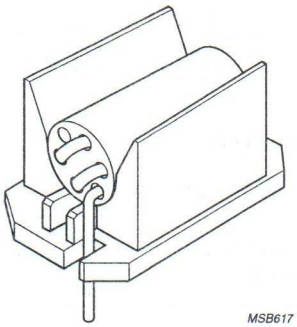
This list indicates the manufacturing capability to provide products for specific customer needs.

Soft Ferrites

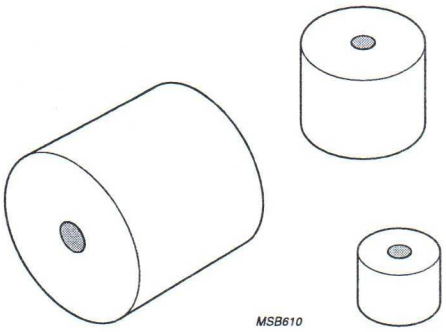
EMI-suppresion products



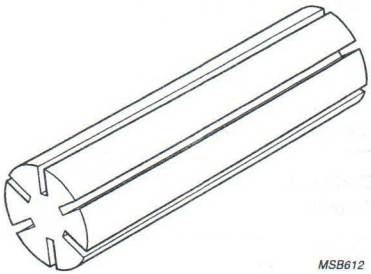
MSB608



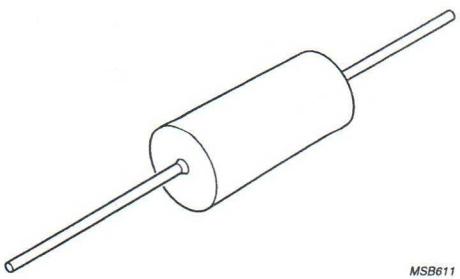
MSB617



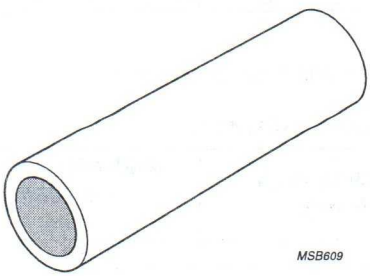
MSB610



MSB612



MSB611



MSB609

BOBBIN CORES

Type BC13/4.8/16

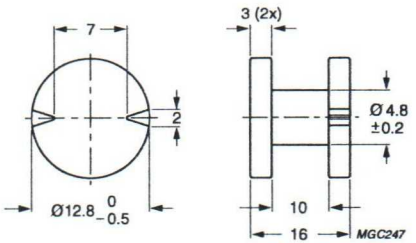
GRADE	A_L (nH)[1]	TYPE NUMBER
3C80	50	BC13/4.8/16-3C80

Note

1. measured with fully wound bobbin.

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

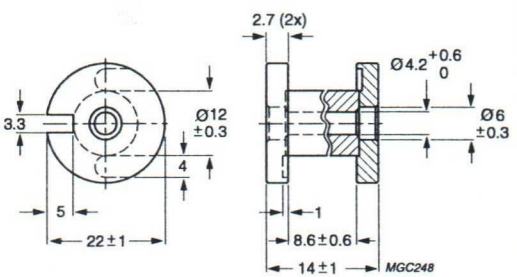
GRADE	A_L (nH)[1]	TYPE NUMBER
3C80	86	BC22/12/14-3C80

Note

1. measured with fully wound bobbin.

Winding data for BC22/12/14

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
43.0	53.4



under change

Dimensions in mm.

Fig.2 BC22/12/14.

Type BC22/12/18

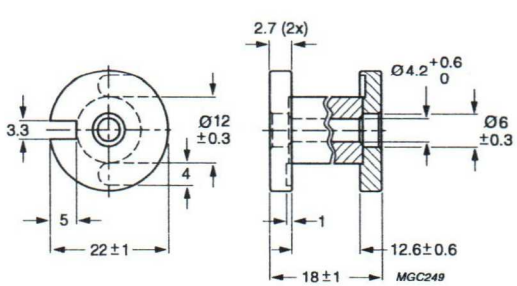
GRADE	A_L (nH)[1]	TYPE NUMBER
3C80	85	BC22/12/18-3C80

Note

1. measured with fully wound bobbin.

Winding data for BC22/12/18

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
63.0	53.4



under change

Dimensions in mm.

Fig.3 BC22/12/18.

Type BC22/12/19

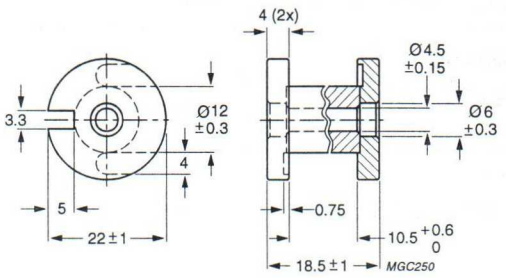
GRADE	A_L(nH)[1]	TYPE NUMBER
3C80	91	BC22/12/19-3C80

Note

1. measured with fully wound bobbin.

Winding data for BC22/12/19

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
52.5	53.4



Dimensions in mm.

Fig.4 BC22/12/19.

Type BC22/12/38

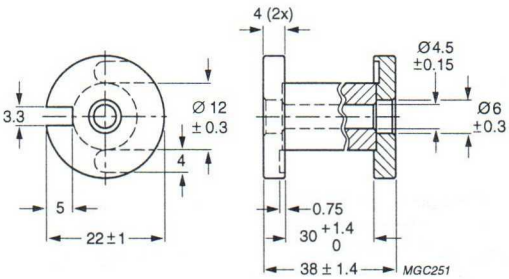
GRADE	A_L(nH)[1]	TYPE NUMBER
3C80	74	BC22/12/38-3C80

Note

1. measured with fully wound bobbin.

Winding data for BC22/12/38

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
150	53.4



Dimensions in mm.

Fig.5 BC22/12/38.

Type BC23/12/14

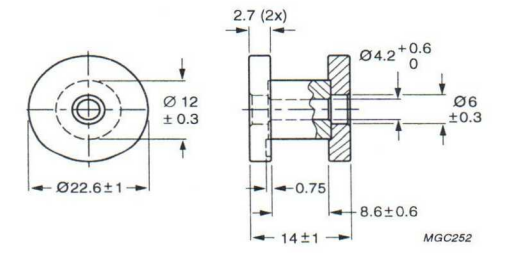
GRADE	A_L(nH)[1]	TYPE NUMBER
3C80	86	BC23/12/14-3C80

Note

1. measured with fully wound bobbin.

Winding data for BC23/12/14

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
45.6	54.3



Dimensions in mm.

Fig.6 BC23/12/14.

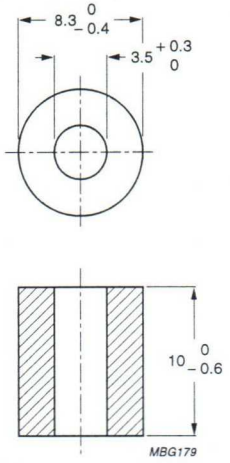
CABLE SHIELDS

Tubular cable shield CST8.3/3.5/10

GRADE	$\|Z\|_{typ}$ (1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	74	30	CST8.3/3.5/10-3S4
	96	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

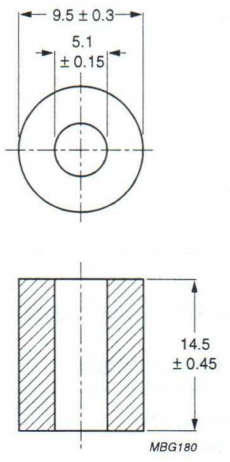
Fig.1 CST8.3/3.5/10.

Tubular cable shield CST9.5/5.1/15

GRADE	$\|Z\|_{typ}$ (1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	66	25	CST9.5/5.1/15-3S4
	110	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

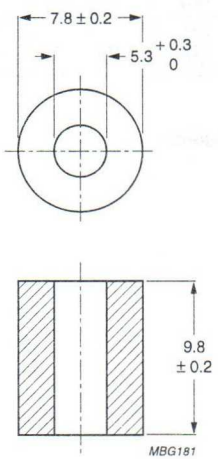
Fig.2 CST9.5/5.1/15

Tubular cable shield CST7.8/5.3/9.8

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	36	30	CST7.8/5.3/9.8-3S4
	50	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

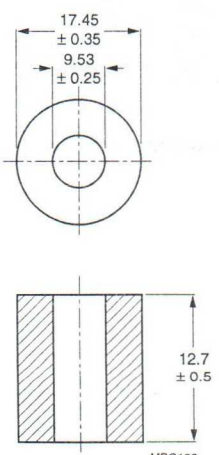
Fig.3 CST7.8/5.3/9.8.

Tubular cable shield CST17/9.5/13

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	55	25	CST17/9.5/13-3S4
	90	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

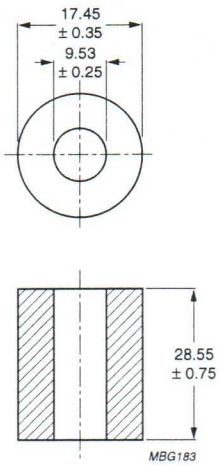
Fig.4 CST17/9.5/13.

Tubular cable shield CST17/9.5/29

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	125	25	CST17/9.5/29-3S4
	200	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

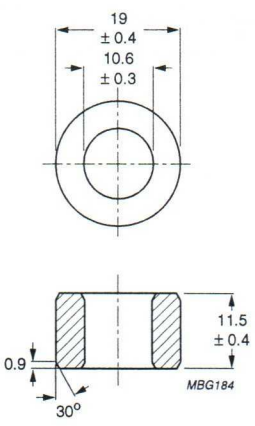
Fig.5 CST17/9.5/29.

Tubular cable shield CST19/11/12

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	50	25	CST19/11/12-3S4
	75	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

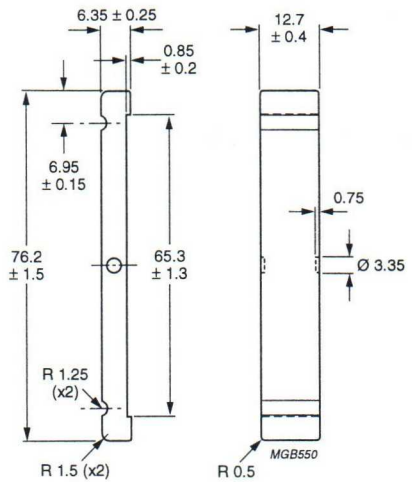
Fig.6 CST19/11/12.

Flat cable shield CSU76/6.4/13

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	36	25	CSU76/6.4/13-3S4
	110	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

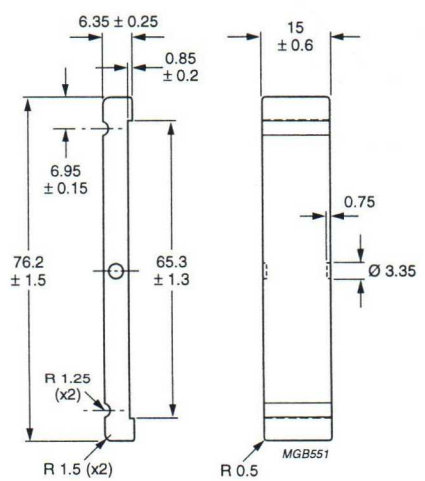
Fig.7 CSU76/6.4/13.

Flat cable shield CSU76/6.4/15

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	50	25	CSU76/6.4/15-3S4
	159	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

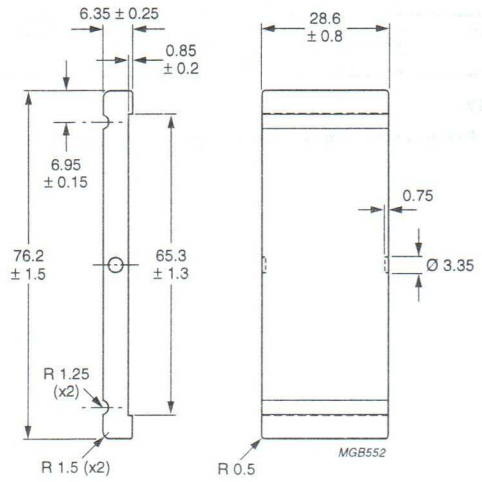
Fig.8 CSU76/6.4/15.

Flat cable shield CSU76/6.4/29

GRADE	$\|Z\|_{typ}$ (1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	70	25	CSU76/6.4/29-3S4
	235	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

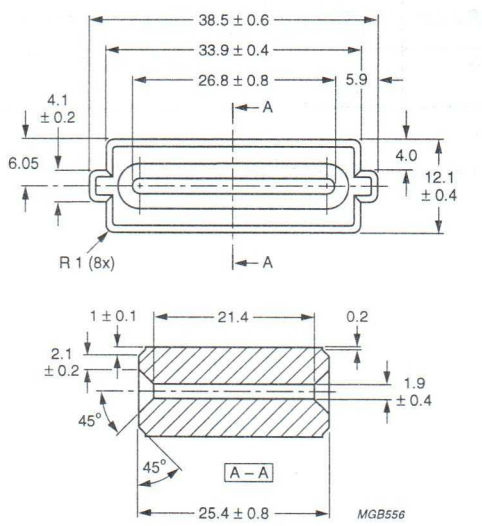
Fig.9 CSU76/6.4/29.

Flat cable shield CSF38/12/25

GRADE	$\|Z\|_{typ}$ (1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	98	25	CSF38/12/25-3S4-S
	196	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

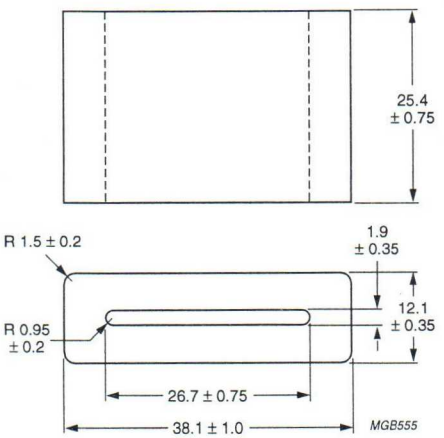
Fig.10 CSF38/12/25.

Flat cable shield CSF38/12/25

GRADE	$\|Z\|_{typ}$[1] (Ω)	at f (MHz)	TYPE NUMBER
3S4	110	25	CSF38/12/25-3S4
	215	100	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

Fig.11 CSF38/12/25.

CUP AND MUSHROOM CORES

Effective core parameters of cup and mushroom set

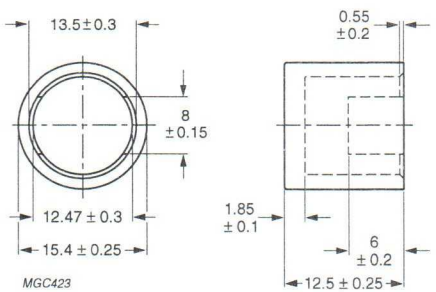
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.459	mm^{-1}
V_e	effective volume	1240	mm^3
l_e	effective length	23.9	mm
A_e	effective area	52.0	mm^2
A_{min}	minimum area	43.9	mm^2
m	mass of cup core	≈4	g
m	mass of mushroom core	≈2	g

Ordering info

GRADE	CORE	TYPE NUMBER
4B1	cup	CUP15/13-4B1
3C85	mushroom	MSC12/7.5/9.5-3C85

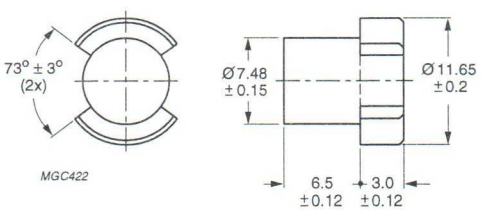
Cup and mushroom cores are intended to form a set with a magnetic volume comparable to P18/11 or RM7/I. The main advantage over a bobbin core or rod is the magnetic shielding provided by the cup core. The A_L value can be decreased by inserting a spacer between mushroom leg and cup core bottom.

Inductance factor: A_L = 100 ±20%.



Dimensions in mm.

Fig.1 Cup core.

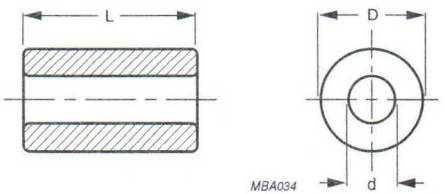


Dimensions in mm.

Fig.2 Mushroom core.

EMI SUPPRESSION BEADS

Color marking: 4S2 has flash of yellow paint.



Dimensions in mm.

Fig.1 EMI suppression bead.

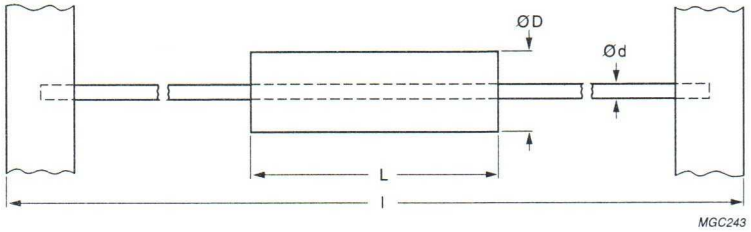
Beads for EMI-suppression

GRADE	$\lvert Z_{typ} \rvert$ (Ω)[1] at frequency (MHz)						DIMENSIONS (mm)			TYPE NUMBER
	1	3	10	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
	34	65	66	53	45	40	5.1–0.3	0.8 +0.1	4 ±0.2	BD5.1/0.8/4-3S1
	73	119	121	96	83	73	3 ±0.1	0.8 +0.1	10 ±0.3	BD3/0.8/10-3S1
	88	156	160	113	88	63	5.1–0.3	0.8 +0.1	10 ±0.3	BD5.1/0.8/10-3S1
	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
	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
	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
4S2	3	10	28	40	63	68	3 ±0.1	0.7+0.1	4 ±0.2	BD3/0.7/4-4S2
	6	19	38	55	85	96	5.1 ±0.3	0.8+0.1	4 ±0.2	BD5.1/0.8/4-4S2
	11	38	69	101	156	169	3 ±0.1	0.8+0.1	10 ±0.3	BD3/0.8/10-4S2
	15	50	94	138	213	238	5.1–0.3	0.8+0.1	10 ±0.3	BD5.1/0.8/10-4S2
	4	11	23	31	48	54	3 ±0.1	1 +0.1/–0.05	4 ±0.2	BD3/1/4-4S2
	9	29	54	76	119	134	3 ±0.1	1 +0.1/–0.05	10 ±0.3	BD3/1/10-4S2
	4	13	25	34	51	59	5.1 –0.3	1.5 +0.15	4 ±0.2	BD5.1/1.5/4-4S2
	5	18	34	48	71	81	8 ±0.2	1.5 +0.15	4 ±0.2	BD8/1.5/4-4S2
	9	31	56	85	130	145	5.1 –0.3	1.5 +0.15	10 ±0.3	BD5.1/1.5/10-4S2
	13	43	88	116	181	201	8 ±0.2	1.5 +0.15	10 ±0.3	BD8/1.5/10-4S2
	3	10	19	25	40	45	5.1 –0.3	2 +0.2	4 ±0.2	BD5.1/2/4-4S2
	5	13	25	39	61	69	8 ±0.2	2 +0.2	4 ±0.2	BD8/2/4-4S2
	8	19	38	64	100	111	5.1 –0.3	2 +0.2	10 ±0.3	BD5.1/2/10-4S2
	11	35	69	96	151	168	8 ±0.2	2 +0.2	10 ±0.3	BD8/2/10-4S2
	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. Minimum |Z| values at 100 MHz are typical minus 20%.

BEADS ON WIRE



For dimensions, see Table 1.
Taping standard in accordance with *IEC 286, part 1* and *EIA-RS-296-D*.

Fig.1 Bead on wire.

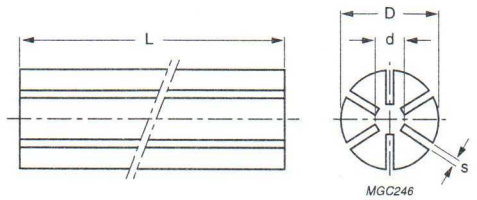
Table 1 Beads on wire for EMI-suppression

GRADE	$\lvert Z_{typ} \rvert$ (Ω)[1] at frequency (MHz)						DIMENSIONS (mm)				TYPE NUMBER
	1	3	10	30	100	300	ØD	L	l	Ød	
3S1	88	156	160	113	88	63	5.1–0.3	10 ±0.3	64.4	0.64	BDW5.1/10-3S1
4S2	5	16	33	49	75	88	3.5 ±0.2	4.7–0.5	64.4	0.64	BDW3.5/4.7-4S2
	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
	4	13	24	36	58	65	3.5 ±0.2	3.5–0.5	64.4	0.64	BDW3.5/3.5-4S2

Note

1. Minimum $\lvert Z \rvert$ values at 100 MHz are typical minus 20%.

IMPEDER CORES



For dimensions see Table 1.

Fig.1 Impeder core.

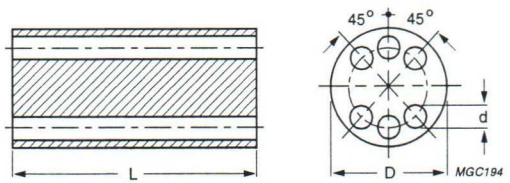
Table 1 Grades, dimensions and ordering information

GRADE	NUMBER OF SLOTS	DIMENSIONS (mm)				TYPE NUMBER
		D	d	L	s	
3B1	6	6 ±0.2	3	200 ±5	0.6	IMP6/3/200-3B1
3C85	6	6 ±0.2	3	200 ±5	0.6	IMP6/3/200-3C85
3B1	6	8 +0/–0.5	3	125 ±5	0.6	IMP8/3/125-3B1
3C85	6	8 ±0.25	3	200 ±5	0.6	IMP8/3/200-3C85
3B1	6	10 +0/–0.5	4.5	170 ±5	0.6	IMP10/4.5/170-3B1
3C85	6	10 ±0.25	4.5	200 ±5	0.6	IMP10/4.5/200-3C85
3B1	8	12 +0/–0.7	5.5	170 ±5	0.7	IMP12/5.5/170-3B1
3C85	8	12 ±0.35	5.5	200 ±5	0.7	IMP12/5.5/200-3C85
3B1	8	14.3 +0/–0.8	6.5	170 ±5	0.8	IMP14/6.5/170-3B1
3C85	8	14.3 ±0.4	6.5	200 ±5	0.8	IMP14/6.5/200-3C85

MULTI-HOLE CORES

Table 1 MHC6

GRADE	DIMENSIONS (mm)			TYPE NUMBER
	D	d	L	
3B1	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-3B1
4B1	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-4B1



For dimensions see Table 1.

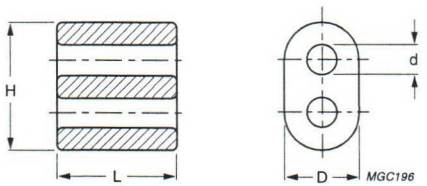
Fig.1 Multihole core circular (MHC6).

Table 2 MHB2

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
	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)
3C85	8.0 ±0.3	3 ±0.3	6 ±0.3	13 ±0.3	MHB2-13/8/6-3C85(1)

Note

1. Chamfered holes and sides

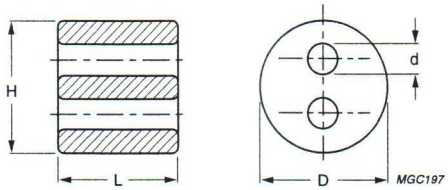


For dimensions see Table 2.

Fig.2 Multihole core binocular (MHB2).

Table 3 MHC2

GRADE	DIMENSIONS (mm)			TYPE NUMBER
	D	d	L	
4B1	5.6 ±0.15	1.5 ±0.15	12 ±0.2	MHC2-5.6/12-4B1

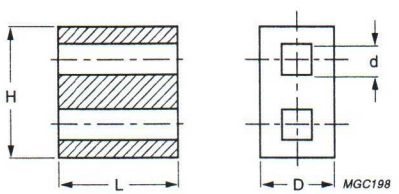


For dimensions see Table 3.

Fig.3 Multihole core circular (MHC2).

Table 4 MHR2

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
3C85	5.4 ±0.3	2.0 ±0.3	10.9 ±0.4	10.8 ±0.3	MHR2-11/5.4/11-3C85

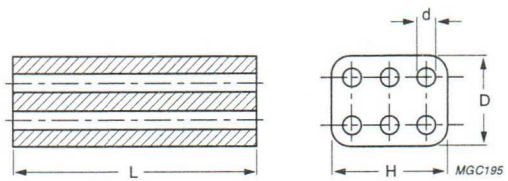


For dimensions see Table 4.

Fig.4 Multihole core rectangular (MHR2).

Table 5 MHR6

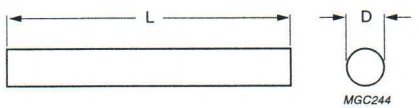
GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
3B1	4 ±0.2	0.7 +0.3	10 ±0.5	6.1 ±0.3	MHR6-6.1/4/10-3B1



For dimensions see Table 5.

Fig.5 Multihole core rectangular (MHR6).

RODS



For dimensions see Table 1.

Fig.1 Rod.

Table 1 Dimensions and ordering information

DIMENSIONS (mm)		TYPE NUMBER		
D	L	3B1	3S3	4B1
2 –0.05	10 –0.6	ROD2/10-3B1-D		ROD2/10-4B1-D
2 –0.05	15 –0.8	ROD2/15-3B1-D		ROD2/15-4B1-D
2 –0.05	20 –0.9	ROD2/20-3B1-D		ROD2/20-4B1-D
3 –0.05	15 –0.8	ROD3/15-3B1-D		ROD3/15-4B1-D
3 –0.05	20 –0.9	ROD3/20-3B1-D		ROD3/20-4B1-D
3 –0.05	25 –1.0	ROD3/25-3B1-D		ROD3/25-4B1-D
3.3 ±0.10	17 ±0.3		ROD3.3/17-3S3	
3.3 ±0.10	20 +0.4/–0.6		ROD3.3/20-3S3	
4 –0.05	15 –0.8	ROD4/15-3B1-D		ROD4/15-4B1-D
4 –0.05	20 –0.9	ROD4/20-3B1-D		ROD4/20-4B1-D
4 –0.05	25 –1.0	ROD4/25-3B1-D		ROD4/25-4B1-D
5 –0.30	14 –0.8		ROD5/14-3S3	
5 –0.30	20 ±0.5		ROD5/20-3S3	
5 –0.30	25 –1.0		ROD5/25-3S3	
5 –0.05	20 –0.9	ROD5/20-3B1-D		ROD5/20-4B1-D
5 –0.05	25 –1.0	ROD5/25-3B1-D		ROD5/25-4B1-D
5 –0.05	30 –1.2	ROD5/30-3B1-D		ROD5/30-4B1-D
5.25 –0.30	18 ±0.3		ROD5.3/18-3S3	
6 –0.30	25 ±0.6		ROD6/25-3S3	
6 –0.10	30 –1.2	ROD6/30-3B1-D		ROD6/30-4B1-D
6 –0.10	40 –1.6	ROD6/40-3B1-D		ROD6/40-4B1-D
6 –0.10	50 ±1.0	ROD6/50-3B1-D		ROD6/50-4B1-D
6.5 –0.30	25 ±0.6		ROD6.5/25-3S3	

Soft Ferrites Rods

DIMENSIONS (mm)		TYPE NUMBER		
D	L	3B1	3S3	4B1
8 –0.40	50 ±1.0	ROD8/50-3B1		ROD8/50-4B1
8 –0.40	150 ±3.0	ROD8/150-3B1		ROD8/150-4B1
8 –0.40	200 ±4.0	ROD8/200-3B1		ROD8/200-4B1
10 –0.50	200 ±4.0	ROD10/200-3B1		ROD10/200-4B1

SMD BEADS

SMD bead type BDS 3/1.8/5.3

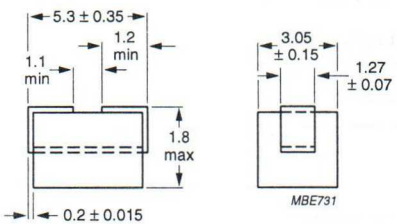
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.1 g
Taping method	*"IEC 286-3"* and *"EIA 481-1"*

BDS 3/1.8/5.3 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
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	

Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <0.6 mΩ.



Dimensions in mm.

Fig.1 BDS 3/1.8/5.3.

SMD bead type BDS 3/3/4.6

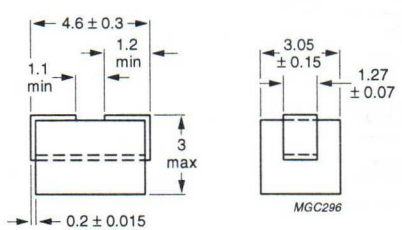
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.15 g
Taping method	*"IEC 286-3"* and *"EIA 481-1"*

BDS 3/3/4.6 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
3S1	25	3	BDS3/3/4.6-3S1
	45	10	
	35	25	
4S2	30	25	BDS3/3/4.6-4S2
	50	100	
	55	300	

Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <0.6 mΩ.



Dimensions in mm.

Fig.2 BDS 3/3/4.6.

SMD bead type BDS 3/3/8.9

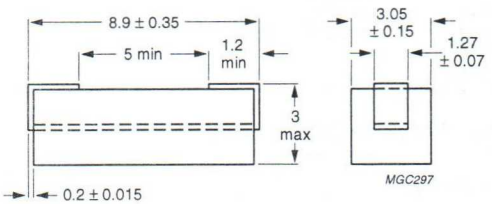
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.3 g
Taping method	*"IEC 286-3"* and *"EIA 481-2"*

BDS 3/3/8.9 for EMI suppression

GRADE	$\|Z\|$ (1)(2) (Ω)	at f (MHz)	TYPE NUMBER
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	

Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <1.0 mΩ.



Dimensions in mm.

Fig.3 BDS 3/3/8.9.

SMD bead type BDS 4.6/3/8.9

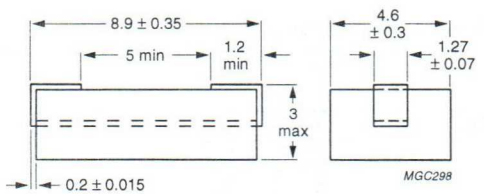
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.5 g
Taping method	*"IEC 286-3"* and *"EIA 481-2"*

BDS 4.6/3/8.9 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
4S2	65	25	BDS 4.6/3/8.9-4S2
	100	100	
	110	300	

Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <1.0 mΩ.



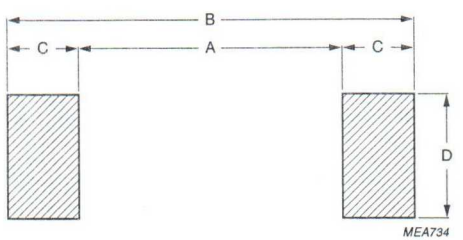
Dimensions in mm.

Fig.4 BDS 4.6/3/8.9.

RECOMMENDED DIMENSIONS OF SOLDERLANDS

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

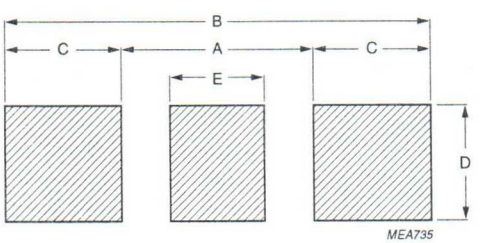


For dimensions see Table 1.

Fig.5 Reflow and vapour phase soldering.

Table 2 Wave soldering

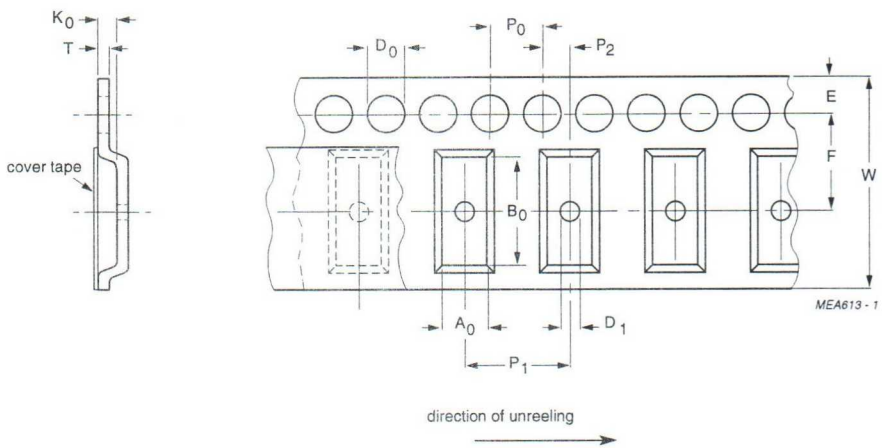
SIZE	DIMENSIONS (mm)				
	A	B	C	D	E
BDS 3/1.8/5.3	2.0	7.2	2.6	3.0	0.8
BDS 3/3/4.6	2.0	6.4	2.2	3.0	0.8
BDS 3/3/8.9	6.0	12.2	3.1	3.0	2.5
BDS 4.6/3/8.9	6.0	12.2	3.1	3.0	2.5



For dimensions see Table 2.

Fig.6 Wave soldering.

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 3.

Fig.7 Blister tape.

Table 3 Physical dimensions of blister tape

SIZE	DIMENSIONS (mm)			
	BDS3/3/4.6	BDS3/3/8.9	BDS4.6/3/8.9	BDS3/1.8/5.3
A_0	3.45 ±0.1	3.45 ±0.1	5.1 ±0.1	3.25 ±0.1
B_0	5.1 ±0.1	9.4 ±0.1	9.4 ±0.1	5.85 ±0.1
T	0.25 ±10%	0.35 ±0.05	0.3 ±0.05	0.3 ±0.05
W	12.0 ±0.3	16.0 ±0.3	16.0 ±0.3	12.0 ±0.3
E	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	5.5 ±0.05	7.5 ±0.1	7.5 ±0.1	5.5 ±0.05
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 ±0.05	2.0 ±0.1	2.0 ±0.1	2.0 ±0.1
K_0	3.1 ±0.1	3.1 ±0.1	3.1 ±0.1	2.0 ±0.1

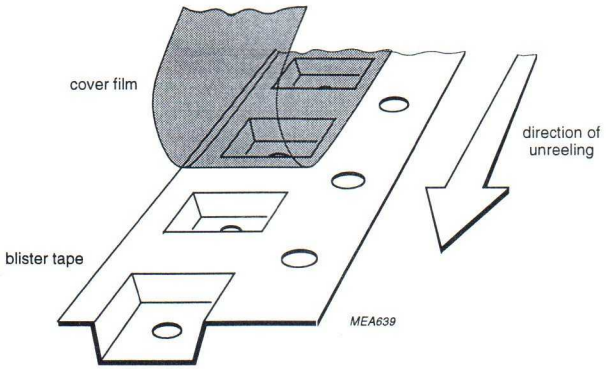
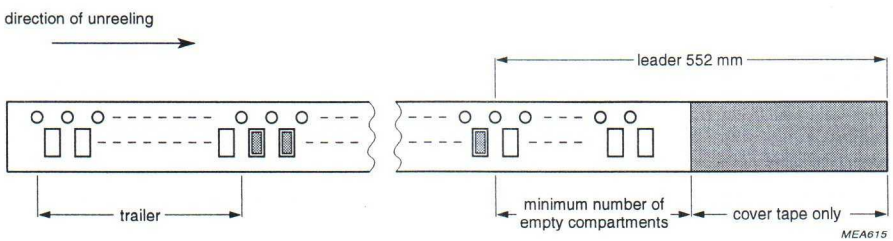
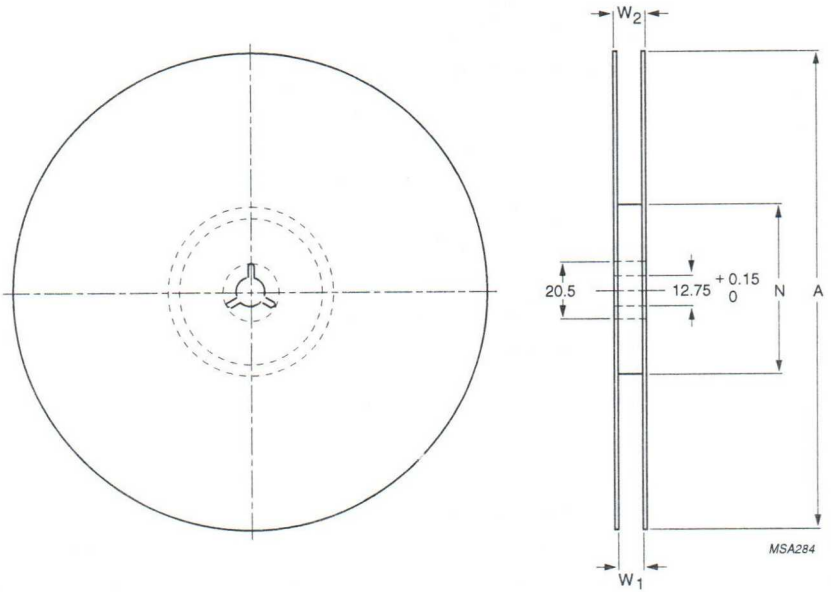


Fig.8 Construction of blister tape.



Leader: length of leader tape is 552 = 69 compartments mm minimum and covered with cover tape.
Trailer: 20 empty compartments minimum (secured with tape).
Storage temperature range for tape: -25 to +45 °C.

Fig.9 Leader/trailer tape.



Dimensions in mm.

Fig.10 Reel.

Table 4 Reel dimensions

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

SMD common mode choke CMS2-5.6/3/4.8

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.3 g
Taping method	*"IEC 286-A"* and *"EIA 481-A"*

SMD common mode choke CMS4-11/3/4.8

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.6 g
Taping method	*"IEC 286-A"* and *"EIA 481-A"*

CMS2-5.6/3/4.8 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
4S2	23	30	CMS2-5.6/3/4.8-4S2
	35	100	
	50	300	

Note

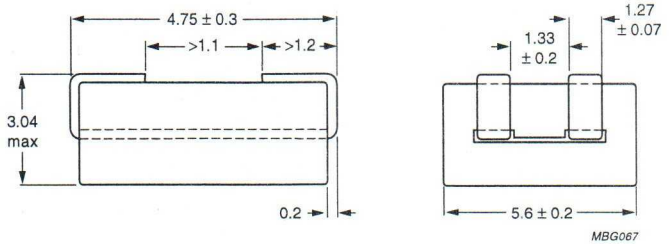
1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <0.6 mΩ.

CMS4-11/3/4.8 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
4S2 inner channel	13	30	CMS4-11/3/4.8-4S2
	23	100	
	42	300	
4S2 outer channel	16	30	
	30	100	
	50	300	

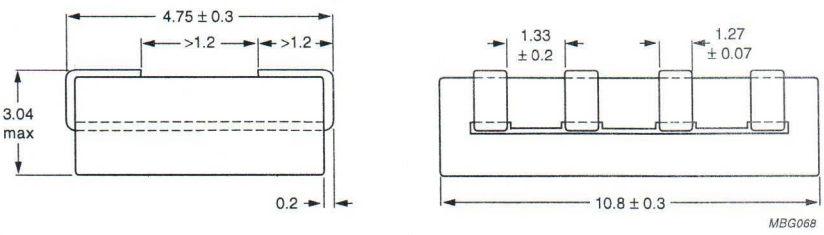
Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <0.6 mΩ.



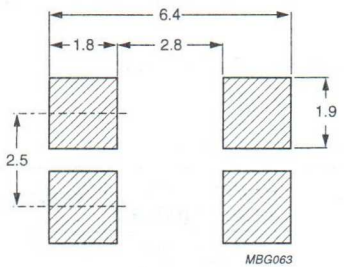
Dimensions in mm.

Fig.1 CMS2-5.6/3/4.8-4S2.



Dimensions in mm.

Fig.2 CMS4-11/3/4.8-4S2.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm²).

Fig.3 Solder lands for reflow soldering of CMS2-5.6/3/4.8.

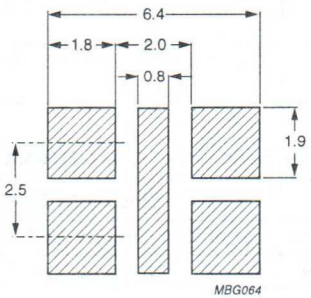
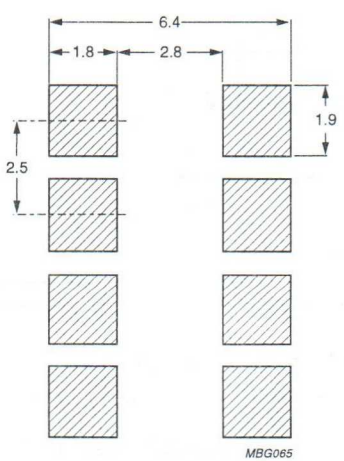


Fig.4 Solder lands for wave soldering of CMS2-5.6/3/4.8.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm²).

Fig.5 Solder lands for reflow soldering of CMS4-11/3/4.8.

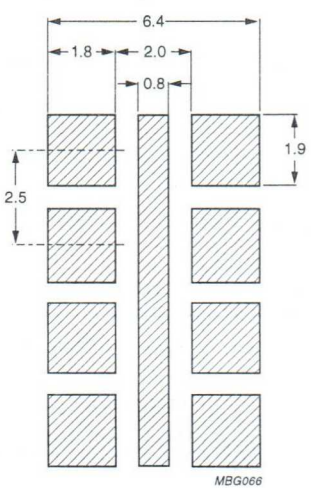


Fig.6 Solder lands for wave soldering of CMS4-11/3/4.8.

SMD WIDEBAND CHOKES

SMD wideband choke WBS2.5-5/4.8/10

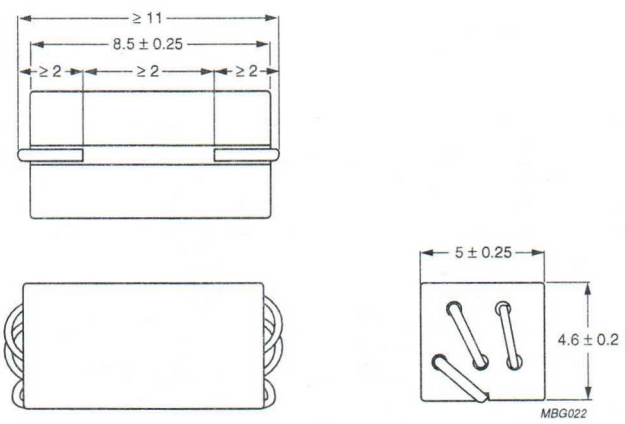
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	*"IEC 286-A"* and *"EIA 481-A"*

WBS2.5-5/4.8/10 for EMI suppression

GRADE	$\|Z\|$ (1) (2) (Ω)	at f (MHz)	TYPE NUMBER
3B1	300	10	WBS2.5-5/4.8/10-3B1
	625	50	
	600	100	
4B1	485	25	WBS2.5-5/4.8/10-4B1
	850	100	
	350	300	

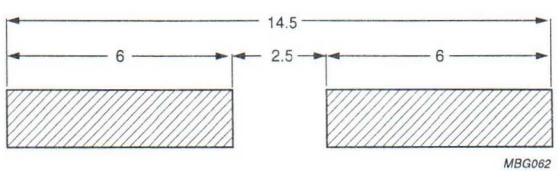
Note

1. Typical values, $|Z|_{min}$ is –20%.
2. DC resistance <7.5 mΩ.



Dimensions in mm.

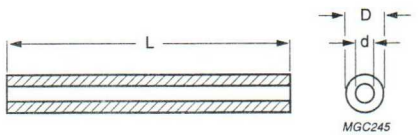
Fig.1 WBS2.5-5/4.8/10.



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 WBS2.5-5/4.8/10.

TUBES



For dimensions see Table 1.

Fig.1 Tube.

Table 1 Dimensions and ordering information

DIMENSIONS (mm)			TYPE NUMBER		
D	d	L	4B1	3B1	3C85
3.5 –0.25	1.2 +0.15	15 –0.8	TUB3.5/1.2/15-4B1	TUB3.5/1.2/15-3B1	TUB3.5/1.2/15-3C85
4.0 –0.25	1.6 +0.15	15 –0.8	TUB4/1.6/15-4B1	TUB4/1.6/15-3B1	TUB4/1.6/15-3C85
4.0 –0.25	1.6 +0.15	40 –1.6	TUB4/1.6/40-4B1	TUB4/1.6/40-3B1	TUB4/1.6/40-3C85
5.0 –0.30	2.0 +0.20	15 –0.8	TUB5/2/15-4B1	TUB5/2/15-3B1	TUB5/2/15-3C85
5.0 –0.30	2.0 +0.20	50 ±1	TUB5/2/50-4B1	TUB5/2/50-3B1	TUB5/2/50-3C85
6.0 –0.30	3.0 +0.20	20 –0.9	TUB6/3/20-4B1	TUB6/3/20-3B1	TUB6/3/20-3C85
6.0 –0.30	3.0 +0.20	30 –1.2	TUB6/3/30-4B1	TUB6/3/30-3B1	TUB6/3/30-3C85
8.0 –0.40	4.0 +0.30	20 –0.9	TUB8/4/20-4B1	TUB8/4/20-3B1	TUB8/4/20-3C85
8.0 –0.40	4.0 +0.30	40 –1.6	TUB8/4/40-4B1	TUB8/4/40-3B1	TUB8/4/40-3C85
8.0 –0.40	4.0 +0.30	200 ±4	–	–	TUB8/4/200-3C85
10.0 –0.50	4.2 +0.30	20 –0.9	TUB10/4.2/20-4B1	TUB10/4.2/20-3B1	TUB10/4.2/20-3C85
10.0 –0.50	4.2 +0.30	45 –1.8	TUB10/4.2/45-4B1	TUB10/4.2/45-3B1	TUB10/4.2/45-3C85
10.0 –0.50	5.0 +0.40	200 ±4	–	–	TUB10/5/200-3C85

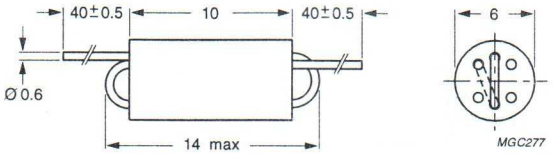
WIDEBAND CHOKES

General data WBC 1.5/A

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 1.5/A for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	1.5	≥300	120	WBC1.5/A-3B1
4B1	1.5	≥350	250	WBC1.5/A-4B1



Dimensions in mm.

Fig.1 WBC 1.5/A.

General data WBC 1.5/1.5/A

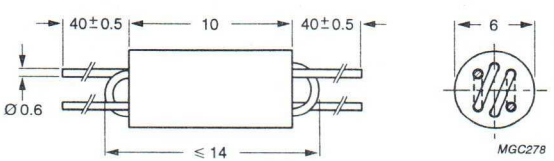
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 1.5/1.5/A for EMI suppression

GRADE	No. OF TURNS	|Z|(1) at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2 × 1.5	≥700	50	WBC1.5/1.5/A-3B1
4B1	2 × 1.5	≥800	110	WBC1.5/1.5/A-4B1
4A15	2 × 1.5	1000	50	WBC1.5/1.5/A-4A15
		1000	180	

Note

1. \|Z\| measured with both windings connected in series.



Dimensions in mm.

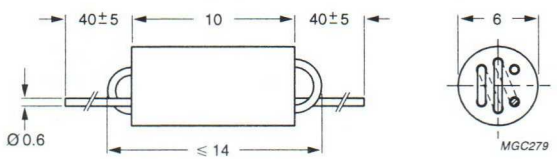
Fig.2 WBC 1.5/1.5/A.

General data WBC 2.5/A

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/A for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/A-3B1
4B1	2.5	≥700	180	WBC2.5/A-4B1
4A15	2.5	800	50	WBC2.5/A-4A15
		820	180	



Dimensions in mm.

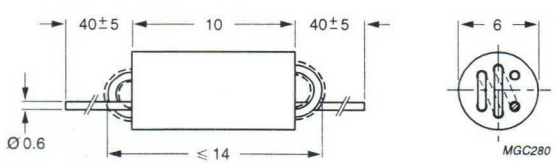
Fig.3 WBC 2.5/A.

General data WBC 2.5/SA

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Wire bends	provided with plastic tubes to prevent short-circuits
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/SA for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/SA-3B1
4B1	2.5	≥700	180	WBC2.5/SA-4B1



Dimensions in mm.

Fig.4 WBC 2.5/SA.

General data WBC 2.5/EA

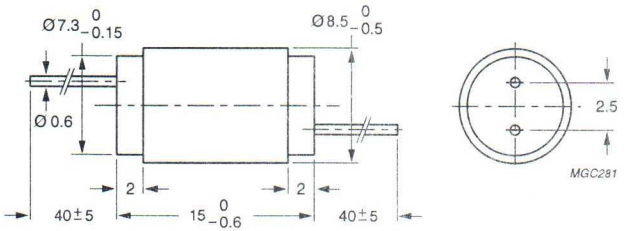
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Isolation caps	polyamide (PA6.6), flame retardant in accordance with UL 94V-0
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/EA for EMI suppression

GRADE(1)	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/EA-3B1
4B1	2.5	≥700	180	WBC2.5/EA-4B1

Note

1. Colour code 3B1 = blue, 4B1 = green.



Dimensions in mm.

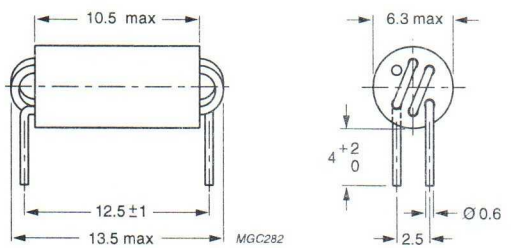
Fig.5 WBC 2.5/EA.

General data WBC 2.5/R

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/R for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/R-3B1
4B1	2.5	≥700	75	WBC2.5/R-4B1



Dimensions in mm.

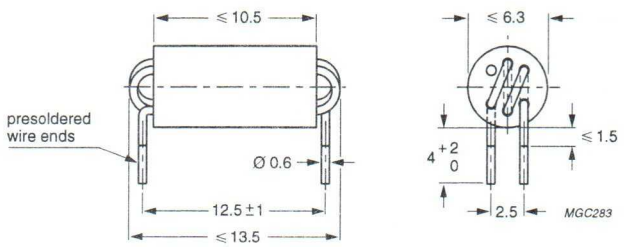
Fig.6 WBC 2.5/R.

General data WBC 2.5/IR

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, enamelled to prevent short-circuits between bends; leads are pre-soldered
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/IR for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/IR-3B1
4B1	2.5	≥700	75	WBC2.5/IR-4B1



Dimensions in mm.

Fig.7 WBC 2.5/IR.

General data WBC 2.5/SP

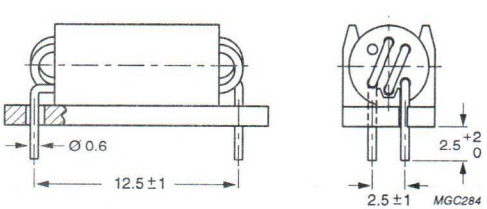
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Support	polyamide (PA6.6) plate to allow mounting across circuit tracks; flame retardant in accordance with UL 94V-0
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/SP for EMI suppression

GRADE[1]	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/SP-3B1
4B1	2.5	≥700	75	WBC2.5/SP-4B1

Note

1. Colour code 3B1 = blue, 4B1 = green.



Dimensions in mm.

Fig.8 WBC 2.5/SP.

General data WBC 2.5/EAT

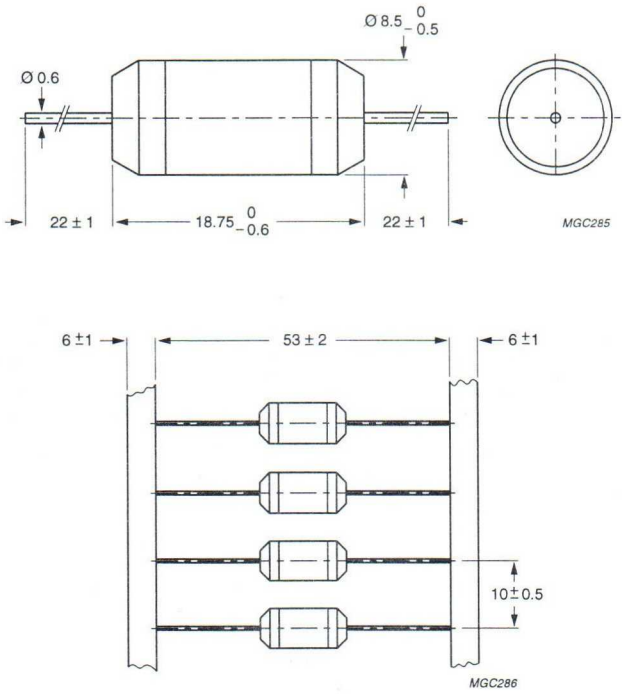
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Isolation	polyamide (PA6.6) caps, flame retardant in accordance with UL 94V-0
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2.5/EAT for EMI suppression

GRADE[1]	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	2.5	≥600	50	WBC2.5/EAT-3B1
4B1	2.5	≥700	180	WBC2.5/EAT-4B1

Note

1. Colour code 3B1 = blue, 4B1 = green.



Dimensions in mm.

Taped axially in accordance with *"IEC 286 part 1"*, and *"EIA/RS-296D"*.

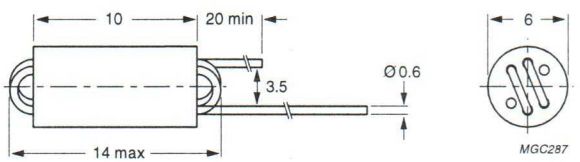
Fig.9 WBC 2.5/EAT.

General data WBC 3/R

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 3/R for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	3	≥650	63	WBC3/R-3B1
4B1	3	≥800	110	WBC3/R-4B1
4A15	3	1000	50	WBC3/R-4A15
		1000	180	



Dimensions in mm.

Fig.10 WBC 3/R.

General data WBC 3/ER

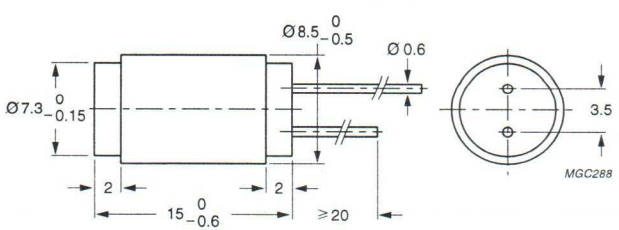
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Isolation	polyamide (PA6.6) caps, flame retardant in accordance with UL 94V-0
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 3/ER for EMI suppression

GRADE[1]	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	3	≥650	63	WBC3/ER-3B1
4B1	3	≥800	110	WBC3/ER-4B1

Note

1. Colour code 3B1 = blue, 4B1 = green.



Dimensions in mm.

Fig.11 WBC 3/ER.

General data WBC 3/ERT

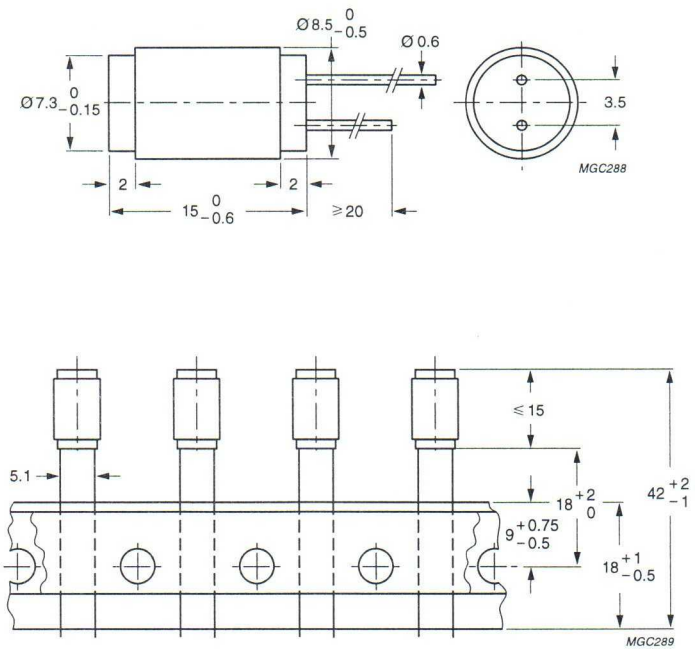
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Isolation	polyamide (PA6.6) caps, flame retardant in accordance with UL 94V-0
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 3/ERT for EMI suppression

GRADE(1)	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
3B1	3	≥650	63	WBC3/ERT-3B1
4B1	3	≥800	110	WBC3/ERT-4B1

Note

1. Colour code 3B1 = blue, 4B1 = green.



Dimensions in mm.

Taped radially in accordance with *"IEC 286 part 2"*.

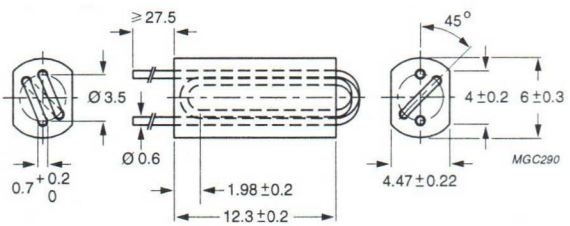
Fig.12 WBC 3/ERT.

General data WBC 2/R

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2/R for EMI suppression

GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
4A15	2	730	50	WBC2/R-4A15
		730	180	



Dimensions in mm.

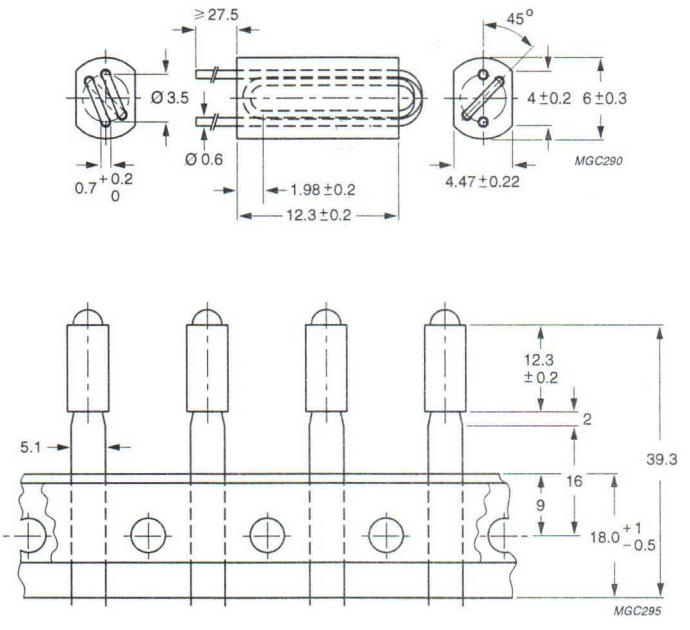
Fig.13 WBC 2/R.

General data WBC 2/RT

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1

WBC 2/RT for EMI suppression

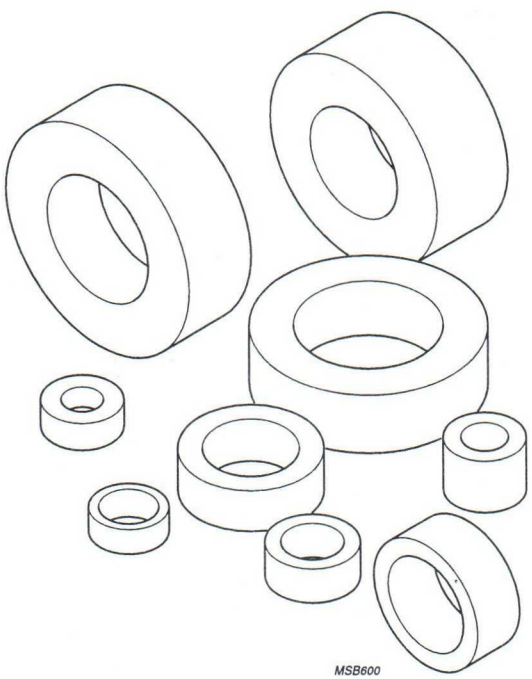
GRADE	No. OF TURNS	|Z| at f		TYPE NUMBER
		(Ω)	(MHz)	
4A15	2	730 750	50 180	WBC2/RT-4A15



Dimensions in mm.

Taped radially in accordance with *"IEC 286 part 2"*.

Fig.14 WBC 2/RT.


MSB600

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Ferrite Ring cores (Toroids)

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
TC2.5/1.3/0.8	2.49	0.45	0.012
TC2.5/1.5/1	2.73	0.45	0.014
T2.5/1.5/1-E	2.94	0.49	0.015
TC3.4/1.8/1.3	7.4	0.97	0.035
TC3.9/2/1	7.8	0.90	0.039
TC3.9/2.2/1.3	9.5	1.03	0.045
TN4/2.2/1.1	8.8	0.96	0.040
TN4/2.2/1.6	12.9	1.40	0.060
TC4.8/2.3/1.3	15.1	1.48	0.075
TC5.8/3.1/1.5	26.1	2.00	0.13
TN6/4/2	30.2	1.97	0.15
TN6.3/3.8/2.5	46.5	3.06	0.23
TC7.6/3.2/4.8	147	9.81	0.7
TN9/6/3	102	4.44	0.5
TC9.5/4.8/3.2	147	7.16	0.7
TN10/6/4	188	7.8	0.95
TX13/7.1/4.8	358	12.1	1.8
TN13/7.5/5	368	12.2	1.8
TX13/7.9/6.4	460	14.8	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	2690	61.2	13.8

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
TN20/10/7	1465	33.6	7.7
TX22/14/6.4	1330	24.6	6.5
TX22/14/13	2820	52.0	14
TN23/14/7	1722	30.9	8.4
TN25/15/10	2945	48.9	15
TX25/15/9.5	2840	46.0	13
TN26/15/10	3360	55.9	17
TN26/15/20	6720	112	34
TN29/19/7.5	2705	36.9	13.5
TX29/19/7.6	2595	35.5	13
TN32/19/13	5820	76.5	29
TN36/23/10	5730	63.9	28
TX36/23/10	5500	61.4	27
TX36/23/15	8690	96.8	40
TN36/23/15	8600	95.9	42
TX39/20/13	9980	117	45
TL42/26/13	9860	95.8	53
TX51/32/19	22300	177	100
TL58/41/18	23200	152	110
TX61/36/13	22700	157	100
T63/38/25	46500	306	220
TX74/39/13	35200	213	170
T87/54/14	46400	217	220
T102/66/15	68200	267	325
T107/65/18	96200	370	456
T107/65/25	133000	514	680

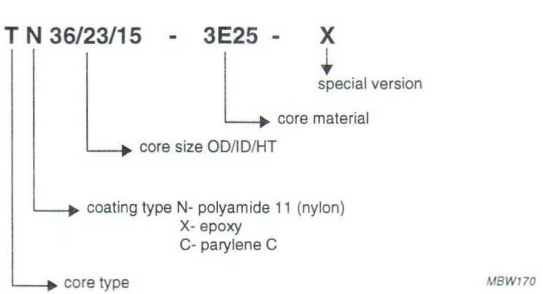


Fig.1 Type number structure for cores.

Ferrite ring cores (toroids) TC2.5/1.3/0.8

RING CORES (TOROIDS)

Effective core parameters

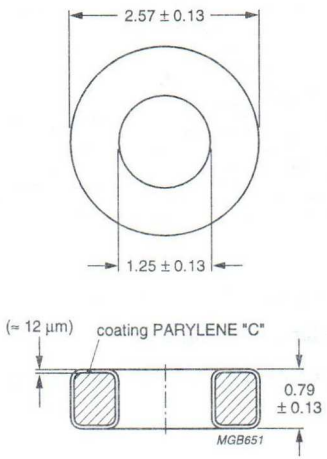
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	13.4	mm^{-1}
V_e	effective volume	2.3	mm^3
l_e	effective length	5.53	mm
A_e	effective area	0.41	mm^2
m	mass of core	≈0.012	g

Coating

The cores are coated with parylene C.

Isolation voltage: $750V_{RMS}$.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC2.5/1.3/0.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	13 ±20%	≈125	TC2.5/1.3/0.8-4C65
3E6	940 ±30%	≈10000	TC2.5/1.3/0.8-3E6

Ferrite ring cores (toroids) TC2.5/1.5/1

RING CORES (TOROIDS)

Effective core parameters

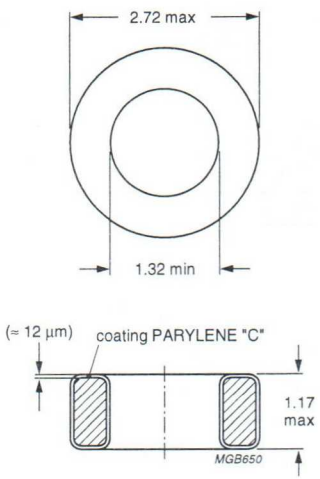
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	13.5	mm^{-1}
V_e	effective volume	2.73	mm^3
l_e	effective length	6.06	mm
A_e	effective area	0.45	mm^2
m	mass of core	≈0.014	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC2.5/1.5/1 ring core.

Ring core data

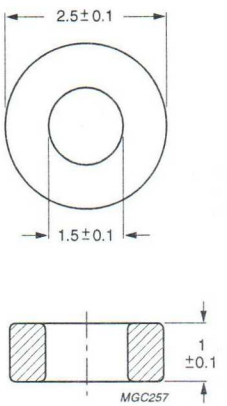
GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	12 ±20%	≈125	TC2.5/1.5/1-4C65
3D3	70 ±20%	≈750	TC2.5/1.5/1-3D3
3B7	215 ±20%	≈2300	TC2.5/1.5/1-3B7
3E27	350 ±20%	≈3800	TC2.5/1.5/1-3E27
3E25	350 ±20%	≈3800	TC2.5/1.5/1-3E25
3E6	930 ±30%	≈10000	TC2.5/1.5/1-3E6

Ferrite ring cores (toroids) T2.5/1.5/1-E

FERRITE RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	12.3	mm^{-1}
V_e	effective volume	2.94	mm^3
l_e	effective length	6.02	mm
A_e	effective area	0.489	mm^2
m	mass of set	≈0.015	g



Dimensions in mm.

Fig.1 T2.5/1.5/1-E ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	13 ±25%	≈125	T2.5/1.5/1-E-4C65-E
4A11	71 ±25%	≈700	T2.5/1.5/1-E-4A11-E
3F3	180 ±25%	≈1800	T2.5/1.5/1-E-3F3-E
3E25	610 ±25%	≈6000	T2.5/1.5/1-E-3E25-E
3E5	920 ±30%	≈9000	T2.5/1.5/1-E-3E5-E
3E6(1)	1020 ±30%	≈10 000	TC2.5/1.5/1-3E6-E

Note

1. Coated with parylene C.

RING CORES (TOROIDS)

Effective core parameters

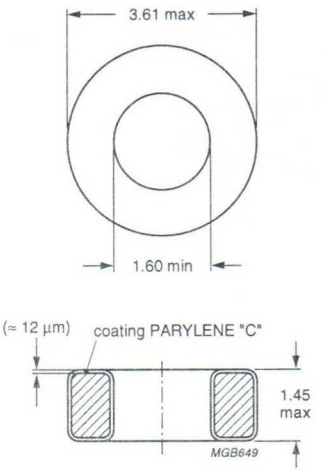
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.93	mm^{-1}
V_e	effective volume	7.3	mm^3
l_e	effective length	7.62	mm
A_e	effective area	0.96	mm^2
m	mass of core	≈0.035	g

Coating

The cores are coated with parylene C.

Isolation voltage: $750V_{RMS}$.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC3.4/1.8/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	20 ±20%	≈125	TC3.4/1.8/1.3-4C65
3D3	110 ±20%	≈750	TC3.4/1.8/1.3-3D3
3B7	375 ±20%	≈2300	TC3.4/1.8/1.3-3B7
3E27	660 ±20%	≈4200	TC3.4/1.8/1.3-3E27
3E25	660 ±20%	≈4200	TC3.4/1.8/1.3-3E25
3E6	1580 ±30%	≈10000	TC3.4/1.8/1.3-3E6

Ferrite ring cores (toroids) TC3.9/2/1

RING CORES (TOROIDS)

Effective core parameters

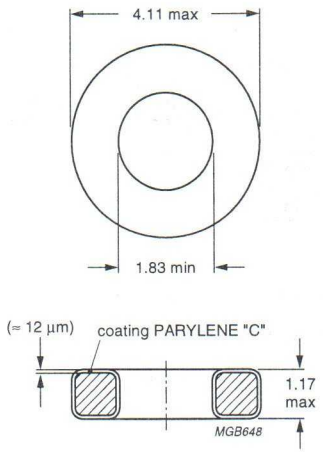
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.99	mm^{-1}
V_e	effective volume	7.5	mm^3
l_e	effective length	8.67	mm
A_e	effective area	0.87	mm^2
m	mass of core	≈0.039	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC3.9/2/1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3	96 ±20%	≈750	TC3.9/2/1-3D3
3E6	1260 ±30%	≈10000	TC3.9/2/1-3E6

Ferrite ring cores (toroids)

TC3.9/2.2/1.3 (891CT050)

RING CORES (TOROIDS)

Effective core parameters

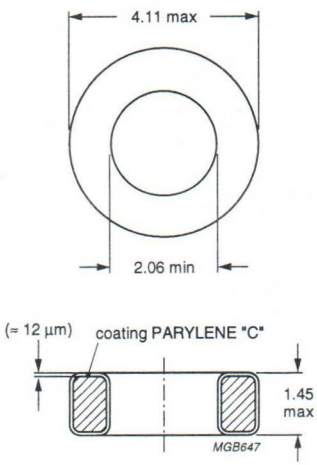
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.20	mm^{-1}
V_e	effective volume	9.20	mm^3
l_e	effective length	9.20	mm
A_e	effective area	1.00	mm^2
m	mass of core	≈0.045	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC3.9/2.2/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	18 ±20%	≈125	TC3.9/2.2/1.3-4C65
3D3	97 ±20%	≈750	TC3.9/2.2/1.3-3D3
3B7	325 ±20%	≈2300	TC3.9/2.2/1.3-3B7
3E27	575 ±20%	≈4100	TC3.9/2.2/1.3-3E27
3E25	575 ±20%	≈4100	TC3.9/2.2/1.3-3E25
3E6	1360 ±30%	≈10000	TC3.9/2.2/1.3-3E6

Ferrite ring cores (toroids) TN4/2.2/1.1

RING CORES (TOROIDS)

Effective core parameters

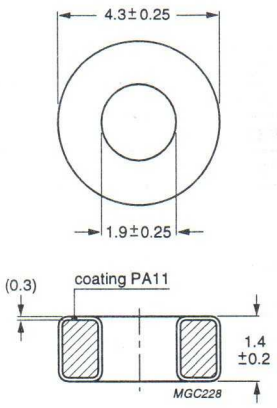
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.55	mm^{-1}
V_e	effective volume	8.82	mm^3
l_e	effective length	9.18	mm
A_e	effective area	0.961	mm^2
m	mass of core	≈0.04	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN4/2.2/1.1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	16 ±25%	≈125	violet	TN4/2.2/1.1-4C65
4A11	92 ±25%	≈700	pink	TN4/2.2/1.1-4A11
3F3	240 ±25%	≈1800	blue	TN4/2.2/1.1-3F3
3E25	725 ±30%	≈5500	orange	TN4/2.2/1.1-3E25
3E5[1]	1120 ±30%	≈8500	yellow/white	TL4/2.2/1.1-3E5
3E6[2]	1315 ±30%	≈10000	–	TC4/2.2/1.1-3E6

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 4.3 ±0.3 mm; Inside diameter = 2.1 ±0.3 mm; Height = 1.25 ±0.3 mm.
2. Ring cores in 3E6 are coated with parylene C and therefore have different dimensions: Outside diameter = 4.0 ±0.15 mm; Inside diameter = 2.2 ±0.15 mm; Height = 1.1 ±0.1 mm.

Ferrite ring cores (toroids) TN4/2.2/1.6

RING CORES (TOROIDS)

Effective core parameters

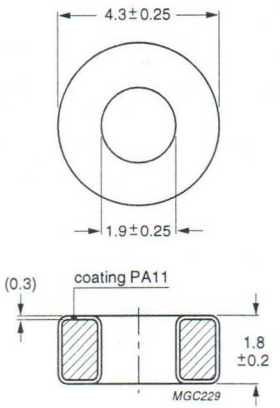
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.56	mm^{-1}
V_e	effective volume	12.9	mm^3
l_e	effective length	9.2	mm
A_e	effective area	1.4	mm^2
m	mass of core	≈0.1	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN4/2.2/1.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	24 ±25%	≈125	violet	TN4/2.2/1.6-4C65
4A11	134 ±25%	≈700	pink	TN4/2.2/1.6-4A11
3F3	340 ±25%	≈1800	blue	TN4/2.2/1.6-3F3
3E25	1050 ±30%	≈5500	orange	TN4/2.2/1.6-3E25
3E5(1)	1630 ±30%	≈8500	yellow/white	TL4/2.2/1.6-3E5
3E6(2)	1915 ±30%	≈10000	purple/white	TC4/2.2/1.6-3E6

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 4.3 ±0.3 mm; Inside diameter = 2.1 ±0.3 mm; Height = 1.75 ±0.3 mm.
2. Ring cores in 3E6 are coated with parylene C and therefore have different dimensions: Outside diameter = 4.0 ±0.15 mm; Inside diameter = 2.2 ±0.15 mm; Height = 1.6 ±0.1 mm.

Ferrite ring cores (toroids)

TC4.8/2.3/1.3 (213CT050)

RING CORES (TOROIDS)

Effective core parameters

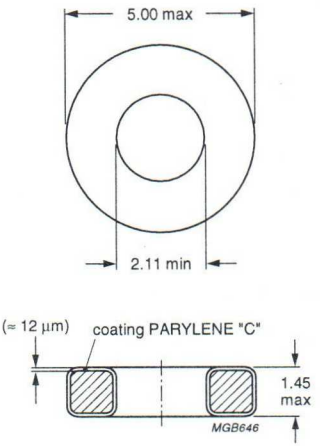
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.84	mm^{-1}
V_e	effective volume	15.1	mm^3
l_e	effective length	10.2	mm
A_e	effective area	1.49	mm^2
m	mass of core	≈0.075	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC4.8/2.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	24 ±20%	≈125	TC4.8/2.3/1.3-4C65
3D3	140 ±20%	≈750	TC4.8/2.3/1.3-3D3
3B7	430 ±20%	≈2300	TC4.8/2.3/1.3-3B7
3E27	850 ±20%	≈4700	TC4.8/2.3/1.3-3E27
3E25	850 ±20%	≈4700	TC4.8/2.3/1.3-3E25
3E6	1830 ±30%	≈10000	TC4.8/2.3/1.3-3E6

Ferrite ring cores (toroids)

TC5.8/3.1/1.5 (1041CT060)

RING CORES (TOROIDS)

Effective core parameters

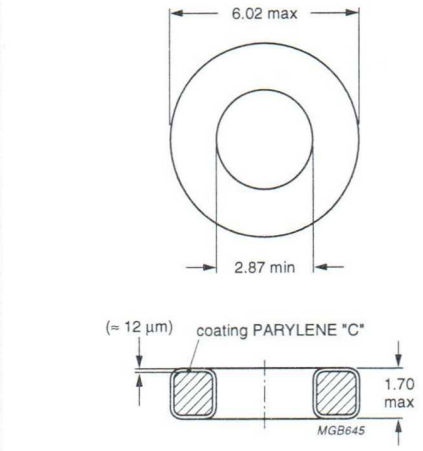
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.52	mm^{-1}
V_e	effective volume	26.1	mm^3
l_e	effective length	13.0	mm
A_e	effective area	2.00	mm^2
m	mass of core	≈0.13	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions 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 ±20%	≈125	TC5.8/3.1/1.5-4C65
3D3	144 ±20%	≈750	TC5.8/3.1/1.5-3D3
3B7	450 ±20%	≈2300	TC5.8/3.1/1.5-3B7
3E27	890 ±20%	≈4600	TC5.8/3.1/1.5-3E27
3E25	890 ±20%	≈4600	TC5.8/3.1/1.5-3E25
3E6	1960 ±30%	≈10200	TC5.8/3.1/1.5-3E6

Ferrite ring cores (toroids) TN6/4/2

RING CORES (TOROIDS)

Effective core parameters

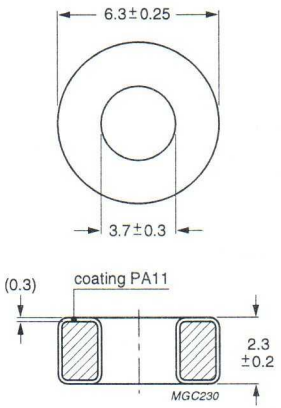
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.75	mm^{-1}
V_e	effective volume	30.2	mm^3
l_e	effective length	15.3	mm
A_e	effective area	1.97	mm^2
m	mass of core	≈0.15	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN6/4/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	20 ±25%	≈125	violet	TN6/4/2-4C65
4A11	114 ±25%	≈700	pink	TN6/4/2-4A11
3F3	290 ±25%	≈1800	blue	TN6/4/2-3F3
3E25	890 ±30%	≈5500	orange	TN6/4/2-3E25
3E5[1]	1380 ±30%	≈8500	yellow/white	TL6/4/2-3E5
3E6[2]	1620 ±30%	≈10000	–	TC6/4/2-3E6

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 6.3 ±0.3 mm; Inside diameter = 3.75 ±0.3 mm; Height = 2.25 ±0.3 mm.
2. Ring cores in 3E6 are coated with parylene C and therefore have different dimensions: Outside diameter = 6.0 ±0.15 mm; Inside diameter = 4.0 ±0.15 mm; Height = 2.0 ±0.1 mm.

Ferrite ring cores (toroids) TN6.3/3.8/2.5

RING CORES (TOROIDS)

Effective core parameters

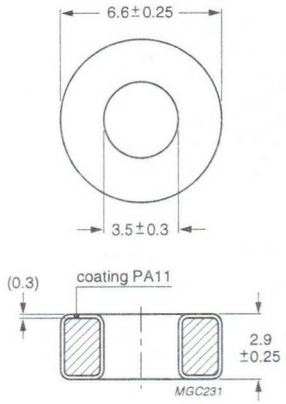
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	46.5	mm^3
l_e	effective length	15.2	mm
A_e	effective area	3.06	mm^2
m	mass of core	≈0.23	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN6.3/3.8/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	32 ±25%	≈125	violet	TN6.3/3.8/2.5-4C65
4A11	177 ±25%	≈700	pink	TN6.3/3.8/2.5-4A11
3F3	450 ±25%	≈1800	blue	TN6.3/3.8/2.5-3F3
3E25	1390 ±30%	≈5500	orange	TN6.3/3.8/2.5-3E25
3E5(1)	2150 ±30%	≈8500	yellow/white	TL6.3/3.8/2.5-3E5
3E6(2)	2530 ±30%	≈10000	–	TC6.3/3.8/2.5-3E6

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 6.6 ±0.3 mm; Inside diameter = 3.55 ±0.3 mm; Height = 2.75 ±0.3 mm.
2. Ring cores in 3E6 are coated with parylene C and therefore have different dimensions: Outside diameter = 6.3 ±0.15 mm; Inside diameter = 3.8 ±0.15 mm; Height = 2.5 ±0..15 mm.

Ferrite ring cores (toroids) TC7.6/3.2/4.8

RING CORES (TOROIDS)

Effective core parameters

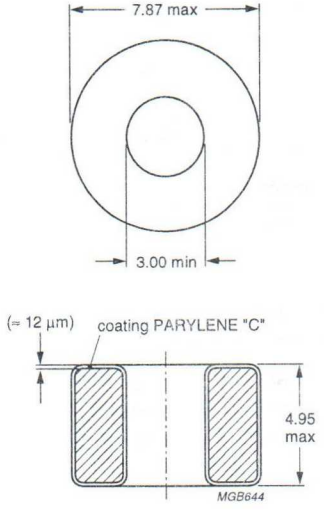
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.52	mm^{-1}
V_e	effective volume	147	mm^3
l_e	effective length	15.0	mm
A_e	effective area	9.84	mm^2
m	mass of core	≈0.7	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC7.6/3.2/4.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	103 ±20%	≈125	TC7.6/3.2/4.8-4C65
3D3	620 ±20%	≈750	TC7.6/3.2/4.8-3D3
3B7	1900 ±20%	≈2300	TC7.6/3.2/4.8-3B7
3C81	2200 ±20%	≈2700	TC7.6/3.2/4.8-3C81
3E27	4100 ±20%	≈5000	TC7.6/3.2/4.8-3E27
3E25	4100 ±20%	≈5000	TC7.6/3.2/4.8-3E25
3E6	8350 ±30%	≈10100	TC7.6/3.2/4.8-3E6

Ferrite ring cores (toroids) TN9/6/3

RING CORES (TOROIDS)

Effective core parameters

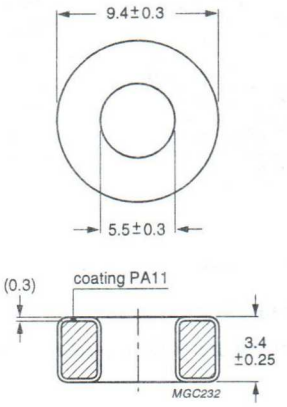
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.17	mm^{-1}
V_e	effective volume	102	mm^3
l_e	effective length	22.9	mm
A_e	effective area	4.44	mm^2
m	mass of core	≈0.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN9/6/3 ring core.

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
3C85	485 ±25%	≈2000	red	TN9/6/3-3C85
3E25	1340 ±30%	≈5500	orange	TN9/6/3-3E25
3E5(2)	2070 ±30%	≈8500	yellow/white	TL9/6/3-3E5
3E6(3)	2435 ±30%	≈10000	–	TC9/6/3-3E6

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 3R1 cores close to their mechanical resonant frequency. For more information see 3R1 material specification.
2. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions:
   Outside diameter = 9.3 ±0.4 mm; Inside diameter = 5.75 ±0.3 mm; Height = 3.25 ±0.3 mm.
3. Ring cores in 3E6 are coated with parylene C and therefore have different dimensions:
   Outside diameter = 9.0 ±0.2 mm; Inside diameter = 6.0 ±0.2 mm; Height = 3.0 ±0.15 mm.

Ferrite ring cores (toroids)

TC9.5/4.8/3.2 (266CT125)

RING CORES (TOROIDS)

Effective core parameters

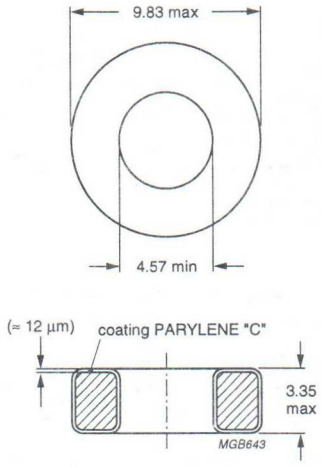
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.89	mm^{-1}
V_e	effective volume	148	mm^3
l_e	effective length	20.7	mm
A_e	effective area	7.16	mm^2
m	mass of core	≈0.7	g

Coating

The cores are coated with parylene C.

Isolation voltage: 750 V_{RMS}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TC9.5/4.8/3.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	55 ±20%	≈125	TC9.5/4.8/3.2-4C65
3D3	330 ±20%	≈750	TC9.5/4.8/3.2-3D3
3B7	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
3E25	2135 ±20%	≈4900	TC9.5/4.8/3.2-3E25
3E6	4390 ±30%	≈10100	TC9.5/4.8/3.2-3E6

Ferrite ring cores (toroids) TN10/6/4

RING CORES (TOROIDS)

Effective core parameters

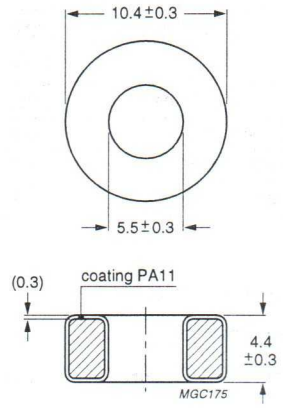
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.07	mm^{-1}
V_e	effective volume	188	mm^3
l_e	effective length	24.1	mm
A_e	effective area	7.8	mm^2
m	mass of core	≈0.95	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	820 ±25%	≈2000	red	TN10/6/4-3C85
3C11	1750 ±25%	≈4300	white	TN10/6/4-3C11
3E25	2250 ±30%	≈5500	orange	TN10/6/4-3E25
3E5(1)	3470 ±30%	≈8500	yellow/white	TL10/6/4-3E5
3E6(1)	4085 ±30%	≈10000	purple/white	TL10/6/4-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 10.25 ±0.4 mm; Inside diameter = 5.75 ±0.3 mm; Height = 4.25 ±0.3 mm.

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
3C85	≥320	≤0.03	≤0.04	–
3F3	≥320	–	≤0.03	≤0.04

Ferrite ring cores (toroids)

TX13/7.1/4.8 (768XT188)

RING CORES (TOROIDS)

Effective core parameters

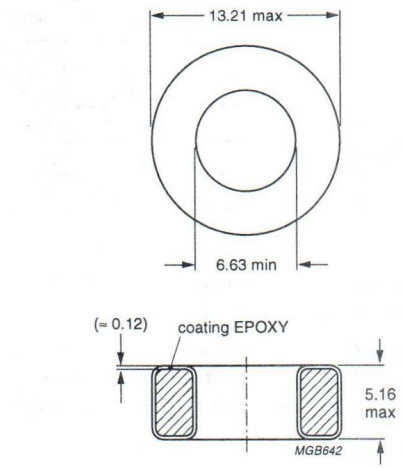
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.43	mm^{-1}
V_e	effective volume	358	mm^3
l_e	effective length	29.5	mm
A_e	effective area	12.1	mm^2
m	mass of core	≈1.8	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



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
4C65	70 ±20%	≈125	violet	TX13/7.1/4.8-4C65
3D3	415 ±20%	≈750	–	TX13/7.1/4.8-3D3
3F3	990 ±20%	≈1800	blue	TX13/7.1/4.8-3F3
3C85	1100 ±20%	≈2000	red	TX13/7.1/4.8-3C85
3C81	1475 ±20%	≈2700	light blue	TX13/7.1/4.8-3C81
3E27	2750 ±20%	≈5000	green	TX13/7.1/4.8-3E27
3E25	2750 ±20%	≈5000	orange	TX13/7.1/4.8-3E25
3E6	5400 ±30%	≈10400	purple	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	–	–
3C85	≥320	≤0.06	≤0.07	–
3F3	≥320	–	≤0.04	≤0.07

Ferrite ring cores (toroids) TN13/7.5/5

RING CORES (TOROIDS)

Effective core parameters

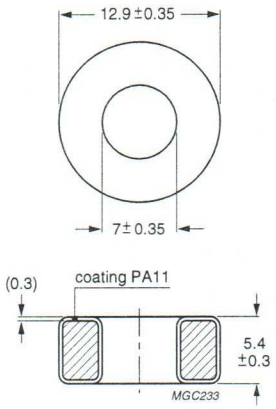
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.46	mm^{-1}
V_e	effective volume	368	mm^3
l_e	effective length	30.1	mm
A_e	effective area	12.2	mm^2
m	mass of core	≈1.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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	380 ±25%	≈750	beige	TN13/7.5/5-3F4
3F3	900 ±25%	≈1800	blue	TN13/7.5/5-3F3
3C85	1000 ±25%	≈2000	red	TN13/7.5/5-3C85
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]	5095 ±30%	≈10000	purple/white	TL13/7.5/5-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 12.75 ±0.4 mm; Inside diameter = 7.25 ±0.35 mm; Height = 5.25 ±0.3 mm.

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
3C85	≥320	≤0.06	≤0.07	–
3F3	≥320	–	≤0.04	≤0.07

Ferrite ring cores (toroids)

TX13/7.9/6.4 (204XT250)

RING CORES (TOROIDS)

Effective core parameters

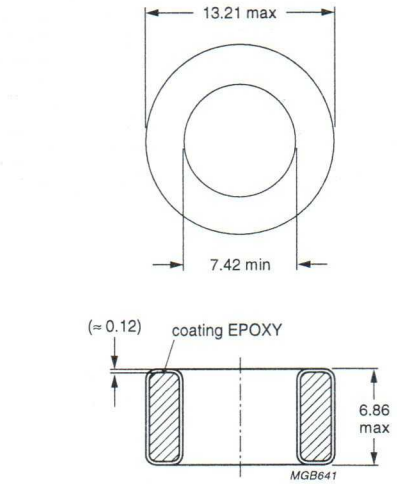
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.25	mm^{-1}
V_e	effective volume	434	mm^3
l_e	effective length	31.2	mm
A_e	effective area	13.9	mm^2
m	mass of core	≈2.2	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



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
4C65	75 ±20%	≈125	violet	TX13/7.9/6.4-4C65
3F3	1100 ±20%	≈1800	blue	TX13/7.9/6.4-3F3
3C85	1200 ±20%	≈2000	red	TX13/7.9/6.4-3C85
3C81	1620 ±20%	≈2700	light blue	TX13/7.9/6.4-3C81
3E27	3000 ±20%	≈5000	green	TX13/7.9/6.4-3E27
3E25	3000 ±20%	≈5000	orange	TX13/7.9/6.4-3E25
3E6	5900 ±30%	≈10600	purple	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	≤0.09	–	–
3C85	≥320	≤0.07	≤0.08	–
3F3	≥320	–	≤0.05	≤0.09

Ferrite ring cores (toroids) TN14/9/5

RING CORES (TOROIDS)

Effective core parameters

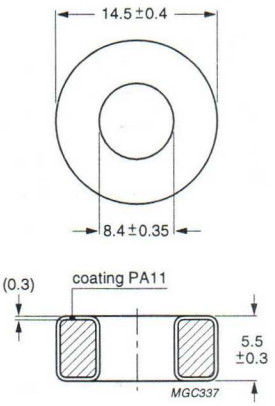
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.84	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	35	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈2.1	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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(2)	–	≈800	black	TN14/9/5-3R1
3F3	790 ±25%	≈1800	blue	TN14/9/5-3F3
3C85	880 ±25%	≈2000	red	TN14/9/5-3C85
3C11	1900 ±25%	≈4300	white	TN14/9/5-3C11
3E25	2430 ±30%	≈5500	orange	TN14/9/5-3E25
3E5(1)	3760 ±30%	≈8500	yellow/white	TL14/9/5-3E5
3E6(1)	4415 ±30%	≈10000	purple/white	TL14/9/5-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 14.25 ±0.4 mm; Inside diameter = 0.75 ±0.35 mm; Height = 5.25 ±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.
   Warning: do not use 3R1 cores close to their mechanical resonant frequency. For more information see 3R1 material specification.

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
3C85	≥320	≤0.07	≤0.08	–
3F3	≥320	–	≤0.05	≤0.08

Ferrite ring cores (toroids) TN14/9/9

RING CORES (TOROIDS)

Effective core parameters

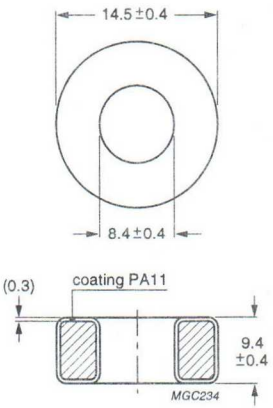
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.58	mm^{-1}
V_e	effective volume	774	mm^3
l_e	effective length	35	mm
A_e	effective area	22.1	mm^2
m	mass of core	≈3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	1600 ±25%	≈2000	red	TN14/9/9-3C85
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]	7955 ±30%	≈10000	purple/white	TL14/9/9-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 14.25 ±0.4 mm; Inside diameter = 8.75 ±0.35 mm; Height = 9.25 ±0.4 mm.

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
3C85	≥320	≤0.12	≤0.14	–
3F3	≥320	–	≤0.09	≤0.15

Ferrite ring cores (toroids)

TX16/9.1/4.7 (331XT185)

RING CORES (TOROIDS)

Effective core parameters

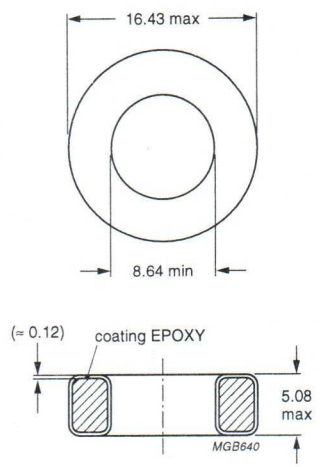
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.53	mm^{-1}
V_e	effective volume	548	mm^3
l_e	effective length	37.2	mm
A_e	effective area	14.7	mm^2
m	mass of core	≈2.7	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



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
3F3	950 ±20%	≈1800	blue	TX16/9.1/4.7-3F3
3C85	1050 ±20%	≈2000	red	TX16/9.1/4.7-3C85
3C81	1400 ±20%	≈2700	light blue	TX16/9.1/4.7-3C81
3E27	2600 ±20%	≈5000	green	TX16/9.1/4.7-3E27
3E25	2600 ±20%	≈5000	orange	TX16/9.1/4.7-3E25
3E6	5200 ±30%	≈10500	purple	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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤0.11	–	–
3C85	≥320	≤.0.09	≤0.10	–
3F3	≥320	–	≤0.06	≤0.11

Ferrite ring cores (toroids) TN16/9.6/6.3

RING CORES (TOROIDS)

Effective core parameters

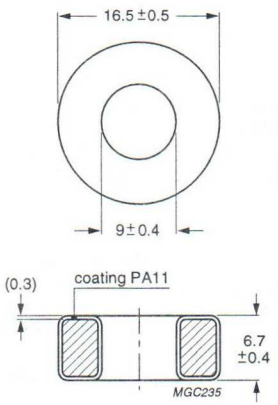
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.95	mm^{-1}
V_e	effective volume	760	mm^3
l_e	effective length	38.5	mm
A_e	effective area	19.7	mm^2
m	mass of core	≈3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	1300 ±25%	≈2000	red	TN16/9.6/6.3-3C85
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]	6430 ±30%	≈10000	purple/white	TL16/9.6/6.3-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 16.25 ±0.5 mm; Inside diameter = 9.35 ±0.4 mm; Height = 6.55 ±0.4 mm.

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
3C85	≥320	≤0.12	≤0.14	–
3F3	≥320	–	≤0.09	≤0.15

Ferrite ring cores (toroids) TN19/11/10

RING CORES (TOROIDS)

Effective core parameters

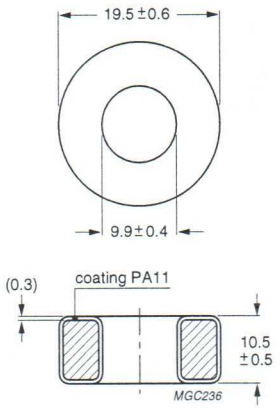
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	1795	mm^3
l_e	effective length	44.0	mm
A_e	effective area	40.8	mm^2
m	mass of core	≈9.2	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN19/11/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	2330 ±25%	≈2000	red	TN19/11/10-3C85
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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤0.28	≤0.32	–

RING CORES (TOROIDS)

Effective core parameters

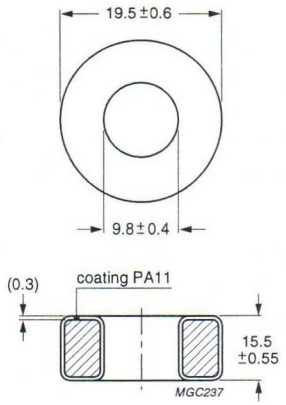
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.718	mm^{-1}
V_e	effective volume	2692	mm^3
l_e	effective length	44.0	mm
A_e	effective area	61.2	mm^2
m	mass of core	≈13.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN19/11/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	3500 ±25%	≈2000	red	TN19/11/15-3C85
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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤0.42	≤0.49	–

Ferrite ring cores (toroids) TN20/10/7

RING CORES (TOROIDS)

Effective core parameters

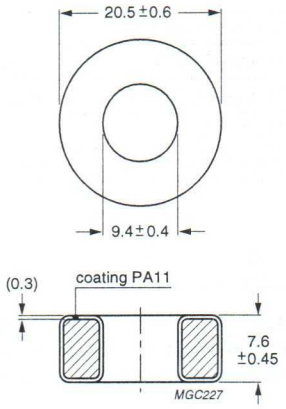
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.30	mm^{-1}
V_e	effective volume	1465	mm^3
l_e	effective length	43.6	mm
A_e	effective area	33.6	mm^2
m	mass of core	≈7.7	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN20/10/7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	121 ±25%	≈125	violet	TN20/10/7-4C65
3C85	1950 ±25%	≈2000	red	TN20/10/7-3C85
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]	9685 ±30%	≈10000	purple/white	TL20/10/7-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 20.25 ±0.6 mm; Inside diameter = 9.75 ±0.4 mm; Height = 7.25 ±0.45 mm.

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
3C85	≥320	≤0.23	≤0.27	–

Ferrite ring cores (toroids)

TX22/14/6.4 (846XT250)

RING CORES (TOROIDS)

Effective core parameters

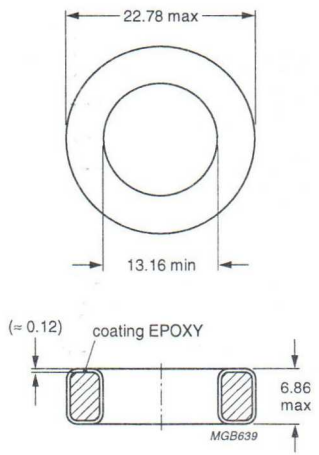
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.20	mm^{-1}
V_e	effective volume	1330	mm^3
l_e	effective length	54.2	mm
A_e	effective area	24.6	mm^2
m	mass of core	≈6.5	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX22/14/6.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	75 ±20%	≈125	violet	TX22/14/6.4-4C65
3F3	1100 ±20%	≈1800	blue	TX22/14/6.4-3F3
3C85	1220 ±20%	≈2000	red	TX22/14/6.4-3C85
3C81	1650 ±20%	≈2700	light blue	TX22/14/6.4-3C81
3E27	3055 ±20%	≈5300	green	TX22/14/6.4-3E27
3E25	3055 ±20%	≈5300	orange	TX22/14/6.4-3E25
3E6	6000 ±30%	≈10500	purple	TX22/14/6.4-3E6

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	≤0.21	–	–
3C85	≥320	≤0.21	≤0.24	–
3F3	≥320	–	≤0.15	≤0.26

Ferrite ring cores (toroids)

TX22/14/13 (846XT500)

RING CORES (TOROIDS)

Effective core parameters

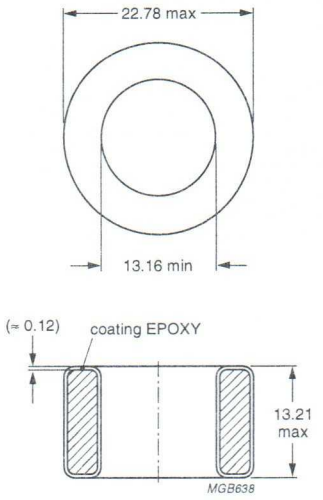
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.07	mm^{-1}
V_e	effective volume	2750	mm^3
l_e	effective length	54.2	mm
A_e	effective area	50.7	mm^2
m	mass of core	≈14	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



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	TX22/14/13-3F3
3C85	2440 ±20%	≈2000	red	TX22/14/13-3C85
3C81	3300 ±20%	≈2700	light blue	TX22/14/13-3C81
3E27	6110 ±20%	≈5000	green	TX22/14/13-3E27
3E25	6110 ±20%	≈5000	orange	TX22/14/13-3E25
3E6	12080 ±30%	≈10300	purple	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 = 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	≤0.56	–	–
3C85	≥320	≤0.43	≤0.50	–
3F3	≥320	–	≤0.30	≤0.52

Ferrite ring cores (toroids) TN23/14/7

RING CORES (TOROIDS)

Effective core parameters

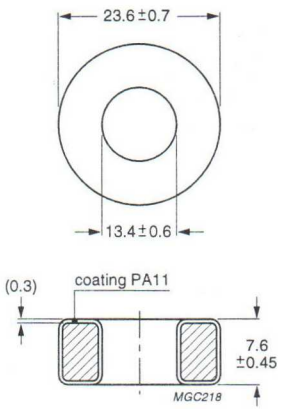
SYMBOL	PARAMETER	VALUE	UU
$\Sigma(l/A)$	core factor (C1)	1.81	mm^{-1}
V_e	effective volume	1722	mm^3
l_e	effective length	55.8	mm
A_e	effective area	30.9	mm^2
m	mass of core	≈8.4	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	1400 ±25%	≈2000	red	TN23/14/7-3C85
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 3R1 cores close to their mechanical resonant frequency. For more information see 3R1 material specification.

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
3C85	≥320	≤0.27	≤0.31	–
3F3	≥320	–	≤0.19	≤0.33

Ferrite ring cores (toroids) TN25/15/10

RING CORES (TOROIDS)

Effective core parameters

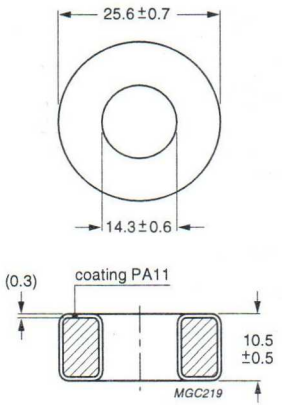
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	2944	mm^3
l_e	effective length	60.2	mm
A_e	effective area	48.9	mm^2
m	mass of core	≈15	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	2050 ±25%	≈2000	red	TN25/15/10-3C85
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)	10200 ±30%	≈10000	purple/white	TL25/15/10-3E6

Note

1. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 25.25 ±0.7 mm; Inside diameter = 14.75 ±0.6 mm; Height = 10.25 ±0.5 mm.

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
3C85	≥320	≤0.46	≤0.53	–
3F3	≥320	–	≤0.53	≤0.56

Ferrite ring cores (toroids) — TX25/15/9.5

RING CORES (TOROIDS)

Effective core parameters

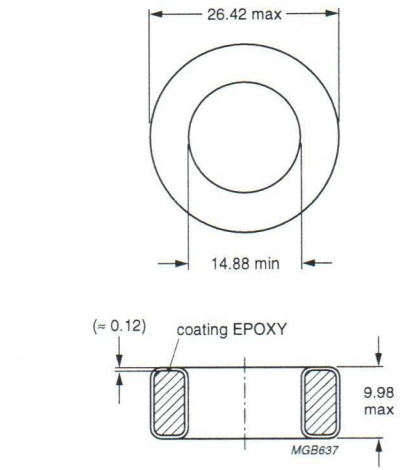
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.44	mm^{-1}
V_e	effective volume	2640	mm^3
l_e	effective length	61.7	mm
A_e	effective area	42.8	mm^2
m	mass of core	≈13	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX25/15/9.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1665 ±20%	≈1800	blue	TX25/15/9.5-3F3
3C85	1850 ±20%	≈2000	red	TX25/15/9.5-3C85
3C81	2500 ±20%	≈2700	light blue	TX25/15/9.5-3C81
3E27	4650 ±20%	≈5000	green	TX25/15/9.5-3E27
3E25	4650 ±20%	≈5000	orange	TX25/15/9.5-3E25
3E6	8730 ±30%	≈10000	purple	TX25/15/9.5-3E6

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	≤0.54	–	–
3C85	≥320	≤0.41	≤0.48	–
3F3	≥320	–	≤0.29	≤0.50

Ferrite ring cores (toroids) TN26/15/10

RING CORES (TOROIDS)

Effective core parameters

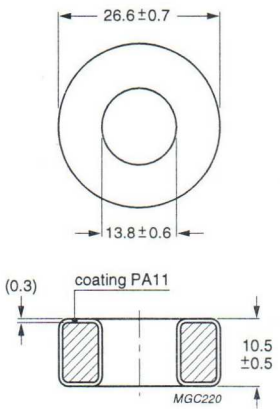
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	60.1	mm
A_e	effective area	55.9	mm^2
m	mass of core	≈17	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN26/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	2300 ±25%	≈2000	red	TN26/15/10-3C85
3C11	5000 ±25%	≈4300	white	TN26/15/10-3C11
3E25	6420 ±25%	≈5500	orange	TN26/15/10-3E25

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤0.52	≤0.60	–

RING CORES (TOROIDS)

Effective core parameters

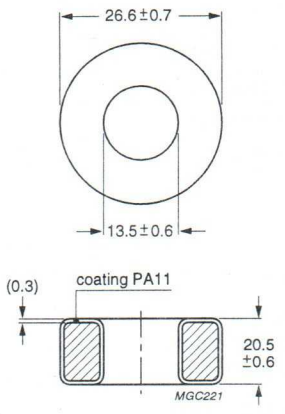
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.538	mm^{-1}
V_e	effective volume	6720	mm^3
l_e	effective length	60.1	mm
A_e	effective area	112	mm^2
m	mass of set	≈34	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN26/15/20 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	4700 ±25%	≈2000	red	TN26/15/20-3C85
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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤1.1	≤1.2	–

Ferrite ring cores (toroids) TN29/19/7.5

RING CORES

Effective core parameters

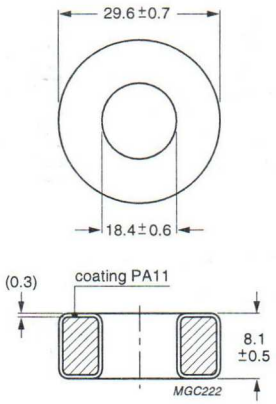
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.98	mm^{-1}
V_e	effective volume	2700	mm^3
l_e	effective length	73.2	mm
A_e	effective area	36.9	mm^2
m	mass of core	≈13.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN29/19/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	1300 ±25%	≈2000	red	TN29/19/7.5-3C85
3C11	2700 ±25%	≈4300	white	TN29/19/7.5-3C11
3E25	3550 ±25%	≈5500	orange	TN29/19/7.5-3E25

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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤0.42	≤0.49	–

Ferrite ring cores (toroids)

TX29/19/7.6 (502XT300)

RING CORES (TOROIDS)

Effective core parameters

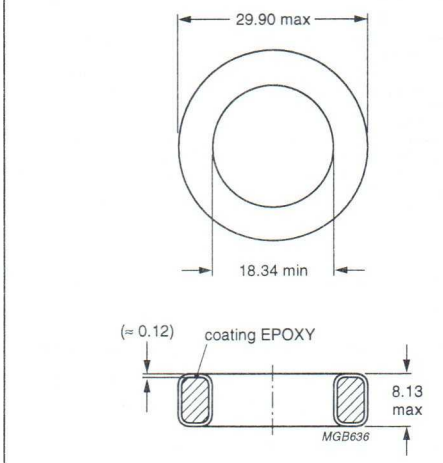
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.06	mm^{-1}
V_e	effective volume	2600	mm^3
l_e	effective length	73.2	mm
A_e	effective area	35.5	mm^2
m	mass of core	≈13	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX29/19/7.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1160 ±20%	≈1900	blue	TX29/19/7.6-3F3
3C85	1290 ±20%	≈2100	red	TX29/19/7.6-3C85
3C81	1740 ±20%	≈2800	light blue	TX29/19/7.6-3C81
3E27	3225 ±20%	≈5300	green	TX29/19/7.6-3E27
3E25	3225 ±20%	≈5300	orange	TX29/19/7.6-3E25
3E6	6340 ±30%	≈10400	purple	TX29/19/7.6-3E6

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	≤0.53	–	–
3C85	≥320	≤0.40	≤0.47	–
3F3	≥320	–	≤0.29	≤0.50

Ferrite ring cores (toroids) TN32/19/13

RING CORES (TOROIDS)

Effective core parameters

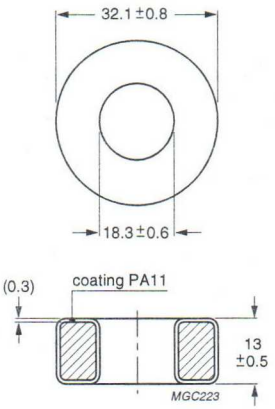
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.99	mm^{-1}
V_e	effective volume	5820	mm^3
l_e	effective length	76	mm
A_e	effective area	76.5	mm^2
m	mass of core	≈29	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN32/19/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2270 ±25%	≈1800	blue	TN32/19/13-3F3
3C85	2530 ±25%	≈2000	red	TN32/19/13-3C85
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 therefore have different dimensions: Outside diameter = 31.75 ±0.8 mm; Inside diameter = 18.75 ±0.7 mm; Height = 12.75 ±0.5 mm.

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
3C85	≥320	≤0.90	≤1.1	–
3F3	≥320	–	≤0.64	≤1.1

Ferrite ring cores (toroids) — TN36/23/10

RING CORES (TOROIDS)

Effective core parameters

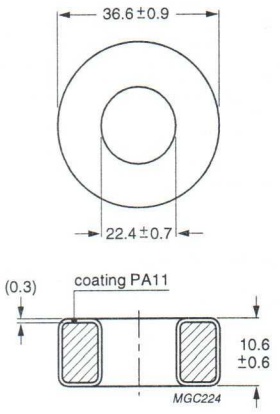
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.40	mm^{-1}
V_e	effective volume	5730	mm^3
l_e	effective length	89.6	mm
A_e	effective area	63.9	mm^2
m	mass of core	≈28	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



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
3C85	1800 ±25%	≈2000	red	TN36/23/10-3C85
3C11	3900 ±25%	≈4300	white	TN36/23/10-3C11

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
3C85	≥320	≤0.89	≤1.1	–

Ferrite ring cores (toroids)

TX36/23/10 (500XT400)

RING CORES (TOROIDS)

Effective core parameters

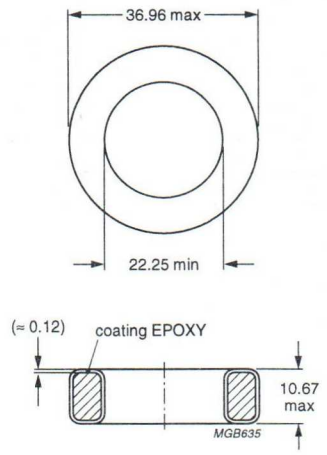
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.46	mm^{-1}
V_e	effective volume	5500	mm^3
l_e	effective length	89.7	mm
A_e	effective area	61.4	mm^2
m	mass of core	≈27	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX36/23/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1635 ±20%	≈1900	blue	TX36/23/10-3F3
3C85	1820 ±20%	≈2100	red	TX36/23/10-3C85
3C81	2455 ±20%	≈2850	light blue	TX36/23/10-3C81
3E27	4545 ±20%	≈5300	green	TX36/23/10-3E27
3E25	4545 ±20%	≈5300	orange	TX36/23/10-3E25
3E6	9090 ±30%	≈10600	purple	TX36/23/10-3E6

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	≤1.1	–	–
3C85	≥320	≤0.85	≤0.99	–
3F3	≥320	–	≤0.61	≤1.1

Ferrite ring cores (toroids)

TX36/23/15 (500XT600)

RING CORES (TOROIDS)

Effective core parameters

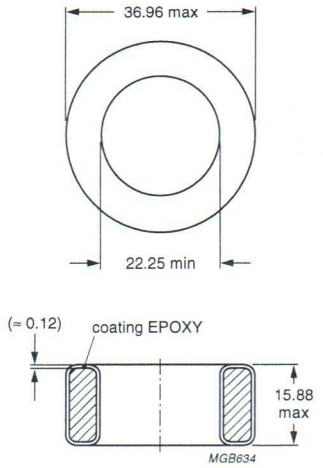
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.96	mm^{-1}
V_e	effective volume	8410	mm^3
l_e	effective length	89.7	mm
A_e	effective area	93.8	mm^2
m	mass of core	≈40	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX36/23/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2450 ±20%	≈1800	blue	TX36/23/15-3F3
3C85	2720 ±20%	≈2000	red	TX36/23/15-3C85
3C81	3670 ±20%	≈2700	light blue	TX36/23/15-3C81
3E27	6800 ±20%	≈5000	green	TX36/23/15-3E27
3E25	6800 ±20%	≈5000	orange	TX36/23/15-3E25
3E6	13600 ±30%	≈10400	purple	TX36/23/15-3E6

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	≤1.7	–	–
3C85	≥320	≤1.3	≤1.5	–
3F3	≥320	–	≤0.93	≤1.6

Ferrite ring cores (toroids) TN36/23/15

RING CORES (TOROIDS)

Effective core parameters

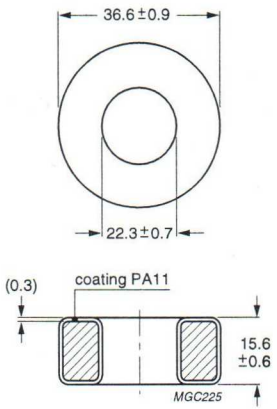
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.935	mm^{-1}
V_e	effective volume	8600	mm^3
l_e	effective length	89.6	mm
A_e	effective area	95.9	mm^2
m	mass of core	≈42	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TN36/23/15 ring core.

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	pink	TN36/23/15-4A11
3R1(2)	–	≈800	black	TN36/23/15-3R1
3F3	2420 ±25%	≈1800	blue	TN36/23/15-3F3
3C85	2700 ±25%	≈2000	red	TN36/23/15-3C85
3C11	5800 ±25%	≈4300	white	TN36/23/15-3C11
3E25	7390 ±25%	≈5500	orange	TN36/23/15-3E25
3E5(1)	11400 ±30%	≈8500	yellow/white	TL36/23/15-3E5

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and therefore have different dimensions: Outside diameter = 36.25 ±0.9 mm; Inside diameter = 22.75 ±0.7 mm; Height = 15.25 ±0.6 mm.
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 see 3R1 material specification.

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
3C85	≥320	≤1.4	≤1.6	–
3F3	≥320	–	≤0.95	≤1.7

Ferrite ring cores (toroids)

TX39/20/13 (528XT500)

RING CORES (TOROIDS)

Effective core parameters

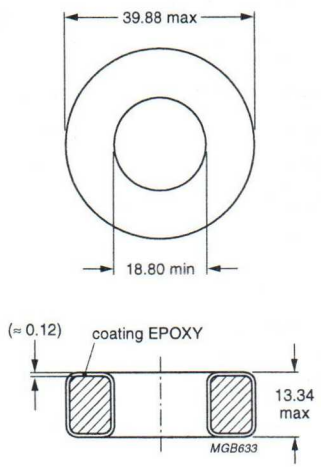
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.76	mm^{-1}
V_e	effective volume	9430	mm^3
l_e	effective length	84.9	mm
A_e	effective area	111	mm^2
m	mass of core	≈45	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX39/20/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	220 ±20%	≈125	violet	TX39/20/13-4C65
3F3	3150 ±20%	≈1800	blue	TX39/20/13-3F3
3C85	3480 ±20%	≈2000	red	TX39/20/13-3C85
3C81	4700 ±20%	≈2700	lightblue	TX39/20/13-3C81
3E27	8720 ±20%	≈5000	green	TX39/20/13-3E27
3E25	8720 ±20%	≈5000	orange	TX39/20/13-3E25
3E6	16700 ±30%	≈10200	purple	TX39/20/13-3E6

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 = 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	≤1.9	–	–
3C85	≥320	≤1.5	≤1.7	–
3F3	≥320	–	≤1.1	≤1.8

Ferrite ring cores (toroids) TL42/26/13

RING CORES (TOROIDS)

Effective core parameters

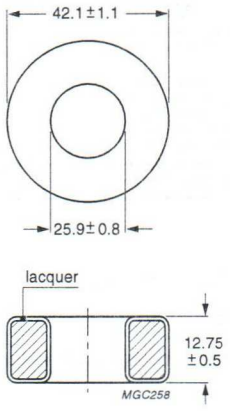
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.076	mm^{-1}
V_e	effective volume	9860	mm^3
l_e	effective length	103	mm
A_e	effective area	95.8	mm^2
m	mass of core	≈53	g

Coating

The cores are coated with polyurethane lacquer.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TL42/26/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	2335 ±25%	≈2000	red/white	TL42/26/13-3C85
3C11	5000 ±25%	≈4300	white	TL42/26/13-3C11
3E25	6425 ±25%	≈5500	orange/white	TL42/26/13-3E25
4A11	810 ±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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤1.5	≤1.8	–

Ferrite ring cores (toroids)

TX51/32/19 (400XT750)

RING CORES (TOROIDS)

Effective core parameters

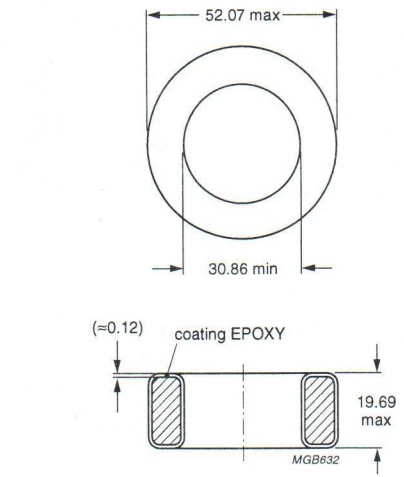
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.73	mm^{-1}
V_e	effective volume	21500	mm^3
l_e	effective length	125	mm
A_e	effective area	172	mm^2
m	mass of core	≈100	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



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	TX51/32/19-3F3
3C85	3555 ±20%	≈2000	red	TX51/32/19-3C85
3C81	4800 ±20%	≈2700	light blue	TX51/32/19-3C81
3E27	8890 ±20%	≈5000	green	TX51/32/19-3E27
3E6	17300 ±30%	≈10000	purple	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	–	–
3C85	≥320	≤3.4	≤3.9	–
3F3	≥320	–	≤2.4	≤4.1

Ferrite ring cores (toroids) TL58/41/18

RING CORES (TOROIDS)

Effective core parameters

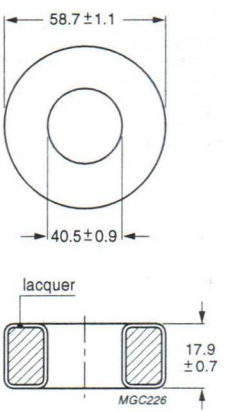
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.0	mm^{-1}
V_e	effective volume	23200	mm^3
l_e	effective length	152.4	mm
A_e	effective area	152.4	mm^2
m	mass of core	≈110	g

Coating

The cores are coated with polyurethane lacquer.

Isolation voltage: 2000 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TL58/41/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C85	2575 ±25%	≈1800	red/white	TL58/41/18-3C85
3C11	5400 ±25%	≈2000	white	TL58/41/18-3C11
3E25	6900 ±25%	≈4300	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	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C85	≥320	≤3.6	≤4.2	–

Ferrite ring cores (toroids) TX61/36/13

RING CORES (TOROIDS)

Effective core parameters

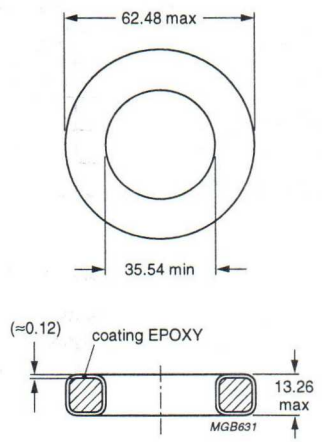
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.95	mm^{-1}
V_e	effective volume	21900	mm^3
l_e	effective length	145	mm
A_e	effective area	152	mm^2
m	mass of core	≈100	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX61/36/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2430 ±20%	≈1800	blue	TX61/36/13-3F3
3C85	2700 ±20%	≈2000	red	TX61/36/13-3C85
3C81	3650 ±20%	≈2700	light blue	TX61/36/13-3C81
3E6	13690 ±30%	≈10400	purple	TX61/36/13-3E6

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 = 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	≤4.5	–	–
3C85	≥320	≤3.4	≤4.0	–
3F3	≥320	–	≤2.4	≤4.2

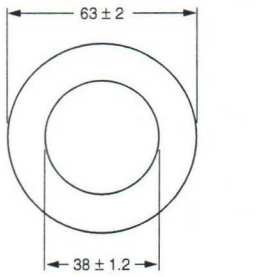
Ferrite ring cores (toroids) T63/38/25

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

Coated cores are available on request.



Dimensions in mm.

Fig.1 T63/38/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25	15165 ±25%	≈5500	T63/38/25-3E25

Ferrite ring cores (toroids)

TX74/39/13 (144XT500)

RING CORES (TOROIDS)

Effective core parameters

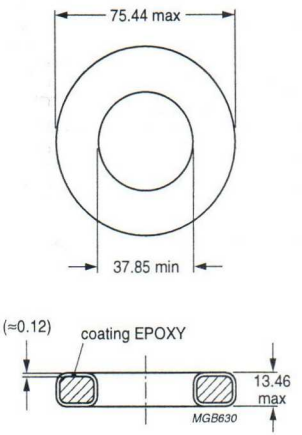
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.80	mm^{-1}
V_e	effective volume	34300	mm^3
l_e	effective length	165	mm
A_e	effective area	208	mm^2
m	mass of core	≈170	g

Coating

The cores are coated with epoxy.

Isolation voltage: 1000 V_{DC}.

Non-coated cores are available on request.



Dimensions in mm.

Fig.1 TX74/39/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	200 ±20%	≈125	violet	TX74/39/13-4C65
3F3	2900 ±20%	≈2000	blue	TX74/39/13-3F3
3C85	3220 ±20%	≈2700	red	TX74/39/13-3C85
3C81	4350 ±20%	≈5000	light blue	TX74/39/13-3C81
3E27	8060 ±20%	≈5000	green	TX74/39/13-3E27
3E6	16280 ±30%	≈10300	purple	TX74/39/13-3E6

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 = 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	–	–
3C85	≥320	≤5.3	≤6.2	–
3F3	≥320	–	≤3.8	≤6.5

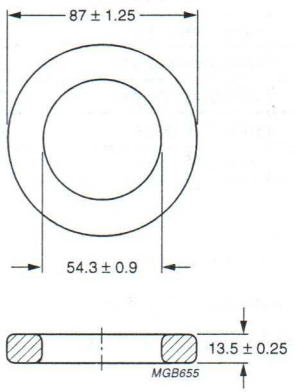
Ferrite ring cores (toroids) T87/54/14

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

Coated cores are available on request.



Dimensions in mm.

Fig.1 T87/54/14 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	5470 ±25%	≈4300	T87/54/14-3C11

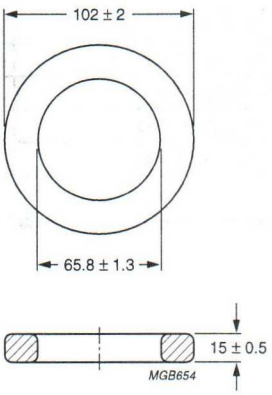
Ferrite ring cores (toroids) T102/66/15

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

Coated cores are available on request.



Dimensions in mm.

Fig.1 T102/66/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	5300 ±25%	≈4300	T102/66/15-3C11
3E25	7900 ±25%	≈5500	T102/66/15-3E25

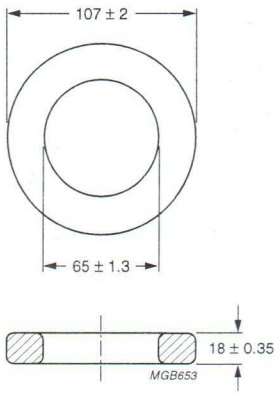
Ferrite ring cores (toroids) T107/65/18

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.700	mm^{-1}
V_e	effective volume	96200	mm^3
l_e	effective length	259	mm
A_e	effective area	370	mm^2
m	mass of core	≈456	g

Coated cores are available on request.



Dimensions in mm.

Fig.1 T107/65/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3F4	1354 ±25%	≈750	T107/65/18-3F4

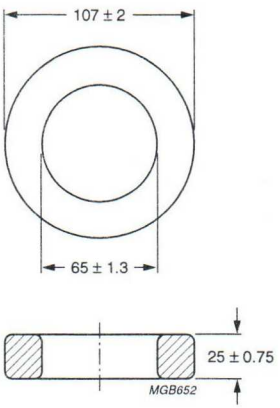
Ferrite ring cores (toroids) T107/65/25

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

Coated cores are available on request.



Dimensions in mm.

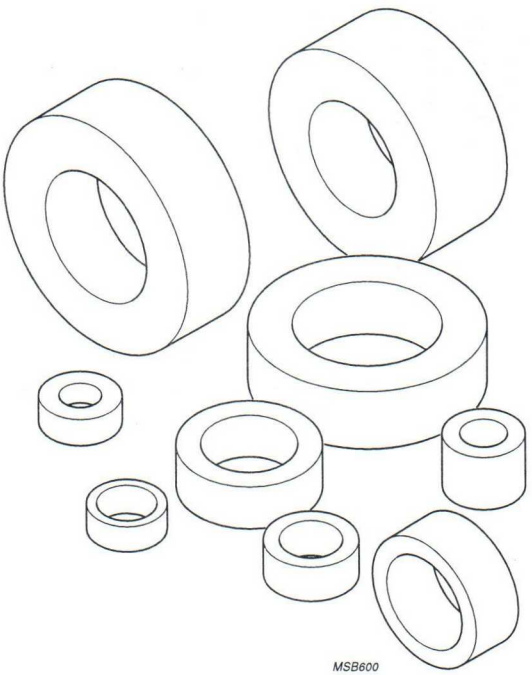
Fig.1 T107/65/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3F4	1870 ±25%	≈750	T107/65/25-3F4
3F3	4485 ±25%	≈1800	T107/65/25-3F3

Soft Ferrites

Iron powder Ring cores (Toroids)



PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Iron powder Ring cores

Core type	V_e (mm^3)	V_e (mm^3)	mass (g)
TN7.5/4.1/3	83.0	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	1900	32.8	13
TN27/15/11	3720	60.4	25
TN33/20/11	5200	65.0	35

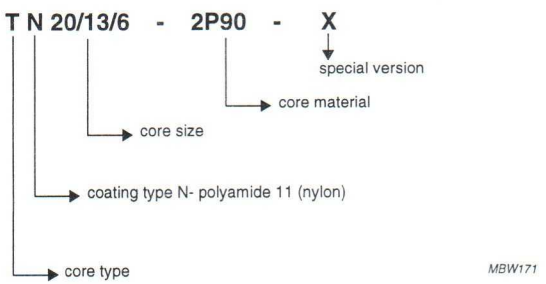


Fig.1 Type number structure for coil formers.

Iron powder ring cores (toroids) TN7.5/4.1/3

RING CORES (TOROIDS)

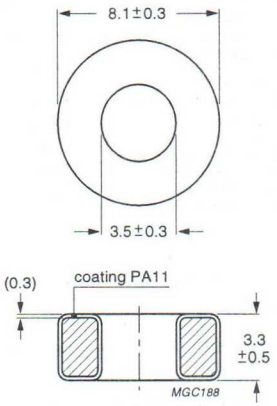
Effective core parameters

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.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



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	14 ±10%	≈40	dark yellow	TN7.5/4.1/3-2P40
2P50	18 ±10%	≈50	dark blue	TN7.5/4.1/3-2P50
2P65	23 ±10%	≈65	dark red	TN7.5/4.1/3-2P65
2P80	28 ±10%	≈80	dark green	TN7.5/4.1/3-2P80
2P90	30 ±10%	≈90	dark brown	TN7.5/4.1/3-2P90

Iron powder ring cores (toroids)

TN12/8/4.4

RING CORES (TOROIDS)

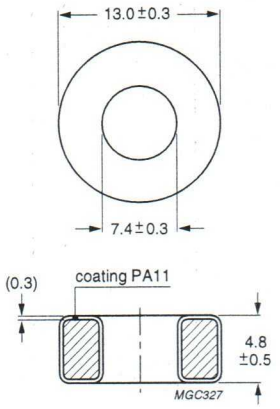
Effective core parameters

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.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



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	15 ±10%	≈40	dark yellow	TN12/8/4.4-2P40
2P50	19 ±10%	≈50	dark blue	TN12/8/4.4-2P50
2P65	25 ±10%	≈65	dark red	TN12/8/4.4-2P65
2P80	31 ±10%	≈80	dark green	TN12/8/4.4-2P80
2P90	33 ±10%	≈90	dark brown	TN12/8/4.4-2P90

Iron powder ring cores (toroids) TN17/9.8/4.4

RING CORES (TOROIDS)

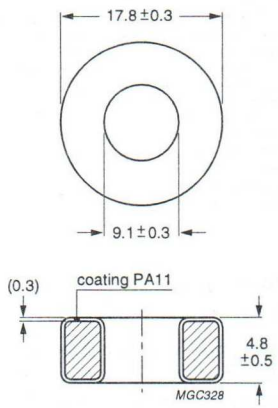
Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.55	mm^{-1}
V_e	effective volume	635	mm^3
l_e	effective length	40.2	mm
A_e	effective area	15.8	mm^2
m	mass of core	≈5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



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	20 ±10%	≈40	dark yellow	TN17/9.8/4.4-2P40
2P50	25 ±10%	≈50	dark blue	TN17/9.8/4.4-2P50
2P65	32 ±10%	≈65	dark red	TN17/9.8/4.4-2P65
2P80	40 ±10%	≈80	dark green	TN17/9.8/4.4-2P80
2P90	42 ±10%	≈90	dark brown	TN17/9.8/4.4-2P90

Iron powder ring cores (toroids) TN20/13/6

RING CORES (TOROIDS)

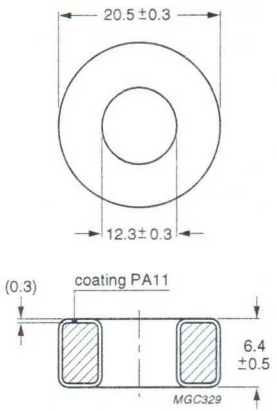
Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.44	mm^{-1}
V_e	effective volume	1020	mm^3
l_e	effective length	49.9	mm
A_e	effective area	20.4	mm^2
m	mass of core	≈7.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN20/13/6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40	21 ±10%	≈40	dark yellow	TN20/13/6-2P40
2P50	26 ±10%	≈50	dark blue	TN20/13/6-2P50
2P65	34 ±10%	≈65	dark red	TN20/13/6-2P65
2P80	41 ±10%	≈80	dark green	TN20/13/6-2P80
2P90	44 ±10%	≈90	dark brown	TN20/13/6-2P90

Iron powder ring cores (toroids) TN24/15/7.5

RING CORES (TOROIDS)

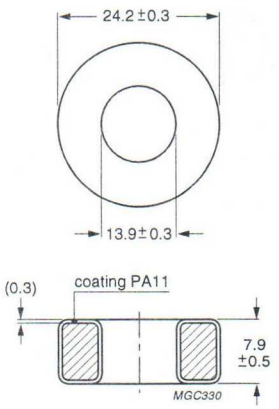
Effective core parameters

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.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



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	29 ±10%	≈40	dark yellow	TN24/15/7.5-2P40
2P50	36 ±10%	≈50	dark blue	TN24/15/7.5-2P50
2P65	47 ±10%	≈65	dark red	TN24/15/7.5-2P65
2P80	57 ±10%	≈80	dark green	TN24/15/7.5-2P80
2P90	61 ±10%	≈90	dark brown	TN24/15/7.5-2P90

Iron powder ring cores (toroids) TN 27/15/11

RING CORES (TOROIDS)

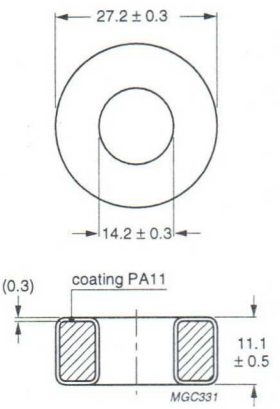
Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	3720	mm^3
l_e	effective length	61.6	mm
A_e	effective area	60.4	mm^2
m	mass of core	≈25	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN27/15/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40	49 ±10%	≈40	dark yellow	TN27/15/11-2P40
2P50	62 ±10%	≈50	dark blue	TN27/15/11-2P50
2P65	80 ±10%	≈65	dark red	TN27/15/11-2P65
2P80	94 ±10%	≈80	dark green	TN27/15/11-2P80
2P90	105 ±10%	≈90	dark brown	TN27/15/11-2P90(1)

Note

1. This type has slightly different dimensions:
   Outside diameter = 27.3 ±0.35 mm; Inside diameter = 14.0 ±0.3 mm; Height = 11.2 ±0.55 mm.

Iron powder ring cores (toroids) TN33/20/11

RING CORES

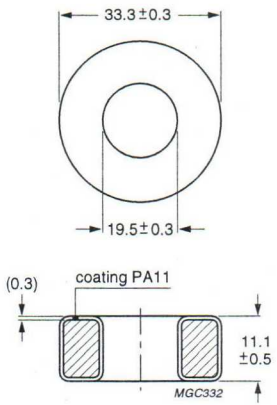
Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	5200	mm^3
l_e	effective length	80.0	mm
A_e	effective area	65.0	mm^2
m	mass of core	≈35	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with UL 94V-2.

Isolation voltage: 1500 V. This is measured with a DC voltage. Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN33/20/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40	41 ±10%	≈40	dark yellow	TN33/20/11-2P40
2P50	51 ±10%	≈50	dark blue	TN33/20/11-2P50
2P65	67 ±10%	≈65	dark red	TN33/20/11-2P65
2P80	82 ±10%	≈80	dark green	TN33/20/11-2P80
2P90	87 ±10%	≈90	dark brown	TN33/20/11-2P90

Conversion list
Typenumber to 11NC

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
ADJ-P14-BROWN	43220213971
ADJ-P14-GREY	43220213979
ADJ-P14-ORANGE	43220213973
ADJ-P14-WHITE	43220213978
ADJ-P18-BLACK	43220213960
ADJ-P18-BROWN	43220213961
ADJ-P18-RED	43220213962
ADJ-P18-VIOLET	43220213967
ADJ-P18-WHITE	43220213968
ADJ-P18-YELLOW	43220213964
ADJ-P22/RM8-BLACK	43220213840
ADJ-P22/RM8-BROWN	43220213841
ADJ-P22/RM8-ORANGE	43220213843
ADJ-P22/RM8-RED	43220213842
ADJ-P22/RM8-WHITE	43220213848
ADJ-P22/RM8-YELLOW	43220213844
ADJ-P26-BROWN	43220213941
ADJ-P26-GREY	43220213949
ADJ-P26-RED	43220213942
ADJ-P26-WHITE	43220213948
ADJ-P30/RM10-GREY	43220213839
ADJ-P30/RM10-YELLOW	43220213834
ADJ-P36/P42-GREY	43220213929
ADJ-P36/P42-WHITE	43220213928
ADJ-P9/P11-BROWN	43220213981
ADJ-P9/P11-GREY	43220213989
ADJ-P9/P11-YELLOW	43220213984
ADJ-RM4/RM5-BLACK	43220213870
ADJ-RM4/RM5-BROWN	43220213871
ADJ-RM4/RM5-GREY	43220213879
ADJ-RM4/RM5-RED	43220213872
ADJ-RM6-BLACK	43220213860
ADJ-RM6-BROWN	43220213861
ADJ-RM6-GREEN	43220213865
ADJ-RM6-GREY	43220213869
ADJ-RM6-RED	43220213862
ADJ-RM6-VIOLET	43220213867
ADJ-RM6-WHITE	43220213868
BC13/4.8/16-3C80	43300303894
BC22/12/14-3C80	43300303648
BC23/12/14-3C80	43300303656
BC22/12/19-3C80	43300303619
BC22/12/18-3C80	43300303647
BC22/12/38-3C80	43300303634
BDS3/1.8/5.3-3S1	43300303685
BDS3/1.8/5.3-4S2	43300303682
BDS3/3/4.6-3S1	43300303642
BDS3/3/4.6-4S2	43300303629

TYPE NUMBER	11 NC
BDS3/3/8.9-3S1	43300303645
BDS3/3/8.9-4S2	43300303630
BDS4.6/3/8.9-4S2	43300303652
BDW3.5/3.3-4S2	43300303881
BDW3.5/4.7-4S2	43300303873
BDW3.5/6.7-4S2	43300303875
BDW3.5/6-4S2	43300303874
BDW3.5/7.6-4S2	43300303876
BDW3.5/8.9-4S2	43300303877
BDW5.1/10-3S1	43300303333
BD3/0.7/10-3S1	43300303211
BD3/0.7/10-4S2	43300303324
BD3/0.7/4-3S1	43300303210
BD3/0.7/4-4S2	43300303311
BD3/1/10-3S1	43300303213
BD3/1/10-4S2	43300303321
BD3/1/4-3S1	43300303212
BD3/1/4-4S2	43300303312
BD5.1/0.8/10-3S1	43300303215
BD5.1/0.8/10-4S2	43300303326
BD5.1/0.8/4-3S1	43300303214
BD5.1/0.8/4-4S2	43300303313
BD5.1/1.5/10-3S1	43300303217
BD5.1/1.5/10-4S2	43300303322
BD5.1/1.5/4-3S1	43300303216
BD5.1/1.5/4-4S2	43300303314
BD5.1/2/10-3S1	43300303219
BD5.1/2/10-4S2	43300303319
BD5.1/2/4-3S1	43300303218
BD5.1/2/4-4S2	43300303315
BD8/1.5/10-4S2	43300303325
BD8/1.5/4-4S2	43300303316
BD8/2/10-4S2	43300303323
BD8/2/4-4S2	43300303317
BD8/3/10-4S2	43300303320
BD8/3/4-4S2	43300303318
BPL2-EC35	43350002717
BPL4-EC35	43350002718
BPL4-EC41	43350002720
BPL4-EC52	43350002722
BPL4-EC70	43350002724
CLA-EC35	43120212601
CLA-EC41	43120212602
CLA-EC41-ST	43120212603
CLA-EC52	43120212604
CLA-EC52-ST	43120212605
CLA-EC70	43120212606
CLA-EC70-ST	43120212607

TYPE NUMBER	11 NC
CLA-E20/10/5	43220212016
CLA-E25/13/7	43120212612
CLA-E30/15/7	43220212017
CLA-E42/21/15	43220210093
CLA-E55/28/21	43120212609
CLA-E65/32/27	43120212611
CLA-EP7	4335000
CLA-EP10	43220210148
CLA-EP13	43220213505
CLA-EP17	43220210144
CLA-EP20	43220210146
CLI-EFD10	43220210090
CLI-EFD12	43220210091
CLI-EFD15	43220213514
CLI-EFD20	43220213515
CLI-EFD25	43220213516
CLI-EFD30	43220213517
CLI-EP7	43220210077
CLI-EP10	43220210078
CLI-EP13	43220210076
CLI-ER11	43220210153
CLI-ER9.5	43220210152
CLI-ETD29	43220213437
CLI-ETD34	43220213389
CLI-ETD39	43220213390
CLI-ETD44	43220213391
CLI-ETD49	43220213392
CLI-E25/13/7	43220210040
CLI/P-RM10/I	43220213432
CLI/P-RM12/I	43220213491
CLI/P-RM14/I	43220213492
CLI/P-RM4/5/I	43220213429
CLI/P-RM4/5	43220213190
CLI/P-RM6	43220213178
CLI/P-RM6/I	43220213430
CLI/P-RM7	43130210395
CLI/P-RM8	43220213184
CLI/P-RM8/I	43220213431
CLM-E25/10/6	4335000
CLM/TP-P9/5	43350002613
CLM/TP-P11/7	43350002614
CLM/TP-P14/8	43350002615
CLM/TP-P18/11	43350002617
CLM/TS-P22/13	43350002619
CLM/TP-P26/16	43350002633
CLM/TS-P30/19	43350002634
CLM/U-EC35	43350002716
CLM/U-EC41	43350002719

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
CLM/U-EC52	43350002721
CLM/U-EC70	43350002723
CMS2-5.6/3/4.8-4S2	43300303688
CMS4-11/3/4.8-4S2	43300303691
CON-P11/7	43220213051
CON-P14/8	43220213052
CON-P18/11	43220213053
CON-P22/13	43220213054
CON-P26/16	43220213055
CON-P30/19	43220213056
CON-P36/22	43220213057
CON-P42/29	43220213058
CON-X22	43220213004
CON-X30/A	43220213117
CON-X30/B	43220213362
CON-X35/A	43220213118
CON-X35/B	43220213363
COV-X22	43220213023
COV-X30	43220213115
COV-X35	43220213116
CP-EC35-1S	43350002734
CP-EC41-1S	43350002735
CP-EC52-1S	43350002736
CP-EC70-1S	43350002737
CP-E13/6/6-1S	43350002693
CP-E19/8/5-1S	43350002694
CP-E19/8/9-1S	43350002695
CP-E25/10/6-1S	43350002696
CP-E30/15/7-1S-A	43350002697
CP-E30/15/7-1S-E	43120212855
CP-E34/14/9-1S	43350002698
CP-E41/16/12-1S	43350002699
CP-E42/21/15-1S-A	43350002700
CP-E42/21/15-1S-E	43120212862
CP-E42/21/20-1S	43350002701
CP-E47/20/16-1S	43350002702
CP-E55/28/21-1S-A	43350002703
CP-E55/28/21-1S-E	43120212871
CP-E56/24/19-1S	43350002704
CP-E65/32/27-1S-E	43120212872
CP-PH5.6/3.6-1S	43220213354
CP-PH7.4/3.9-1S	43220213299
CP-PH9.4/4.8-1S	43220213170
CP-PH14/7.5-1S	43220213025
CP-PH26/9.2-1S	43220213370
CP-PQ20/16-1S-14P	43350002671
CP-PQ20/16-1S-14PD	43350002672
CP-PQ20/20-1S-14P	43350002673
CP-PQ20/20-1S-14PD	43350002674
CP-PQ26/20-1S-12P	43350002675
CP-PQ26/20-1S-12PD	43350002676
CP-PQ26/25-1S-12P	43350002677
CP-PQ26/25-1S-12PD	43350002678
CP-PQ32/20-1S-12P	43350002679
CP-PQ32/20-1S-12PD	43350002680
CP-PQ32/30-1S-12P	43350002681
CP-PQ32/30-1S-12PD	43350002682
CP-P11/7-1S-E	43220213024
CP-P11/7-1S-A	43350002601
CP-P11/7-2S-A	43350002602
CP-P11/7-3S-A	43350002603
CP-P14/8-1S-E	43220213025
CP-P14/8-1S-A	43350002604
CP-P14/8-2S-E	43220213026
CP-P14/8-2S-A	43350002605
CP-P14/8-3S-A	43350002606
CP-P18/11-1S-E	43220213027
CP-P18/11-1S-A	43350002607
CP-P18/11-2S-E	43220213028
CP-P18/11-3S-E	43220213029
CP-P18/11-2S-A	43350002608
CP-P18/11-3S-A	43350002609
CP-P22/13-1S-A	43350002610
CP-P22/13-1S-E	43220213030
CP-P22/13-2S-A	43350002611
CP-P22/13-2S-E	43220213031
CP-P22/13-3S-E	43220213032
CP-P22/13-3S-A	43350002612
CP-P26/16-1S-A	43350002620
CP-P26/16-2S-A	43350002621
CP-P26/16-3S-A	43350002622
CP-P26/16-1S-E	43220213033
CP-P26/16-2S-E	43220213034
CP-P26/16-3S-E	43220213035
CP-P30/19-1S-A	43350002623
CP-P30/19-2S-A	43350002624
CP-P30/19-3S-A	43350002625
CP-P30/19-1S-E	43220213036
CP-P30/19-2S-E	43220213037
CP-P30/19-3S-E	43220213038
CP-P36/22-1S-A	43350002626
CP-P36/22-2S-A	43350002627
CP-P36/22-3S-A	43350002628
CP-P36/22-1S-E	43220213039
CP-P36/22-2S-E	43220213040
CP-P36/22-3S-E	43220213041
CP-P42/29-1S-A	43350002629
CP-P42/29-2S-A	43350002630
CP-P42/29-1S-E	43220213042
CP-P42/29-2S-E	43220213043
CP-P66/56-1S	43220213132 43350002631
CP-P7/4-1S-E	43220213299
CP-P7/4-1S-A	43350002599
CP-P9/5-1S-A	43350002600
CP-P9/5-1S-E	43220213170
CPH-EC35-1S-13P	43220213331
CPH-EC41-1S-12P	43220213348
CPH-EC41-1S-9P	43220213332
CPH-EC52-1S-11P	43220213333
CPH-EC52-1S-14P	43220213350
CPH-EC70-1S-15P	43220213334
CPH-EFD15-1S-8P	43220210025
CPH-EFD20-1S-10P	43220210026
CPH-ETD29-1S-13P	43220213438
CPH-ETD34-1S-14P	43220213385
CPH-ETD39-1S-16P	43220213386
CPH-ETD44-1S-18P	43220213387
CPH-ETD49-1S-20P	43220213388
CPH-E13/7/4-1S-6P	43120212620
CPH-E16/8/5-1S-6P	43120212623
CPH-E19/8/5-1S-8P	43350002705
CPH-E20/10/6-1S-8P	43120212621
CPH-E25/10/6-1S-10P	43350002707
CPH-E25/13/7-1S-10P	43120210039
CPH-E32/16/9-1S-12P	43120212622
CPH-E34/14/9-1S-12P	43350002709
CPH-E41/17/12-1S-12P	43350002710
CPH-E42/15-1S-10P-A	43350002711
CPH-E42/15-1S-10P-E	43220213183
CPH-E42/20-1S-12PD	43350002712
CPH-E47/20/16-1S-12P	43350002713
CPH-E55/28/21-1S-14P	43350002714
CPH-E56/24/19-1S-12P	43350002715
CPH-U10//8/3-1S-4P	31221340259
CPH-U15/11/6-1S-4P	43220213507
CPH-U15/11/6-2S-4P	43220213508
CPH-U20/16/7-1S-4P	31221376414
CPH-U25/20/13-1S-10P	31221376191
CPH-U30/25/16-1S-9P	31221375536
CPHS-EFD10-1S-8P	43220210056
CPHS-EFD12-1S-8P	43220210057
CPHS-EFD15-1S-8P	43220210004
CPHS-EFD20-1S-10P	43220210007

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
CPHS-E5.3/2-1S-6P	43220210136
CPHS-E6.3/2-1S-6P	43220210134
CPV-EC41-1S-9P	43220213335
CPV-EC52-1S-11P	43220213336
CPV-EC70-1S-15P	43220213337
CPV-P14/8-1S-4SPD	43350002635
CPV-P14/8-1S-4SPDL	43350002636
CPV-P14/8-1S-6PD	43350002637
CPV-P14/8-1S-6PDL	43350002638
CPV-P14/8-2S-4SPD	43350002639
CPV-P14/8-2S-4SPDL	43350002640
CPV-P14/8-2S-6PD	43350002641
CPV-P14/8-2S-6PDL	43350002642
CPV-P18/11-1S-6PD	43350002643
CPV-P18/11-1S-6PDL	43350002644
CPV-P18/11-2S-6PD	43350002645
CPV-P18/11-2S-6PDL	43350002646
CPV-P18/11-3S-6PD	43350002647
CPV-P18/11-3S-6PDL	43350002648
CPV-P22/13-1S-6PD	43350002652
CPV-P22/13-1S-6PDL	43350002653
CPV-P22/13-2S-6PD	43350002654
CPV-P22/13-2S-6PDL	43350002655
CPV-P22/13-3S-6PD	43350002656
CPV-P22/13-3S-6PDL	43350002657
CPV-P26/16-1S-6PD	43350002658
CPV-P26/16-1S-6PDL	43350002659
CPV-P26/16-2S-6PD	43350002660
CPV-P26/16-2S-6PDL	43350002661
CPV-P26/16-3S-6PD	43350002662
CPV-P26/16-3S-6PDL	43350002663
CPV-P30/19-1S-6PD	43350002664
CPV-P30/19-1S-6PDL	43350002665
CPV-PT14/8-1S-6P	43350002667
CPV-PT23/11-1S-10P	43350002668
CPV-PT23/18-1S-10P	43350002669
CPV-PT30/19-1S-10P	43350002670
CPV-RM10/I-1S-12PD	43220213406
CPV-RM12/I-1S-12PD	43220213411
CPV-RM14/I-1S-12PD	43220213407
CPV-RM6S/I-1S-8PD	43220213404
CPV-RM8/I-1S-12PD	43220213405
CPVS-ER11-1S-10P	43220210150
CPVS-ER9.5-1S-8P	43220210149
CPVS-RM4-1S-6P	43220210054
CPVS-RM5-1S-8P	43220210013
CPVS-RM5/ILP-1S-8P	43220210089
CSCI-ETD34-1S-7P	43220213423
CSCO-ETD34-1S-7P	43220213424
CSH-EC35-1S-11P	43220213341
CSH-EFD15-1S-8P	43220213520
CSH-EFD20-1S-8P	43220213522
CSH-EFD25-1S-10P	43220213524
CSH-EFD30-1S-12P	43220213525
CSH-EP7-1S-6P	43220210044
CSH-EP7-2S-6P	43220210045
CSH-EP10-1S-8P	43220210046
CSH-EP10-2S-8P	43220210047
CSH-EP13-1S-10P	43220213503
CSH-EP13-2S-10P	43220213506
CSH-EP17-1S-8P	43220210048
CSH-EP17-2S-8P	43220210049
CSH-EP20-1S-10P	43220210141
CSH-EP20-2S-10P	43220210142
CSH-E20/10/5-1S-8P	43220212024
CSH-E30/7-1S-10P-A	43350002708
CSH-E30/7-1S-10P-E	43220212025
CSF38/12/25-3S4	43300303699
CSF38/12/25-3S4-S	43300303698
CST7.8/5.3/9.8-3S4	43300304363
CST8.3/3.5/10-3S4	43300303692
CST9.5/5.1/15-3S4	43300304358
CST17/9.5/13-3S4	43300304357
CST17/9.5/29-3S4	43300304356
CST19/11/12-3S4	43300304569
CSU76/6.4/13-3S4	43300303695
CSU76/6.4/15-3S4	43300303696
CSU76/6.4/29-3S4	43300303697
CSV-RM10-1S-10P	43220213474
CSV-RM10-1S-11P	43220213475
CSV-RM10-1S-12P	43220213247
CSV-RM10-1S-12P	43220213476
CSV-RM10-1S-5P	43220213244
CSV-RM10-1S-5P	43220213472
CSV-RM10-1S-8P	43220213245
CSV-RM10-1S-8P	43220213473
CSV-RM10-2S-10P	43220213479
CSV-RM10-2S-11P	43220213480
CSV-RM10-2S-12P	43220213279
CSV-RM10-2S-12P	43220213481
CSV-RM10-2S-5P	43220213477
CSV-RM10-2S-8P	43220213246
CSV-RM10-2S-8P	43220213478
CSV-RM4-1S-6P	43120212934
CSV-RM4-1S-6P	43220210036
CSV-RM4-1S-6P	43220210097
CSV-RM4-1S-6P	43220213221
CSV-RM4-1S-6P	43220213442
CSV-RM5-1S-4P	43220213445
CSV-RM5-1S-5P	43220213446
CSV-RM5-1S-6P	43120212932
CSV-RM5-1S-6P	43220213447
CSV-RM5-2S-4P	43220213448
CSV-RM5-2S-5P	43220213449
CSV-RM5-2S-6P	43220213450
CSV-RM6R-1S-5P	43220213453
CSV-RM6R-1S-6P	43220210096
CSV-RM6R-1S-6P	43220213454
CSV-RM6R-2S-5P	43220213455
CSV-RM6R-2S-6P	43220213231
CSV-RM6R-2S-6P	43220213456
CSV-RM6S-1S-5P	43220213457
CSV-RM6S-1S-6P	43120212925
CSV-RM6S-1S-6P	43220210037
CSV-RM6S-1S-6P	43220210099
CSV-RM6S-1S-6P	43220213458
CSV-RM6S-2S-5P	43220213459
CSV-RM6S-2S-6P	43220213295
CSV-RM6S-2S-6P	43220213460
CSV-RM6S/R-1S-4P	43220213451
CSV-RM6S/R-2S-4P	43220213452
CSV-RM7/I-1S-4P	43220213461
CSV-RM7/I-1S-5P	43220213462
CSV-RM7/I-1S-8P	43220213463
CSV-RM7/I-2S-5P	43220213464
CSV-RM7/I-2S-8P	43220213465
CSV-RM8-1S-12P	43220213239
CSV-RM8-1S-12P	43220213468
CSV-RM8-1S-4P	43220213236
CSV-RM8-1S-4P	43220213486
CSV-RM8-1S-5P	43220213466
CSV-RM8-1S-8P	43120212930
CSV-RM8-1S-8P	43220213263
CSV-RM8-1S-8P	43220213467
CSV-RM8-2S-12P	43220213471
CSV-RM8-2S-5P	43220213469
CSV-RM8-2S-8P	43120212931
CSV-RM8-2S-8P	43220213242
CSV-RM8-2S-8P	43220213470
CSV-X22-1S-8P	43120212883
CSV-X22-1S-8P	43220213287
CSV-X30-1S-12P	43120212881
CSV-X30-1S-12P	43220213342
CSV-X35-1S-16P	43220213343

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
CUP15/13-4B1	43300303661
ECLI-ETD34	43220213394
ECLI-ETD39	43220213395
ECLI-ETD44	43220213396
ECLI-ETD49	43220213397
EC35-3C80	43220205250 43350001580
EC35-3C81	43350001586
EC35-3C81-E100	43350001587
EC35-3C81-E160	43350001588
EC35-3C81-A250	43350001589
EC35-3C81-A315	43350001590
EC35-3C81-A400	43350001591
EC35-3C85	43350001592
EC35-3C85-E100	43350001593
EC35-3C85-E160	43350001594
EC35-3C85-A250	43350001595
EC35-3C85-A315	43350001596
EC35-3C85-A400	43350001597
EC41-3C80	43220205251 43350001610
EC41-3C81	43350001616
EC41-3C81-E100	43350001617
EC41-3C81-E160	43350001618
EC41-3C81-E250	43350001619
EC41-3C81-A315	43350001620
EC41-3C81-A400	43350001621
EC41-3C85	43350001622
EC41-3C85-E100	43350001623
EC41-3C85-E160	43350001624
EC41-3C85-E250	43350001625
EC41-3C85-A315	43350001626
EC41-3C85-A400	43350001627
EC52-3C80	43220205252 43350001640
EC52-3C81	433500016
EC52-3C81-E160	433500016
EC52-3C81-E250	433500016
EC52-3C81-E315	433500016
EC52-3C81-A400	433500016
EC52-3C81-A630	433500016
EC52-3C85	433500016
EC52-3C85-E160	433500016
EC52-3C85-E250	433500016
EC52-3C85-E315	433500016
EC52-3C85-A400	433500016
EC52-3C85-A630	433500016
EC70-3C80	43220205253 43350001670

TYPE NUMBER	11 NC
EC70-3C81	43350001676
EC70-3C81-E250	43350001677
EC70-3C81-E315	43350001678
EC70-3C81-E400	43350001679
EC70-3C81-A630	43350001680
EC70-3C81-A1000	43350001681
EC70-3C85	43350001682
EC70-3C85-E250	43350001683
EC70-3C85-E315	43350001684
EC70-3C85-E400	43350001685
EC70-3C85-A630	43350001686
EC70-3C85-A1000	43350001687
EFD10-3F3	432200205264
EFD10-3F3-A25	4322
EFD10-3F3-A40	4322
EFD10-3F3-A63	4322
EFD10-3F4	43220205265
EFD10-3F4-A25	4322
EFD10-3F4-A40	4322
EFD10-3F4-A63	4322
EFD10-4F1	4322
EFD12-3F3	43220205266
EFD12-3F3-A40	4322
EFD12-3F3-A63	4322
EFD12-3F3-A100	4322
EFD12-3F4	43220205267
EFD12-3F4-A40	4322
EFD12-3F4-A63	4322
EFD12-3F4-A100	4322
EFD12-4F1	4322
EFD15-3F3	43120204100 4322
EFD15-3F3-A63	4322
EFD15-3F3-A100	4322
EFD15-3F3-A160	4322
EFD15-3F4	43120204141 4322
EFD15-3F4-A63	4322
EFD15-3F4-A100	4322
EFD15-3F4-A160	4322
EFD15-4F1	4322
EFD20-3C30	4312
EFD20-3C85	4312
EFD20-3C90	4312
EFD20-3F3	43120204108
EFD20-3F4	43120204146
EFD25-3C30	4312
EFD25-3C85	43120204120

TYPE NUMBER	11 NC
EFD25-3C90	43120204180
EFD25-3F3	43120204116
EFD25-3F4	43120204161
EFD30-3C30	4312
EFD30-3C85	43120204128
EFD30-3C90	43120204184
EFD30-3F3	43120204124
EFD30-3F4	43120204166
EP7-3C81	43350003521
EP7-3C81-E25	43350003522
EP7-3C81-A40	43350003523
EP7-3C81-A63	43350003524
EP7-3C81-A100	43350003525
EP7-3C81-A160	43350003526
EP7-3C85	43350003529 43220220880
EP7-3C85-E25	43350003530
EP7-3C85-A40	43350003531
EP7-3C85-A63	43350003532
EP7-3C85-A100	43350003533
EP7-3C85-A160	43350003534
EP7-3E1	43220250860
EP7-3E5	43220250820 43350000154
EP7-3E25	43350003541
EP7-3E27	43350003542
EP7-3F3	43350003535 43220250840
EP7-3F3-E25	43350003536
EP7-3F3-A40	43350003537
EP7-3F3-A63	43350003538
EP7-3F3-A100	43350003539
EP7-3F3-A160	43350003540
EP7-3F4	43220250850
EP7-3F4-A100	43220250854
EP7-3F4-A160	43220250855
EP7-3H1	43220250810
EP7-3H1-A63	43220250813
EP7-3H1-A100	43220250814
EP7-3H1-A160	43220250815
EP7-3H1-A250	43220250816
EP10-3C81	43350003543
EP10-3C81-E25	43350003544
EP10-3C81-A40	43350003545
EP10-3C81-A63	43350003546
EP10-3C81-A100	43350003548
EP10-3C81-A160	43350003549
EP10-3C85	43350003550

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
EP10-3C85-E25	43350003551
EP10-3C85-A40	43350003552
EP10-3C85-A63	43350003553
EP10-3C85-A100	43350003554
EP10-3C85-A160	43350003555
EP10-3E1	43220250910
EP10-3E4	43220250980
EP10-3E25	43350003568
EP10-3E27	43350003569
EP10-3E5	43350000155 43220250920
EP10-3F3	43350003556
EP10-3F3-E25	43350003557
EP10-3F3-A40	43350003558
EP10-3F3-A63	43350003559
EP10-3F3-A100	43350003560
EP10-3F3-A160	43350003561
EP10-3F4	43220250930
EP10-3F4-A63	43220250931
EP10-3F4-A100	43220250932
EP10-3F4-A160	43220250933
EP13-3C81	43350003570
EP13-3C81-E40	43350003572
EP13-3C81-A63	43350003574
EP13-3C81-A100	43350003576
EP13-3C81-A160	43350003578
EP13-3C81-A250	43350003580
EP13-3C85	43350003581 43220251014
EP13-3C85-E40	43350003582
EP13-3C85-A63	43350003583 43220251001
EP13-3C85-A100	43350003584 43220251003
EP13-3C85-A160	43350003585 43220251004
EP13-3C85-A250	43350003586 43220251006
EP13-A315	43220251007
EP13-3E1	43220251033
EP13-3E4	43220251055
EP13-3E27	43350003595
EP13-3E25	43350003594 43220251080
EP13-3E5	43350000156 43220251077
EP13-3E6	43220251020
EP13-3F3	43350003587 43220251090

TYPE NUMBER	11 NC
EP13-3F3-E40	43350003588
EP13-3F3-A63	43350003589
EP13-3F3-A100	43350003590 43220251093
EP13-3F3-A160	43350003591 43220251094
EP13-3F3-A250	43350003593 43220251096
EP13-3F3-A315	43220251097
EP13-3F4	43220251040
EP13-3F4-A160	43220251041
EP13-3F4-A250	43220251042
EP13-3F4-A315	43220251043
EP17-3C81	43350003596
EP17-3C81-E63	43350003597
EP17-3C81-A100	43350003598
EP17-3C81-A160	43350003600
EP17-3C81-A250	43350003602
EP17-3C81-A315	43350003603
EP17-3C85	43350003604
EP17-3C85-E63	43350003605
EP17-3C85-A100	43350003606
EP17-3C85-A160	43350003607
EP17-3C85-A250	43350003608
EP17-3C85-A315	43350003609
EP17-3E25	43350003617
EP17-3E27	43350003618
EP17-3E5	43350000157
EP17-3F3	43350003611
EP17-3F3-E63	43350003612
EP17-3F3-A100	43350003613
EP17-3F3-A160	43350003614
EP17-3F3-A250	43350003615
EP17-3F3-A315	43350003616
EP20-3C81	43350003619
EP20-3C81-A160	43350003620
EP20-3C81-A250	43350003621
EP20-3C81-A315	43350003622
EP20-3C81-A400	43350003623
EP20-3C81-A630	43350003624
EP20-3C85	43350003625
EP20-3C85-A160	43350003626
EP20-3C85-A250	43350003627
EP20-3C85-A315	43350003628
EP20-3C85-A400	43350003629
EP20-3C85-A630	43350003630
EP20-3E25	43350003637
EP20-3E27	433500003638

TYPE NUMBER	11 NC
EP20-3E5	433350000158
EP20-3F3	43350003631
EP20-3F3-A160	43350003632
EP20-3F3-A250	43350003633
EP20-3F3-A315	43350003634
EP20-3F3-A400	43350003635
EP20-3F3-A630	43350003636
ER9.5-3E5	4322
ER9.5-3E6	4322
ER9.5-3F3	4322
ER9.5-3F4	4322
ER11-3E5	4322
ER11-3E6	4322
ER11-3F3	4322
ER11-3F4	4322
ER28-3C30	43120205600
ER28-3C80	43120204412
ER28-3C85	43120204419
ER28-3C90	43120205601
ER28L-3C30	43120205602
ER28L-3C80	43120204686
ER28L-3C85	43120204687
ER28L-3C90	43120205603
ER35-3C30	43120205511
ER35-3C80	43120204640
ER35-3C85	43120204641
ER35-3C90	43120205539
ER40-3C30	43120205513
ER40-3C80	43120204642
ER40-3C85	43120204643
ER40-3C90	43120205604
ER42-3C30	43120205515
ER42-3C80	43120204638
ER42-3C85	43120204639
ER42-3C90	43120205605
ER42A-3C30	43120205606
ER42A-3C80	43120204662
ER42A-3C85	43120204666
ER42A-3C90	43120205607
ER48-3C30	43120205608
ER48-3C80	43120203485
ER48-3C90	43120205609
ER54-3C30	43120205610
ER54-3C80	43120204669
ER54-3C85	43120204670
ER54-3C90	43120205611
ETD29-3C11	43120203789
ETD29-3C30	43120203979

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
ETD29-3C85	43120203750
ETD29-3C85-G1000	43120203769
ETD29-3C85-G150	43120203752
ETD29-3C85-G350	43120203754
ETD29-3C85-G50	43120203751
ETD29-3C90	43120203992
ETD29-3F3	43120203800
ETD29-3F3-G1000	43120203808
ETD29-3F3-G150	43120203806
ETD29-3F3-G350	43120203807
ETD29-3F3-G50	43120203805
ETD34-3C30	43120203981
ETD34-3C80	43120203700
ETD34-3C80-G100	43120203701
ETD34-3C80-G200	43120203702
ETD34-3C80-G500	43120203703
ETD34-3C80-G800	43120203766
ETD34-3C85	43120203720
ETD34-3C85-G100	43120203721
ETD34-3C85-G200	43120203722
ETD34-3C85-G500	43120203723
ETD34-3C85-G800	43120203724
ETD34-3C90	43120203993
ETD34-3F3	43120203801
ETD34-3F3-G100	43120203809
ETD34-3F3-G200	43120203810
ETD34-3F3-G500	43120203811
ETD34-3F3-G800	43120203812
ETD39-3C30	43120203983
ETD39-3C80	43120203705
ETD39-3C80-G100	43120203706
ETD39-3C80-G200	43120203707
ETD39-3C80-G500	43120203708
ETD39-3C80-G800	43120203763
ETD39-3C85	43120203725
ETD39-3C85-G100	43120203726
ETD39-3C85-G200	43120203727
ETD39-3C85-G500	43120203728
ETD39-3C85-G800	43120203729
ETD39-3C90	43120204700
ETD39-3F3	43120203802
ETD39-3F3-G100	43120203813
ETD39-3F3-G200	43120203814
ETD39-3F3-G500	43120203815
ETD39-3F3-G800	43120203816
ETD44-3C30	43120203984
ETD44-3C80	43120203710
ETD44-3C80-G100	43120203759
ETD44-3C80-G200	43120203711
ETD44-3C80-G500	43120203712
ETD44-3C80-G800	43120203760
ETD44-3C85	43120203730
ETD44-3C85-G100	43120203731
ETD44-3C85-G200	43120203732
ETD44-3C85-G500	43120203733
ETD44-3C85-G800	43120203734
ETD44-3C90	43120204701
ETD44-3F3	43120203803
ETD44-3F3-G100	43120203817
ETD44-3F3-G200	43120203818
ETD44-3F3-G500	43120203819
ETD44-3F3-G800	43120203820
ETD49-3C30	43120203986
ETD49-3C80	43120203715
ETD49-3C80-G100	43120203770
ETD49-3C80-G1400	43120203755
ETD49-3C80-G200	43120203716
ETD49-3C80-G500	43120203717
ETD49-3C80-G800	43120203756
ETD49-3C85	43120203735
ETD49-3C85-G100	43120203736
ETD49-3C85-G200	43120203737
ETD49-3C85-G500	43120203738
ETD49-3C85-G800	43120203739
ETD49-3C90	43120204702
ETD49-3F3	43120203804
ETD49-3F3-G100	43120203821
ETD49-3F3-G1400	43120203825
ETD49-3F3-G200	43120203822
ETD49-3F3-G500	43120203823
ETD49-3F3-G800	43120203824
ETD54-3C30	43120204703
ETD54-3C85	43120203792
ETD54-3C90	43120204704
ETD54-3F3	43120203826
ETD59-3C30	43120204705
ETD59-3C85	43120203793
ETD59-3C90	43120204706
ETD59-3F3	43120203827
E5.3/2.7/2-3E5	43220205273
E5.3/2.7/2-3E6	43220205274
E5.3/2.7/2-3F3	43220205277
E5.3/2.7/2-3F4	43220205278
E6.3/2.9/2-3E5	43220205275
E6.3/2.9/2-3E6	43220205276
E6.3/2.9/2-3F3	43220205279
E6.3/2.9/2-3F4	43220205280
E13/6/6-3C80	43350001001
E13/6/6-3C81	43350001007
E13/6/6-3C81-A63	43350001008
E13/6/6-3C81-A100	43350001009
E13/6/6-3C81-A160	43350001010
E13/6/6-3C81-A250	43350001011
E13/6/6-3C81-A315	43350001012
E13/6/6-3C85	43350001013
E13/6/6-3C85-A63	43350001014
E13/6/6-3C85-A100	43350001015
E13/6/6-3C85-A160	43350001016
E13/6/6-3C85-A250	43350001017
E13/6/6-3C85-A315	43350001018
E13/6/6-3C90	43350001019
E13/6/6-3E25	43350001541
E13/6/6-3E27	43350001542
E13/6/6-3F3	43350001025
E13/6/6-3F3-A63	43350001026
E13/6/6-3F3-A100	43350001027
E13/6/6-3F3-A160	43350001028
E13/6/6-3F3-A250	43350001029
E13/6/6-3F3-A315	43350001030
E13/7/4-3C11	43120204514
E13/7/4-3C30	43120205556
E13/7/4-3C80	43120203447
E13/7/4-3C80-G150	43120204508
E13/7/4-3C80-G50	43120204616
E13/7/4-3C80-G500	43120204509
E13/7/4-3C85	43120204510
E13/7/4-3C85-G150	43120204512
E13/7/4-3C85-G50	43120204511
E13/7/4-3C85-G500	43120204513
E13/7/4-3C90	43120205557
E13/7/4-3F3	43120204556
E13/7/4-3F3-G150	43120204558
E13/7/4-3F3-G50	43120204557
E13/7/4-3F3-G500	43120204559
E14/3.5/5-3F3	43220209752
E14/3.5-3F3-A25-E	43220209778
E14/3.5-3F3-A25-P	43220209783
E14/3.5-3F3-A40-E	43220209779
E14/3.5-3F3-A40-P	43220209781
E14/3.5-3F3-A63-E	43220209780
E14/3.5-3F3-A63-P	43220209785
E14/3.5-3F3-A100-E	43220209781
E14/3.5-3F3-A100-P	43220209786
E14/3.5-3F3-A160-E	43220209782

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E14/3.5-3F3-A160-P	43220209787
E14/3.5/5-3F4	43220209754
E14/3.5-3F4-A25-E	43220209788
E14/3.5-3F4-A25-P	43220209793
E14/3.5-3F4-A40-E	43220209789
E14/3.5-3F4-A40-P	43220209794
E14/3.5-3F4-A63-E	43220209790
E14/3.5-3F4-A63-P	43220209795
E14/3.5-3F4-A100-E	43220209791
E14/3.5-3F4-A100-P	43220209796
E14/3.5-3F4-A160-E	43220209792
E14/3.5-3F4-A160-P	43220209797
E16/8/5-3C11	43120204523
E16/8/5-3C30	43120205558
E16/8/5-3C80	43120203555
E16/8/5-3C80-G150	43120204517
E16/8/5-3C80-G50	43120204516
E16/8/5-3C80-G500	43120204518
E16/8/5-3C85	43120204519
E16/8/5-3C85-G150	43120204521
E16/8/5-3C85-G50	43120204520
E16/8/5-3C85-G500	43120204522
E16/8/5-3C90	43120205559
E16/8/5-3F3	43120204560
E16/8/5-3F3-G150	43120204562
E16/8/5-3F3-G50	43120204561
E16/8/5-3F3-G500	43120204563
E18/4/10-3F3	43220209756
E18/4-3F3-A63-E	43220209798
E18/4-3F3-A63-P	43220209231
E18/4-3F3-A100-E	43220209799
E18/4-3F3-A100-P	43220209232
E18/4-3F3-A160-E	43220209228
E18/4-3F3-A160-P	43220209233
E18/4-3F3-A250-E	43220209229
E18/4-3F3-A250-P	43220209234
E18/4-3F3-A315-E	43220209230
E18/4-3F3-A315-P	43220209235
E18/4-3F4	43220209758
E18/4-3F4-A63-E	43220209236
E18/4-3F4-A63-P	43220209241
E18/4-3F4-A100-E	43220209237
E18/4-3F4-A100-P	43220209242
E18/4-3F4-A160-E	43220209238
E18/4-3F4-A160-P	43220209243
E18/4-3F4-A250-E	43220209239
E18/4-3F4-A250-P	43220209244
E18/4-3F4-A315-E	43220209240

TYPE NUMBER	11 NC
E18/4-3F4-A315-P	43220209245
E19/8/5-3C80	43350001031
E19/8/5-3C81	43350001037
E19/8/5-3C81-A63	43350001038
E19/8/5-3C81-A100	43350001039
E19/8/5-3C81-A160	43350001040
E19/8/5-3C81-A250	43350001041
E19/8/5-3C81-A315	43350001042
E19/8/5-3C85	43350001043
E19/8/5-3C85-A63	43350001044
E19/8/5-3C85-A100	43350001045
E19/8/5-3C85-A160	43350001046
E19/8/5-3C85-A250	43350001047
E19/8/5-3C85-A315	43350001048
E19/8/5-3C90	43350001049
E19/8/5-3E25	43350001544
E19/8/5-3E27	43350001545
E19/8/5-3F3	43350001055
E19/8/5-3F3-A63	43350001056
E19/8/5-3F3-A100	43350001057
E19/8/5-3F3-A160	43350001058
E19/8/5-3F3-A250	43350001059
E19/8/5-3F3-A315	43350001060
E19/8/9-3C80	43350001061
E19/8/9-3C81	43350001067
E19/8/9-3C81-A100	43350001068
E19/8/9-3C81-A160	43350001069
E19/8/9-3C81-A250	43350001070
E19/8/9-3C81-A315	43350001071
E19/8/9-3C81-A400	43350001072
E19/8/9-3C85	43350001073
E19/8/9-3C85-A100	43350001074
E19/8/9-3C85-A160	43350001075
E19/8/9-3C85-A250	43350001076
E19/8/9-3C85-A315	43350001077
E19/8/9-3C85-A400	43350001078
E19/8/9-3C90	43350001079
E19/8/9-3E25	43350001547
E19/8/9-3E27	433500010548
E19/8/9-3F3	43350001085
E19/8/9-3F3-A100	43350001086
E19/8/9-3F3-A160	43350001087
E19/8/9-3F3-A250	43350001088
E19/8/9-3F3-A315	43350001089
E19/8/9-3F3-A400	43350001090
E20/10/5-3C11	43120203597
E20/10/5-3C30	43120205560
E20/10/5-3C80	43120203407

TYPE NUMBER	11 NC
E20/10/5-3C80-G150	43120203537
E20/10/5-3C80-G50	43120203536
E20/10/5-3C80-G500	43120204538
E20/10/5-3C85	43120204539
E20/10/5-3C85-G150	43120204541
E20/10/5-3C85-G50	43120204540
E20/10/5-3C85-G500	43120204542
E20/10/5-3C90	43120205561
E20/10/5-3F3	43120204552
E20/10/5-3F3-G150	43120204579
E20/10/5-3F3-G50	43120204578
E20/10/5-3F3-G500	43120204580
E20/10/6-3C11	43120203556
E20/10/6-3C30	43120205562
E20/10/6-3C80	43120203504
E20/10/6-3C80-G150	43120203551
E20/10/6-3C80-G50	43120203550
E20/10/6-3C80-G500	43120204524
E20/10/6-3C85	43120204525
E20/10/6-3C85-G150	43120204527
E20/10/6-3C85-G50	43120204526
E20/10/6-3C85-G500	43120204528
E20/10/6-3F3	43120204554
E20/10/6-3F3-G150	43120204566
E20/10/6-3F3-G50	43120204565
E20/10/6-3C90	43120205563
E20/10/6-3F3-G500	43120204567
E22/6/16-3F3	43220209760
E22/6-3F3-A160-E	43220209246
E22/6-3F3-A160-P	43220209055
E22/6-3F3-A250-E	43220209247
E22/6-3F3-A250-P	43220209056
E22/6-3F3-A315-E	43220209248
E22/6-3F3-A315-P	43220209057
E22/6-3F3-A400-E	43220209249
E22/6-3F3-A400-P	43220209058
E22/6-3F3-A630-E	43220209054
E22/6-3F3-A630-P	43220209059
E22/6/16-3F4	43220209765
E22/6-3F4-A160-E	43220209060
E22/6-3F4-A160-P	43220209065
E22/6-3F4-A250-E	43220209061
E22/6-3F4-A250-P	43220209066
E22/6-3F4-A315-E	43220209062
E22/6-3F4-A315-P	43220209067
E22/6-3F4-A400-E	43220209063
E22/6-3F4-A400-P	43220209068
E22/6-3F4-A630-E	43220209064

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E22/6-3F4-A630-P	43220209069
E25/10/6-3C11	4312020
E25/10/6-3C30	43120205566
E25/10/6-3C80	43350001091
E25/10/6-3C81	43350001097
E25/10/6-3C81-A100	43350001098
E25/10/6-3C81-A160	43350001099
E25/10/6-3C81-A250	43350001100
E25/10/6-3C81-A315	43350001101
E25/10/6-3C81-A400	43350001102
E25/10/6-3C85	43350001103 43120204408
E25/10/6-3C85-A100	43350001104
E25/10/6-3C85-A160	43350001105
E25/10/6-3C85-A250	43350001106
E25/10/6-3C85-A315	43350001107
E25/10/6-3C85-A400	43350001108
E25/10/6-3C90	43350001109 43120205567
E25/10/6-3F3	43350001115
E25/10/6-3F3-A100	43350001116
E25/10/6-3F3-A160	43350001117
E25/10/6-3F3-A250	43350001118
E25/10/6-3F3-A315	43350001119
E25/10/6-3F3-A400	43350001120
E25/10/6-3E27	43350001551
E25/10/6-3E25	43120204411 43350001550
E25/13/7-3C11	43120204648
E25/13/7-3C30	43120205531
E25/13/7-3C80	43120203402 43350001121
E25/13/7-3C80-G150	43120203546
E25/13/7-3C80-G50	43120203545
E25/13/7-3C80-G500	43120204501
E25/13/7-3C81	43350001127
E25/13/7-3C81-A160	43350001128
E25/13/7-3C81-A250	43350001129
E25/13/7-3C81-A315	43350001130
E25/13/7-3C81-A400	43350001131
E25/13/7-3C81-A630	43350001132
E25/13/7-3C85	43120204529 43350001133
E25/13/7-3C85-A160	43350001134
E25/13/7-3C85-A250	43350001135
E25/13/7-3C85-A315	43350001136
E25/13/7-3C85-A400	43350001137
E25/13/7-3C85-A630	43350001138
E25/13/7-3C85-G150	43120204531
E25/13/7-3C85-G50	43120204530
E25/13/7-3C85-G500	43120204532
E25/13/7-3C90	43350001139 43120205522
E25/13/7-3E25	43350001553
E25/13/7-3E27	43350001554
E25/13/7-3F3	43120204555 43350001145
E25/13/7-3F3-A160	43350001146
E25/13/7-3F3-A250	43350001147
E25/13/7-3F3-A315	43350001148
E25/13/7-3F3-A400	43350001149
E25/13/7-3F3-A630	43350001150
E25/13/7-3F3-G150	43120204570
E25/13/7-3F3-G50	43120204569
E25/13/7-3F3-G500	43120204571
E25/16/6-3C30	43120205568
E25/16/6-3C85	43120204407
E25/16/6-3C90	43120205569
E25/16/6-3E25	43120204410
E25/9/6-3C30	43120205564
E25/9/6-3C85	43120204406
E25/9/6-3C90	43120205565
E25/9/6-3E25	43120204409
E30/15/13-3C30	43120205570
E30/15/13-3C85	43120204689
E30/15/13-3C90	43120205571
E30/15/7-3C11	43120204647
E30/15/7-3C30	43120205533
E30/15/7-3C80	43120203455 43350001151
E30/15/7-3C80-G100	43120203533
E30/15/7-3C80-G200	43120203534
E30/15/7-3C80-G800	43120203535
E30/15/7-3C81	43350001157
E30/15/7-3C81-A160	43350001158
E30/15/7-3C81-A250	43350001159
E30/15/7-3C81-A315	43350001160
E30/15/7-3C81-A400	43350001161
E30/15/7-3C81-A630	43350001162
E30/15/7-3C85	43120204543 43350001163
E30/15/7-3C85-A160	43350001164
E30/15/7-3C85-A250	43350001165
E30/15/7-3C85-A315	43350001166
E30/15/7-3C85-A400	43350001167
E30/15/7-3C85-A630	43350001168
E30/15/7-3C85-G100	43120204544
E30/15/7-3C85-G200	43120204545
E30/15/7-3C85-G500	43120204546
E30/15/7-3C85-G800	43120204547
E30/15/7-3C90	43350001169 43120205540
E30/15/7-3E25	43350001556
E30/15/7-3E27	43350001557
E30/15/7-3F3	43120204553 43350001175
E30/15/7-3F3-A160	43350001176
E30/15/7-3F3-A250	43350001177
E30/15/7-3F3-A315	43350001178
E30/15/7-3F3-A400	43350001179
E30/15/7-3F3-A630	43350001180
E30/15/7-3F3-G100	43120204564
E30/15/7-3F3-G200	43120204568
E30/15/7-3F3-G500	43120204577
E30/15/7-3F3-G800	43120204581
E31/13/9-3C80	43350001181
E31/13/9-3C81	43350001187
E31/13/9-3C81-A250	43350001188
E31/13/9-3C81-A315	43350001189
E31/13/9-3C81-A400	43350001190
E31/13/9-3C81-A630	43350001191
E31/13/9-3C81-A1000	43350001192
E31/13/9-3C85	43350001193
E31/13/9-3C85-A250	43350001194
E31/13/9-3C85-A315	43350001195
E31/13/9-3C85-A400	43350001196
E31/13/9-3C85-A630	43350001197
E31/13/9-3C85-A1000	43350001198
E31/13/9-3C90	43350001199
E31/13/9-3E25	43350001559
E31/13/9-3E27	43350001560
E31/13/9-3F3	43350001205
E31/13/9-3F3-A250	43350001206
E31/13/9-3F3-A315	43350001207
E31/13/9-3F3-A400	43350001208
E31/13/9-3F3-A630	43350001209
E31/13/9-3F3-A1000	43350001210
E32/6/20-3C85	43350001991
E32/6-3C85-E160-E	43350001992
E32/6-3C85-E160-P	43350002157
E32/6-3C85-E250-E	43350001993
E32/6-3C85-E250-P	43350002158
E32/6-3C85-A315-E	43350001994
E32/6-3C85-A315-P	43350002159
E32/6-3C85-A400-E	43350001995
E32/6-3C85-A400-P	43350002160

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E32/6-3C85-A630-E	43350001996
E32/6-3C85-A630-P	43350002161
E22/6/20-3F3	43350002003
E22/6-3F3-E160-E	43350002004
E22/6-3F3-E160-P	43350002169
E22/6-3F3-E250-E	43350002005
E22/6-3F3-E250-P	43350002170
E22/6-3F3-A315-E	43350002006
E22/6-3F3-A315-P	43350002171
E22/6-3F3-A400-E	43350002007
E22/6-3F3-A400-P	43350002172
E22/6-3F3-A630-E	43350002008
E22/6-3F3-A630-P	43350002173
E22/6/20-3F4	43350002009
E22/6-3F4-E160-E	43350002010
E22/6-3F4-E160-P	43350002175
E22/6-3F4-E250-E	43350002011
E22/6-3F4-E250-P	43350002176
E22/6-3F4-A315-E	43350002012
E22/6-3F4-A315-P	43350002177
E22/6-3F4-A400-E	433500021013
E22/6-3F4-A400-P	43350002178
E22/6-3F4-A630-E	43350002014
E22/6-3F4-A630-P	43350002179
E32/16/9-3C11	43120204649
E32/16/9-3C30	43120205572
E32/16/9-3C80	43120203540
E32/16/9-3C80-G100	43120203541
E32/16/9-3C80-G200	43120203542
E32/16/9-3C80-G500	43120203543
E32/16/9-3C80-G800	43120203544
E32/16/9-3C85	43120204533
E32/16/9-3C85-G100	43120204534
E32/16/9-3C85-G200	43120204535
E32/16/9-3C85-G500	43120204536
E32/16/9-3C85-G800	43120204537
E32/16/9-3F3	43120204572
E32/16/9-3F3-G100	43120204573
E32/16/9-3F3-G200	43120204574
E32/16/9-3F3-G500	43120204575
E32/16/9-3F3-G800	43120204576
E32/16/9-3C90	43120205573
E34/14/9-3C80	43350001211
E34/14/9-3C81	43350001217
E34/14/9-3C81-A250	43350001218
E34/14/9-3C81-A315	43350001219
E34/14/9-3C81-A400	43350001220
E34/14/9-3C81-A630	43350001221

TYPE NUMBER	11 NC
E34/14/9-3C81-A1000	43350001222
E34/14/9-3C85	43350001223
E34/14/9-3C85-A250	43350001224
E34/14/9-3C85-A315	43350001225
E34/14/9-3C85-A400	43350001226
E34/14/9-3C85-A630	43350001227
E34/14/9-3C85-A1000	43350001228
E34/14/9-3C90	43350001229
E34/14/9-3E25	43350001562
E34/14/9-3E27	43350001563
E34/14/9-3F3	43350001235
E34/14/9-3F3-A250	43350001236
E34/14/9-3F3-A315	43350001237
E34/14/9-3F3-A400	43350001238
E34/14/9-3F3-A630	43350001239
E34/14/9-3F3-A1000	43350001240
E36/21/15-3C30	43120205574
E36/21/15-3C85	31123249101
E36/21/15-3C90	43120205575
E38/8/25-3C85	43350002015
E38/8-3C85-E250-E	43350002016
E38/8-3C85-E250-P	43350002181
E38/8-3C85-E315-E	43350002017
E38/8-3C85-E315-P	43350002182
E38/8-3C85-E400-E	43350002018
E38/8-3C85-E400-P	43350002183
E38/8-3C85-A630-E	43350002019
E38/8-3C85-A630-P	43350002184
E38/8-3C85-A1000-E	43350002020
E38/8-3C85-A1000-P	43350002185
E38/8/25-3F3	43350002027
E38/8-3F3-E250-E	43350002028
E38/8-3F3-E250-P	43350002193
E38/8-3F3-E315-E	43350002029
E38/8-3F3-E315-P	43350002194
E38/8-3F3-E400-E	43350002030
E38/8-3F3-E400-P	43350002195
E38/8-3F3-A630-E	43350002031
E38/8-3F3-A630-P	43350002196
E38/8-3F3-A1000-E	43350002032
E38/8-3F3-A1000-P	43350002197
E38/8/25-3F4	43350002033
E38/8-3F4-E250-E	43350002034
E38/8-3F4-E250-P	43350002199
E38/8-3F4-E315-E	43350002035
E38/8-3F4-E315-P	43350002200
E38/8-3F4-E400-E	43350002036
E38/8-3F4-E400-P	43350002201

TYPE NUMBER	11 NC
E38/8-3F4-A630-E	43350002037
E38/8-3F4-A630-P	43350002202
E38/8-3F4-A1000-E	43350002038
E38/8-3F4-A1000-P	43350002203
E41/17/12-3C11	4312020
E41/17/12-3C30	43120205576
E41/17/12-3C80	43350001241 43120204404
E41/17/12-3C81	43350001247
E41/17/12-3C81-E250	43350001248
E41/17/12-3C81-E315	43350001249
E41/17/12-3C81-A400	43350001250
E41/17/12-3C81-A630	43350001251
E41/17/12-3C81-A1000	43350001252
E41/17/12-3C85	43120204404 43350001253
E41/17/12-3C85-E250	43350001254
E41/17/12-3C85-E315	43350001255
E41/17/12-3C85-A400	43350001256
E41/17/12-3C85-A630	43350001257
E41/17/12-3C85-A1000	43350001258
E41/17/12-3C90	43350001259 43120205577
E41/17/12-3E25	43350001565
E41/17/12-3E27	43350001566
E41/17/12-3F3	43350001265
E41/17/12-3F3-E250	43350001266
E41/17/12-3F3-E315	43350001267
E41/17/12-3F3-A400	43350001268
E41/17/12-3F3-A630	43350001269
E41/17/12-3F3-A1000	43350001270
E42/21/15-3C11	43120203598
E42/21/15-3C30	43120205535
E42/21/15-3C80	43120203411 43350001271
E42/21/15-3C80-G100	43120203529
E42/21/15-3C80-G200	43120203530
E42/21/15-3C80-G500	31123249036
E42/21/15-3C80-G500	43120203528
E42/21/15-3C80-G800	43120203496
E42/21/15-3C81	43350001277
E42/21/15-3C81-E250	43350001278
E42/21/15-3C81-E315	43350001279
E42/21/15-3C81-A400	43350001280
E42/21/15-3C81-A630	43350001281
E42/21/15-3C81-A1000	43350001282
E42/21/15-3C85	43120203564 43350001283
E42/21/15-3C85-E250	43350001284

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E42/21/15-3C85-E315	43350001285
E42/21/15-3C85-A400	43350001286
E42/21/15-3C85-A630	43350001287
E42/21/15-3C85-A1000	43350001288
E42/21/15-3C85-G100	43120204548
E42/21/15-3C85-G200	43120203581
E42/21/15-3C85-G500	43120204549
E42/21/15-3C85-G800	43120204600
E42/21/15-3C90	43350001289 43120205578
E42/21/15-3E25	43350001568
E42/21/15-3E27	43350001569
E42/21/15-3F3	43120204550 43350001295
E42/21/15-3F3-E250	43350001296
E42/21/15-3F3-E315	43350001297
E42/21/15-3F3-A400	43350001298
E42/21/15-3F3-A630	43350001299
E42/21/15-3F3-A1000	43350001300
E42/21/15-3F3-G100	43120204582
E42/21/15-3F3-G200	43120204583
E42/21/15-3F3-G500	43120204584
E42/21/15-3F3-G800	43120204585
E42/21/20-3C30	43120205579
E42/21/20-3C80	43120203412 43350001301
E42/21/20-3C80-G100	43120203523
E42/21/20-3C80-G200	43120203524
E42/21/20-3C80-G500	43120203525
E42/21/20-3C80-G800	43120203526
E42/21/20-3C81	43350001307
E42/21/20-3C81-E250	43350001308
E42/21/20-3C81-E315	43350001309
E42/21/20-3C81-A400	43350001310
E42/21/20-3C81-A630	43350001311
E42/21/20-3C81-A1000	43350001312
E42/21/20-3C85	43120203565 43350001313
E42/21/20-3C85-E250	43350001314
E42/21/20-3C85-E315	43350001315
E42/21/20-3C85-A400	43350001316
E42/21/20-3C85-A630	43350001317
E42/21/20-3C85-A1000	43350001318
E42/21/20-3C85-G100	43120204601
E42/21/20-3C85-G200	43120204602
E42/21/20-3C85-G500	43120204603
E42/21/20-3C85-G800	43120204604
E42/21/20-3C90	43350001319 43120205580

TYPE NUMBER	11 NC
E42/21/20-3E25	43350001571
E42/21/20-3E27	43350001572
E42/21/20-3F3	43120204551 43350001325
E42/21/20-3F3-E250	43350001326
E42/21/20-3F3-E315	43350001327
E42/21/20-3F3-A400	43350001328
E42/21/20-3F3-A630	43350001329
E42/21/20-3F3-A1000	43350001330
E42/21/20-3F3-G100	43120204586
E42/21/20-3F3-G200	43120204587
E42/21/20-3F3-G500	43120204588
E42/21/20-3F3-G800	43120204589
E42/33/20-3C30	43120205581
E42/33/20-3C80	43120203419
E42/33/20-3C85	43120204678
E42/33/20-3C90	43120205582
E42/33/20-3F3	43120205100
E43/10/28-3C85	4335000
E43/10-3C85-E250-E	43350002039
E43/10-3C85-E250-P	43350002204
E43/10-3C85-E315-E	43350002040
E43/10-3C85-E315-P	43350002205
E43/10-3C85-E400-E	43350002041
E43/10-3C85-E400-P	43350002206
E43/10-3C85-A630-E	43350002042
E43/10-3C85-A630-P	43350002207
E43/10-3C85-A1000-E	43350002043
E43/10-3C85-A1000-P	43350002208
E43/10/28-3F3	4335000
E43/10-3F3-E250-E	43350002050
E43/10-3F3-E250-P	43350002215
E43/10-3F3-E315-E	43350002051
E43/10-3F3-E315-P	43350002216
E43/10-3F3-E400-E	43350002052
E43/10-3F3-E400-P	43350002217
E43/10-3F3-A630-E	43350002053
E43/10-3F3-A630-P	43350002218
E43/10-3F3-A1000-E	43350002054
E43/10-3F3-A1000-P	43350002219
E43/10/28-3F4	4335000
E43/10-3F4-E250-E	43350002055
E43/10-3F4-E250-P	43350002220
E43/10-3F4-E315-E	43350002056
E43/10-3F4-E315-P	43350002221
E43/10-3F4-E400-E	43350002056
E43/10-3F4-E400-P	43350002222
E43/10-3F4-A630-E	43350002057

TYPE NUMBER	11 NC
E43/10-3F4-A630-P	43350002223
E43/10-3F4-A1000-E	43350002058
E43/10-3F4-A1000-P	43350002224
E46/23/30-3C30	43120205583
E46/23/30-3C80	31123249087
E46/23/30-3C85	31123249088
E46/23/30-3C90	43120205584
E47/20/16-3C30	43120205585
E47/20/16-3C80	43120204664 43350001331
E47/20/16-3C81	43350001337
E47/20/16-3C81-E250	43350001338
E47/20/16-3C81-E315	43350001339
E47/20/16-3C81-E400	43350001340
E47/20/16-3C81-A630	43350001341
E47/20/16-3C81-A1000	43350001342
E47/20/16-3C85	43350001343 43120204414
E47/20/16-3C85-E250	43350001344
E47/20/16-3C85-E315	43350001345
E47/20/16-3C85-E400	43350001346
E47/20/16-3C85-A630	43350001347
E47/20/16-3C85-A1000	43350001348
E47/20/16-3C90	43350001349 43120205586
E47/20/16-3E25	43350001574
E47/20/16-3E27	43350001575
E47/20/16-3F3	43350001355
E47/20/16-3F3-E250	43350001356
E47/20/16-3F3-E315	43350001357
E47/20/16-3F3-E400	43350001358
E47/20/16-3F3-A630	43350001359
E47/20/16-3F3-A1000	43350001360
E50/27/15-3C81	43350001367
E50/27/15-3C81-E250	43350001368
E50/27/15-3C81-E315	43350001369
E50/27/15-3C81-E400	43350001370
E50/27/15-3C81-A630	43350001371
E50/27/15-3C81-A1000	43350001372
E50/27/15-3C85	43350001373
E50/27/15-3C85-E250	43350001374
E50/27/15-3C85-E315	43350001375
E50/27/15-3C85-E400	43350001376
E50/27/15-3C85-A630	43350001377
E50/27/15-3C85-A1000	43350001378
E50/27/15-3C90	43350001379
E55/28/21-3C11	43120204504
E55/28/21-3C30	43120205587

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E55/28/21-3C80	43120203410 43350001391
E55/28/21-3C80-G1200	43120203492
E55/28/21-3C80-G150	43120203518
E55/28/21-3C80-G450	43120203521
E55/28/21-3C81	43350001397
E55/28/21-3C81-E315	43350001398
E55/28/21-3C81-E400	43350001399
E55/28/21-3C81-E630	43350001400
E55/28/21-3C81-A1000	43350001401
E55/28/21-3C81-A1600	43350001402
E55/28/21-3C85	43120203591 43350001403
E55/28/21-3C85-E315	43350001404
E55/28/21-3C85-E400	43350001405
E55/28/21-3C85-E630	43350001406
E55/28/21-3C85-A1000	43350001407
E55/28/21-3C85-A1600	43350001408
E55/28/21-3C85-G1200	43120204607
E55/28/21-3C85-G150	43120204605
E55/28/21-3C85-G450	43120204606
E55/28/21-3C90	43350001409 43120205588
E55/28/21-3E27	43350001935
E55/28/21-3F3	43120204590 43350001415
E55/28/21-3F3-E315	43350001416
E55/28/21-3F3-E400	43350001417
E55/28/21-3F3-E630	43350001418
E55/28/21-3F3-A1000	43350001419
E55/28/21-3F3-A1600	43350001420
E55/28/21-3F3-G1200	43120204593
E55/28/21-3F3-G150	43120204591
E55/28/21-3F3-G450	43120204592
E55/28/25-3C90	43120205590
E55/28/25-3C80	43120204515
E55/28/25-3C80-G1500	43120204609
E55/28/25-3C80-G2500	43120204503
E55/28/25-3C80-G500	43120204608
E55/28/25-3C85	43120203592
E55/28/25-3C85-G1500	43120204611
E55/28/25-3C85-G500	43120204610
E55/28/25-3C90	43120205590
E55/28/25-3F3	43120204599
E56/24/19-3C80	43350001421
E56/24/19-3C81	43350001427
E56/24/19-3C81-E315	43350001428
E56/24/19-3C81-E400	43350001429
E56/24/19-3C81-E630	43350001430

TYPE NUMBER	11 NC
E56/24/19-3C81-A1000	43350001431
E56/24/19-3C81-A1600	43350001432
E56/24/19-3C85	43350001433
E56/24/19-3C85-E315	43350001434
E56/24/19-3C85-E400	43350001435
E56/24/19-3C85-E630	43350001436
E56/24/19-3C85-A1000	43350001437
E56/24/19-3C85-A1600	43350001438
E56/24/19-3C90	43350001439
E56/24/19-3E25	433500001577
E56/24/19-3E27	43350001578
E58/11/38-3C85	4335000
E58/11-3C85-E315-E	43350002060
E58/11-3C85-E315-P	43350002225
E58/11-3C85-E400-E	43350002061
E58/11-3C85-E400-P	43350002226
E58/11-3C85-E630-E	43350002062
E58/11-3C85-E630-P	43350002227
E58/11-3C85-A1000-E	43350002063
E58/11-3C85-A1000-P	43350002228
E58/11-3C85-A1600-E	43350002064
E58/11-3C85-A1600-P	43350002229
E58/11/38-3F3	4335000
E58/11-3F3-E315-E	43350002071
E58/11-3F3-E315-P	43350002236
E58/11-3F3-E400-E	43350002072
E58/11-3F3-E400-P	43350002237
E58/11-3F3-E630-E	43350002073
E58/11-3F3-E630-P	43350002238
E58/11-3F3-A1000-E	43350002074
E58/11-3F3-A1000-P	43350002239
E58/11-3F3-A1600-E	43350002075
E58/11-3F3-A1600-P	43350002240
E58/11/38-3F4	4335000
E58/11-3F4-E315-E	43350002076
E58/11-3F4-E315--P	43350002241
E58/11-3F4-E400-E	43350002077
E58/11-3F4-E400-P	43350002242
E58/11-3F4-E630-E	43350002078
E58/11-3F4-E630-P	43350002243
E58/11-3F4-A1000-E	43350002079
E58/11-3F4-A1000-P	43350002244
E58/11-3F4-A1600-E	43350002080
E58/11-3F4-A1600-P	43350002245
E64/10/50-3C85	4335000
E64/10-3C85-E630-E	43350002081
E64/10-3C85-E630-P	43350002246
E64/10-3C85-E1000-E	43350002082

TYPE NUMBER	11 NC
E64/10-3C85-E1000-P	43350002247
E64/10-3C85-A1600-E	43350002083
E64/10-3C85-A1600-P	43350002248
E64/10-3C85-A2500-E	43350002084
E64/10-3C85-A2500-P	43350002249
E64/10-3C85-A3150-E	43350002085
E64/10-3C85-A3150-P	43350002250
E64/10/50-3F3	4335000
E64/10-3F3-E630-E	43350002092
E64/10-3F3-E630-P	43350002257
E64/10-3F3-E1000-E	43350002093
E64/10-3F3-E1000-P	43350002258
E64/10-3F3-A1600-E	43350002094
E64/10-3F3-A1600-P	43350002259
E64/10-3F3-A2500-E	43350002095
E64/10-3F3-A2500-P	43350002260
E64/10-3F3-A3150-E	43350002096
E64/10-3F3-A3150-P	43350002261
E64/10/50-3F4	4335000
E64/10-3F4-E630-E	43350002097
E64/10-3F4-E630-P	43350002262
E64/10-3F4-E1000-E	43350002098
E64/10-3F4-E1000-P	43350002263
E64/10-3F4-A1600-E	43350002099
E64/10-3F4-A1600-P	43350002264
E64/10-3F4-A2500-E	43350002100
E64/10-3F4-A2500-P	43350002265
E64/10-3F4-A3150-E	43350002101
E64/10-3F4-A3150-P	43350002266
E65/32/27-3C11	43120204505
E65/32/27-3C30	43120205591
E65/32/27-3C80	43120203438
E65/32/27-3C80-G1250	43120203587
E65/32/27-3C80-G150	43120203512
E65/32/27-3C80-G450	43120203515
E65/32/27-3C85	43120204612
E65/32/27-3C85-E400	43350001458
E65/32/27-3C85-E630	43350001459
E65/32/27-3C85-E1000	43350001460
E65/32/27-3C85-A1600	43350001461
E65/32/27-3C85-A2500	43350001462
E65/32/27-3C85-G1250	43120204615
E65/32/27-3C85-G150	43120204613
E65/32/27-3C85-G450	43120204614
E65/32/27-3C90	43120205548
E65/32/27-3F3	43120204594
E65/32/27-3F3-E400	43350001470
E65/32/27-3F3-E630	43350001471

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
E65/32/27-3F3-E1000	43350001472
E65/32/27-3F3-A1600	43350001473
E65/32/27-3F3-A2500	43350001474
E65/32/27-3F3-G1250	43120204597
E65/32/27-3F3-G150	43120204595
E65/32/27-3F3-G450	43120204596
E71/33/32-3C30	43120205592
E71/33/32-3C85	43120205503
E71/33/32-3C90	43120205593
E80/38/20-3C81	43350001487
E80/38/20-3C81-E315	43350001488
E80/38/20-3C81-E400	43350001489
E80/38/20-3C81-E630	43350001490
E80/38/20-3C81-A1000	43350001491
E80/38/20-3C81-A1600	43350001492
E80/38/20-3C85	43350001493
E80/38/20-3C85-E315	43350001494
E80/38/20-3C85-E400	43350001495
E80/38/20-3C85-E630	43350001496
E80/38/20-3C85-A1000	43350001497
E80/38/20-3C85-A1600	43350001498
E80/38/20-3C90	43350001499
E80/38/20-3F3	43350001505
E80/38/20-3F3-E315	43350001500
E80/38/20-3F3-E400	43350001501
E80/38/20-3F3-E630	43350001502
E80/38/20-3F3-A1000	43350001503
E80/38/20-3F3-A1600	43350001504
FIB	43220213072
H10-3E25	43220203304
H10-3E25-S	43220203306
H16-3E25	43220203303
H20-3E25	43220203300
H7-3E25	43220203302
IMP10/4.5/170-3B1	43300303099
IMP10/4.5/200-3C85	43300303123
IMP12/5.5/170-3B1	43300303125
IMP12/5.5/200-3C85	43300303124
IMP6/3/200-3C85	43300303121
IMP6/3/200-3B1	43300303119
IMP8/3/125-3B1	43300303097
IMP8/3/200-3C85	43300303122
I100/25/25-3C80	43120203361
I15/3/3-3C80	43120204325
I20/6/5-3C80	43120204326
I25/7/7-3C80	31221349062
I25/7/7-3C80	43120204327
I93/28/16-3C80	43120203356

TYPE NUMBER	11 NC
I93/28/30-3C80	43120203359
MHB2-13/8/6-3C85	43130204005
MHB2-13/8/6-4B1	43130204003
MHB2-144.3/14-4B1	43120203152
MHB2-14/8.5/8-4B1	43120203157
MHC2-5.6/12-4B1	43300303274
MHC6-6/10-3B1	43120203150
MHC6-6/10-4B1	43120203155
MHR2-11/5.4/11-3C85	43130202080
MHR2-11/5.4/11-4A11	43130202057
MHR6-6.1/4/10-3B1	43120203153
MSC12/7.5/9.5-3C85	31280649022
NUT	43220213071
PH14/7.5-3H1	43220205480
PH26/9.2-3H1	43220205490
PH5.6/3.6-3D3	43220205421
PH7.4/3.9-3D3	43220205451
PH9.4/4.8-3D3	43220205471
PIN-EC	43350002738
PINH-EC	43350002739
P7/4-3B7	43350000401
P7/4-3B7-A100	43350000402
P7/4-3B7-A160	43350000403
P7/4-3B9	43350000404
P7/4-3B9-A100	43350000405
P7/4-3B9-A160	43350000406
P7/4-3D3	4335000
P7/4-3E5	43350000407
P7/4-3H1-A100	43220250704
P7/4-3H1-A63	43220250703
P7/4-3H1-A970	43220250700
P9/5-3B7	43350000408 43220202097
P9/5-3B7-A63	43350000409
P9/5-3B7-A63/N	43350000423
P9/5-3B7-A100	43350000411 43220224104
P9/5-3B7-A100/N	43350000412 43220226104
P9/5-3B7-A160	43350000413
P9/5-3B7-A160/N	43350000414
P9/5-3B9	43350000416
P9/5-3B9-A63	43350000418
P9/5-3B9-A63/N	43350000949
P9/5-3B9-A100	43350000419
P9/5-3B9-A100/N	43350000420
P9/5-3B9-A160	43350000421
P9/5-3B9-A160/N	43350000422

TYPE NUMBER	11 NC
P9/5-3B9-3E5	43350000426
P9/5-3D3-E40	43220224142
P9/5-3D3-E40/N	43220226142
P9/5-3D3-E63	43220224143
P9/5-3D3-E63/N	43220226143
P9/5-3D3	43220224140
P9/5-3H1-A100	43220224124
P9/5-3H1-A100/N	43220226124
P9/5-3H1	43220224120
P9/5-3H1-A160	43220224125
P9/5-3H1-A160/N	43220226125
P9/5-3H1-A63	43220224123
P9/5-3H1-A63/N	43220226123
P9/5-4C6	43220224179
P9/5-4C6-E16	43220224180
P9/5-4C6-E16/N	43220226180
P9/5-4C6-E25	43220224181
P9/5-4C6-E25/N	43220226181
P9/5-4C6-E40	43220224182
P9/5-4C6-E40/N	43220226182
P11/7-3B7	43350000438 43220202100
P11/7-3B7-A100	43350000439 43220220104
P11/7-3B7-A100/N	43350000449 43220222104
P11/7-3B7-A160	43350000441 43220220105
P11/7-3B7-A160/N	43350000450 43220222105
P11/7-3B7-A250	43350000442 43220220106
P11/7-3B7-A250/N	43350000451 43220222106
P11/7-3B8-A100	43220220190
P11/7-3B8-A160	43220220191
P11/7-3B8	43220220188
P11/7-3B8-A250	43220220192
P11/7-3B9	43350000445
P11/7-3B9-A100	43350000446
P11/7-3B9-A100/N	43350000452
P11/7-3B9-A160	43350000447
P11/7-3B9-A160/N	43350000453
P11/7-3B9-A250	43350000448
P11/7-3B9-A250/N	43350000454
P11/7-3C81	43350000427
P11/7-3C81-A100	43350000428
P11/7-3C81-A160	43350000429
P11/7-3C81-A250	43350000430

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P11/7-3E4	43220220164
P11/7-3E5	43350000455
P11/7-3F3	43350000431
	43220220169
P11/7-3F3-A100	43350000432
	43220220171
P11/7-3F3-A160	43350000433
	43220220172
P11/7-3F3-A250	43350000434
	43220220173
P11/7-3D3-A100	43220220144
P11/7-3D3-A100/N	43220222144
P11/7-3D3-E16	43220220140
P11/7-3D3-E16/N	43220222140
P11/7-3D3-E25	43220220141
P11/7-3D3-E25/N	43220222141
P11/7-3D3-E40	43220220142
P11/7-3D3-E40/N	43220222142
P11/7-3D3-A63	43220220143
P11/7-3D3-A63/N	43220222143
P11/7-3D3	43220220139
P11/7-3H1-A100	43220220124
P11/7-3H1-A100/N	43220222124
P11/7-3H1-A160	43220220125
P11/7-3H1-A160/N	43220222125
P11/7-3H1	43220220120
P11/7-3H1-A250	43220220126
P11/7-3H1-A250/N	43220222126
P11/7-3H3-A160	43220220155
P11/7-3H3-A160/N	43220222155
P11/7-3H3	43220220150
P11/7-3H3-A250	43220220156
P11/7-3H3-A250/N	43220222156
P11/7-4C6	43220220179
P11/7-4C6-E25	43220220181
P11/7-4C6-E25/N	43220222181
P11/7-4C6-E40	43220220182
P11/7-4C6-E40/N	43220222182
P11/7/I-3C81	43350000875
P11/7/I-3C81-A63	43350000876
P11/7/I-3C81-A100	43350000877
P11/7/I-3C81-A160	43350000878
P11/7/I-3C81-A250	43350000879
P11/7/I-3C81-A315	43350000880
P11/7/I-3C85	43350000881
P11/7/I-3C85-A63	43350000882
P11/7/I-3C85-A100	43350000883
P11/7/I-3C85-A160	43350000884
P11/7/I-3C85-A250	43350000885

TYPE NUMBER	11 NC
P11/7/I-3C85-A315	43350000886
P11/7/I-3F3	43350000887
P11/7/I-3F3-A63	43350000888
P11/7/I-3F3-A100	43350000889
P11/7/I-3F3-A160	43350000890
P11/7/I-3F3-A250	43350000891
P11/7/I-3F3-A315	43350000892
P14/8-3B7	43350000485
	43220202125
P14/8-3B7-E63	43350000486
P14/8-3B7-E63/N	43350000487
P14/8-3B7-E100	43350000488
	43220220304
P14/8-3B7-E100/N	43350000489
	43220222304
P14/8-3B7-E160	43350000490
	43220220305
P14/8-3B7-E160/N	43350000491
	43220222305
P14/8-3B7-A250	43350000492
	43220220306
P14/8-3B7-A250/N	43350000493
	43220222306
P14/8-3B7-A315	43350000494
	43220220307
P14/8-3B7-A315/N	43350000950
	43220222307
P14/8-3B8-A160	43220220385
P14/8-3B8	43220220397
P14/8-3B8-A250	43220220386
P14/8-3B8-A315	43220220387
P14/8-3B8-A400	43220220388
P14/8-3B8-A630	43220220389
P14/8-3B9	43350000491
P14/8-3B9-E63	43350000500
P14/8-3B9-E63/N	43350000951
P14/8-3B9-E100	43350000501
P14/8-3B9-E100/N	43350000502
P14/8-3B9-E160	43350000503
P14/8-3B9-E160/N	43350000504
P14/8-3B9-A250	43350000506
P14/8-3B9-A250/N	43350000507
P14/8-3B9-A315	43350000508
P14/8-3B9-A315/N	43350000952
P14/8-3C81	43350000456
P14/8-3C81-E63	43350000457
P14/8-3C81-A100	43350000458
P14/8-3C81-A160	43350000460
P14/8-3C81-A250	43350000462

TYPE NUMBER	11 NC
P14/8-3C81-A315	43350000463
P14/8-3C85	43220220366
	43350000465
P14/8-3C85-E63	43350000466
P14/8-3C85-A100	43350000467
	43220220371
P14/8-3C85-A160	43350000468
	43220220367
P14/8-3C85-A250	43350000468
	43220220368
P14/8-3C85-A315	43350000471
	43220220369
P14/8-3C85-A400	43220220370
P14/8-3D3-E40	43220220342
P14/8-3D3-E40/N	43220222342
P14/8-3D3-E100	43220220344
P14/8-3D3-E100/N	43220222344
P14/8-3D3	43220220340
P14/8-3D3-E63	43220220343
P14/8-3D3-E63/N	43220222343
P14/8-3E1	43220220379
P14/8-3E4	43220220377
P14/8-3E5	43350000516
	43220220373
P14/8-3E25	43350000514
P14/8-3E27	43350000515
P14/8-3F3	43220220392
	43350000472
P14/8-3F3-E63	43350000473
P14/8-3F3-A100	43350000475
	43220220376
P14/8-3F3-A160	43220220393
	43350000476
P14/8-3F3-A250	43220220394
	43350000478
P14/8-3F3-A315	43220220395
	43350000479
P14/8-3F3-A400	43220220396
P14/8-3F4	43220253300
P14/8-3F4-A160	43220253301
P14/8-3F4-A250	43220253302
P14/8-3F4-A315	43220253303
P14/8-3H1-A160	43220220325
P14/8-3H1-A160/N	43220222325
P14/8-3H1	43220220321
P14/8-3H1-A250	43220220326
P14/8-3H1-A250/N	43220222326
P14/8-3H1-A315	43220220327
P14/8-3H1-A315/N	43220222327

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P14/8-3H1-A400	43220220328
P14/8-3H1-A400/N	43220222328
P14/8-3H1-A630	43220220330
P14/8-3H1-A630/N	43220222330
P14/8-3H3-A160	43220220355
P14/8-3H3-A160/N	43220222355
P14/8-3H3	43220220360
P14/8-3H3-A250	43220220356
P14/8-3H3-A250/N	43220222356
P14/8-3H3-A315	43220220357
P14/8-3H3-A315/N	43220222357
P14/8-3H3-A400	43220220358
P14/8-3H3-A400/N	43220222358
P14/8-4C6	43220220380
P14/8-4C6-E25	43220220381
P14/8-4C6-E25/N	43220222381
P14/8-4C6-E40	43220220382
P14/8-4C6-E40/N	43220222382
P14/8-4C6-E63	43220220383
P14/8-4C6-E63/N	43220222383
P14/8/I-3C81	43350000894
P14/8/I-3C81-A100	43350000895
P14/8/I-3C81-A160	43350000896
P14/8/I-3C81-A250	43350000897
P14/8/I-3C81-A315	43350000898
P14/8/I-3C81-A400	43350000899
P14/8/I-3C85	43350000900
P14/8/I-3C85-A100	43350000901
P14/8/I-3C85-A160	43350000902
P14/8/I-3C85-A250	43350000903
P14/8/I-3C85-A315	43350000904
P14/8/I-3C85-A400	43350000905
P14/8/I-3F3	43350000906
P14/8/I-3F3-A100	43350000907
P14/8/I-3F3-A160	43350000908
P14/8/I-3F3-A250	43350000909
P14/8/I-3F3-A315	43350000910
P14/8/I-3F3-A400	43350000911
P18/11-3B7	43350000544 43220202150
P18/11-3B7-E100	43350000545 43220220504
P18/11-3B7-E100/N	43350000561 43220222504
P18/11-3B7-E160	43350000546 43220220505
P18/11-3B7-E160/N	43350000562 43220222505
P18/11-3B7-A250	43350000547 43220220506
P18/11-3B7-A250/N	43350000563 43220222506
P18/11-3B7-A315	43350000548 43220220507
P18/11-3B7-A315/N	43350000564 43220222507
P18/11-3B7-A400	43350000549 43220220508
P18/11-3B7-A400/N	43350000565 43220222508
P18/11-3B7-A630	43350000551 43220220510
P18/11-3B7-A630/N	43350000953 43220222510
P18/11-3B8	43220220577
P18/11-3B8-A160	43220220591
P18/11-3B8-A250	43220220592
P18/11-3B8-A315	43220220590
P18/11-3B8-A400	43220220594
P18/11-3B8-A630	43220220595
P18/11-3B9	43350000552
P18/11-3B9-E100	43350000553
P18/11-3B9-E100/N	43350000561
P18/11-3B9-A250	43350000555
P18/11-3B9-A250/N	43350000568
P18/11-3B9-A315	43350000556
P18/11-3B9-A315/N	43350000569
P18/11-3B9-A400	43350000557
P18/11-3B9-A400/N	43350000570
P18/11-3C81	43350000517
P18/11-3C81-E100	43350000519
P18/11-3C81-A160	43350000521
P18/11-3C81-A250	43350000523
P18/11-3C81-A315	43350000524
P18/11-3C81-A400	43350000525
P18/11-3C85	43350000526 43220220578
P18/11-3C85-E100	43350000528
P18/11-3C85-A160	43220220586 43350000530
P18/11-3C85-A250	43220220587 43350000532
P18/11-3C85-A315	43350000533 43220220588
P18/11-3C85-A400	43350000534 43220220589
P18/11-3D3-E63	43220220543
P18/11-3D3-E63/N	43220222543
P18/11-3D3-E100	43220220544
P18/11-3D3-E100/N	43220222544
P18/11-3D3	43220220540
P18/11-3D3-E160	43220220545
P18/11-3D3-E160/N	43220222545
P18/11-3E1	43220220547
P18/11-3E4	43220220579
P18/11-3E5	43350000573
P18/11-3E25	43350000571
P18/11-3E27	43350000572
P18/11-3F3-A160	43220220568 43350000538
P18/11-3F3-A250	43220220569 43350000539
P18/11-3F3	43220220566 43350000535
P18/11-3F3-A315	43220220570 43350000540
P18/11-3F3-A400	43220220571 43350000541
P18/11-3F4	43220253400
P18/11-3F4-160	43220253401
P18/11-3F4-250	43220253402
P18/11-3F4-315	43220253403
P18/11-3F4-400	43220253404
P18/11-3H1-E160	43220220525
P18/11-3H1-E160/N	43220222525
P18/11-3H1-A250	43220220526
P18/11-3H1-A250/N	43220222526
P18/11-3H1-A315	43220220527
P18/11-3H1-A315/N	43220222527
P18/11-3H1-A3400	43220220521
P18/11-3H1-A400	43220220528
P18/11-3H1-A400/N	43220222528
P18/11-3H3-E160	43220220555
P18/11-3H3-E160/N	43220222555
P18/11-3H3-A250	43220220556
P18/11-3H3-A250/N	43220222556
P18/11-3H3-A3100	43220220550
P18/11-3H3-A315	43220220557
P18/11-3H3-A315/N	43220222557
P18/11-3H3-A400	43220220558
P18/11-3H3-A400/N	43220222558
P18/11-4C6	43220220580
P18/11-4C6-E25	43220220581
P18/11-4C6-E25/N	43220222581
P18/11-4C6-E40	43220220582
P18/11-4C6-E40/N	43220222582

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P18/11-4C6-E63	43220220583
P18/11-4C6-E63/N	43220222583
P18/11/I-3C81	43350000912
P18/11/I-3C81-A160	43350000913
P18/11/I-3C81-A250	43350000914
P18/11/I-3C81-A315	43350000915
P18/11/I-3C81-A400	43350000916
P18/11/I-3C81-A630	43350000917
P18/11/I-3C85	43350000918
P18/11/I-3C85-A160	43350000919
P18/11/I-3C85-A250	43350000920
P18/11/I-3C85-A315	43350000921
P18/11/I-3C85-A400	43350000922
P18/11/I-3C85-A630	43350000923
P18/11/I-3F3	43350000924
P18/11/I-3F3-A160	43350000925
P18/11/I-3F3-A250	43350000926
P18/11/I-3F3-A315	43350000927
P18/11/I-3F3-A400	43350000928
P18/11/I-3F3-A630	43350000929
P22/13-3B7	43350000613 43220202175
P22/13-3B7-E160	43350000615 43220220705
P22/13-3B7-E160/N	43350000621 43220222705
P22/13-3B7-E250	43350000616 43220220706
P22/13-3B7-E250/N	43350000632 43220222706
P22/13-3B7-A315	43350000617 43220220707
P22/13-3B7-A315/N	43350000633 43220222707
P22/13-3B7-A400	43350000618 43220220708
P22/13-3B7-A400/N	43350000634 43220222708
P22/13-3B7-A630	43350000620 43220220710
P22/13-3B7-A630/N	43350000635 43220222710
P22/13-3B8-A160	43220220791
P22/13-3B8-A250	43220220792
P22/13-3B8-A315	43220220793
P22/13-3B8-A400	43220220794
P22/13-3B8	43220220797
P22/13-3B8-A630	43220220795
P22/13-3B9	43350000623

TYPE NUMBER	11 NC
P22/13-3B9-E160	43350000625
P22/13-3B9-E160/N	43350000636
P22/13-3B9-E250	43350000626
P22/13-3B9-E250/N	43350000637
P22/13-3B9-A315	43350000627
P22/13-3B9-A315/N	43350000638
P22/13-3B9-A400	43350000628
P22/13-3B9-A400/N	43350000629
P22/13-3B9-A630	43350000631
P22/13-3B9-A630/N	43350000640
P22/13-3C81	43350000574
P22/13-3C81-A160	43350000579
P22/13-3C81-A250	43350000580
P22/13-3C81-A315	43350000581
P22/13-3C81-A400	43350000582
P22/13-3C81-A630	43350000585
P22/13-3C85-A160	43220220785 43350000589
P22/13-3C85-A250	43220220786 43350000590
P22/13-3C85-A315	43220220787 43350000600
P22/13-3C85	43220220777 43350000586
P22/13-3C85-A400	43220220788 43350000601
P22/13-3C85-A630	43220220789 43350000603
P22/13-3D3-E40	43220220742
P22/13-3D3-E40/N	43220222742
P22/13-3D3-E63	43220220743
P22/13-3D3-E63/N	43220222743
P22/13-3D3-E100	43220220744
P22/13-3D3-E100/N	43220222744
P22/13-3D3-E160	43220220745
P22/13-3D3-E160/N	43220222745
P22/13-3D3	43220220740
P22/13-3E1	43220220772
P22/13-3E4	43220220790
P22/13-3E5	43350000643
P22/13-3E25	43350000641
P22/13-3E27	43350000642
P22/13-3F3-A160	43220220765 43350000607
P22/13-3F3-A250	43220220766 43350000608
P22/13-3F3-A315	43220220767 43350000609

TYPE NUMBER	11 NC
P22/13-3F3	43220220764 43350000604
P22/13-3F3-A400	43220220768 43350000610
P22/13-3F3-A630	43220220769 43350000612
P22/13-3F4	43220253500
P22/13-3F4-A160	43220253501
P22/13-3F4-A250	43220253502
P22/13-3F4-A315	43220253503
P22/13-3F4-A400	43220253504
P22/13-3F4-A630	43220253505
P22/13-3H1-E160	43220220725
P22/13-3H1-E160/N	43220222725
P22/13-3H1-E250	43220220726
P22/13-3H1-E250/N	43220222726
P22/13-3H1-A315	43220220727
P22/13-3H1-A315/N	43220222727
P22/13-3H1-A400	43220220728
P22/13-3H1-A400/N	43220222728
P22/13-3H1-A4300	43220220720
P22/13-3H1-A630	43220220730
P22/13-3H1-A630/N	43220222730
P22/13-3H3-E160	43220220755
P22/13-3H3-E160/N	43220222755
P22/13-3H3-E250	43220220756
P22/13-3H3-E250/N	43220222756
P22/13-3H3-A315	43220220757
P22/13-3H3-A315/N	43220222757
P22/13-3H3	43220220759
P22/13-3H3-A400	43220220758
P22/13-3H3-A400/N	43220222758
P22/13-3H3-A630	43220220760
P22/13-3H3-A630/N	43220222760
P22/13-4C6-E25	43220220781
P22/13-4C6-E25/N	43220222781
P22/13-4C6	43220220779
P22/13-4C6-E40	43220220782
P22/13-4C6-E40/N	43220222782
P22/13-4C6-E63	43220220783
P22/13-4C6-E63/N	43220222783
P22/13/I-3C81	43350000930
P22/13/I-3C81-A250	43350000931
P22/13/I-3C81-A315	43350000932
P22/13/I-3C81-A400	43350000933
P22/13/I-3C81-A630	43350000934
P22/13/I-3C81-A1000	43350000935
P22/13/I-3C85	43350000936

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P22/13/I-3C85-A250	43350000937
P22/13/I-3C85-A315	43350000938
P22/13/I-3C85-A400	43350000939
P22/13/I-3C85-A630	43350000940
P22/13/I-3C85-A1000	43350000941
P22/13/I-3F3	43350000943
P22/13/I-3F3-A250	43350000944
P22/13/I-3F3-A315	43350000945
P22/13/I-3F3-A400	43350000946
P22/13/I-3F3-A630	43350000947
P22/13/I-3F3-A1000	43350000948
P26/16-3B7	43350000675
	43220202200
P26/16-3B7-E160	433500000200
	43220220905
P26/16-3B7-E160/N	43350000688
	43220222905
P26/16-3B7-E250	43350000202
	43220220906
P26/16-3B7-E250/N	43350000689
	43220222906
P26/16-3B7-E315	43350000204
	43220220907
P26/16-3B7-E315/N	43350000690
	43220222907
P26/16-3B7-A400	43350000205
	43220220908
P26/16-3B7-A400/N	43350000691
	43220222908
P26/16-3B7-A630	43350000677
	43220220910
P26/16-3B7-A630/N	43350000693
	43220222910
P26/16-3B8-A250	43220220986
P26/16-3B8-A315	43220220987
P26/16-3B8-A400	43220220988
P26/16-3B8	43220220985
P26/16-3B8-A630	43220220989
P26/16-3B9	43350000680
P26/16-3B9-E160	43350000201
P26/16-3B9-E160/N	43350000681
P26/16-3B9-E250	43350000203
P26/16-3B9-E250/N	43350000696
P26/16-3B9-E315	43350000682
P26/16-3B9-E315/N	43350000697
P26/16-3B9-A400	43350000683
P26/16-3B9-A400/N	43350000684
P26/16-3B9-A630	43350000686
P26/16-3B9-A630/N	43350000699

TYPE NUMBER	11 NC
P26/16-3C81	43350000644
P26/16-3C81-E100	43350000645
P26/16-3C81-E160	43350000646
P26/16-3C81-A250	43350000649
P26/16-3C81-A315	43350000650
P26/16-3C81-A400	43350000651
P26/16-3C81-A630	43350000654
P26/16-3C85-E160	43350000659
	43220253025
P26/16-3C85-A250	43220253026
	43350000661
P26/16-3C85-A315	43220253027
	43350000662
P26/16-3C85-A400	43220253028
	43350000663
P26/16-3C85	43220220973
	43350000657
P26/16-3C85-A630	43220253030
	43350000665
P26/16-3D3-E100	43220220944
P26/16-3D3-E100/N	43220222944
P26/16-3D3-E160	43220220945
P26/16-3D3-E160/N	43220222945
P26/16-3D3	43220220949
P26/16-3D3-E250	43220220946
P26/16-3D3-E250/N	43220222946
P26/16-3E1	43220220967
P26/16-3E4	43220220965
P26/16-3E5	43350000701
P26/16-3E25	43350000700
P26/16-3E27	43350000701
P26/16-3F3-A250	43220253046
	43350000670
P26/16-3F3-A315	43220253047
	43350000671
P26/16-3F3-A400	43220253048
	43350000672
P26/16-3F3	43220220950
	43350000666
P26/16-3F3-A630	43220253050
	43350000674
P26/16-3H1-E160	43220220925
P26/16-3H1-E160/N	43220222925
P26/16-3H1-E250	43220220926
P26/16-3H1-E250/N	43220222926
P26/16-3H1-E315	43220220927
P26/16-3H1-E315/N	43220222927
P26/16-3H1-E400	43220220928
P26/16-3H1-E400/N	43220222928

TYPE NUMBER	11 NC
P26/16-3H1	43220220972
P26/16-3H1-A630	43220220930
P26/16-3H1-A630/N	43220222930
P26/16-3H3-E160	43220220955
P26/16-3H3-E160/N	43220222955
P26/16-3H3-E250	43220220956
P26/16-3H3-E250/N	43220222956
P26/16-3H3-E315	43220220957
P26/16-3H3-E315/N	43220222957
P26/16-3H3-E400	43220220958
P26/16-3H3-E400/N	43220222958
P26/16-3H3	43220220951
P26/16-3H3-A630	43220220960
P26/16-3H3-A630/N	43220222960
P26/16-4C6-E100	43220220984
P26/16-4C6-E100/N	43220222984
P26/16-4C6	43220220980
P26/16-4C6-E63	43220220983
P26/16-4C6-E63/N	43220222983
P26/16/I-3C81	43350000954
P26/16/I-3C81-A250	43350000955
P26/16/I-3C81-A315	43350000956
P26/16/I-3C81-A400	43350000957
P26/16/I-3C81-A630	43350000958
P26/16/I-3C81-A1000	43350000959
P26/16/I-3C85	43350000960
P26/16/I-3C85-A250	43350000961
P26/16/I-3C85-A315	43350000962
P26/16/I-3C85-A400	43350000963
P26/16/I-3C85-A630	43350000964
P26/16/I-3C85-A1000	43350000965
P26/16/I-3F3	43350000966
P26/16/I-3F3-A250	43350000967
P26/16/I-3F3-A315	43350000968
P26/16/I-3F3-A400	43350000969
P26/16/I-3F3-A630	43350000970
P26/16/I-3F3-A1000	43350000971
P30/19-3B7	43350000737
P30/19-3B7-E250	43350000738
	43220221106
P30/19-3B7-E250/N	43350000752
	43220223106
P30/19-3B7-E315	43350000739
	43220221107
P30/19-3B7-E315/N	43350000753
	43220223107
P30/19-3B7-E400	43350000740
	43220221108

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P30/19-3B7-E400/N	43350000754 43220223108
P30/19-3B7-A630	43350000742 43220221110
P30/19-3B7-A630/N	43350000756 43220223110
P30/19-3B7-A1000	43350000743 43220221111
P30/19-3B7-A1000/N	43350000757 43220223111
P30/19-3B8-A250	43220221184
P30/19-3B8-A315	43220221185
P30/19-3B8-A400	43220221186
P30/19-3B8-A630	43220221187
P30/19-3B8	43220221182
P30/19-3B9	43350000745
P30/19-3B9-E250	43350000746
P30/19-3B9-E250/N	43350000759
P30/19-3B9-E315	43350000747
P30/19-3B9-E315/N	43350000760
P30/19-3B9-E400	43350000748
P30/19-3B9-E400/N	43350000761
P30/19-3B9-A630	43350000750
P30/19-3B9-A630/N	43350000763
P30/19-3B9-A1000	43350000751
P30/19-3B9-A1000/N	43350000764
P30/19-3C81	43350000703
P30/19-3C81-E250	43350000709
P30/19-3C81-A315	43350000711
P30/19-3C81-A400	43350000712
P30/19-3C81-A630	43350000714
P30/19-3C81-A1000	43350000716
P30/19-3C85	43220221160 43350000717
P30/19-3C85-E250	43220221164 43350000720
P30/19-3C85-A315	43220221165 43350000721
P30/19-3C85-A400	43220221166 43350000722
P30/19-3C85-A630	43220221167 43350000724
P30/19-3C85-A1000	43220221168 43350000726
P30/19-3E1	43220221191
P30/19-3E4	43220221190
P30/19-3E5	43350000767
P30/19-3E25	43350000765
P30/19-3E27	43350000766

TYPE NUMBER	11 NC
P30/19-3F3-E250	43220221151 43350000730
P30/19-3F3-A315	43220221152 43350000731
P30/19-3F3-A400	43220221153 43350000732
P30/19-3F3	43220221148 43350000727
P30/19-3F3-A630	43220221154 43350000734
P30/19-3F3-A1000	43350000736 43220221155
P30/19-3H1-A1000	43220221131
P30/19-3H1-A1000/N	43220223131
P30/19-3H1-A1600	43220221132
P30/19-3H1-E250	43220221126
P30/19-3H1-E250/N	43220223126
P30/19-3H1-E315	43220221127
P30/19-3H1-E315/N	43220223127
P30/19-3H1-E400	43220221128
P30/19-3H1-E400/N	43220223128
P30/19-3H1-A630	43220221130
P30/19-3H1-A630/N	43220223130
P30/19-3H1	43220221120
P36/22-3B7	43350000795 43220202250
P36/22-3B7-E315	43350000797 43220221307
P36/22-3B7-E315/N	43350000814 43220223307
P36/22-3B7-E400	43350000798 43220221308
P36/22-3B7-E400/N	43350000815 43220223308
P36/22-3B7-E630	43350000800 43220221310
P36/22-3B7-E630/N	43350000817 43220223310
P36/22-3B7-A1000	43350008001 43220221311
P36/22-3B7-A1000/N	43350000818 43220223311
P36/22-3B7-A1600	43350000802 43220221312
P36/22-3B7-A1600/N	43350000819 43220223312
P36/22-3B8-A250	43220221381
P36/22-3B8-A315	43220221382
P36/22-3B8-A400	43220221383

TYPE NUMBER	11 NC
P36/22-3B8-A630	43220221384
P36/22-3B8	43220221378
P36/22-3B9	43350000803
P36/22-3B9-E315	43350000806
P36/22-3B9-E315/N	43350000822
P36/22-3B9-E400	43350000807
P36/22-3B9-E400/N	43350000823
P36/22-3B9-E630	43350000810
P36/22-3B9-E630/N	43350000825
P36/22-3B9-A1000	43350000811
P36/22-3B9-A1000/N	43350000826
P36/22-3B9-A1600	43350000812
P36/22-3B9-A1600/N	43350000972
P36/22-3C81	43350000768
P36/22-3C81-E315	43350000772
P36/22-3C81-E400	43350000773
P36/22-3C81-A630	43350000774
P36/22-3C81-A1000	43350000776
P36/22-3C81-A1600	43350000777
P36/22-3C85-E250	43220221364
P36/22-3C85-E315	43220221365 43350000781
P36/22-3C85-E400	43220221366 43350000782
P36/22-3C85-A630	43220221367 43350000783
P36/22-3C85	43220221360 43350000778
P36/22-3C85-A1000	43350000784 43220221368
P36/22-3C85-A1600	43350000785
P36/22-3E1	43220221396
P36/22-3E4	43220221397
P36/22-3E5	43350000829
P36/22-3E25	43350000827
P36/22-3E27	43350000828
P36/22-3F3-E250	43220221351
P36/22-3F3-E315	43220221352 43350000790
P36/22-3F3-E400	43220221353 43350000791
P36/22-3F3-A630	43220221354 43350000792
P36/22-3F3-A1000	43350000793 43220221355
P36/22-3F3-A1600	43350000794
P36/22-3F3	43220221350 43350000787
P36/22-3H1-A1000	43220221331

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
P36/22-3H1-A1000/N	43220223331
P36/22-3H1-A1600	43220221332
P36/22-3H1-A1600/N	43220223332
P36/22-3H1-A400	43220221328
P36/22-3H1-A400/N	43220223328
P36/22-3H1-A630	43220221330
P36/22-3H1-A630/N	43220223330
P36/22-3H1	43220221320
P42/29-3B7	43350000857
P42/29-3B7-E315	43350000859
P42/29-3B7-E315/N	43350000865
P42/29-3B7-E400	43350000860
P42/29-3B7-E400/N	43350000866
P42/29-3B7-E630	43350000862
P42/29-3B7-E630/N	43350000868
P42/29-3B7-A1000	43350000863
P42/29-3B7-A1000/N	43350000869
P42/29-3B7-A1600	43350000864
P42/29-3B7-A1600/N	43350000870
P42/29-3C81	43350000830
P42/29-3C81-E315	43350000973
P42/29-3C81-E400	43350000835
P42/29-3C81-A630	43350000836
P42/29-3C81-A1000	43350000838
P42/29-3C81-A1600	43350000839
P42/29-3C85-E315	43220221593 43350000843
P42/29-3C85-E400	43220221594 43350000844
P42/29-3C85-A630	43220221595 43350000845
P42/29-3C85-A1000	43350000847 43220221596
P42/29-3C85-A1600	43350000848 43220221597
P42/29-3C85	43220221590 43350000840
P42/29-3F3-E315	43220221583 43350000852
P42/29-3F3-E400	43220221584 43350000853
P42/29-3F3-A630	43220221585 43350000854
P42/29-3F3-A1000	43350000856 43220221586
P42/29-3F3-A1600	43350000974
P42/29-3F3	43220221580 43350000849
P42/29-3H1-A1000	43220221531

TYPE NUMBER	11 NC
P42/29-3H1-A1000/N	43220223531
P42/29-3H1-A1600	43220221532
P42/29-3H1-A1600/N	43220223532
P42/29-3H1-E315	43220221527
P42/29-3H1-A315/N	43220223527
P42/29-3H1-A400	43220221528
P42/29-3H1-A400/N	43220223528
P42/29-3H1-E315/N	43220223527
P42/29-3H1-E400	43220221528
P42/29-3H1-E400/N	43220223528
P42/29-3H1-A630	43220221530
P42/29-3H1-A630/N	43220223530
P42/29-3H1	43220221520
P66/56-3C81	43350000871
P66/56-3E1	43220221700
P66/56-3F3	43220221710
PLT14/5/1.5-3F3	43220209753
PLT14/5/1.5-3F4	43220209755
PLT18/10/2-3F3	43220209757
PLT18/10/2-3F4	43220209759
PLT22/16/2.5-3F3	43220209761
PLT22/16/2.5-3F4	43220209766
PLT32/20/3-3F3	43350000145
PLT32/20/3-3F4	43350000161
PLT38/25/4-3C85	43350000165
PLT38/25/4-3F3	43350000166
PLT38/25/4-3F4	43350000167
PLT43/28/4-3C85	43350000256
PLT43/28/4-3F3	43350000257
PLT43/28/4-3F4	43350000258
PLT58/38/4-3C85	43350000273
PLT58/38/4-3F3	43350000274
PLT58/38/4-3F4	43350000275
PLT64/50/5-3F3	4335000
PLT64/50/5-3F4	4335000
PT14/8-3B7	43350003021
PT14/8/3B7-E63	43350003022
PT14/8-3B7-A100	43350003024
PT14/8-3B7-A160	43350003026
PT14/8-3B7-A250	43350003028
PT14/8/3B7-A315	43350003030
PT14/8-3B9	43350003031
PT14/8-3B9-E63	43350003032
PT14/8-3B9-A100	43350003034
PT14/8-3B9-A160	43350003036
PT14/8-3B9-A250	43350003038
PT14/8-3B9-A315	43350000976
PT14/8-3C81	43350003000

TYPE NUMBER	11 NC
PT14/8-3C81-A63	43350003001
PT14/8-3C81-A100	43350003002
PT14/8-3C81-A160	43350003004
PT14/8-3C81-A250	43350003006
PT14/8-3C81-A315	43350003007
PT14/8-3C85	43350003009
PT14/8-3C85-A63	43350003010
PT14/8-3C85-A100	43350003011
PT14/8-3C85-A100	43350003012
PT14/8-3C85-A250	43350003013
PT14/8-3C85-A315	43350003014
PT14/8-3E5	43350003041
PT14/8-3E27	43350003040
PT14/8-3F3	43350003015
PT14/8-3F3-A63	43350003016
PT14/8-3F3-A100	43350003017
PT14/8-3F3-A160	43350003018
PT14/8-3F3-A250	43350003019
PT14/8-3F3-A315	43350003020
PT18/11-3B7	43350003060
PT18/11-3B7-E100	43350003061
PT18/11-3B7-E160	43350003062
PT18/11-3B7-A250	43350003063
PT18/11-3B7-A315	43350003064
PT18/11-3B7-A400	43350003065
PT18/11-3B9	43350003066
PT18/11-3B9-E100	43350003067
PT18/11-3B9-E160	43350003068
PT18/11-3B9-A250	43350003069
PT18/11-3B9-A315	43350003070
PT18/11-3B9-A400	43350003071
PT18/11-3C81	43350003042
PT18/11-3C81-A100	43350003043
PT18/11-3C81-A160	43350003044
PT18/11-3C81-A250	43350003045
PT18/11-3C81-A315	43350003046
PT18/11-3C81-A400	43350003047
PT18/11-3C85	43350003048
PT18/11-3C85-A100	43350003049
PT18/11-3C85-A160	43350003050
PT18/11-3C85-A250	43350003051
PT18/11-3C85-A315	43350003052
PT18/11-3C85-A400	43350003053
PT18/11-3E5	43350003073
PT18/11-3E27	43350003072
PT18/11-3F3	43350003054
PT18/11-3F3-A100	43350003055
PT18/11-3F3-A160	43350003056

Conversion list — Type number to 11NC

TYPE NUMBER	11 NC
PT18/11-3F3-A250	43350003057
PT18/11-3F3-A315	43350003058
PT18/11-3F3-A400	43350003059
PT23/11-3B9	43350003099
PT23/11-3B9-A160	43350003100
PT23/11-3B9-A250	43350003101
PT23/11-3B9-A315	43350003102
PT23/11-3B9-A400	43350003103
PT23/11-3B9-A630	43350003104
PT23/11-3C81	43350003074
PT23/11-3C81-A160	43350003075
PT23/11-3C81-A250	43350003076
PT23/11-3C81-A315	43350003077
PT23/11-3C81-A400	43350003079
PT23/11-3C81-A630	43350003080
PT23/11-3C85	43350003081
PT23/11-3C85-A160	43350003082
PT23/11-3C85-A250	43350003083
PT23/11-3C85-A315	43350003084
PT23/11-3C85-A400	43350003085
PT23/11-3C85-A630	43350003086
PT23/11-3E5	43350003106
PT23/11-3E27	43350003105
PT23/11-3F3	43350003087
PT23/11-3F3-A160	43350003088
PT23/11-3F3-A250	43350003089
PT23/11-3F3-A315	43350003090
PT23/11-3F3-A400	43350003091
PT23/11-3F3-A630	43350003092
PT23/18-3B9	43350003133
PT23/18-3B9-E160	43350003134
PT23/18-3B9-A250	43350003136
PT23/18-3B9-A315	43350003138
PT23/18-3B9-A400	43350003139
PT23/18-3B9-A630	433500030142
PT23/18-3C81	43350003107
PT23-18-3C81-A160	43350003108
PT23-18-3C81-A250	43350003110
PT23-18-3C81-A315	43350003111
PT23-18-3C81-A400	43350003112
PT23-18-3C81-A630	43350003014
PT23/18-3C85	43350003115
PT23/18-3C85-A160	43350003116
PT23/18-3C85-A250	43350003117
PT23/18-3C85-A315	43350003118
PT23/18-3C85-A400	43350003119
PT23/18-3C85-A630	43350003120
PT23/18-3E5	43350003144

TYPE NUMBER	11 NC
PT23/18-3E27	43350003143
PT23/18-3F3	43350003121
PT23/18-3F3-A160	43350003122
PT23/18-3F3-A250	43350003123
PT23/18-3F3-A315	43350003124
PT23/18-3F3-A400	43350003125
PT23/18-3F3-A630	43350003126
PT30/19-3B7	43350003168
PT30/19-3B7-E315	43350003171
PT30/19-3B7-A400	43350003172
PT30/19-3B7-A630	43350003174
PT30/19-3B7-A1000	43350003176
PT30/19-3B7-A1600	43350003177
PT30/19-3B9	43350003178
PT30/19-3B9-E315	43350003181
PT30/19-3B9-A400	43350003182
PT30/19-3B9-A630	43350003184
PT30/19-3B9-A1000	43350003187
PT30/19-3B9-A1600	43350000978
PT30/19-3C81	43350003145
PT30/19-3C81-A315	43350003148
PT30/19-3C81-A400	43350003149
PT30/19-3C81-A630	43350003150
PT30/19-3C81-A1000	43350003152
PT30/19-3C81-A1600	43350003153
PT30/19-3C85	43350003155
PT30/19-3C85-A315	43350003156
PT30/19-3C85-A400	43350003157
PT30/19-3C85-A630	43350003158
PT30/19-3C85-A1000	43350003159
PT30/19-3C85-A1600	43350003160
PT30/19-3E5	433500033190
PT30/19-3E27	43350003189
PT30/19-3F3	43350003161
PT30/19-3F3-A315	43350003163
PT30/19-3F3-A400	43350003164
PT30/19-3F3-A630	43350003165
PT30/19-3F3-A1000	43350003166
PT30/19-3F3-A1600	43350003167
PTS14/8-3B7	43350003208
PTS14/8-3B7-E63	43350003209
PTS14/8-3B7-E100	43350003210
PTS14/8-3B7-A160	43350003211
PTS14/8-3B7-A250	43350003212
PTS14/8-3B7-A315	43350003213
PTS14/8-3B9	43350003214
PTS14/8-3B9-E63	43350003215
PTS14/8-3B9-E100	43350003216

TYPE NUMBER	11 NC
PTS14/8-3B9-A160	43350003217
PTS14/8-3B9-A250	43350003218
PTS14/8-3B9-A315	43350003219
PTS14/8-3C81	43350003191
PTS14/8-3C81-A63	43350003192
PTS14/8-3C81-A100	43350003193
PTS14/8-3C81-A160	43350003194
PTS14/8-3C81-A250	43350003195
PTS14/8-3C81-A315	43350003196
PTS14/8-3C85	43350003197
PTS14/8-3C85-A63	43350003198
PTS14/8-3C85-A100	43350003199
PTS14/8-3C85-A160	43350003200
PTS14/8-3C85-A250	43350003201
PTS14/8-3C85-A315	43350003202
PTS14/8-3E5	43350003221
PTS14/8-3E27	43350003220
PTS14/8-3F3	4335000
PTS14/8-3F3-A63	43350003203
PTS14/8-3F3-A100	43350003204
PTS14/8-3F3-A160	43350003205
PTS14/8-3F3-A250	43350003206
PTS14/8-3F3-A315	43350003207
PTS18/11-3B7	43350003240
PTS18/11-3B7-E100	43350003241
PTS18/11-3B7-E160	43350003242
PTS18/11-3B7-A250	43350003243
PTS18/11-3B7-A315	43350003244
PTS18/11-3B7-A400	43350003245
PTS18/11-3B9	43350003246
PTS18/11-3B9-E100	43350003247
PTS18/11-3B9-E160	43350003248
PTS18/11-3B9-A250	43350003249
PTS18/11-3B9-A315	43350003250
PTS18/11-3B9-A400	43350003251
PTS18/11-3C81	43350003222
PTS18/11-3C81-A100	43350003223
PTS18/11-3C81-A160	43350003224
PTS18/11-3C81-A250	43350003225
PTS18/11-3C81-A315	43350003226
PTS18/11-3C81-A400	43350003227
PTS18/11-3C85	43350003228
PTS18/11-3C85-A100	43350003229
PTS18/11-3C85-A160	43350003230
PTS18/11-3C85-A250	43350003231
PTS18/11-3C85-A315	43350003232
PTS18/11-3C85-A400	43350003233
PTS18/11-3E5	43350003253

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
PTS18/11-3E27	43350003252
PTS18/11-3F3	43350003234
PTS18/11-3F3-A100	43350003235
PTS18/11-3F3-A160	43350003236
PTS18/11-3F3-A250	43350003237
PTS18/11-3F3-A315	43350003238
PTS18/11-3F3-A400	43350003239
PTS23/11-3B9	43350003279
PTS23/11-3B9-E160	43350003280
PTS23/11-3B9-E250	43350003281
PTS23/11-3B9-A315	43350003282
PTS23/11-3B9-A400	43350003283
PTS23/11-3B9-A630	43350003284
PTS23/11-3C81	43350003254
PTS23/11-3C81-A160	43350003255
PTS23/11-3C81-A250	43350003256
PTS23/11-3C81-A315	43350003257
PTS23/11-3C81-A400	43350003259
PTS23/11-3C81-A630	43350003260
PTS23/11-3C85	43350003261
PTS23/11-3C85-A160	43350003262
PTS23/11-3C85-A250	43350003263
PTS23/11-3C85-A315	43350003264
PTS23/11-3C85-A400	43350003265
PTS23/11-3C85-A630	43350003266
PTS23/11-3E5	43350003286
PTS23/11-3E27	433500033285
PTS23/11-3F3	43350003267
PTS23/11-3F3-A160	43350003268
PTS23/11-3F3-A250	43350003269
PTS23/11-3F3-A315	43350003270
PTS23/11-3F3-A400	43350003271
PTS23/11-3F3-A630	43350003272
PTS23/18-3B9	4335000
PTS23/18-3B9-E160	43350003311
PTS23/18-3B9-E250	43350003312
PTS23/18-3B9-A315	43350003313
PTS23/18-3B9-A400	43350003314
PTS23/18-3B9-A630	43350003315
PTS23/18-3C81	43350003287
PTS23/18-3C81-A160	43350003288
PTS23/18-3C81-A250	43350003289
PTS23/18-3C81-A315	43350003290
PTS23/18-3C81-A400	43350003291
PTS23/18-3C81-A630	43350003292
PTS23/18-3C85	43350003293
PTS23/18-3C85-A160	43350003294
PTS23/18-3C85-A250	43350003295
PTS23/18-3C85-A315	43350003296
PTS23/18-3C85-A400	43350003297
PTS23/18-3C85-A630	43350003298
PTS23/18-3E5	43350003317
PTS23/18-3E27	43350003316
PTS23/18-3F3	43350003299
PTS23/18-3F3-A160	43350003300
PTS23/18-3F3-A250	43350003301
PTS23/18-3F3-A315	43350003302
PTS23/18-3F3-A400	43350003303
PTS23/18-3F3-A630	43350003304
PTS30/19-3B7	43350003337
PTS30/19-3B7-E315	43350003338
PTS30/19-3B7-E400	43350003339
PTS30/19-3B7-A630	43350003340
PTS30/19-3B7-A1000	43350003341
PTS30/19-3B7-A1600	43350003342
PTS30/19-3B9	43350003343
PTS30/19-3B9-A315	43350003344
PTS30/19-3B9-A400	43350003345
PTS30/19-3B9-A630	43350003346
PTS30/19-3B9-A1000	43350003347
PTS30/19-3B9-A1600	43350003348
PTS30/19-3C81	43350003318
PTS30/19-3C81-A315	43350003320
PTS30/19-3C81-A400	43350003321
PTS30/19-3C81-A630	43350003322
PTS30/19-3C81-A1000	43350003323
PTS30/19-3C81-A1600	43350003324
PTS30/19-3C85	43350003325
PTS30/19-3C85-A315	43350003326
PTS30/19-3C85-A400	43350003327
PTS30/19-3C85-A630	43350003328
PTS30/19-3C85-A1000	43350003329
PTS30/19-3C85-A1600	43350003330
PTS30/19-3E5	43350003350
PTS30/19-3E27	43350003349
PTS30/19-3F3	43350003331
PTS30/19-3F3-A315	43350003332
PTS30/19-3F3-A400	43350003333
PTS30/19-3F3-A630	43350003334
PTS30/19-3F3-A1000	43350003335
PTS30/19-3F3-A1600	43350003336
PQ20/16-3C81	43350003639
PQ20/16-3C81-A100	43350003640
PQ20/16-3C81-A160	43350003641
PQ20/16-3C81-A250	43350003642
PQ20/16-3C81-A315	43350003643
PQ20/16-3C81-A400	43350003644
PQ20/16-3C81-A630	43350003645
PQ20/16-3C85	43350003646
PQ20/16-3C85-A100	43350003647
PQ20/16-3C85-A160	43350003648
PQ20/16-3C85-A250	43350003649
PQ20/16-3C85-A315	43350003650
PQ20/16-3C85-A400	43350003652
PQ20/16-3C85-A630	43350003653
PQ20/16-3F3	43350003655
PQ20/16-3F3-A100	43350003656
PQ20/16-3F3-A160	43350003657
PQ20/16-3F3-A250	43350003658
PQ20/16-3F3-A315	43350003659
PQ20/16-3F3-A400	43350003660
PQ20/16-3F3-A630	43350003661
PQ20/20-3C81	43350003662
PQ20/20-3C81-A100	43350003663
PQ20/20-3C81-A160	43350003664
PQ20/20-3C81-A250	43350003665
PQ20/20-3C81-A315	43350003666
PQ20/20-3C81-A400	43350003667
PQ20/20-3C81-A630	43350003668
PQ20/20-3C85	43350003669
PQ20/20-3C85-A100	43350003670
PQ20/20-3C85-A160	43350003671
PQ20/20-3C85-A250	43350003672
PQ20/20-3C85-A315	43350003673
PQ20/20-3C85-A400	43350003674
PQ20/20-3C85-A630	43350003675
PQ20/20-3F3	43350003676
PQ20/20-3F3-A100	43350003677
PQ20/20-3F3-A160	43350003678
PQ20/20-3F3-A250	43350003679
PQ20/20-3F3-A315	43350003680
PQ20/20-3F3-A400	43350003681
PQ20/20-3F3-A630	43350003682
PQ26/20-3C81	43350003683
PQ26/20-3C81-E160	43350003685
PQ26/20-3C81-E250	43350003686
PQ26/20-3C81-A315	43350003687
PQ26/20-3C81-A400	43350003688
PQ26/20-3C81-A630	43350003689
PQ26/20-3C81-A1000	43350003690
PQ26/20-3C85	43350003691
PQ26/20-3C85-E160	43350003693
PQ26/20-3C85-E250	43350003694
PQ26/20-3C85-A315	43350003695

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
PQ26/20-3C85-A400	43350003696
PQ26/20-3C85-A630	43350003697
PQ26/20-3C85-A1000	43350003698
PQ26/20-3F3	43350003699
PQ26/20-3F3-E160	43350003701
PQ26/20-3F3-E250	43350003702
PQ26/20-3F3-A315	43350003703
PQ26/20-3F3-A400	43350003704
PQ26/20-3F3-A630	43350003705
PQ26/20-3F3-A1000	43350003706
PQ26/25-3C81	43350003707
PQ26/25-3C81-E160	43350003709
PQ26/25-3C81-E250	43350003710
PQ26/25-3C81-A315	43350003711
PQ26/25-3C81-A400	43350003712
PQ26/25-3C81-A630	43350003713
PQ26/25-3C81-A1000	43350003714
PQ26/25-3C85	4335000
PQ26/25-3C85-E160	43350003716
PQ26/25-3C85-E250	43350003717
PQ26/25-3C85-A315	43350003718
PQ26/25-3C85-A400	43350003719
PQ26/25-3C85-A630	43350003720
PQ26/25-3C85-A1000	43350003721
PQ26/25-3F3	43350003722
PQ26/25-3F3-E160	43350003724
PQ26/25-3F3-E250	43350003725
PQ26/25-3F3-A315	43350003726
PQ26/25-3F3-A400	43350003727
PQ26/25-3F3-A630	43350003728
PQ26/'25-3F3-A1000	43350003729
PQ32/20-3C81	43350003730
PQ32/20-3C81-E315	43350003731
PQ32/20-3C81-A400	43350003732
PQ32/20-3C81-A630	43350003733
PQ32/20-3C81-A1000	43350003734
PQ32/20-3C81-A1600	43350003735
PQ32/20-3C85	43350003736
PQ32/20-3C83-E315	43350003737
PQ32/20-3C83-A400	43350003738
PQ32/20-3C83-A630	43350003739
PQ32/20-3C83-A1000	43350003740
PQ32/20-3C85-A1600	43350003741
PQ32/20-3F3	43350003742
PQ32/20-3F3-E315	43350003743
PQ32/20-3F3-A400	43350003744
PQ32/20-3F3-A630	43350003745
PQ32/20-3F3-A1000	43350003746

TYPE NUMBER	11 NC
PQ32/20-3F3-A1600	43350003747
PQ32/30-3C81	43350003748
PQ32/30-3C81-E315	43350003749
PQ32/30-3C81-A400	43350003750
PQ32/30-3C81-A630	43350003751
PQ32/30-3C81-A1000	43350003752
PQ32/30-3C81-A1600	43350003753
PQ32/30-3C85	43350003754
PQ32/30-3C85-E315	43350003755
PQ32/30-3C85-A400	43350003756
PQ32/30-3C85-A630	43350003757
PQ32/30-3C85-A1000	43350003758
PQ32/30-3C85-A1600	43350003759
PQ32/30-3F3	43350003760
PQ32/30-3F3-E315	43350003761
PQ32/30-3F3-A400	43350003762
PQ32/30-3F3-A630	43350003763
PQ32/30-3F3-A1000	43350003764
PQ32/30-3F3-A1600	43350003765
PQ35/35-3C81	43350003766
PQ35/35-3C81-E315	43350003767
PQ35/35-3C81-A400	43350003768
PQ35/35-3C81-A630	43350003769
PQ35/35-3C81-A1000	43350003770
PQ35/35-3C81-A1600	43350003771
PQ35/35-3C85	43350003772
PQ35/35-3C85-E315	43350003773
PQ35/35-3C85-A400	43350003774
PQ35/35-3C85-A630	43350003775
PQ35/35-3C85-A1000	43350003776
PQ35/35-3C85-A1600	43350003777
PQ35/35-3F3	43350003778
PQ35/35-3F3-E315	43350003779
PQ35/35-3F3-A400	43350003780
PQ35/35-3F3-A630	43350003781
PQ35/35-3F3-A1000	43350003782
PQ35/35-3F3-A1600	43350003783
RM10-3B7	43350003423
RM10-3B7-E250	43350003424
RM10-3B7-E250/N	43350003435
RM10-3B7-E315	43350003425
RM10-3B7-E315/N	43350003436
RM10-3B7-A400	43350003426
RM10-3B7-A400/N	43350003437
RM10-3B7-A630	43350003427
RM10-3B7-A630/N	43350003438
RM10-3B7-A1000	43350003428
RM10-3B7-A1000/N	43350003439

TYPE NUMBER	11 NC
RM10-3B9	43350003429
RM10-3B9-E250	43350003430
RM10-3B9-E250/N	43350003440
RM10-3B9-E315	43350003431
RM10-3B9-E315/N	43350003441
RM10-3B9-A400	43350003432
RM10-3B9-A400/N	43350003442
RM10-3B9-A630	43350003433
RM10-3B9-A630/N	43350003443
RM10-3B9-A1000	43350003434
RM10-3B9-A1000/N	43350003444
RM10-3H1	43220225020
RM10-3H1-A250	43220225026
RM10-3H1-A250/N	43220227026
RM10-3H1-A315	43220225027
RM10-3H1-A315/N	43220227027
RM10-3H1-A400	43220225028
RM10-3H1-A400/N	43220227028
RM10-3H1-A630	43220225030
RM10-3H1-A630/N	43220227030
RM10/I-3B8-A160	43220225046
RM10/I-3B8-A250	43220225048
RM10/I-3B8-A315	43220225049
RM10/I-3B8-A400	43220225050
RM10/I-3B8	43220225040
RM10/I-3B8-A630	43220225052
RM10/I-3C81	43350003500
RM10/I-3C81-E160	43350003501
RM10/I-3C81-A250	43350003502
RM10/I-3C81-A315	43350003503
RM10/I-3C81-A400	43350003504
RM10/I-3C81-A630	43350003505
RM10/I-3C85-A160	43220225099
RM10/I-3C85-E160	43350003507
RM10/I-3C85-A250	43220225086 43350003508
RM10/I-3C85-A315	43220225087 43350003509
RM10/I-3C85-A400	43220225088 43350003510
RM10/I-3C85-A630	43350003511 43220225089
RM10/I-3C85	43220225060 43350003506
RM10/I-3E1	43220225090
RM10/I-3E4	43220225093
RM10/I-3E5	43220225094
RM10/I-3E25	43350003518
RM10/I-3F3-A160	43220250265

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
RM10/I-3F3-E160	43350003513
RM10/I-3F3-A250	43220250266
	43350003514
RM10/I-3F3-A315	43220250267
	43350003515
RM10/I-3F3-A400	43220250268
	43350003516
RM10/I-3F3	43220250260
	43350003512
RM10/I-3F3-A630	43220250269
	43350003517
RM10/ILP-3C85	4322
RM10/ILP-3C90	4322
RM10/ILP-3F3	4322
RM10/ILP-3F4	4322
RM12/I-3B8-A160	43220250645
RM12/I-3B8-A250	43220250646
RM12/I-3B8-A315	43220250647
RM12/I-3B8-A400	43220250648
RM12/I-3B8	43220250640
RM12/I-3C85-A160	43220250605
RM12/I-3C85-A250	43220250606
RM12/I-3C85-A315	43220250607
RM12/I-3C85-A400	43220250608
RM12/I-3C85	43220250600
RM12/I-3E1	43220250670
RM12/I-3E4	43220250660
RM12/I-3F3-A160	43220250625
RM12/I-3F3-A250	43220250626
RM12/I-3F3-A315	43220250627
RM12/I-3F3-A400	43220250628
RM12/I-3F3	43220250620
RM12/ILP-3C85	4322
RM12/ILP-3C90	4322
RM12/ILP-3F3	4322
RM12/ILP-3F4	4322
RM14/I-3B8-A1000	43220250391
RM14/I-3B8-A250	43220250386
RM14/I-3B8-A315	43220250387
RM14/I-3B8-A400	43220250388
RM14/I-3B8-A630	43220250390
RM14/I-3B8	43220250380
RM14/I-3C85-A1000	43220250321
RM14/I-3C85-A250	43220250316
RM14/I-3C85-A315	43220250317
RM14/I-3C85-A400	43220250318
RM14/I-3C85	43220250300
RM14/I-3C85-A630	43220250320
RM14/I-3F3-A1000	43220250371

TYPE NUMBER	11 NC
RM14/I-3F3-A250	43220250366
RM14/I-3F3-A315	43220250367
RM14/I-3F3-A400	43220250368
RM14/I-3F3	43220250360
RM14/I-3F3-A630	43220250370
RM14/ILP-3C85	4322
RM14/ILP-3C90	4322
RM14/ILP-3F3	4322
RM14/ILP-3F4	4322
RM4-3D3	43220225739
RM4-3D3-E40	43220225742
RM4-3D3-E40/N	43220227742
RM4-3D3-A63	43220225743
RM4-3D3-A63/N	43220227743
RM4-3H1	43220225720
RM4-3H1-A100	43220225724
RM4-3H1-A100/N	43220227724
RM4-3H1-A160	43220225725
RM4-3H1-A160/N	43220227725
RM4-3H1-A63	43220225723
RM4-3H1-A63/N	43220227723
RM4-3H3	43220225750
RM4-3H3-A100	43220225754
RM4-3H3-A100/N	43220227754
RM4-3H3-A160	43220225755
RM4-3H3-A160/N	43220227755
RM4-3H3-A63	43220225753
RM4-3H3-A63/N	43220227753
RM4-4C6	43220225779
RM4-4C6-E16	43220225780
RM4-4C6-E16/N	43220227780
RM4-4C6-E25	43220225781
RM4-4C6-E25/N	43220227781
RM4/I-3E1	43220225770
RM4/I-3E4	43220225791
RM4/I-3E5	43220225775
RM4/I-3F3-A100	43220225714
RM4/I-3F3-A160	43220225715
RM4/I-3F3-A250	43220225716
RM4/I-3F3	43220225710
RM4/I-3F4	43220224600
RM4/I-3F4-A100	43220224601
RM4/I-3F4-A160	43220224602
RM4/I-3F4-A250	43220224603
RM4/ILP-3C85	4322
RM4/ILP-3C90	4322
RM4/ILP-3F3	4322
RM4/ILP-3F4	4322

TYPE NUMBER	11 NC
RM5-3B7	43350003351
RM5-3B7-E63	43350003352
RM5-3B7-E63/N	43350003357
RM5-3B7-E100	43350003353
RM5-3B7-E100/N	43350003358
RM5-3B7-A160	43350003354
RM5-3B7-A160/N	43350003359
RM5-3B7-A250	43350003355
RM5-3B7-A250/N	43350003360
RM5-3B7-A315	43350003356
RM5-3B7-A315/N	43350003361
RM5-3B9	43350003362
RM5-3B9-E63	43350003363
RM5-3B9-E63/N	43350003368
RM5-3B9-E100	43350003364
RM5-3B9-E100/N	43350003369
RM5-3B9-A160	43350003365
RM5-3B9-A160/N	43350003370
RM5-3B9-A250	43350003366
RM5-3B9-A250/N	43350003371
RM5-3B9-A315	43350003367
RM5-3B9-A315/N	43350003372
RM5-3D3	43220225940
RM5-3D3-A100	43220225944
RM5-3D3-A100/N	43220227944
RM5-3D3-A63	43220225943
RM5-3D3-A63/N	43220227943
RM5-3H1	43220225920
RM5-3H1-A160	43220225925
RM5-3H1-A160/N	43220227925
RM5-3H1-A250	43220225926
RM5-3H1-A250/N	43220227926
RM5-3H1-A315	43220225927
RM5-3H1-A315/N	43220227927
RM5-3H3-A160	43220225955
RM5-3H3-A160/N	43220227955
RM5-3H3-A250	43220225956
RM5-3H3-A250/N	43220227956
RM5-3H3-A315	43220225957
RM5-3H3-A315/N	43220227957
RM5-4C6	43220225984
RM5-4C6-E25	43220225981
RM5-4C6-E25/N	43220227981
RM5-4C6-E40	43220225982
RM5-4C6-E40/N	43220227982
RM5/I-3B8-A100	43220225947
RM5/I-3B8-A160	43220225948
RM5/I-3B8	43220225946

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
RM5/I-3B8-A250	43220225949
RM5/I-3C85-A63	43350003446
	43220220403
RM5/I-3C85-A100	43220250404
	43350003447
RM5/I-3C85-A160	43220250405
	43350003448
RM5/I-3C85	43220250400
	43350003445
RM5/I-3C85-A250	43220250406
	43350003449
RM5/I-3C85-A315	43350003450
	43220220407
RM5/I-3E1	43220225990
RM5/I-3E4	43220225991
RM5/I-3E5	43220225992
RM5/I-3E6	43220225916
RM5/I-3E25	43350003458
RM5/I-3F3-A63	43350003452
	43220220413
RM5/I-3F3-A100	43220250414
	43350003453
RM5/I-3F3-A160	43220250415
	43350003454
RM5/I-3F3	43220250410
	43350003451
RM5/I-3F3-A250	43220250416
	43350003455
RM5/I-3F3-A315	43350003456
	43220220417
RM5/I-3F4	43220250420
RM5/I-3F4-A100	43220250421
RM5/I-3F4-A160	43220250422
RM5/I-3F4-A250	43220250423
RM5/ILP-3C85	4322
RM5/ILP-3C90	4322
RM5/ILP-3F3	4322
RM5/ILP-3F4	4322
RM6R-3B7	43350003374
	43220202512
RM6R-3B7-E100	43350003375
	43220225504
RM6R-3B7-E100/N	43350003387
	43220227504
RM6R-3B7-A160	43350003376
	43220225505
RM6R-3B7-A160/N	43350003388
	43220227505

TYPE NUMBER	11 NC
RM6R-3B7-A250	43350003377
	43220225506
RM6R-3B7-A250/N	43350003389
	43220227506
RM6R-3B7-A315	43350003378
	43220225507
RM6R-3B7-A315/N	43350003390
	43220227507
RM6R-3B7-A400	43350003379
	43220225508
RM6R-3B7-A400/N	43350003391
	43220227508
RM6R-3B9	43350003380
RM6R-3B9-E100	43350003382
RM6R-3B9-E100/N	43350003392
RM6R-3B9-A160	43350003383
RM6R-3B9-A160/N	43350003393
RM6R-3B9-A250	43350003384
RM6R-3B9-A250/N	43350003394
RM6R-3B9-A315	43350003385
RM6R-3B9-A315/N	43350003395
RM6R-3B9-A400	43350003386
RM6R-3B9-A400/N	43350003396
RM6R-3D3	43220225540
RM6R-3D3-E100	43220225544
RM6R-3D3-E100/N	43220227544
RM6R-3D3-A160	43220225545
RM6R-3D3-A160/N	43220227545
RM6R-3D3-E63	43220225543
RM6R-3D3-E63/N	43220227543
RM6R-3H1	43220225520
RM6R-3H1-A160	43220225525
RM6R-3H1-A160/N	43220227525
RM6R-3H1-A250	43220225526
RM6R-3H1-A250/N	43220227526
RM6R-3H1-A315	43220225527
RM6R-3H1-A315/N	43220227527
RM6R-3H1-A400	43220225528
RM6R-3H1-A400/N	43220227528
RM6R-3H3	43220225562
RM6R-3H3-A160	43220225555
RM6R-3H3-A160/N	43220227555
RM6R-3H3-A200	43220225568
RM6R-3H3-A200/N	43220227568
RM6R-3H3-A250	43220225556
RM6R-3H3-A250/N	43220227556
RM6R-3H3-A315	43220225557
RM6R-3H3-A315/N	43220227557
RM6R-3H3-A400	43220225558

TYPE NUMBER	11 NC
RM6R-3H3-A400/N	43220227558
RM6R-4C6	43220225566
RM6R-4C6-E25	43220225581
RM6R-4C6-E25/N	43220227581
RM6R-4C6-E40	43220225582
RM6R-4C6-E40/N	43220227582
RM6R-4C6-E63	43220225583
RM6R-4C6-E63/N	43220227583
RM6S-3D3	43220224740
RM6S-3D3-E100	43220224744
RM6S-3D3-E100/N	43220226744
RM6S-3D3-A160	43220224745
RM6S-3D3-A160/N	43220226745
RM6S-3D3-A63	43220224743
RM6S-3D3-A63/N	43220226743
RM6S-3H1	43220224721
RM6S-3H1-A160	43220224725
RM6S-3H1-A160/N	43220226725
RM6S-3H1-A250	43220224726
RM6S-3H1-A250/N	43220226726
RM6S-3H1-A315	43220224727
RM6S-3H1-A315/N	43220226727
RM6S-3H1-A400	43220224728
RM6S-3H1-A400/N	43220226728
RM6S-3H3-A160	43220224755
RM6S-3H3-A160/N	43220226755
RM6S-3H3-A250	43220224756
RM6S-3H3-A250/N	43220226756
RM6S-3H3-A315	43220224757
RM6S-3H3-A315/N	43220226757
RM6S-3H3-A400	43220224758
RM6S-3H3-A400/N	43220226758
RM6S-4C6	43220224778
RM6S-4C6-E25	43220224781
RM6S-4C6-E25/N	43220226781
RM6S-4C6-E40	43220224782
RM6S-4C6-E40/N	43220226782
RM6S-4C6-E63	43220224783
RM6S-4C6-E63/N	43220226783
RM6S/I-3B8-A100	43220224774
RM6S/I-3B8-A160	43220224773
RM6S/I-3B8-A250	43220224788
RM6S/I-3B8-A2600	43220224785
RM6S/I-3B8-A63	43220224772
RM6S/I-3C81	43350003461
RM6S/I-3C81-A63	43350003462
RM6S/I-3C81-A100	43350003463
RM6S/I-3C81-A160	43350003464

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
RM6S/I-3C81-A250	43350003465
RM6S/I-3C81-A315	43350003466
RM6S/I-3C85-A100	43220250504 43350003470
RM6S/I-3C85-A160	43220250505 43350003471
RM6S/I-3C85	43220250500 43350003468
RM6S/I-3C85-A250	43220250506 43350003472
RM6S/I-3C85-A315	43350003473 43220250507
RM6S/I-3C85-A63	43220250503 43350003469
RM6S/I-3E1	43220224786
RM6S/I-3E4	43220224793
RM6S/I-3E5	43220224794
RM6S/I-3E6	43220224784
RM6S/I-3E25	43350003480
RM6S/I-3F3-A100	43220250514 43350003477
RM6S/I-3F3-A160	43220250515 43350000191
RM6S/I-3F3	43220250511 43350003475
RM6S/I-3F3-A250	43220250519 43350003478
RM6S/I-3F3-A315	43350003479
RM6S/I-3F3-A63	43220250513 43350003476
RM6S/I-3F4	43220250530
RM6S/I-3F4-A63	43220250531
RM6S/I-3F4-A100	43220250532
RM6S/I-3F4-A160	43220250533
RM6S/I-3F4-A250	43220250534
RM6S/I-3F4-A315	43220250535
RM6S/ILP-3C85	4322
RM6S/ILP-3C90	4322
RM6S/ILP-3F3	4322
RM6S/ILP-3F4	4322
RM7/I-3B8-A160	43220250065
RM7/I-3B8-A250	43220250066
RM7/I-3B8	43220250060
RM7/I-3C85-A100	43220250044
RM7/I-3C85-A160	43220250045
RM7/I-3C85-A250	43220250046
RM7/I-3C85	43220250040
RM7/I-3E1	43220250099
RM7/I-3E4	43220250090

TYPE NUMBER	11 NC
RM7/I-3E5	43220250095
RM7/I-3F3-A100	43220250084
RM7/I-3F3-A160	43220250085
RM7/I-3F3-A250	43220250086
RM7/I-3F3	43220250080
RM7/ILP-3C85	4322
RM7/ILP-3C90	4322
RM7/ILP-3F3	4322
RM7/ILP-3F4	4322
RM8-3B7	43350003397 43220202725
RM8-3B7-E160	43350003398 43220225105
RM8-3B7-E160/N	43350003411 43220227105
RM8-3B7-A250	43350003399 43220225106
RM8-3B7-A250/N	43350003412 43220227106
RM8-3B7-A315	43350003400 43220225107
RM8-3B7-A315/N	43350003413 43220227107
RM8-3B7-A400	43350003401 43220225108
RM8-3B7-A400/N	43350003414 43220227108
RM8-3B7-A630	43350003402 43220225110
RM8-3B7-A630/N	43350003415 43220227110
RM8-3B9	43350003404
RM8-3B9-E160	43350003406
RM8-3B9-E160/N	43350003418
RM8-3B9-A250	43350003407
RM8-3B9-A250/N	43350003419
RM8-3B9-A315	43350003408
RM8-3B9-A315/N	43350003420
RM8-3B9-A400	43350003409
RM8-3B9-A400/N	43350003421
RM8-3B9-A630	43350003410
RM8-3B9-A630/N	43350003422
RM8-3D3	43220225140
RM8-3D3-E100	43220225144
RM8-3D3-E100/N	43220227144
RM8-3D3-E160	43220225145
RM8-3D3-E160/N	43220227145
RM8-3H1	43220225120
RM8-3H1-E250	43220225126

TYPE NUMBER	11 NC
RM8-3H1-E250/N	43220227126
RM8-3H1-A315	43220225127
RM8-3H1-A315/N	43220227127
RM8-3H1-A400	43220225128
RM8-3H1-A400/N	43220227128
RM8-3H1-A630	43220225130
RM8-3H1-A630/N	43220227130
RM8-3H1-A630/N	43220227137
RM8-3H3	43220225170
RM8-3H3-E250	43220225156
RM8-3H3-E250/N	43220227156
RM8-3H3-A315	43220225157
RM8-3H3-A315/N	43220227157
RM8-3H3-A400	43220225158
RM8-3H3-A400/N	43220227158
RM8-3H3-A630	43220225160
RM8-3H3-A630/N	43220227160
RM8-4C6	43220225181
RM8-4C6-E40	43220225182
RM8-4C6-E40/N	43220227182
RM8-4C6-E63	43220225183
RM8-4C6-E63/N	43220227183
RM8/I-3B8-A160	43220225147
RM8/I-3B8-A250	43220225148
RM8/I-3B8-A315	43220225149
RM8/I-3B8	43220225146
RM8/I-3B8-A400	43220225150
RM8/I-3C81	43350003483
RM8/I-3C81-E100	43350003484
RM8/I-3C81-A160	43350003485
RM8/I-3C81-A250	43350003486
RM8/I-3C81-A315	43350003487
RM8/I-3C81-A400	43350003488
RM8/I-3C85-A100	43220250144
RM8/I-3C85-E100	43350003490
RM8/I-3C85-A160	43220250145 43350003491
RM8/I-3C85-A250	43220250146 43350003492
RM8/I-3C85-A315	43220250147 43350003493
RM8/I-3C85	43220250120 43350003489
RM8/I-3C85-A400	43220250148 43350003494
RM8/I-3E1	43220225186
RM8/I-3E4	43220225187
RM8/I-3E5	43220225188
RM8/I-3E6	43220250191

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
RM8/I-3E25	43350003497
RM8/I-3F3-A100	43220250164
RM8/I-3F3-E100	43350003496
RM8/I-3F3-A160	43220250165 43350000180
RM8/I-3F3-A250	43220250166 43350000181
RM8/I-3F3	43220250160 43350003495
RM8/I-3F3-A315	43220250167 43350000183
RM8/I-3F3-A400	43220250168 43350000182
RM8/I-3F4	43220250170
RM8/I-3F4-A100	43220250171
RM8/I-3F4-A160	43220250172
RM8/I-3F4-A250	43220250173
RM8/I-3F4-A315	43220250174
RM8/I-3F4-A400	43220250175
RM8/ILP-3C85	4322
RM8/ILP-3C90	4322
RM8/ILP-3F3	4322
RM8/ILP-3F4	4322
ROD10/200-3B1	43300303146
ROD10/200-4B1	43300303071
ROD10/200-4B1	43300304060
ROD2/10-3B1-D	43300303133
ROD2/10-4B1-D	43300304021
ROD2/15-3B1-D	43300303134
ROD2/15-4B1-DL	43300304022
ROD2/20-3B1-D	43300303145
ROD2/20-4B1-D	43300304054
ROD3/15-3B1-D	43300303135
ROD3/15-4B1-D	43300304023
ROD3/20-3B1-D	43300303136
ROD3.3/17-3S3	43300304257
ROD3.3/20-3S3	43300304259
ROD3/20-4B1-D	43300304024
ROD3/25-3B1-D	43300303147
ROD3/25-4B1-D	43300304055
ROD4/15-3B1-D	43300303137
ROD4/15-4B1-D	43300304025
ROD4/20-3B1-D	43300303138
ROD4/20-4B1-D	43300304026
ROD4/25-3B1-D	43300303149
ROD4/25-4B1-D	43300304056
ROD5/14-3S3	43300304263
ROD5/20-3S3	43300304262
ROD5/20-3B1-D	43300303139

TYPE NUMBER	11 NC
ROD5/20-4B1-D	43300304027
ROD5/25-3B1-D	43300303140
ROD5/25-3S3	43300304254
ROD5/25-4B1-D	43300304028
ROD5/30-3B1-D	43300303151
ROD5/30-4B1-D	43300304057
ROD5.3/18-3S3	43300304256
ROD6/25-3S3	43300304265
ROD6/30-3B1-D	43300303141
ROD6/30-3S3	43300304267
ROD6/30-4B1-D	43300304029
ROD6/40-3B1-D	43300303142
ROD6/40-4B1-D	43300304030
ROD6/50-3B1-D	43300303153
ROD6/50-4B1-D	43300304058
ROD8/150-3B1	43300303144
ROD8/150-4B1	43300304032
ROD8/200-3B1	43300303155
ROD8/200-4B1	43300303159
ROD8/200-4B1	43300304059
ROD8/50-3B1	43300303143
ROD8/50-4B1	43300304031
SAMPLEBOX1	43300322201
SAMPLEBOX2	43300322202
SAMPLEBOX3	43300322203
SAMPLEBOX4	43300322204
SAMPLEBOX5	43300322205
SAMPLEBOX6	43300322206
SPR-EC35	43120212615
SPR-EC41	43120212616
SPR-EC52	43120212617
SPR-EC70	43120212618
SPR-E20/10/5	43220212022
SPR-E25/13/7	43120212619
SPR-E30/15/7	43220212023
SPR-E42/21/15	43220210092
SPR-E42/21/15	43220213192
SPR-E55/28/21	43120212613
SPR-E65/32/27	43120212614
SPR-EP7	4335000
SPR-EP10	43220210147
SPR-EP13	43220213504
SPR-EP17	43220210143
SPR-EP20	43220210145
SPR-P11/7	43220213062
SPR-P14/8	43220213063
SPR-P18/11	43220213064
SPR-P22/13	43220213065

TYPE NUMBER	11 NC
SPR-P26/16	43220213066
SPR-P30/19	43220213067
SPR-P36/22	43220213068
SPR-P42/29	43220213069
SPR-X30	43220213021
SPR-X35	43220213022
TGP-P11/7	43220213018
TGP-P14/8	43220213044
TGP-P18/11	43220213045
TGP-P22/13	43220210125
TGP-P22/13	43220213046
TGP-P26/16	43220213047
TGP-P30/19	43220213048
TGP-P36/22	43220213049
TGP-P42/29	43220213050
TC2.5/1.3/0.8-4C65	43350001937
TC2.5/1.5/1-3B7	43350001476
TC2.5/1.5/1-3D3	43350001480
TC2.5/1.5/1-3E25	43350001477
TC2.5/1.5/1-3E27	43350001478
TC2.5/1.5/1-3E6	43350001479
TC2.5/1.5/1-3E6-E	43300304580
TC2.5/1.5/1-4C65	43350001475
TC3.4/1.8/1.3-3B7	43350002453
TC3.4/1.8/1.3-3D3	43350002454
TC3.4/1.8/1.3-3E25	43350002450
TC3.4/1.8/1.3-3E27	43350002451
TC3.4/1.8/1.3-3E6	43350002452
TC3.4/1.8/1.3-4C65	43350002455
TC3.9/2/1-3D3	43350001482
TC3.9/2/1-3E6	4335000
TC3.9/2.2/1.3-3B7	43350002459
TC3.9/2.2/1.3-3D3	43350002460
TC3.9/2.2/1.3-3E25	43350002456
TC3.9/2.2/1.3-3E27	43350002457
TC3.9/2.2/1.3-3E6	43350002458
TC3.9/2.2/1.3-4C65	43350002461
TC4/2.2/1.1-3E6	43300304581
TC4/2.2/1.6-3E6	43300304582
TC4.8/2.3/1.3-3B7	43350002465
TC4.8/2.3/1.3-3D3	43350002466
TC4.8/2.3/1.3-3E25	43350002462
TC4.8/2.3/1.3-3E27	43350002463
TC4.8/2.3/1.3-3E6	43350002464
TC4.8/2.3/1.3-4C65	43350002467
TC5.8/3.1/1.5-3B7	43350002471
TC5.8/3.1/1.5-3D3	43350002472
TC5.8/3.1/1.5-3E25	43350002468

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
TC5.8/3.1/1.5-3E27	43350002469
TC5.8/3.1/1.5-3E6	43350002470
TC5.8/3.1/1.5-4C65	43350002473
TC6/4/2-3E6	43300304583
TC6.3/3.8/2.5-3E6	43300304584
TC7.6/3.2/4.8-3B7	43350002480
TC7.6/3.2/4.8-3C81	43350002474
TC7.6/3.2/4.8-3D3	43350002481
TC7.6/3.2/4.8-3E25	43350002477
TC7.6/3.2/4.8-3E27	43350002478
TC7.6/3.2/4.8-3E6	43350002479
TC7.6/3.2/4.8-4C65	43350002482
TC9/6/3-3E6	43300304585
TC9.5/4.8/3.2-3B7	43350002489
TC9.5/4.8/3.2-3C81	43350002486
TC9.5/4.8/3.2-3D3	43350002490
TC9.5/4.8/3.2-3E25	43350002483
TC9.5/4.8/3.2-3E27	43350002485
TC9.5/4.8/3.2-3E6	43350002486
TC9.5/4.8/3.2-4C65	43350002491
TL10/6/4-3E5	43300303466
TL13/7.5/5-3E5	43300303764
TL14/5-3E5	43300303585
TL14/9/5-3E5	43300303765
TL14/9/9-3E5	43300303766
TL16/9.6/6.3-3E5	43300303767
TL20/10/7-3E5	43300303525
TL25/15/10-3E5	43300303526
TL32/19/13-3E5	43300303527
TL36/23/15-3E5	43300303528
TL4/2.2/1.1-3E5	43300303761
TL4/2.2/1.6-3E5	43300303760
TL42/26/13-3C11	43300303522
TL42/26/13-3C85	43300303552
TL58/41/18-3C11	43300303520
TL58/41/18-3C85	43300303553
TL58/41/18-3E25	43300304515
TL58/41/18-3E5	43300303496
TL6.3/3.8/2.5-3E5	43300303762
TL6/4/2-3E5	43300303763
TL9/6/3-3E25	43300303719
TN10/6/4-3C11	43300303450
TN10/6/4-3C85	43300303446
TN10/6/4-3E25	43300303458
TN10/6/4-3F3	43300303498
TN10/6/4-4A11	43300303488
TN10/6/4-4C65	43300303480
TN12/8/4.4-2P40	43300306002

TYPE NUMBER	11 NC
TN12/8/4.4-2P50	43300306009
TN12/8/4.4-2P65	43300306016
TN12/8/4.4-2P80	43300306023
TN12/8/4.4-2P90	43300306030
TN12/8/4.4-2P90	43300306039
TN13/7.5/5-3C11	43300303492
TN13/7.5/5-3C85	43300303779
TN13/7.5/5-3E25	43300303710
TN13/7.5/5-3F3	43300303792
TN13/7.5/5-4A11	43300303440
TN13/7.5/5-4C65	43300303481
TN14/9/5-3C11	43300303582
TN14/9/5-3C11	43300303746
TN14/9/5-3C85	43300303745
TN14/9/5-3C85	43300304517
TN14/9/5-3E25	43300303711
TN14/9/5-3F3	43300303793
TN14/9/5-3R1	43300303769
TN14/9/5-4A11	43300303441
TN14/9/5-4C65	43220209718
TN14/9/9-3C11	43300303505
TN14/9/9-3C85	43300303780
TN14/9/9-3E25	43300303712
TN14/9/9-3F3	43300303794
TN14/9/9-4A11	43300303442
TN17/9.8/4.4-2P40	43300306003
TN17/9.8/4.4-2P50	43300306010
TN17/9.8/4.4-2P65	43300306017
TN17/9.8/4.4-2P80	43300306024
TN17/9.8/4.4-2P90	43300306031
TN20/13/6-2P40	43300306004
TN20/13/6-2P50	43300306011
TN20/13/6-2P65	43300306018
TN20/13/6-2P80	43300306025
TN20/13/6-2P90	43300306032
TN19/11/10-3C11	43300303747
TN19/11/10-3C85	43300303491
TN19/11/10-3E25	43300303734
TN/19/11/15-3C11	43300303749
TN/19/11/15-3C85	43300303748
TN/19/11/15-3E25	43300303714
TN20/10/7-3C11	43300303451
TN20/10/7-3C85	43300303447
TN20/10/7-3E25	43300303459
TN20/10/7-4C65	43300303482
TN24/15/7.5-2P40	43300306005
TN24/15/7.5-2P50	43300306012
TN24/15/7.5-2P65	43300306019

TYPE NUMBER	11 NC
TN24/15/7.5-2P80	43300306026
TN24/15/7.5-2P90	43300306033
TN23/14/7-3C11	43300303751
TN23/14/7-3C85	43300303750
TN23/14/7-3E25	43300303509
TN23/14/7-3E25	43300303716
TN23/14/7-3F3	43300303499
TN23/14/7-3R1	43300303770
TN23/14/7-4A11	43300303444
TN23/14/7-4C65	43220209719
TN25/15/10-3C11	43300303452
TN25/15/10-3C85	43300303448
TN25/15/10-3E25	43300303460
TN25/15/10-3F3	43300303500
TN27/15/11-2P40	43300306006
TN27/15/11-2P50	43300306013
TN27/15/11-2P65	43300306020
TN27/15/11-2P80	43300306027
TN27/15/11-2P90	43300306034
TN26/15/10-3C11	43300303524
TN26/15/10-3C11	43300303703
TN26/15/10-3C11	43300303752
TN26/15/10-3C85	43300303783
TN26/15/10-3E25	43300303564
TN26/15/10-3E25	43300303717
TN26/15/10-3E25	43300304561
TN26/15/20-3C11	43300303753
TN26/15/20-3C85	43300303784
TN26/15/20-3E25	43300303754
TN29/19/7.5-3C11	43300303758
TN29/19/7.5-3C85	43300303785
TN29/19/7.5-3E25	43300303423
TN32/19/13-3C11	43300303453
TN32/19/13-3C85	43300303449
TN32/19/13-3E25	43300303461
TN32/19/13-3F3	43300303501
TN33/20/11-2P40	43300306007
TN33/20/11-2P50	43300306014
TN33/20/11-2P65	43300306021
TN33/20/11-2P80	43300306028
TN36/23/10-3C11	43300303755
TN36/23/10-3C85	43300303786
TN36/23/10-4C65	43300303471
TN36/23/15-3C11	43300303756
TN36/23/15-3C85	43300303787
TN36/23/15-3E25	43300303422
TN36/23/15-3F3	43300303502
TN36/23/15-3R1	43300303431

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
TN36/23/15-4A11	43300303445
TN36/23/15-4C65	43220209720
TN36/23/15-4C65	43300303545
TN4/2.2/1.1-3E25	43300303735
TN4/2.2/1.1-3F3	43300303789
TN4/2.2/1.1-4A11	43300303436
TN4/2.2/1.1-4C65	43300303469
TN4/2.2/1.6-3F3	43300303478
TN4/2.2/1.6-4A11	43300303437
TN4/2.2/1.6-4C65	43300303470
TN6.3/3.8/2.5-3E25	43300303494
TN6.3/3.8/2.5-3F3	43300303497
TN6.3/3.8/2.5-4A11	43300303487
TN6.3/3.8/2.5-4C65	43300303479
TN6/4/2-3E25	43300303708
TN6/4/2-3F3	43300303790
TN6/4/2-4A11	43300303438
TN6/4/2-4C65	43220209716
TN7.5/4.1/3-2P40	43300306001
TN7.5/4.1/3-2P50	43300306008
TN7.5/4.1/3-2P65	43300306015
TN7.5/4.1/3-2P80	43300306022
TN7.5/4.1/3-2P90	43300306029
TN7.5/4.1/3-2P90	43300306038
TN9/6/3-3C85	43300303580
TN9/6/3-3E25	43300303709
TN9/6/3-3F3	43300303791
TN9/6/3-3R1	43300303768
TN9/6/3-4A11	43300303439
TN9/6/3-4C65	43220209717
TN9/6/3-4C65	43300303433
T2.5/1.5/1-3E5-E	43300303514
T2.5/1.5/1-3F3-E	43300303513
T2.5/1.5/1-4A11-E	43300303405
T2.5/1.5/1-4C65-E	43300303472
T102/66/15-3C11	43300304573
T102/66/15-3E25	43300304553
T107/65/18-3F4	43300304538
T107/65/25-3F3	43300304578
T107/65/25-3F4	43300304579
T63/38/25-3E25	43300304564
T87/54/14-3C11	43300304532
TUB10/4.2/20-3B1	43300303364
TUB10/4.2/20-3C85	43300303377
TUB10/4.2/20-4B1	43300304043
TUB10/4.2/45-3B1	43300303365
TUB10/4.2/45-3C85	43300303378
TUB10/4.2/45-4B1	43300304044
TUB10/5/200-3C85	43300303346
TUB3.5/1.2/15-3B1	43300303355
TUB3.5/1.2/15-3C85	43300303368
TUB3.5/1.2/15-4B1	43300304034
TUB4/1.6/15-3B1	43300303356
TUB4/1.6/15-3C85	43300303369
TUB4/1.6/15-4B1	43300304035
TUB4/1.6/40-3B1	43300303357
TUB4/1.6/40-3C85	43300303370
TUB4/1.6/40-4B1	43300304036
TUB4/2/5-3B1	43130201517
TUB5/2/15-3B1	43300303358
TUB5/2/15-3C85	43300303371
TUB5/2/15-4B1	43300304037
TUB5/2/50-3B1	43300303359
TUB5/2/50-3C85	43300303372
TUB5/2/50-4B1	43300304038
TUB6/3/20-3B1	43300303360
TUB6/3/20-3C85	43300303373
TUB6/3/20-4B1	43300304039
TUB6/3/30-3B1	43300303361
TUB6/3/30-3C85	43300303374
TUB6/3/30-4B1	43300304040
TUB8/4/20-3B1	43300303362
TUB8/4/20-3C85	43300303375
TUB8/4/20-4B1	43300304041
TUB8/4/200-3C85	43300303345
TUB8/4/40-3B1	43300303363
TUB8/4/40-3C85	43300303376
TUB8/4/40-4B1	43300304042
TX13/7.1/4.8-3C81	43350002495
TX13/7.1/4.8-3C85	43350002496
TX13/7.1/4.8-3D3	43350002500
TX13/7.1/4.8-3E6	43350002494
TX13/7.1/4.8-3E25	43350002492
TX13/7.1/4.8-3E27	43350002493
TX13/7.1/4.8-3F3	43350002498
TX13/7.1/4.8-4C65	43350002501
TX13/7.9/6.4-3C81	43350002505
TX13/7.9/6.4-3C85	43350002506
TX13/7.9/6.4-3E6	43350002504
TX13/7.9/6.4-3E25	43350002502
TX13/7.9/6.4-3E27	43350002503
TX13/7.9/6.4-3F3	43350002508
TX13/7.9/6.4-4C65	43350002509
TX16/9.1/4.7-3C81	43350002513
TX16/9.1/4.7-3C85	43350002514
TX16/9.1/4.7-3E6	43350002512
TX16/9.1/4.7-3E25	43350002510
TX16/9.1/4.7-3E27	43350002511
TX16/9.1/4.7-3F3	43350002516
TX22/14/6.4-3C81	43350002520
TX22/14/6.4-3C85	43350002521
TX22/14/6.4-3E6	43350002519
TX22/14/6.4-3E25	43350002517
TX22/14/6.4-3E27	43350002518
TX22/14/6.4-3F3	43350002523
TX22/14/6.4-4C65	43350002524
TX22/14/13-3C81	43350002528
TX22/14/13-3C85	43350002529
TX22/14/13-3E6	43350002527
TX22/14/13-3E25	43350002525
TX22/14/13-3E27	43350002526
TX22/14/13-3F3	43350002531
TX25/15/9.5-3C81	43350002535
TX25/15/9.5-3C85	43350002536
TX25/15/9.5-3E6	43350002534
TX25/15/9.5-3E25	43350002532
TX25/15/9.5-3E27	43350002533
TX25/15/9.5-3F3	43350002538
TX29/19/7.6-3C81	43350002542
TX29/19/7.6-3C85	43350002543
TX29/19/7.6-3E25	43350002539
TX29/19/7.6-3E27	43350002540
TX29/19/7.6-3E6	43350002541
TX29/19/7.6-3F3	43350002545
TX36/23/10-3C81	43350002549
TX36/23/10-3C85	43350002550
TX36/23/10-3E6	43350002548
TX36/23/10-3E25	43350002546
TX36/23/10-3E27	43350002547
TX36/23/10-3F3	43350002552
TX36/23/15-3C81	43350002556
TX36/23/15-3C85	43350002557
TX36/23/15-3E6	43350002555
TX36/23/15-3E25	43350002553
TX36/23/15-2E27	43350002554
TX36/23/15-3F3	43350002559
TX39/20/13-3C81	43350002563
TX39/20/13-3C85	43350002564
TX39/20/13-3E6	43350002562
TX39/20/13-3E25	43350002560
TX39/20/13-3E27	43350002561
TX39/20/13-3F3	43350002566
TX39/20/13-4C65	43350002567
TX51/32/19-3C81	43350002570

Conversion list

Type number to 11NC

TYPE NUMBER	11 NC
TX51/32/19-3C85	43350002571
TX51/32/19-3E6	43350002569
TX51/32/19-3E27	43350002568
TX51/32/19-3F3	43350002573
TX61/36/13-3C81	43350002576
TX61/36/13-3C85	43350002577
TX61/36/13-3E6	43350002575
TX61/36/13-3F3	43350002579
TX74/39/13-3C81	43350002582
TX74/39/13-3C85	43350002583
TX74/39/13-3E6	43350002581
TX74/39/13-3E27	43350002580
TX74/39/13-3F3	43350002585
TX74/39/13-4C65	43350002586
UR28/16/20-3C85	43120204310
UR28/20/13-3C80	43120204338
UR28/20/13-3C85	43120204341
UR28/20/13-3C30	4312020
UR32/20/10-3C80	31221349199
UR34/26/9-3C80	31221349332
UR35/28/13-3C30	43120204373
UR35/28/13-3C10	43120204360
UR35/34/13-3C10	43120204315
UR35/34/13-3C15	43120204346
UR35/34/13-3C30	4312020
UR35/34/13-3C80	43120203381
UR37/25/18-3C10	43120204317
UR37/25/18-3C80	43120203374
UR37/25/18-3C85	43120203385
UR37/29/13-3C10	43120204321
UR37/29/18-3C10	43120204319
UR37/29/18-3C80	43120203371
UR37/34/13-3C85	43120204353
UR39/35/15-3C15	43120204320
UR39/35/15-3C30	4312020
UR39/35/15-3C80	43120204340
UR40/32/22-3C10	43120204342
UR41/34/13-3C15	43120204361
UR41/34/13-3C30	43120204375
UR42/32/15-3C80	31221349352
UR42/21/12-3C80	43350002276
UR42/21/12-3C81	43350002277
UR42/35/24-3C10	31221349282
UR42/35/24-3C15	31221349348
UR43/29/16-3C80	43120204306
UR43/34/16-3C80	43120203368
UR44/31/15-3C10	43120204304
UR44/36/15-3C10	43120204305
UR44/36/15-3C15	43120204334
UR44/36/15-3C30	4312020
UR44/38/16-3C10	43120204339
UR46/33/11-3C80	31221049048
UR47/25/18-3C80	43120203352
UR48/39/17-3C10	31221349384
UR48/39/17-3C15	4312020
UR48/39/17-3C30	4312020
UR50/37/16-3C80	43120203376
UR57/28/16-3C80	43120203319
UR59/36/17-3C80	43120203340
UR64/29/14-3C80	43350002280
UR64/29/14-3C30	43350002281
UR64/40/20-3C80	31221349139
UR64/46/20-3C80	43120204302
UR70/33/17-3C80	31221049395
U10/8/3-3C80	31123249080
U10/8/3-3C80	31221349116
U10/8/3-3C80	43120204322
U10/8/3-3C85	43120204328
U100/48/25-3C80	43120204349
U100/57/25-3C80	43120203360
U15/11/6-2P90	31123349016
U15/11/6-2P90	43300306053
U15/11/6-3C11	43120204311
U15/11/6-3C80	43120204323
U15/11/6-3C85	43120204329
U15/11/6-3E25	43120203382
U20/16/7-2P90	43300306058
U20/16/7-3C11	43120204312
U20/16/7-3C80	43120203351
U20/16/7-3C85	43120204303
U20/16/7-3E25	43120203389
U25/16/6-3C81	43350002267
U25/16/6-3E25	43350002302
U25/16/6-3E27	43350002303
U25/20/13-3C11	43120204313
U25/20/13-3C80	31123249070
U25/20/13-3C80	31221349046
U25/20/13-3C80	43120204307
U25/20/13-3C85	31123249107
U25/20/13-3C85	43120204330
U25/20/13-3E25	31123249134
U30/25/16-3C11	43120204314
U30/25/16-3C80	31221349076
U30/25/16-3C80	43120204324
U30/25/16-3C85	43120204331
U33/22/9-3C81	43350002273
U67/27/14-3C81	43350000188
U93/52/30-3C80	43120203358
U93/76/16-3C80	43120203355
U93/76/30-3C80	43120203357
WAS-CLM/TP-P14/8	43350002616
WAS-CLM/TP-P18/11	43350002618
WAS-CLM/TS-P22/13	43350002666
WBC1.5/A-3B1	43120203663
WBC1.5/A-4B1	43120203669
WBC1.5/1.5/A-3B1	43120203665
WBC1.5/1.5/A-4A15	43300304146
WBC1.5/1.5/A-4B1	43120203671
WBC2.5/A-3B1	43120203664
WBC2.5/A-3B1	43300304130
WBC2.5/A-4A15	43300304144
WBC2.5/A-4B1	43120203670
WBC2.5/EA-3B1	43300304124
WBC2.5/EA-4B1	43300304125
WBC2.5/EAT-3B1	43300304122
WBC2.5/EAT-4B1	43300304123
WBC2.5/IR-3B1	43300303896
WBC2.5/IR-4B1	43300304107
WBC2.5/R-3B1	43300303808
WBC2.5/R-4B1	43300304118
WBC2.5/SA-3B1	43300304152
WBC2.5/SA-4B1	43300304153
WBC2.5/SP-3B1	43300304136
WBC2.5/SP-4B1	43300304143
WBC2/R-4A15	43300303618
WBC2/RT-4A15	43300304105
WBC3/ER-3B1	43300304126
WBC3/ER-4B1	43300304127
WBC3/ERT-3B1	43300304141
WBC3/ERT-4B1	43300304142
WBC3/R-3B1	43120203676
WBC3/R-4A15	43300304145
WBC3/R-4B1	43300304114
WBS2.5-5/4.8/10-3B1	43300304166
WBS2.5-5/4.8/10-4B1	43300304168
X22-3B8-A3900	43220224560
X22-3D3-A1500	43220224540
X22-3H1-A1000	43220224531
X22-3H1-A1000/N	43220226531
X22-3H1-A3900	43220224520
X22-3H1-A400	43220224528
X22-3H1-A400/N	43220226528
X22-3H1-A630/N	43220226530
X22-4C6-A220	43220224580

Soft Ferrites

TYPE NUMBER	11 NC
X30-3B8-A4900	43220251320
X30-3H1-A1000	43220221931
X30-3H1-A1000/N	43220223931
X30-3H1-A1600	43220221932
X30-3H1-A1600/N	43220223932
X30-3H1-A400	43220221928
X30-3H1-A400/N	43220223928
X30-3H1-A4900	43220251300
X30-3H1-A630	43220221930
X30-3H1-A630/N	43220223930
X35-3B8-A6050	43220225300
X35-3H1-A1000	43220225331
X35-3H1-A1600	43220225332
X35-3H1-A400	43220225328
X35-3H1-A6050	43220225320
X35-3H1-A630	43220225330
X35-3H1-A630/N	43220227330

Conversion list
11NC to Typenumber

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
31123249036	E42/21/15-3C80-G500
31123249063	E42/21/15-3C85-G200
31123249070	U25/20/13-3C80
31123249075	E42/21/20-3C85
31123249079	E42/33/20-3C80
31123249080	U10/8/3-3C80
31123249087	E46/23/30-3C80
31123249088	E46/23/30-3C85
31123249092	E42/21/15-3C80
31123249097	E42/21/15-3C80-G200
31123249101	E36/21/15-3C85
31123249107	U25/20/13-3C85
31123249111	E42/21/15-3C85
31123249134	U25/20/13-3E25
31123349016	U15/11/6-2P90
31221049048	UR46/33/11-3C80
31221049049	ROD4.9/36-3C6/DL
31221049395	UR70/33/17-3C80
31221340254	CPH-U15/I20-1S-4P
31221340259	CPH-U10/I15-1S-4P
31221349021	E55/28/25-3C80
31221349046	U25/20/13-3C80
31221349062	I25/7/7-3C80
31221349076	U30/25/16-3C80
31221349116	U10/8/3-3C80
31221349139	UR64/40/20-3C80
31221349180	E42/21/20-3C80
31221349199	UR32/20/10-3C80
31221349282	UR42/35/24-3C10
31221349332	UR34/26/9-3C80
31221349348	UR42/35/24-3C15
31221349352	UR42/32/15-3C80
31221349384	UR48/39/17-3C10
31221376414	CPH-U20/I25-1S-4P
31250000009	ROD6/25-3S3
43120203057	ROD5/20-4B1
43120203150	MHC6/10-3B1
43120203152	MHB14/14-4B1
43120203153	MHR6/10-3B1
43120203155	MHC6/10-4B1
43120203157	MHB14/8-4B1
43120203319	UR57/28/16-3C80
43120203340	UR59/36/17-3C80
43120203351	U20/16/7-3C80
43120203352	UR47/25/18-3C80
43120203355	U93/76/16-3C80
43120203356	I93/28/16-3C80
43120203357	U93/76/30-3C80

11 NC	TYPE NUMBER
43120203358	U93/52/30-3C80
43120203359	I93/28/30-3C80
43120203360	U100/57/25-3C80
43120203361	I100/25/25-3C80
43120203368	UR43/34/16-3C80
43120203371	UR37/29/18-3C80
43120203374	UR37/25/18-3C80
43120203376	UR50/37/16-3C80
43120203381	UR35/34/13-3C80
43120203382	U15/11/6-3E25
43120203385	UR37/25/18-3C85
43120203389	U20/16/7-3E25
43120203402	E25/13/7-3C80
43120203407	E20/10/5-3C80
43120203410	E55/28/21-3C80
43120203411	E42/21/15-3C80
43120203412	E42/21/20-3C80
43120203419	E42/33/20-3C80
43120203427	E42/21/20-3C80
43120203438	E65/32/27-3C80
43120203447	E13/7/4-3C80
43120203455	E30/15/7-3C80
43120203485	ER48-3C80
43120203492	E55/28/21-3C80-G1200
43120203493	E32/16/9-3C11
43120203496	E42/21/15-3C80-G800
43120203504	E20/10/6-3C80
43120203508	E30/15/7-3C11
43120203512	E65/32/27-3C80-G150
43120203515	E65/32/27-3C80-G450
43120203518	E55/28/21-3C80-G150
43120203521	E55/28/21-3C80-G450
43120203523	E42/21/20-3C80-G100
43120203524	E42/21/20-3C80-G200
43120203525	E42/21/20-3C80-G500
43120203526	E42/21/20-3C80-G800
43120203528	E42/21/15-3C80-G500
43120203529	E42/21/15-3C80-G100
43120203530	E42/21/15-3C80-G200
43120203533	E30/15/7-3C80-G100
43120203534	E30/15/7-3C80-G200
43120203535	E30/15/7-3C80-G800
43120203536	E20/10/5-3C80-G50
43120203537	E20/10/5-3C80-G150
43120203540	E32/16/9-3C80
43120203541	E32/16/9-3C80-G100
43120203542	E32/16/9-3C80-G200
43120203543	E32/16/9-3C80-G500

11 NC	TYPE NUMBER
43120203544	E32/16/9-3C80-G800
43120203545	E25/13/7-3C80-G50
43120203546	E25/13/7-3C80-G150
43120203550	E20/10/6-3C80-G50
43120203551	E20/10/6-3C80-G150
43120203555	E16/8/5-3C80
43120203556	E20/10/6-3C11
43120203562	E25/13/7-3C11
43120203564	E42/21/15-3C85
43120203565	E42/21/20-3C85
43120203581	E42/21/15-3C85-G200
43120203584	E42/21/20-3C80
43120203587	E65/32/27-3C80-G1250
43120203591	E55/28/21-3C85
43120203592	E55/28/25-3C85
43120203597	E20/10/5-3C11
43120203598	E42/21/15-3C11
43120203663	WBC1.5-A-3B1
43120203664	WBC2.5-A-3B1
43120203665	WBC1.5/1.5-A-3B1
43120203669	WBC1.5-A-4B1
43120203670	WBC2.5-A-4B1
43120203671	WBC1.5/1.5-A-4B1
43120203676	WBC3-R-3B1
43120203700	ETD34-3C80
43120203701	ETD34-3C80-G100
43120203702	ETD34-3C80-G200
43120203703	ETD34-3C80-G500
43120203705	ETD39-3C80
43120203706	ETD39-3C80-G100
43120203707	ETD39-3C80-G200
43120203708	ETD39-3C80-G500
43120203710	ETD44-3C80
43120203711	ETD44-3C80-G200
43120203712	ETD44-3C80-G500
43120203715	ETD49-3C80
43120203716	ETD49-3C80-G200
43120203717	ETD49-3C80-G500
43120203720	ETD34-3C85
43120203721	ETD34-3C85-G100
43120203722	ETD34-3C85-G200
43120203723	ETD34-3C85-G500
43120203724	ETD34-3C85-G800
43120203725	ETD39-3C85
43120203726	ETD39-3C85-G100
43120203727	ETD39-3C85-G200
43120203728	ETD39-3C85-G500
43120203729	ETD39-3C85-G800

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43120203730	ETD44-3C85
43120203731	ETD44-3C85-G100
43120203732	ETD44-3C85-G200
43120203733	ETD44-3C85-G500
43120203734	ETD44-3C85-G800
43120203735	ETD49-3C85
43120203736	ETD49-3C85-G100
43120203737	ETD49-3C85-G200
43120203738	ETD49-3C85-G500
43120203739	ETD49-3C85-G800
43120203740	ETD34-3C80
43120203741	ETD34-3C80
43120203750	ETD29-3C85
43120203751	ETD29-3C85-G50
43120203752	ETD29-3C85-G150
43120203754	ETD29-3C85-G350
43120203755	ETD49-3C80-G1400
43120203756	ETD49-3C80-G800
43120203759	ETD44-3C80-G100
43120203760	ETD44-3C80-G800
43120203763	ETD39-3C80-G800
43120203766	ETD34-3C80-G800
43120203769	ETD29-3C85-G1000
43120203770	ETD49-3C80-G100
43120203772	ETD49-3C80-G1400
43120203775	ETD44-3C80-G200
43120203778	ETD44-3C80-G500
43120203779	ETD44-3C80
43120203783	ETD34-3C80
43120203784	ETD39-3C80
43120203785	ETD44-3C80
43120203786	ETD49-3C80
43120203789	ETD29-3C11
43120203791	ETD39-3C80
43120203792	ETD54-3C85
43120203793	ETD59-3C85
43120203800	ETD29-3F3
43120203801	ETD34-3F3
43120203802	ETD39-3F3
43120203803	ETD44-3F3
43120203804	ETD49-3F3
43120203805	ETD29-3F3-G50
43120203806	ETD29-3F3-G150
43120203807	ETD29-3F3-G350
43120203808	ETD29-3F3-G1000
43120203809	ETD34-3F3-G100
43120203810	ETD34-3F3-G200
43120203811	ETD34-3F3-G500

11 NC	TYPE NUMBER
43120203812	ETD34-3F3-G800
43120203813	ETD39-3F3-G100
43120203814	ETD39-3F3-G200
43120203815	ETD39-3F3-G500
43120203816	ETD39-3F3-G800
43120203817	ETD44-3F3-G100
43120203818	ETD44-3F3-G200
43120203819	ETD44-3F3-G500
43120203820	ETD44-3F3-G800
43120203821	ETD49-3F3-G100
43120203822	ETD49-3F3-G200
43120203823	ETD49-3F3-G500
43120203824	ETD49-3F3-G800
43120203825	ETD49-3F3-G1400
43120203826	ETD54-3F3
43120203827	ETD59-3F3
43120203900	ETD39-3C85
43120203917	ETD49-3C80-G800
43120203923	ETD29-3C85
43120203925	ETD34-3C80
43120203926	ETD34-3C80-G100
43120203927	ETD34-3C80-G200
43120203928	ETD34-3C80-G500
43120203930	ETD39-3C80
43120203931	ETD39-3C80-G500
43120203933	ETD44-3C80
43120203934	ETD44-3C80-G200
43120203939	ETD49-3C80
43120203940	ETD49-3C80-G500
43120203941	ETD49-3C80-G800
43120203944	ETD44-3C85
43120203945	ETD49-3C85
43120203959	ETD44-3C80-G500
43120203962	ETD29-3C85-G150
43120203977	43120203977
43120204100	EFD15-3F3
43120204101	EFD15-3F3-G170
43120204102	EFD15-3F3-G100
43120204103	EFD15-3F3-G60
43120204108	EFD20-3F3
43120204116	EFD25-3F3
43120204117	EFD25-3F3-G600
43120204118	EFD25-3F3-G300
43120204119	EFD25-3F3-G200
43120204120	EFD25-3C85
43120204121	EFD25-3C85-G600
43120204122	EFD25-3C85-G300
43120204123	EFD25-3C85-G200

11 NC	TYPE NUMBER
43120204124	EFD30-3F3
43120204125	EFD30-3F3-G500
43120204126	EFD30-3F3-G350
43120204127	EFD30-3F3-G250
43120204128	EFD30-3C85
43120204129	EFD30-3C85-G500
43120204130	EFD30-3C85-G350
43120204131	EFD30-3C85-G250
43120204132	EFD15-3F3
43120204302	UR64/46/20-3C80
43120204303	U20/16/7-3C85
43120204304	UR44/31/15-3C10
43120204305	UR44/36/15-3C10
43120204306	UR43/29/16-3C80
43120204307	U25/20/13-3C80
43120204310	UR28/16/20-3C85
43120204311	U15/11/6-3C11
43120204312	U20/16/7-3C11
43120204313	U25/20/13-3C11
43120204314	U30/25/16-3C11
43120204315	UR35/34/13-3C10
43120204317	UR37/25/18-3C10
43120204319	UR37/29/18-3C10
43120204320	UR39/35/15-3C15
43120204321	UR37/29/13-3C10
43120204322	U10/8/3-3C80
43120204323	U15/11/6-3C80
43120204324	U30/25/16-3C80
43120204325	I15/3/3-3C80
43120204326	I20/6/5-3C80
43120204327	I25/7/7-3C80
43120204328	U10/8/3-3C85
43120204329	U15/11/6-3C85
43120204330	U25/20/13-3C85
43120204331	U30/25/16-3C85
43120204334	UR44/36/15-3C15
43120204338	UR28/20/14-3C80
43120204339	UR44/38/16-3C10
43120204340	UR39/35/15-3C80
43120204341	UR28/20/14-3C85
43120204342	UR40/32/22-3C10
43120204346	UR35/34/13-3C15
43120204349	U100/48/25-3C80
43120204353	UR37/34/13-3C85
43120204360	UR35/28/13-3C10
43120204361	UR41/34/13-3C15
43120204404	E41/17/12-3C85
43120204406	E25/9/6-3C85

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43120204407	E25/16/6-3C85
43120204408	E25/10/6-3C85
43120204409	E25/9/6-3E25
43120204410	E25/16/6-3E25
43120204411	E25/10/6-3E25
43120204412	ER28-3C80
43120204414	E47/20/16-3C85
43120204419	ER28-3C85
43120204454	E42/21/15-3C80
43120204455	E42/21/15-3C85
43120204456	E42/21/20-3C80
43120204457	E42/21/20-3C85
43120204503	E55/28/25-3C80-G2500
43120204504	E55/28/21-3C11
43120204505	E65/32/27-3C11
43120204508	E13/7/4-3C80-G150
43120204509	E13/7/4-3C80-G500
43120204510	E13/7/4-3C85
43120204511	E13/7/4-3C85-G50
43120204512	E13/7/4-3C85-G150
43120204513	E13/7/4-3C85-G500
43120204514	E13/7/4-3C11
43120204515	E55/28/25-3C80
43120204516	E16/8/5-3C80-G50
43120204517	E16/8/5-3C80-G150
43120204518	E16/8/5-3C80-G500
43120204519	E16/8/5-3C85
43120204520	E16/8/5-3C85-G50
43120204521	E16/8/5-3C85-G150
43120204522	E16/8/5-3C85-G500
43120204523	E16/8/5-3C11
43120204524	E20/10/6-3C80-G500
43120204525	E20/10/6-3C85
43120204526	E20/10/6-3C85-G50
43120204527	E20/10/6-3C85-G150
43120204528	E20/10/6-3C85-G500
43120204529	E25/13/7-3C85
43120204530	E25/13/7-3C85-G50
43120204531	E25/13/7-3C85-G150
43120204532	E25/13/7-3C85-G500
43120204533	E32/16/9-3C85
43120204534	E32/16/9-3C85-G100
43120204535	E32/16/9-3C85-G200
43120204536	E32/16/9-3C85-G500
43120204537	E32/16/9-3C85-G800
43120204538	E20/10/5-3C80-G500
43120204539	E20/10/5-3C85
43120204540	E20/10/5-3C85-G50
43120204541	E20/10/5-3C85-G150
43120204542	E20/10/5-3C85-G500
43120204543	E30/15/7-3C85
43120204544	E30/15/7-3C85-G100
43120204545	E30/15/7-3C85-G200
43120204546	E30/15/7-3C85-G500
43120204547	E30/15/7-3C85-G800
43120204548	E42/21/15-3C85-G100
43120204549	E42/21/15-3C85-G500
43120204550	E42/21/15-3F3
43120204551	E42/21/20-3F3
43120204552	E20/10/5-3F3
43120204553	E30/15/7-3F3
43120204554	E20/10/6-3F3
43120204555	E25/13/7-3F3
43120204556	E13/7/4-3F3
43120204557	E13/7/4-3F3-G50
43120204558	E13/7/4-3F3-G150
43120204559	E13/7/4-3F3-G500
43120204560	E16/8/5-3F3
43120204561	E16/8/5-3F3-G50
43120204562	E16/8/5-3F3-G150
43120204563	E16/8/5-3F3-G500
43120204564	E30/15/7-3F3-G100
43120204565	E20/10/6-3F3-G50
43120204566	E20/10/6-3F3-G150
43120204567	E20/10/6-3F3-G500
43120204568	E30/15/7-3F3-G200
43120204569	E25/13/7-3F3-G50
43120204570	E25/13/7-3F3-G150
43120204571	E25/13/7-3F3-G500
43120204572	E32/16/9-3F3
43120204573	E32/16/9-3F3-G100
43120204574	E32/16/9-3F3-G200
43120204575	E32/16/9-3F3-G500
43120204576	E32/16/9-3F3-G800
43120204577	E30/15/7-3F3-G500
43120204578	E20/10/5-3F3-G50
43120204579	E20/10/5-3F3-G150
43120204580	E20/10/5-3F3-G500
43120204581	E30/15/7-3F3-G800
43120204582	E42/21/15-3F3-G100
43120204583	E42/21/15-3F3-G200
43120204584	E42/21/15-3F3-G500
43120204585	E42/21/15-3F3-G800
43120204586	E42/21/20-3F3-G100
43120204587	E42/21/20-3F3-G200
43120204588	E42/21/20-3F3-G500
43120204589	E42/21/20-3F3-G800
43120204590	E55/28/21-3F3
43120204591	E55/28/21-3F3-G150
43120204592	E55/28/21-3F3-G450
43120204593	E55/28/21-3F3-G1200
43120204594	E65/32/27-3F3
43120204595	E65/32/27-3F3-G150
43120204596	E65/32/27-3F3-G450
43120204597	E65/32/27-3F3-G1250
43120204599	E55/28/25-3F3
43120204600	E42/21/15-3C85-G800
43120204601	E42/21/20-3C85-G100
43120204602	E42/21/20-3C85-G200
43120204603	E42/21/20-3C85-G500
43120204604	E42/21/20-3C85-G800
43120204605	E55/28/21-3C85-G150
43120204606	E55/28/21-3C85-G450
43120204607	E55/28/21-3C85-G1200
43120204608	E55/28/25-3C80-G500
43120204609	E55/28/25-3C80-G1500
43120204610	E55/28/25-3C85-G500
43120204611	E55/28/25-3C85-G1500
43120204612	E65/32/27-3C85
43120204613	E65/32/27-3C85-G150
43120204614	E65/32/27-3C85-G450
43120204615	E65/32/27-3C85-G1250
43120204616	E13/7/4-3C80-G50
43120204638	ER42-3C80
43120204639	ER42-3C85
43120204640	ER35-3C80
43120204641	ER35-3C85
43120204642	ER40-3C80
43120204643	ER40-3C85
43120204647	E30/15/7-3C11
43120204649	E32/16/9-3C11
43120204662	ER42A-3C80
43120204664	E47/20/16-3C80
43120204666	ER42A-3C85
43120204669	ER54-3C80
43120204670	ER54-3C85
43120204678	E42/33/20-3C85
43120204684	E41/17/12-3C85
43120204686	ER28L-3C80
43120204687	ER28L-3C85
43120204689	E30/15/13-3C85
43120205100	E42/33/20-3F3
43120212601	CLA-EC35
43120212602	CLA-EC41

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43120212603	CLA-EC41-ST
43120212604	CLA-EC52
43120212605	CLA-EC52-ST
43120212606	CLA-EC70
43120212607	CLA-EC70-ST
43120212609	CLA-E55/28/21
43120212611	CLA-E65/32/27
43120212612	CLA-E25/13/7
43120212613	SPR-E55/28/21
43120212614	SPR-E65/32/27
43120212615	SPR-EC35
43120212616	SPR-EC41
43120212617	SPR-EC52
43120212618	SPR-EC70
43120212619	SPR-E25/13/7
43120212620	CPH-E13/7/4-1S-6P
43120212621	CPH-E20/10/6-1S-8P
43120212622	CPH-E32/16/9-1S-12P
43120212623	CPH-E16/8/5-1S-6P
43120212626	CPH-E25/13/7-1S-8P
43120212630	CP-P9/5-1S
43120212633	CP-P14/8-1S
43120212634	CP-P14/8-2S
43120212635	CP-P18/11-1S
43120212636	CP-P18/11-2S
43120212637	CP-P22/13-1S
43120212638	CP-P22/13-2S
43120212639	CP-P26/16-1S
43120212855	CP-E30/15/7-1S
43120212862	CP-E42/21/15-1S
43120212871	CP-E55/28/21-1S
43120212872	CP-E65/32/27-1S
43120212881	CSV-X30-1S-12P
43120212883	CSV-X22-1S-8P
43120212925	CSV-RM6S-1S-6P
43120212930	CSV-RM8-1S-8P
43120212931	CSV-RM8-2S-8P
43120212932	CSV-RM5-1S-6P
43120212934	CSV-RM4-1S-6P
43130201517	TUB4/2/5-3B1
43130202057	MHR11/11-4A11
43130202080	MHR11/11-3C85
43130204003	MHB13/6-4B1
43130204005	MHB13/6-3C85
43130210395	CLI/P-RM7
43220202813	RM7/I-3E4-A6600
43220203300	H20-3E25
43220203302	H7-3E25

11 NC	TYPE NUMBER
43220203303	H16-3E25
43220203304	H10-3E25
43220203306	H10-3E25-S
43220203945	ROD5/25-3B1/D
43220205250	EC35-3C80
43220205251	EC41-3C80
43220205252	EC52-3C80
43220205253	EC70-3C80
43220205421	PH5.6/3.6-3D3
43220205451	PH7.4/3.9-3D3
43220205471	PH9.4/4.8-3D3
43220205480	PH14/7.5-3H1
43220205490	PH26/9.2-3H1
43220209716	RCC6/2-4C65
43220209717	RCC9/3-4C65
43220209718	RCC14/5-4C65
43220209719	RCC23/7-4C65
43220209720	RCC36/15-4C65
43220210004	CPHS-EFD15-1S-8P
43220210007	CPHS-EFD20-1S-10P
43220210025	CPH-EFD15-1S-8P
43220210026	CPH-EFD20-1S-10P
43220210036	CSV-RM4-1S-6P
43220210037	CSV-RM6S-1S-6P
43220210056	CPHS-EFD10-1S-8P
43220210057	CPHS-EFD12-1S-8P
43220210092	SPR-E42/21/15
43220210093	CLA-E42/21/15
43220210096	CSV-RM6R-1S-6P
43220210097	CSV-RM4-1S-6P
43220210099	CSV-RM6S-1S-6P
43220210125	TGP-P22/13
43220210132	432202101321
43220212016	CLA-E20/10/5
43220212017	CLA-E30/15/7
43220212022	SPR-E20/10/5
43220212023	SPR-E30/15/7
43220212024	CSH-E20/10/5-1S-8P
43220212025	CSH-E30/15/7-1S-10P
43220213004	CON-X22
43220213018	TGP-P11/7
43220213021	SPR-X30
43220213022	SPR-X35
43220213023	COV-X22
43220213024	CP-P11/7-1S
43220213025	CP-P14/8-1S
43220213026	CP-P14/8-2S
43220213027	CP-P18/11-1S

11 NC	TYPE NUMBER
43220213028	CP-P18/11-2S
43220213029	CP-P18/11-3S
43220213030	CP-P22/13-1S
43220213031	CP-P22/13-2S
43220213032	CP-P22/13-3S
43220213033	CP-P26/16-1S
43220213034	CP-P26/16-2S
43220213035	CP-P26/16-3S
43220213036	CP-P30/19-1S
43220213037	CP-P30/19-2S
43220213038	CP-P30/19-3S
43220213039	CP-P36/22-1S
43220213040	CP-P36/22-2S
43220213041	CP-P36/22-3S
43220213042	CP-P42/29-1S
43220213043	CP-P42/29-2S
43220213044	TGP-P14/8
43220213045	TGP-P18/11
43220213046	TGP-P22/13
43220213047	TGP-P26/16
43220213048	TGP-P30/19
43220213049	TGP-P36/22
43220213050	TGP-P42/29
43220213051	CON-P11/7
43220213052	CON-P14/8
43220213053	CON-P18/11
43220213054	CON-P22/13
43220213055	CON-P26/16
43220213056	CON-P30/19
43220213057	CON-P36/22
43220213058	CON-P42/29
43220213062	SPR-P11/7
43220213063	SPR-P14/8
43220213064	SPR-P18/11
43220213065	SPR-P22/13
43220213066	SPR-P26/16
43220213067	SPR-P30/19
43220213068	SPR-P36/22
43220213069	SPR-P42/29
43220213071	NUT
43220213072	FIB
43220213115	COV-X30
43220213116	COV-X35
43220213117	CON-X30/A
43220213118	CON-X35/A
43220213132	CP-P66/56-1S
43220213170	CP-P9/5-1S
43220213178	CLI/P-RM6

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220213183	CPH-E42/21/15-1S-10P
43220213184	CLI/P-RM8
43220213190	CLI/P-RM4/RM5
43220213191	CLA-E42/21/15
43220213192	SPR-E42/21/15
43220213221	CSV-RM4-1S-6P
43220213231	CSV-RM6R-2S-6P
43220213236	CSV-RM8-1S-4P
43220213239	CSV-RM8-1S-12P
43220213242	CSV-RM8-2S-8P
43220213244	CSV-RM10-1S-5P
43220213245	CSV-RM10-1S-8P
43220213246	CSV-RM10-2S-8P
43220213247	CSV-RM10-1S-12P
43220213263	CSV-RM8-1S-8P
43220213279	CSV-RM10-2S-12P
43220213287	CSV-X22-1S-8P
43220213295	CSV-RM6S-2S-6P
43220213299	CP-P7.4/4.2-1S
43220213331	CPH-EC35-1S-13P
43220213332	CPH-EC41-1S-9P
43220213333	CPH-EC52-1S-11P
43220213334	CPH-EC70-1S-15P
43220213335	CPV-EC41-1S-9P
43220213336	CPV-EC52-1S-11P
43220213337	CPV-EC70-1S-15P
43220213341	CSH-EC35-1S-11P
43220213342	CSV-X30-1S-12P
43220213343	CSV-X35-1S-16P
43220213348	CPH-EC41-1S-12P
43220213350	CPH-EC52-1S-14P
43220213355	CP-P5.8/3.3-1S
43220213362	CON-X30/B
43220213363	CON-X35/B
43220213370	CP-PH26/9.2-1S
43220213385	CPH-ETD34-1S-14P
43220213386	CPH-ETD39-1S-16P
43220213387	CPH-ETD44-1S-18P
43220213388	CPH-ETD49-1S-20P
43220213389	CLI-ETD34
43220213390	CLI-ETD39
43220213391	CLI-ETD44
43220213392	CLI-ETD49
43220213394	ECLI-ETD34
43220213395	ECLI-ETD39
43220213396	ECLI-ETD44
43220213397	ECLI-ETD49
43220213404	CPV-RM6S/I-1S-8PD

11 NC	TYPE NUMBER
43220213405	CPV-RM8/I-1S-12PD
43220213406	CPV-RM10/I-1S-12PD
43220213407	CPV-RM14/I-1S-12PD
43220213411	CPV-RM12/I-1S-12PD
43220213423	CSCI-ETD34-1S-7P
43220213424	CSCO-ETD34-1S-7P
43220213429	CLI/P-RM4/I/RM5/I
43220213430	CLI/P-RM6/I
43220213431	CLI/P-RM8/I
43220213432	CLI/P-RM10/I
43220213437	CLI-ETD29
43220213438	CPH-ETD29-1S-13P
43220213442	CSV-RM4-1S-6P
43220213445	CSV-RM5-1S-4P
43220213446	CSV-RM5-1S-5P
43220213447	CSV-RM5-1S-6P
43220213448	CSV-RM5-2S-4P
43220213449	CSV-RM5-2S-5P
43220213450	CSV-RM5-2S-6P
43220213451	CSV-RM6S/R-1S-4P
43220213452	CSV-RM6S/R-2S-4P
43220213453	CSV-RM6R-1S-5P
43220213454	CSV-RM6R-1S-6P
43220213455	CSV-RM6R-2S-5P
43220213456	CSV-RM6R-2S-6P
43220213457	CSV-RM6S-1S-5P
43220213458	CSV-RM6S-1S-6P
43220213459	CSV-RM6S-2S-5P
43220213460	CSV-RM6S-2S-6P
43220213461	CSV-RM7/I-1S-4P
43220213462	CSV-RM7/I-1S-5P
43220213463	CSV-RM7/I-1S-8P
43220213464	CSV-RM7/I-2S-5P
43220213465	CSV-RM7/I-2S-8P
43220213466	CSV-RM8-1S-5P
43220213467	CSV-RM8-1S-8P
43220213468	CSV-RM8-1S-12P
43220213469	CSV-RM8-2S-5P
43220213470	CSV-RM8-2S-8P
43220213471	CSV-RM8-2S-12P
43220213472	CSV-RM10-1S-5P
43220213473	CSV-RM10-1S-8P
43220213474	CSV-RM10-1S-10P
43220213475	CSV-RM10-1S-11P
43220213476	CSV-RM10-1S-12P
43220213477	CSV-RM10-2S-5P
43220213478	CSV-RM10-2S-8P
43220213479	CSV-RM10-2S-10P

11 NC	TYPE NUMBER
43220213480	CSV-RM10-2S-11P
43220213481	CSV-RM10-2S-12P
43220213486	CSV-RM8-1S-4P
43220213491	CLI/P-RM12/I
43220213492	CLI/P-RM14/I
43220213503	CSH-EP13-1S-10P
43220213507	CPH-U15/I20-1S-4P
43220213508	CPH-U15/I20-2S-4P
43220213514	CLI-EFD15
43220213515	CLI-EFD20
43220213516	CLI-EFD25
43220213517	CLI-EFD30
43220213520	CSH-EFD15-1S-8P
43220213522	CSH-EFD20-1S-8P
43220213524	CSH-EFD25-1S-10P
43220213525	CSH-EFD30-1S-12P
43220213832	ADJ-P30/RM10-RED
43220213834	ADJ-P30/RM10-YELLOW
43220213838	ADJ-P30/RM10-WHITE
43220213839	ADJ-P30/RM10-GREY
43220213840	ADJ-P22/RM8-BLACK
43220213841	ADJ-P22/RM8-BROWN
43220213842	ADJ-P22/RM8-RED
43220213843	ADJ-P22/RM8-ORANGE
43220213844	ADJ-P22/RM8-YELLOW
43220213845	ADJ-P22/RM8-GREEN
43220213848	ADJ-P22/RM8-WHITE
43220213849	ADJ-P22/RM8-GREY
43220213860	ADJ-RM6-BLACK
43220213861	ADJ-RM6-BROWN
43220213862	ADJ-RM6-RED
43220213864	ADJ-RM6-YELLOW
43220213865	ADJ-RM6-GREEN
43220213867	ADJ-RM6-VIOLET
43220213868	ADJ-RM6-WHITE
43220213869	ADJ-RM6-GREY
43220213870	ADJ-RM4/RM5-BLACK
43220213871	ADJ-RM4/RM5-BROWN
43220213872	ADJ-RM4/RM5-RED
43220213875	ADJ-RM4/RM5-GREEN
43220213878	ADJ-RM4/RM5-WHITE
43220213879	ADJ-RM4/RM5-GREY
43220213924	ADJ-P36/P42-YELLOW
43220213928	ADJ-P36/P42-WHITE
43220213929	ADJ-P36/P42-GREY
43220213941	ADJ-P26-BROWN
43220213942	ADJ-P26-RED
43220213945	ADJ-P26-GREEN

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220213948	ADJ-P26-WHITE
43220213949	ADJ-P26-GREY
43220213960	ADJ-P18-BLACK
43220213961	ADJ-P18-BROWN
43220213962	ADJ-P18-RED
43220213963	ADJ-P18-ORANGE
43220213964	ADJ-P18-YELLOW
43220213965	ADJ-P18-GREEN
43220213967	ADJ-P18-VIOLET
43220213968	ADJ-P18-WHITE
43220213970	ADJ-P14-BLACK
43220213971	ADJ-P14-BROWN
43220213972	ADJ-P14-RED
43220213973	ADJ-P14-ORANGE
43220213974	ADJ-P14-YELLOW
43220213975	ADJ-P14-GREEN
43220213978	ADJ-P14-WHITE
43220213979	ADJ-P14-GREY
43220213981	ADJ-P9/P11-BROWN
43220213984	ADJ-P9/P11-YELLOW
43220213985	ADJ-P9/P11-GREEN
43220213989	ADJ-P9/P11-GREY
43220220120	P11/7-3H1
43220220125	P11/7-3H1-A160
43220220126	P11/7-3H1-A250
43220220139	P11/7-3D3
43220220143	P11/7-3D3-A63
43220220144	P11/7-3D3-A100
43220220150	P11/7-3H3
43220220155	P11/7-3H3-A160
43220220156	P11/7-3H3-A250
43220220169	P11/7-3F3
43220220171	P11/7-3F3-A100
43220220172	P11/7-3F3-A160
43220220173	P11/7-3F3-A250
43220220179	P11/7-4C6
43220220181	P11/7-4C6-A25
43220220182	P11/7-4C6-A40
43220220188	P11/7-3B8
43220220190	P11/7-3B8-A100
43220220191	P11/7-3B8-A160
43220220192	P11/7-3B8-A250
43220220321	P14/8-3H1
43220220325	P14/8-3H1-A160
43220220326	P14/8-3H1-A250
43220220327	P14/8-3H1-A315
43220220328	P14/8-3H1-A400
43220220340	P14/8-3D3

11 NC	TYPE NUMBER
43220220343	P14/8-3D3-A63
43220220344	P14/8-3D3-A100
43220220355	P14/8-3H3-A160
43220220356	P14/8-3H3-A250
43220220357	P14/8-3H3-A315
43220220358	P14/8-3H3-A400
43220220360	P14/8-3H3
43220220366	P14/8-3C85
43220220367	P14/8-3C85-A160
43220220368	P14/8-3C85-A250
43220220369	P14/8-3C85-A315
43220220370	P14/8-3C85-A400
43220220377	P14/8-3E4
43220220379	P14/8-3E1
43220220380	P14/8-4C6-A160
43220220381	P14/8-4C6-A25
43220220382	P14/8-4C6-A40
43220220383	P14/8-4C6-A63
43220220385	P14/8-3B8-A160
43220220386	P14/8-3B8-A250
43220220387	P14/8-3B8-A315
43220220388	P14/8-3B8-A400
43220220392	P14/8-3F3
43220220393	P14/8-3F3-A160
43220220394	P14/8-3F3-A250
43220220395	P14/8-3F3-A315
43220220396	P14/8-3F3-A400
43220220397	P14/8-3B8
43220220521	P18/11-3H1
43220220525	P18/11-3H1-A160
43220220526	P18/11-3H1-A250
43220220527	P18/11-3H1-A315
43220220528	P18/11-3H1-A400
43220220540	P18/11-3D3
43220220543	P18/11-3D3-A63
43220220544	P18/11-3D3-A100
43220220545	P18/11-3D3-A160
43220220550	P18/11-3H3
43220220555	P18/11-3H3-A160
43220220556	P18/11-3H3-A250
43220220557	P18/11-3H3-A315
43220220558	P18/11-3H3-A400
43220220566	P18/11-3F3
43220220568	P18/11-3F3-A160
43220220569	P18/11-3F3-A250
43220220570	P18/11-3F3-A315
43220220571	P18/11-3F3-A400
43220220577	P18/11-3B8

11 NC	TYPE NUMBER
43220220578	P18/11-3C85
43220220580	P18/11-4C6
43220220581	P18/11-4C6-A25
43220220582	P18/11-4C6-A40
43220220583	P18/11-4C6-A63
43220220586	P18/11-3C85-A160
43220220587	P18/11-3C85-A250
43220220588	P18/11-3C85-A315
43220220589	P18/11-3C85-A400
43220220590	P18/11-3B8-A315
43220220591	P18/11-3B8-A160
43220220592	P18/11-3B8-A250
43220220594	P18/11-3B8-A400
43220220720	P22/13-3H1
43220220725	P22/13-3H1-A160
43220220726	P22/13-3H1-A250
43220220727	P22/13-3H1-A315
43220220728	P22/13-3H1-A400
43220220730	P22/13-3H1-A630
43220220740	P22/13-3D3
43220220744	P22/13-3D3-A100
43220220745	P22/13-3D3-A160
43220220755	P22/13-3H3-A160
43220220756	P22/13-3H3-A250
43220220757	P22/13-3H3-A315
43220220758	P22/13-3H3-A400
43220220759	P22/13-3H3
43220220760	P22/13-3H3-A630
43220220764	P22/13-3F3
43220220765	P22/13-3F3-A160
43220220766	P22/13-3F3-A250
43220220767	P22/13-3F3-A315
43220220768	P22/13-3F3-A400
43220220769	P22/13-3F3-A630
43220220777	P22/13-3C85
43220220779	P22/13-4C6-A250
43220220781	P22/13-4C6-A25
43220220782	P22/13-4C6-A40
43220220783	P22/13-4C6-A63
43220220785	P22/13-3C85-A160
43220220786	P22/13-3C85-A250
43220220787	P22/13-3C85-A315
43220220788	P22/13-3C85-A400
43220220789	P22/13-3C85-A630
43220220791	P22/13-3B8-A160
43220220792	P22/13-3B8-A250
43220220793	P22/13-3B8-A315
43220220794	P22/13-3B8-A400

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220220795	P22/13-3B8-A630
43220220797	P22/13-3B8
43220220925	P26/16-3H1-A160
43220220926	P26/16-3H1-A250
43220220927	P26/16-3H1-A315
43220220928	P26/16-3H1-A400
43220220930	P26/16-3H1-A630
43220220944	P26/16-3D3-A100
43220220945	P26/16-3D3-A160
43220220946	P26/16-3D3-A250
43220220949	P26/16-3D3
43220220950	P26/16-3F3
43220220951	P26/16-3H3
43220220955	P26/16-3H3-A160
43220220956	P26/16-3H3-A250
43220220957	P26/16-3H3-A315
43220220958	P26/16-3H3-A400
43220220960	P26/16-3H3-A630
43220220972	P26/16-3H1
43220220973	P26/16-3C85
43220220980	P26/16-4C6-A310
43220220983	P26/16-4C6-A63
43220220984	P26/16-4C6-A100
43220220985	P26/16-3B8
43220220986	P26/16-3B8-A250
43220220987	P26/16-3B8-A315
43220220988	P26/16-3B8-A400
43220220989	P26/16-3B8-A630
43220221120	P30/19-3H1
43220221124	P30/19-3H1-A315
43220221126	P30/19-3H1-A250
43220221127	P30/19-3H1-A315
43220221128	P30/19-3H1-A400
43220221130	P30/19-3H1-A630
43220221131	P30/19-3H1-A1000
43220221132	P30/19-3H1-A1600
43220221148	P30/19-3F3
43220221151	P30/19-3F3-A250
43220221152	P30/19-3F3-A315
43220221153	P30/19-3F3-A400
43220221154	P30/19-3F3-A630
43220221160	P30/19-3C85
43220221164	P30/19-3C85-A250
43220221165	P30/19-3C85-A315
43220221166	P30/19-3C85-A400
43220221167	P30/19-3C85-A630
43220221182	P30/19-3B8
43220221184	P30/19-3B8-A250

11 NC	TYPE NUMBER
43220221185	P30/19-3B8-A315
43220221186	P30/19-3B8-A400
43220221187	P30/19-3B8-A630
43220221320	P36/22-3H1
43220221328	P36/22-3H1-A400
43220221330	P36/22-3H1-A630
43220221331	P36/22-3H1-A1000
43220221332	P36/22-3H1-A1600
43220221350	P36/22-3F3
43220221351	P36/22-3F3-A250
43220221352	P36/22-3F3-A315
43220221353	P36/22-3F3-A400
43220221354	P36/22-3F3-A630
43220221360	P36/22-3C85
43220221364	P36/22-3C85-A250
43220221365	P36/22-3C85-A315
43220221366	P36/22-3C85-A400
43220221367	P36/22-3C85-A630
43220221378	P36/22-3B8
43220221381	P36/22-3B8-A250
43220221382	P36/22-3B8-A315
43220221383	P36/22-3B8-A400
43220221384	P36/22-3B8-A630
43220221520	P42/29-3H1
43220221527	P42/29-3H1-A315
43220221528	P42/29-3H1-A400
43220221530	P42/29-3H1-A630
43220221531	P42/29-3H1-A1000
43220221532	P42/29-3H1-A1600
43220221580	P42/29-3F3
43220221583	P42/29-3F3-A315
43220221584	P42/29-3F3-A400
43220221585	P42/29-3F3-A630
43220221590	P42/29-3C85
43220221593	P42/29-3C85-A315
43220221594	P42/29-3C85-A400
43220221595	P42/29-3C85-A630
43220221700	P66/56-3E1
43220221928	X30-3H1-A400
43220221930	X30-3H1-A630
43220221931	X30-3H1-A1000
43220221932	X30-3H1-A1600
43220222125	P11/7-3H1-A160/N
43220222126	P11/7-3H1-A250/N
43220222143	P11/7-3D3-A63/N
43220222144	P11/7-3D3-A100/N
43220222155	P11/7-3H3-A160/N
43220222156	P11/7-3H3-A250/N

11 NC	TYPE NUMBER
43220222181	P11/7-4C6-A25/N
43220222182	P11/7-4C6-A40/N
43220222325	P14/8-3H1-A160/N
43220222326	P14/8-3H1-A250/N
43220222327	P14/8-3H1-A315/N
43220222328	P14/8-3H1-A400/N
43220222343	P14/8-3D3-A63/N
43220222344	P14/8-3D3-A100/N
43220222355	P14/8-3H3-A160/N
43220222356	P14/8-3H3-A250/N
43220222357	P14/8-3H3-A315/N
43220222358	P14/8-3H3-A400/N
43220222381	P14/8-4C6-A25/N
43220222382	P14/8-4C6-A40/N
43220222383	P14/8-4C6-A63/N
43220222525	P18/11-3H1-A160/N
43220222526	P18/11-3H1-A250/N
43220222527	P18/11-3H1-A315/N
43220222528	P18/11-3H1-A400/N
43220222543	P18/11-3D3-A63/N
43220222544	P18/11-3D3-A100/N
43220222545	P18/11-3D3-A160/N
43220222555	P18/11-3H3-A160/N
43220222556	P18/11-3H3-A250/N
43220222557	P18/11-3H3-A315/N
43220222558	P18/11-3H3-A400/N
43220222581	P18/11-4C6-A25/N
43220222582	P18/11-4C6-A40/N
43220222583	P18/11-4C6-A63/N
43220222725	P22/13-3H1-A160/N
43220222726	P22/13-3H1-A250/N
43220222727	P22/13-3H1-A315/N
43220222728	P22/13-3H1-A400/N
43220222730	P22/13-3H1-A630/N
43220222744	P22/13-3D3-A100/N
43220222745	P22/13-3D3-A160/N
43220222755	P22/13-3H3-A160/N
43220222756	P22/13-3H3-A250/N
43220222757	P22/13-3H3-A315/N
43220222758	P22/13-3H3-A400/N
43220222760	P22/13-3H3-A630/N
43220222781	P22/13-4C6-A25/N
43220222782	P22/13-4C6-A40/N
43220222783	P22/13-4C6-A63/N
43220222925	P26/16-3H1-A160/N
43220222926	P26/16-3H1-A250/N
43220222927	P26/16-3H1-A315/N
43220222928	P26/16-3H1-A400/N

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220222930	P26/16-3H1-A630/N
43220222944	P26/16-3D3-A100/N
43220222945	P26/16-3D3-A160/N
43220222946	P26/16-3D3-A250/N
43220222955	P26/16-3H3-A160/N
43220222956	P26/16-3H3-A250/N
43220222957	P26/16-3H3-A315/N
43220222958	P26/16-3H3-A400/N
43220222960	P26/16-3H3-A630/N
43220222983	P26/16-4C6-A63/N
43220222984	P26/16-4C6-A100/N
43220223126	P30/19-3H1-A250/N
43220223127	P30/19-3H1-A315/N
43220223128	P30/19-3H1-A400/N
43220223130	P30/19-3H1-A630/N
43220223131	P30/19-3H1-A1000/N
43220223328	P36/22-3H1-A400/N
43220223330	P36/22-3H1-A630/N
43220223331	P36/22-3H1-A1000/N
43220223332	P36/22-3H1-A1600/N
43220223527	P42/29-3H1-A315/N
43220223528	P42/29-3H1-A400/N
43220223530	P42/29-3H1-A630/N
43220223531	P42/29-3H1-A1000/N
43220223532	P42/29-3H1-A1600/N
43220223928	X30-3H1-A400/N
43220223930	X30-3H1-A630/N
43220223931	X30-3H1-A1000/N
43220223932	X30-3H1-A1600/N
43220224120	P9/5-3H1
43220224123	P9/5-3H1-A63
43220224124	P9/5-3H1-A100
43220224125	P9/5-3H1-A160
43220224140	P9/5-3D3
43220224142	P9/5-3D3-A40
43220224143	P9/5-3D3-A63
43220224179	P9/5-4C6-A100
43220224180	P9/5-4C6-A16
43220224181	P9/5-4C6-A25
43220224182	P9/5-4C6-A40
43220224520	X22-3H1
43220224528	X22-3H1-A400
43220224531	X22-3H1-A1000
43220224540	X22-3D3
43220224560	X22-3B8
43220224580	X22-4C6
43220224721	RM6S-3H1
43220224725	RM6S-3H1-A160

11 NC	TYPE NUMBER
43220224726	RM6S-3H1-A250
43220224727	RM6S-3H1-A315
43220224728	RM6S-3H1-A400
43220224740	RM6S-3D3
43220224743	RM6S-3D3-A63
43220224744	RM6S-3D3-A100
43220224745	RM6S-3D3-A160
43220224755	RM6S-3H3-A160
43220224756	RM6S-3H3-A250
43220224757	RM6S-3H3-A315
43220224758	RM6S-3H3-A400
43220224768	RM6S-3H3-A200
43220224772	RM6S/I-3B8-A63
43220224773	RM6S/I-3B8-A160
43220224774	RM6S/I-3B8-A100
43220224778	RM6S-4C6
43220224781	RM6S-4C6-A25
43220224782	RM6S-4C6-A40
43220224783	RM6S-4C6-A63
43220224784	RM6S/I-3E6
43220224785	RM6S/I-3B8
43220224786	RM6S/I-3E1
43220224787	RM6S/I-3E5
43220224788	RM6S/I-3B8-A250
43220224793	RM6S/I-3E4
43220224794	RM6S/I-3E5
43220225020	RM10-3H1
43220225026	RM10-3H1-A250
43220225027	RM10-3H1-A315
43220225028	RM10-3H1-A400
43220225030	RM10-3H1-A630
43220225040	RM10/I-3B8
43220225046	RM10/I-3B8-A160
43220225048	RM10/I-3B8-A250
43220225049	RM10/I-3B8-A315
43220225050	RM10/I-3B8-A400
43220225052	RM10/I-3B8-A630
43220225060	RM10/I-3C85
43220225086	RM10/I-3C85-A250
43220225087	RM10/I-3C85-A315
43220225088	RM10/I-3C85-A400
43220225089	RM10/I-3C85-A630
43220225090	RM10/I-3E1
43220225091	RM10/I-3E4
43220225093	RM10/I-3E4
43220225094	RM10/I-3E5
43220225099	RM10/I-3C85-A160
43220225120	RM8-3H1

11 NC	TYPE NUMBER
43220225126	RM8-3H1-A250
43220225127	RM8-3H1-A315
43220225128	RM8-3H1-A400
43220225130	RM8-3H1-A630
43220225140	RM8-3D3
43220225144	RM8-3D3-A100
43220225145	RM8-3D3-A160
43220225146	RM8/I-3B8
43220225147	RM8/I-3B8-A160
43220225148	RM8/I-3B8-A250
43220225149	RM8/I-3B8-A315
43220225150	RM8/I-3B8-A400
43220225156	RM8-3H3-A250
43220225157	RM8-3H3-A315
43220225158	RM8-3H3-A400
43220225160	RM8-3H3-A630
43220225170	RM8-3H3
43220225181	RM8-4C6
43220225182	RM8-4C6-A40
43220225183	RM8-4C6-A63
43220225186	RM8/I-3E1
43220225187	RM8/I-3E4
43220225188	RM8/I-3E5
43220225190	RM8/I-3E4
43220225198	RM8/I-3E5
43220225300	X35-3B8
43220225320	X35-3H1
43220225328	X35-3H1-A400
43220225330	X35-3H1-A630
43220225331	X35-3H1-A1000
43220225332	X35-3H1-A1600
43220225520	RM6R-3H1
43220225525	RM6R-3H1-A160
43220225526	RM6R-3H1-A250
43220225527	RM6R-3H1-A315
43220225528	RM6R-3H1-A400
43220225540	RM6R-3D3
43220225543	RM6R-3D3-A63
43220225544	RM6R-3D3-A100
43220225545	RM6R-3D3-A160
43220225555	RM6R-3H3-A160
43220225556	RM6R-3H3-A250
43220225557	RM6R-3H3-A315
43220225558	RM6R-3H3-A400
43220225562	RM6R-3H3
43220225566	RM6R-4C6
43220225568	RM6R-3H3-A200
43220225581	RM6R-4C6-A25

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220225582	RM6R-4C6-A40
43220225583	RM6R-4C6-A63
43220225710	RM4/I-3F3-A950
43220225714	RM4/I-3F3-A100
43220225715	RM4/I-3F3-A160
43220225716	RM4/I-3F3-A250
43220225720	RM4-3H1
43220225723	RM4-3H1-A63
43220225724	RM4-3H1-A100
43220225725	RM4-3H1-A160
43220225739	RM4-3D3
43220225742	RM4-3D3-A40
43220225743	RM4-3D3-A63
43220225750	RM4-3H3
43220225753	RM4-3H3-A63
43220225754	RM4-3H3-A100
43220225755	RM4-3H3-A160
43220225770	RM4/I-3E1
43220225775	RM4/I-3E5
43220225779	RM4-4C6
43220225780	RM4-4C6-A16
43220225781	RM4-4C6-A25
43220225791	RM4/I-3E4
43220225916	RM5/I-3E6
43220225920	RM5-3H1
43220225925	RM5-3H1-A160
43220225926	RM5-3H1-A250
43220225927	RM5-3H1-A315
43220225940	RM5-3D3
43220225943	RM5-3D3-A63
43220225944	RM5-3D3-A100
43220225946	RM5/I-3B8
43220225948	RM5/I-3B8-A160
43220225949	RM5/I-3B8-A250
43220225955	RM5-3H3-A160
43220225956	RM5-3H3-A250
43220225957	RM5-3H3-A315
43220225981	RM5-4C6-A25
43220225982	RM5-4C6-A40
43220225984	RM5-4C6
43220225990	RM5/I-3E1
43220225991	RM5/I-3E4
43220225992	RM5/I-3E5
43220225994	RM5/I-3E5
43220226123	P9/5-3H1-A63/N
43220226124	P9/5-3H1-A100/N
43220226125	P9/5-3H1-A160/N
43220226142	P9/5-3D3-A40/N
43220226143	P9/5-3D3-A63/N
43220226180	P9/5-4C6-A16/N
43220226181	P9/5-4C6-A25/N
43220226182	P9/5-4C6-A40/N
43220226528	X22-3H1-A400/N
43220226530	X22-3H1-A630/N
43220226531	X22-3H1-A1000/N
43220226725	RM6S-3H1-A160/N
43220226726	RM6S-3H1-A250/N
43220226727	RM6S-3H1-A315/N
43220226728	RM6S-3H1-A400/N
43220226743	RM6S-3D3-A63/N
43220226744	RM6S-3D3-A100/N
43220226745	RM6S-3D3-A160/N
43220226755	RM6S-3H3-A160/N
43220226756	RM6S-3H3-A250/N
43220226757	RM6S-3H3-A315/N
43220226758	RM6S-3H3-A400/N
43220226768	RM6S-3H3-A200/N
43220226781	RM6S-4C6-A25/N
43220226782	RM6S-4C6-A40/N
43220226783	RM6S-4C6-A63/N
43220227026	RM10-3H1-A250/N
43220227027	RM10-3H1-A315/N
43220227028	RM10-3H1-A400/N
43220227030	RM10-3H1-A630/N
43220227126	RM8-3H1-A250/N
43220227127	RM8-3H1-A315/N
43220227128	RM8-3H1-A400/N
43220227130	RM8-3H1-A630/N
43220227137	RM8-3H1-A630/N
43220227144	RM8-3D3-A100/N
43220227145	RM8-3D3-A160/N
43220227156	RM8-3H3-A250/N
43220227157	RM8-3H3-A315/N
43220227158	RM8-3H3-A400/N
43220227160	RM8-3H3-A630/N
43220227182	RM8-4C6-A40/N
43220227183	RM8-4C6-A63/N
43220227330	X35-3H1-A630/N
43220227525	RM6R-3H1-A160/N
43220227526	RM6R-3H1-A250/N
43220227527	RM6R-3H1-A315/N
43220227528	RM6R-3H1-A400/N
43220227543	RM6R-3D3-A63/N
43220227544	RM6R-3D3-A100/N
43220227545	RM6R-3D3-A160/N
43220227555	RM6R-3H3-A160/N
43220227556	RM6R-3H3-A250/N
43220227557	RM6R-3H3-A315/N
43220227558	RM6R-3H3-A400/N
43220227568	RM6R-3H3-A200/N
43220227581	RM6R-4C6-A25/N
43220227582	RM6R-4C6-A40/N
43220227583	RM6R-4C6-A63/N
43220227723	RM4-3H1-A63/N
43220227724	RM4-3H1-A100/N
43220227725	RM4-3H1-A160/N
43220227742	RM4-3D3-A40/N
43220227743	RM4-3D3-A63/N
43220227753	RM4-3H3-A63/N
43220227754	RM4-3H3-A100/N
43220227755	RM4-3H3-A160/N
43220227780	RM4-4C6-A16/N
43220227781	RM4-4C6-A25/N
43220227925	RM5-3H1-A160/N
43220227926	RM5-3H1-A250/N
43220227927	RM5-3H1-A315/N
43220227943	RM5-3D3-A63/N
43220227944	RM5-3D3-A100/N
43220227955	RM5-3H3-A160/N
43220227956	RM5-3H3-A250/N
43220227957	RM5-3H3-A315/N
43220227981	RM5-4C6-A25/N
43220227982	RM5-4C6-A40/N
43220250040	RM7/I-3C85
43220250045	RM7/I-3C85-A160
43220250046	RM7/I-3C85-A250
43220250060	RM7/I-3B8
43220250065	RM7/I-3B8-A160
43220250066	RM7/I-3B8-A250
43220250080	RM7/I-3F3
43220250085	RM7/I-3F3-A160
43220250086	RM7/I-3F3-A250
43220250090	RM7/I-3E4
43220250095	RM7/I-3E5
43220250099	RM7/I-3E1
43220250120	RM8/I-3C85
43220250144	RM8/I-3C85-A100
43220250145	RM8/I-3C85-A160
43220250146	RM8/I-3C85-A250
43220250147	RM8/I-3C85-A315
43220250148	RM8/I-3C85-A400
43220250160	RM8/I-3F3
43220250165	RM8/I-3F3-A160
43220250166	RM8/I-3F3-A250

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43220250167	RM8/I-3F3-A315
43220250168	RM8/I-3F3-A400
43220250191	RM8/I-3E6
43220250260	RM10/I-3F3
43220250265	RM10/I-3F3-A160
43220250266	RM10/I-3F3-A250
43220250267	RM10/I-3F3-A315
43220250268	RM10/I-3F3-A400
43220250269	RM10/I-3F3-A630
43220250300	RM14/I-3C85
43220250316	RM14/I-3C85-A250
43220250317	RM14/I-3C85-A315
43220250318	RM14/I-3C85-A400
43220250320	RM14/I-3C85-A630
43220250321	RM14/I-3C85-A1000
43220250360	RM14/I-3F3
43220250366	RM14/I-3F3-A250
43220250367	RM14/I-3F3-A315
43220250368	RM14/I-3F3-A400
43220250370	RM14/I-3F3-A630
43220250371	RM14/I-3F3-A1000
43220250380	RM14/I-3B8
43220250386	RM14/I-3B8-A250
43220250387	RM14/I-3B8-A315
43220250388	RM14/I-3B8-A400
43220250390	RM14/I-3B8-A630
43220250391	RM14/I-3B8-A1000
43220250400	RM5/I-3C85
43220250404	RM5/I-3C85-A100
43220250405	RM5/I-3C85-A160
43220250406	RM5/I-3C85-A250
43220250410	RM5/I-3F3
43220250414	RM5/I-3F3-A100
43220250415	RM5/I-3F3-A160
43220250416	RM5/I-3F3-A250
43220250500	RM6S/I-3C85
43220250503	RM6S/I-3C85-A63
43220250504	RM6S/I-3C85-A100
43220250505	RM6S/I-3C85-A160
43220250506	RM6S/I-3C85-A250
43220250511	RM6S/I-3F3
43220250513	RM6S/I-3F3-A63
43220250514	RM6S/I-3F3-A100
43220250515	RM6S/I-3F3-A160
43220250516	RM6S/I-3F3-A250
43220250519	RM6S/I-3F3-A250
43220250600	RM12/I-3C85
43220250605	RM12/I-3C85-A160

11 NC	TYPE NUMBER
43220250606	RM12/I-3C85-A250
43220250607	RM12/I-3C85-A315
43220250608	RM12/I-3C85-A400
43220250620	RM12/I-3F3
43220250625	RM12/I-3F3-A160
43220250626	RM12/I-3F3-A250
43220250627	RM12/I-3F3-A315
43220250628	RM12/I-3F3-A400
43220250640	RM12/I-3B8
43220250645	RM12/I-3B8-A160
43220250646	RM12/I-3B8-A250
43220250647	RM12/I-3B8-A315
43220250648	RM12/I-3B8-A400
43220250660	RM12/I-3E4
43220250670	RM12/I-3E1
43220250700	P7/4-3H1
43220250703	P7/4-3H1-A63
43220250704	P7/4-3H1-A100
43220250820	EP7-3E5
43220250840	EP7-3F3
43220250860	EP7-3E1
43220251003	EP13-3C85-A100
43220251004	EP13-3C85-A160
43220251006	EP13-3C85-A250
43220251007	EP13-3C85-A315
43220251014	EP13-3C85
43220251020	EP13-3E6
43220251033	EP13-3E1
43220251077	EP13-3E5
43220251080	EP13-3E25
43220251090	EP13-3F3
43220251094	EP13-3F3-A160
43220251096	EP13-3F3-A250
43220251097	EP13-3F3-A315
43220251300	X30-3H1
43220251320	X30-3B8
43220253026	P26/16-3C85-A250
43220253027	P26/16-3C85-A315
43220253028	P26/16-3C85-A400
43220253030	P26/16-3C85-A630
43220253046	P26/16-3F3-A250
43220253047	P26/16-3F3-A315
43220253048	P26/16-3F3-A400
43220253050	P26/16-3F3-A630
43300303008	ROD5/25-4B1/D
43300303071	ROD10/200-4B1
43300303097	IMP8/3/125-3D3
43300303099	IMP10/4.5/170-3D3

11 NC	TYPE NUMBER
43300303114	ROD5/20-4B1/D
43300303119	IMP6/3/200-3D3
43300303121	IMP6/3/200-3C85
43300303122	IMP8/3/200-3C85
43300303123	IMP10/4.5/200-3C85
43300303124	IMP12/5.5/200-3C85
43300303125	IMP12/5.5/170-3D3
43300303133	ROD2/10-3B1/D
43300303134	ROD2/15-3B1/D
43300303135	ROD3/15-3B1/D
43300303136	ROD3/20-3B1/D
43300303137	ROD4/15-3B1/D
43300303138	ROD4/20-3B1/D
43300303139	ROD5/20-3B1/D
43300303140	ROD5/25-3B1/D
43300303141	ROD6/30-3B1/D
43300303142	ROD6/40-3B1
43300303143	ROD8/50-3B1
43300303144	ROD8/150-3B1
43300303145	ROD2/20-3B1/D
43300303146	ROD10/200-3B1
43300303147	ROD3/25-3B1/D
43300303149	ROD4/25-3B1/D
43300303151	ROD5/30-3B1/D
43300303153	ROD6/50-3B1/D
43300303155	ROD8/200-3B1
43300303157	ROD5/30-4B1/DL
43300303159	ROD8/200-4B1
43300303210	BD3/0.7/4-3S1
43300303211	BD3/0.7/10-3S1
43300303212	BD3/1/4-3S1
43300303213	BD3/1/10-3S1
43300303214	BD5.1/0.8/4-3S1
43300303215	BD5.1/0.8/10-3S1
43300303216	BD5.1/1.5/4-3S1
43300303217	BD5.1/1.5/10-3S1
43300303218	BD5.1/2/4-3S1
43300303219	BD5.1/2/10-3S1
43300303274	MHB5.6/12-4B1
43300303311	BD3/0.7/4-4S2
43300303312	BD3/1/4-4S2
43300303313	BD5.1/0.8/4-4S2
43300303314	BD5.1/1.5/4-4S2
43300303315	BD5.1/2/4-4S2
43300303316	BD8/1.5/4-4S2
43300303317	BD8/2/4-4S2
43300303318	BD8/3/4-4S2
43300303319	BD5/2/10-4S2

Conversion list

11NC to Type number

11 NC	TYPE NUMBER
43300303320	BD8/3/10-4S2
43300303321	BD3/1/10-4S2
43300303322	BD5/1.5/10-4S2
43300303323	BD8/2/10-4S2
43300303324	BD3/0.7/10-4S2
43300303325	BD8/1.5/10-4S2
43300303326	BD5/0.7/10-4S2
43300303345	TUB8/4/200-3C85
43300303346	TUB10/5/200-3C85
43300303354	TUB3.5/1.2/5-3B1
43300303355	TUB3.5/1.2/15-3B1
43300303356	TUB4/1.6/15-3B1
43300303357	TUB4/1.6/40-3B1
43300303358	TUB5/2/15-3B1
43300303359	TUB5/2/50-3B1
43300303360	TUB6/3/20-3B1
43300303361	TUB6/3/30-3B1
43300303362	TUB8/4/20-3B1
43300303363	TUB8/4/40-3B1
43300303364	TUB10/4.2/20-3B1
43300303365	TUB10/4.2/45-3B1
43300303366	TUB10/6.5/20-3B1
43300303367	TUB3.5/1.2/5-3C85
43300303368	TUB3.5/1.2/15-3C85
43300303369	TUB4/1.6/15-3C85
43300303370	TUB4/1.6/40-3C85
43300303371	TUB5/2/15-3C85
43300303372	TUB5/2/50-3C85
43300303373	TUB6/3/20-3C85
43300303374	TUB6/3/30-3C85
43300303375	TUB8/4/20-3C85
43300303376	TUB8/4/40-3C85
43300303377	TUB10/4.2/20-3C85
43300303378	TUB10/4.2/45-3C85
43300303379	TUB10/6.5/20-3C85
43300303405	T2.5/1.5/1-4A11
43300303422	TN/23/15-3E25
43300303423	TN29/19/7.5-3E25
43300303431	TN36/23/15-3R1
43300303433	TN6/3-4C65
43300303436	TN4/2.2/1.1-4A11
43300303437	TN4/2.2/1.6-4A11
43300303438	TN6/4/2-4A11
43300303439	TN9/6/3-4A11
43300303440	TN13/7.5/5/5-4A11
43300303441	TN14/9/5-4A11
43300303442	TN/14/9/9-4A11
43300303443	TN16/9.6/6.3-4A11

11 NC	TYPE NUMBER
43300303444	TN23/14/7-4A11
43300303445	TN36/23/15-4A11
43300303446	TN10/6/4-3C85
43300303447	TN20/10/7-3C85
43300303448	TN25/15/10-3C85
43300303449	TN32/19/13-3C85
43300303450	TN10/6/4-3C11
43300303451	TN20/10/7-3C11
43300303452	TN25/15/10-3C11
43300303453	TN32/19/13-3C11
43300303458	TN10/6/4-3E25
43300303459	TN20/10/7-3E25
43300303460	TN25/15/10-3E25
43300303461	TN32/19/13-3E25
43300303466	TN10/6/4-3E5
43300303469	TN4/2.2/1.1-4C65
43300303470	TN4/2.2/1.6-4C65
43300303471	TN36/23/10-4C65
43300303472	T2.5/1.5/1-4C65
43300303478	TN4/2.2/1.6-3F3
43300303479	TN6.3/3.8/2.5-4C65
43300303480	TN10/6/4-4C65
43300303481	TN13/7.5/5-4C65
43300303482	TN20/10/7-4C65
43300303487	TN6.3/3.8/2.5-4A11
43300303488	TN10/6/4-4A11
43300303491	TN19/11/10-3C85
43300303492	TN13/7.5/5-3C11
43300303494	TN6.3/3.8/2.5-3E25
43300303496	TN6.3/3.8/2.5-3E5
43300303497	TN6.3/3.8/2.5-3F3
43300303498	TN10/6/4-3F3
43300303499	TN23/14/7-3F3
43300303500	TN25/15/10-3F3
43300303501	TN32/19/13-3F3
43300303502	TN36/23/15-3F3
43300303505	TN14/9/9-3C11
43300303509	TN23/14/7-3E25
43300303513	T2.5/1.5/1-3F3
43300303514	T2.5/1.5/1-3E5
43300303520	TL58/41/18-3C11
43300303522	TL42/26/13-3C11
43300303524	TN26/15/10-3C11
43300303525	TN20/10/7-3E5
43300303526	TN25/15/10-3E5
43300303527	TN32/19/13-3E5
43300303528	TN36/23/15-3E5
43300303545	TN36/23/15-4C65

11 NC	TYPE NUMBER
43300303552	TL42/26/13-3C85
43300303553	TL58/41/18-3C85
43300303564	TN26/15/10-3E25
43300303580	TN9/6/3-3C85
43300303582	TN14/9/5-3C11
43300303585	TN14/9/5-3E5
43300303618	WBC2/R-4A15
43300303619	BC22/18.5-3C80
43300303629	BDS4.6/3/3-4S2
43300303630	BDS8.9/3/3-4S2
43300303634	BC22/38-3C80
43300303642	BDS4.6/3/3-3S1
43300303645	BDS8.9/3/3-3S1
43300303647	BC22/18-3C80
43300303648	BC22/14-3C80
43300303652	BDS8.9/4.6/3-4S2
43300303656	BC22/14-3C80
43300303668	BDS4.6/3/3-4S2
43300303669	BDS8.9/3/3-4S2
43300303703	TN27/15/11-3C11
43300303708	TN6/4/2-3E25
43300303709	TN9/6/3-3E25
43300303710	TN13/7.5/5-3E25
43300303711	TN14/9/5-3E25
43300303712	TN14/9/9-3E25
43300303713	TN16/9.6/6.3-3E25
43300303714	TN1911/15-3E25
43300303716	TN23/14/7-3E25
43300303717	TN26/15/10-3E25
43300303718	TN16/9.6/6.3-3C11
43300303719	T2.5/1.5/1-3E25
43300303734	TN19/11/10-3E25
43300303735	TN4/2.2/1.1-3E25
43300303745	TN14/9/5-3C85
43300303746	TN14/9/5-3C11
43300303747	TN19/11/10-3C11
43300303748	TN19/11/15-3C85
43300303749	TN19/11/15-3C11
43300303750	TN23/14/7-3C85
43300303751	TN23/14/7-3C11
43300303752	TN26/15/10-3C11
43300303753	TN26/15/20-3C11
43300303754	TN26/15/20-3E25
43300303755	TN36/23/10-3C11
43300303756	TN36/23/253C11
43300303758	TN29/19/7.5-3C11
43300303760	TL4/2.2/1.6-3E5
43300303761	TL4/2.2/1.1-3E5

Philips Components Application Literature

9398 082 97011	Loss formulas for power ferrites and their use in transformer design
9398 074 80011	Application note on the design of low profile high frequency transformers
9398 083 05011	The use of soft ferrites for interference suppression
9398 069 70011	EFD for low-profile DC-DC converters
9398 080 00011	3F4 ferrite for MHz power conversion
9398 235 82011	SMD coil formers and cores
9398 235 68011	SMD beads and chokes
9398 235 69011	3S4 a new soft ferrite for EMI-suppression
9398 387 00011	Wideband chokes
9398 075 00011	3R1 ferrite ring cores in magnetic amplifiers
9398 973 30011	Calculation program for 3R1 saturable inductors (disc)
9398 236 01011	3C90 and 3C30, new low-loss power ferrites
9398 402 12011	Soft ferrite design tools (disc)

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

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

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Data handbook system

DATA HANDBOOK SYSTEM

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Our data handbook titles are listed here.

Display components

Book	*Title*
DC01	Colour TV Picture Tubes and Assemblies Colour Monitor Tubes
DC02	Monochrome Monitor Tubes and Deflection Units
DC03	Television Tuners, Coaxial Aerial Input Assemblies
DC05	Flyback Transformers, Mains Transformers and General-purpose FXC Assemblies

Magnetic products

MA01	Soft Ferrites
MA03	Piezoelectric Ceramics and Specialty Ferrites
MA04	Dry-reed Switches

Passive components

PA01	Electrolytic Capacitors
PA02	Varistors, Thermistors and Sensors
PA03	Potentiometers
PA04	Variable Capacitors
PA05	Film Capacitors
PA06	Ceramic Capacitors
PA07	Quartz Crystals for Special and Industrial Applications
PA08	Fixed Resistors
PA10	Quartz Crystals for Automotive and Standard Applications
PA11	Quartz Oscillators

Professional components

PC04	Photo Multipliers
PC05	Plumbicon Camera Tubes and Accessories
PC07	Vidicon and Newvicon Camera Tubes and Deflection Units
PC08	Image Intensifiers
PC12	Electron Multipliers

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Integrated circuits

Book	*Title*
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IC02	Semiconductors for Television and Video Systems
IC03	Semiconductors for Telecom Systems
IC04	CMOS HE4000B Logic Family
IC06	High-speed CMOS Logic Family
IC11	General-purpose/Linear ICs
IC12	I^2C Peripherals
IC13	Programmable Logic Devices (PLD)
IC14	8048-based 8-bit Microcontrollers
IC15	FAST TTL Logic Series
IC16	CMOS Integrated Circuits for Clocks and Watches
IC17	Wireless Communications
IC18	Semiconductors for In-Car Electronics
IC19	ICs for Data Communications
IC20	80C51-based 8-bit Microcontrollers
IC22	Desktop Video
IC23	QUBiC Advanced BiCMOS Interface Logic ABT MULTIBYTE™
IC24	Low Voltage CMOS & BiCMOS Logic
IC25	16-bit 80C51XA Microcontrollers (eXtended Architecture)

Discrete semiconductors

SC01	Diodes
SC02	Power Diodes
SC03	Thyristors and Triacs
SC04	Small-signal Transistors
SC05	Video Transistors and Modules for Monitors
SC06	High-voltage and Switching NPN Power Transistors
SC07	Small-signal Field-effect Transistors
SC08a	RF Power Transistors for HF and VHF
SC08b	RF Power Transistors for UHF
SC09	RF Power Modules
SC10	Surface Mounted Semiconductors
SC13	PowerMOS Transistors including TOPFETs and IGBTs

Discrete semiconductors (continued)

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SC16	Wideband Hybrid IC Modules
SC17	Semiconductor Sensors

Professional components

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PC06	Circulators and Isolators

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