Soft Ferrites and Accessories

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DATA SHEET STATUS DEFINITIONS

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

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PRODUCT STATUS DEFINITIONS

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

THE NATURE OF SOFT FERRITES

Composition

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

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

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

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

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

Manufacturing process

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

RAW MATERIALS

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

PROPORTIONS OF THE COMPOSITION

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

MIXING

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

PRE-SINTERING

The mixed oxides are calcined at approximately 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 centre pole grinding.

Magnetism in ferrites

A sintered ferrite consists of small crystals, typically 10 to 20 μm in dimension. Domains exist within these crystals (Weiss domains) in which the molecular magnets are already aligned (ferrimagnetism). When a driving magnetic field (H) is applied to the material the domains progressively align with it, as shown in Fig.2.

During this magnetization process energy barriers have to be overcome. Therefore the magnetization will always lag behind the field. A so-called hysteresis loop (see Fig.1) is the result.

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

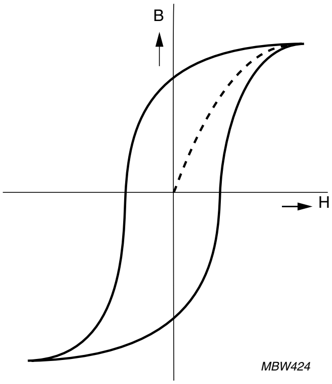


Fig.1 Hysteresis loop.

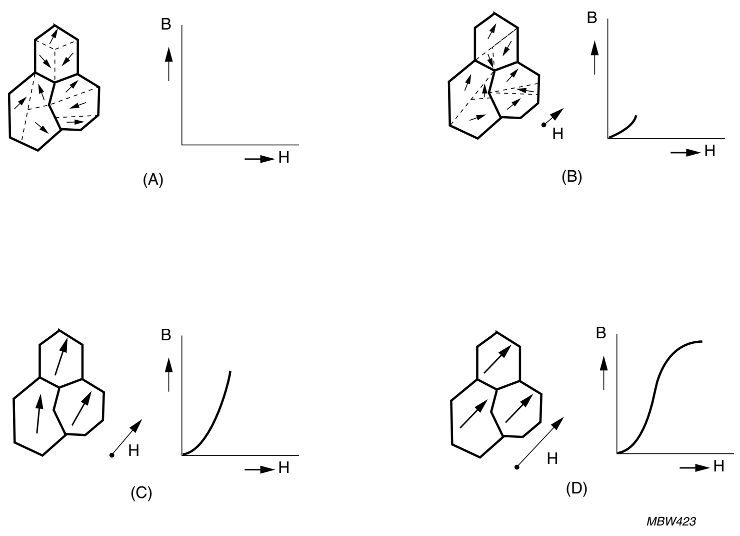


Fig.2 Alignment of domains.

EXPLANATION OF TERMS AND FORMULAE

Symbols and units

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

Definition of terms

PERMEABILITY

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

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

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.

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

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.

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

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.

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

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.

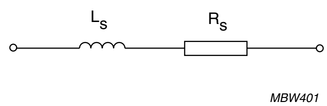


Fig.3 Series representation.

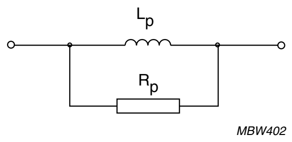


Fig.4 Parallel representation.

For series representation

$$\bar{Z} = j\omega L_s + R_s \tag{8}$$

and for parallel representation,

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

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

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

The phase shift caused by magnetic losses is given by:

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

For calculations on inductors and also to characterize ferrites, the series representations is generally used (μ'_s and μ''_s). In some applications e.g. signal transformers, the use of the parallel representation (μ'_p and μ''_p) is more convenient.

The relationship between the representations is given by:

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

LOSS FACTOR

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

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

This gives the formula:

$$\tan\delta_m = \tan\delta_h + \tan\delta_f + \tan\delta_r \tag{13}$$

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

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

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

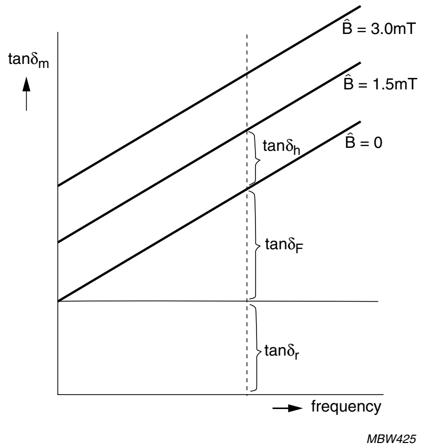


Fig.5 Magnetic losses $(\tan\delta_m)$ as a function of frequency.

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

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

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

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

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

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

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:

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

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

HYSTERESIS MATERIAL CONSTANT

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

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

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

$$\frac{\tan\delta_h}{\mu_e} = \eta_B \times \hat{B} \quad (20)$$

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

EFFECTIVE CORE DIMENSIONS

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

The reluctance of the ideal ring core would be:

$$\frac{l_e}{\mu \times A_e} \quad (21)$$

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

$$\frac{1}{\mu_e} \times \Sigma\frac{l}{A} \quad (22)$$

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

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

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

for sine wave:

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

for square wave:

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

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):

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

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

INDUCTANCE FACTOR (A_L)

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

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

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

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

MAGNETIZATION CURVES (H_C, B_R, B_S)

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

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

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

These points are clearly shown in Fig.6.

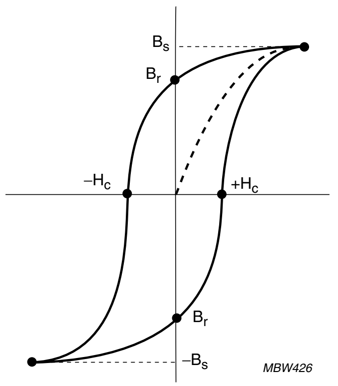


Fig.6 Typical BH curve showing points B_s, B_r and H_c.

TEMPERATURE DEPENDENCE OF THE PERMEABILITY

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

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

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

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

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

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

$$= \mu_e \times \alpha_F$$

So α_F is defined as:

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

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

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

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.

TOTAL HARMONIC DISTORTION (THD)

Harmonic distortion is generated when a sine wave magnetic field H, which is proportional to the current, induces a non-sinusoidal flux density B. This is due to a non linear relation between B and H in the ferrite core of a transformer. Consequently the induced output voltage, which is proportional to the flux density B, is also not a pure sine wave, but somewhat distorted. The periodic voltage signals can be decomposed by writing them as the sum of sine waves with frequencies equal to multiples of the fundamental frequency.
THD is defined as the logarithmic ratio of the square root of the quadratic sum of the amplitudes of these sine waves and the amplitude of the fundamental wave (V_1). It is often sufficient to consider only the strongly dominant third harmonic for the THD. In that case the definition of THD can be simplified to:

$$THD \approx V_3 / V_1 \text{ or } 20.{}^{10}\log (V_3 / V_1) \text{ [dB]}$$

Introducing an airgap in a core set reduces the THD in the same way as it reduces temperature dependence and magnetic losses, which shows that the THD is not a pure material characteristic. It can be shown by calculation and measurement that THD/μ_{ae} is a real material characteristic. It is a function of flux density (B), frequency (f) and temperature (T), but not of the airgap length in a core set. THD/μ_{ae} is defined as the THD-factor, denoted as THD_F.

The term μ_{ae} stands for effective amplitude permeability of the ferrite material. It is a more general term than the effective permeability μ_e which is only defined for very low flux densities (<0.1 mT).

If the THD-factor as a function of f, B and T of a ferrite material is known, the expected THD of a core set with an effective amplitude permeability μ_{ae} can be calculated with:

$$THD = THD\text{-}factor \times \mu_{ae} = \left(\frac{THD}{\mu_a}\right) \times \mu_{ae} \qquad (33)$$

THD MEASUREMENTS

Measured THD values as well as accuracies depend on the impedances in the measuring circuit used.

Fig.7 shows an equivalent THD test or measuring circuit. In Fig.8 a simplified equivalent circuit is shown with the generated (V_{F3}) and measured third harmonic voltage (V_{M3}).

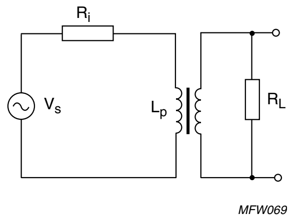


Fig.7 Equivalent test circuit for THD measurement.

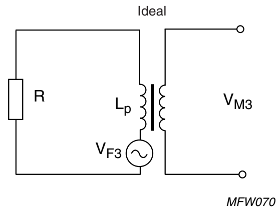


Fig.8 Equivalent test circuit for THD measurement.

The test circuit consists basically of a voltage source and a measuring device capable of measuring the third harmonic voltage or directly the THD. Both devices are often combined in one instrument like e.g. an audio analyzer which is represented by V_s in Fig.7.

R_i represents the total equivalent resistance in the primary circuit, which consists of the internal resistance of the voltage source, possibly in combination with other resistors in this part of the circuit. L_p is the inductance of the transformer under test connected to the load resistance R_L.

The generated third harmonic voltage V_{F3} will cause a current flow through the impedances R_i and R_L, resulting in a voltage drop. These impedances are combined to one equivalent resistance R as shown in Fig.8. This equivalent resistance can be calculated with:

$$R = \frac{R_i \times R_{L_p}}{R_i + R_{L_p}} \qquad (34)$$

in which R_{Lp} is R_L referred to the primary side:

$$R_{L_p} = \left(\frac{N_p}{N_s}\right)^2 \times R_L \qquad (35)$$

Hardly any voltage drop will occur when R is very high compared to the impedance $3\omega L_p$. In that case the measured third harmonic voltage V_{M3} would be equal to the real generated third harmonic V_{F3} multiplied by the transformation ratio N_s/N_p.

The measuring situation would be fully current driven. However in practical situations the resistance R will play a role and V_{F3} can be calculated with equation:

$$V_{F3} = V_{M3} \times \text{Circuit correction factor (CCF)} \qquad (36)$$

$$= V_{M3} \times \frac{N_p}{N_s} \times \sqrt{1 + (3\omega L_p / R)^2}$$

It is recommended to translate measuring data V_{M3} to V_{F3} in the current driven situation, because this can be considered as a calibrated reference when several different measuring circuits are being used.

MEASUREMENT PRECAUTIONS

In general it is advised to check measuring conditions and the test circuit with impedances R and ωL_p in order to keep the circuit correction factor as low as possible. This avoids measuring in non-discriminating ranges (<-80 dB), which may lead to inaccurate or useless results. It is recommended to use low measuring frequencies, preferably < 25 kHz, for several reasons.At high frequencies it will often be difficult to reach the required flux level in the core of the transformer or inductor because of output voltage limitations. At the same time the circuit correction factor increases with frequency, which will lead to inaccurate results.

Now also the real generated $THD_F = V_{F3} / V_{F1}$ can be calculated from the measured $THD_M = V_{M3} / V_{M1}$, knowing that $V_{F1} = V_{M1}$ x (N_p/N_s):

$$THD_F = THD_M \times \sqrt{1 + (3\omega L_p / R)^2} \qquad (37)$$

This value of the real generated THD_F is used to calculate the THD-factor of the ferrite material in the transformer core set (eq. 33).

TIME STABILITY

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

$$D = \frac{\mu_1 - \mu_2}{\mu_1} \qquad (38)$$

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

$$d = \frac{\mu_1 - \mu_2}{\mu_1 \times \log(t_1 / t_2)} \qquad (39)$$

Where t_1 and t_2 are time intervals after the disturbance. As with temperature dependence, the influence of disaccommodation on the inductance drift of a coil will be reduced by μ_e/μ_i.

Therefore, a disaccommodation factor D_F is defined:

$$D_F = \frac{d}{\mu_i} = \frac{\mu_1 - \mu_2}{\mu_1^2 \times \log(t_1 / t_2)} \qquad (40)$$

Usually ferrite cores are magnetically conditioned by means of a saturating alternating field which is gradually reduced to zero. Measurements for our data sheets are taken 10 and 100 minutes after this disturbance.
The variability or disaccommodation with time of a coil can now easily be predicted by:

$$D = \frac{L_1 - L_2}{L_1} = \mu_e \times D_F \times \log\left(\frac{t_1}{t_2}\right) \qquad (41)$$

L_1 and L_2 are values at 2 time intervals after a strong disturbance.

RESISTIVITY

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

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

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

Table 1 Resistivity as a function of temperature of a MnZn-ferrite (3C94)

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 (4C65)

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

At higher frequencies the crystal boundaries are more or less short-circuited by heir capacitance and the measured resistivity decreases, as shown in Tables 3 and 4.

Table 3 Resistivity as function of frequency for MnZn ferrites

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

Table 4 Resistivity as function of frequency for NiZn ferrites

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

PERMITTIVITY

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

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

Table 5 Permittivity as a function of frequency for MnZn ferrites

FREQUENCY (MHz)	PERMITTIVITY (ε_r)
0.1	$\approx 2.10^5$
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)	PERMITTIVITY (ε_r)
0.001	≈100
0.01	≈50
1	≈25
10	≈15
100	≈12

QUALITY

Quality standards

Our ferrite cores are produced to meet constantly high quality standards. High quality components in mass production require advanced production techniques as well as background knowledge of the product itself. The quality standard is achieved in our ferrite production centres by implementation of a Quality Assurance System based on ISO9001 and our process control is based on SPC techniques.

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

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

The system is applicable for the total manufacturing process including,

- Raw material
- Production of process
- Finished products.

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

Aspects of quality

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

- Delivery quality
- Fitness for use
- Reliability.

DELIVERY QUALITY

After production, the ferrite components are tested once again for their main characteristics. Tests are conducted in accordance with the guidelines specified by IEC 60367. If a component does not comply with the specification published in this handbook, it is considered to be defective. A sampling system, in accordance with ISO 2859 and ISO 3951 is used. The Acceptable Quality Levels (AQL's) are generally set at 0.25%.

Different criteria can be agreed upon for customized products. Also PPM agreements with customers are encouraged.

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.

ENVIRONMENTAL ASPECTS OF SOFT FERRITES

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

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

Their general chemical formula is:

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

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

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

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

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

General warning rules

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

ORDERING INFORMATION

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

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

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

- Technical information:
  - type number
  - 11-digit code number
  - delivery and/or production batch numbers
- Logistic information:
  - 12-digit code number
  - quantity
  - country of origin
  - production week
  - production centre.

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

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

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

Product status definitions

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

APPLICATIONS

Introduction

Soft ferrite cores are used wherever effective coupling between an electric current and a magnetic flux is required. They form an essential part of inductors and transformers used in today's main application areas:

- Telecommunications
- Power conversion
- Interference suppression.

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

FILTERING

Filter network with well defined pass-band.

High Q-values for selectivity and good temperature stability.

Material requirements:

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

Preferred materials: 3D3, 3H3.

INTERFERENCE SUPPRESSION

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

Material requirements:

- High impedance in covered frequency range.

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

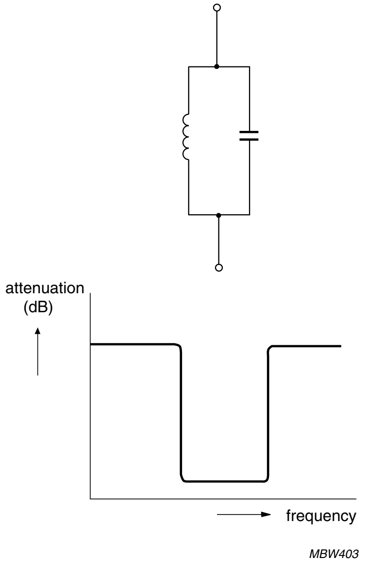


Fig.1 Filter application.

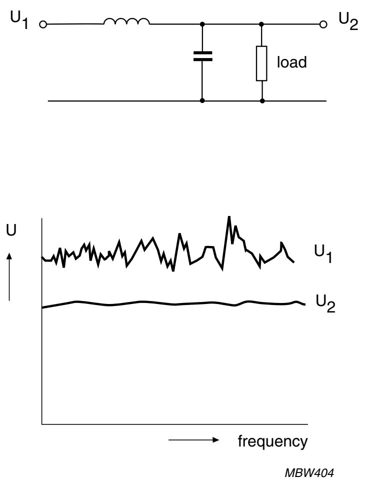


Fig.2 Suppression application.

DELAYING PULSES

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

Material requirements:

- High permeability (μ_i).

Preferred materials: 3E25, 3E5, 3E6, 3E7, 3E8, 3E9.

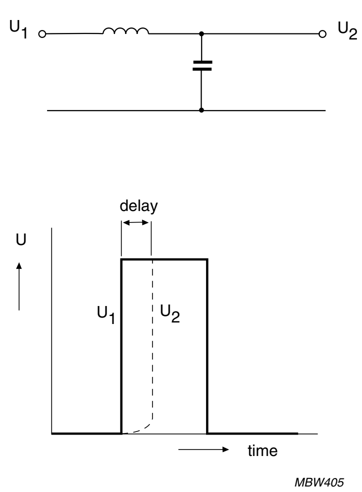


Fig.3 Pulse delay application.

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: 3C30, 3C34, 3C90, 3C92, 3C96 2P-iron powder.

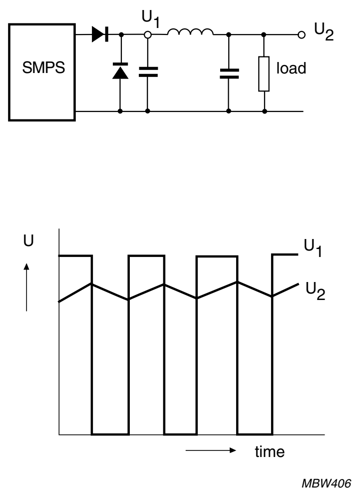


Fig.4 Smoothing/storage application.

PULSE TRANSFORMERS/GENERAL PURPOSE TRANSFORMERS

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

Material requirements:

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

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

POWER TRANSFORMERS

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

Material requirements:

- Low power losses
- High saturation (B_s).

Preferred materials: 3C15, 3C30, 3C34, 3C81, 3C90, 3C91, 3C93, 3C94, 3C96, 3F3, 3F35, 3F4, 3F45, 3F5, 4F1.

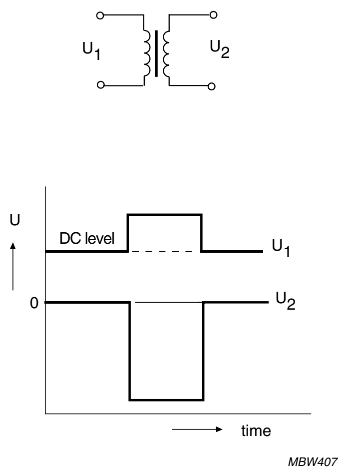


Fig.5 Pulse and general purpose transformer.

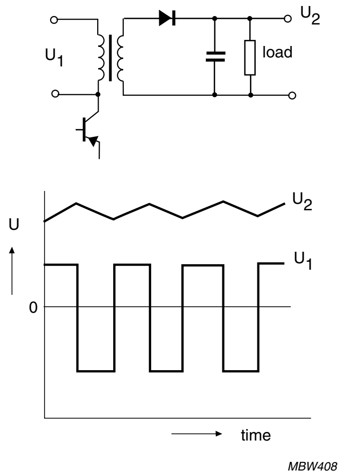


Fig.6 Power transformer application.

TUNING

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

Material requirements:

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

Preferred materials: 3D3, 4A11, 4B1, 4C65, 4D2, 4E1.

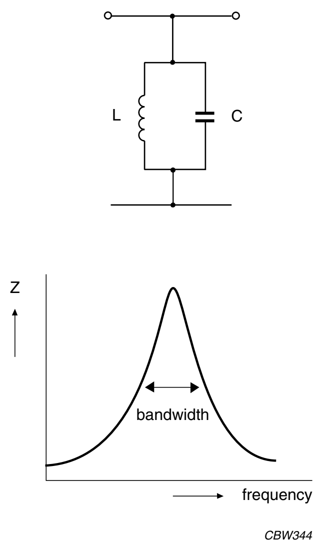


Fig.7 Tuning application.

Ferrites for Telecommunications

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

Most important applications are in:

- Filter inductors
- Pulse and matching transformers.

FILTER COILS

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

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

RM cores are a later design, leading to a more economic usage of the surface area on the PCB.

For filter coils, the following design parameters are important:

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

Q VALUE

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

Losses in a coil can be divided into:

- Winding losses, due to the DC resistance of the wire eddy-current losses in the wire, electric losses in insulation
- Core losses, due to hysteresis losses in the core material, eddy-current and residual losses in the core material.

Losses appear as series resistances in the coil:

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

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

DC resistive losses

The DC resistive losses in a winding are given by:

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

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

Eddy-current losses in the winding

Eddy-current losses in a winding are given by:

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

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

Dielectric losses

The capacitances associated with the coil are not loss free. They have a loss factor which also increases the effective coil resistance:

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

Hysteresis losses

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

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

Eddy-current and residual losses

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

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

Inductor design

The specification of an inductor usually includes:

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

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

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

Frequency, core type and material grade

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

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

  Note: high inductance factors are associated with high temperature coefficients of inductance.
- Frequencies between 20 kHz and 200 kHz:
  high Q will generally be obtained with a core also in 3H3. Maximum Q will not necessarily be obtained from the large-size core, particularly at higher frequencies, so the choice of inductance factor is less important. Bunched, stranded conductors should be used to reduce eddy-current losses in the copper. Above 50 kHz, the strands should not be thicker than 0.07 mm.
- Frequencies between 200 kHz and 2 MHz:
  use a core of 3D3 material. Bunched conductors of maximum strand diameter 0.04 mm are recommended.

Signal level

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

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

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

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

DC polarization

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

A_L value

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

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

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

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

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

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

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

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

FERROXCUBEPULSE AND SIGNAL TRANSFORMERS

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

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

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

The general equivalent circuit of a signal transformer is shown in Fig.8.

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

E_s = source voltage

R_s = source resistance

R_w = total winding resistance = R1 + R2, where R1 is the primary winding resistance and R2 is the secondary winding resistance referred to the primary

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

L_p = open circuit inductance

R_p = the shunt loss resistance representing the core loss

N1, N2 = the primary and referred secondary self or stray capacitance respectively

R_b = load resistance referred to the primary turns ratio.

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

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

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

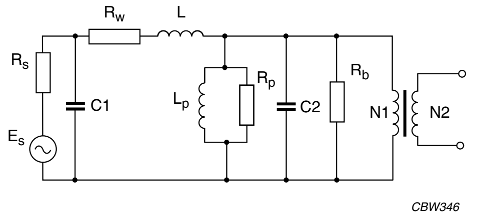


Fig.8 Simplified equivalent circuit of a transformer.

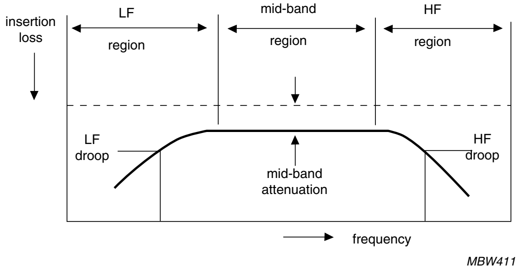


Fig.9 Transmission characteristic of a wideband transformer.

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

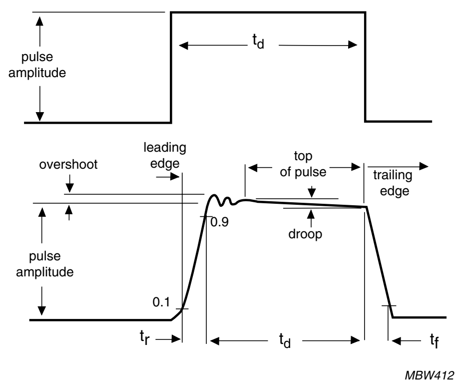


Fig.10 An ideal rectangular pulse and the main pulse distortions that may be introduced by a transformer.

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

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

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

Suitable core types for this application in the materials 3E27, 3E28, 3E5, 3E55, 3E6, 3E7, 3E8 and 3E9 are:

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

In applications where THD is a critical parameter, the special low THD material 3E55 is recommended. If the signal is superimposed on a DC current, core saturation may become a problem. In that case the special DC-bias material 3E28 or a lower permeability material such as 3H3, 3C81 or 3C90 is recommended.

Gapping also decreases the effect of bias currents. Gapped toroids are available on request.

Ferrites for Power conversion

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

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

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

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

SWITCHED MODE POWER SUPPLY CIRCUITS

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

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

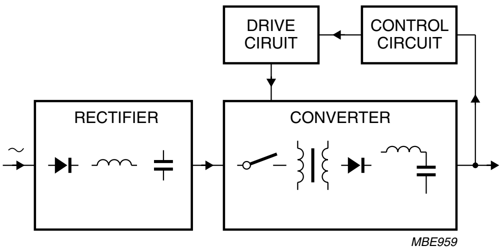


Fig.11 Block diagram of a Switched Mode Power Supply.

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

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

These are:

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

FLYBACK CONVERTER

Figure 12 shows the basic circuit of a flyback converter and its associated waveforms.

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

This basic circuit can be developed into a practical circuit using an inductor with two windings (see Fig.13).

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

Another advantage of the flyback converter is that no smoothing choke is required in the output circuit. This is important in high-voltage supplies and in power supplies with a number of output circuits (see Fig.14).

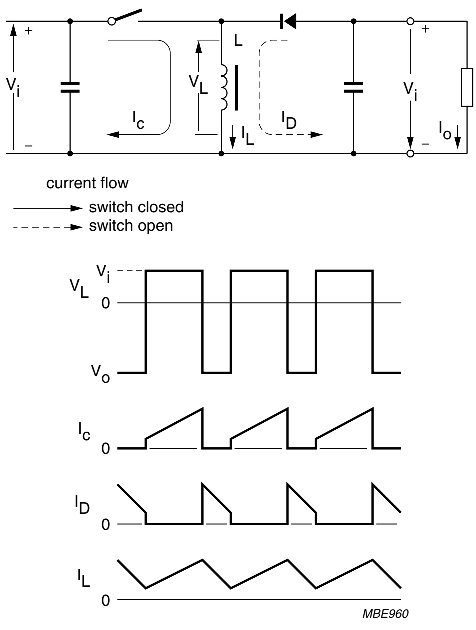


Fig.12 Basic circuit of a DC to DC flyback converter with associated waveforms.

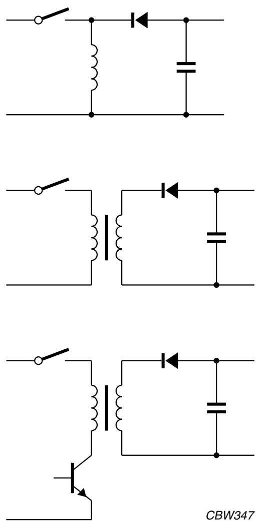


Fig.13 Practical flyback converter circuits.

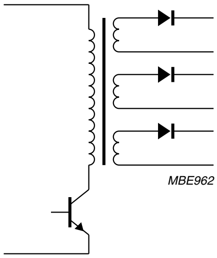


Fig.14 Multiple output flyback converter circuit.

A disadvantage of this type of converter is that the output capacitor is charged only during the transistor's OFF cycle. Hence the output capacitor ripple current is high when compared with the other types of converters.

Another disadvantage of the flyback converter concerns the energy stored in the inductor. The inductor is driven in one direction only; this requires a larger core in a flyback design than for an equivalent design using a forward or push-pull converter.

FORWARD CONVERTER

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

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

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

A more practical forward converter circuit with a line-isolation transformer is shown in Fig.16.

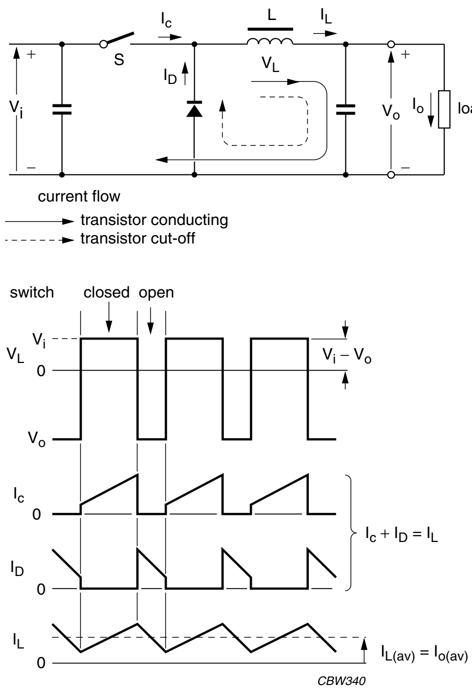


Fig.15 Basic circuit of a DC to DC forward converter with associated waveforms.

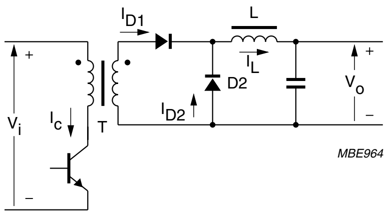


Fig.16 Forward converter with line isolation.

PUSH-PULL CONVERTER

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

The push-pull converter is an arrangement of two forward converters operating in antiphase (push-pull action). With switch S1 closed (Fig.17a) diode D2 conducts and energy is simultaneously stored in the inductor and supplied to the load. With S1 and S2 open (Fig.17b), the energy stored in the inductor continues to support the load current via the parallel diodes D1 and D2, which are now acting as flywheel diodes. When switch S2 closes (Fig.17c), diode D1 continues to conduct, diode D2 stops conducting and the process repeats itself.

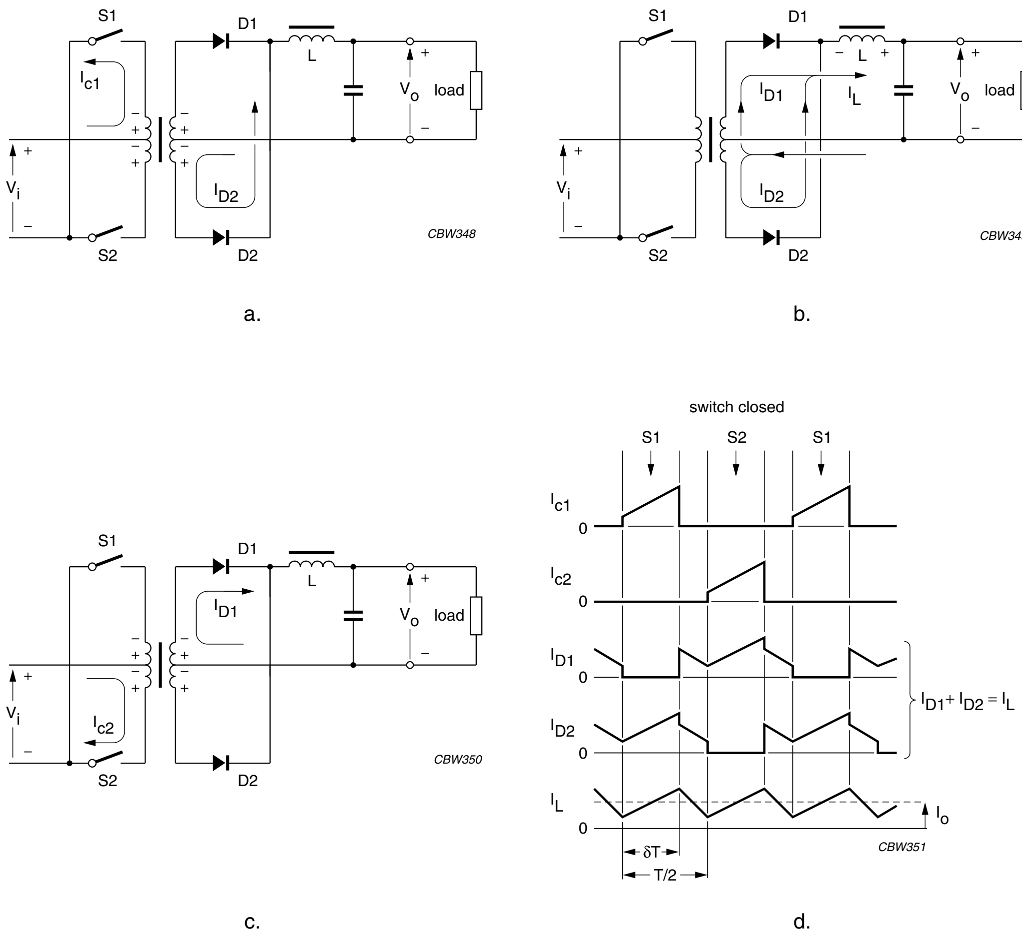


Fig.17 Basic circuit of a DC to DC push-pull converter with associated waveforms.

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

Multiple outputs can be constructed by using several secondary windings, each with its own output diodes, inductor and smoothing capacitor.

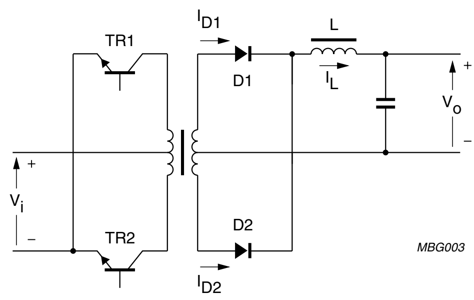


Fig.18 Conventional push-pull converter circuit.

CONVERTER SELECTION

In each of the three basic converter designs there are several different circuit possibilities. In the flyback and forward converters, single and two-transistor designs can be used. If two transistors are used, they will switch simultaneously. This type of circuit preference is determined by the allowable collector-emitter voltage and collector current of the transistor. In push-pull converter designs, the primary of the transformer can be connected in several ways (see Fig.19).

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

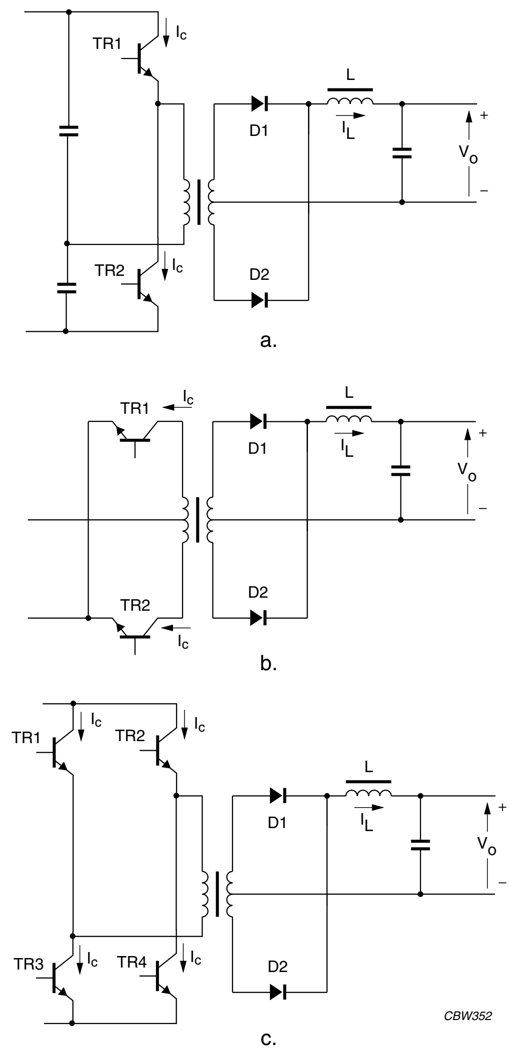


Fig.19 Several push-pull converter circuits.

For a practical converter design, the first selection that should be considered is the type of converter circuit to use. To aid in this initial converter circuit selection, Fig.20 offers a rough guide to the type of converter, its output voltage and power capability. This selection has to be considered along with other requirements, including line isolation, ripple content, overall efficiency, multiple outputs, etc.

Table 1 summarizes the most significant properties of a converter design. It shows the relative strengths and weaknesses of the three types of converters with regard to these characteristics.

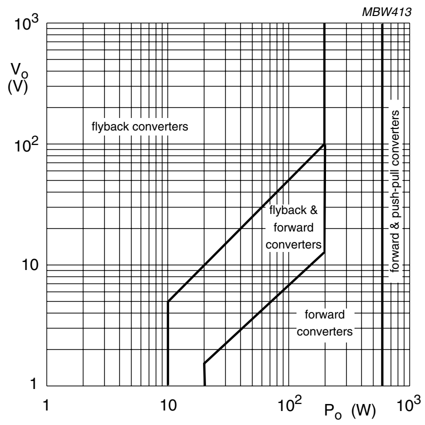


Fig.20 Converter circuit selection as a function of output voltage and throughput power.

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

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

Table 1 Converter design selection chart (I)

FUNCTION	TYPE OF CONVERTER CIRCUIT(1)		
	FLYBACK	FORWARD	PUSH-PULL
Circuit simplicity	+	0	–
Number of components	+	0	–
Drive circuitry	+	0	–
Output ripple	–	0	+
Choke volume	not required	0	+
Transformer volume	–	0	+
Mains isolation	+	–	+
High power	–	0	+
High voltage	+	0	0
Multiple outputs	+	0	0

Note

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

CORE SELECTION

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

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

Table 2 Converter design selection chart (II)

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

Note

1. ‘+’ = favourable; ‘0’ = average; ‘–’ = unfavourable.

Operating frequency

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

Ambient temperature

Ambient temperature, together with the maximum core temperature, determines the maximum temperature rise, which in turn fixes the permissible total power dissipation in the transformer. Normally, a maximum ambient temperature of 60 °C has been assumed. This allows a 40 °C temperature rise from the ambient to the centre of the transformer for a maximum core temperature of 100 °C. There is a tendency however towards higher temperatures to increase power throughput densities. Our new material 3C93 meets these increased temperature requirements with a loss minimum around 140 °C

Flux density

To avoid saturation in the cores the flux density in the minimum cross-section must not exceed the saturation flux density of the material at 100 °C. The allowable total flux is the product of this flux density and the minimum core area and must not be exceeded even under transient conditions, that is, when a load is suddenly applied at the power supply output, and maximum duty factor occurs together with maximum supply voltage. Under steady-state conditions, where maximum duty factor occurs with minimum supply voltage, the flux is reduced from its absolute maximum permissible value by the ratio of the minimum to maximum supply voltage (at all higher supply voltages the voltage control loop reduces the duty factor and keeps the steady-state flux constant).
The minimum to maximum supply voltage ratio is normally taken as 1 : 1.72 for most applications.

SELECTING THE CORRECT CORE TYPE

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

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

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

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

Choice of ferrite for power transformers and inductors

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

3C30

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

3C34

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

3C81

Low frequency (< 100 kHz) material with loss minimum around 60 °C.

3C90

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

3C91

Medium frequency (< 300 kHz) material with loss minimum around 60 °C.

3C92

Low frequency (< 200 kHz) material with a very high saturation level. Specially recommended for inductors and output chokes.

3C93

Medium frequency (< 300 kHz) material with loss minimum around 140 °C.

3C94

Medium frequency material (< 300 kHz).
Low losses, especially at high flux densities.

3C96

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

3F3

High frequency material (up to 700 kHz).

3F35

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

3F4

High frequency material (up to 2 MHz).
Specially recommended for resonant supplies.

3F45

High frequency material (up to 2 MHz).
Specially recommended for resonant supplies.

3F5

High frequency material (up to 4 MHz).
Specially recommended for resonant supplies.

4F1

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

Performance factor of power ferrites

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

OUTPUT CHOKES

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

In a closed ferrite circuit, this can easily lead to saturation. Power ferrites such as 3C90 or 3F3 start saturating at field strengths of about 50 A/m. Permeability drops sharply, as can be seen in the graphs of the material data section. The choke loses its effectiveness. The new material 3C92 is optimized for use in power inductors. It features a very high saturation level as well as a high Tc, making it the best material for power inductors, especially at elevated temperatures.

There are two remedies against the saturation effect:

- The use of gapped ferrite cores
- The use of a material with low permeability and high saturation, like iron powder 2P.

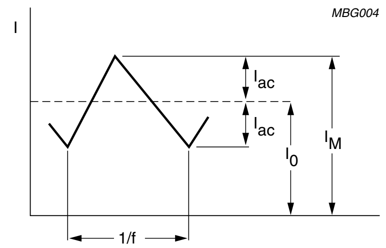


Fig.21 Choke waveform.

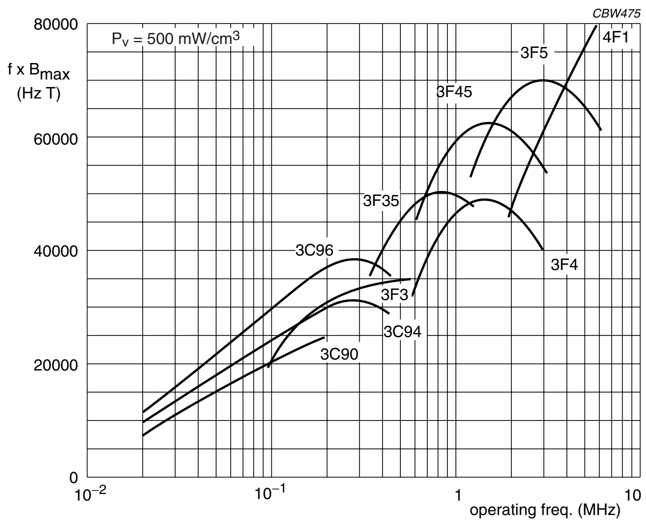


Fig.22 Performance factor ($f \times B_{max}$) at PV = 500 mW/cm^3 as a function of frequency for power ferrite materials.

GAPPED CORE SETS

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

For each operating condition an optimum air gap length can be found. In a design, the maximum output current (I) and the value of inductance (L) necessary to smooth the ripple to the required level are known.

The product I^2L is a measure of the energy which is stored in the core during one half cycle.

Using this I^2L value and the graphs given on the following pages for most core types, the proper core and air gap can be selected quickly at a glance.

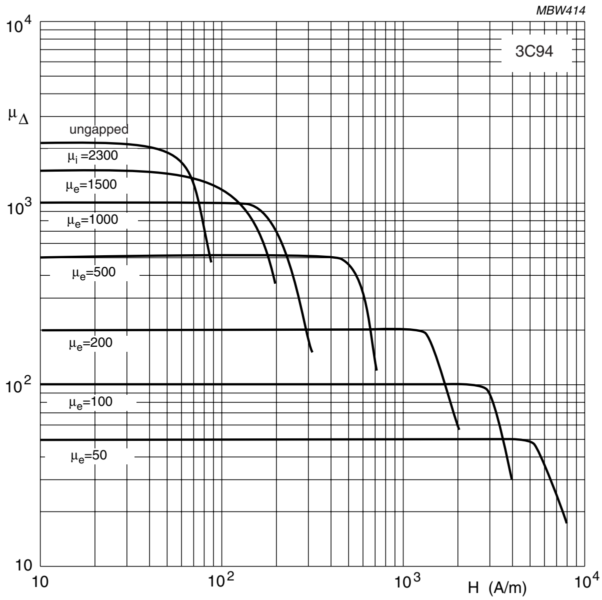


Fig.23 Effect of increased gap length.

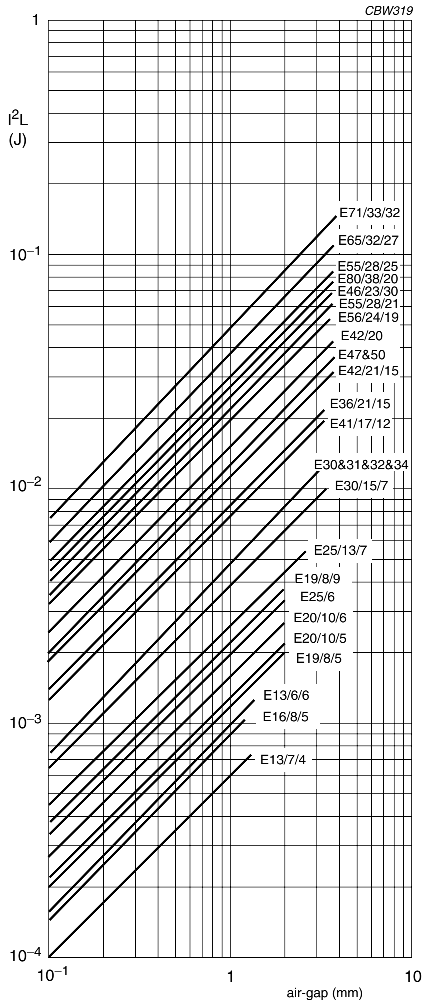


Fig.24 I^2L graph for E cores.

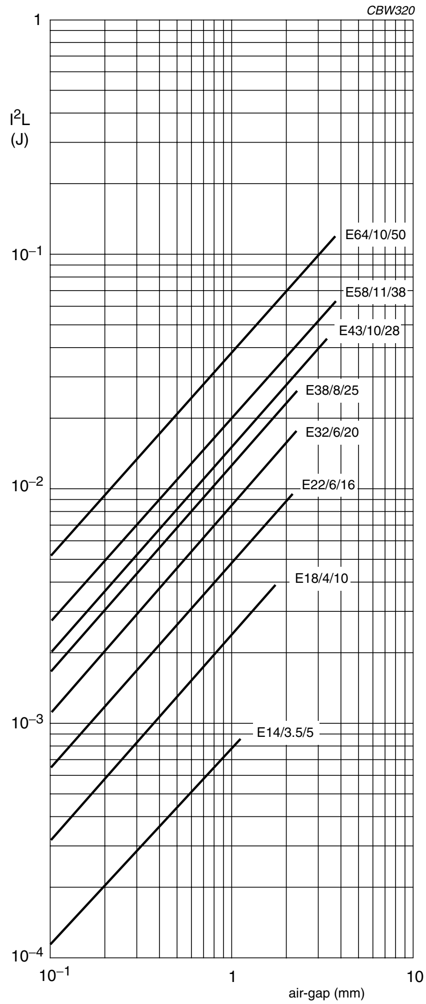


Fig.25 I^2L graph for planar E cores (valid for E + E and E + PLT combinations).

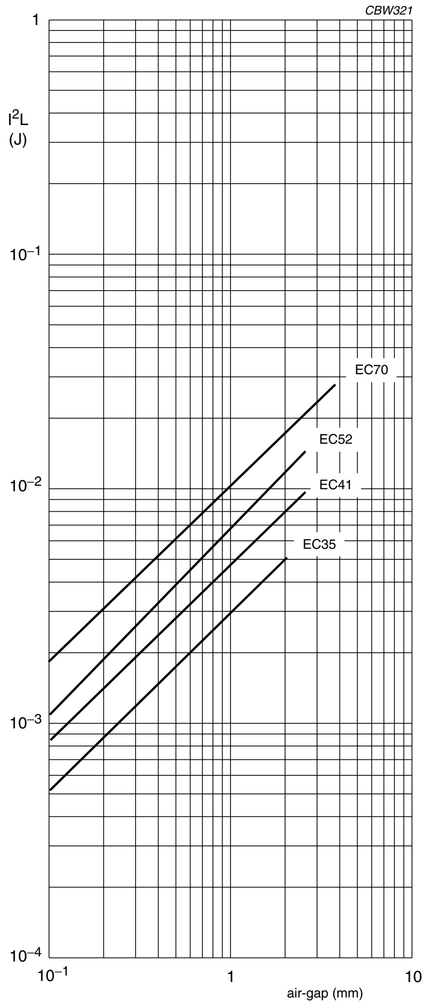


Fig.26 I^2L graph for EC cores.

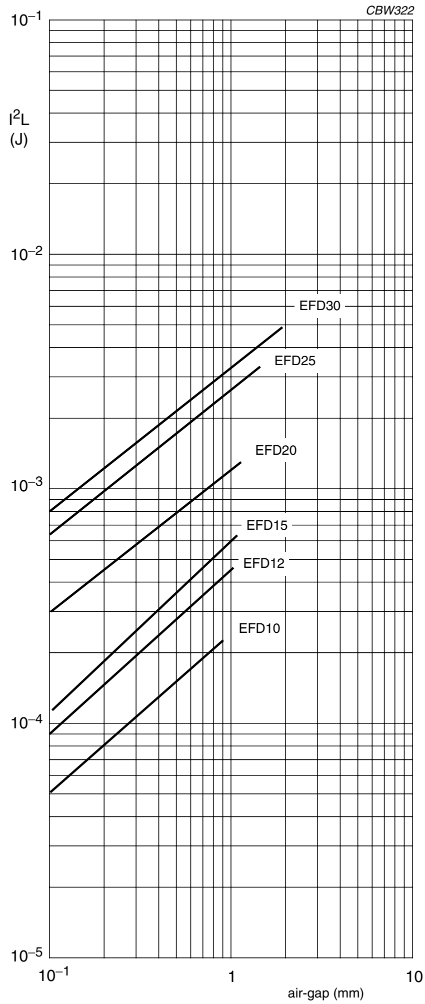


Fig.27 I^2L graph for EFD cores.

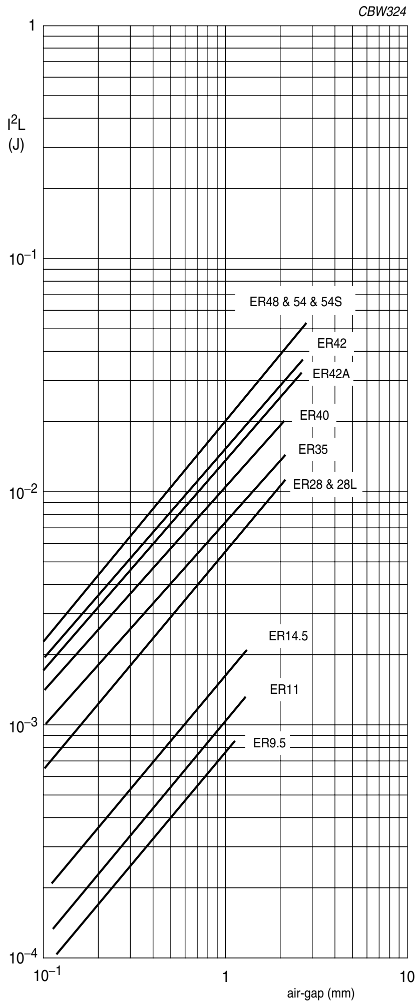


Fig.28 I^2L graph for ER cores.

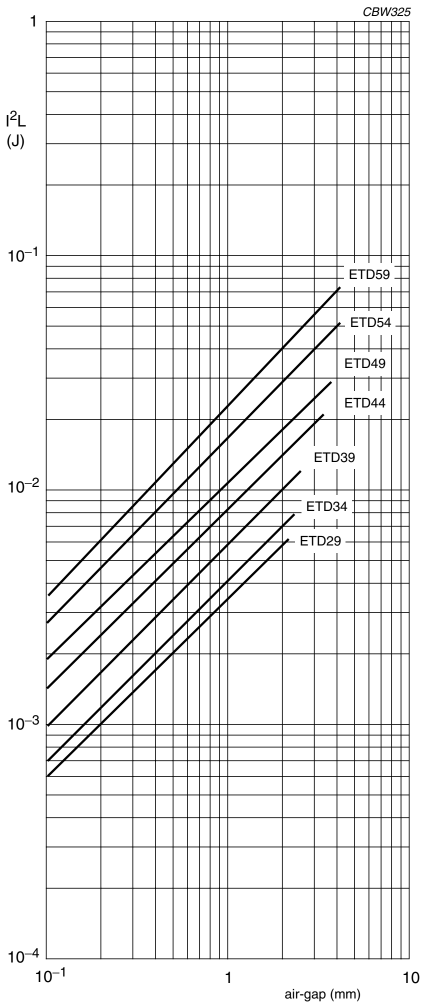


Fig.29 I^2L graph for ETD cores.

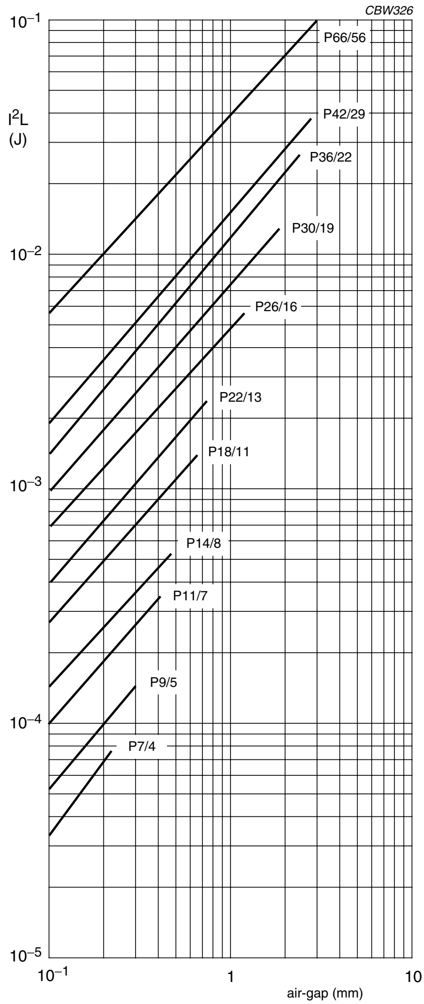


Fig.30 I^2L graph for P cores.

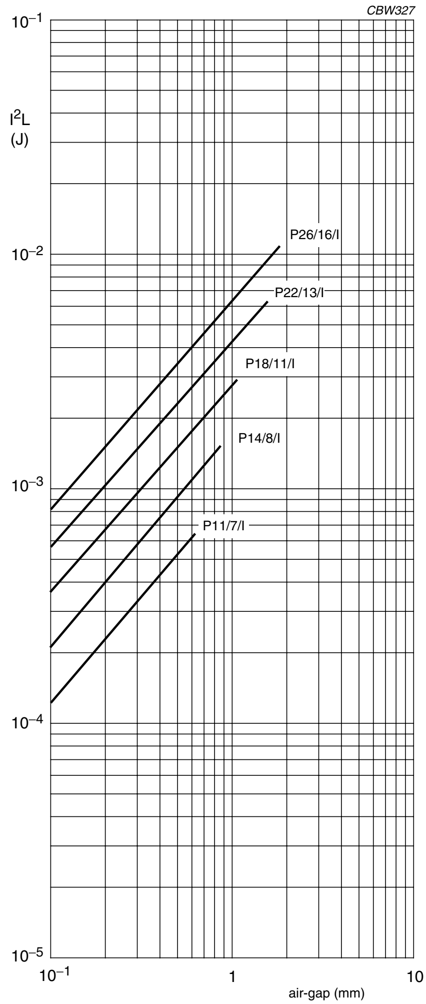


Fig.31 I^2L graph for P/I cores.

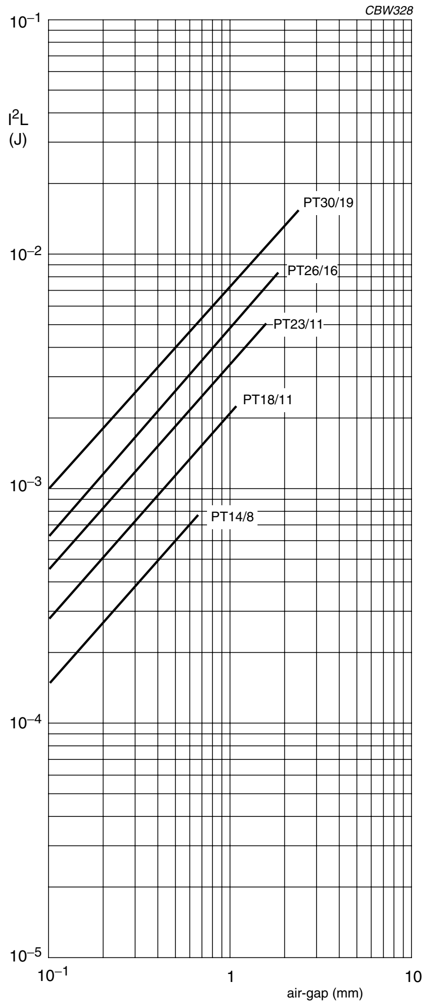


Fig.32 I^2L graph for PT cores.

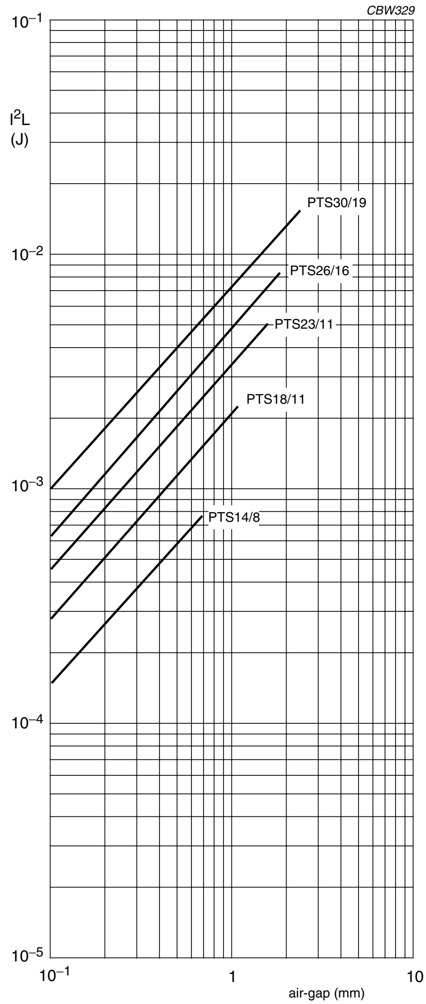


Fig.33 I^2L graph for PTS cores.

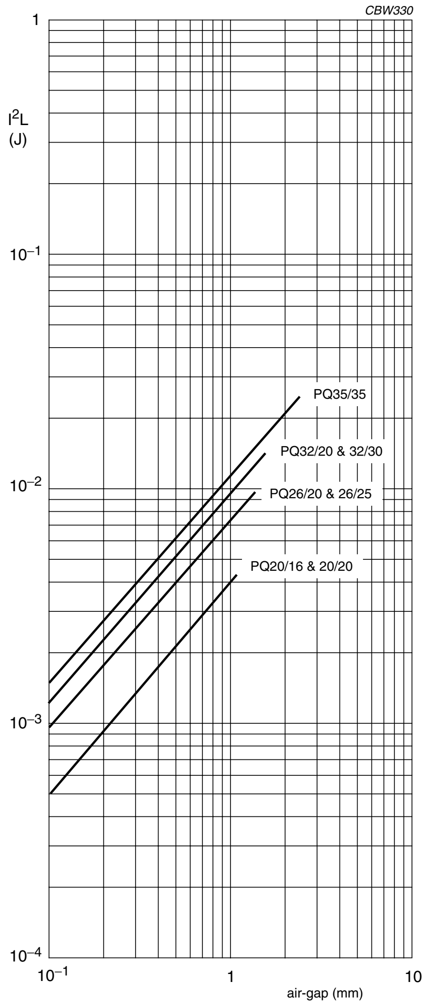


Fig.34 I^2L graph for PQ cores.

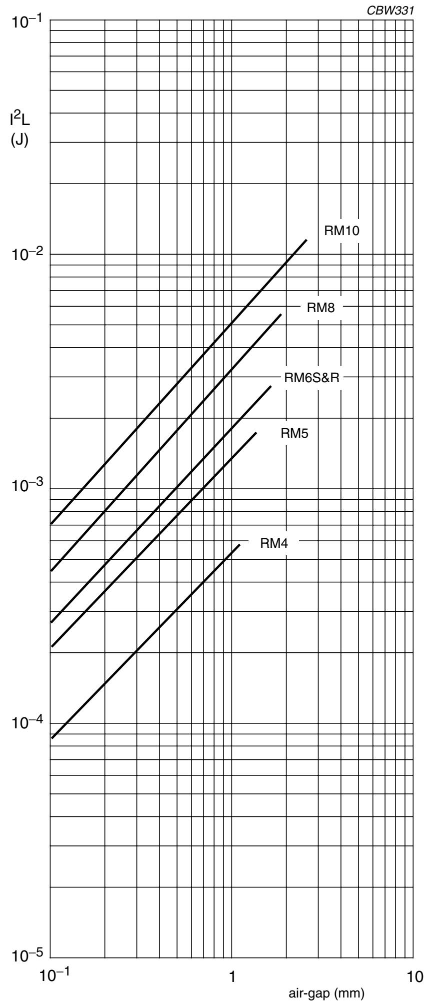


Fig.35 I^2L graph for RM cores.

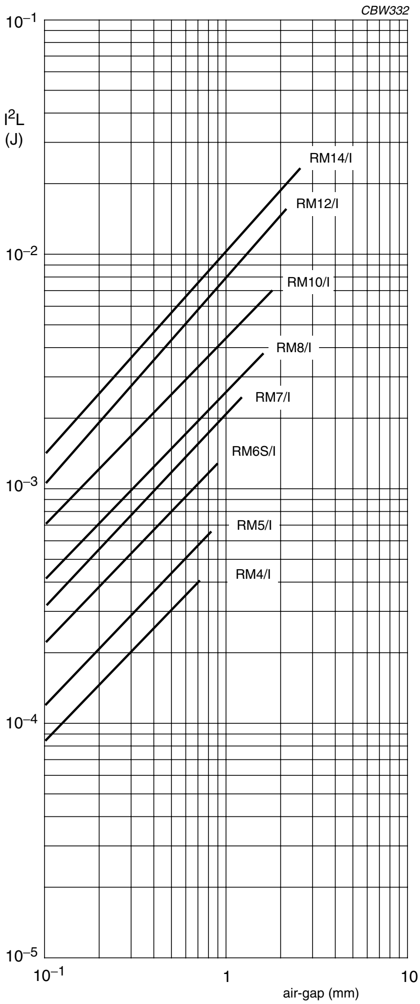


Fig.36 I^2L graph for RM/I cores.

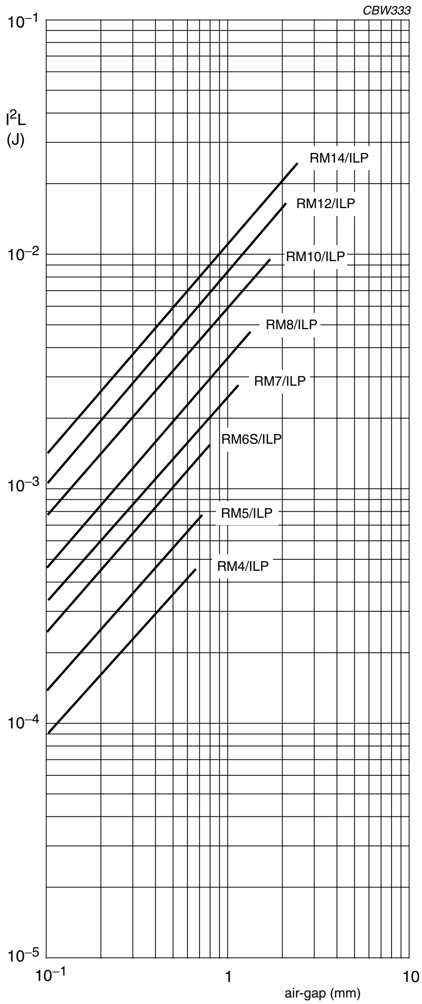


Fig.37 I^2L graph for RM/ILP cores.

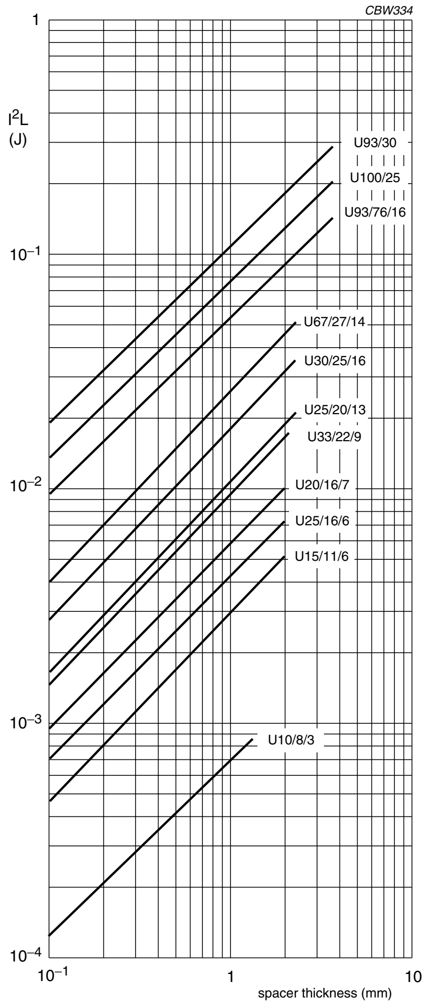


Fig.38 I^2L graph for U cores.

IRON POWDER RING CORES

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

INPUT FILTERS (COMMON MODE CHOKES)

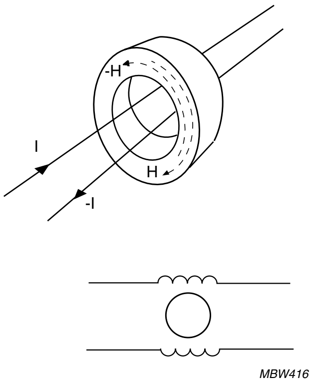


Fig.39 Common mode choke.

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

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

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

If, for some reason, current compensation is not complete or impossible, high permeability materials will saturate. In that case one of the power materials may be a better compromise. Another important factor in the design process is the frequency range of the interference signal. High permeability ferrites have a limited bandwidth as can be seen from Fig.40.

These materials only perform well as an inductor below the frequency where ferromagnetic resonance occurs. Above this cut-off frequency, a coil will have a highly resistive character and the Q-factor of the LC filter circuit will be limited an thus, also the impedance. A better result could have been obtained with a grade having a lower permeability. Figure 41 provides a quick method of choosing the right ferrite for the job.

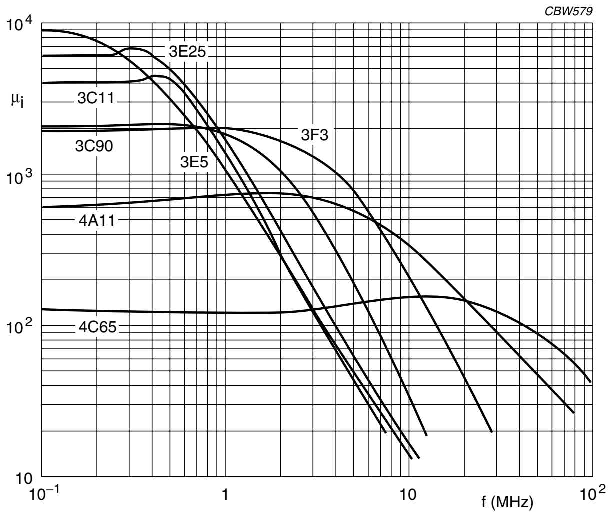


Fig.40 Permeability as a function of frequency of different materials.

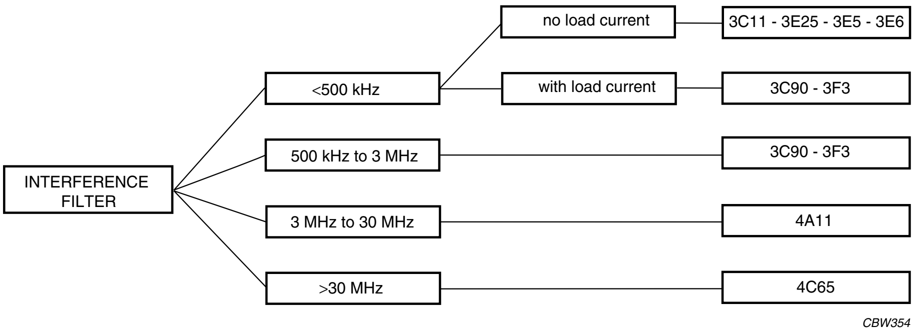


Fig.41 Selection chart for materials used in input filters.

3R1 TOROIDS IN MAGNETIC REGULATORS

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

Operating principles

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

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

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

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

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

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

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

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

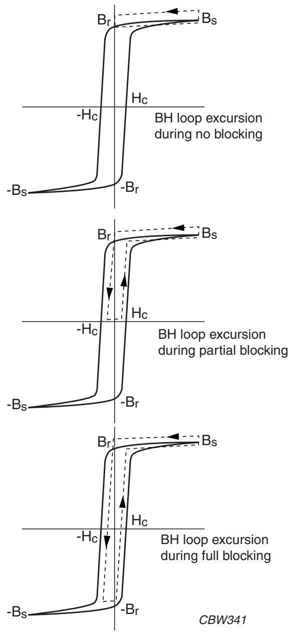


Fig.42 Behaviour of the ferrite material in a saturable inductor.

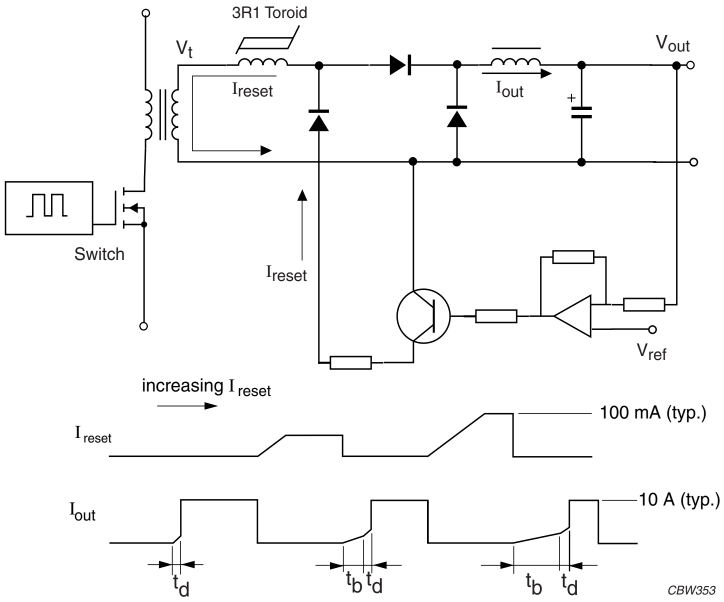


Fig.43 Schematic of a saturable inductor and associated waveforms (with regulation).

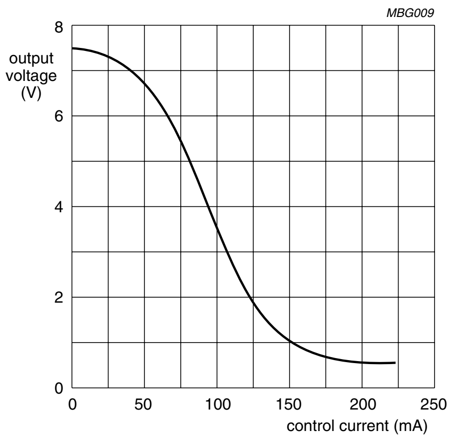


Fig.44 Typical control curve for a 3R1 ring core (size 14 × 9 × 5 mm, with 15 turns).

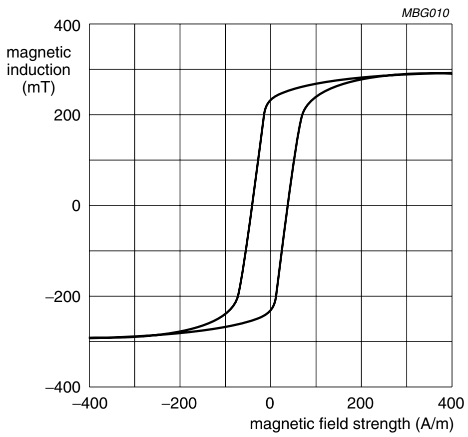


Fig.45 Properties of 3R1 ferrite material; f = 100 kHz, T = 25 °C.

Ferrites for Interference Suppression and Electromagnetic Compatibility (EMC)

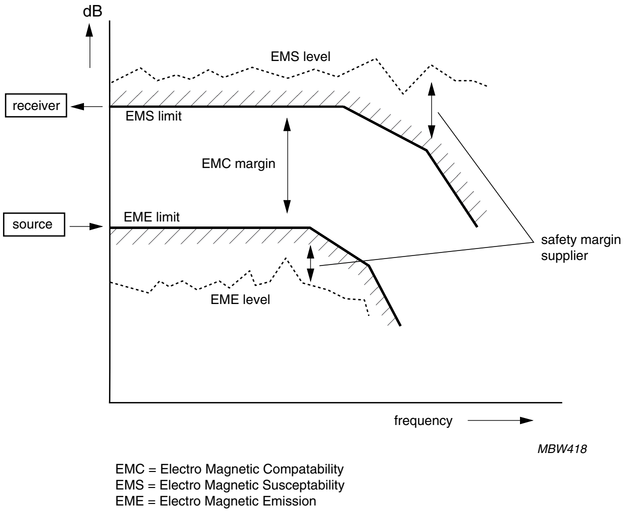


Fig.46 Principles of Electromagnetic Compatibility (EMC).

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

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

During the design phase, problems with interference can be avoided to some extent. Often additional suppression components such as capacitors and coils will be necessary to meet the required levels. Inductive components are very effective in blocking interfering signals, especially at high frequencies. The principles of suppression are shown in Fig.47.

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

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

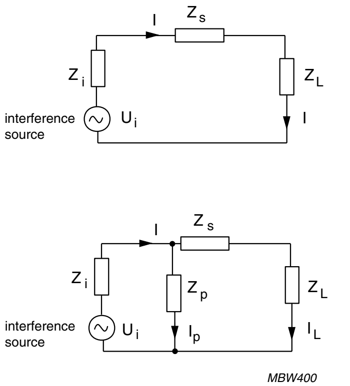


Fig.47 Basic suppression circuits.

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

Ferroxcube have a full range of ring cores, beads, multilayer suppressors and inductors, 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.

SAMPLE BOXES

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

- Sample box 9: SMD beads and chokes
- Sample box 10: Cable shielding
- Sample box 11: EMI suppression products
- Sample box 12: Multilayer suppressors.
- Sample box 13: Multilayer inductors.

INTERFERENCE SUPPRESSION BEADS

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

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

- 3S1 for frequencies up to 30 MHz
- 3S4 for frequencies from 30 to 1000 MHz
- 4S2 for frequencies from 30 to 1000 MHz.

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

The grade 3S1 has a high permeability and is therefore rather sensitive for DC load. In applications where a high DC current is flowing 4S2 can be a better choice (see Figs 48, 49 and 50).

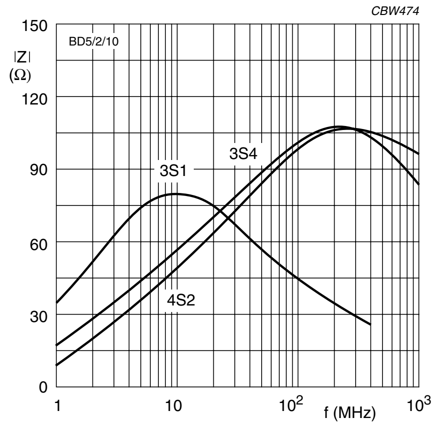


Fig.48 Impedance as a function of frequency for material grades 3S1, 3S4 and 4S2; bead size 5 × 2 × 10 mm.

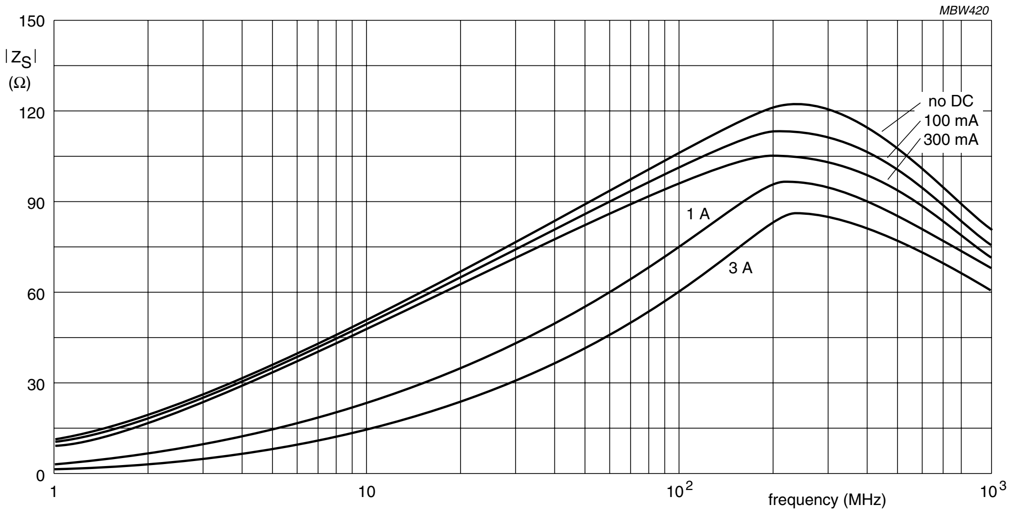


Fig.49 Impedance as a function of frequency at different DC levels for material grade 4S2.

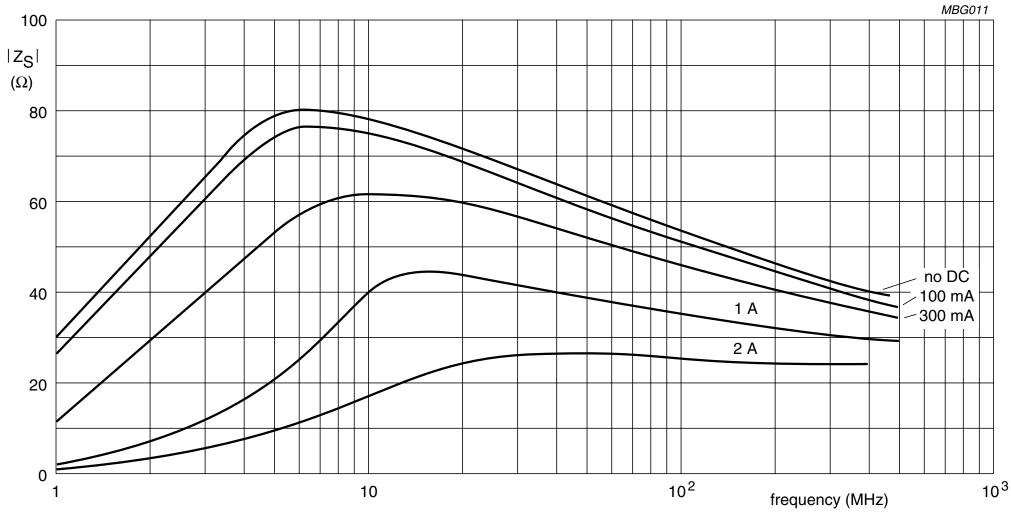


Fig.50 Impedance as a function of frequency at different DC levels for material grade 3S1.

BEADS ON WIRE

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

SMD FERRITE BEADS

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

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

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

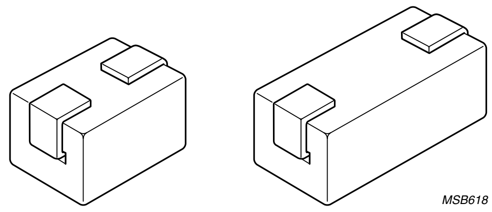


Fig.51 Outline of SMD beads.

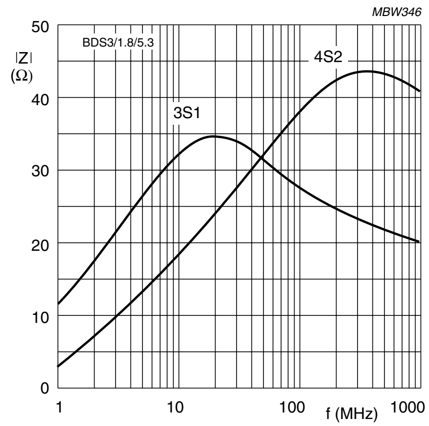


Fig.52 Impedance as a function of frequency for SMD beads.

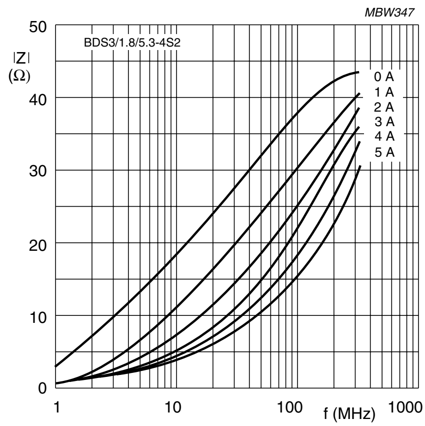


Fig.53 Impedance as a function of frequency for an SMD bead with bias current as a parameter.

SMD FERRITE BEADS FOR COMMON-MODE INTERFERENCE SUPPRESSION

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

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

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

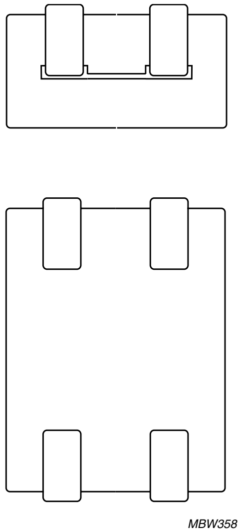


Fig.54 Outline of an SMD common-mode choke.

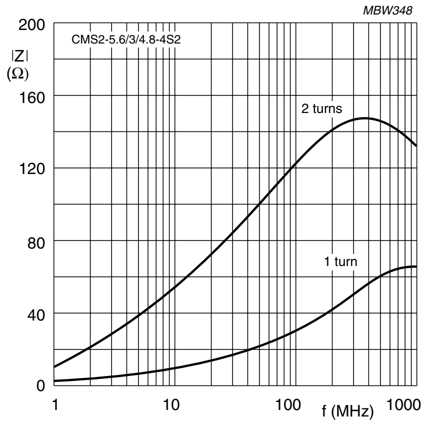


Fig.55 Impedance as a function of frequency of an SMD common mode bead with two conductors.

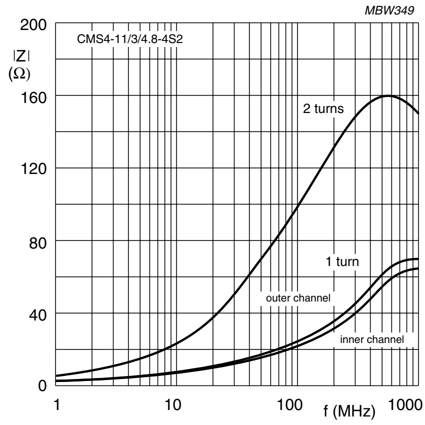


Fig.56 Impedance as a function of frequency of an SMD common mode bead with four conductors.

WIDEBAND CHOKES

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

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

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

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

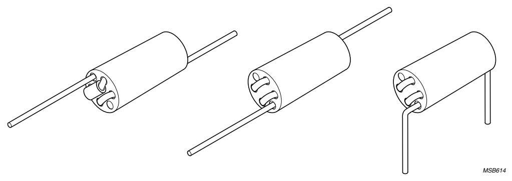


Fig.57 Outline of wideband chokes.

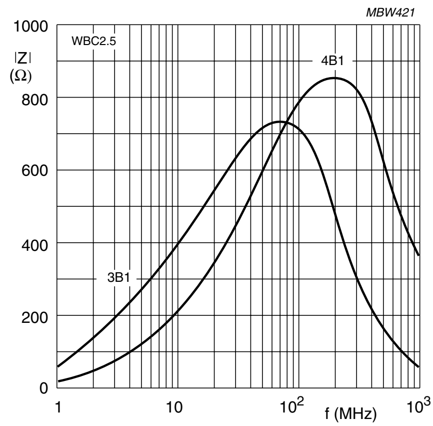


Fig.58 Impedance as a function of frequency for a wideband choke.

SMD WIDEBAND CHOKES

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

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

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

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

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

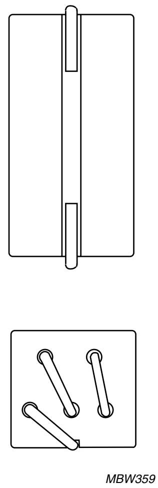


Fig.60 Outline of an SMD wideband choke.

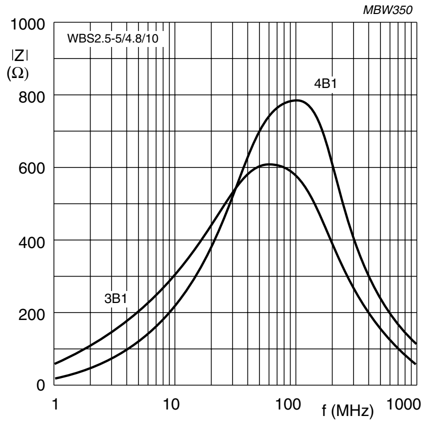


Fig.61 Impedance as a function of frequency for SMD wideband chokes.

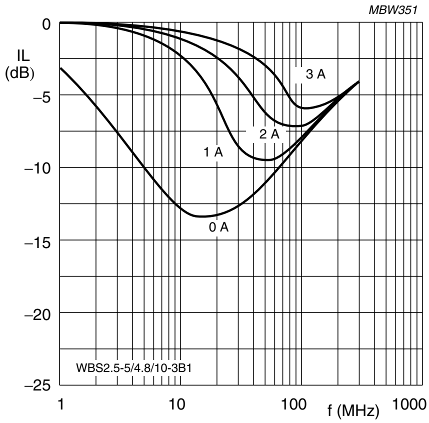


Fig.62 Insertion loss of a 3B1 SMD wideband choke as a function of frequency (50 Ω circuit).

CABLE SHIELDS

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

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

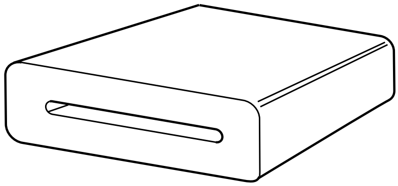


Fig.63 Outline of a cable shield.

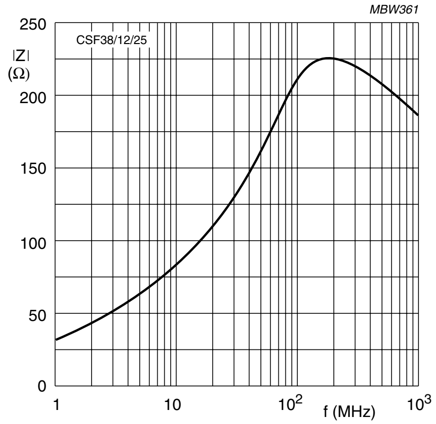


Fig.64 Impedance of a cable shield as a function of frequency.

RODS AND TUBES

Rods and tubes are generally used to increase the inductance of a coil. The magnetic circuit is very open and therefore the mechanical dimensions have more influence on the inductance than the ferrite's permeability (see Fig.65) unless the rod is very slender.

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

- Calculate the length to diameter ratio of the rod (l/d)
- Find this value on the horizontal axis and draw a vertical line.

The intersection of this line with the curve of the material permeability gives the effective rod permeability.

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

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

where:

N = number of turns

A = cross sectional area of rod

l = length of coil.

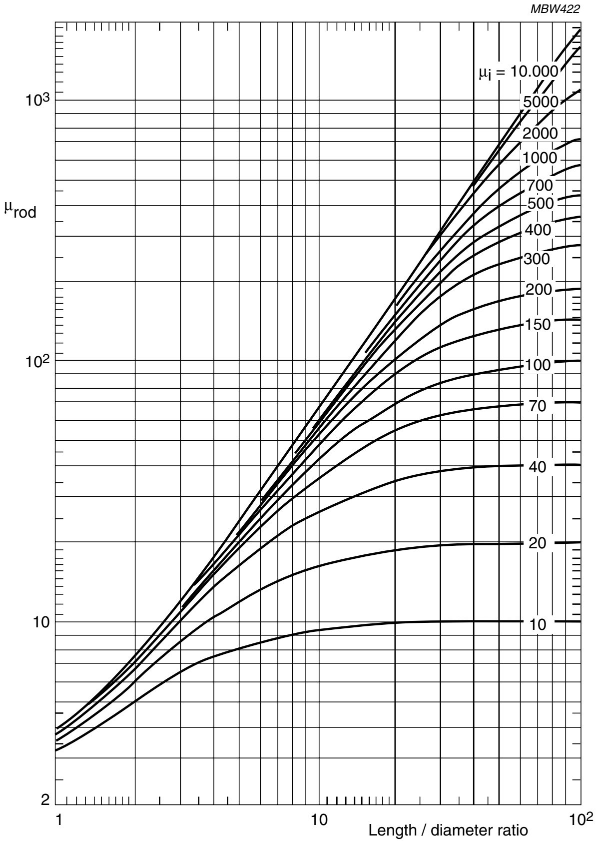


Fig.65 Rod permeability (μ_{rod}) as a function of length to diameter ratio with material permeability as a parameter.

Literature and reference materials

PHILIPS COMPONENTS APPLICATION LITERATURE

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

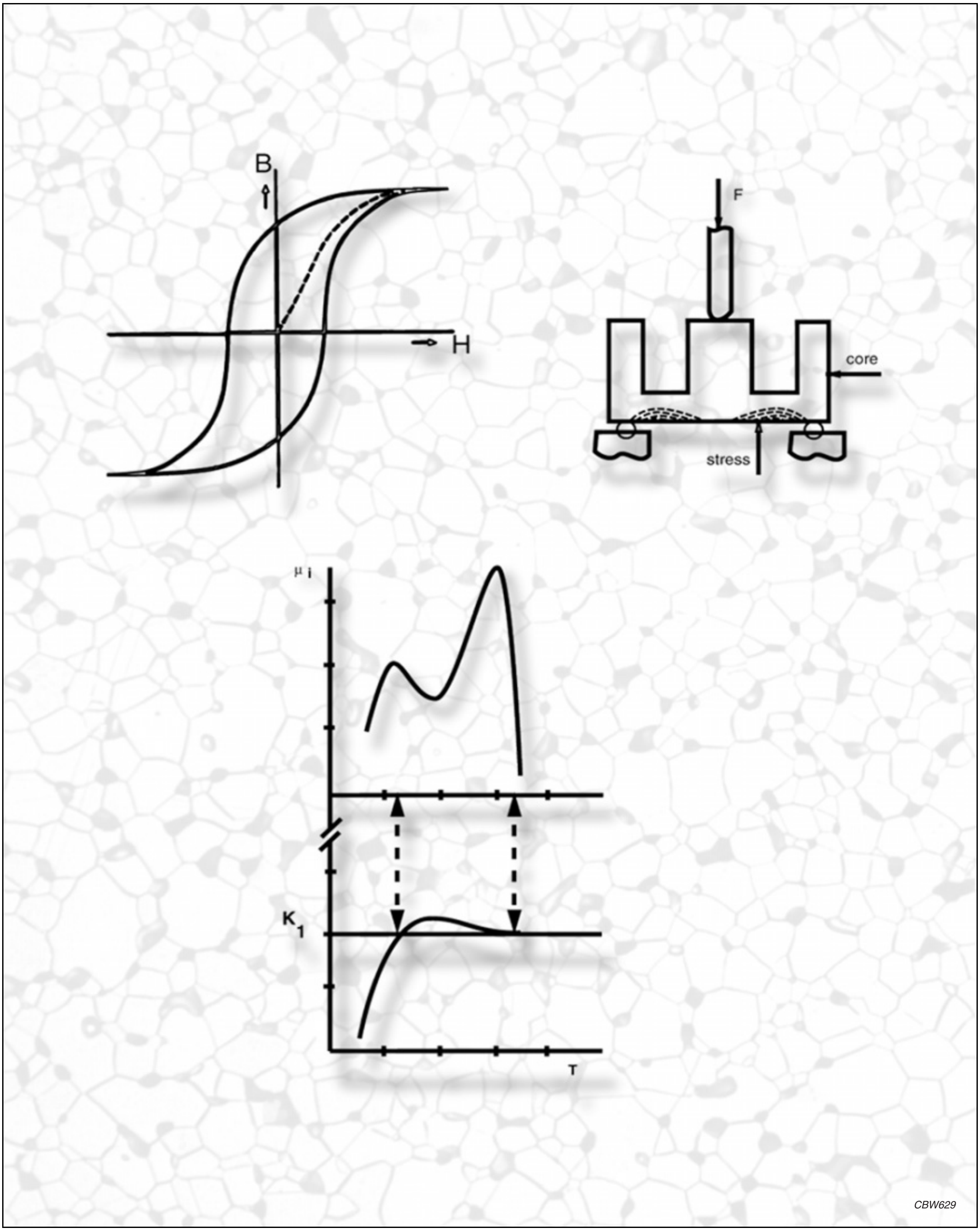
IEC STANDARDS ON SOFT FERRITES

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

Literature and reference materials

REFERENCE BOOKS ON MAGNETIC COMPONENT DESIGN

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


B
H
F
core
stress
μ i
K1
T
CBW629

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

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

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

Ferrite material survey

MAIN APPLICATION AREA	FREQUENCY RANGE (MHZ)	MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	T_C (°C)	ρ (Ωm)	FERRITE TYPE	AVAILABLE CORE SHAPES
Telecom filters Proximity sensors	< 0.1	3B7	2300	≈ 450	≥ 170	≈ 1	MnZn	RM, P, PT, PTS, EP, E, ER, RM/I, RM/ILP, PH
	0.2 - 2	3D3	750	≈ 400	≥ 200	≈ 2	MnZn	
	< 0.2	3H3	2000	≈ 400	≥ 160	≈ 2	MnZn	
Wideband signal transformers Pulse transformers Delay lines		3E27	6000	≈ 400	≥ 150	≈ 0.5	MnZn	RM, P, PT, PTS, EP, EP/LP, EPX, E, ER, RM/I, RM/ILP, Toroids
		3E28	4000	≈ 400	≥ 145	≈ 1	MnZn	
		3E5	10000	≈ 400	≥ 125	≈ 0.5	MnZn	
		3E55	10000	≈ 350	≥ 100	≈ 0.1	MnZn	
		3E6	12000	≈ 400	≥ 130	≈ 0.1	MnZn	
		3E7	15000	≈ 400	≥ 130	≈ 0.1	MnZn	
		3E8	18000	≈ 350	≥ 100	≈ 0.1	MnZn	
		3E9	20000	≈ 350	≥ 100	≈ 0.1	MnZn	
Line output transformers (LOT)	< 0.2	3C30	2100	≈ 500	≥ 240	≈ 2	MnZn	UR
	< 0.3	3C34	2100	≈ 500	≥ 240	≈ 5	MnZn	
Power transformers Power inductors General purpose transformers and inductors	< 0.2	3C81	2700	≈ 450	≥ 210	≈ 1	MnZn	E, Planar E, EC, EFD, EP, ETD, ER, U, RM/I, RM/ILP, P, P/I,PT, PTS, PQ, Toroids
	< 0.2	3C90	2300	≈ 450	≥ 220	≈ 5	MnZn	
	< 0.3	3C91	3000	≈ 450	≥ 220	≈ 5	MnZn	
	< 0.2	3C92	1500	≈ 500	≥ 280	≈ 5	MnZn	
	< 0.3	3C93	1800	≈ 450	≥ 240	≈ 5	MnZn	
	< 0.3	3C94	2300	≈ 450	≥ 220	≈ 5	MnZn	
	< 0.4	3C96	2000	≈ 500	≥ 240	≈ 5	MnZn	
	0.2 - 0.5	3F3	2000	≈ 450	≥ 200	≈ 2	MnZn	
	0.5 - 1	3F35	1400	≈ 500	≥ 240	≈ 10	MnZn	
	1 - 2	3F4	900	≈ 450	≥ 220	≈ 10	MnZn	
	1 - 2	3F45	900	≈ 500	≥ 300	≈ 10	MnZn	
	2 - 4	3F5	650	≈ 500	≥ 300	≈ 10	MnZn	
	4 - 10	4F1	80	≈ 350	≥ 260	≈ 10^5	NiZn	
Wideband EMI-suppression Wideband transformers Balun transformers	10 - 100	3B1	900	≈ 400	≥ 150	≈ 0.2	MnZn	BD, BDW, BDS, MLS, CMS, Cable shields, Rods, Toroids, WBS, WBC
	1 - 30	3S1	4000	≈ 400	≥ 125	≈ 1	MnZn	
	30 - 1000	3S3	350	≈ 350	≥ 225	≈ 10^4	MnZn	
	10 - 300	3S4	1700	≈ 350	≥ 110	≈ 10^3	MnZn	
	30 - 1000	4A11	700	≈ 350	≥ 125	≈ 10^5	NiZn	
	10 - 300	4A15	1200	≈ 350	≥ 125	≈ 10^5	NiZn	
	30 - 1000	4B1	250	≈ 350	≥ 250	≈ 10^5	NiZn	
	50 - 1000	4C65	125	≈ 400	≥350	≈ 10^5	NiZn	
	30 - 1000	4S2	700	≈ 350	≥ 125	≈ 10^5	NiZn	

MAIN APPLICATION AREA	FREQUENCY RANGE (MHZ)	MATERIAL	μ_i at 25 °C	B_{sat} (mT) at 25 °C (3000 A/m)	T_C (°C)	ρ (Ωm)	FERRITE TYPE	AVAILABLE CORE SHAPES
EMI-filters Current compensated chokes		3C11	4300	≈ 400	≥125	≈ 1	MnZn	Toroids E, U
		3E25	6000	≈ 400	≥125	≈ 0.5	MnZn	
		3E26	7000	≈ 450	≥155	≈ 0.5	MnZn	
		3E5	10000	≈ 400	≥125	≈ 0.5	MnZn	
		3E6	12000	≈ 400	≥130	≈ 0.1	MnZn	
		4A11	700	≈ 350	≥ 125	≈ 10^5	NiZn	
HF Tuning	< 1	3B1	900	≈400	≥150	≈0.2	MnZn	Rods, Tubes, Wideband chokes
	< 2	3D3	750	≈ 400	≥ 200	≈ 2	MnZn	
	< 5	4B1	250	≈350	≥250	≈10^5	NiZn	
	< 20	4C65	125	≈ 400	≥350	≈ 10^5	NiZn	
	< 50	4D2	60	≈240	≥400	≈10^5	NiZn	
	< 200	4E1	15	≈200	≥500	≈10^5	NiZn	
magnetic regulators	< 0.2	3R1	800	≈450	≥230	≈10^3	MnZn	Toroids
scientific particle accelerators	< 10	4B3	300	≈400	≥250	≈10^5	NiZn	Large toroids Machined ferrite products
	< 100	4E2	25	≈350	≥400	≈10^5	NiZn	
	< 10	4M2	140	≈350	≥200	≈10^5	NiZn	
	< 1	8C11	900	≈350	≥125	≈10^5	NiZn	
	< 10	8C12	1200	≈300	≥125	≈10^5	NiZn	

Iron powder material grade survey

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

Typical mechanical and thermal properties

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

RESISTIVITY

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

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

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

Table 1 Resistivity as a function of temperature of a MnZn-ferrite (3C94)

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 (4C65)

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 Tables 3 and 4.

Table 3 Resistivity as function of frequency for MnZn ferrites

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

Table 4 Resistivity as function of frequency for NiZn ferrites

FREQUENCY (MHz)	RESISTIVITY (Ωm)
0.1	$\approx 10^5$
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. The isolating material on the grain boundaries also has a permittivity of approximately 10. However, if the bulk permittivity of a ferrite is measured, very different values of apparent permittivity result. This is caused by the conductivity inside the crystallites. The complicated network of more or less leaky capacitors also shows a strong frequency dependence.

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

Table 5 Permittivity as a function of frequency for MnZn ferrites

FREQUENCY (MHz)	PERMITTIVITY (ε_r)
0.1	$\approx 2.10^5$
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)	PERMITTIVITY (ε_r)
0.001	≈100
0.01	≈50
1	≈25
10	≈15
100	≈12

2P.. SPECIFICATIONS

These iron powder materials are mainly used for low frequency power inductors and output chokes.

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	≤1500 × 10^{-6}	
B_r	from 25 × 10^3 A/m	≈ 250	mT
H_C	from 25 × 10^3 A/m	≈ 2000	A/m
B	H = 25 × 10^3 A/m	≈ 950	mT
α_F	25 to 55 °C	≈ 10 × 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	≈ 1500 × 10^{-6}	
B_r	from 25 × 10^3 A/m	≈ 300	mT
H_C	from 25 × 10^3 A/m	≈ 1800	A/m
B	H = 25 × 10^3 A/m	≈ 1000	mT
α_F	25 to 55 °C	≈ 20 × 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	≈ 1000 × 10^{-6}	
B_r	from 25 × 10^3 A/m	≈ 350	mT
H_C	from 25 × 10^3 A/m	≈ 1500	A/m
B	H = 25 × 10^3 A/m	≈ 1150	mT
α_F	25 to 55 °C	≈ 15 × 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	≈ 1000 × 10^{-6}	
B_r	from 25 × 10^3 A/m	≈ 400	mT
H_C	from 25 × 10^3 A/m	≈ 1200	A/m
B	H = 25 × 10^3 A/m	≈ 1400	mT
α_F	25 to 55 °C	≈ 15 × 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	≈ 1000 × 10^{-6}	
B_r	from 25 × 10^3 A/m	≈ 450	mT
H_C	from 25 × 10^3 A/m	≈ 900	A/m
B	H = 25 × 10^3 A/m	≈ 1600	mT
α_F	25 to 55 °C	≈ 15 × 10^{-6}	K^{-1}
T_{max}		140	°C

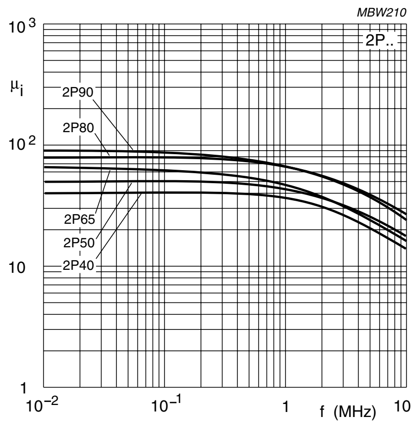


Fig.1 Initial permeability as a function of frequency.

Material specification 2P..

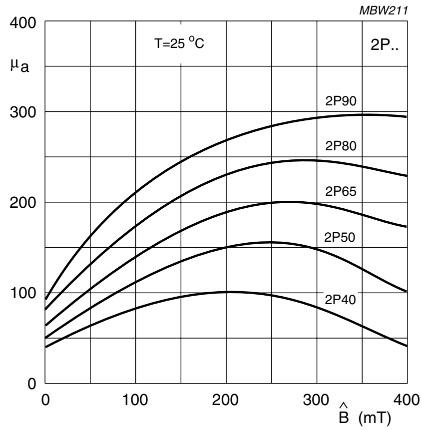


Fig.2 Amplitude permeability as a function of peak flux density.

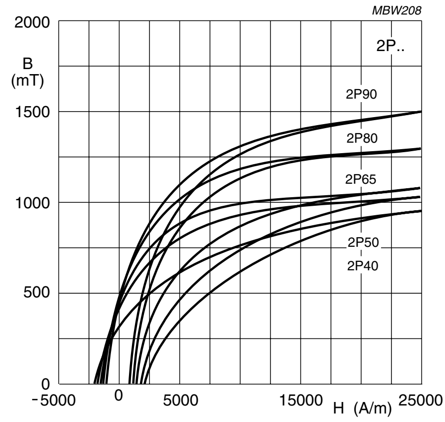


Fig.3 Typical B-H loops.

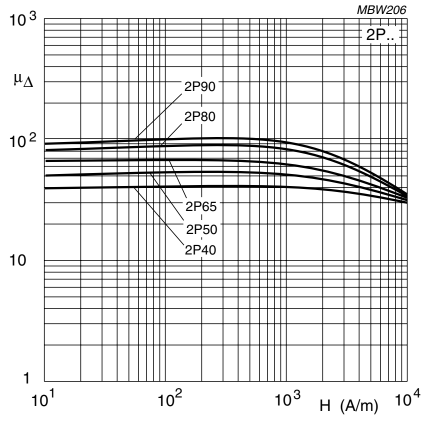


Fig.4 Incremental permeability as a function of magnetic field strength.

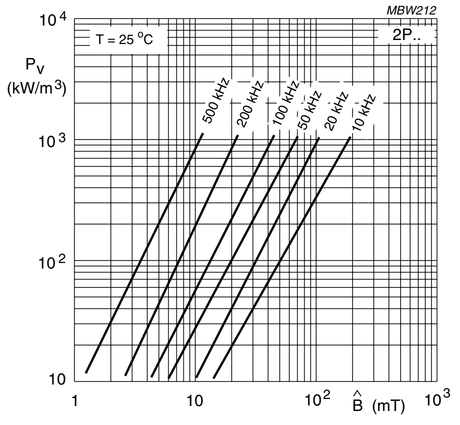


Fig.5 Specific power loss as a function of peak flux density with frequency as a parameter.

3B1 SPECIFICATIONS

Medium permeability MnZn ferrite for use in wideband EMI-suppression (10 - 100 MHz) as well as RF tuning, wideband and balun transformers.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	900 ±20%	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈ 330 ≈ 200	mT
$\tan\delta/\mu_i$	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

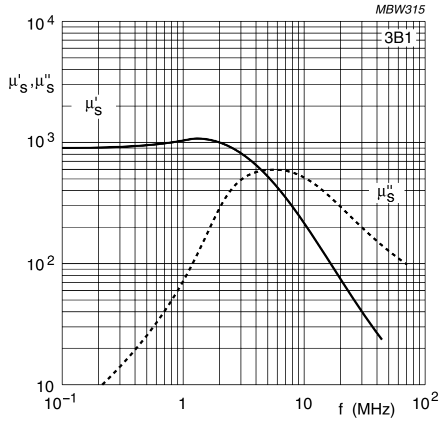


Fig.1 Complex permeability as a function of frequency.

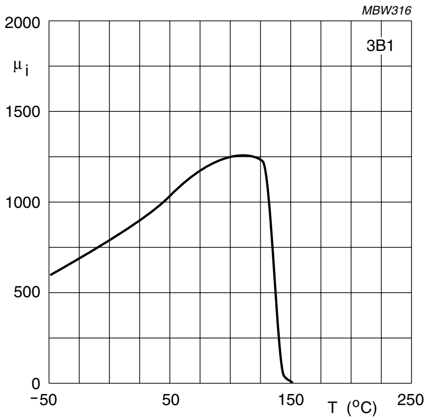


Fig.2 Initial permeability as a function of temperature.

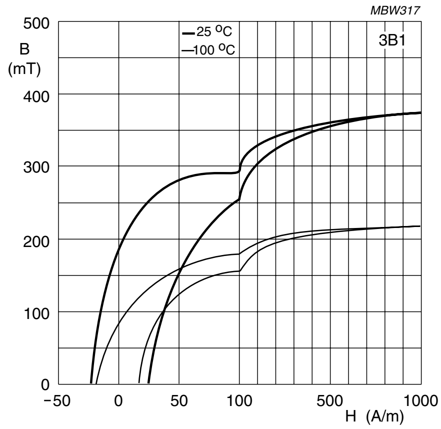


Fig.3 Typical B-H loops.

Material specification 3B1

3B7 SPECIFICATIONS

A low frequency filter material optimized for frequencies up to 0.1 MHz.

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

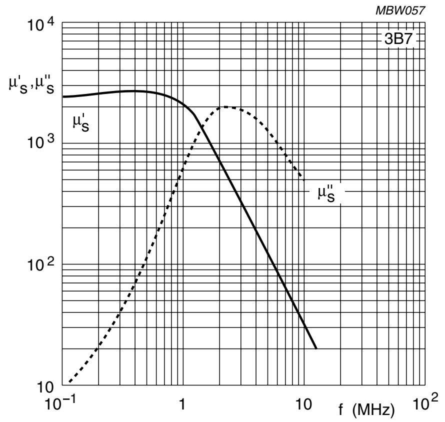


Fig.1 Complex permeability as a function of frequency.

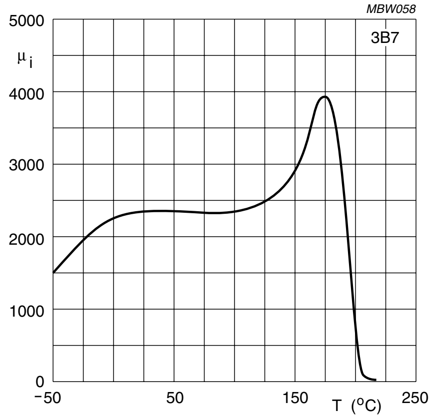


Fig.2 Initial permeability as a function of temperature.

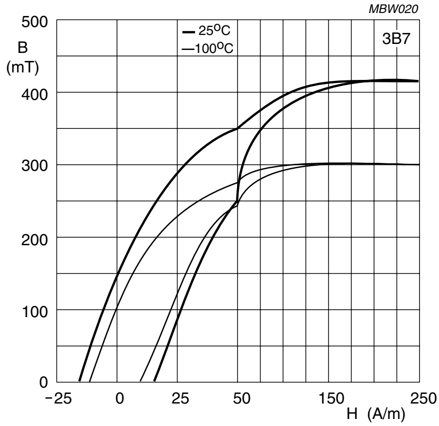


Fig.3 Typical B-H loops.

Material specification 3B7

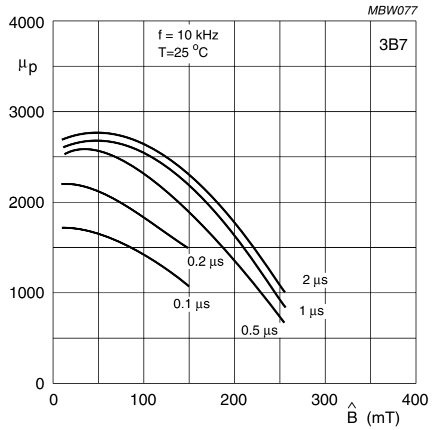


Fig.4 Pulse characteristics (unipolar pulses).

Material specification 3C11

3C11 SPECIFICATIONS

A medium permeability material mainly for use in current compensated chokes in EMI-suppression filters.

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

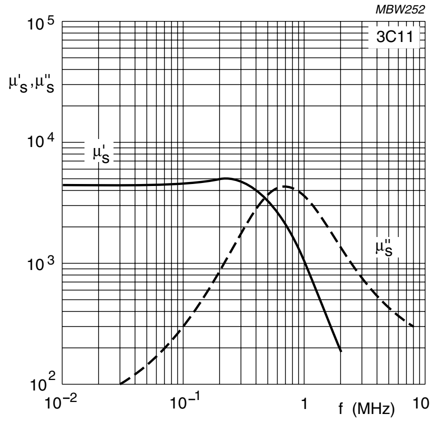


Fig.1 Complex permeability as a function of frequency.

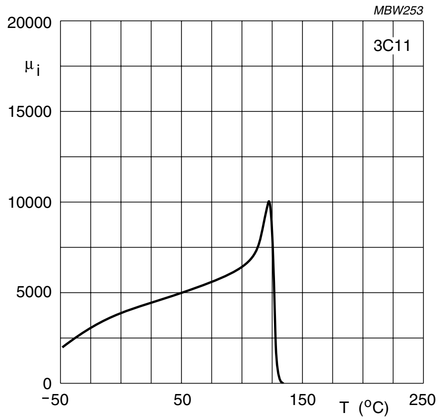


Fig.2 Initial permeability as a function of temperature.

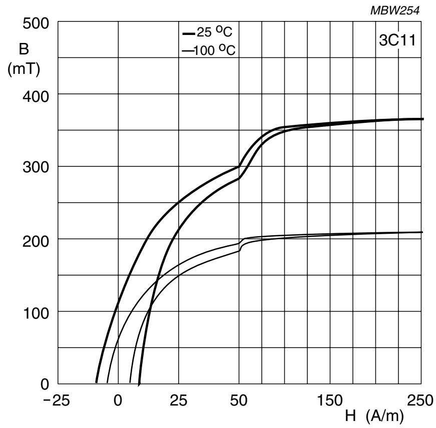


Fig.3 Typical B-H loops.

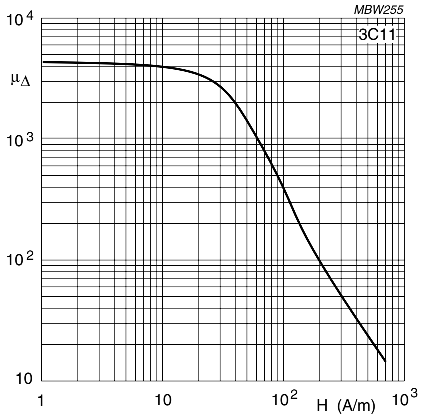


Fig.4 Incremental permeability as a function of magnetic field strength.

3C30 SPECIFICATIONS

A low frequency, high Bsat power material optimized for use in line output transformers at frequencies up to 0.2 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2100 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5000 ±25%	
B	100 °C; 10 kHz; 250 A/m	≥ 370	mT
P_V	100 °C; 25 kHz; 200 mT	≤ 80	kW/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

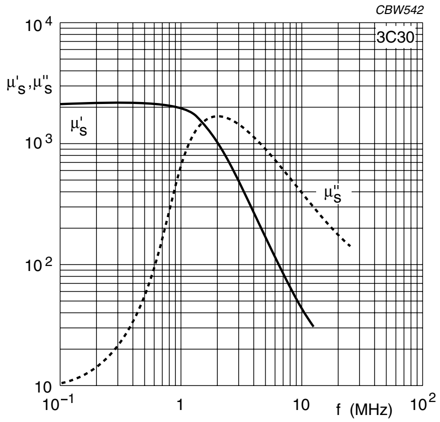


Fig.1 Complex permeability as a function of frequency.

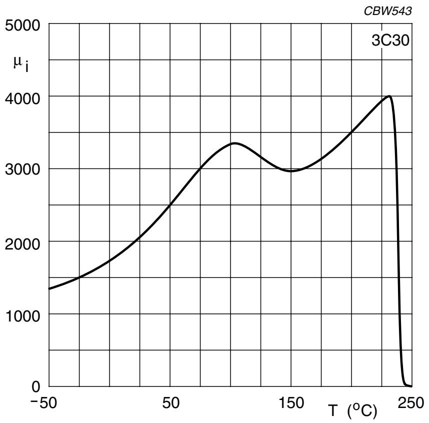


Fig.2 Initial permeability as a function of temperature.

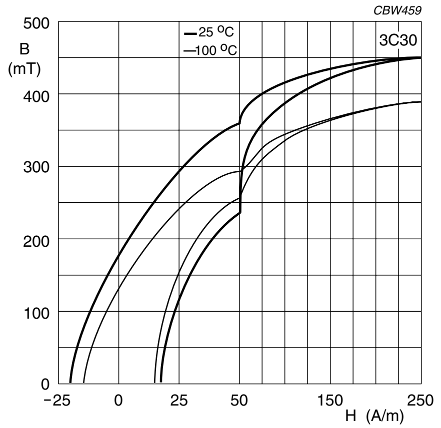


Fig.3 Typical B-H loops.

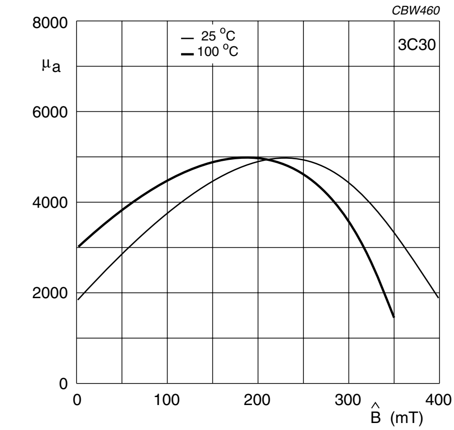


Fig.4 Amplitude permeability as a function of peak flux density.

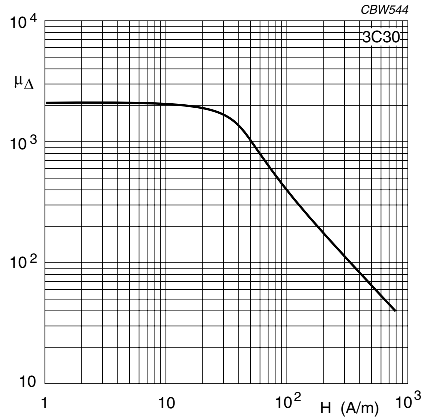


Fig.5 Incremental permeability as a function of magnetic field strength.

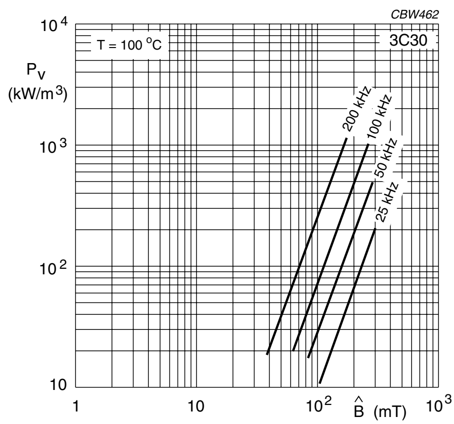


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

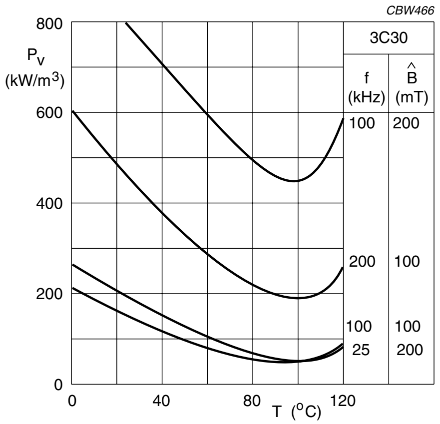


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C34 SPECIFICATIONS

A medium frequency, high Bsat power material optimized for use in line output transformers at frequencies up to 0.3 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2100 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	6500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥ 430	mT
	100 °C; 10 kHz; 250 A/m	≥ 370	mT
P_V	100 °C; 100 kHz; 100 mT	≤ 60	kW/m^3
	100 °C; 100 kHz; 200 mT	≤ 400	
ρ	DC; 25 °C	≈ 5	Ωm
T_C		≥ 240	°C
density		≈ 4800	kg/m^3

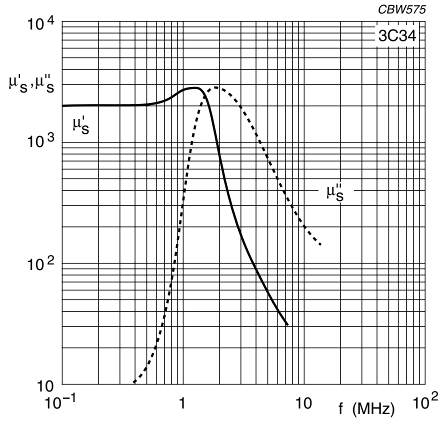


Fig.1 Complex permeability as a function of frequency.

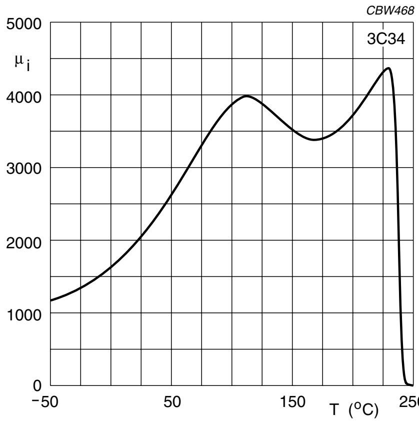


Fig.2 Initial permeability as a function of temperature.

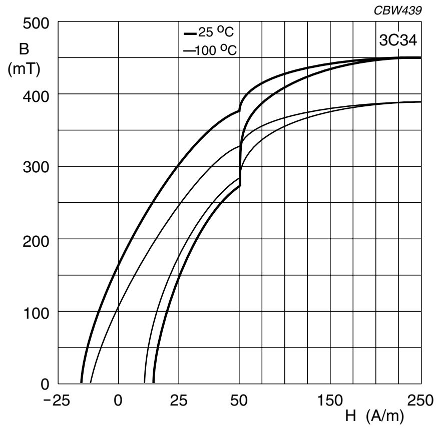


Fig.3 Typical B-H loops.

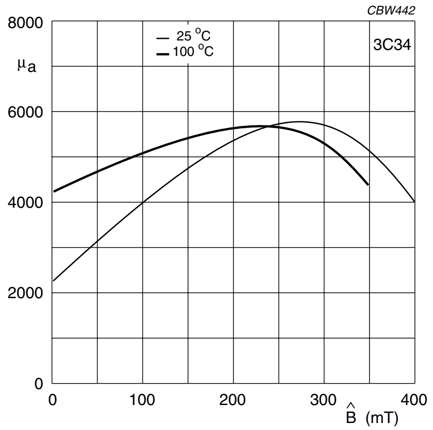


Fig.4 Amplitude permeability as a function of peak flux density.

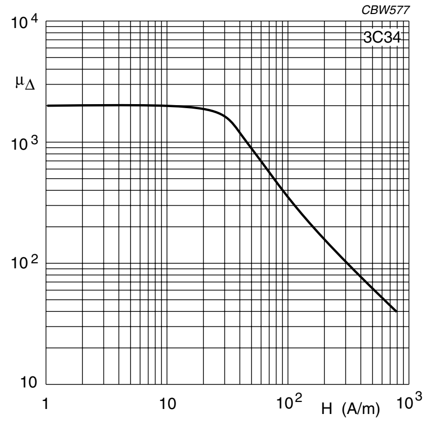


Fig.5 Incremental permeability as a function of magnetic field strength.

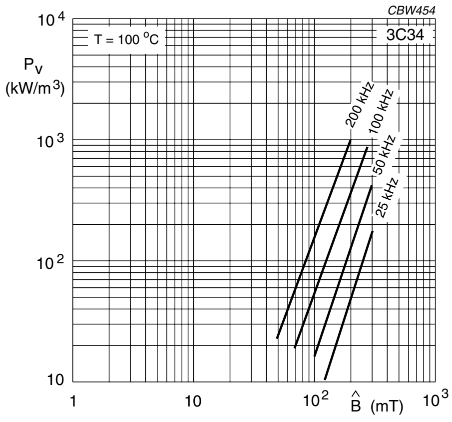


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

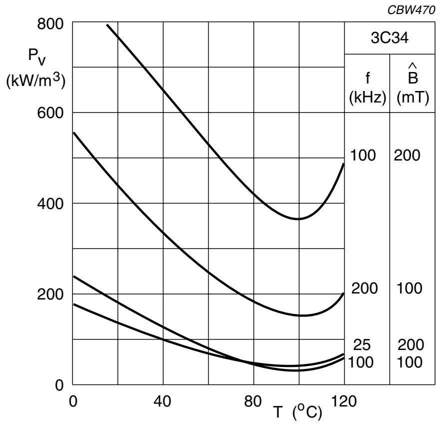


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C81 SPECIFICATIONS

A low frequency power material with minimum power losses around 60 °C for use in power and general purpose transformers at frequencies up to 0.2 MHz.

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

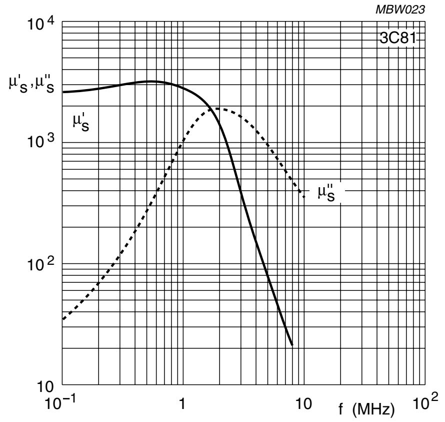


Fig.1 Complex permeability as a function of frequency.

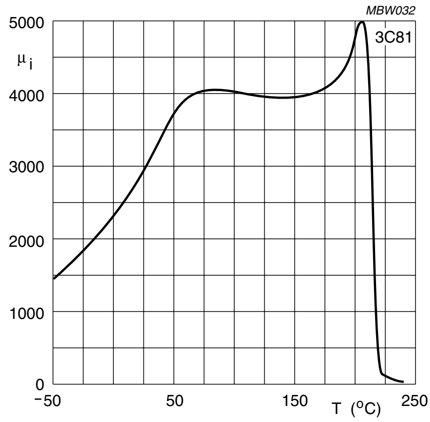


Fig.2 Initial permeability as a function of temperature.

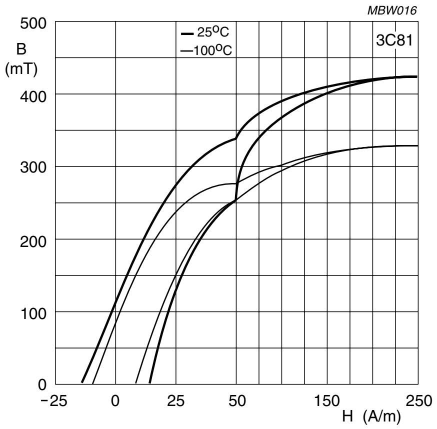


Fig.3 Typical B-H loops.

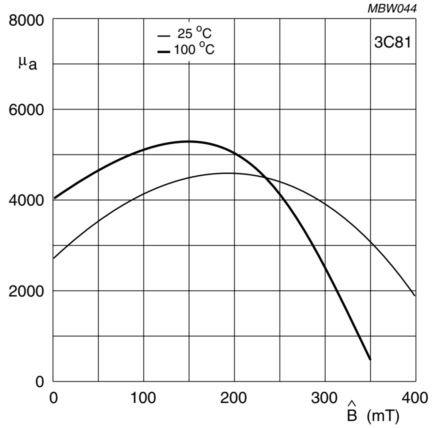


Fig.4 Amplitude permeability as a function of peak flux density.

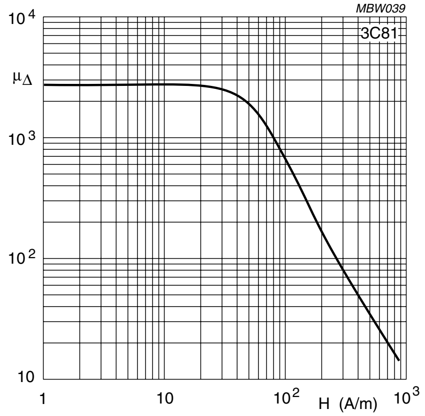


Fig.5 Incremental permeability as a function of magnetic field strength.

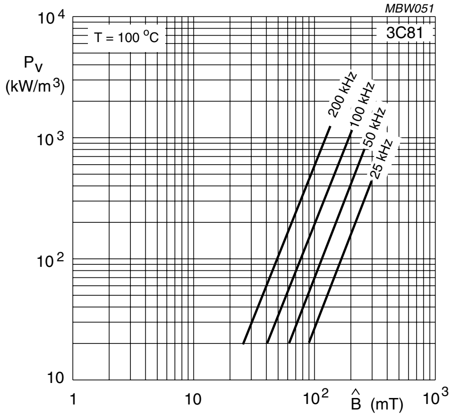


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

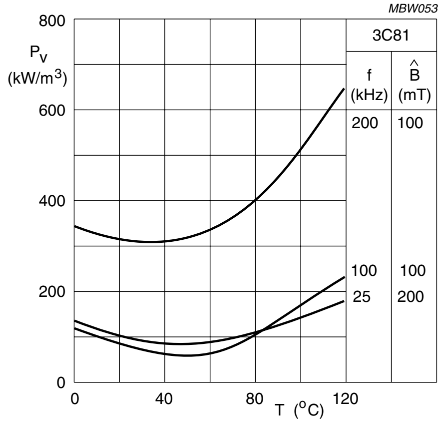


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material specification 3C90

3C90 SPECIFICATIONS

A low frequency power material for use in power and general purpose transformers at frequencies up to 0.2 MHz.

	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥ 430	mT
	100 °C; 10 kHz; 250 A/m	≥ 340	mT
P_V	100 °C; 25 kHz; 200 mT	≤ 80	kW/m^3
	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/m^3

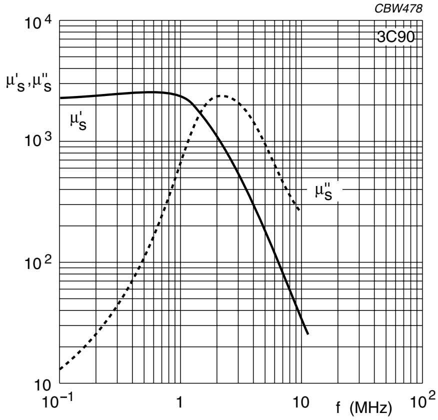


Fig.1 Complex permeability as a function of frequency.

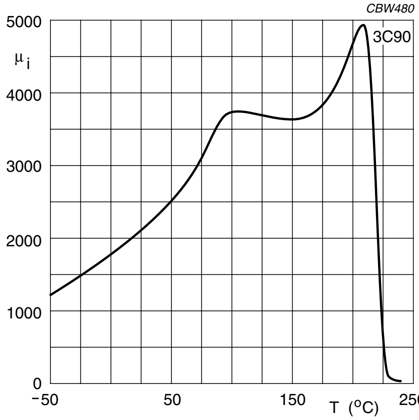


Fig.2 Initial permeability as a function of temperature.

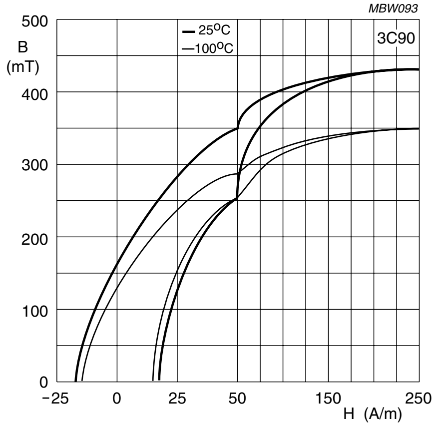


Fig.3 Typical B-H loops.

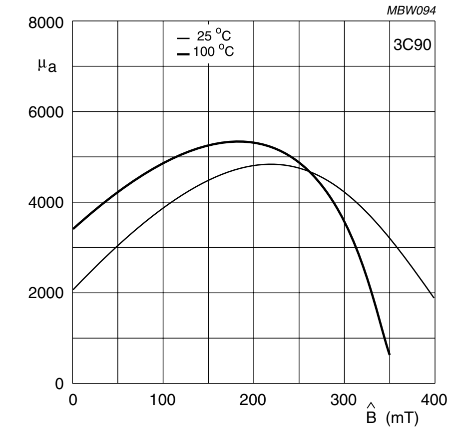


Fig.4 Amplitude permeability as a function of peak flux density.

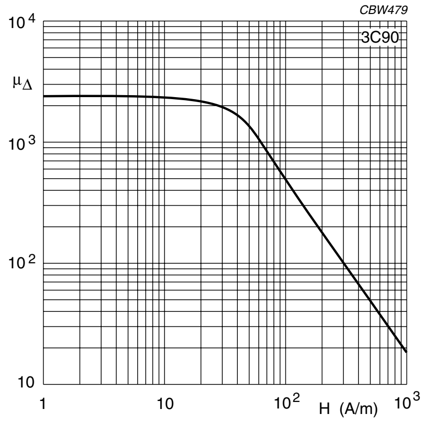


Fig.5 Incremental permeability as a function of magnetic field strength.

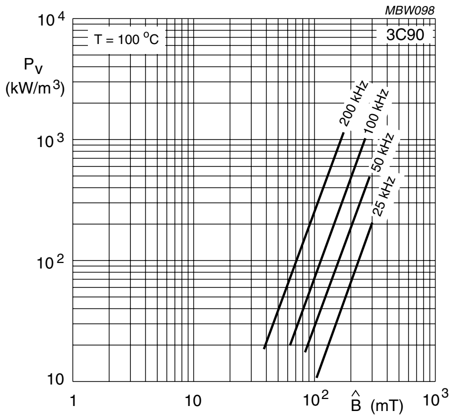


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

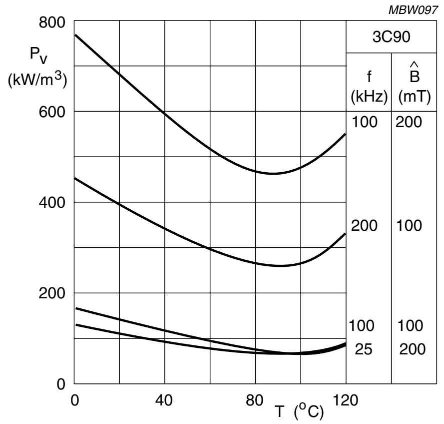


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C91 SPECIFICATIONS

A medium frequency power material with minimum power losses around 60 °C for use in power and general purpose transformers at frequencies up to 0.3 MHz.

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

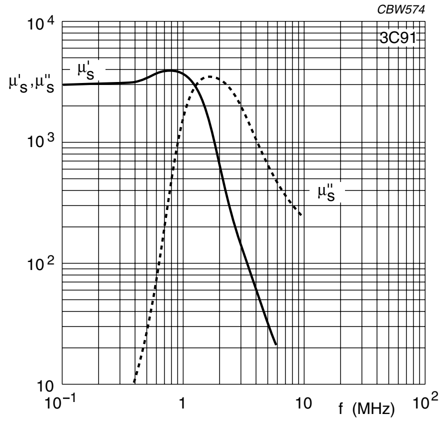


Fig.1 Complex permeability as a function of frequency.

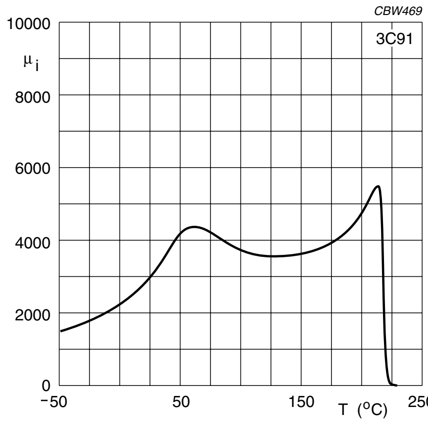


Fig.2 Initial permeability as a function of temperature.

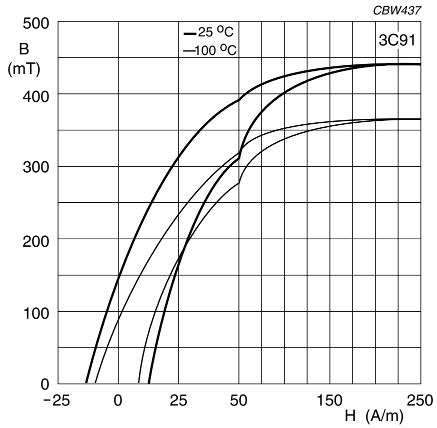


Fig.3 Typical B-H loops.

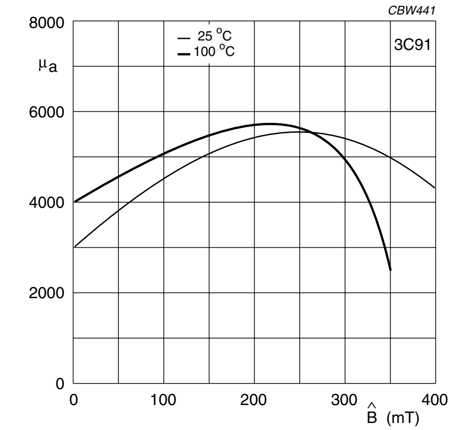


Fig.4 Amplitude permeability as a function of peak flux density.

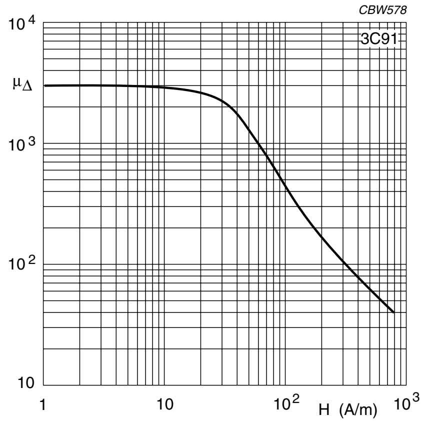


Fig.5 Incremental permeability as a function of magnetic field strength.

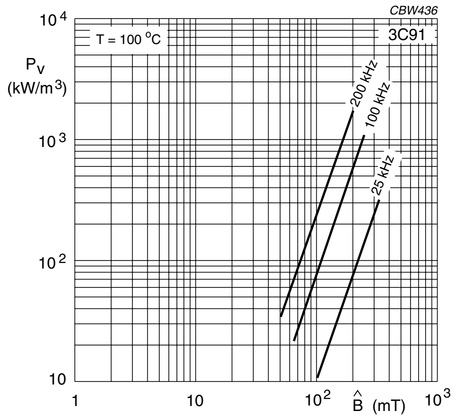


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

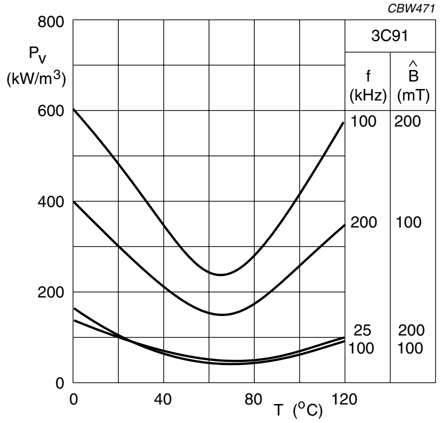


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C92 SPECIFICATIONS

A low frequency, high Bsat power material for use in power inductors at frequencies up to 0.2 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1500 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈ 5000	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈ 470 ≈ 410	mT
P_V	100 °C; 25 kHz; 200 mT 100 °C; 100 kHz; 200 mT	≈ 50 ≈ 350	kW/m^3
ρ	DC; 25 °C	≈ 5	Ωm
T_C		≥ 280	°C
density		≈ 4800	kg/m^3

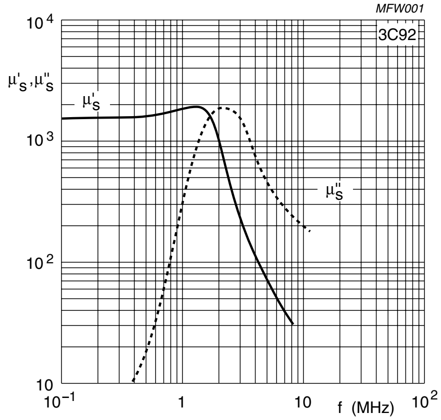


Fig.1 Complex permeability as a function of frequency.

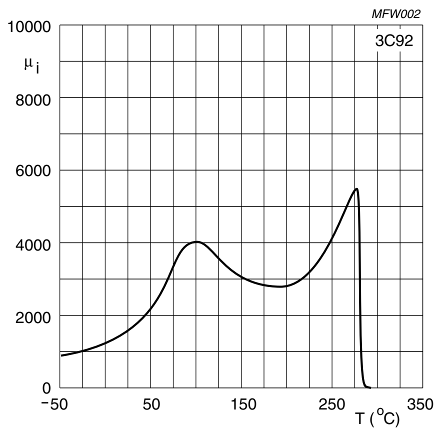


Fig.2 Initial permeability as a function of temperature.

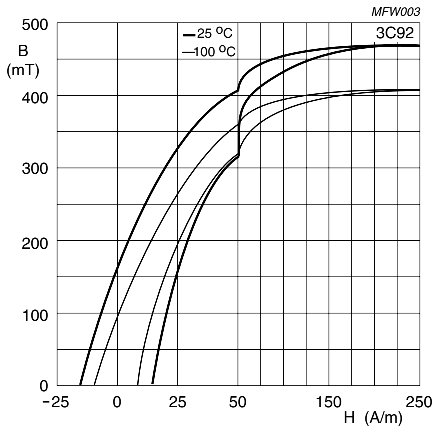


Fig.3 Typical B-H loops.

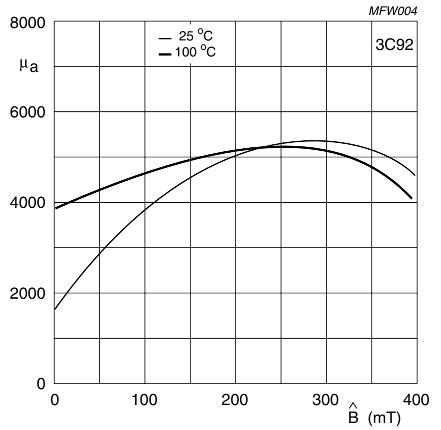


Fig.4 Amplitude permeability as a function of peak flux density.

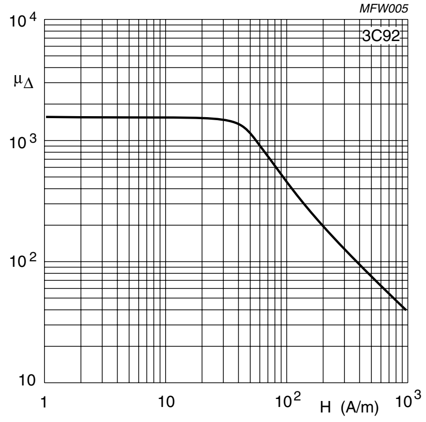


Fig.5 Incremental permeability as a function of magnetic field strength.

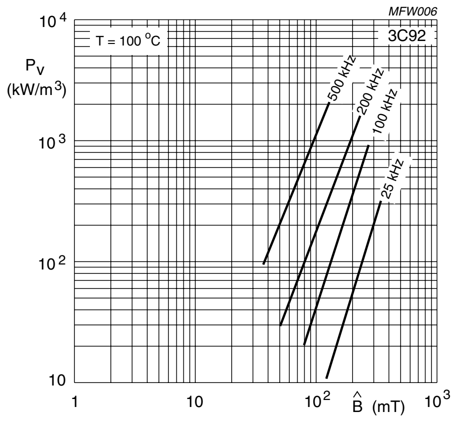


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

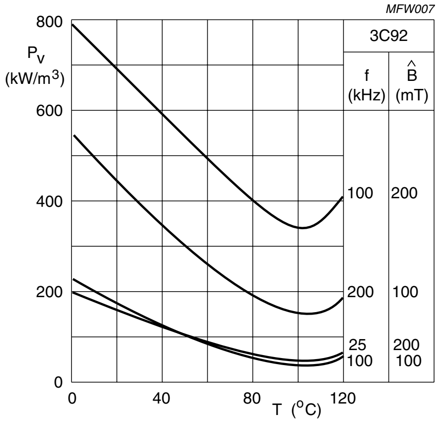


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Preliminary material specification 3C93

3C93 SPECIFICATIONS

A low to medium frequency power material with minimum power losses around 140 °C for use in power transformers at frequencies up to 0.5 MHz.

	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1800 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈ 5000	
B	25 °C; 10 kHz; 250 A/m	≈ 450	mT
	100 °C; 10 kHz; 250 A/m	≈ 380	
P_V	140 °C; 100 kHz; 100 mT	≈ 50	kW/m^3
	140 °C; 100 kHz; 200 mT	≈ 350	
	140 °C; 500 kHz; 50 mT	≈ 300	
ρ	DC; 25 °C	≈ 5	Ωm
T_C		≥ 240	°C
density		≈ 4800	kg/m^3

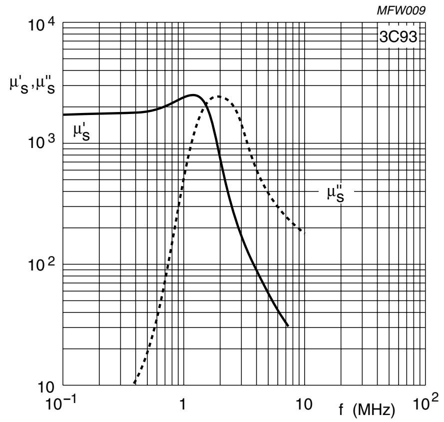


Fig.1 Complex permeability as a function of frequency.

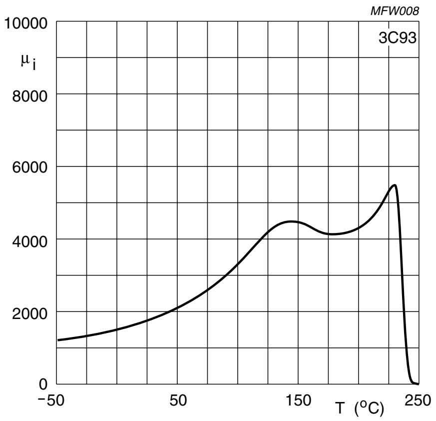


Fig.2 Initial permeability as a function of temperature.

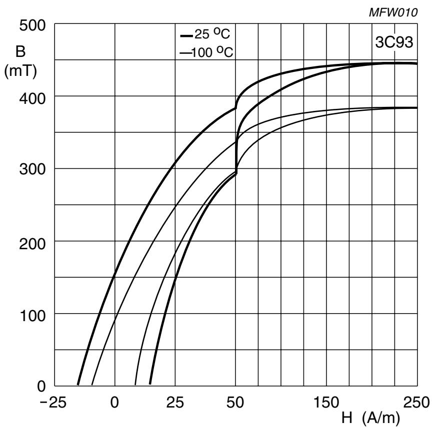


Fig.3 Typical B-H loops.

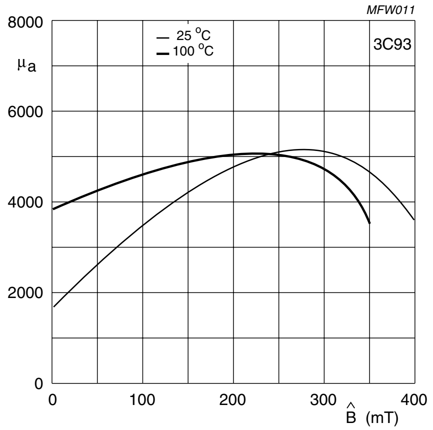


Fig.4 Amplitude permeability as a function of peak flux density.

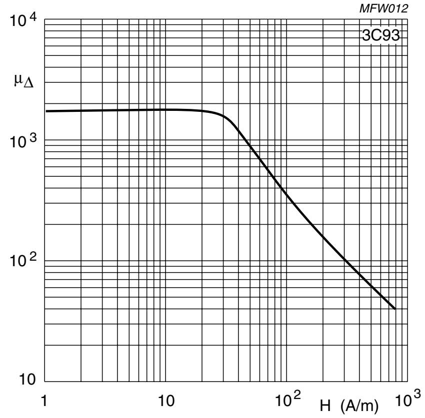


Fig.5 Incremental permeability as a function of magnetic field strength.

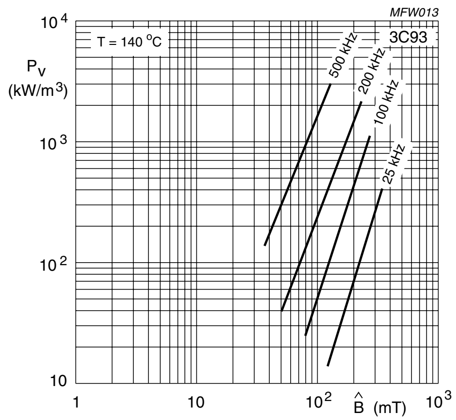


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

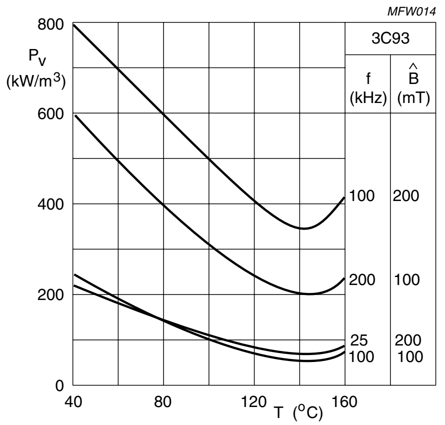


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3C94 SPECIFICATIONS

A low frequency power material for use in power and general purpose transformers at frequencies up to 0.3 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2300 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	5500 ±25%	
B	25 °C; 10 kHz; 250 A/m	≥ 430	mT
	100 °C; 10 kHz; 250 A/m	≥ 340	
P_V	100 °C; 100 kHz; 100 mT	≤ 60	kW/m^3
	100 °C; 100 kHz; 200 mT	≤ 400	
ρ	DC, 25 °C	≈ 5	Ωm
T_C		≥ 220	°C
density		≈ 4800	kg/m^3

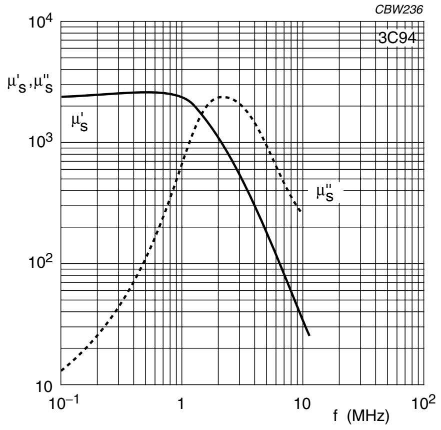


Fig.1 Complex permeability as a function of frequency.

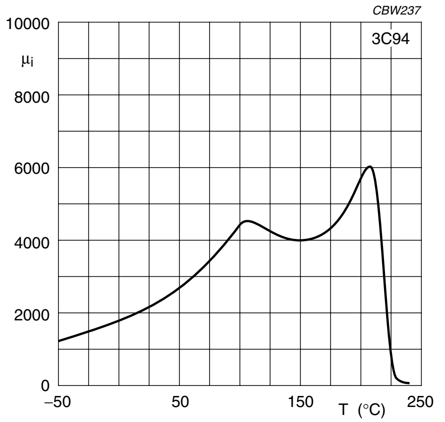


Fig.2 Initial permeability as a function of temperature.

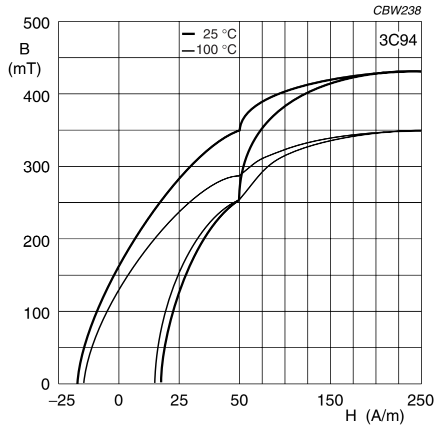


Fig.3 Typical B-H loops.

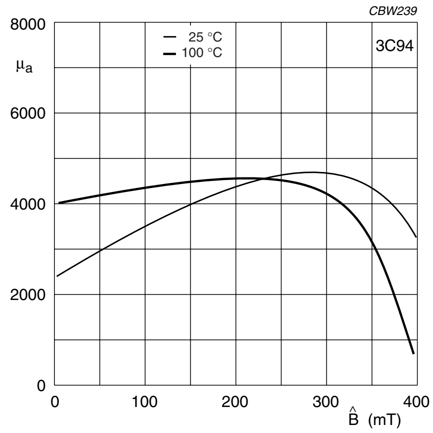


Fig.4 Amplitude permeability as a function of peak flux density.

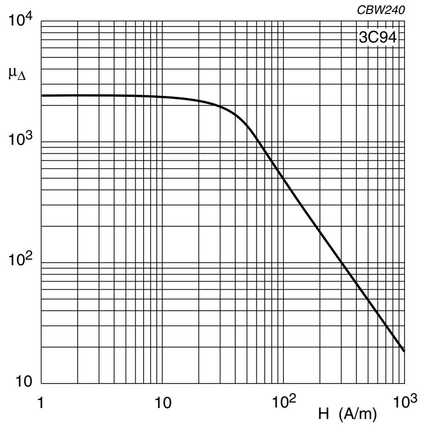


Fig.5 Incremental permeability as a function of magnetic field strength.

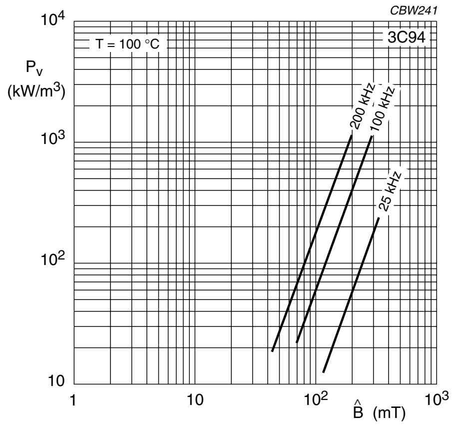


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

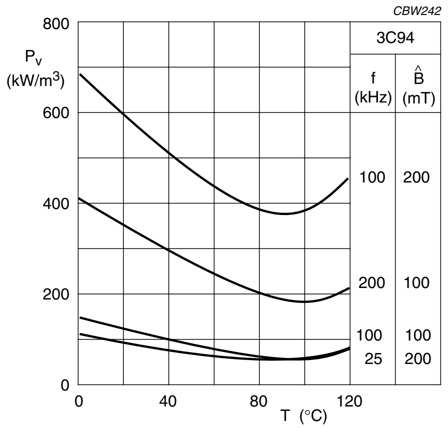


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material specification 3C96

3C96 SPECIFICATIONS

A low to medium frequency power material for use in power and general purpose transformers at frequencies up to 0.4 MHz.

	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	2000 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈ 5500	
B	25 °C; 10 kHz; 250 A/m	≥ 430	mT
	100 °C; 10 kHz; 250 A/m	≥ 370	
P_V	100 °C; 100 kHz; 100 mT	≈ 40	kW/m^3
	100 °C; 100 kHz; 200 mT	≈ 300	
	100 °C; 500 kHz; 50 mT	≈ 250	
ρ	DC; 25 °C	≈ 5	Ωm
T_C		≥ 240	°C
density		≈ 4800	kg/m^3

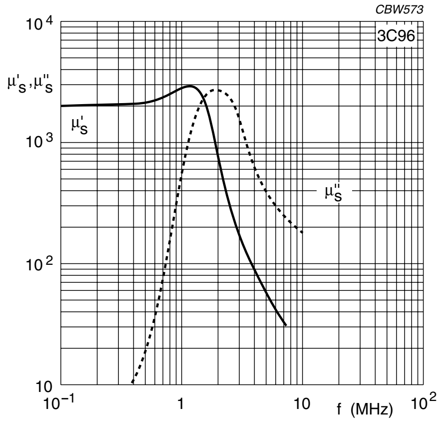


Fig.1 Complex permeability as a function of frequency.

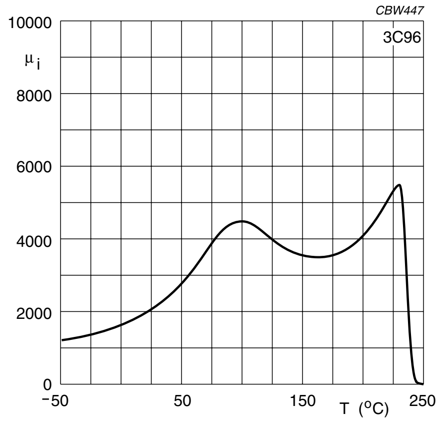


Fig.2 Initial permeability as a function of temperature.

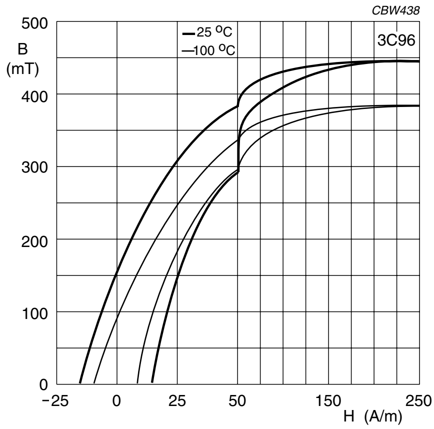


Fig.3 Typical B-H loops.

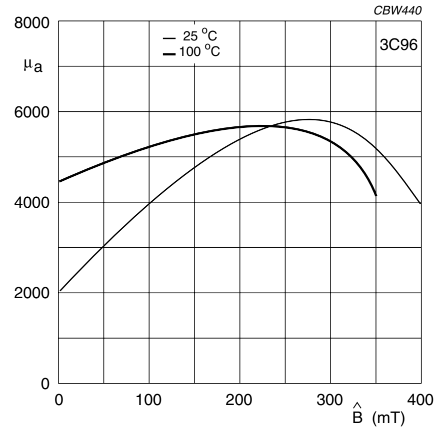


Fig.4 Amplitude permeability as a function of peak flux density.

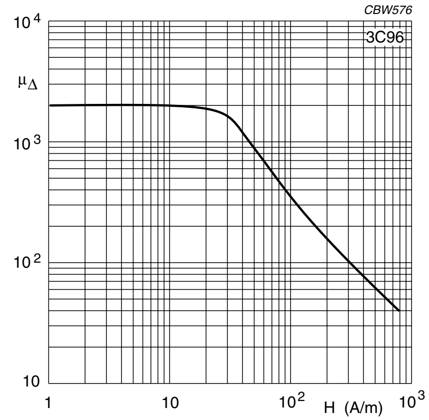


Fig.5 Incremental permeability as a function of magnetic field strength.

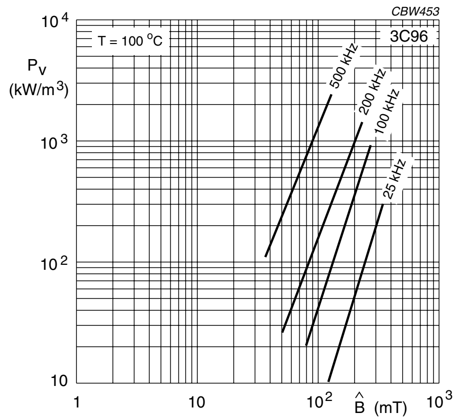


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

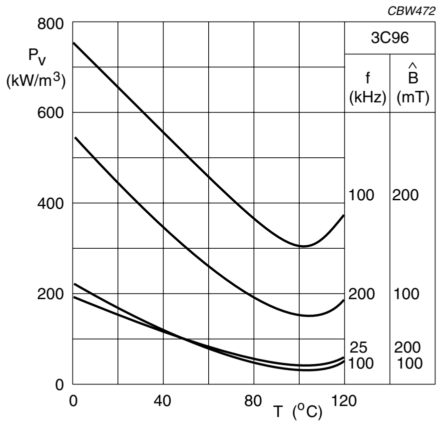


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3D3 SPECIFICATIONS

A medium frequency filter and tuning material optimized for frequencies from 0.2 up to 2 MHz.

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

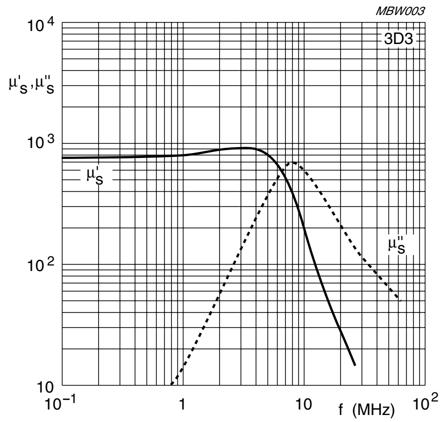


Fig.1 Complex permeability as a function of frequency.

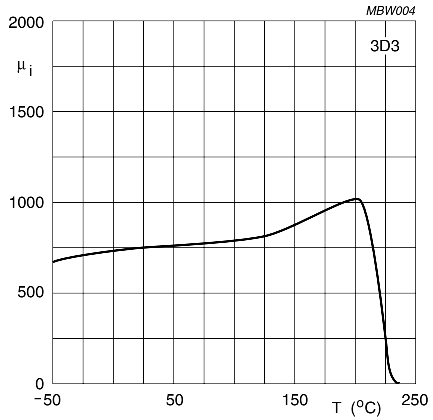


Fig.2 Initial permeability as a function of temperature.

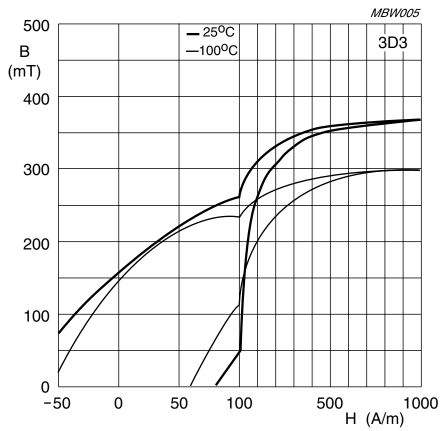


Fig.3 Typical B-H loops.

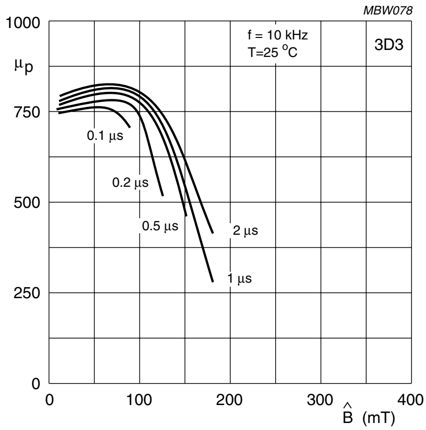


Fig.4 Pulse characteristics (unipolar pulses).

3E25 SPECIFICATIONS

A medium permeability material mainly for use in current compensated chokes in EMI-suppression filters.

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/m³

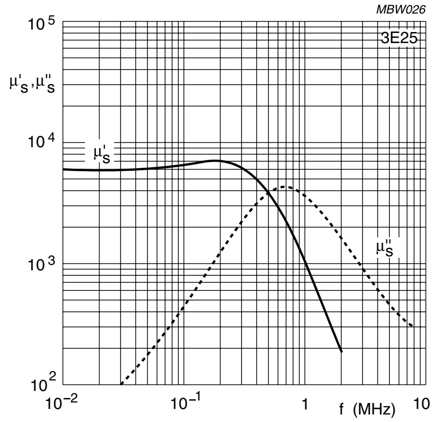


Fig.1 Complex permeability as a function of frequency.

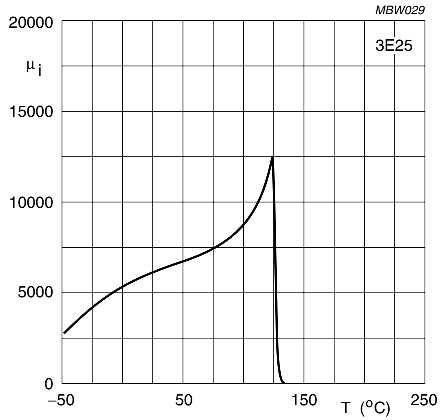


Fig.2 Initial permeability as a function of temperature.

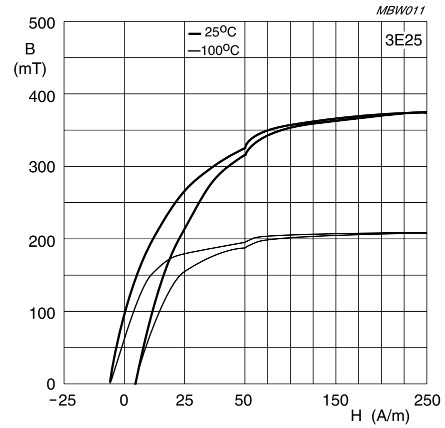


Fig.3 Typical B-H loops.

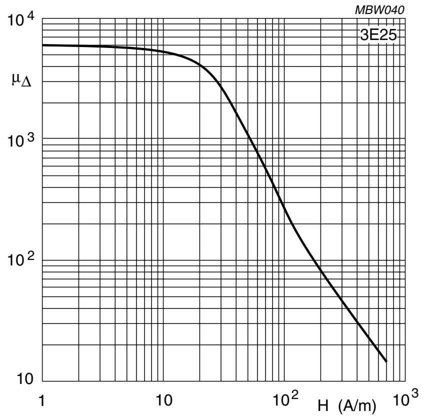


Fig.4 Incremental permeability as a function of magnetic field strength.

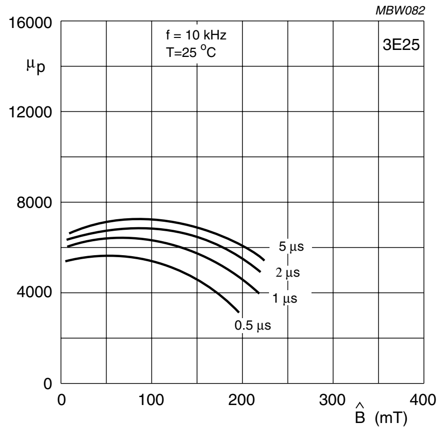


Fig.5 Pulse characteristics (unipolar pulses).

Material specification 3E26

3E26 SPECIFICATIONS

A medium permeability material mainly for use in current compensated chokes in EMI-suppression filters.

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

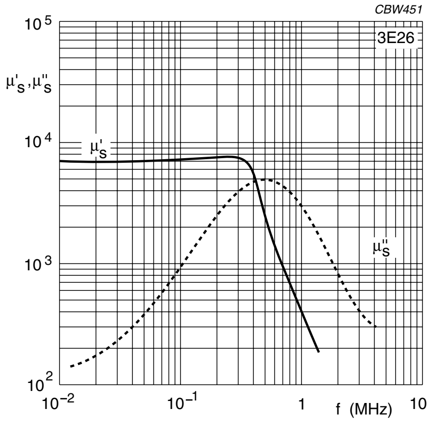


Fig.1 Complex permeability as a function of frequency.

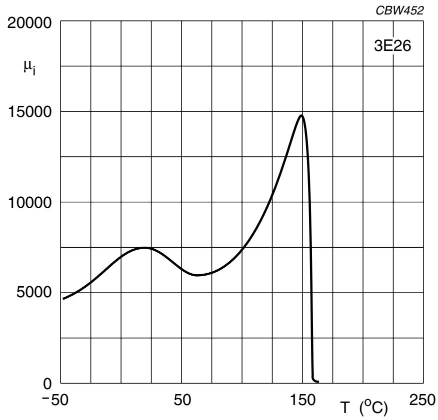


Fig.2 Initial permeability as a function of temperature.

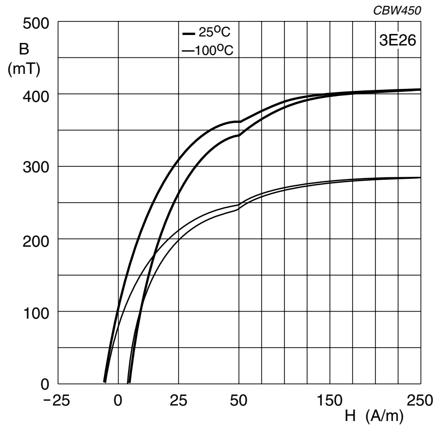


Fig.3 Typical B-H loops.

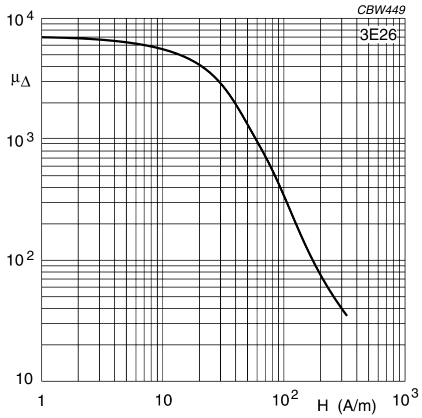


Fig.4 Incremental permeability as a function of magnetic field strength.

3E27 SPECIFICATIONS

A medium permeability material with low losses and a relatively high T_c optimized for use in wideband transformers as well as EMI-suppression filters.

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

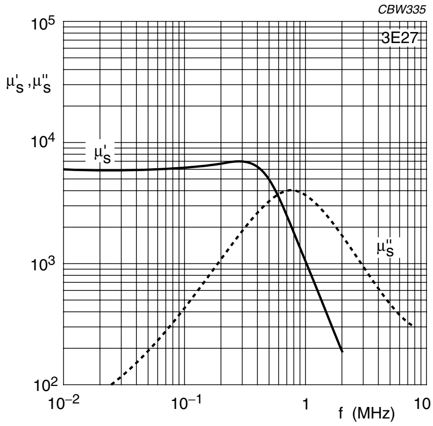


Fig.1 Complex permeability as a function of frequency.

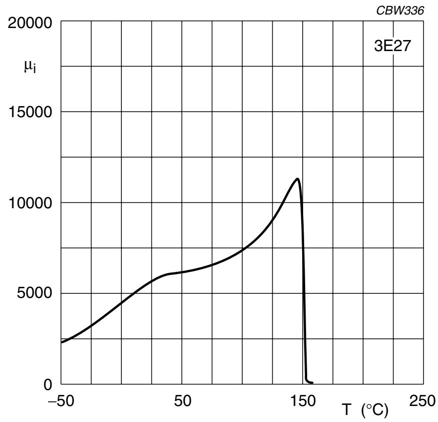


Fig.2 Initial permeability as a function of temperature.

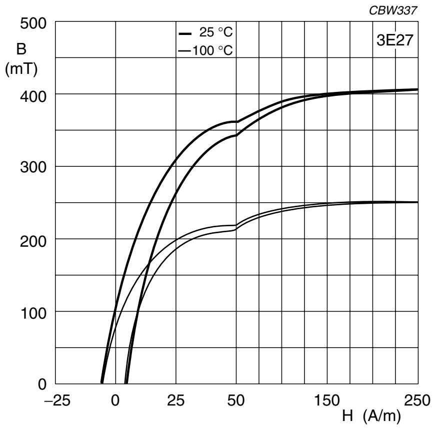


Fig.3 Typical B-H loops.

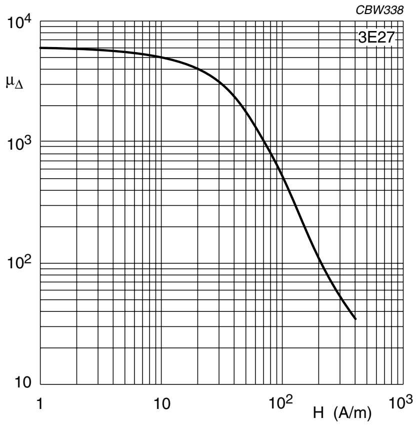


Fig.4 Incremental permeability as a function of magnetic field strength.

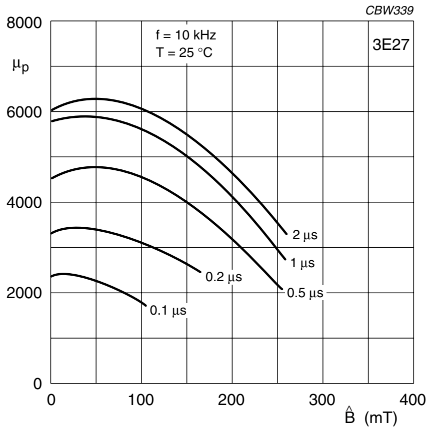


Fig.5 Pulse characteristics (unipolar pulses).

Material specification 3E28

3E28 SPECIFICATIONS

A medium permeability material optimized for use in wideband LAN transformers with a high DC-bias current over a wide temperature range.

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

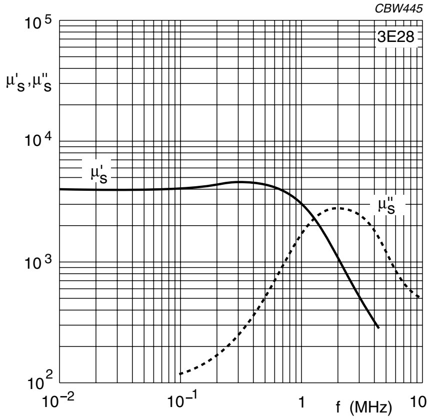


Fig.1 Complex permeability as a function of frequency.

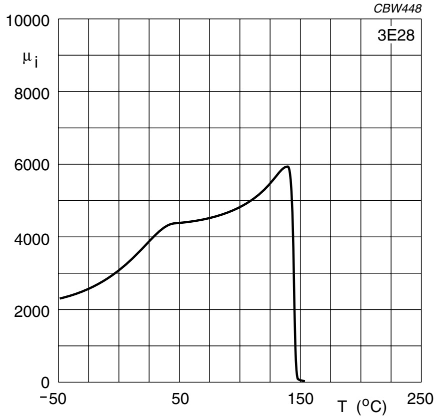


Fig.2 Initial permeability as a function of temperature.

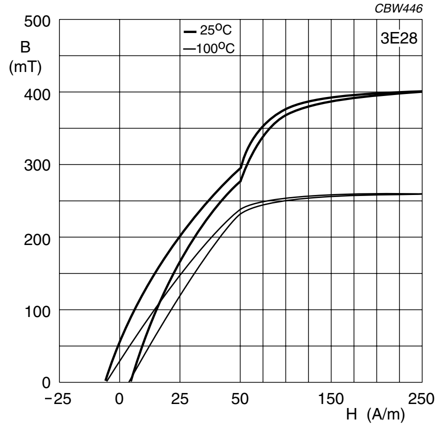


Fig.3 Typical B-H loops.

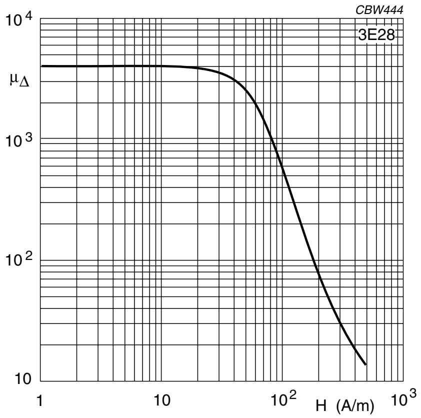


Fig.4 Incremental permeability as a function of magnetic field strength.

Material specification 3E5

3E5 SPECIFICATIONS

A high permeability material optimized for use in wideband transformers as well as EMI-suppression filters.

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

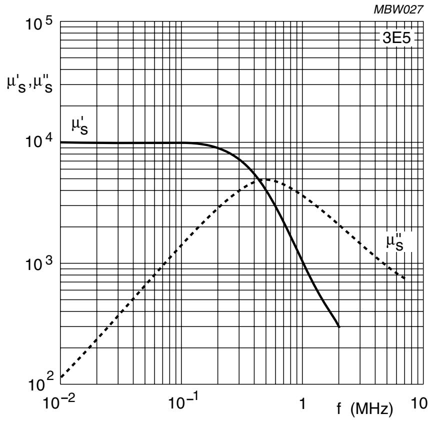


Fig.1 Complex permeability as a function of frequency.

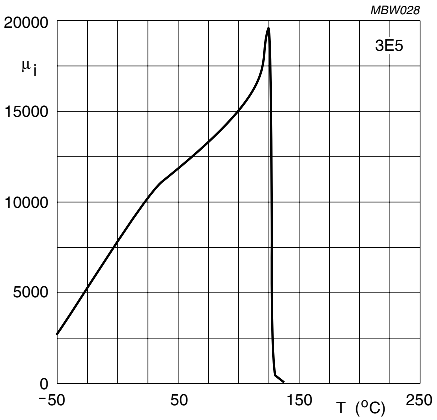


Fig.2 Initial permeability as a function of temperature.

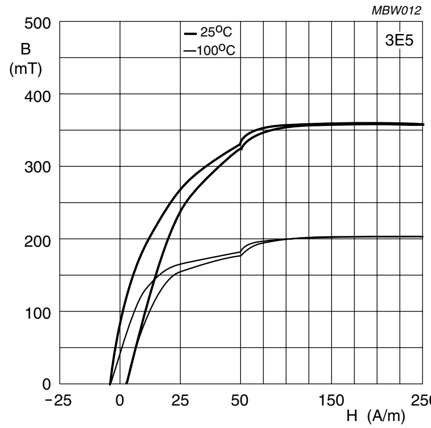


Fig.3 Typical B-H loops.

Material specification 3E5

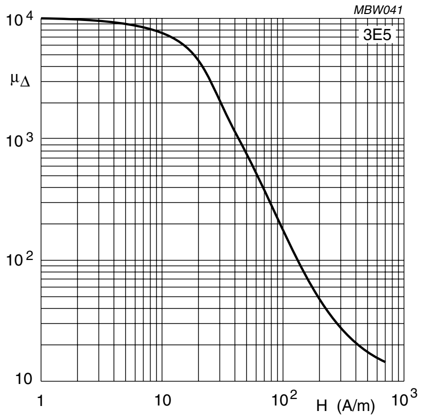


Fig.4 Incremental permeability as a function of magnetic field strength.

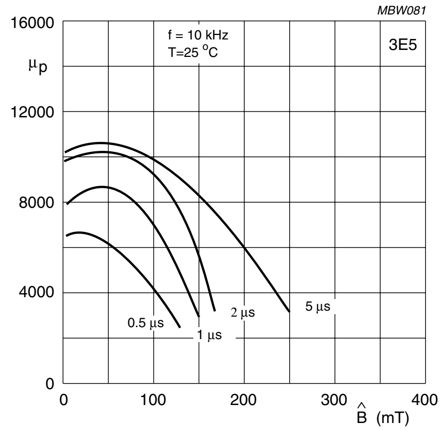


Fig.5 Pulse characteristics (unipolar pulses).

3E6 SPECIFICATIONS

A high permeability material optimized for use in wideband transformers as well as EMI-suppression filters.

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

Note

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

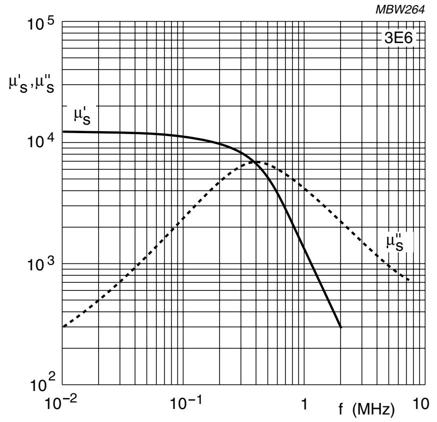


Fig.1 Complex permeability as a function of frequency.

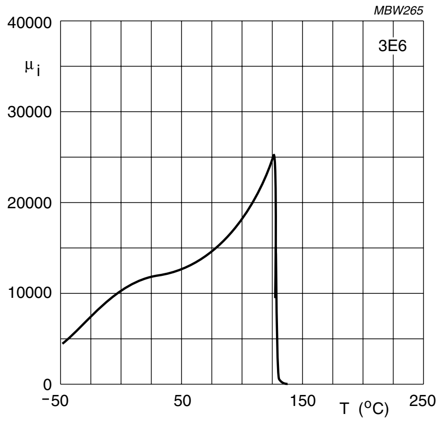


Fig.2 Initial permeability as a function of temperature.

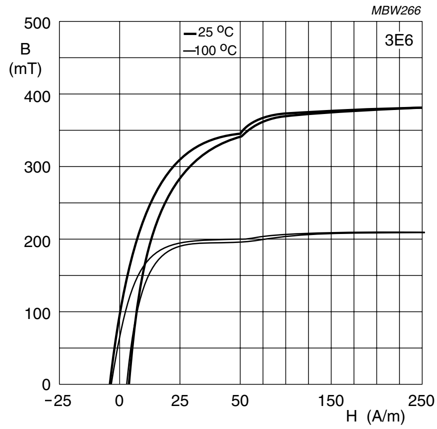


Fig.3 Typical B-H loops.

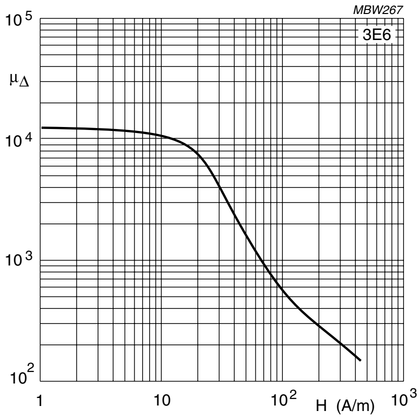


Fig.4 Incremental permeability as a function of magnetic field strength.

3E55 SPECIFICATIONS

A high permeability material optimized for a very low Total Harmonic Distortion factor (THD/μ_a) over the full operating temperature range of DSL wideband transformers.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	10000 ± 20%	
B	25 °C; 10 kHz; 250 A/m	≈ 350	mT
	80 °C; 10 kHz; 250 A/m	≈ 200	
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$	
	25 °C; 30 kHz; 0.1 mT	$\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 0.2 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈ 0.1	Ωm
T_C		≥ 100	°C
density		≈ 5000	kg/m^3

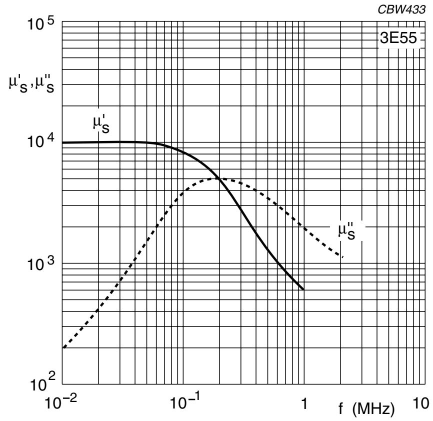


Fig.1 Complex permeability as a function of frequency.

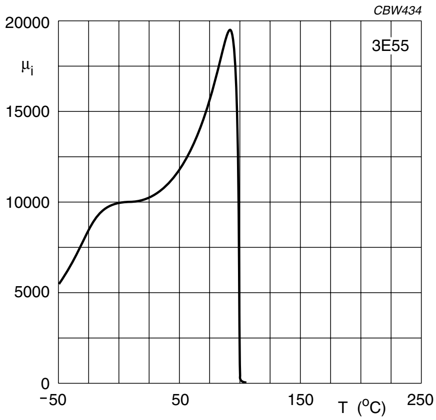


Fig.2 Initial permeability as a function of temperature.

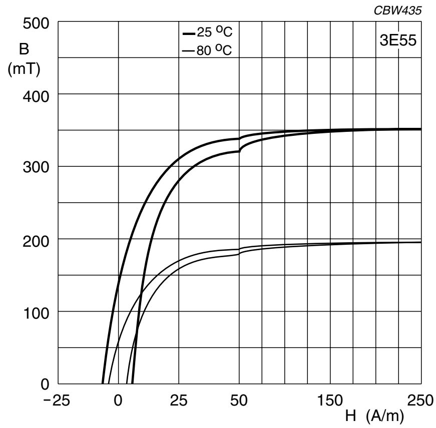


Fig.3 Typical B-H loops.

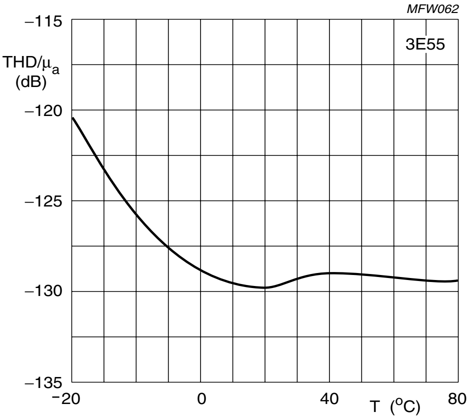


Fig.4 THD-factor as a function of temperature (B =10 mT, f = 25 kHz).

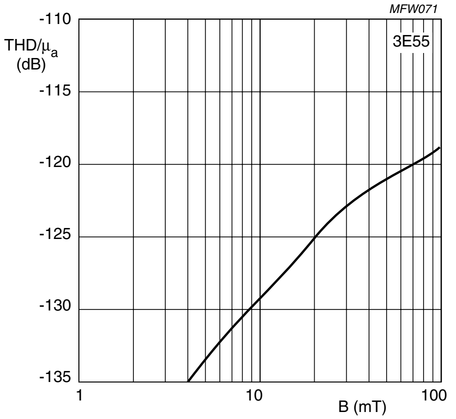


Fig.5 THD-factor as a function of flux density (f = 25 kHz, T = 25 °C).

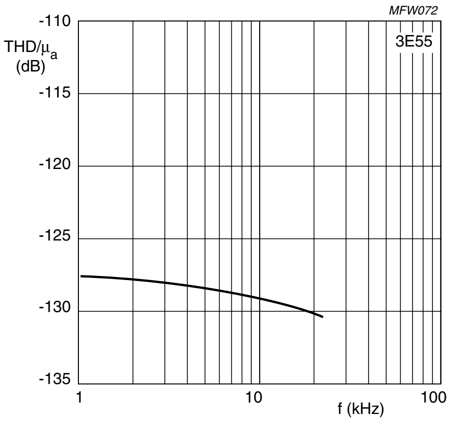


Fig.6 THD-factor as a function of frequency (B =10 mT, T = 25 °C).

Material specification 3E7

3E7 SPECIFICATIONS

A high permeability material optimized for use in wideband transformers where small size or a low number of turns are important design parameters.

	CONDITIONS	VALUE[1]	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	15000 ± 20%	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈ 380 ≈ 210	mT
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT 25 °C; 30 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈ 0.1	Ωm
T_C		≥ 130	°C
density		≈ 4900	kg/m³

Note

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

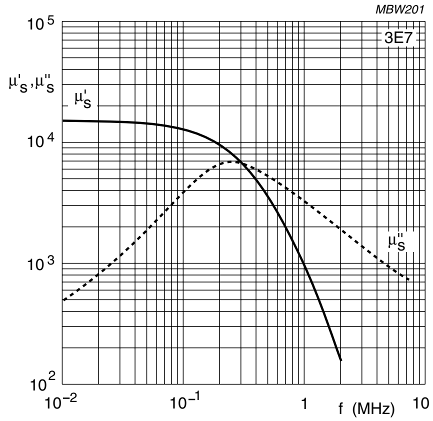


Fig.1 Complex permeability as a function of frequency.

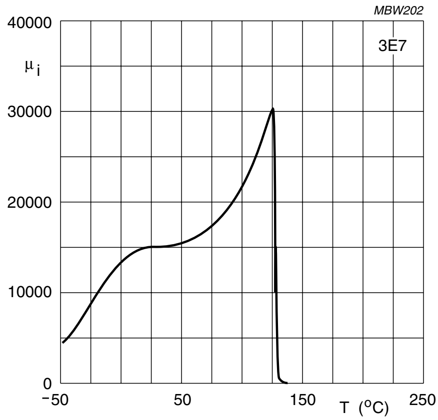


Fig.2 Initial permeability as a function of temperature.

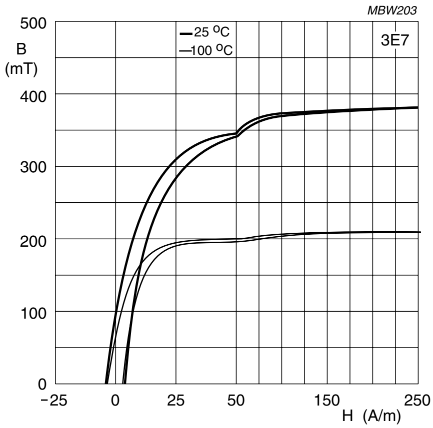


Fig.3 Typical B-H loops.

Material specification 3E7

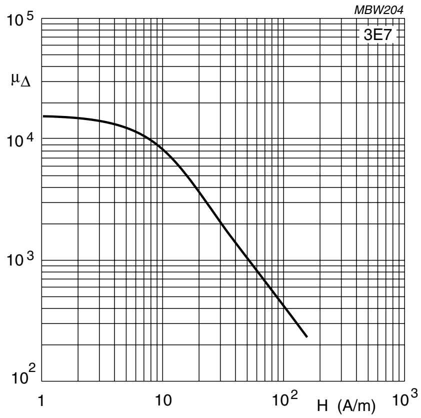


Fig.4 Incremental permeability as a function of magnetic field strength.

3E8 SPECIFICATIONS

A high permeability material optimized for use in wideband transformers and delay lines where small size or a low number of turns are important design parameters.

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

Note

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

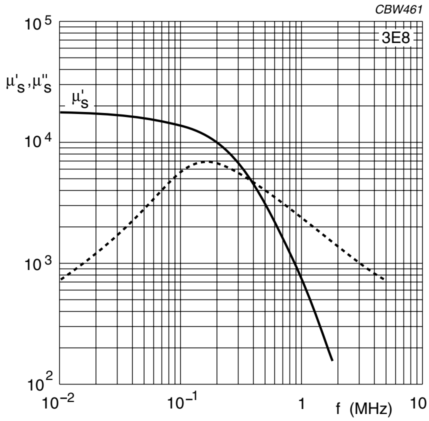


Fig.1 Complex permeability as a function of frequency.

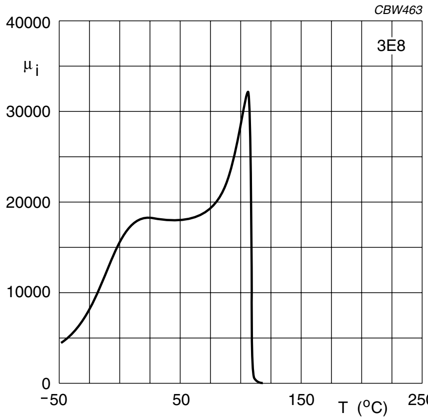


Fig.2 Initial permeability as a function of temperature.

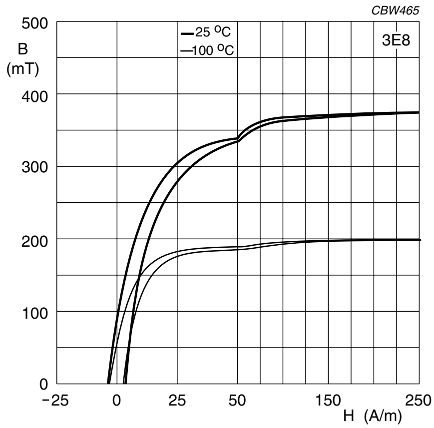


Fig.3 Typical B-H loops.

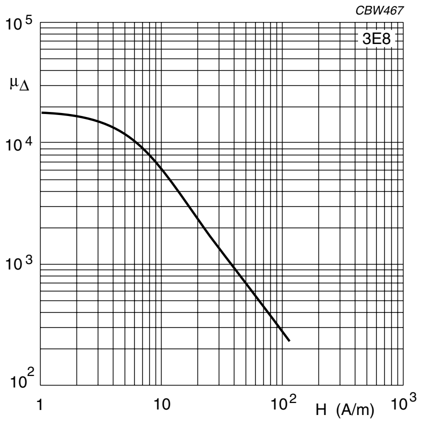


Fig.4 Incremental permeability as a function of magnetic field strength.

Preliminary material specification 3E9

3E9 SPECIFICATIONS

A high permeability material optimized for small toroids used in miniaturized wideband transformers and delay lines.

	CONDITIONS	VALUE[1]	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	20000 ± 20%	
B	25 °C; 10 kHz; 250 A/m 100 °C; 10 kHz; 250 A/m	≈ 350 ≈ 150	mT
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.1 mT 25 °C; 30 kHz; 0.1 mT	$\leq 10 \times 10^{-6}$ $\leq 50 \times 10^{-6}$	
η_B	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T^{-1}
ρ	DC; 25 °C	≈ 0.1	Ωm
T_C		≥ 100	°C
density		≈ 5000	kg/m^3

Note

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

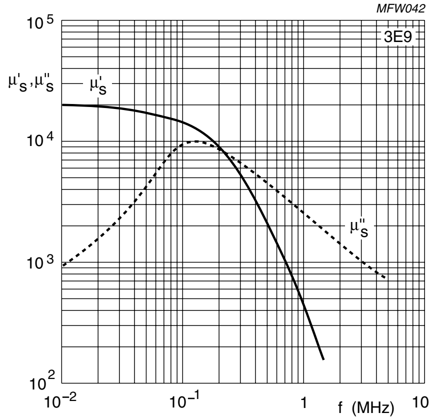


Fig.1 Complex permeability as a function of frequency.

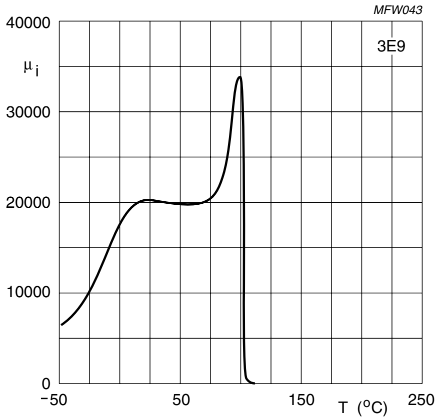


Fig.2 Initial permeability as a function of temperature.

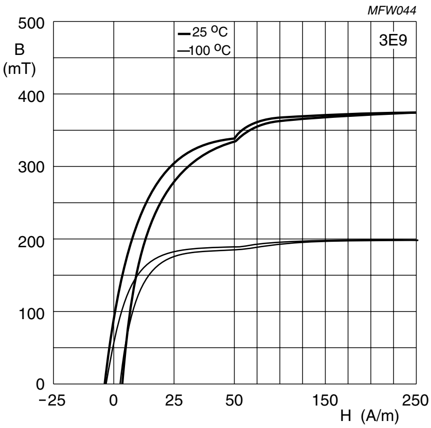


Fig.3 Typical B-H loops.

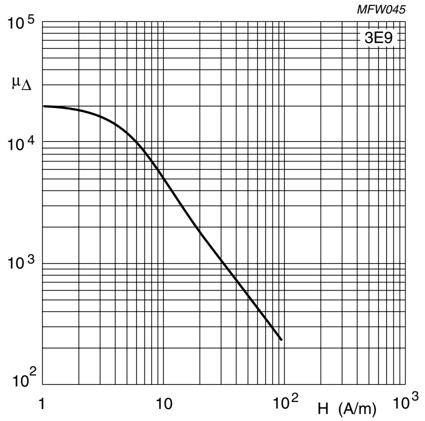


Fig.4 Incremental permeability as a function of magnetic field strength.

3F3 SPECIFICATIONS

A medium frequency power material for use in power and general purpose transformers at frequencies of 0.2 - 0.5 MHz.

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

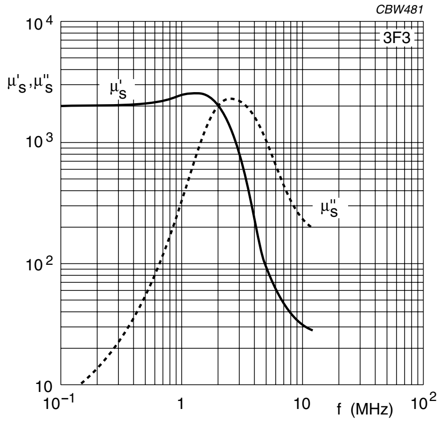


Fig.1 Complex permeability as a function of frequency.

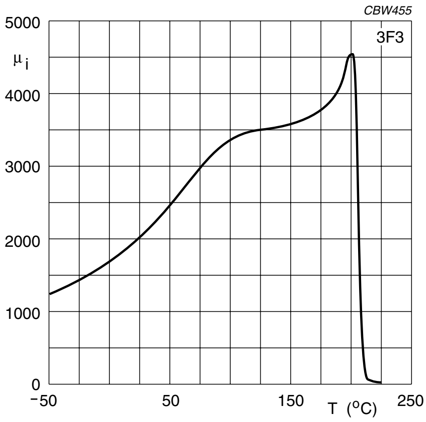


Fig.2 Initial permeability as a function of temperature.

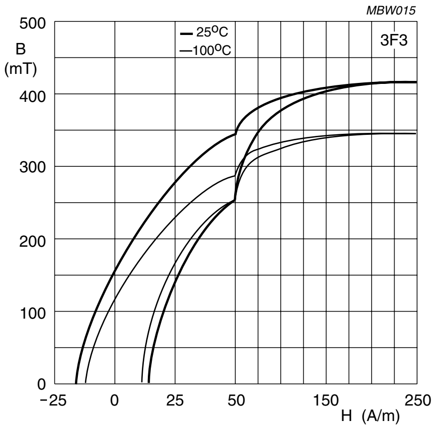


Fig.3 Typical B-H loops.

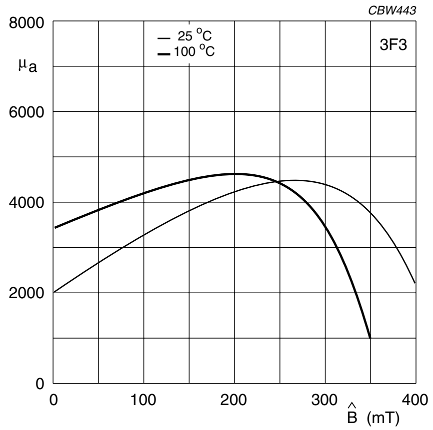


Fig.4 Amplitude permeability as function of peak flux density.

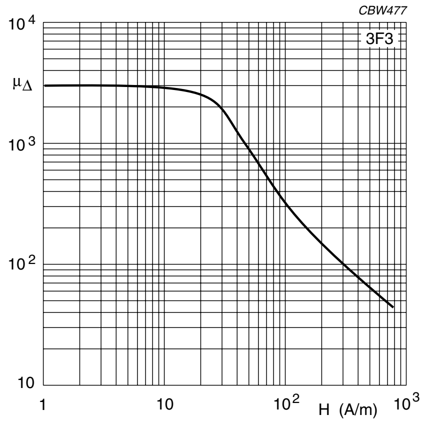


Fig.5 Incremental permeability as a function of magnetic field strength.

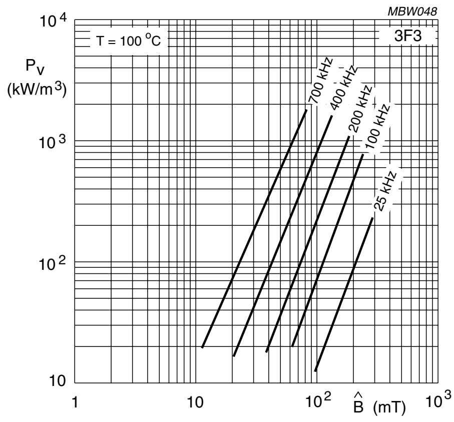


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

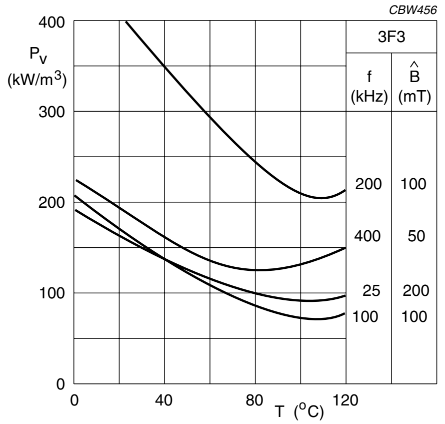


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3F35 SPECIFICATIONS

A medium to high frequency power material for use in power and general purpose transformers at frequencies of 0.5 - 1 MHz.

	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	1400 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈ 2400	
B	25 °C; 10 kHz; 250 A/m	≈ 450	mT
	100 °C; 10 kHz; 250 A/m	≈ 370	
P_v	100 °C; 400 kHz; 50 mT	≈ 60	kW/m^3
	100 °C; 500 kHz; 50 mT	≈ 90	
	100 °C; 500 kHz; 100 mT	≈ 700	
ρ	DC; 25 °C	≈ 10	Ωm
T_C		≥ 240	°C
density		≈ 4750	kg/m^3

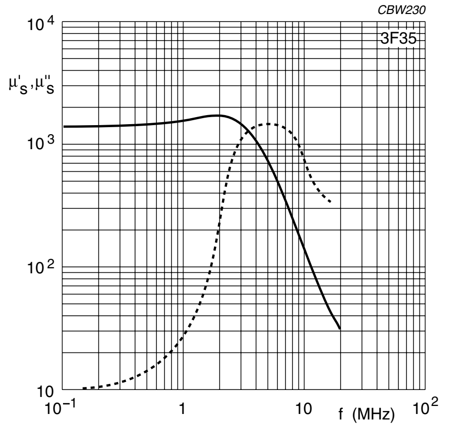


Fig.1 Complex permeability as a function of frequency.

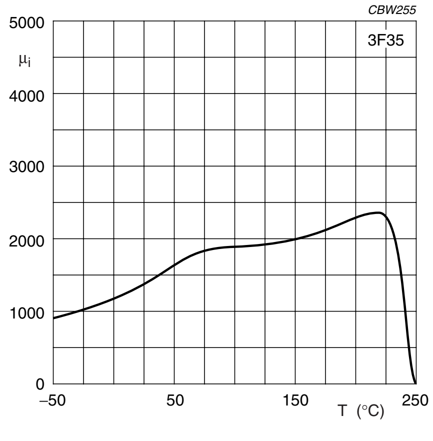


Fig.2 Initial permeability as a function of temperature.

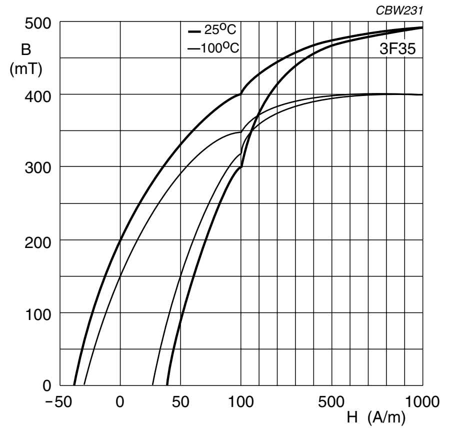


Fig.3 Typical B-H loops.

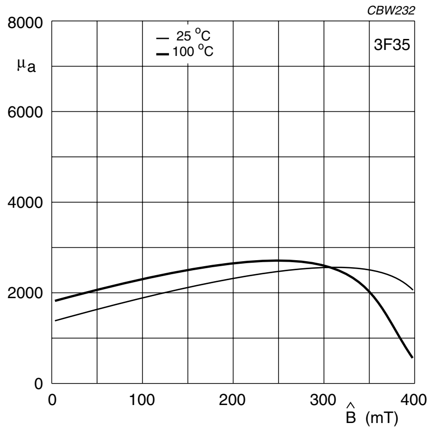


Fig.4 Amplitude permeability as function of peak flux density.

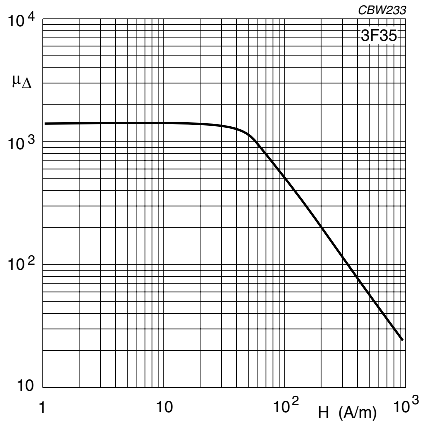


Fig.5 Incremental permeability as a function of magnetic field strength.

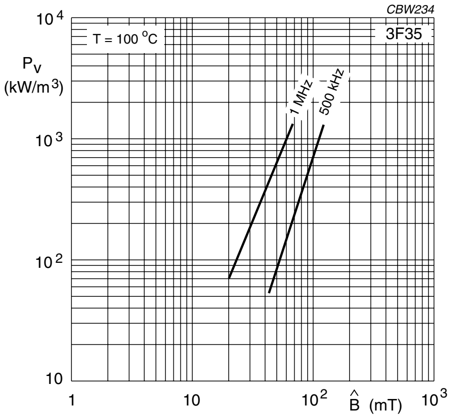


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

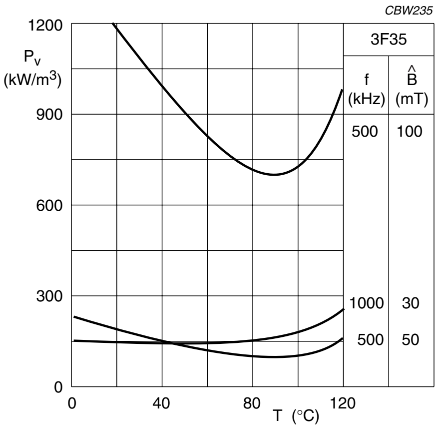


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3F4 SPECIFICATIONS

A high frequency power material for use in power and general purpose transformers at frequencies of 1 - 2 MHz.

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

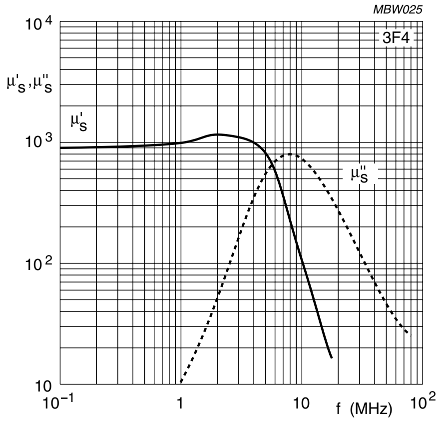


Fig.1 Complex permeability as a function of frequency.

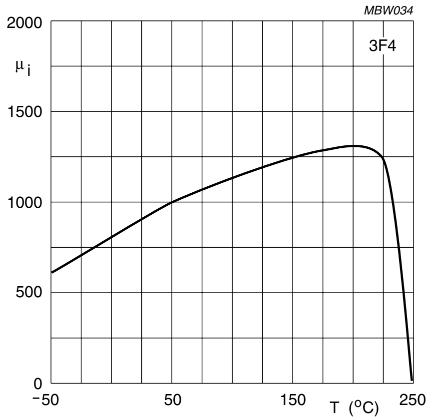


Fig.2 Initial permeability as a function of temperature.

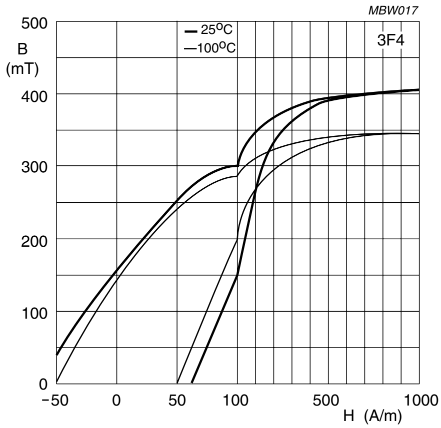


Fig.3 Typical B-H loops.

Material specification 3F4

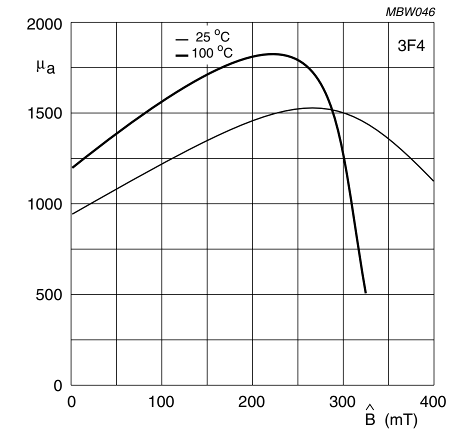


Fig.4 Amplitude permeability as function of peak flux density.

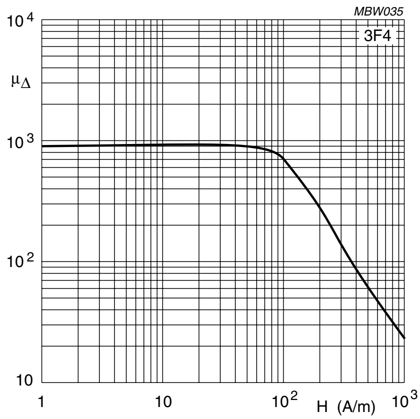


Fig.5 Incremental permeability as a function of magnetic field strength.

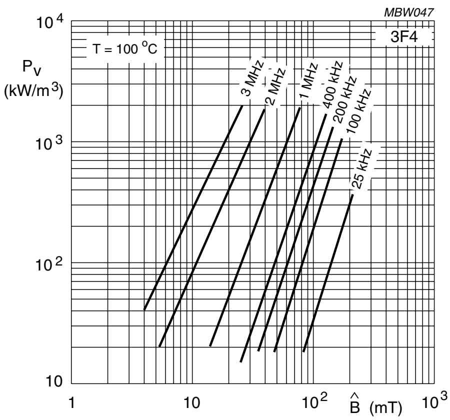


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

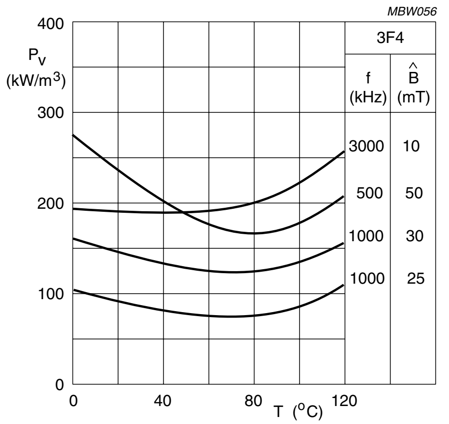


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3F45 SPECIFICATIONS

A high frequency power material for use in power and general purpose transformers at frequencies of 1 - 2 MHz.

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	≈ 380	mT
	100 °C; 10 kHz; 250 A/m	≈ 330	
P_V	100 °C; 1 MHz; 50 mT	≈ 300	kW/m^3
	100 °C; 1 MHz; 70 mT	≈ 700	
ρ	DC; 25 °C	≈ 10	Ωm
T_C		≥ 300	°C
density		≈ 4800	kg/m^3

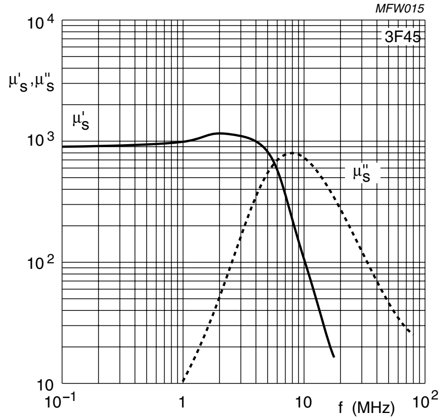


Fig.1 Complex permeability as a function of frequency.

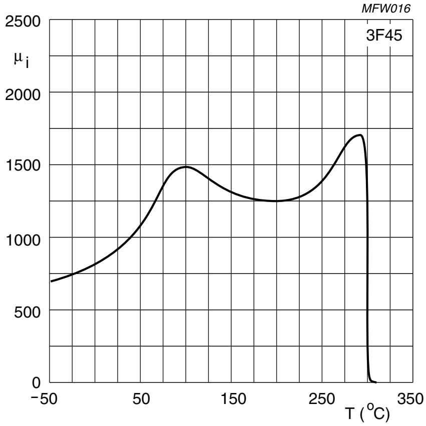


Fig.2 Initial permeability as a function of temperature.

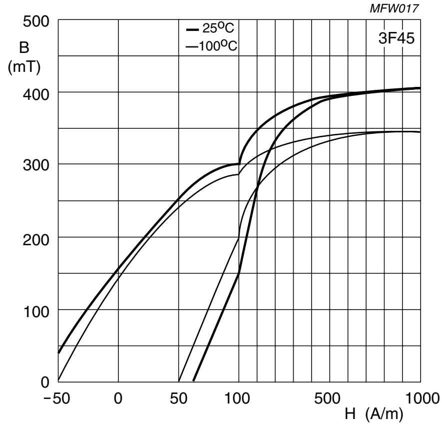


Fig.3 Typical B-H loops.

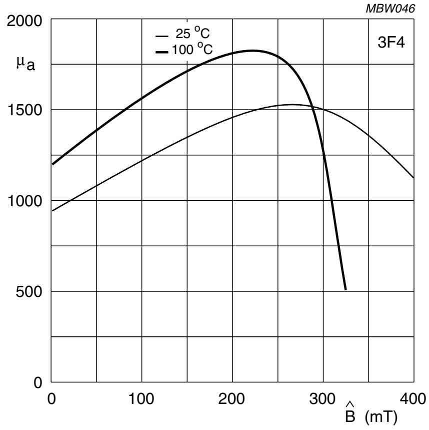


Fig.4 Amplitude permeability as function of peak flux density.

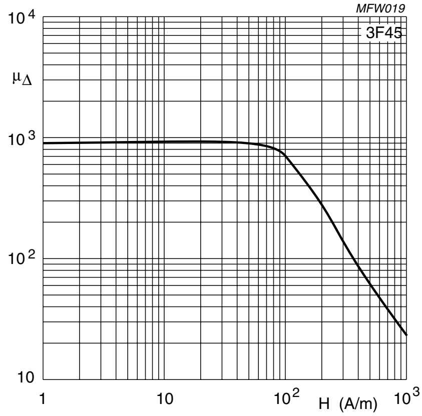


Fig.5 Incremental permeability as a function of magnetic field strength.

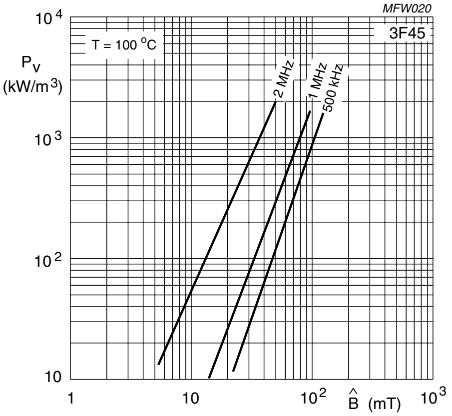


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

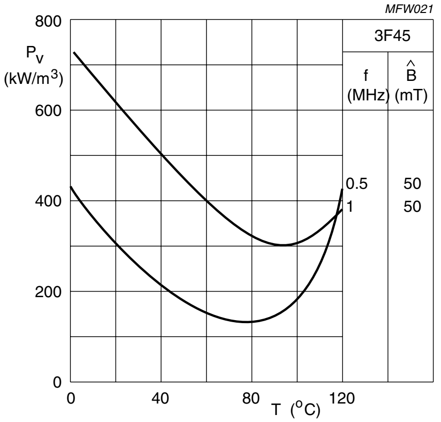


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Preliminary material specification 3F5

3F5 SPECIFICATIONS

A very high frequency power material for use in power and general purpose transformers optimized for frequencies of 2 - 4 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	650 ±20%	
μ_a	100 °C; 25 kHz; 200 mT	≈ 1000	
B	25 °C; 10 kHz; 250 A/m	≈ 250	mT
	100 °C; 10 kHz; 250 A/m	≈ 220	
P_V	100 °C; 3 MHz; 10 mT	≈ 100	kW/m^3
	100 °C; 3 MHz; 30 mT	≈ 900	
ρ	DC; 25 °C	≈ 10	Ωm
T_C		≥ 300	°C
density		≈ 4750	kg/m^3

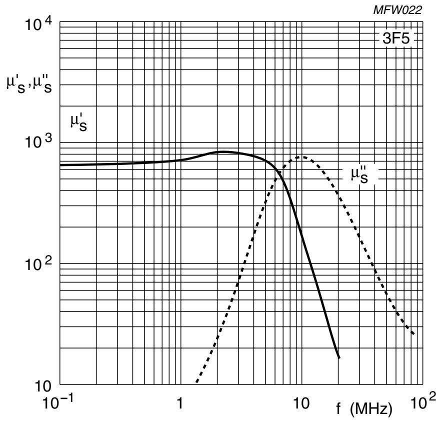


Fig.1 Complex permeability as a function of frequency.

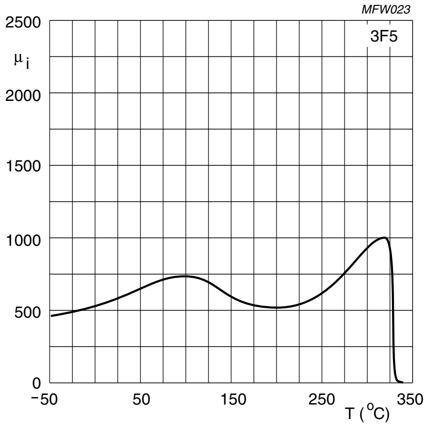


Fig.2 Initial permeability as a function of temperature.

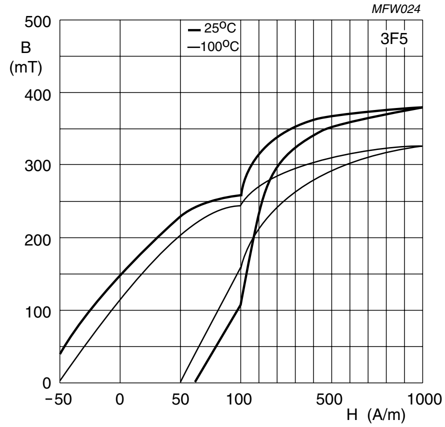


Fig.3 Typical B-H loops.

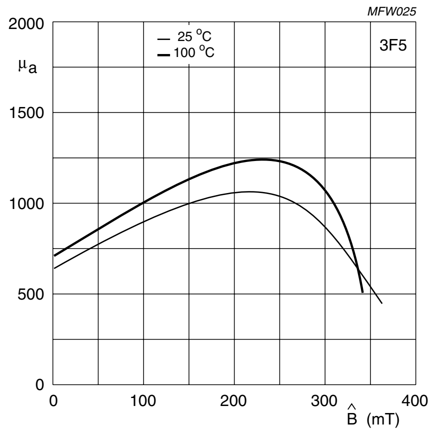


Fig.4 Amplitude permeability as function of peak flux density.

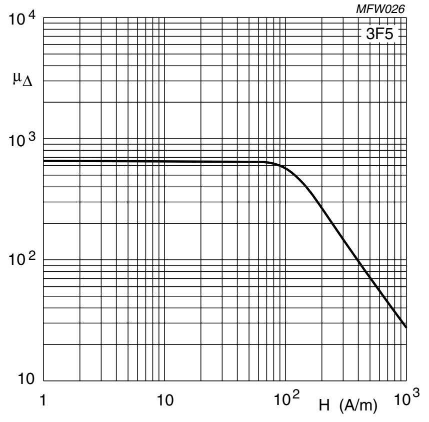


Fig.5 Incremental permeability as a function of magnetic field strength.

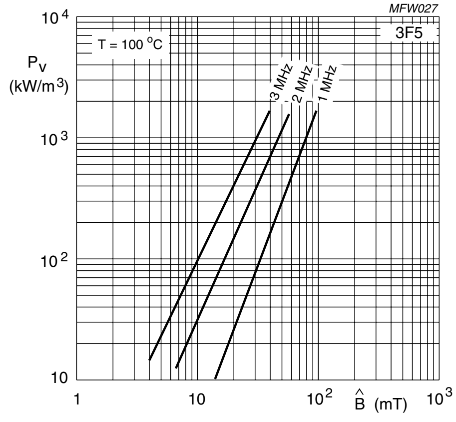


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

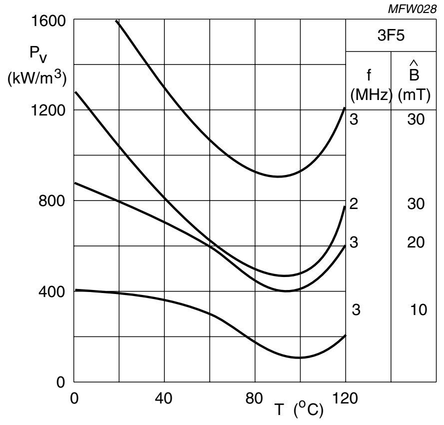


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

3H3 SPECIFICATIONS

A low frequency filter material optimized for frequencies up to 0.2 MHz.

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

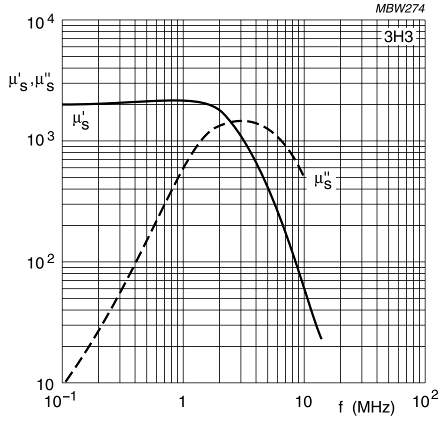


Fig.1 Complex permeability as a function of frequency.

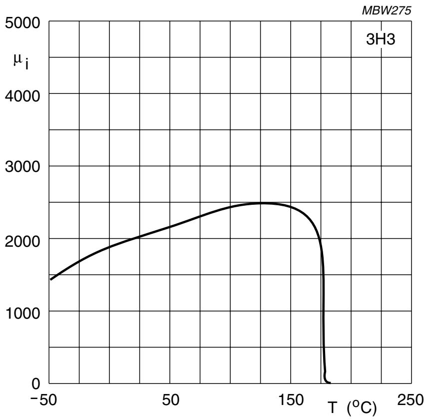


Fig.2 Initial permeability as a function of temperature.

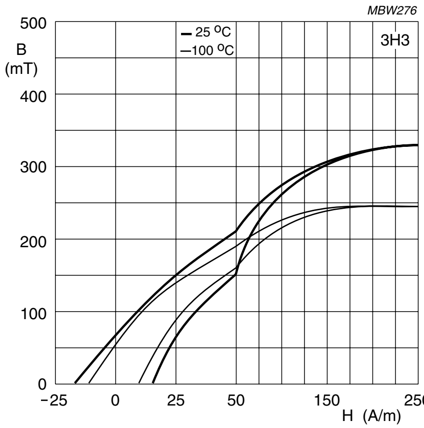


Fig.3 Typical B-H loops.

Material specification 3R1

3R1 SPECIFICATIONS

MnZn ferrite with a nearly rectangular hysteresis loop for use in magnetic regulators/amplifiers.

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

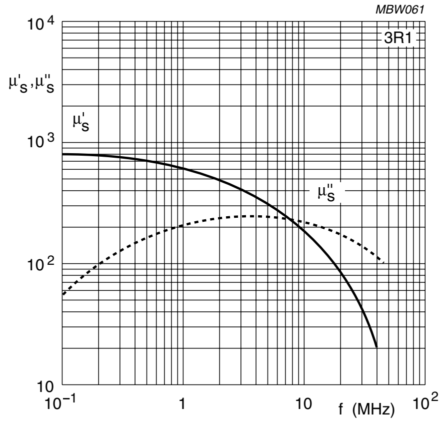


Fig.1 Complex permeability as a function of frequency.

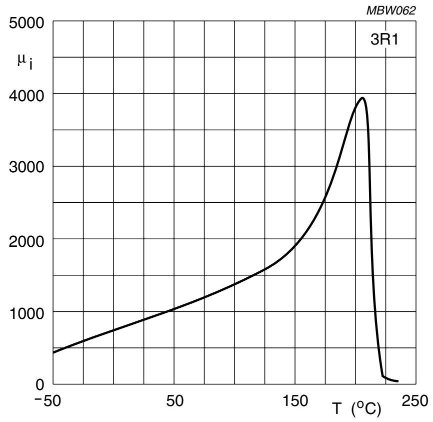


Fig.2 Initial permeability as a function of temperature.

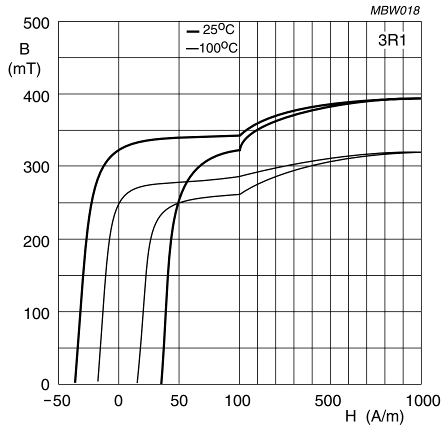


Fig.3 Typical B-H loops.

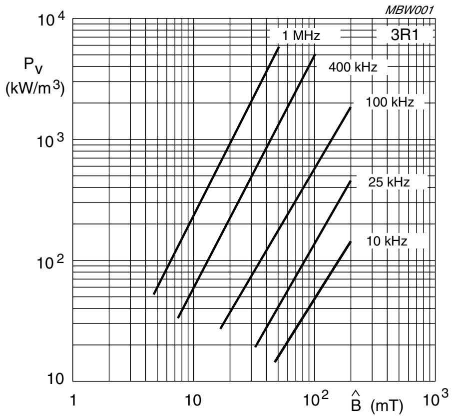


Fig.4 Specific power loss as a function of peak flux density with frequency as a parameter.

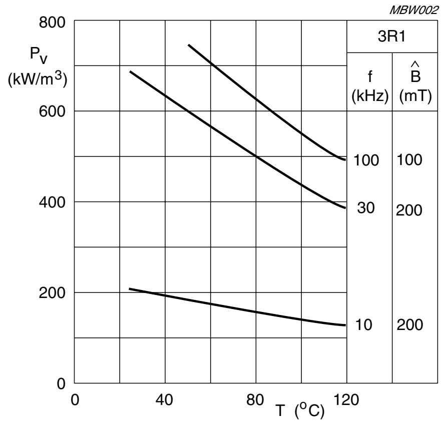


Fig.5 Specific power loss for several frequency/flux density combinations as a function of temperature.

Remark:

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

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

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

where:

f = radial resonant frequency (kHz)

D_o = outside diameter (mm)

D_i = inside diameter (mm).

3S1 SPECIFICATIONS

A low frequency EMI-suppression material specified on impedance and optimized for frequencies up to 30 MHz.

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.

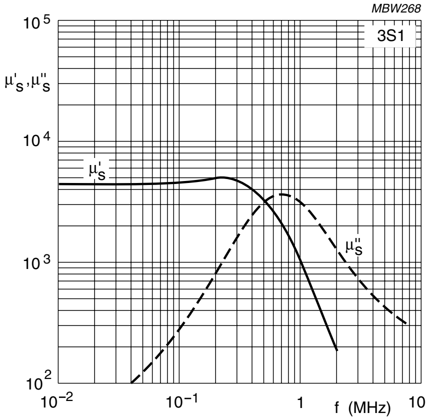


Fig.1 Complex permeability as a function of frequency.

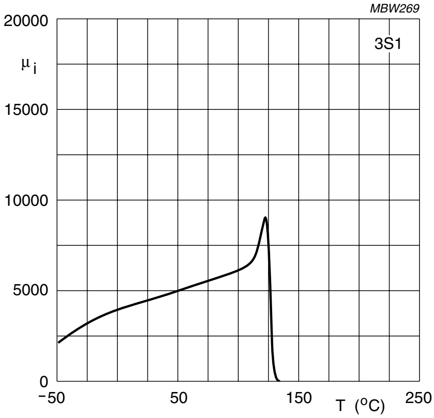


Fig.2 Initial permeability as a function of temperature.

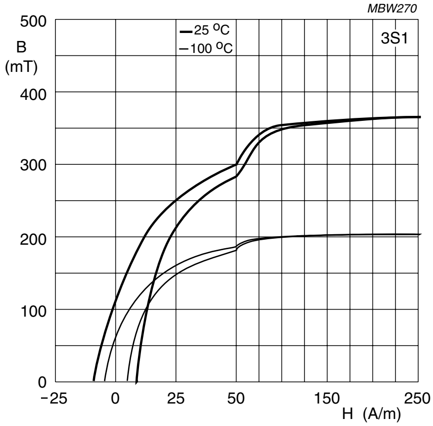


Fig.3 Typical B-H loops.

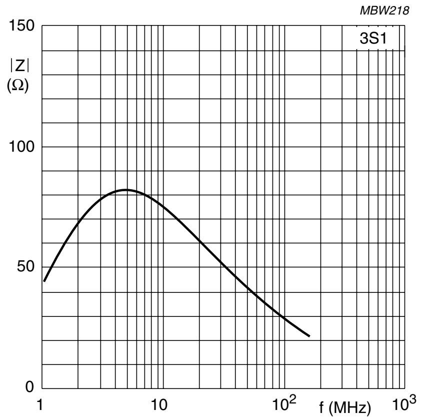


Fig.3 Impedance as a function of frequency.

Material specification 3S3

3S3 SPECIFICATIONS

This wideband EMI-suppression material is specified on impedance and optimized for frequencies from 30 to 1000 MHz in applications with high bias currents at elevated temperatures (e.g. rods for chokes in commutation motors).

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	≈ 10^4	Ωm
T_C		≥ 225	°C
density		≈ 4800	kg/m^3

Note

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

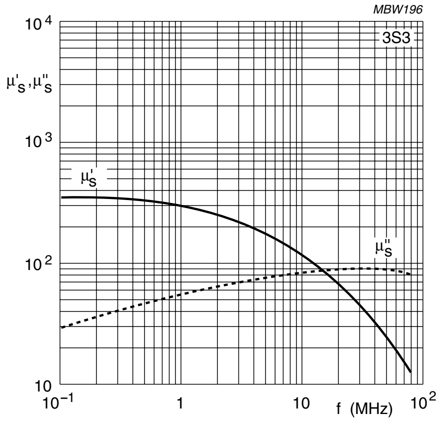


Fig.1 Complex permeability as a function of frequency.

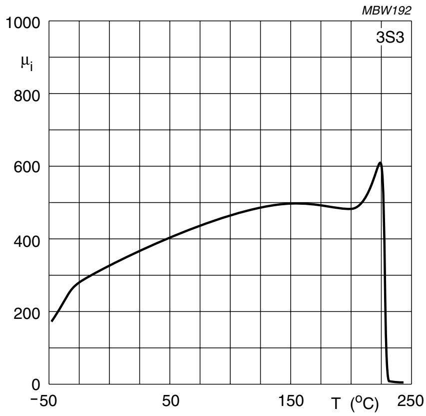


Fig.2 Initial permeability as a function of temperature.

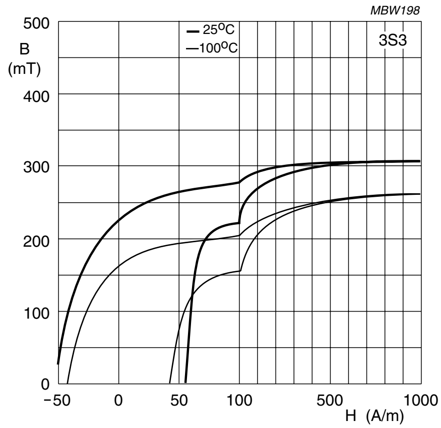


Fig.3 Typical B-H loops.

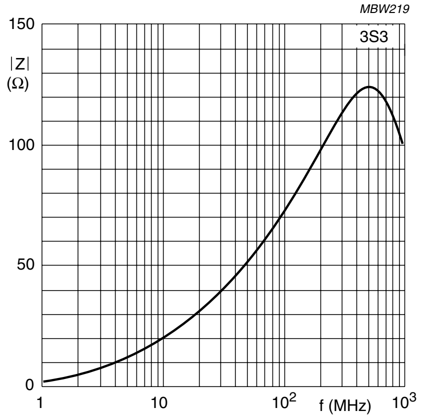


Fig.4 Impedance as a function of frequency.

3S4 SPECIFICATIONS

Wideband EMI-suppression material specified on impedance and optimized for frequencies from 10 to 300 MHz.

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.

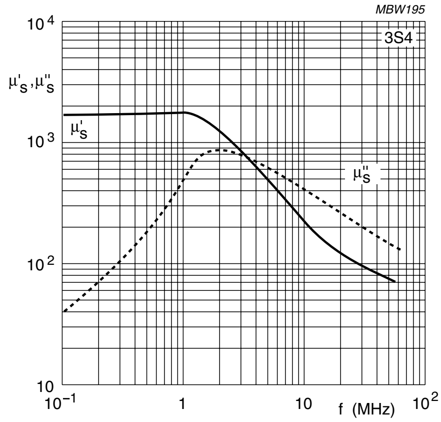


Fig.1 Complex permeability as a function of frequency.

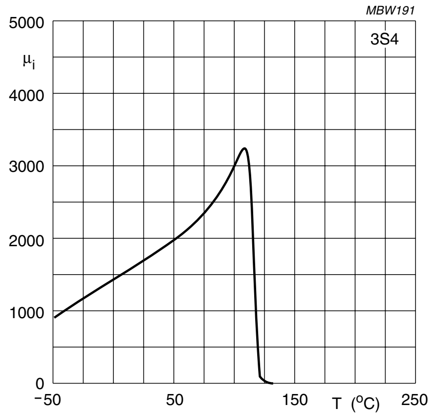


Fig.2 Initial permeability as a function of temperature.

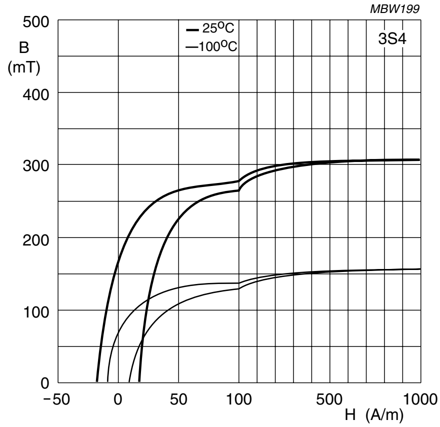


Fig.3 Typical B-H loops.

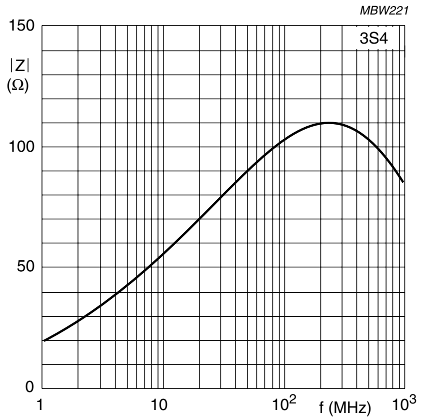


Fig.4 Impedance as a function of frequency.

4A11 SPECIFICATIONS

Medium permeability NiZn ferrite for use in wideband EMI-suppression (30 - 1000 MHz) as well as RF wideband and balun transformers.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	850 ±20%	
B	25 °C; 10 kHz; 250 A/m	≈ 270	mT
	100 °C; 10 kHz; 250 A/m	≈ 180	
$\tan\delta/\mu_i$	25 °C; 1 MHz; 0.1 mT	$\leq 100 \times 10^{-6}$	
	25 °C; 3 MHz; 0.1 mT	$\leq 1000 \times 10^{-6}$	
ρ	DC; 25 °C	$\approx 10^5$	Ωm
T_C		≥ 125	°C
density		≈ 5100	kg/m^3

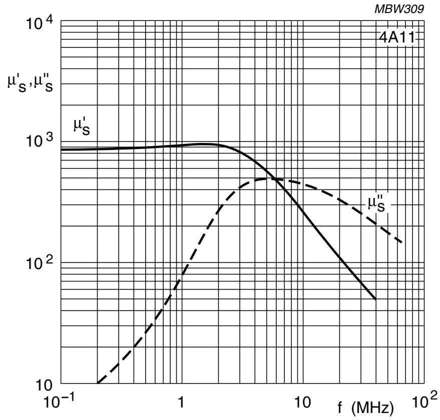


Fig.1 Complex permeability as a function of frequency.

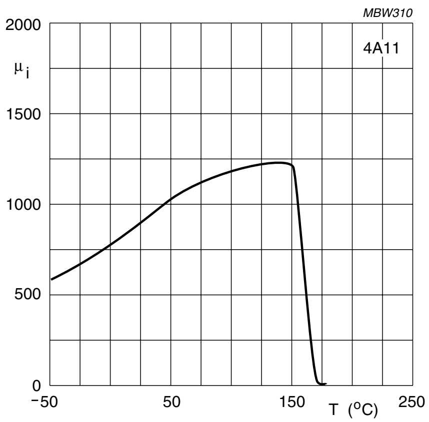


Fig.2 Initial permeability as a function of temperature.

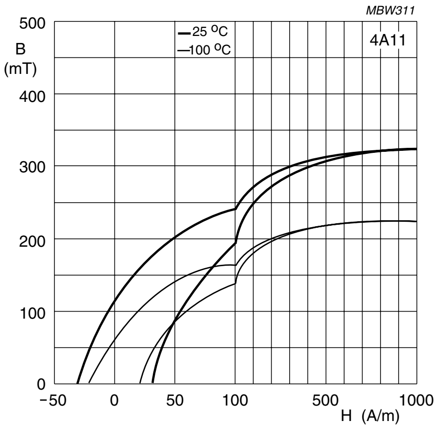


Fig.3 Typical B-H loops.

4A15 SPECIFICATIONS

High permeability NiZn ferrite for use in wideband EMI-suppression (10 - 300 MHz) as well as RF wideband and balun transformers.

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

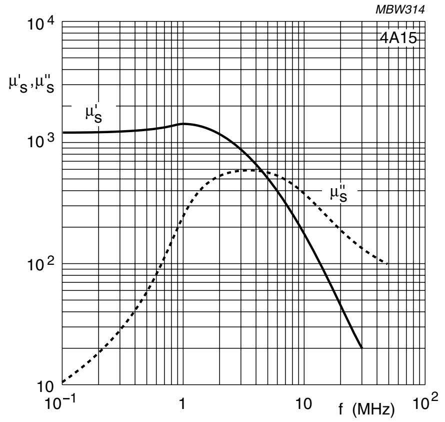


Fig.1 Complex permeability as a function of frequency.

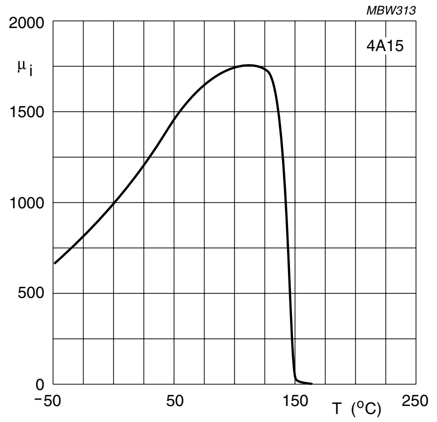


Fig.2 Initial permeability as a function of temperature.

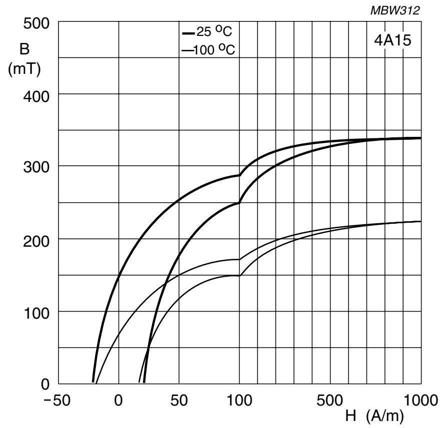


Fig.3 Typical B-H loops.

4B1 SPECIFICATIONS

Medium permeability NiZn ferrite for use in wideband EMI-suppression (30 - 1000 MHz) as well as RF tuning, wideband and balun transformers.

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

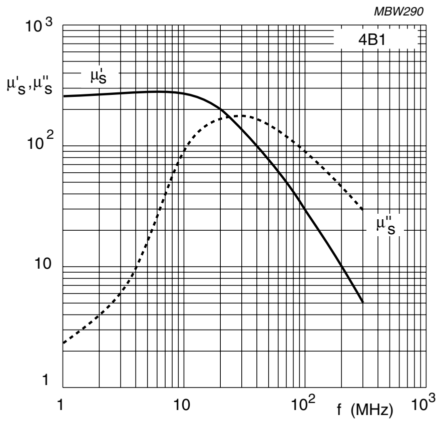


Fig.1 Complex permeability as a function of frequency.

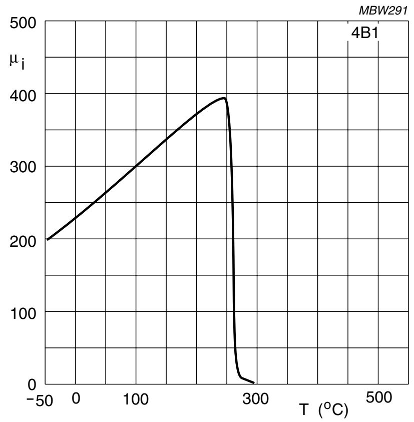


Fig.2 Initial permeability as a function of temperature.

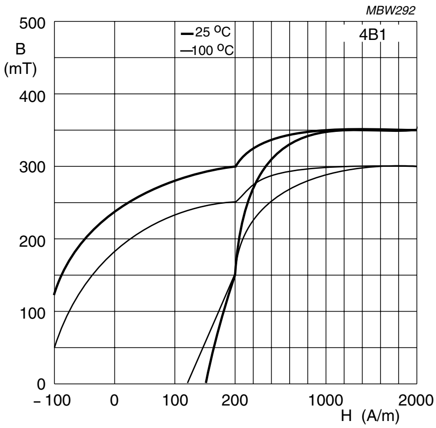


Fig.3 Typical B-H loops.

4B3 SPECIFICATIONS

Medium permeability specialty NiZn ferrite only used in large toroids and machined products mainly for scientific particle accelerators operating at frequencies < 10 MHz.

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

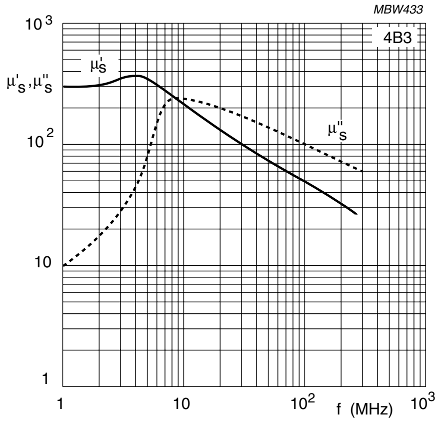


Fig.1 Complex permeability as a function of frequency.

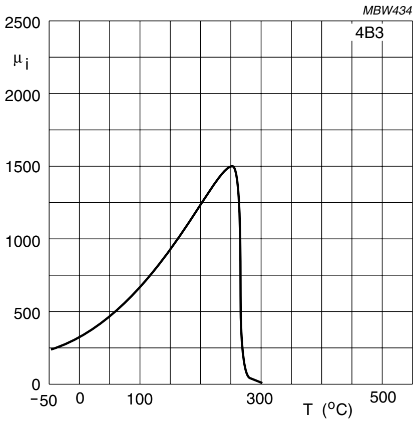


Fig.2 Initial permeability as a function of temperature.

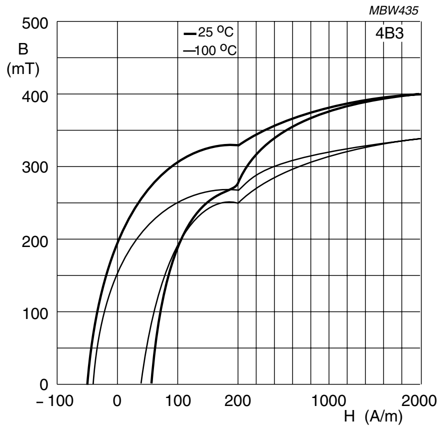


Fig.3 Typical B-H loops.

4C65 SPECIFICATIONS

Low permeability NiZn ferrite for use in RF tuning, wideband and balun transformers.

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

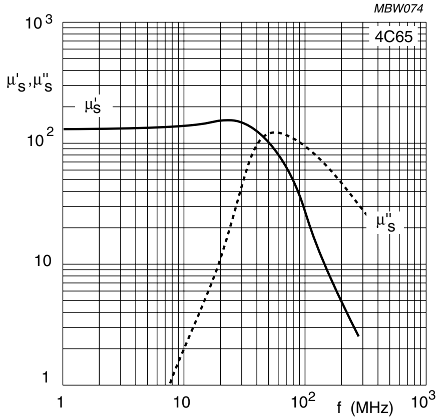


Fig.1 Complex permeability as a function of frequency.

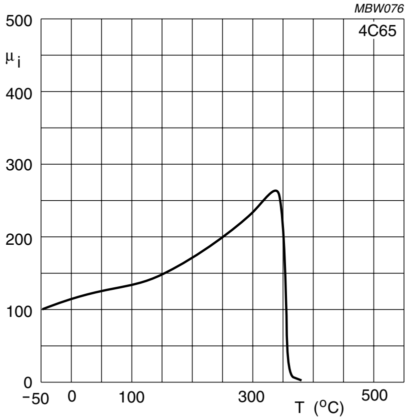


Fig.2 Initial permeability as a function of temperature.

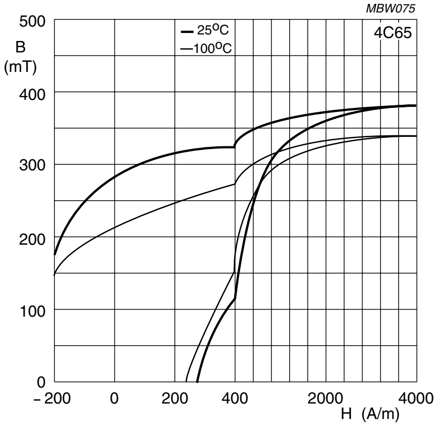


Fig.3 Typical B-H loops.

Material specification 4C65

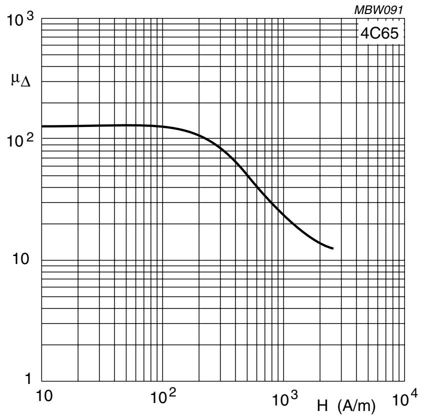


Fig.4 Incremental permeability as a function of magnetic field strength.

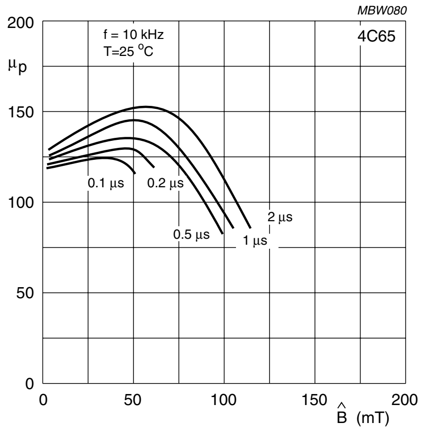


Fig.5 Pulse characteristics (unipolar pulses).

4D2 SPECIFICATIONS

Low permeability NiZn ferrite for use in RF tuning, wideband and balun transformers.

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

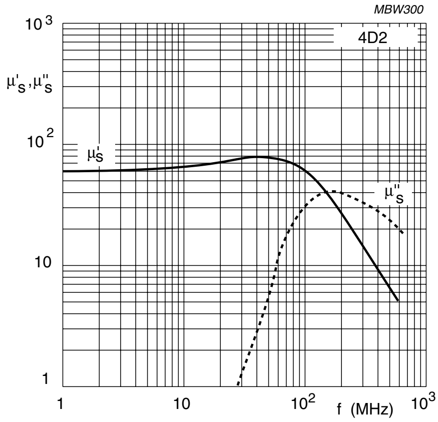


Fig.1 Complex permeability as a function of frequency.

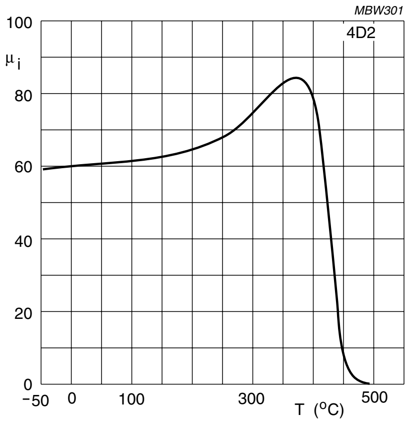


Fig.2 Initial permeability as a function of temperature.

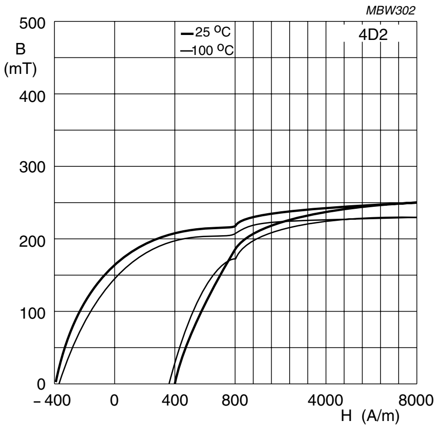


Fig.3 Typical B-H loops.

4E1 SPECIFICATIONS

Low permeability NiZn ferrite for use in RF tuning, wideband and balun transformers.

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

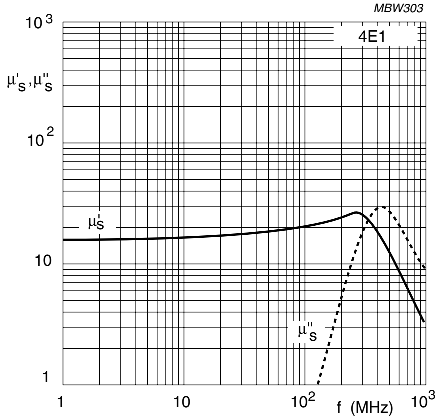


Fig.1 Complex permeability as a function of frequency.

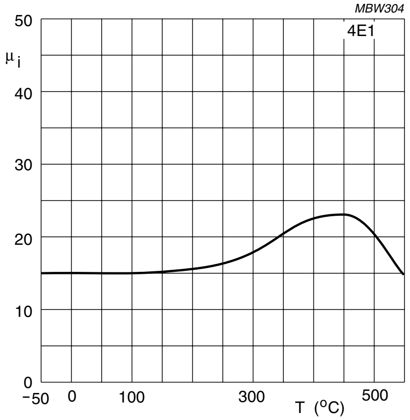


Fig.2 Initial permeability as a function of temperature.

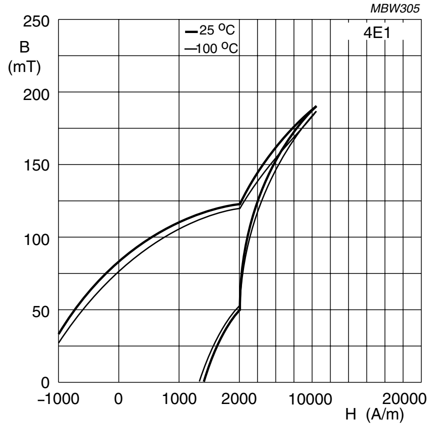


Fig.3 Typical B-H loops.

4E2 SPECIFICATIONS

Low permeability specialty NiZn ferrite only used in large toroids and machined products mainly for scientific particle accelerators operating at frequencies up to 100 MHz..

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

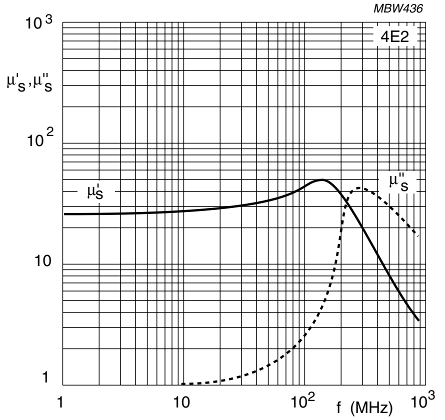


Fig.1 Complex permeability as a function of frequency.

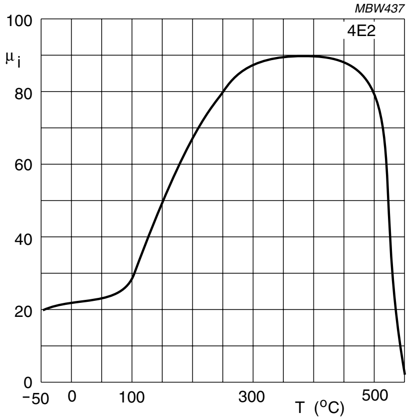


Fig.2 Initial permeability as a function of temperature.

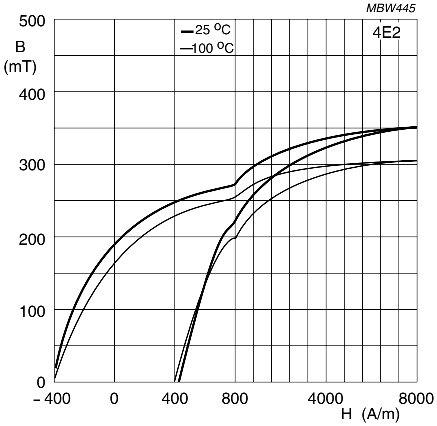


Fig.3 Typical B-H loops.

Material specification 4E2

4F1 SPECIFICATIONS

A very high frequency NiZn power material for use in power and general purpose transformers optimized for frequencies of 4 - 10 MHz.

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

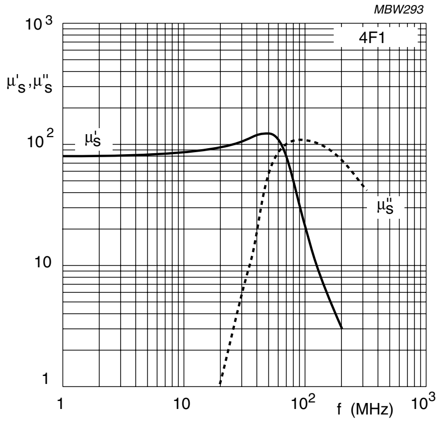


Fig.1 Complex permeability as a function of frequency.

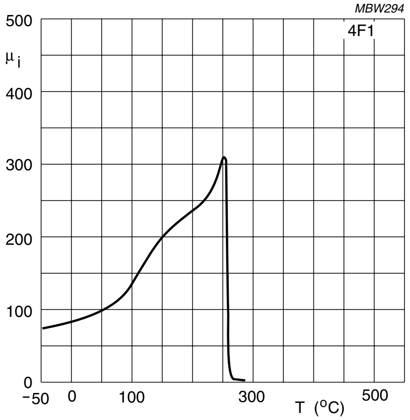


Fig.2 Initial permeability as a function of temperature.

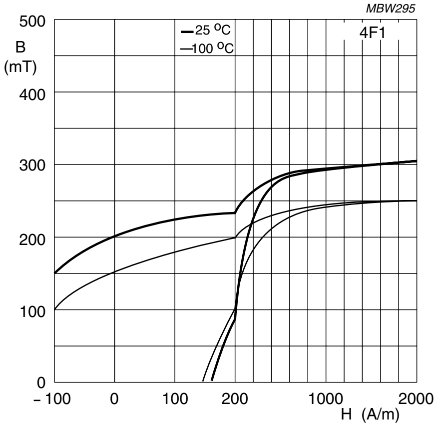


Fig.3 Typical B-H loops.

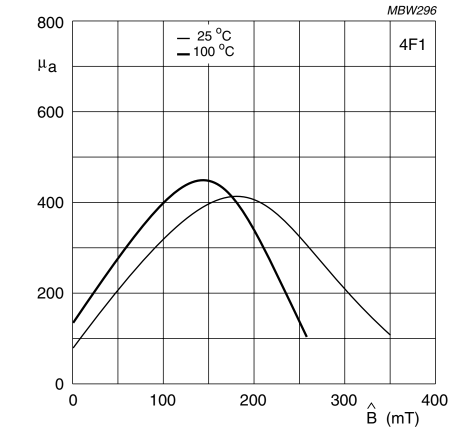


Fig.4 Amplitude permeability as function of peak flux density.

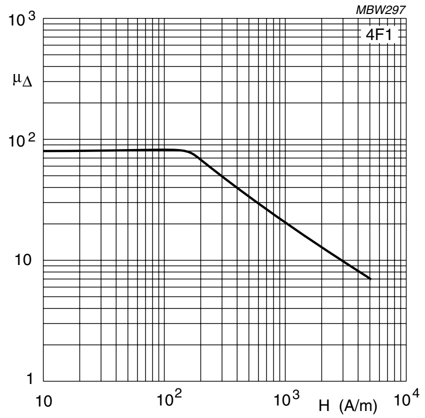


Fig.5 Incremental permeability as a function of magnetic field strength.

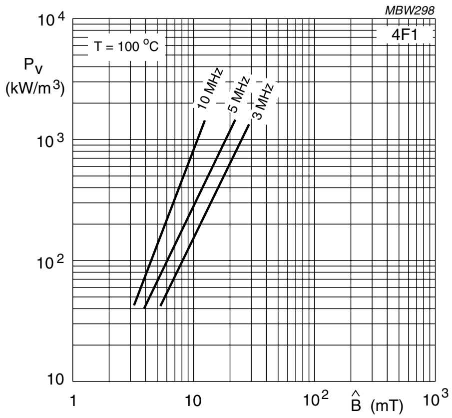


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

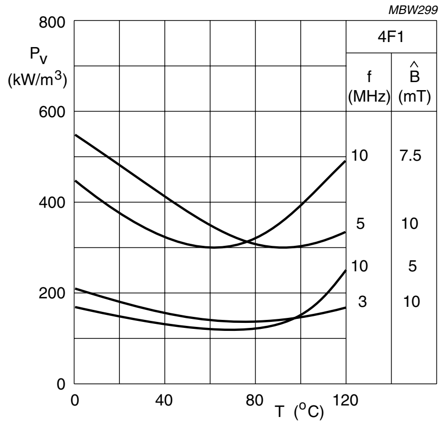


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

4M2 SPECIFICATIONS

Low permeability specialty NiZn ferrite only used in large toroids and machined products mainly for scientific particle accelerators operating at frequencies up to 10 MHz..

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

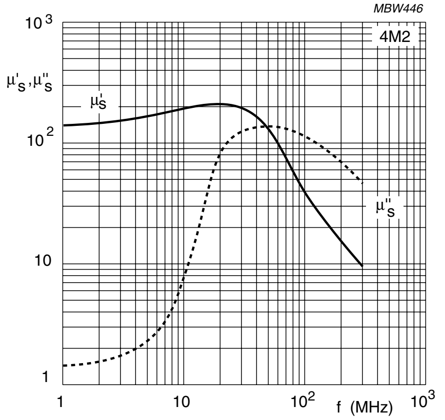


Fig.1 Complex permeability as a function of frequency.

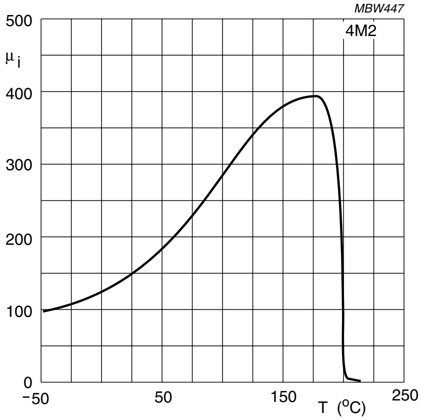


Fig.2 Initial permeability as a function of temperature.

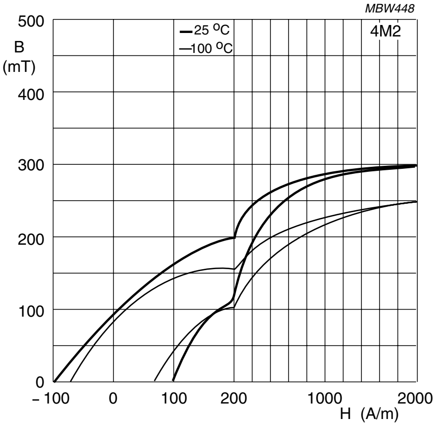


Fig.3 Typical B-H loops.

Material specification 4M2

4S2 SPECIFICATIONS

Wideband EMI-suppression material specified on impedance and optimized for frequencies from 30 to 1000 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.1 mT	≈ 850	
B	25 °C; 10 kHz; 250 A/m	≈ 270	mT
	100 °C; 10 kHz; 250 A/m	≈ 180	
$\lvert Z \rvert$(1)	25 °C; 30 MHz	≥ 50	Ω
	25 °C; 300 MHz	≥ 90	
ρ	DC; 25 °C	≈ 10^5	Ωm
T_C		≥ 125	°C
density		≈ 5000	kg/m^3

Note

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

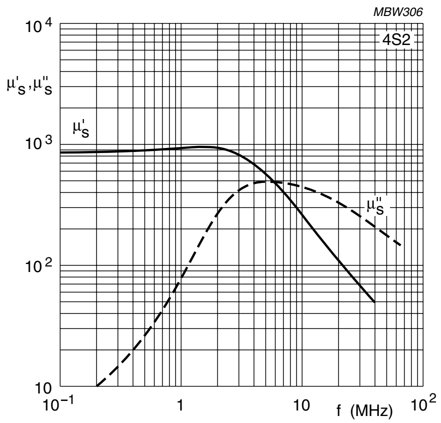


Fig.1 Complex permeability as a function of frequency.

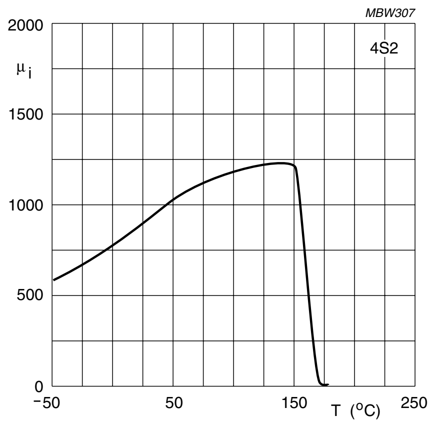


Fig.2 Initial permeability as a function of temperature.

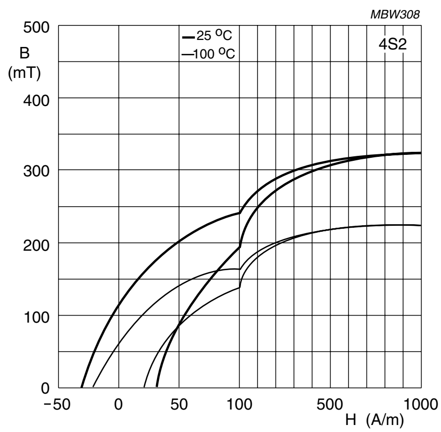


Fig.3 Typical B-H loops.

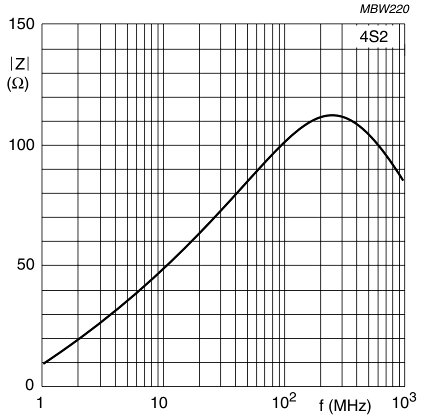


Fig.4 Impedance as a function of frequency.

Material specification 8C11

8C11 SPECIFICATIONS

High permeability specialty NiZn ferrite only used in large toroids and machined products mainly for scientific particle accelerators operating at frequencies up to 1 MHz..

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

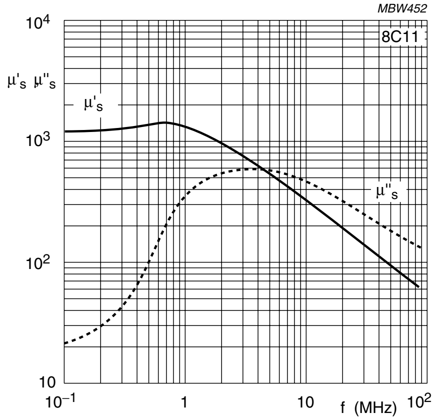


Fig.1 Complex permeability as a function of frequency.

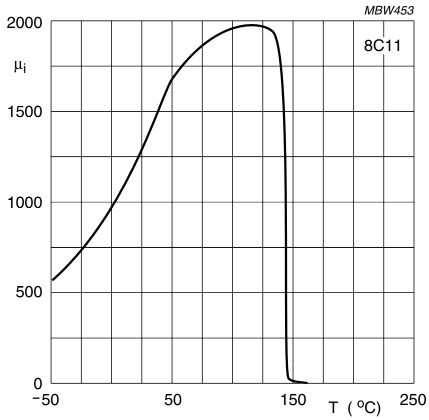


Fig.2 Initial permeability as a function of temperature.

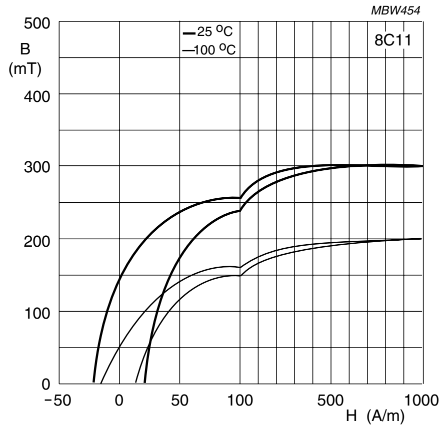


Fig.3 Typical B-H loops.

8C12 SPECIFICATIONS

High permeability specialty NiZn ferrite only used in large toroids and machined products mainly for scientific particle accelerators operating at frequencies up to 2 MHz..

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

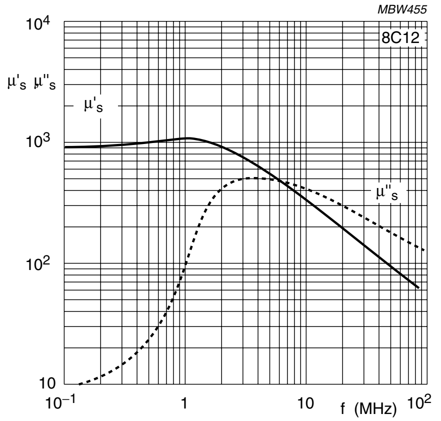


Fig.1 Complex permeability as a function of frequency.

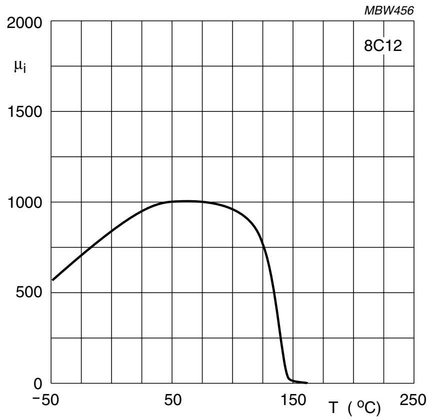


Fig.2 Initial permeability as a function of temperature.

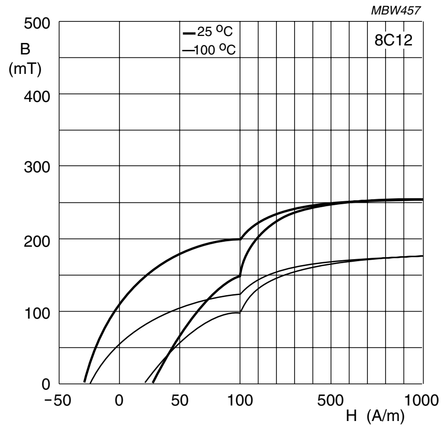


Fig.3 Typical B-H loops.

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

INTRODUCTION

Ferrites are used not only in the known consumer and professional electronics applications, but also in science and industry. The specifications and tolerances required for scientific and industrial applications are generally very demanding and critical. Experts in ceramic technologies know that making ferrite is one thing, machining it to close tolerances is another.

Hence there are only a few ferrite manufacturers in the world who can deliver ferrites with the required magnetic properties and within critical tolerances.

FERROXCUBE is one of those few manufacturers but with a difference. We bring along with us the experience gained by supplying customized products to some of the most prestigious scientific institutions and industries.

This means we can support you in finding the best solution for any inductive component you may need. Especially if your requirements cannot be met with ferrite cores from our standard ranges, the Advanced Design Center is at your service to make the necessary design calculations, machine first prototypes from solid blocks, or press and sinter small series using "quick tools".

Being a major worldwide supplier of a wide variety of Soft Ferrites gives us the experience and know-how to support such projects.

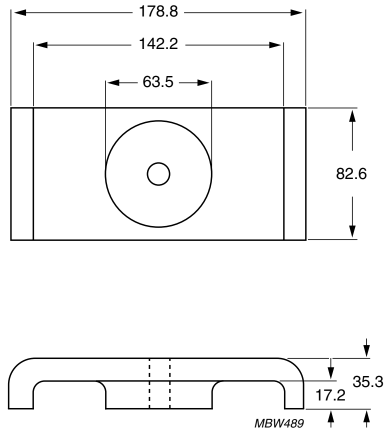
MACHINED FERRITES AND SPECIALTY SHAPES

We stock most of our material grades in blocks and are able to machine numerous prototype cores. Very close tolerances can be realized if required.

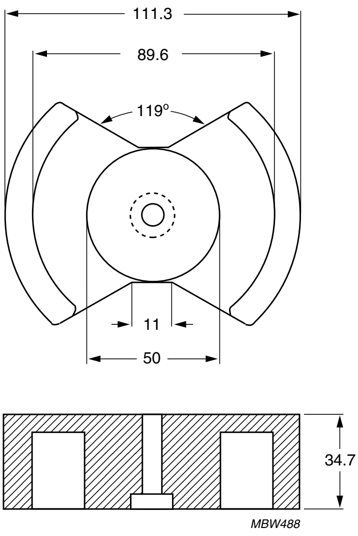
Ferrites, being very hard and brittle are difficult to work. The machining and grinding of ferrites and similar materials to micron precision, places stringent requirements on machines and men. To attain optimum standards requires close cooperation between us, the manufacturers of the machines and the machine tools we use.

There are several reasons to choose machined ferrite cores. Samples are sometimes required on very short notice, while pressing tools are not yet available. On other occasions, only a limited number of cores will be needed and it is not worthwhile to make a tool at all. Cores can be so complicated or large that machining is the only viable solution.

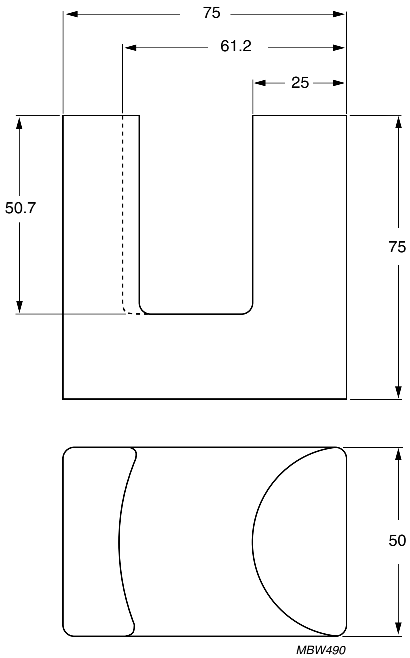
The drawings provide a good impression of the variety of cores we have produced. For some of the cores we also have pressing tools available.



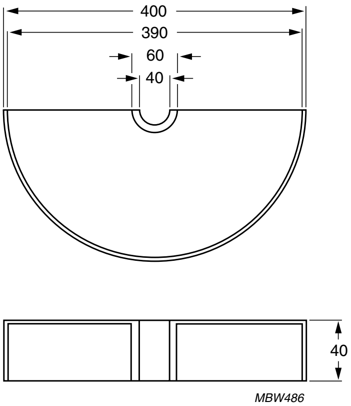
ER type core



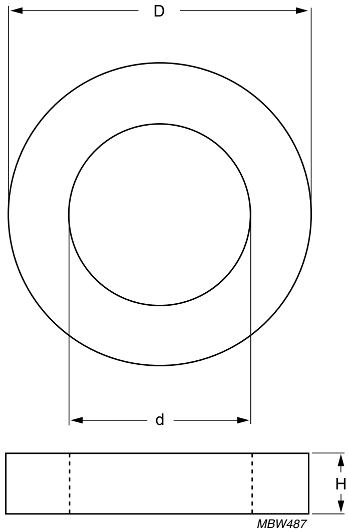
PM type core.



Quarter part of an ETD150 core set.



Huge P core section



Example of large ring cores:
T90/40/35, T120/60/35, T130/80/35

FERRITE IN SCIENTIFIC PARTICLE ACCELERATORS

The application

Ferrites are used extensively in modern scientific experiments. One of the most exciting and advanced applications is in particle accelerators. Scientists are trying to discover the mysteries of the universe by smashing atomic particles with titanic forces. This requires particle beams to be accelerated to very high speeds and guided into a collision chamber with the help of specially designed magnetic rings and kicker magnets.

Our materials

At Ferroxcube's research and development laboratories located in Eindhoven, The Netherlands, we can build on 50 years' experience in ferrite technology. We developed the required materials which fulfil the demanding specifications. Due to our long involvement with ferrite technology, we are one of only two major suppliers in the world who support such demanding projects. Because of the extremely demanding nature of the specifications, these magnetic rings and blocks are designed and developed in close interaction with the scientists. This has enabled us to develop unique material grades, which are processed in our highly controlled production environment to deliver the required product performance.

Our product range

Our range of large ring cores and blocks was developed especially for use in scientific particle accelerators. Applications include kicker magnets and acceleration stations. Dynamic behaviour under pulse conditions is important for both applications, so special ferrite grades are optimized for low losses at high flux densities. These large rings have also been used successfully in delay lines for very high powers such as in pulsed lasers or radar equipment. Sizes other than those mentioned in the following tables can be made on request.

- Standard range of sizes
- Optimized grades for particle accelerators
- Other sizes on request.

General properties of the grades are described in the section on Material Grades. Specific properties, related to their use in particle accelerators, are provided in the following table.

Relevant properties of ferrites in accelerator applications

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

Products generally do not fully comply with the material specification. Deviations may occur due to shape, size and grinding operations. Detailed specifications are given in the data sheets or product drawings.

MATERIALS FOR PARTICLE ACCELERATORS

Materials and relevant values

PARAMETER	8C11	8C12	4M2	4E2	4B3
μ_i (±20%)	1200	900	140	25	300
μ_{rem} approx.	850	600	130	20	–
B_s 25 °C (mT, 800 A/m)	≥300	280	250	250	≥300
B_s 40 °C (mT, 800 A/m)	≥280	250	220	220	–
H_c (A/m, after 800 A/m)	≤20	30	100	500	<80
ρ DC (Ωm)	$>10^5$	$>10^5$	$>10^5$	$>10^5$	$>10^5$
T_C (°C)	≥125	≥125	≥150	≥400	≥250
μQ in remanence 200 kHz:					
10 mT		15×10^3			
20 mT		9×10^3			
50 mT		4×10^3			
μQ in remanence 500 kHz:					
10 mT		10×10^3			
20 mT		6×10^3			
50 mT		25×10^3			
μQ in remanence 1 MHz:					
5 mT		10×10^3	20×10^3		
10 mT		75×10^3	20×10^3		
20 mT		5×10^3	15×10^3		
30 mT		–	8×10^3		
μQ in remanence 2.5 MHz:					
5 mT			20×10^3		
10 mT			20×10^3		
20 mT			15×10^3		
30 mT			7×10^3		
μQ in remanence 5 MHz:					
5 mT			15×10^3		
10 mT			15×10^3		
20 mT			10×10^3		
30 mT			7×10^3		
μQ in remanence 10 MHz:					
5 mT			12×10^3		
10 mT			10×10^3		
μQ in remanence 80 MHz:					
1 mT				2.5×10^3	
μQ in remanence 100 MHz				2×10^3	
Decrease in μQ (%), measured 10 ms after application of DC bias (approx.)		10	15	30	
μ_Δ with DC bias field (approx.):					
0 A/m		600	130		
250 A/m		120	80		
500 A/m		50	40		
1000 A/m		22	22		
2000 A/m		8	12		
3000 A/m		5.5	8		
Frequency range (with or without DC bias) in MHz		up to 2	2 to 10	20 to 100	
Application area and special features	kicker magnets; high resistance	high frequency ratio possible with DC bias	fast recovery after magnetic bias	high frequency material	high (B_s + B_r)

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
T76/38/13	38500	232	≈ 220
T170/110/20	251500	589	≈ 1300
T240/160/20	482000	789	≈ 2500
T498/270/25	3120000	2760	≈ 17000
T498/300/25	2900000	2420	≈ 15000
T500/240/25	3300000	3100	≈ 19000
T500/300/25	2950000	2450	≈ 16000

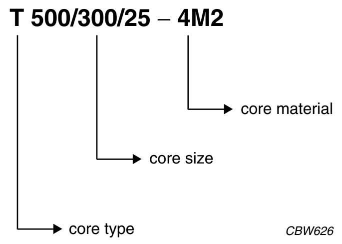


Fig.0 Type number structure for toroids.

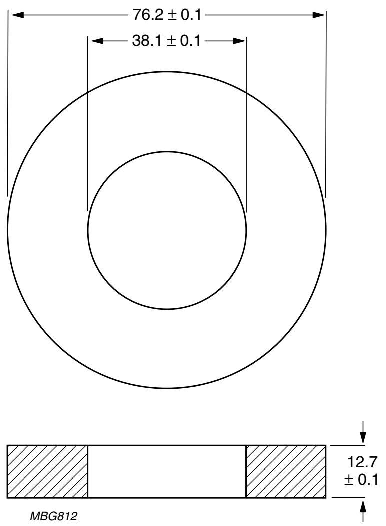
RING CORES T76/38/13

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.716	mm^{-1}
V_e	effective volume	38500	mm^3
l_e	effective length	166	mm
A_e	effective area	232	mm^2
m	mass	≈ 220	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4M2	≈ 250	T76/38/13-4M2
8C11	≈ 2000	T76/38/13-8C11
8C12	≈ 1600	T76/38/13-8C12



Dimensions in mm.

Fig.1 Ring core T76/38/13.

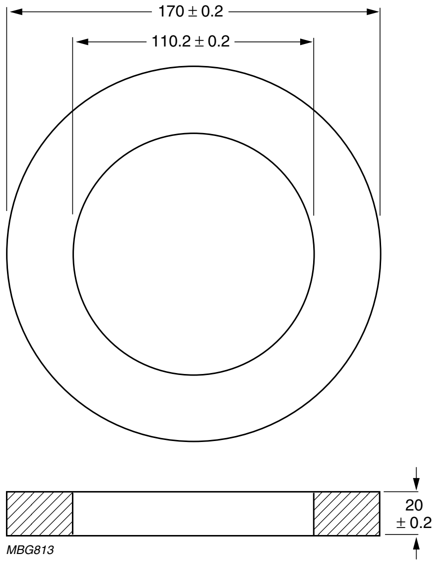
RING CORES T170/110/20

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.725	mm^{-1}
V_e	effective volume	251500	mm^3
l_e	effective length	427	mm
A_e	effective area	589	mm^2
m	mass	≈ 1300	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C11	≈ 2600	T170/110/20-8C11



Dimensions in mm.

Fig.2 Ring core T170/110/20.

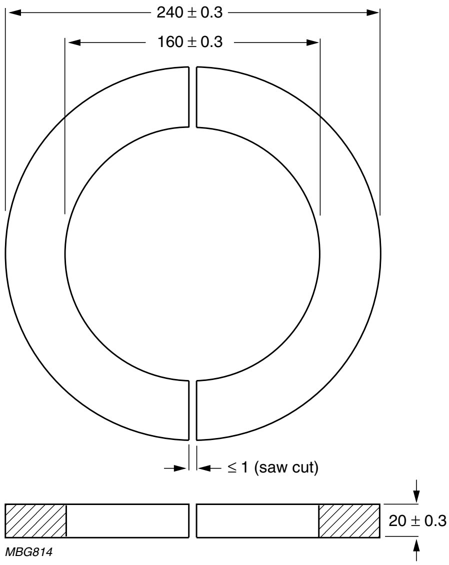
SPLIT RING CORE T240/160/20

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.774	mm^{-1}
V_e	effective volume	482000	mm^3
l_e	effective length	611	mm
A_e	effective area	789	mm^2
m	mass	≈ 2500	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C11	–	T240/160/20-8C11



Dimensions in mm.

Fig.6 Split ring core T240/160/20.

RING CORE T498/270/25

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.409	mm^{-1}
V_e	effective volume	3120000	mm^3
I_e	effective length	1130	mm
A_e	effective area	2760	mm^2
m	mass	≈ 17000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C12	≈ 2800	T498/270/25-8C12

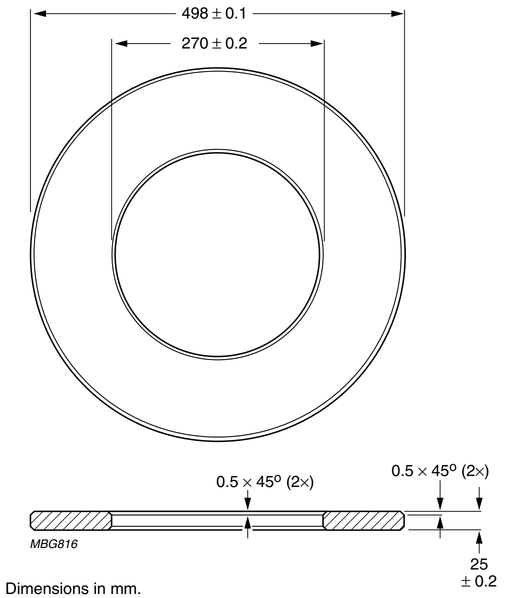


Fig.7 Ring core T498/270/25.

RING CORE T498/300/25

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.496	mm^{-1}
V_e	effective volume	2900000	mm^3
I_e	effective length	1200	mm
A_e	effective area	2420	mm^2
m	mass	≈ 15000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
8C12	≈ 2300	T498/300/25-8C12

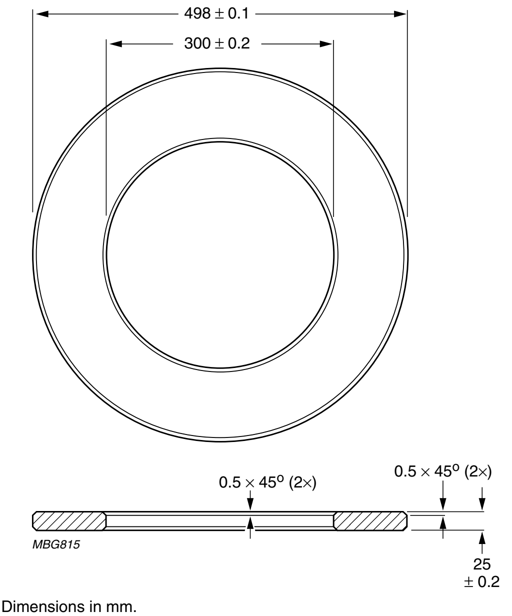


Fig.8 Ring core T498/300/25.

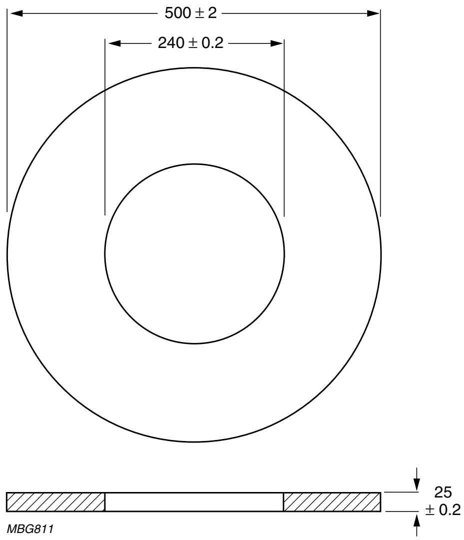
RING CORE T500/240/25

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.342	mm^{-1}
V_e	effective volume	3300000	mm^3
l_e	effective length	1060	mm
A_e	effective area	3100	mm^2
m	mass	≈ 19000	g

Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4B3	≈ 1300	T500/240/25-4B3



Dimensions in mm.

Fig.9 Ring core T500/240/25.

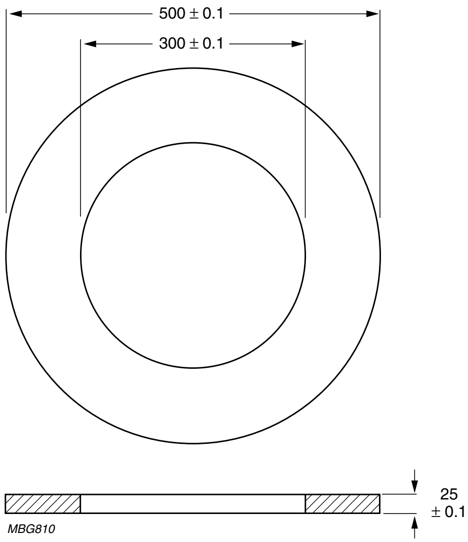
RING CORE T500/300/25

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.49	mm^{-1}
V_e	effective volume	2950000	mm^3
l_e	effective length	1200	mm
A_e	effective area	2450	mm^2
m	mass	≈ 16000	g

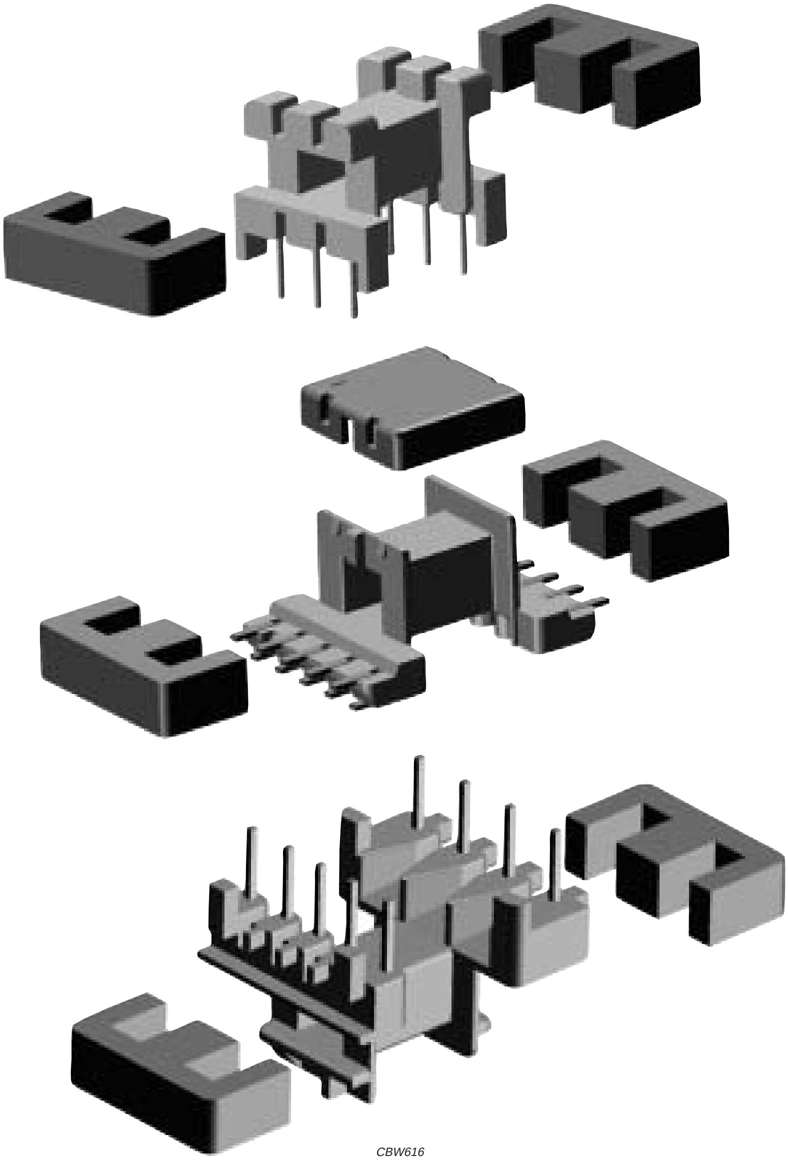
Ring core data

GRADE	A_L (nH)	TYPE NUMBER
4M2	≈ 350	T500/300/25-4M2



Dimensions in mm.

Fig.10 Ring core T500/300/25.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview E cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
E5.3/2.7/2	33.3	2.66	0.08
E6.3/2.9/2	40.6	3.30	0.12
E8.8/4.1/2	78.0	5.00	0.25
E13/6/3	281	10.1	0.7
E13/6/6	559	20.2	1.4
E13/7/4	369	12.4	0.9
E16/8/5	750	20.1	2.0
E16/12/5	1070	19.4	2.6
E19/8/5	900	22.6	2.3
E19/8/9	1650	41.3	4.0
E20/10/5	1340	31.2	4.0
E20/10/6	1490	32.0	3.7
E20/14/5	1513	24.4	4.2
E22/16/10	5143	86.0	14
E25/9/6	1860	38.4	4.8
E25/10/6	1930	37.0	4.8
E25/13/7	2990	52.0	8.0
E25/13/11	4500	78.4	11
E30/15/7	4000	60.0	11
E31/13/9	5150	83.2	13
E32/16/9	6180	83.0	16
E34/14/9	5590	80.7	14
E35/18/10	8070	100	15
E36/21/12	12160	126	31
E41/17/12	11500	149	30
E42/21/15	17300	178	44
E42/21/20	22700	233	56
E42/33/20	34200	236	82
E47/20/16	20800	234	53
E50/27/15	26900	225	68
E55/28/21	44000	353	108
E55/28/25	52000	420	130
E56/24/19	36000	337	90
E65/32/27	79000	540	205
E71/33/32	102000	683	260
E80/38/20	72300	392	180

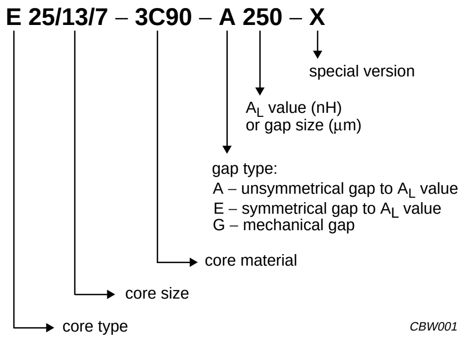


Fig.1 Type number structure for cores.

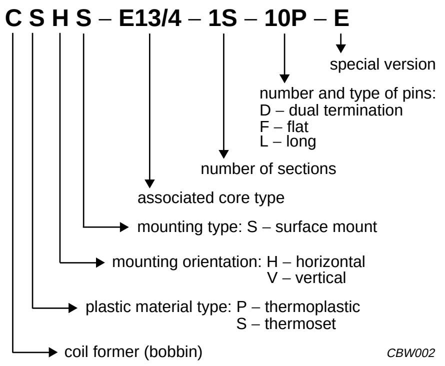
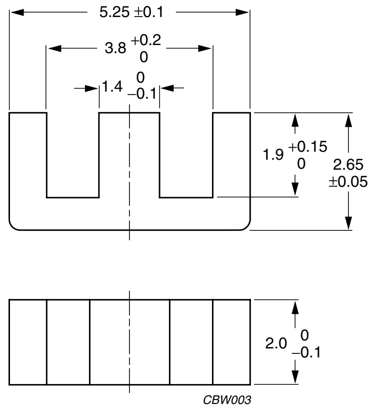


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

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



Dimensions in mm.

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

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 5 ±2 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	300 ±25%	≈ 1120	≈ 0	E5.3/2.7/2-3C94
3C96 prot	275 ±25%	≈ 1030	≈ 0	E5.3/2.7/2-3C96
3F3	265 ±25%	≈ 990	≈ 0	E5.3/2.7/2-3F3
3F35 prot	225 ±25%	≈ 840	≈ 0	E5.3/2.7/2-3F35
3F4 des	165 ±25%	≈ 615	≈ 0	E5.3/2.7/2-3F4

Core halves of high permeability grades

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	1400 +40/−30%	≈ 5240	≈ 0	E5.3/2.7/2-3E5
3E6	1600 +40/−30%	≈ 5980	≈ 0	E5.3/2.7/2-3E6

E cores and accessories E5.3/2.7/2

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.003	≤ 0.02	–
3C96	≥340	≤ 0.0024	≤ 0.016	≤ 0.007
3F3	≥300	≤ 0.005	–	≤ 0.008
3F35	≥300	–	–	≤ 0.003
3F4	≥250	–	–	–

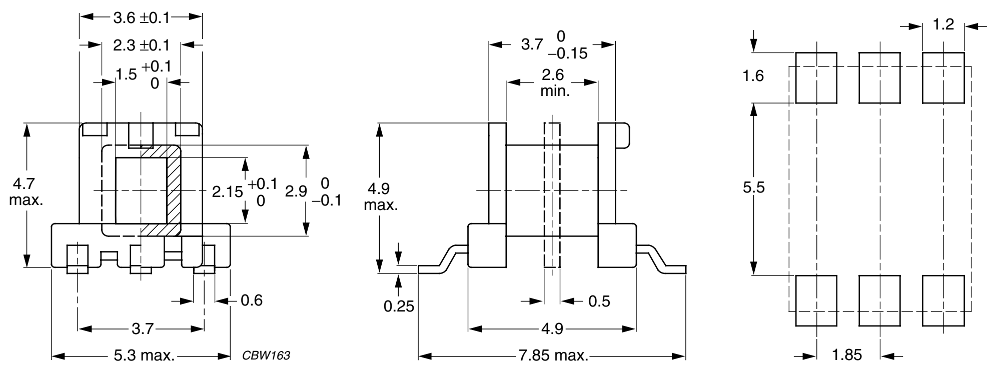
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.012	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.004	≤ 0.035	–	–
3F4	≥250	–	–	≤ 0.009	≤ 0.015

COIL FORMERS

General data

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



Dimensions in mm.

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

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

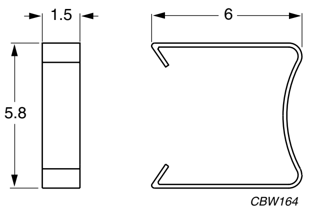
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.5	2.6	12.6	CPHS-E5.3/2-1S-4P
1	1.5	2.6	12.6	CPHS-E5.3/2-1S-6P
2	2 × 0.6	2 × 1.0	12.6	CPHS-E5.3/2-2S-6P

E cores and accessories E5.3/2.7/2

MOUNTING PARTS

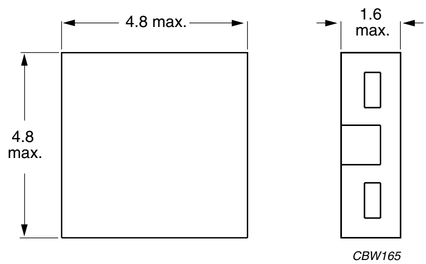
General data for mounting parts

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



Dimensions in mm.

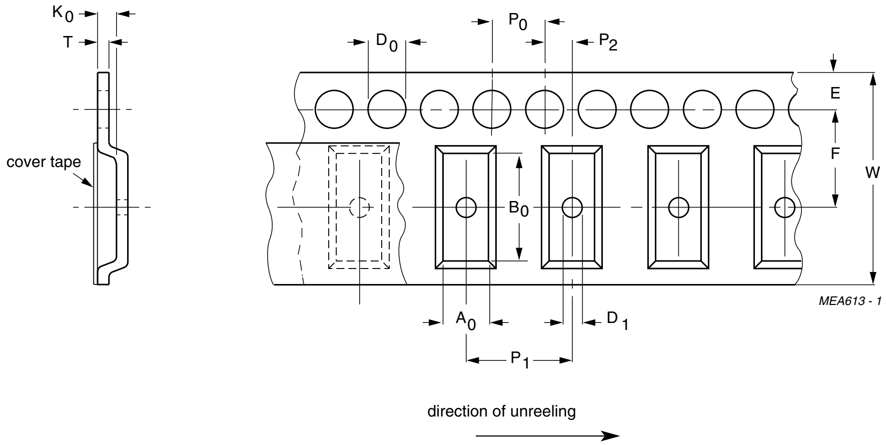
Fig.3 E5.3/2.7/2 clamp.



Dimensions in mm.

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

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 1.

Fig.5 Blister tape.

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

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

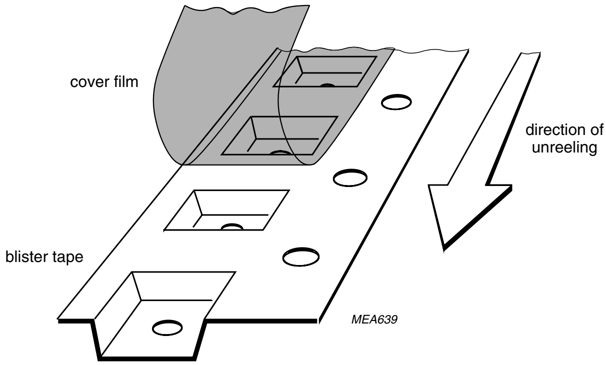
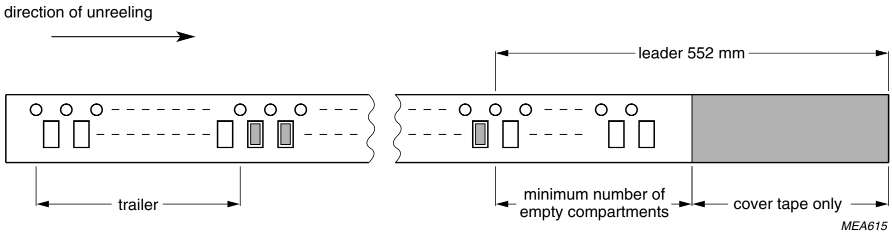
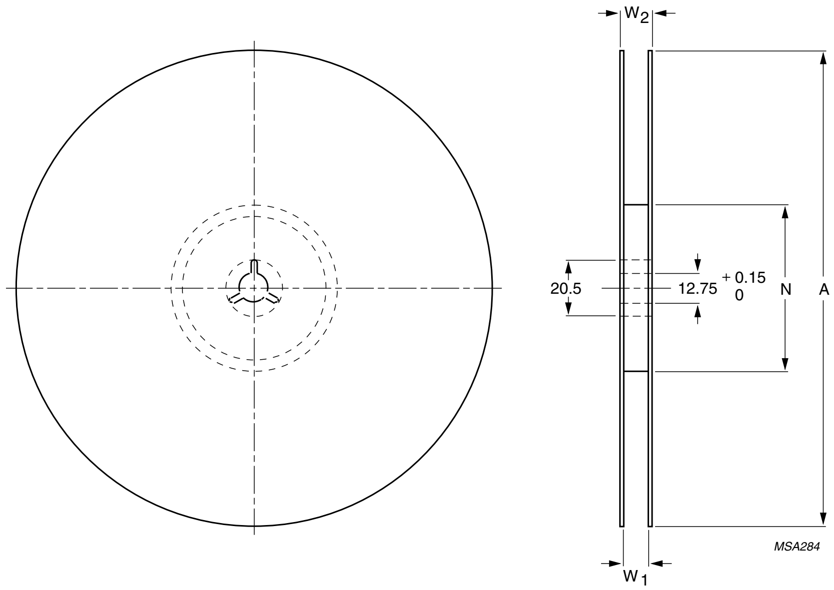


Fig.6 Construction of blister tape.



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

Fig.7 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

Table 2 Reel dimensions; see Fig.8

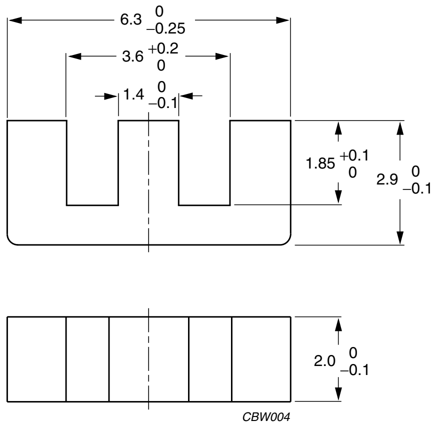
SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4

E cores and accessories E6.3/2.9/2

CORE SETS

Effective core parameters

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



Dimensions in mm.

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

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 5 ±2 N.

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

Core halves of high permeability grades

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

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.004	≤ 0.025	–
3C96	≥340	≤ 0.003	≤ 0.02	≤ 0.008
3F3	≥300	≤ 0.007	–	≤ 0.01
3F35	≥300	–	–	≤ 0.004
3F4	≥250	–	–	–

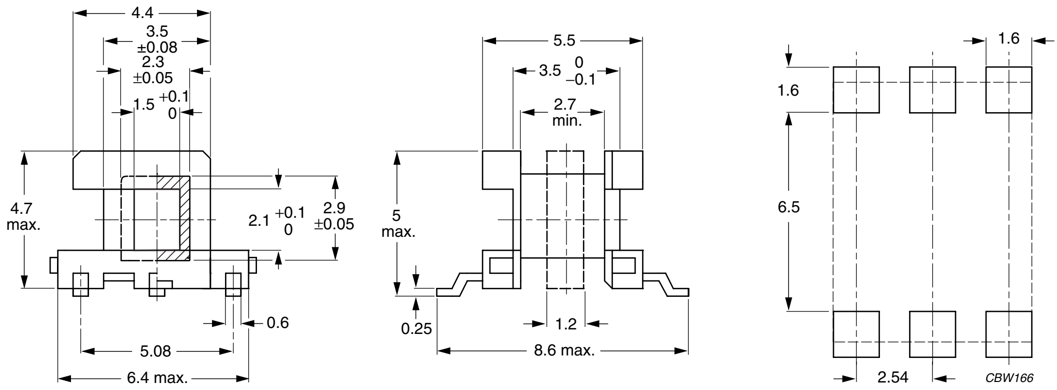
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.015	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.005	≤ 0.045	–	–
3F4	≥250	–	–	≤ 0.012	≤ 0.019

COIL FORMERS

General data

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



Dimensions in mm.

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

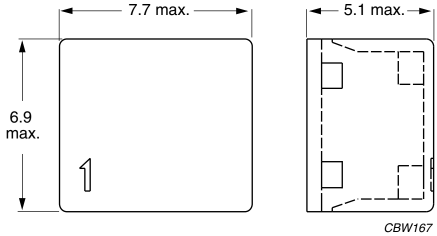
Winding data for E6.3/2.9/2 coil former (SMD) with 6 solder pads

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

MOUNTING PARTS

General data for mounting parts

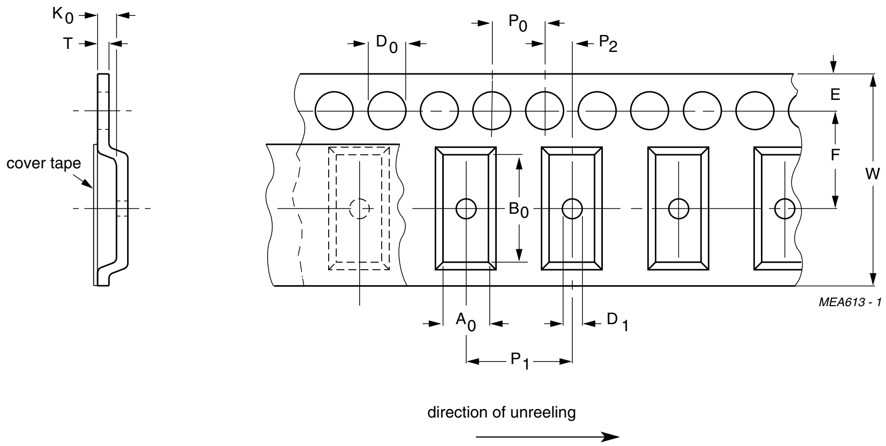
ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	liquid crystal polymer (LCP)	3	COV-E6.3/2



Dimensions in mm.

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

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 1.

Fig.4 Blister tape.

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

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

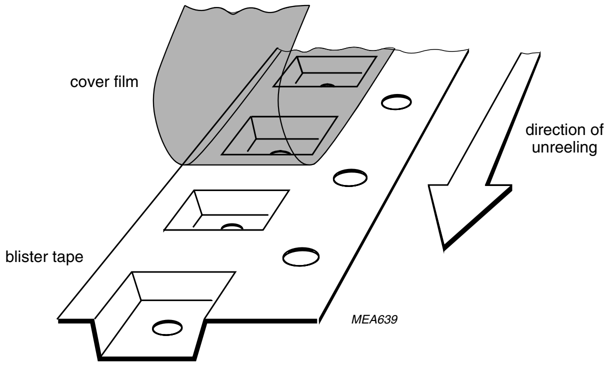
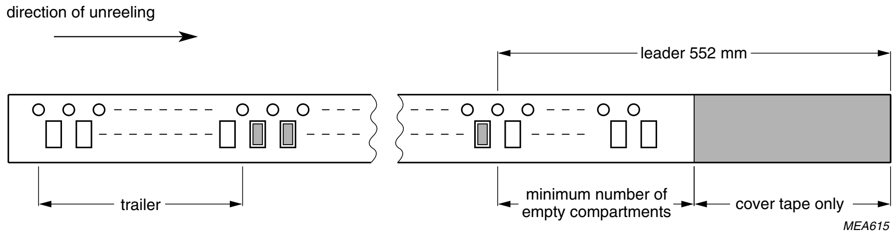
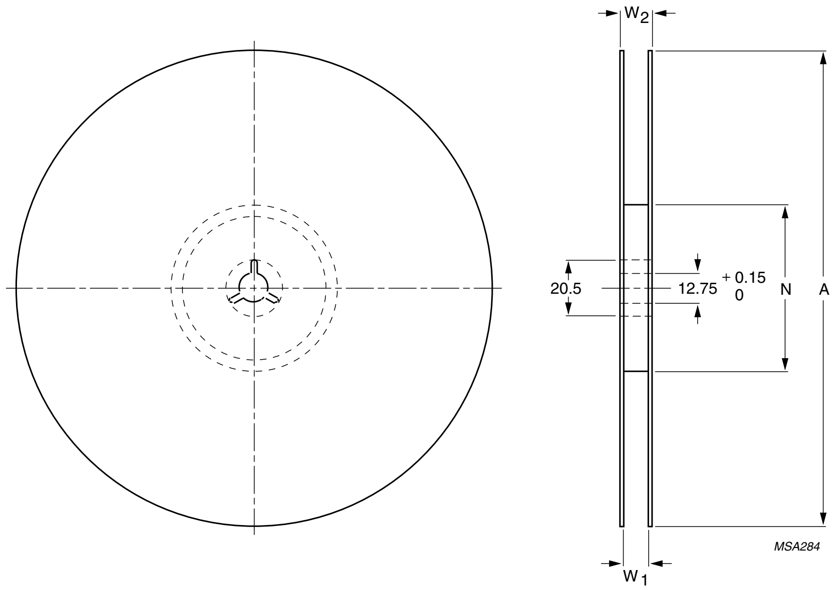


Fig.5 Construction of blister tape.



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

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

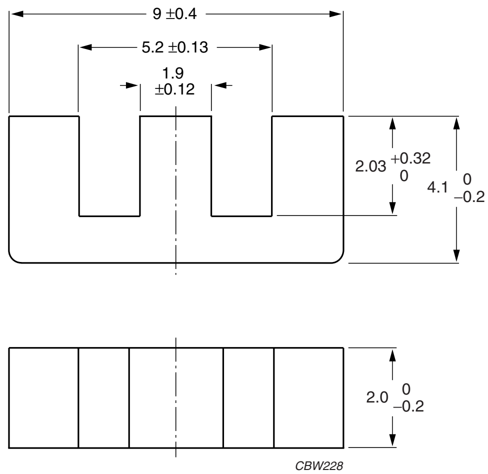
Table 2 Reel dimensions; see Fig.7

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

CORE SETS

Effective core parameters

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



Dimensions in mm.

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

Core halves

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

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

Core halves of high permeability grades

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

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

E cores and accessories E8.8/4.1/2

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.007	≤ 0.04	–
3C96	≥340	≤ 0.0055	≤ 0.032	≤ 0.014
3F3	≥300	≤ 0.01	–	≤ 0.014
3F35	≥300	–	–	≤ 0.007
3F4	≥250	–	–	–

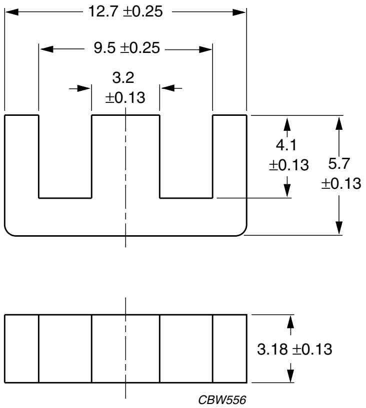
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 500 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.029	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.011	≤ 0.082	–	–
3F4	≥250	–	–	≤ 0.023	≤ 0.037

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E13/6/3 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈138	≈ 250	E13/6/3-3C90-A63
	100 ±8%	≈ 219	≈140	E13/6/3-3C90-A100
	160 ±8%	≈ 350	≈ 75	E13/6/3-3C90-A160
	250 ±20%	≈ 548	≈ 40	E13/6/3-3C90-A250
	315 ±20%	≈ 690	≈ 30	E13/6/3-3C90-A315
	730 ±25%	≈1590	≈ 0	E13/6/3-3C90

Core halves of high permeability grades

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

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

Properties of core sets under power conditions

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

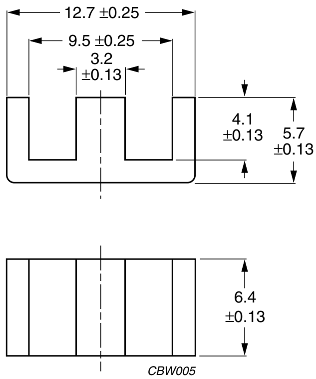
E cores and accessories

E13/6/6 (814E250)

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E13/6/6 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±5%	≈ 70	≈ 560	E13/6/6-3C81-A63
	100 ±8%	≈ 110	≈ 310	E13/6/6-3C81-A100
	160 ±8%	≈ 175	≈ 175	E13/6/6-3C81-A160
	250 ±20%	≈ 275	≈ 100	E13/6/6-3C81-A250
	315 ±20%	≈ 340	≈ 75	E13/6/6-3C81-A315
	1950 ±25%	≈ 2130	≈ 0	E13/6/6-3C81
3C90	63 ±5%	≈ 70	≈ 560	E13/6/6-3C90-A63
	100 ±8%	≈ 110	≈ 310	E13/6/6-3C90-A100
	160 ±8%	≈ 175	≈ 175	E13/6/6-3C90-A160
	250 ±20%	≈ 275	≈ 100	E13/6/6-3C90-A250
	315 ±20%	≈ 340	≈ 75	E13/6/6-3C90-A315
	1470 ±25%	≈ 1605	≈ 0	E13/6/6-3C90
3C91 prot	1950 ±25%	≈ 2130	≈ 0	E13/6/6-3C91
3C94 des	1470 ±25%	≈ 1605	≈ 0	E13/6/6-3C94
3C96 prot	1250 ±25%	≈ 1360	≈ 0	E13/6/6-3C96

E cores and accessories

E13/6/6 (814E250)

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%	≈ 70	≈ 560	E13/6/6-3F3-A63
	100 ±8%	≈ 110	≈ 310	E13/6/6-3F3-A100
	160 ±8%	≈ 175	≈ 175	E13/6/6-3F3-A160
	250 ±20%	≈ 275	≈ 100	E13/6/6-3F3-A250
	315 ±20%	≈ 340	≈ 75	E13/6/6-3F3-A315
	1250 ±25%	≈ 1370	≈ 0	E13/6/6-3F3
3F35 prot	1000 ±25%	≈ 1090	≈ 0	E13/6/6-3F35

Core halves of high permeability grades

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

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.12	–	–	–
3C90	≥320	≤ 0.06	≤ 0.06	–	–
3C91	≥320	–	≤ 0.037(1)	≤ 0.25(1)	–
3C94	≥320	–	≤ 0.048	≤ 0.33	–
3C96	≥340	–	≤ 0.037	≤ 0.25	–
3F3	≥320	–	≤ 0.06	–	≤ 0.11
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.21	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.075	≤ 0.6	–	–

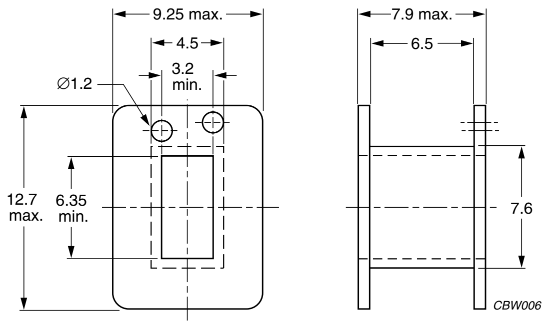
Note

1. Measured at 60 °C.

COIL FORMERS

General data for E13/6/6 coil former

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



Dimensions in mm.

Fig.2 E13/6/6 coil former.

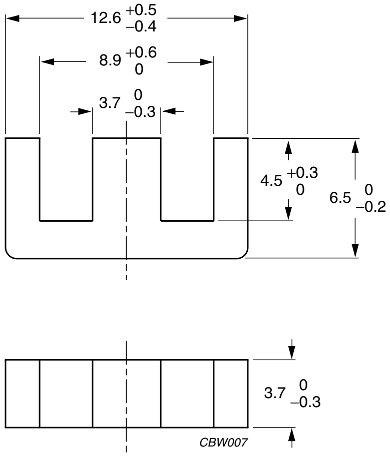
Winding data for E13/6/6 coil former

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

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E13/7/4 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 120	≈ 320	E13/7/4-3C90-A63
	100 ±8%	≈ 190	≈ 175	E13/7/4-3C90-A100
	160 ±8%	≈ 305	≈ 100	E13/7/4-3C90-A160
	250 ±15%	≈ 480	≈ 55	E13/7/4-3C90-A250
	315 ±15%	≈ 600	≈ 40	E13/7/4-3C90-A315
	800 ±25%	≈1525	≈ 0	E13/7/4-3C90
3C94 des	800 ±25%	≈ 1525	≈ 0	E13/7/4-3C94
3C96 prot	700 ±25%	≈ 1330	≈ 0	E13/7/4-3C96
3F3	63 ±5%	≈ 120	≈ 320	E13/7/4-3F3-A63
	100 ±8%	≈ 190	≈ 175	E13/7/4-3F3-A100
	160 ±8%	≈ 305	≈ 100	E13/7/4-3F3-A160
	250 ±15%	≈ 480	≈ 55	E13/7/4-3F3-A250
	315 ±15%	≈ 600	≈ 40	E13/7/4-3F3-A315
	700 ±25%	≈ 1330	≈ 0	E13/7/4-3F3
3F35 prot	560 ±25%	≈ 1070	≈ 0	E13/7/4-3F35

E cores and accessories

E13/7/4 (EF12.6)

Core halves of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.05	≤ 0.05	–	–
3C94	≥320	–	≤ 0.04	≤ 0.2	–
3C96	≥340	–	≤ 0.03	≤ 0.16	–
3F3	≥320	–	≤ 0.05	–	≤ 0.07
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.14	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.05	≤ 0.39	–	–

COIL FORMER

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

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

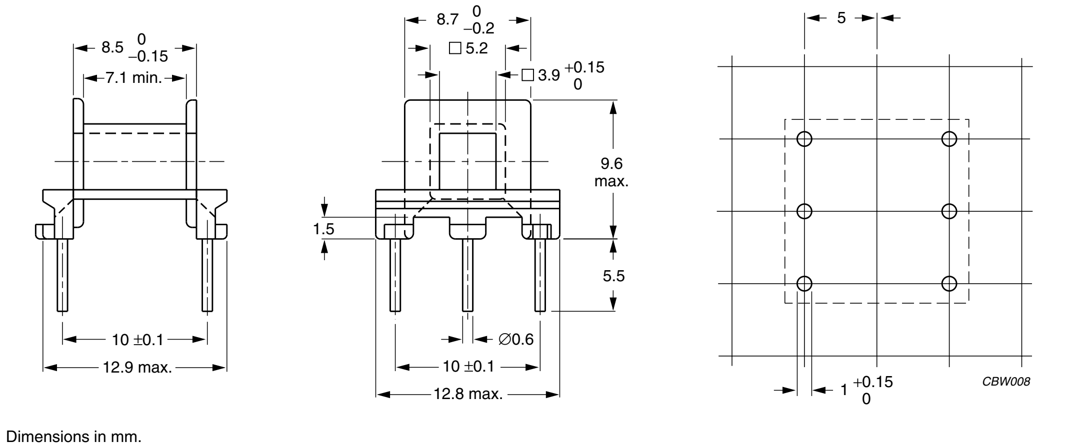


Fig.2 E13/7/4 coil former; 6-pins.

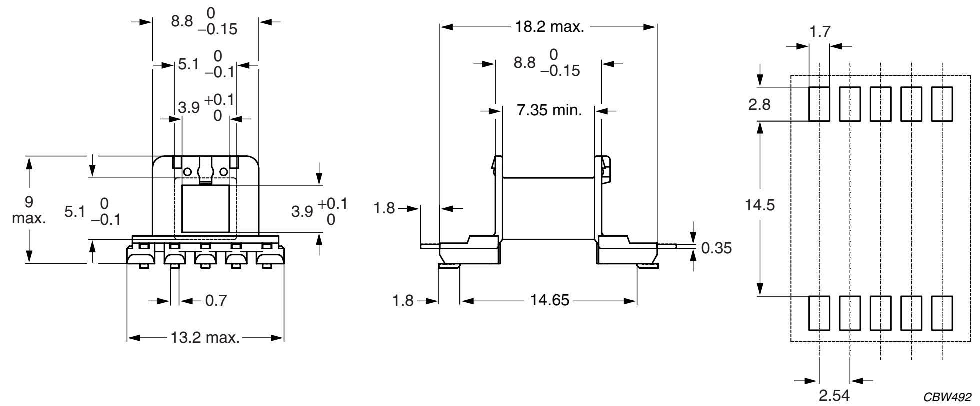
Winding data 6-pins for E13/7/4 coil former

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

COIL FORMER

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

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



Dimensions in mm.

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

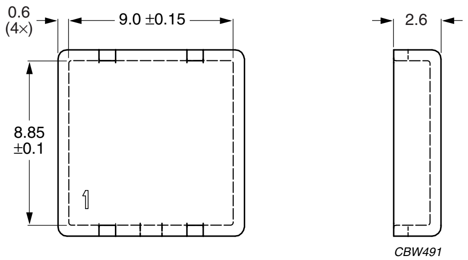
Winding data for E13/7/4 SMD coil former

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

MOUNTING PARTS

General data for mounting parts

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



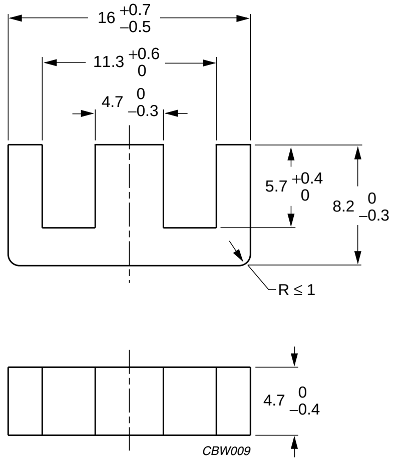
Dimensions in mm.

Fig.4 E13/7/4 cover.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E16/8/5 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 95	≈ 570	E16/8/5-3C90-A63
	100 ±8%	≈ 150	≈ 310	E16/8/5-3C90-A100
	160 ±8%	≈ 240	≈ 170	E16/8/5-3C90-A160
	250 ±15%	≈ 370	≈ 95	E16/8/5-3C90-A250
	315 ±15%	≈ 470	≈ 70	E16/8/5-3C90-A315
	1100 ±25%	≈1640	≈ 0	E16/8/5-3C90
3C94 des	1100 ±25%	≈ 1640	≈ 0	E16/8/5-3C94
3C96 prot	980 ±25%	≈ 1460	≈ 0	E16/8/5-3C96
3F3	63 ±5%	≈ 95	≈ 570	E16/8/5-3F3-A63
	100 ±8%	≈ 150	≈ 310	E16/8/5-3F3-A100
	160 ±8%	≈ 240	≈ 170	E16/8/5-3F3-A160
	250 ±15%	≈ 370	≈ 95	E16/8/5-3F3-A250
	315 ±15%	≈ 470	≈ 70	E16/8/5-3F3-A315
	980 ±25%	≈ 1460	≈ 0	E16/8/5-3F3
3F35 prot	760 ±25%	≈ 1130	≈ 0	E16/8/5-3F35

E cores and accessories E16/8/5

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.1	≤ 0.1	–	–
3C94	≥320	–	≤ 0.075	≤ 0.38	–
3C96	≥340	–	≤ 0.055	≤ 0.3	–
3F3	≥320	–	≤ 0.1	–	≤ 0.15
3F35	≥300	–	–	–	–

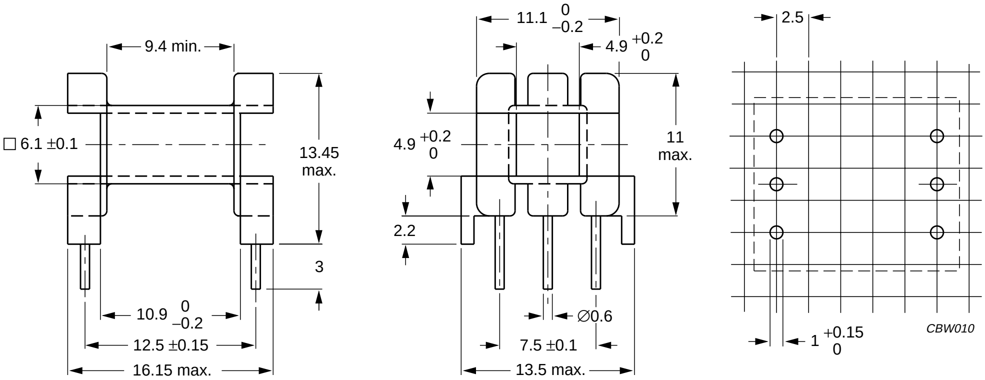
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.28	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.1	≤ 0.8	–	–

COIL FORMER

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

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



Dimensions in mm.

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

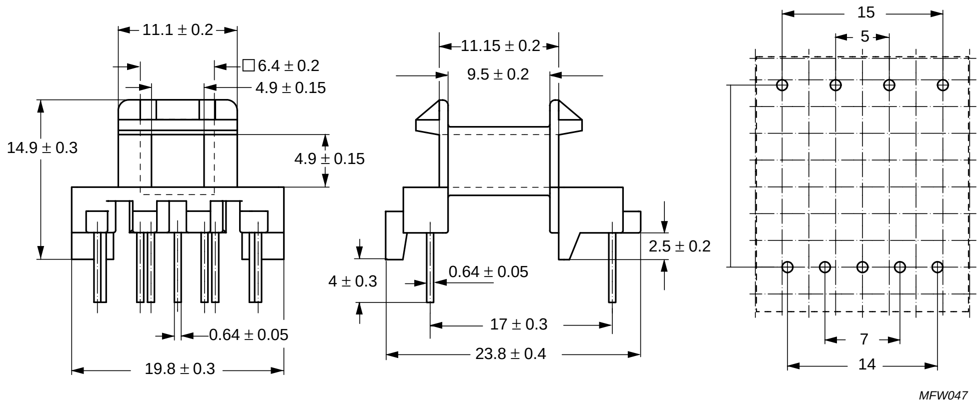
Winding data for 6-pins E16/8/5 coil former

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

COIL FORMER

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

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



Dimensions in mm.

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

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

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	20.2	9.6	35	CSH-E16/8/5-1S-9P

Note

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

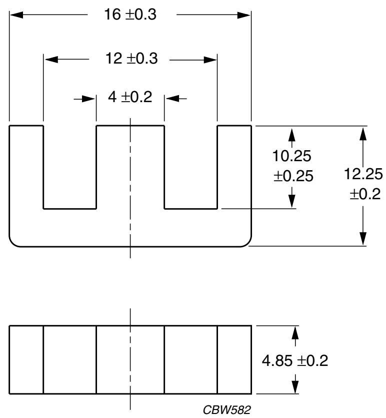
E cores and accessories

E16/12/5 (EL16)

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E16/12/5 core half.

Core halves

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

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

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

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

Properties of core sets under power conditions

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

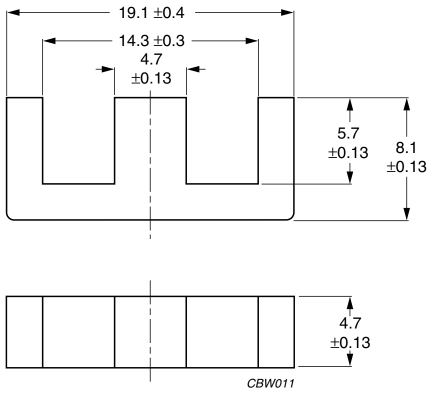
E cores and accessories

E19/8/5 (813E187)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
A_{min}	minimum area	22.1	mm^2
m	mass of core half	≈ 2.3	g



Dimensions in mm.

Fig.1 E19/8/5 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±5%	≈ 88	≈ 650	E19/8/5-3C81-A63
	100 ±8%	≈140	≈ 350	E19/8/5-3C81-A100
	160 ±8%	≈ 225	≈ 200	E19/8/5-3C81-A160
	250 ±15%	≈350	≈110	E19/8/5-3C81-A250
	315 ±15%	≈ 440	≈ 80	E19/8/5-3C81-A315
	1500 ±25%	≈ 2110	≈ 0	E19/8/5-3C81
3C90	63 ±5%	≈ 88	≈ 640	E19/8/5-3C90-A63
	100 ±8%	≈140	≈ 350	E19/8/5-3C90-A100
	160 ±8%	≈ 225	≈ 190	E19/8/5-3C90-A160
	250 ±15%	≈ 350	≈110	E19/8/5-3C90-A250
	315 ±15%	≈ 440	≈ 80	E19/8/5-3C90-A315
	1170 ±25%	≈ 1650	≈ 0	E19/8/5-3C90
3C91 prot	1500 ±25%	≈ 2110	≈ 0	E19/8/5-3C91
3C94 des	1170 ±25%	≈ 1650	≈ 0	E19/8/5-3C94
3C96 prot	1000 ±25%	≈ 1400	≈ 0	E19/8/5-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%	≈ 88	≈ 640	E19/8/5-3F3-A63
	100 ±8%	≈140	≈ 330	E19/8/5-3F3-A100
	160 ±8%	≈ 225	≈ 190	E19/8/5-3F3-A160
	250 ±15%	≈ 350	≈ 110	E19/8/5-3F3-A250
	315 ±15%	≈ 440	≈ 80	E19/8/5-3F3-A315
	1000 ±25%	≈ 1400	≈ 0	E19/8/5-3F3
3F35 prot	810 ±25%	≈ 1140	≈ 0	E19/8/5-3F35

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.2	–	–	–
3C90	≥320	≤ 0.09	≤ 0.1	–	–
3C91	≥320	–	≤ 0.064(1)	≤ 0.37(1)	–
3C94	≥320	–	≤ 0.08	≤ 0.45	–
3C96	≥340	–	≤ 0.064	≤ 0.37	–
3F3	≥320	–	≤ 0.1	–	≤ 0.17
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.32	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.12	≤ 0.95	–	–

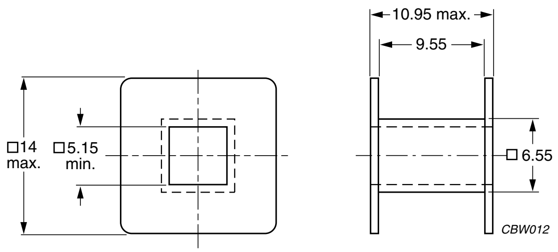
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

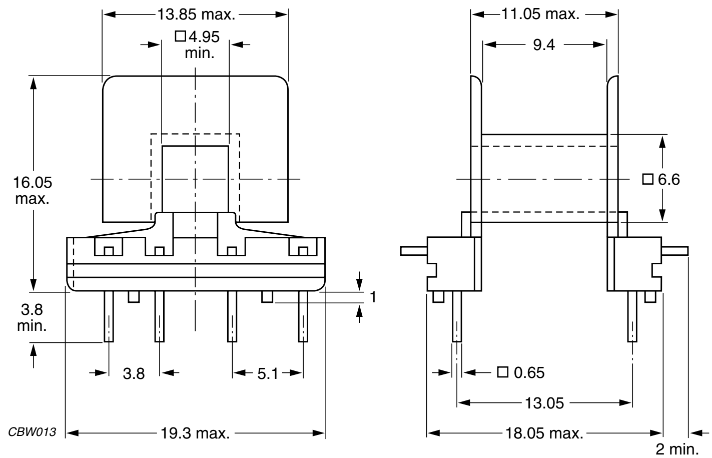
Fig.2 E19/8/5 coil former.

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

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

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

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



Dimensions in mm.

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

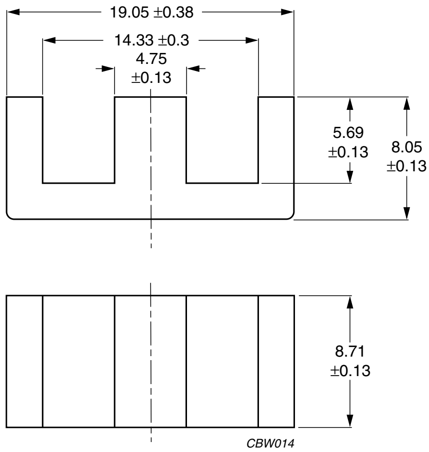
Winding data for 8-pins E19/8/5 coil former

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

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.960	mm^{-1}
V_e	effective volume	1650	mm^3
l_e	effective length	39.9	mm
A_e	effective area	41.3	mm^2
A_{min}	minimum area	41.1	mm^2
m	mass of core half	≈ 4.0	g



Dimensions in mm.

Fig.1 E19/8/9 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±5%(1)	≈ 48	≈ 640	E19/8/9-3C81-E63
	100 ±8%(1)	≈ 77	≈ 350	E19/8/9-3C81-E100
	160 ±8%	≈123	≈ 390	E19/8/9-3C81-A160
	250 ±15%	≈ 192	≈ 220	E19/8/9-3C81-A250
	315 ±15%	≈ 242	≈ 170	E19/8/9-3C81-A315
	2740 ±25%	≈ 2680	≈ 0	E19/8/9-3C81
3C90	63 ±5%(1)	≈ 48	≈ 650	E19/8/9-3C90-E63
	100 ±8%(1)	≈ 77	≈ 350	E19/8/9-3C90-E100
	160 ±8%	≈123	≈ 380	E19/8/9-3C90-A160
	250 ±15%	≈ 192	≈ 220	E19/8/9-3C90-A250
	315 ±15%	≈ 240	≈170	E19/8/9-3C90-A315
	2150 ±25%	≈ 2100	≈ 0	E19/8/9-3C90
3C91 prot	2740 ±25%	≈ 2680	≈ 0	E19/8/9-3C91
3C94 des	2150 ±25%	≈ 2100	≈ 0	E19/8/9-3C94
3C96 prot	1830 ±25%	≈ 1410	≈ 0	E19/8/9-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%(1)	≈ 48	≈ 650	E19/8/9-3F3-E63
	100 ±8%(1)	≈ 77	≈ 350	E19/8/9-3F3-E100
	160 ±8%	≈123	≈ 380	E19/8/9-3F3-A250
	250 ±15%	≈ 192	≈ 220	E19/8/9-3F3-A315
	315 ±15%	≈ 240	≈170	E19/8/9-3F3-A400
	1830 ±25%	≈ 1410	≈ 0	E19/8/9-3F3
3F35 prot	1490 ±25%	≈ 1150	≈ 0	E19/8/9-3F35

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.4	–	–	–
3C90	≥320	≤ 0.17	≤ 0.18	–	–
3C91	≥320	–	≤ 0.11(1)	≤ 0.68(1)	–
3C94	≥320	–	≤ 0.14	≤ 0.85	–
3C96	≥340	–	≤ 0.11	≤ 0.68	–
3F3	≥320	–	≤ 0.18	–	≤ 0.31
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.6	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.22	≤ 1.7	–	–

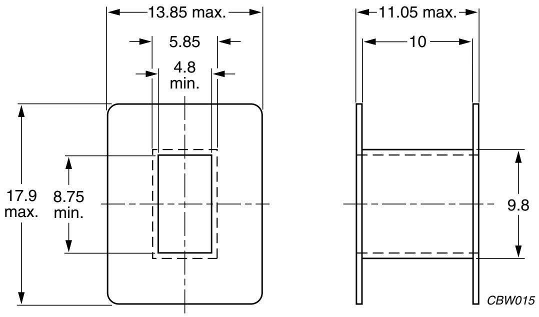
Note

1. Measured at 60 °C.

COIL FORMER

General data for E19/8/9 coil former

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



Dimensions in mm.

Fig.2 E19/8/9 coil former.

Winding data for E19/8/9 coil former

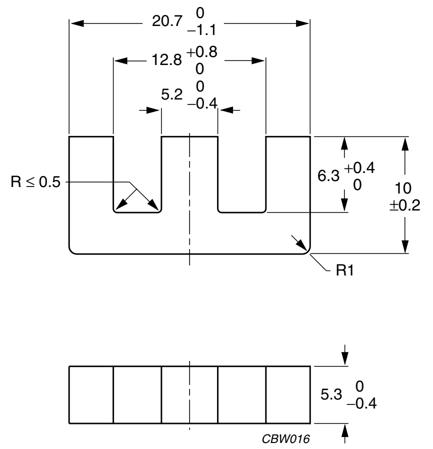
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	39.7	10	45.2	CP-E19/8/9-1S

E cores and accessories E20/10/5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.37	mm^{-1}
V_e	effective volume	1340	mm^3
l_e	effective length	42.8	mm
A_e	effective area	31.2	mm^2
A_{min}	minimum area	25.2	mm^2
m	mass of core half	≈ 4.0	g



Dimensions in mm.

Fig.1 E20/10/5 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 69	≈ 950	E20/10/5-3C90-A63
	100 ±8%	≈109	≈ 510	E20/10/5-3C90-A100
	160 ±8%	≈175	≈ 280	E20/10/5-3C90-A160
	250 ±15%	≈ 273	≈160	E20/10/5-3C90-A250
	315 ±15%	≈ 344	≈120	E20/10/5-3C90-A315
	1500 ±25%	≈1640	≈ 0	E20/10/5-3C90
3C94 des	1500 ±25%	≈1640	≈ 0	E20/10/5-3C94
3C96 prot	1400 ±25%	≈1530	≈ 0	E20/10/5-3C96
3F3	63 ±5%	≈ 69	≈ 950	E20/10/5-3F3-A63
	100 ±8%	≈ 109	≈ 510	E20/10/5-3F3-A100
	160 ±8%	≈175	≈ 280	E20/10/5-3F3-A160
	250 ±15%	≈ 273	≈160	E20/10/5-3F3-A250
	315 ±15%	≈ 344	≈120	E20/10/5-3F3-A315
	1400 ±25%	≈1530	≈ 0	E20/10/5-3F3
3F35 prot	1060 ±25%	≈1160	≈ 0	E20/10/5-3F35

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈ 2840	≈ 0	E20/10/5-3C11
3E27	2800 ±25%	≈ 2870	≈ 0	E20/10/5-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.15	≤ 0.17	–	–
3C94	≥320	–	≤ 0.13	≤ 0.7	–
3C96	≥340	–	≤ 0.1	≤ 0.56	–
3F3	≥320	–	≤ 0.16	–	≤ 0.28
3F35	≥300	–	–	–	–

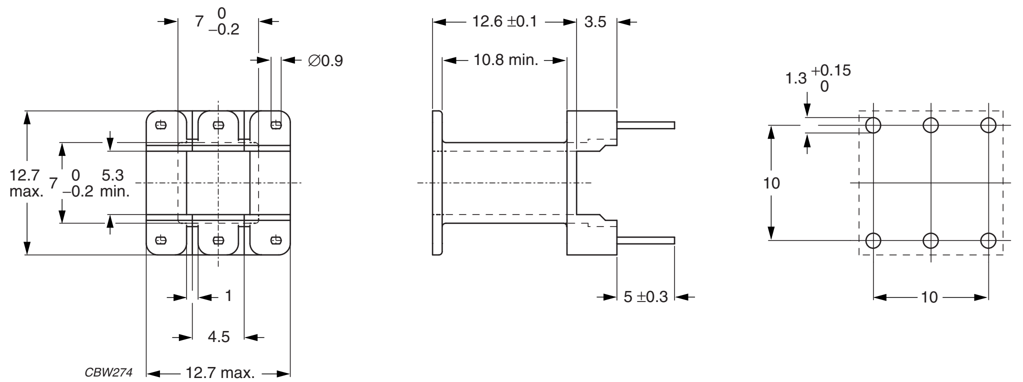
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.5	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.18	≤ 1.4	–	–

COIL FORMER

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

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



Dimensions in mm.

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

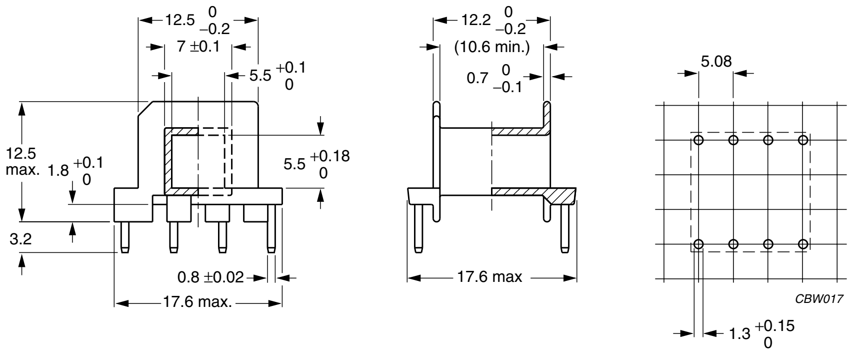
Winding data for 8-pins E20/10/5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	28.6	10.8	38.7	CPV-E20/10/5-1S-6P

COIL FORMER

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

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



Dimensions in mm.

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

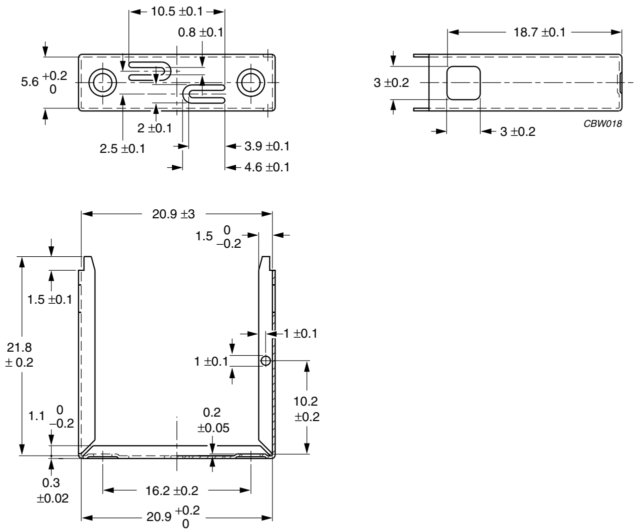
Winding data for 8-pins E20/10/5 coil former

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

MOUNTING PARTS

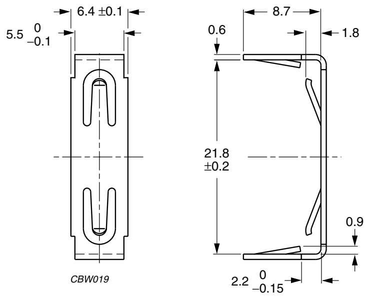
General data and ordering information

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



Dimensions in mm.

Fig.4 E20/10/5 clasp.



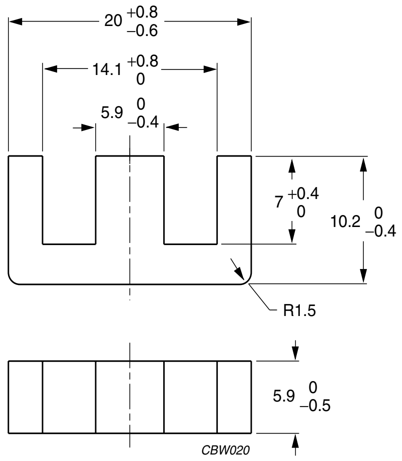
Dimensions in mm.

Fig.5 E20/10/5 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
A_{min}	minimum area	32.0	mm^2
m	mass of core half	≈ 3.7	g



Dimensions in mm.

Fig.1 E20/10/6 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 72	≈ 980	E20/10/6-3C90-A63
	100 ±8%	≈114	≈ 520	E20/10/6-3C90-A100
	160 ±8%	≈183	≈ 280	E20/10/6-3C90-A160
	250 ±15%	≈ 286	≈160	E20/10/6-3C90-A250
	315 ±15%	≈ 360	≈120	E20/10/6-3C90-A315
	1450 ±25%	≈1660	≈ 0	E20/10/6-3C90
3C94 des	1450 ±25%	≈1660	≈ 0	E20/10/6-3C94
3C96 prot	1350 ±25%	≈1580	≈ 0	E20/10/6-3C96
3F3	63 ±5%	≈ 72	≈ 980	E20/10/6-3F3-A63
	100 ±8%	≈114	≈ 520	E20/10/6-3F3-A100
	160 ±8%	≈183	≈ 280	E20/10/6-3F3-A160
	250 ±15%	≈ 286	≈160	E20/10/6-3F3-A250
	315 ±15%	≈ 360	≈120	E20/10/6-3F3-A315
	1350 ±25%	≈1580	≈ 0	E20/10/6-3F3
3F35 prot	1000 ±25%	≈1140	≈ 0	E20/10/6-3F35

E cores and accessories E20/10/6

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈ 2970	≈ 0	E20/10/6-3C11
3E27	2700 ±25%	≈ 3090	≈ 0	E20/10/6-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.16	≤ 0.18	–	–
3C94	≥320	–	≤ 0.14	≤ 0.75	–
3C96	≥340	–	≤ 0.11	≤ 0.6	–
3F3	≥320	–	≤ 0.2	–	≤ 0.3
3F35	≥300	–	–	–	–

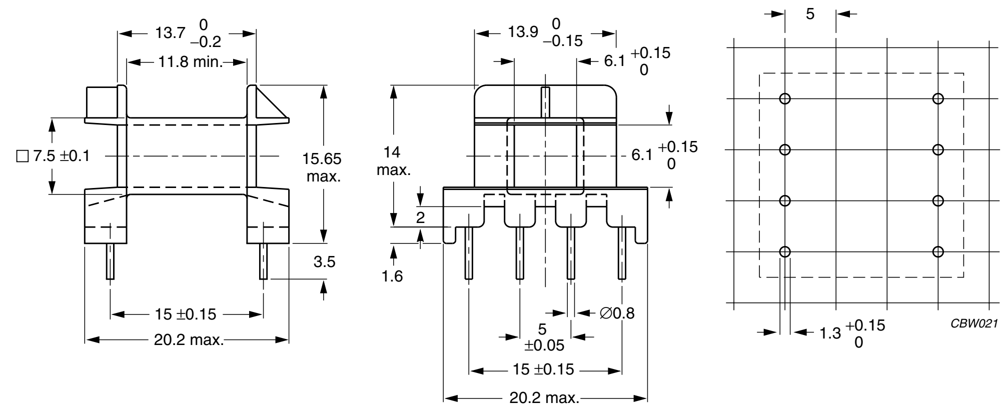
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.55	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.2	≤ 1.5	–	–

COIL FORMER

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

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



Dimensions in mm.

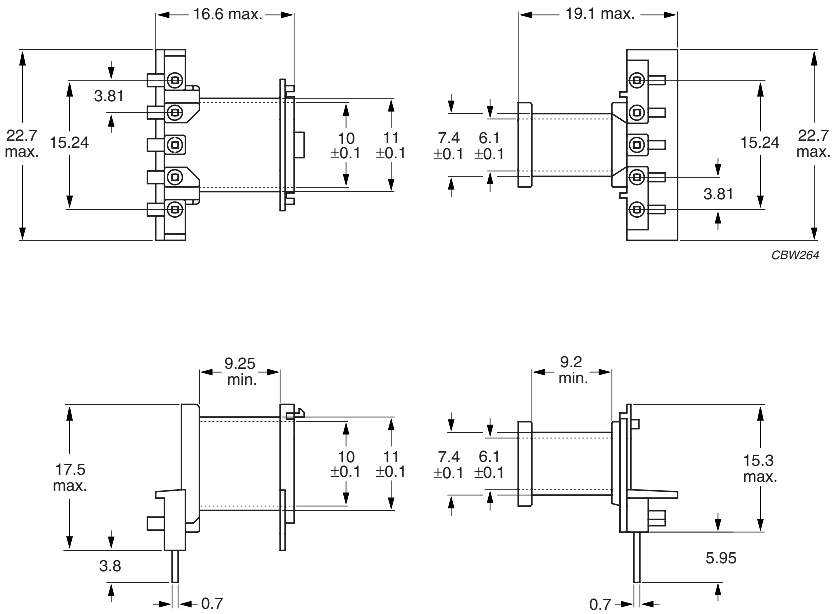
Fig.2 E20/10/6 coil former; 8-pins.

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

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

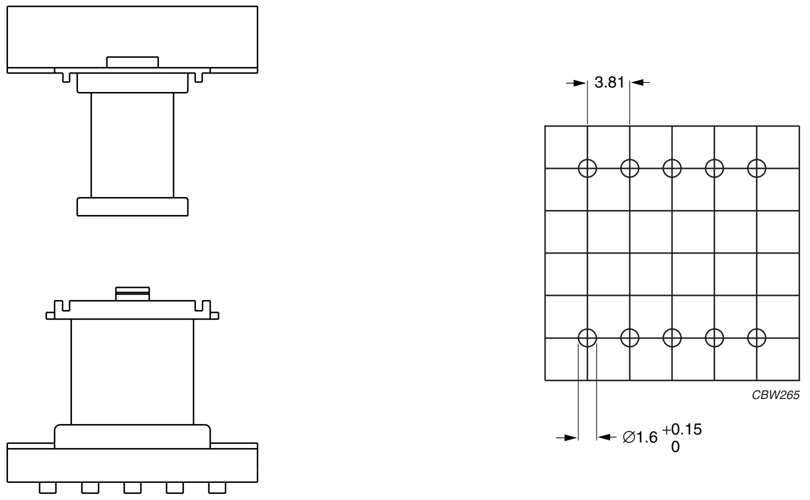
General data 10-pins coaxial E20/10/6 coil former

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



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

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



Dimensions in mm.

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

Fig.4 Mounting grid and method of fitting.

Winding data for coaxial E20/10/6 coil former

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

Note

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

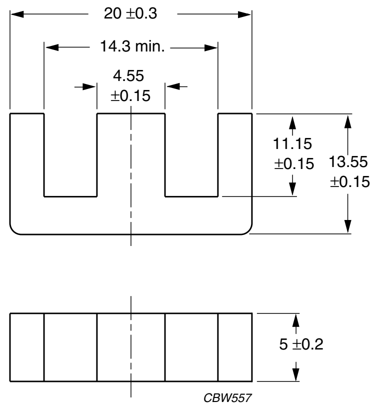
E cores and accessories

E20/14/5 (EC19)

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E20/14/5 core half.

Core halves

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

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

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

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

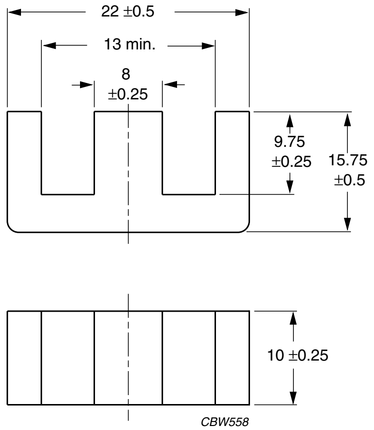
Properties of core sets under power conditions

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

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E22/16/10 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 35	≈ 3100	E22/16/10-3C90-A63
	100 ±8%	≈ 55	≈ 1650	E22/16/10-3C90-A100
	160 ±8%	≈ 89	≈ 880	E22/16/10-3C90-A160
	250 ±15%	≈ 138	≈ 500	E22/16/10-3C90-A250
	315 ±15%	≈ 174	≈ 380	E22/16/10-3C90-A315
	3090 ±25%	≈1710	≈ 0	E22/16/10-3C90

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤ 0.55	≤ 0.6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	1860	mm^3
l_e	effective length	47.4	mm
A_e	effective area	38.4	mm^2
A_{min}	minimum area	37.0	mm^2
m	mass of core half	≈ 4.8	g

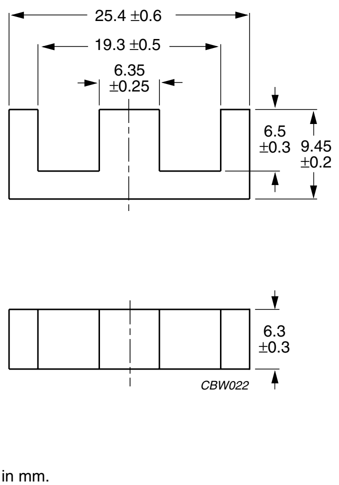


Fig.1 E25/9/6 core half.

Core halves

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

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

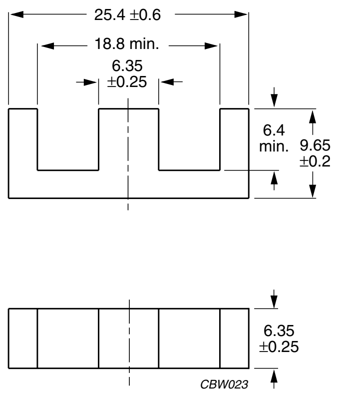
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.20	≤ 0.22	–	–
3C94	≥330	–	≤ 0.17	≤ 1.1	–

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E25/10/6 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±5%(1)	≈ 62	≈ 620	E25/10/6-3C81-E63
	100 ±8%	≈ 99	≈ 660	E25/10/6-3C81-A100
	160 ±8%	≈158	≈ 360	E25/10/6-3C81-A160
	250 ±15%	≈ 247	≈ 210	E25/10/6-3C81-A250
	315 ±15%	≈ 311	≈ 160	E25/10/6-3C81-A315
	2340 ±25%	≈ 2310	≈ 0	E25/10/6-3C81
3C90	63 ±5%(1)	≈ 62	≈ 620	E25/10/6-3C90-E63
	100 ±8%	≈ 99	≈ 660	E25/10/6-3C90-A100
	160 ±8%	≈158	≈ 360	E25/10/6-3C90-A160
	250 ±15%	≈ 247	≈ 210	E25/10/6-3C90-A250
	315 ±15%	≈ 311	≈ 150	E25/10/6-3C90-A315
	1600 ±25%	≈ 1580	≈ 0	E25/10/6-3C90
3C91 prot	2340 ±25%	≈ 2310	≈ 0	E25/10/6-3C91
3C94 des	1600 ±25%	≈ 1580	≈ 0	E25/10/6-3C94
3C96 prot	1470 ±25%	≈ 1450	≈ 0	E25/10/6-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%[1]	≈ 62	≈ 620	E25/10/6-3F3-E63
	100 ±8%	≈ 99	≈ 660	E25/10/6-3F3-A100
	160 ±8%	≈158	≈ 360	E25/10/6-3F3-A160
	250 ±15%	≈ 247	≈ 210	E25/10/6-3F3-A250
	315 ±15%	≈ 311	≈ 150	E25/10/6-3F3-A315
	1470 ±25%	≈ 1450	≈ 0	E25/10/6-3F3
3F35 prot	1150 ±25%	≈ 1140	≈ 0	E25/10/6-3F35

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	2600 ±25%	≈ 2570	≈ 0	E25/10/6-3C11
3E27	3200 ±25%	≈ 3160	≈ 0	E25/10/6-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.4	–	–	–
3C90	≥330	≤ 0.2	≤ 0.22	–	–
3C91	≥320	–	≤0.13(1)	≤ 0.8(1)	–
3C94	≥330	–	≤ 0.17	≤ 1.0	–
3C96	≥340	–	≤ 0.13	≤ 0.8	–
3F3	≥320	–	≤ 0.22	–	≤ 0.38
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 0.7	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.26	≤ 2.0	–	–

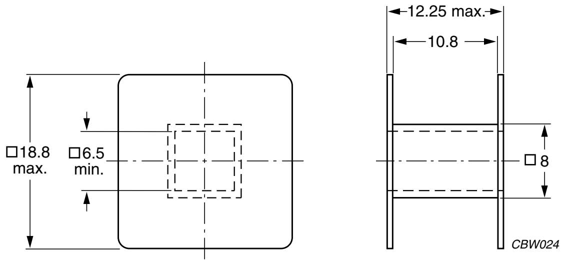
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

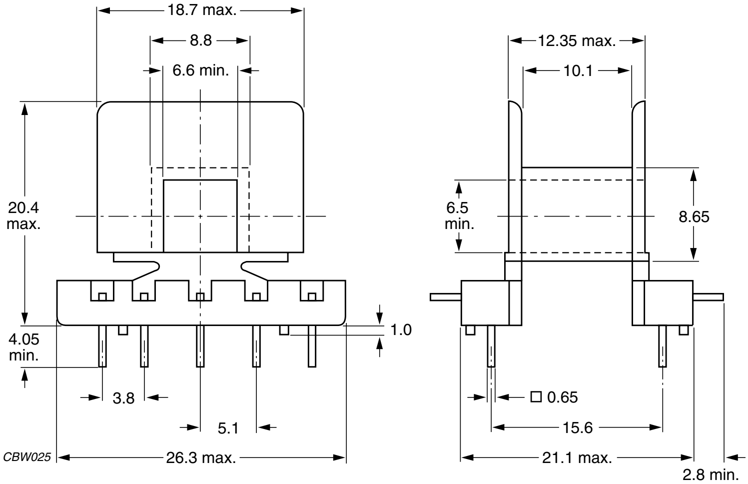
Fig.2 E25/10/6 coil former.

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

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

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

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



Dimensions in mm.

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

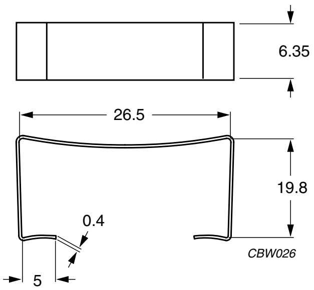
Winding data for 10-pins E25/10/6 coil former

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

MOUNTING PARTS

General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈30 N	3	CLM-E25/10/6



Dimensions in mm.

Fig.3 E25/10/6 clamp.

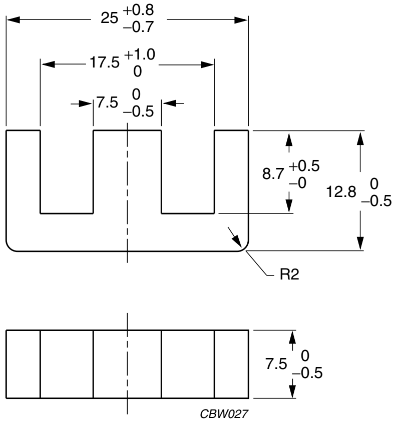
E cores and accessories

E25/13/7 (EF25)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
A_{min}	minimum area	52.0	mm^2
m	mass of core half	≈ 8	g



Dimensions in mm.

Fig.1 E25/13/7 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±5%(1)	≈ 56	≈ 870	E25/13/7-3C81-E63
	100 ±8%	≈ 99	≈ 920	E25/13/7-3C81-A100
	160 ±8%	≈143	≈ 500	E25/13/7-3C81-A160
	250 ±15%	≈ 224	≈ 280	E25/13/7-3C81-A250
	315 ±15%	≈ 282	≈ 210	E25/13/7-3C81-A315
	2460 ±25%	≈ 2200	≈ 0	E25/13/7-3C81
3C90	63 ±5%(1)	≈ 56	≈ 870	E25/13/7-3C90-E63
	100 ±8%	≈ 99	≈ 920	E25/13/7-3C90-A100
	160 ±8%	≈143	≈ 500	E25/13/7-3C90-A160
	250 ±15%	≈ 224	≈ 280	E25/13/7-3C90-A250
	315 ±15%	≈ 282	≈ 210	E25/13/7-3C90-A315
	1900 ±25%	≈ 1700	≈ 0	E25/13/7-3C90
3C91 prot	2460 ±25%	≈ 2200	≈ 0	E25/13/7-3C91
3C94 des	1900 ±25%	≈ 1700	≈ 0	E25/13/7-3C94
3C96 prot	1650 ±25%	≈ 1480	≈ 0	E25/13/7-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±5%[(1)]	≈ 56	≈ 870	E25/13/7-3F3-E63
	100 ±8%	≈ 99	≈ 920	E25/13/7-3F3-A100
	160 ±8%	≈143	≈ 500	E25/13/7-3F3-A160
	250 ±15%	≈ 224	≈ 280	E25/13/7-3F3-A250
	315 ±15%	≈ 282	≈ 210	E25/13/7-3F3-A315
	1650 ±25%	≈ 1480	≈ 0	E25/13/7-3F3
3F35 prot	1250 ±25%	≈ 1120	≈ 0	E25/13/7-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3100 ±25%	≈ 2780	≈ 0	E25/13/7-3C11
3E27	4000 ±25%	≈ 3580	≈ 0	E25/13/7-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.61	–	–	–
3C90	≥330	≤ 0.35	≤ 0.38	–	–
3C91	≥320	–	≤ 0.22[(1)]	≤ 1.2[(1)]	–
3C94	≥330	–	≤ 0.3	≤ 1.5	–
3C96	≥340	–	≤ 0.22	≤ 1.2	–
3F3	≥320	–	≤ 0.38	–	≤ 0.65
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.1	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.4	≤ 3.1	–	–

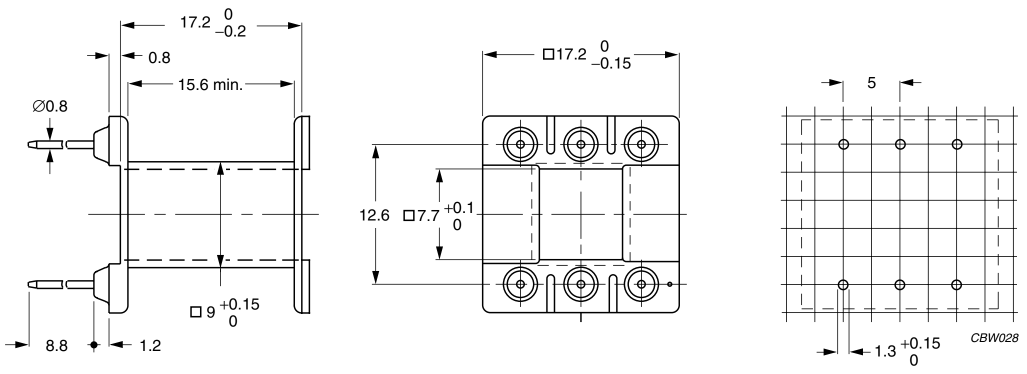
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

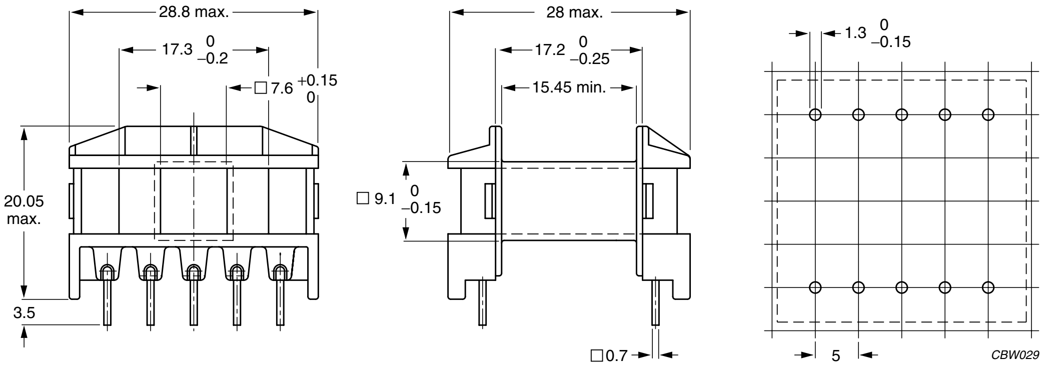
Fig.2 E25/13/7 coil former; 6-pins.

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

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



Dimensions in mm.

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

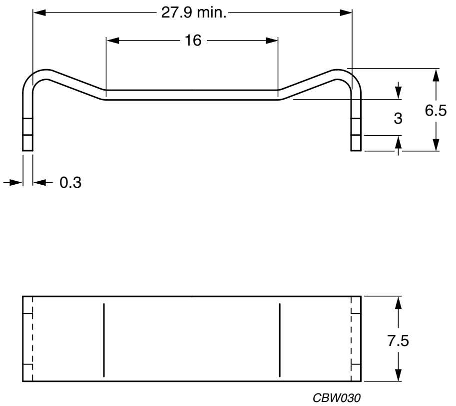
Winding data for 10-pins E25/13/7 coil former

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

MOUNTING PARTS

General data for mounting parts

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



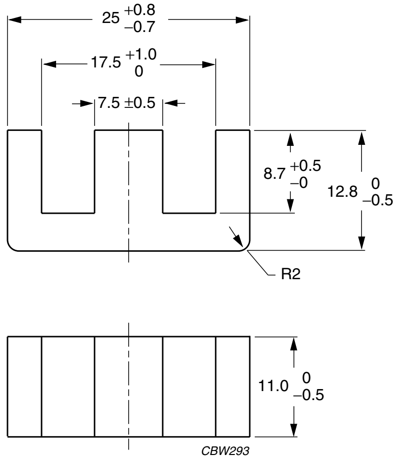
Dimensions in mm.

Fig.4 Clip: E25/13/7.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E25/13/11 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%(1)	≈ 37	≈ 1400	E25/13/11-3C90-E63
	100 ±8%(1)	≈ 58	≈ 740	E25/13/11-3C90-E100
	160 ±8%	≈ 93	≈ 790	E25/13/11-3C90-A160
	250 ±15%	≈ 146	≈ 450	E25/13/11-3C90-A250
	315 ±15%	≈ 184	≈ 340	E25/13/11-3C90-A315
	2800 ±25%	≈ 1630	≈ 0	E25/13/11-3C90
3C94 des	2800 ±25%	≈ 1630	≈ 0	E25/13/11-3C94
3C96 prot	2700 ±25%	≈ 1580	≈ 0	E25/13/11-3C96
3F3	63 ±5%(1)	≈ 37	≈ 1400	E25/13/11-3F3-E63
	100 ±8%(1)	≈ 58	≈ 740	E25/13/11-3F3-E100
	160 ±8%	≈ 93	≈ 790	E25/13/11-3F3-A160
	250 ±15%	≈ 146	≈ 450	E25/13/11-3F3-A250
	315 ±15%	≈ 184	≈ 340	E25/13/11-3F3-A315
	2700 ±25%	≈ 1580	≈ 0	E25/13/11-3F3
3F35 prot	2000 ±25%	≈ 1170	≈ 0	E25/13/11-3F35

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 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 = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.55	≤ 0.55	–	–
3C94	≥330	–	≤ 0.42	≤ 2.4	–
3C96	≥340	–	≤ 0.33	≤ 1.9	–
3F3	≥320	–	≤ 0.55	–	≤ 0.95
3F35	≥300	–	–	–	–

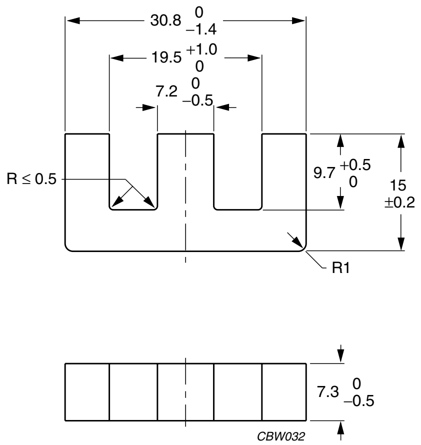
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.7	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.6	≤ 4.7	–	–

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E30/15/7 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 89	≈ 550	E30/15/7-3C81-E100
	160 ±5%	≈142	≈ 580	E30/15/7-3C81-A160
	250 ±5%	≈ 222	≈ 330	E30/15/7-3C81-A250
	315 ±5%	≈ 280	≈ 240	E30/15/7-3C81-A315
	400 ±8%	≈ 355	≈ 180	E30/15/7-3C81-A400
	630 ±15%	≈ 560	≈ 100	E30/15/7-3C81-A630
	2500 ±25%	≈ 2220	≈ 0	E30/15/7-3C81
3C90	100 ±5%(1)	≈ 89	≈ 550	E30/15/7-3C90-E100
	160 ±5%	≈142	≈ 580	E30/15/7-3C90-A160
	250 ±5%	≈ 222	≈ 330	E30/15/7-3C90-A250
	315 ±5%	≈ 280	≈ 240	E30/15/7-3C90-A315
	400 ±8%	≈ 355	≈ 180	E30/15/7-3C90-A400
	630 ±15%	≈ 560	≈ 100	E30/15/7-3C90-A630
	1900 ±25%	≈ 1690	≈ 0	E30/15/7-3C90
3C91 prot	2500 ±25%	≈ 2220	≈ 0	E30/15/7-3C91
3C94 des	1900 ±25%	≈ 1690	≈ 0	E30/15/7-3C94
3C96 prot	1600 ±25%	≈ 1420	≈ 0	E30/15/7-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%[1]	≈ 89	≈ 550	E30/15/7-3F3-E100
	160 ±5%	≈142	≈ 580	E30/15/7-3F3-A160
	250 ±5%	≈ 222	≈ 330	E30/15/7-3F3-A250
	315 ±5%	≈ 280	≈ 240	E30/15/7-3F3-A315
	400 ±8%	≈ 355	≈ 180	E30/15/7-3F3-A400
	630 ±15%	≈ 560	≈ 100	E30/15/7-3F3-A630
	1600 ±25%	≈1420	≈ 0	E30/15/7-3F3
3F35 prot	1250 ±25%	≈1110	≈ 0	E30/15/7-3F35

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	3300 ±25%	≈ 2930	≈ 0	E30/15/7-3C11
3E27	4100 ±25%	≈ 3640	≈ 0	E30/15/7-3E27

E cores and accessories E30/15/7

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.82	–	–	–
3C90	≥330	≤ 0.45	≤ 0.48	–	–
3C91	≥320	–	≤ 0.27(1)	≤ 1.6(1)	–
3C94	≥330	–	≤ 0.36	≤ 2.0	–
3C96	≥340	–	≤ 0.27	≤ 1.6	–
3F3	≥320	–	≤ 0.47	–	≤ 0.80
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.5	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.54	≤ 4.2	–	–

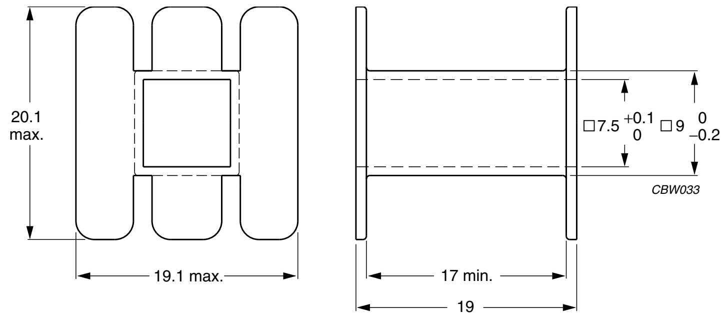
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

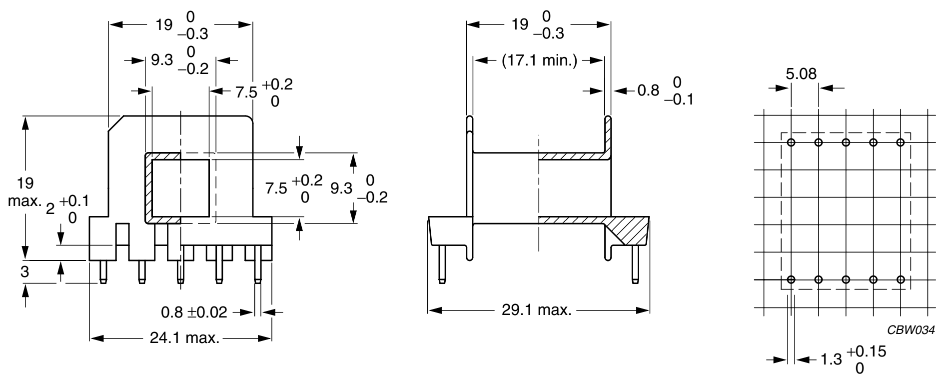
Fig.2 E30/15/7 coil former.

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

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80	17.0	56	CP-E30/15/7-1S

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

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



Dimensions in mm.

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

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

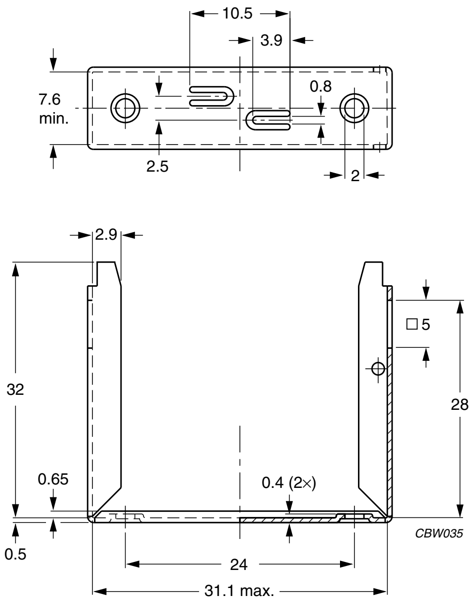
NUMBER OF NECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80	17.1	56	CSH-E30/7-1S-10P

E cores and accessories E30/15/7

MOUNTING PARTS

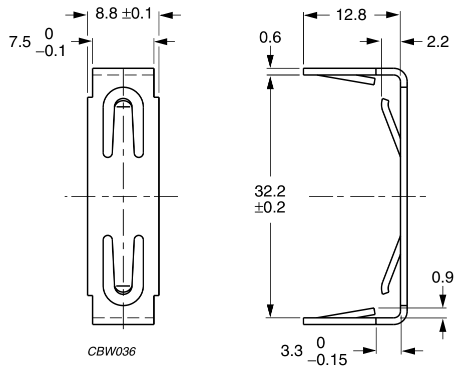
General data and ordering information

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



Dimensions in mm.

Fig.4 E30/15/7 clasp.



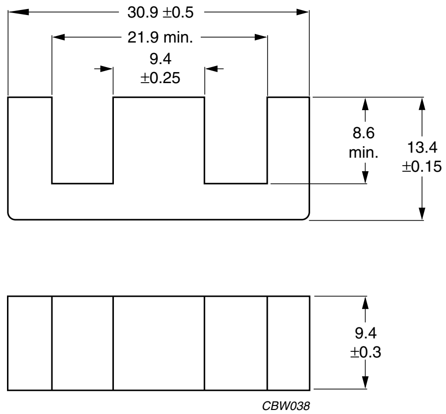
Dimensions in mm.

Fig.5 E30/15/7 spring.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E31/13/9 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 59	≈ 780	E31/13/9-3C81-E100
	160 ±5%(1)	≈ 95	≈ 420	E31/13/9-3C81-E160
	250 ±5%	≈ 148	≈ 480	E31/13/9-3C81-A250
	315 ±5%	≈ 186	≈ 360	E31/13/9-3C81-A315
	400 ±8%	≈ 237	≈ 270	E31/13/9-3C81-A400
	630 ±15%	≈ 373	≈ 150	E31/13/9-3C81-A630
	3735 ±25%	≈ 2210	≈ 0	E31/13/9-3C81
3C90	100 ±5%(1)	≈ 59	≈ 780	E31/13/9-3C90-E100
	160 ±5%(1)	≈ 95	≈ 420	E31/13/9-3C90-E160
	250 ±5%	≈ 148	≈ 480	E31/13/9-3C90-A250
	315 ±5%	≈ 186	≈ 360	E31/13/9-3C90-A315
	400 ±8%	≈ 237	≈ 270	E31/13/9-3C90-A400
	630 ±15%	≈ 373	≈ 150	E31/13/9-3C90-A630
	2970 ±25%	≈1760	≈ 0	E31/13/9-3C90
3C91 prot	3735 ±25%	≈ 2210	≈ 0	E31/13/9-3C91
3C94 des	2970 ±25%	≈ 1760	≈ 0	E31/13/9-3C94
3C96 prot	2650 ±25%	≈ 1570	≈ 0	E31/13/9-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%[1]	≈ 59	≈ 780	E31/13/9-3F3-E100
	160 ±5%[1]	≈ 95	≈ 420	E31/13/9-3F3-E160
	250 ±5%	≈ 148	≈ 480	E31/13/9-3F3-A250
	315 ±5%	≈ 186	≈ 360	E31/13/9-3F3-A315
	400 ±8%	≈ 237	≈ 270	E31/13/9-3F3-A400
	630 ±15%	≈ 373	≈ 150	E31/13/9-3F3-A630
	2650 ±25%	≈ 1570	≈ 0	E31/13/9-3F3
3F35 prot	1950 ±25%	≈ 1150	≈ 0	E31/13/9-3F35

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	6790 ±25%	≈ 4020	≈ 0	E31/13/9-3E27

E cores and accessories E31/13/9

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤ 1.1	–	–	–
3C90	≥320	≤ 0.52	≤ 0.58	–	–
3C91	≥320	–	≤ 0.35[1]	≤ 2.1[1]	–
3C94	≥320	–	≤ 0.46	≤ 2.6	–
3C96	≥340	–	≤ 0.35	≤ 2.1	–
3F3	≥320	–	≤ 0.57	–	≤ 0.98
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C**	**f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C**	**f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C**
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 1.9	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.7	≤ 5.4	–	–

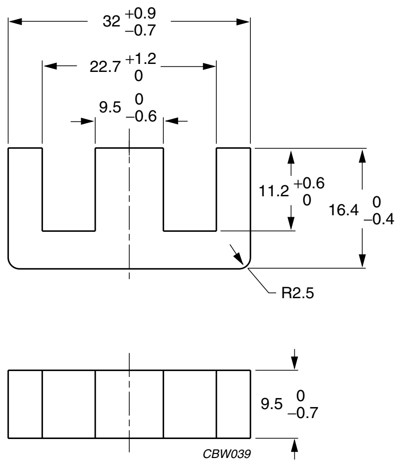
Note

1. Measured at 60 °C.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E32/16/9 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 71	≈ 800	E32/16/9-3C90-E100
	160 ±5%(1)	≈ 114	≈ 430	E32/16/9-3C90-E160
	250 ±5%	≈ 177	≈ 480	E32/16/9-3C90-A250
	315 ±5%	≈ 223	≈ 360	E32/16/9-3C90-A315
	400 ±8%	≈ 284	≈ 260	E32/16/9-3C90-A400
	630 ±15%	≈ 447	≈ 150	E32/16/9-3C90-A630
	2500 ±25%	≈ 1770	≈ 0	E32/16/9-3C90
3C94 des	2500 ±25%	≈ 1770	≈ 0	E32/16/9-3C94
3C96 prot	2300 ±25%	≈ 1630	≈ 0	E32/16/9-3C96
3F3	100 ±5%(1)	≈ 71	≈ 800	E32/16/9-3F3-E100
	160 ±5%(1)	≈ 114	≈ 430	E32/16/9-3F3-E160
	250 ±5%	≈ 177	≈ 480	E32/16/9-3F3-A250
	315 ±5%	≈ 223	≈ 360	E32/16/9-3F3-A315
	400 ±8%	≈ 284	≈ 260	E32/16/9-3F3-A400
	630 ±15%	≈ 447	≈ 150	E32/16/9-3F3-A630
	2300 ±25%	≈ 1630	≈ 0	E32/16/9-3F3
3F35 prot	1700 ±25%	≈ 1210	≈ 0	E32/16/9-3F35

Core halves of high permeability grades

Clamping force for A_L measurements 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	4000 ±25%	≈ 2840	≈ 0	E32/16/9-3C11
3E27	5000 ±25%	≈ 3550	≈ 0	E32/16/9-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.65	≤ 0.7	–	–
3C94	≥330	–	≤ 0.55	≤ 3.2	–
3C96	≥340	–	≤ 0.43	≤ 2.5	–
3F3	≥320	–	≤ 0.75	–	≤ 1.3
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 2.3	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.83	≤ 6.5	–	–

COIL FORMER

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

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

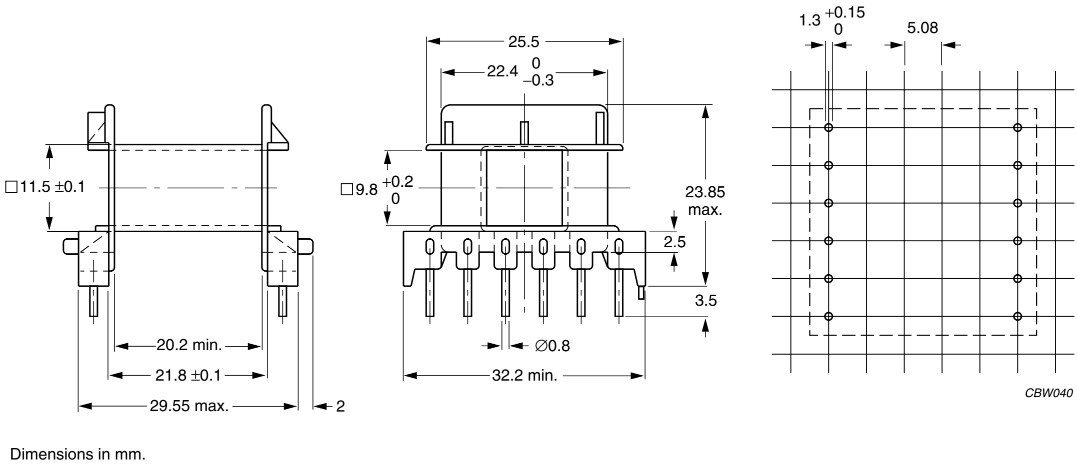


Fig.2 E32/16/9 coil former; 12-pins.

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	20.2	60	CPH-E32/16/9-1S-12P

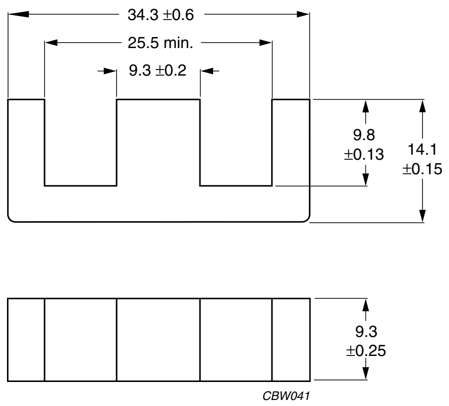
E cores and accessories

E34/14/9 (E375)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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
A_{min}	minimum area	80.7	mm^2
m	mass of core half	≈ 14	g



Dimensions in mm.

Fig.1 E34/14/9 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 68	≈ 760	E34/14/9-3C81-E100
	160 ±5%(1)	≈ 109	≈ 410	E34/14/9-3C81-E160
	250 ±5%	≈ 171	≈ 460	E34/14/9-3C81-A250
	315 ±5%	≈ 215	≈ 350	E34/14/9-3C81-A315
	400 ±8%	≈ 273	≈ 260	E34/14/9-3C81-A400
	630 ±15%	≈ 431	≈ 140	E34/14/9-3C81-A630
	3200 ±25%	≈ 2190	≈ 0	E34/14/9-3C81
3C90	100 ±5%(1)	≈ 68	≈ 760	E34/14/9-3C90-E100
	160 ±5%(1)	≈ 109	≈ 410	E34/14/9-3C90-E160
	250 ±5%	≈ 171	≈ 460	E34/14/9-3C90-A250
	315 ±5%	≈ 215	≈ 350	E34/14/9-3C90-A315
	400 ±8%	≈ 273	≈ 260	E34/14/9-3C90-A400
	630 ±15%	≈ 431	≈ 140	E34/14/9-3C90-A630
	2440 ±25%	≈ 1670	≈ 0	E34/14/9-3C90
3C91 prot	3200 ±25%	≈ 2190	≈ 0	E34/14/9-3C91
3C94 des	2440 ±25%	≈ 1760	≈ 0	E34/14/9-3C94
3C96 prot	2125 ±25%	≈ 1450	≈ 0	E34/14/9-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 68	≈ 760	E34/14/9-3F3-E100
	160 ±5%(1)	≈ 109	≈ 410	E34/14/9-3F3-E160
	250 ±5%	≈ 171	≈ 460	E34/14/9-3F3-A250
	315 ±5%	≈ 215	≈ 350	E34/14/9-3F3-A315
	400 ±8%	≈ 273	≈ 260	E34/14/9-3F3-A400
	630 ±15%	≈ 431	≈ 140	E34/14/9-3F3-A630
	2125 ±25%	≈ 1450	≈ 0	E34/14/9-3F3
3F35 prot	1680 ±25%	≈ 1150	≈ 0	E34/14/9-3F35

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	4700 ±25%	≈ 3200	≈ 0	E34/14/9-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.2	–	–	–
3C90	≥320	≤ 0.56	≤ 0.63	–	–
3C91	≥320	–	≤ 0.38[(1)]	≤ 2.3[(1)]	–
3C94	≥320	–	≤ 0.5	≤ 2.9	–
3C96	≥340	–	≤ 0.38	≤ 2.3	–
3F3	≥320	–	≤ 0.62	–	≤ 1.1
3F35	≥300	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 2.1	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.75	≤ 5.9	–	–

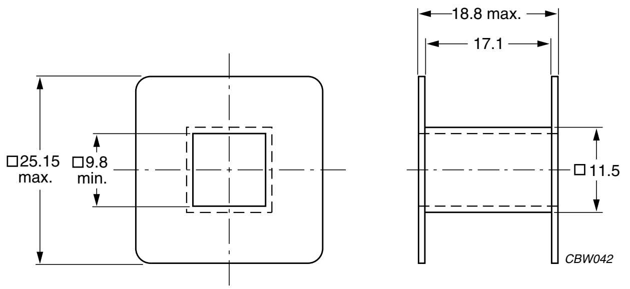
Note

1. Measured at 60 °C.

COIL FORMERS

General data for E34/14/9 coil former

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



Dimensions in mm.

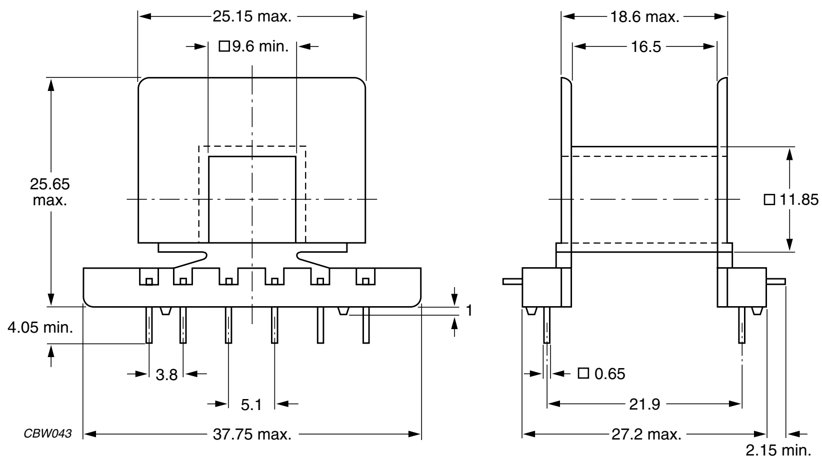
Fig.2 E34/14/9 coil former.

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

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

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

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



Dimensions in mm.

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

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

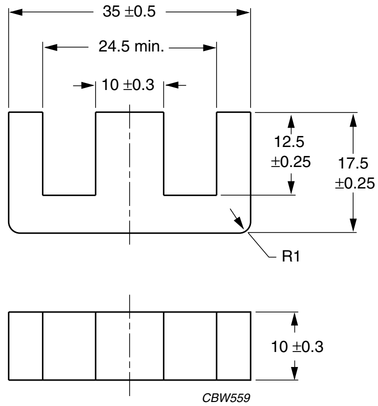
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	102	16.5	69.0	CPH-E34/14/9-1S-12PD

E cores and accessories E35/18/10

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E35/18/10 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 30 ±15 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 64	≈ 1000	E35/18/10-3C90-E100
	160 ±5%(1)	≈ 103	≈ 530	E35/18/10-3C90-E160
	250 ±5%	≈ 161	≈ 590	E35/18/10-3C90-A250
	315 ±5%	≈ 202	≈ 440	E35/18/10-3C90-A315
	400 ±8%	≈ 257	≈ 330	E35/18/10-3C90-A400
	630 ±15%	≈ 405	≈ 180	E35/18/10-3C90-A630
	2500 ±25%	≈ 1610	≈ 0	E35/18/10-3C90

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 30 ±15 N.

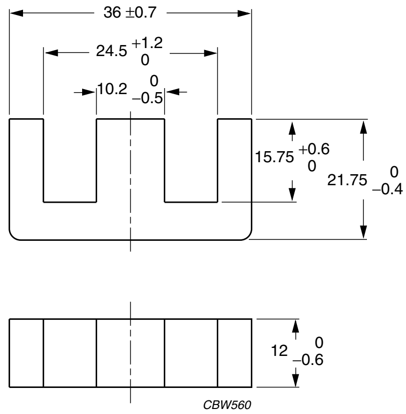
Properties of core sets under power conditions

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
3C90	≥330	≤ 0.95	≤ 1.1

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E36/21/12 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%[1]	≈ 61	≈ 1360	E36/21/12-3C90-E100
	160 ±5%[1]	≈ 97	≈ 700	E36/21/12-3C90-E160
	250 ±5%	≈ 152	≈ 770	E36/21/12-3C90-A250
	315 ±5%	≈ 191	≈ 570	E36/21/12-3C90-A315
	400 ±8%	≈ 243	≈ 420	E36/21/12-3C90-A400
	630 ±15%	≈ 382	≈ 230	E36/21/12-3C90-A630
	2650 ±25%	≈ 1610	≈ 0	E36/21/12-3C90

Note

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

Properties of core sets under power conditions

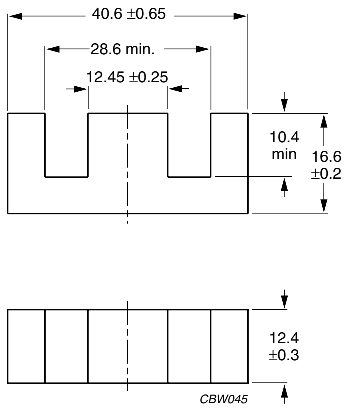
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤ 1.4	≤ 1.5

E cores and accessories E41/17/12

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E41/17/12 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 41	≈ 1500	E41/17/12-3C81-E100
	160 ±5%(1)	≈ 66	≈ 810	E41/17/12-3C81-E160
	250 ±5%(1)	≈ 103	≈ 460	E41/17/12-3C81-E250
	315 ±5%	≈ 130	≈ 690	E41/17/12-3C81-A315
	400 ±8%	≈ 164	≈ 520	E41/17/12-3C81-A400
	630 ±15%	≈ 259	≈ 300	E41/17/12-3C81-A630
	5370 ±25%	≈ 2210	≈ 0	E41/17/12-3C81
3C90	100 ±5%(1)	≈ 41	≈ 1500	E41/17/12-3C90-E100
	160 ±5%(1)	≈ 66	≈ 810	E41/17/12-3C90-E160
	250 ±5%(1)	≈ 103	≈ 460	E41/17/12-3C90-E250
	315 ±5%	≈ 130	≈ 690	E41/17/12-3C90-A315
	400 ±8%	≈ 164	≈ 520	E41/17/12-3C90-A400
	630 ±15%	≈ 259	≈ 300	E41/17/12-3C90-A630
	4100 ±25%	≈ 1670	≈ 0	E41/17/12-3C90
3C91 prot	5370 ±25%	≈ 2210	≈ 0	E41/17/12-3C91
3C94 des	4100 ±25%	≈ 1670	≈ 0	E41/17/12-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 41	≈ 1500	E41/17/12-3F3-E100
	160 ±5%(1)	≈ 66	≈ 810	E41/17/12-3F3-E160
	250 ±5%(1)	≈ 103	≈ 460	E41/17/12-3F3-E250
	315 ±5%	≈ 130	≈ 690	E41/17/12-3F3-A315
	400 ±8%	≈ 164	≈ 520	E41/17/12-3F3-A400
	630 ±15%	≈ 259	≈ 300	E41/17/12-3F3-A630
	3575 ±25%	≈ 1470	≈ 0	E41/17/12-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 2.4	–	–	–
3C90	≥320	≤ 1.3	≤ 1.45	–	–
3C91	≥320	–	≤ 0.85(1)	≤ 5.1(1)	–
3C94	≥320	–	≤ 1.1	≤ 6.4	–
3F3	≥320	–	≤ 1.4	–	≤ 2.2

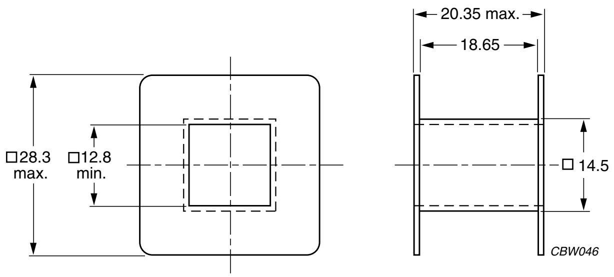
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

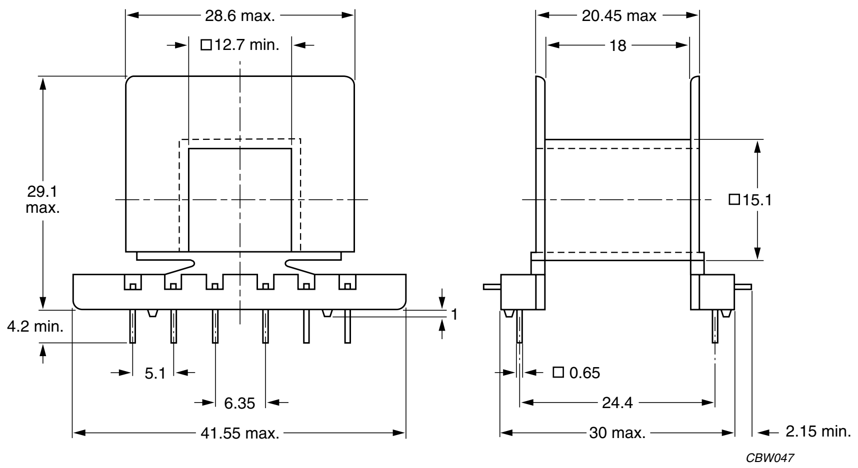
Fig.2 E41/17/12 coil former.

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

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



Dimensions in mm.

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

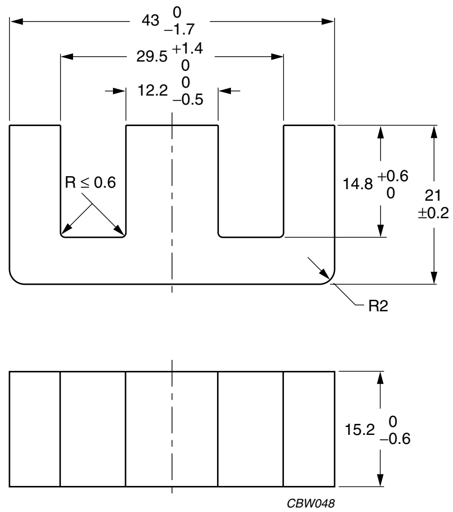
Winding data for 12-pins E41/17/12 coil former

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

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E42/21/15 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 43	≈ 1980	E42/21/15-3C81-E100
	160 ±5%(1)	≈ 69	≈ 1030	E42/21/15-3C81-E160
	250 ±5%(1)	≈ 108	≈ 570	E42/21/15-3C81-E250
	315 ±5%	≈ 137	≈ 850	E42/21/15-3C81-A315
	400 ±8%	≈ 173	≈ 630	E42/21/15-3C81-A400
	630 ±15%	≈ 273	≈ 360	E42/21/15-3C81-A630
	5300 ±25%	≈ 2300	≈ 0	E42/21/15-3C81
3C90	100 ±5%(1)	≈ 43	≈ 1980	E42/21/15-3C90-E100
	160 ±5%(1)	≈ 69	≈ 1030	E42/21/15-3C90-E160
	250 ±5%(1)	≈ 108	≈ 570	E42/21/15-3C90-E250
	315 ±5%	≈ 137	≈ 850	E42/21/15-3C90-A315
	400 ±8%	≈ 173	≈ 630	E42/21/15-3C90-A400
	630 ±15%	≈ 273	≈ 360	E42/21/15-3C90-A630
	3950 ±25%	≈ 1710	≈ 0	E42/21/15-3C90
3C91 prot	5300 ±25%	≈ 2300	≈ 0	E42/21/15-3C91
3C94 des	4100 ±25%	≈ 1780	≈ 0	E42/21/15-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 43	≈ 1980	E42/21/15-3F3-E100
	160 ±5%(1)	≈ 69	≈ 1030	E42/21/15-3F3-E160
	250 ±5%(1)	≈ 108	≈ 570	E42/21/15-3F3-E250
	315 ±5%	≈ 137	≈ 850	E42/21/15-3F3-A315
	400 ±8%	≈ 173	≈ 630	E42/21/15-3F3-A400
	630 ±15%	≈ 273	≈ 360	E42/21/15-3F3-A630
	3600 ±25%	≈ 1560	≈ 0	E42/21/15-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	8000 ±25%	≈ 3470	≈ 0	E42/21/15-3C11
3E27	8000 ±25%	≈ 3470	≈ 0	E42/21/15-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 3.6	–	–	–
3C90	≥320	≤ 1.9	≤ 2.2	–	–
3C91	≥320	–	≤ 1.3(1)	≤ 7.0(1)	–
3C94	≥320	–	≤ 1.7	≤ 8.8	–
3F3	≥320	–	≤ 2.2	–	≤ 3.8

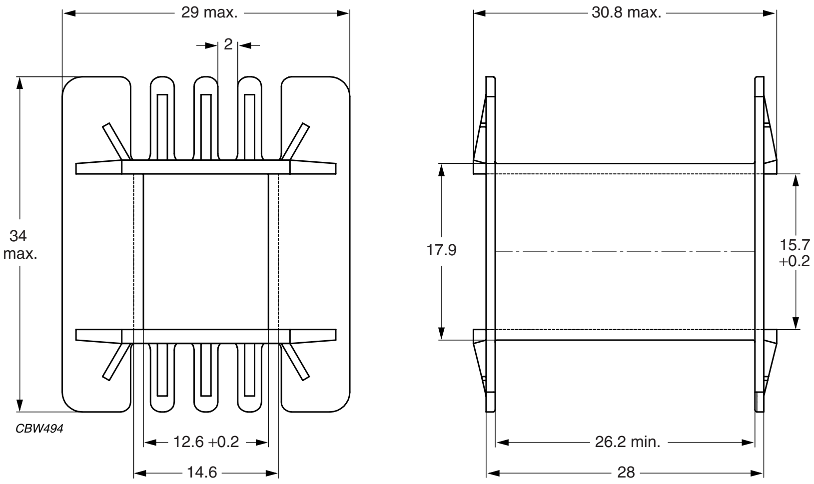
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

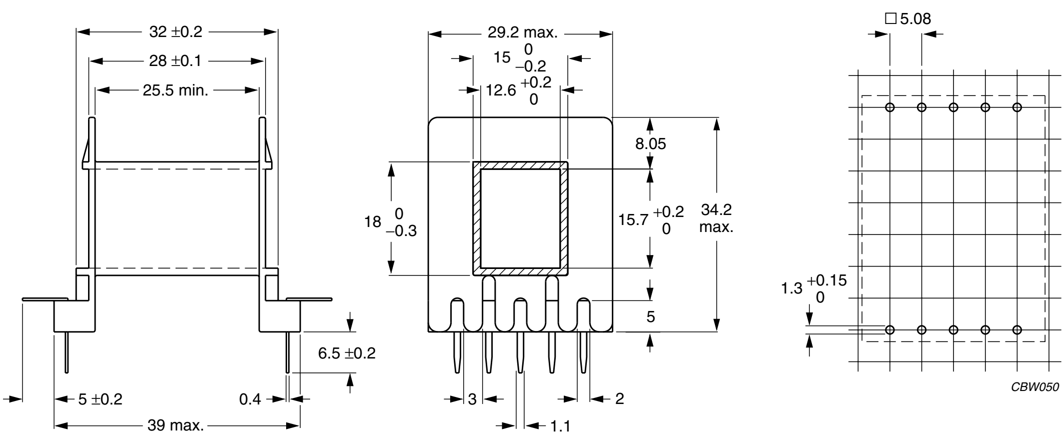
Fig.2 E42/21/15 coil former.

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

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	178	26.2	93	CP-E42/21/15-1S

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

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



Dimensions in mm.

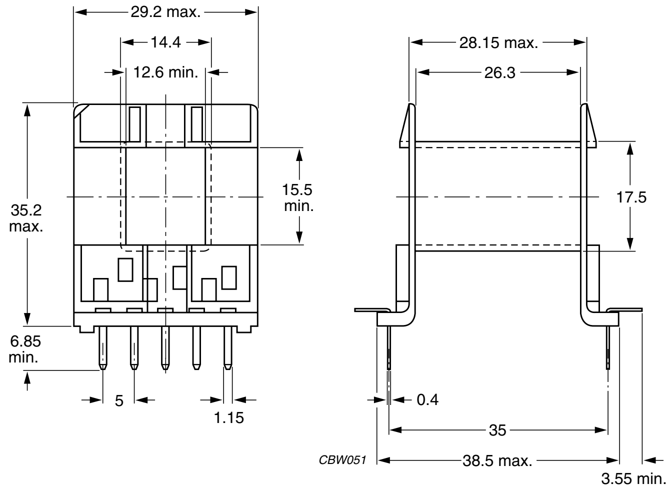
Fig.3 E42/21/15 coil former; 10-pins.

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

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

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

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



Dimensions in mm.

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

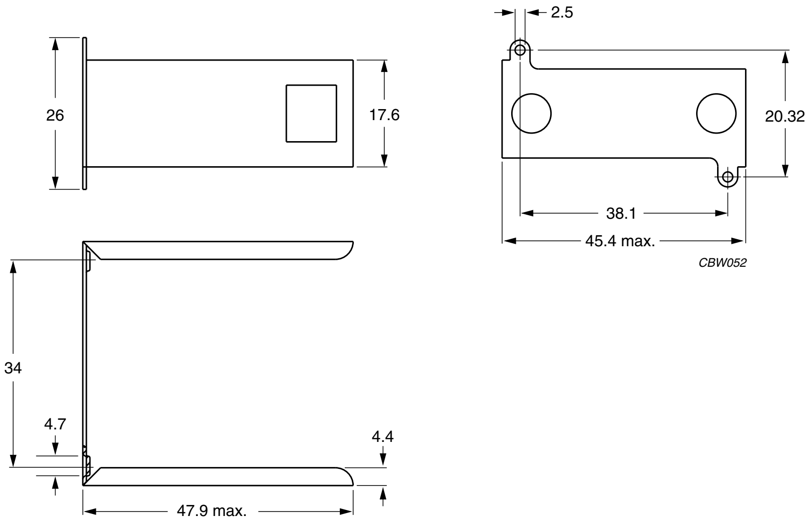
Winding data for 10-pins E42/21/15 coil former

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

MOUNTING PARTS

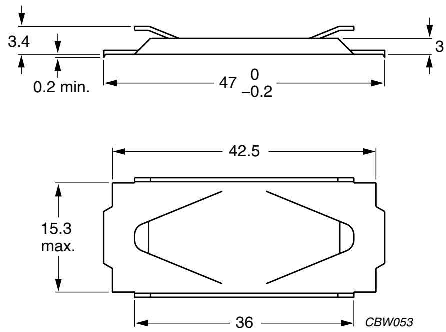
General data for mounting parts

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



Dimensions in mm.

Fig.5 E42/21/15 clasp.



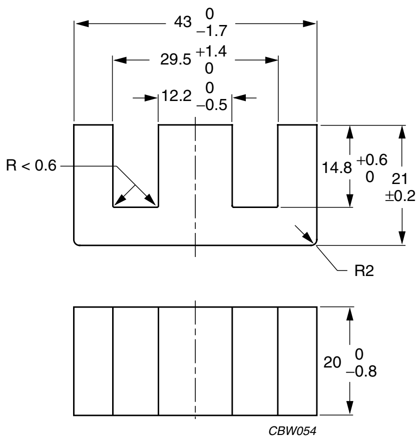
Dimensions in mm.

Fig.6 E42/21/15 spring.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E42/21/20 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 33	≈ 2660	E42/21/20-3C81-E100
	160 ±5%(1)	≈ 53	≈ 1400	E42/21/20-3C81-E160
	250 ±5%(1)	≈ 83	≈ 770	E42/21/20-3C81-E250
	315 ±5%(1)	≈ 104	≈ 580	E42/21/20-3C81-E315
	400 ±8%	≈ 133	≈ 850	E42/21/20-3C81-A400
	630 ±15%	≈ 209	≈ 490	E42/21/20-3C81-A630
	6950 ±25%	≈ 2300	≈ 0	E42/21/20-3C81
3C90	100 ±5%(1)	≈ 33	≈ 2660	E42/21/20-3C90-E100
	160 ±5%(1)	≈ 53	≈ 1400	E42/21/20-3C90-E160
	250 ±5%(1)	≈ 83	≈ 770	E42/21/20-3C90-E250
	315 ±5%(1)	≈ 104	≈ 580	E42/21/20-3C90-E315
	400 ±8%	≈ 133	≈ 850	E42/21/20-3C90-A400
	630 ±15%	≈ 209	≈ 490	E42/21/20-3C90-A630
	5000 ±25%	≈ 1660	≈ 0	E42/21/20-3C90
3C91 prot	6950 ±25%	≈ 2300	≈ 0	E42/21/20-3C91
3C94 des	5200 ±25%	≈ 1720	≈ 0	E42/21/20-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 33	≈ 2660	E42/21/20-3F3-E100
	160 ±5%(1)	≈ 53	≈ 1400	E42/21/20-3F3-E160
	250 ±5%(1)	≈ 83	≈ 770	E42/21/20-3F3-E250
	315 ±5%(1)	≈ 104	≈ 580	E42/21/20-3F3-E315
	400 ±8%	≈ 133	≈ 850	E42/21/20-3F3-A400
	630 ±15%	≈ 209	≈ 490	E42/21/20-3F3-A630
	4600 ±25%	≈1520	≈ 0	E42/21/20-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	10500 ±25%	≈ 3480	≈ 0	E42/21/20-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 4.7	–	–	–
3C90	≥320	≤ 2.4	≤ 2.9	–	–
3C91	≥320	–	≤ 1.8(1)	≤ 9.4(1)	–
3C94	≥320	–	≤ 2.3	≤ 12	–
3F3	≥320	–	≤ 2.7	–	≤ 5.0

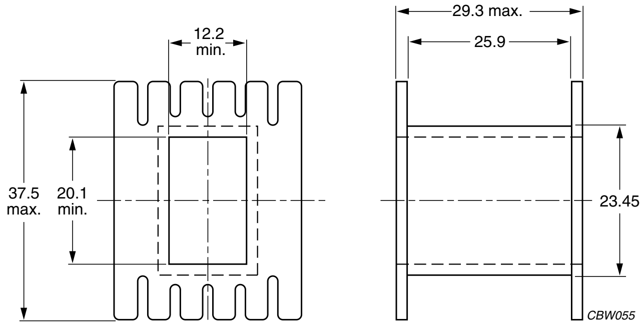
Note

1. Measured at 60 °C.

COIL FORMER

General data for E42/21/20 coil former

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



Dimensions in mm.

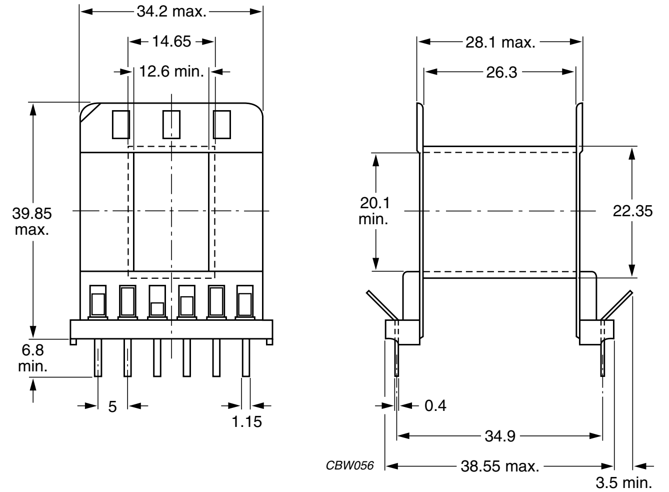
Fig.2 E42/21/20 coil former.

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

NUMBER OF SECTIONS	MINIMUM WINDING AREA (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

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



Dimensions in mm.

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

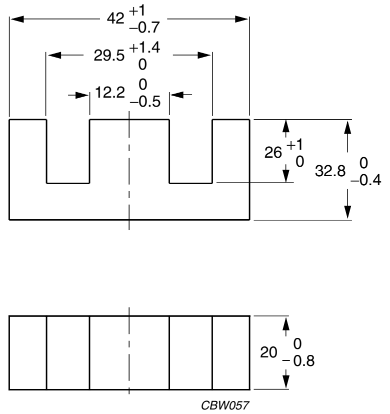
Winding data for 12-pins E42/21/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (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
$\Sigma(I/A)$	core factor (C1)	0.614	mm^{-1}
V_e	effective volume	34200	mm^3
l_e	effective length	145	mm
A_e	effective area	236	mm^2
A_{min}	minimum area	234	mm^2
m	mass of core half	≈ 82	g



Dimensions in mm.

Fig.1 E42/33/20 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 49	≈ 2740	E42/33/20-3C90-E100
	160 ±5%(1)	≈ 78	≈ 1420	E42/33/20-3C90-E160
	250 ±5%(1)	≈ 122	≈ 770	E42/33/20-3C90-E250
	315 ±5%	≈ 154	≈ 1140	E42/33/20-3C90-A315
	400 ±8%	≈ 196	≈ 840	E42/33/20-3C90-A400
	630 ±15%	≈ 308	≈ 470	E42/33/20-3C90-A630
	4000 ±25%	≈ 1960	≈ 0	E42/33/20-3C90
3C94 des	4000 ±25%	≈ 1960	≈ 0	E42/33/20-3C94
3F3	100 ±5%(1)	≈ 49	≈ 2740	E42/33/20-3F3-E100
	160 ±5%(1)	≈ 78	≈ 1420	E42/33/20-3F3-E160
	250 ±5%(1)	≈ 122	≈ 770	E42/33/20-3F3-E250
	315 ±5%	≈ 154	≈ 1140	E42/33/20-3F3-A315
	400 ±8%	≈ 196	≈ 840	E42/33/20-3F3-A400
	630 ±15%	≈ 308	≈ 470	E42/33/20-3F3-A630
	3700 ±25%	≈ 1810	≈ 0	E42/33/20-3F3

Properties of core sets under power conditions

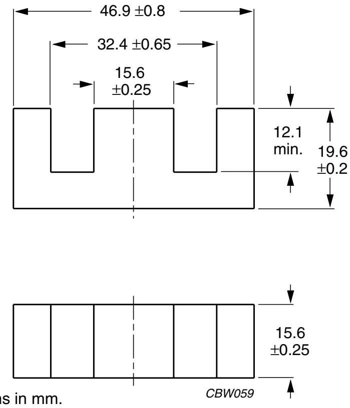
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 3.6	≤ 4.2	–	–
3C94	≥330	–	≤ 3.4	≤ 20	–
3F3	≥320	–	≤ 4.0	–	≤ 7.3

E cores and accessories E47/20/16

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E47/20/16 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 30	≈ 2540	E47/20/16-3C81-E100
	160 ±5%(1)	≈ 48	≈ 1360	E47/20/16-3C81-E160
	250 ±5%(1)	≈ 76	≈ 770	E47/20/16-3C81-E250
	315 ±5%(1)	≈ 95	≈ 570	E47/20/16-3C81-E315
	400 ±8%(1)	≈ 121	≈ 430	E47/20/16-3C81-E400
	630 ±10%	≈ 190	≈ 490	E47/20/16-3C81-A630
	7540 ±25%	≈ 2280	≈ 0	E47/20/16-3C81
3C90	100 ±5%(1)	≈ 30	≈ 2540	E47/20/16-3C90-E100
	160 ±5%(1)	≈ 48	≈ 1360	E47/20/16-3C90-E160
	250 ±5%(1)	≈ 76	≈ 770	E47/20/16-3C90-E250
	315 ±5%(1)	≈ 95	≈ 570	E47/20/16-3C90-E315
	400 ±8%(1)	≈ 121	≈ 430	E47/20/16-3C90-E400
	630 ±10%	≈ 190	≈ 490	E47/20/16-3C90-A630
	5500 ±25%	≈ 1660	≈ 0	E47/20/16-3C90
3C91 prot	7540 ±25%	≈ 2280	≈ 0	E47/20/16-3C91
3C94 des	5600 ±25%	≈ 1690	≈ 0	E47/20/16-3C94

E cores and accessories E47/20/16

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 30	≈ 2540	E47/20/16-3F3-E100
	160 ±5%(1)	≈ 48	≈ 1360	E47/20/16-3F3-E160
	250 ±5%(1)	≈ 76	≈ 770	E47/20/16-3F3-E250
	315 ±5%(1)	≈ 95	≈ 570	E47/20/16-3F3-E315
	400 ±8%(1)	≈ 121	≈ 430	E47/20/16-3F3-E400
	630 ±10%	≈ 190	≈ 490	E47/20/16-3F3-A630
	5100 ±25%	≈ 1540	≈ 0	E47/20/16-3F3

Note

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

Core halves of high permeability grades

Clamping force 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	11475 ±25%	≈ 3470	≈ 0	E47/20/16-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 4.3	–	–	–
3C90	≥320	≤ 2.3	≤ 2.7	–	–
3C91	≥320	–	≤ 1.7(1)	≤ 8.8(1)	–
3C94	≥320	–	≤ 2.1	≤ 11	–
3F3	≥320	–	≤ 2.5	–	≤ 4.0

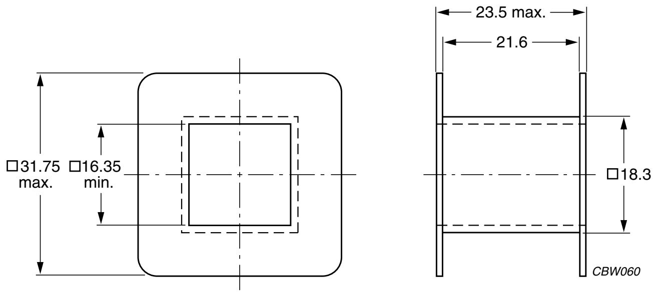
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

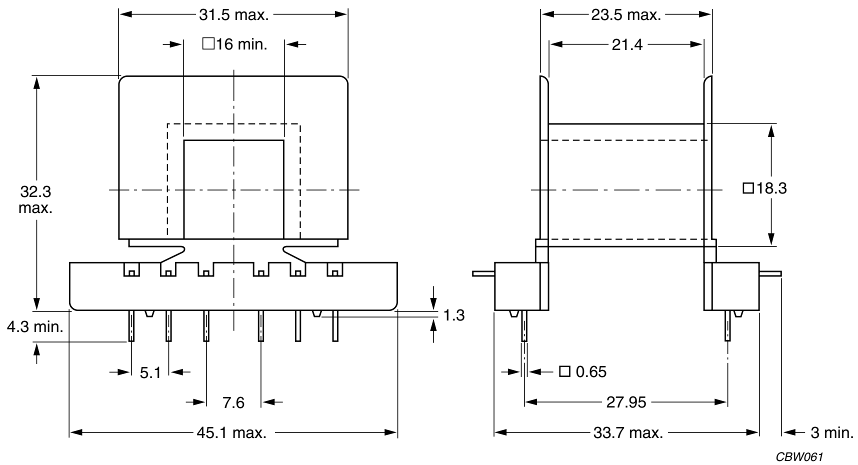
Fig.2 E47/20/16 coil former.

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

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

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

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



Dimensions in mm.

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

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

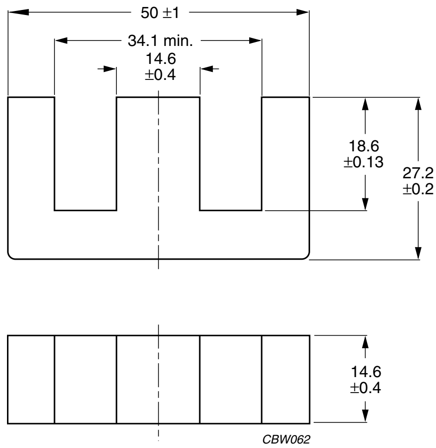
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	131	21.4	94.7	CPH-E47/16-1S-12PD

E cores and accessories E50/27/15

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
A_{min}	minimum area	213	mm^2
m	mass of core half	≈ 68	g



Dimensions in mm.

Fig.1 E50/27/15 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 42	≈ 2700	E50/27/15-3C81-E100
	160 ±5%(1)	≈ 68	≈ 1380	E50/27/15-3C81-E160
	250 ±5%(1)	≈ 106	≈ 750	E50/27/15-3C81-E250
	315 ±5%(1)	≈ 134	≈ 550	E50/27/15-3C81-E315
	400 ±8%(1)	≈ 170	≈ 410	E50/27/15-3C81-E400
	630 ±10%	≈ 267	≈ 460	E50/27/15-3C81-A630
	5500 ±25%	≈ 2330	≈ 0	E50/27/15-3C81
3C90	100 ±5%(1)	≈ 42	≈ 2700	E50/27/15-3C90-E100
	160 ±5%(1)	≈ 68	≈ 1380	E50/27/15-3C90-E160
	250 ±5%(1)	≈ 106	≈ 750	E50/27/15-3C90-E250
	315 ±5%(1)	≈ 134	≈ 550	E50/27/15-3C90-E315
	400 ±8%(1)	≈ 170	≈ 410	E50/27/15-3C90-E400
	630 ±10%	≈ 267	≈ 460	E50/27/15-3C90-A630
	4350 ±25%	≈1850	≈ 0	E50/27/15-3C90
3C91 prot	5500 ±25%	≈ 2330	≈ 0	E50/27/15-3C91
3C94 des	4350 ±25%	≈1850	≈ 0	E50/27/15-3C94

Note

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 5.5	–	–	–
3C90	≥320	≤ 2.7	≤ 3.4	–	–
3C91	≥320	–	≤ 2.1(1)	≤ 12(1)	–
3C94	≥320	–	≤ 2.7	≤ 16	–

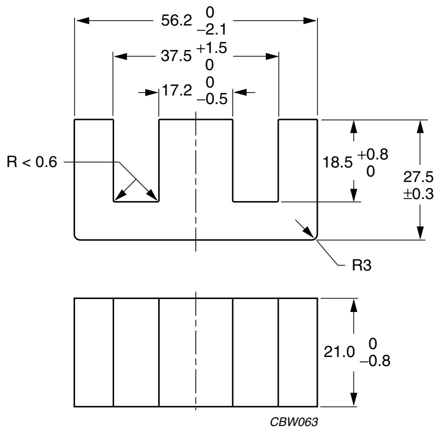
Note

1. Measured at 60 °C.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E55/28/21 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 28	≈ 4370	E55/28/21-3C81-E100
	160 ±5%(1)	≈ 45	≈ 2280	E55/28/21-3C81-E160
	250 ±5%(1)	≈ 70	≈ 1250	E55/28/21-3C81-E250
	315 ±5%(1)	≈ 88	≈ 920	E55/28/21-3C81-E315
	400 ±8%(1)	≈ 112	≈ 680	E55/28/21-3C81-E400
	630 ±10%(1)	≈ 176	≈ 390	E55/28/21-3C81-E630
	8625 ±25%	≈ 2410	≈ 0	E55/28/21-3C81
3C90	100 ±5%(1)	≈ 28	≈ 4370	E55/28/21-3C90-E100
	160 ±5%(1)	≈ 45	≈ 2280	E55/28/21-3C90-E160
	250 ±5%(1)	≈ 70	≈ 1250	E55/28/21-3C90-E250
	315 ±5%(1)	≈ 88	≈ 920	E55/28/21-3C90-E315
	400 ±8%(1)	≈ 112	≈ 680	E55/28/21-3C90-E400
	630 ±10%(1)	≈ 176	≈ 390	E55/28/21-3C90-E630
	6300 ±25%	≈ 1760	≈ 0	E55/28/21-3C90
3C91 prot	8625 ±25%	≈ 2410	≈ 0	E55/28/21-3C91
3C94 des	6400 ±25%	≈ 1790	≈ 0	E55/28/21-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 28	≈ 4370	E55/28/21-3F3-E100
	160 ±5%(1)	≈ 45	≈ 2280	E55/28/21-3F3-E160
	250 ±5%(1)	≈ 70	≈ 1250	E55/28/21-3F3-E250
	315 ±5%(1)	≈ 88	≈ 920	E55/28/21-3F3-E315
	400 ±8%(1)	≈ 112	≈ 680	E55/28/21-3F3-E400
	630 ±10%(1)	≈ 176	≈ 390	E55/28/21-3F3-E630
	5700 ±25%	≈1590	≈ 0	E55/28/21-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	12800 ±25%	≈ 3580	≈ 0	E55/28/21-3C11
3E27	15400 ±25%	≈ 4300	≈ 0	E55/28/21-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 9.0	–	–	–
3C90	≥320	≤ 4.8	≤ 5.9	–	–
3C91	≥320	–	≤ 3.5(1)	≤ 20(1)	–
3C94	≥320	–	≤ 3.8	≤ 27	–
3F3	≥320	–	≤ 5.6	–	≤ 10

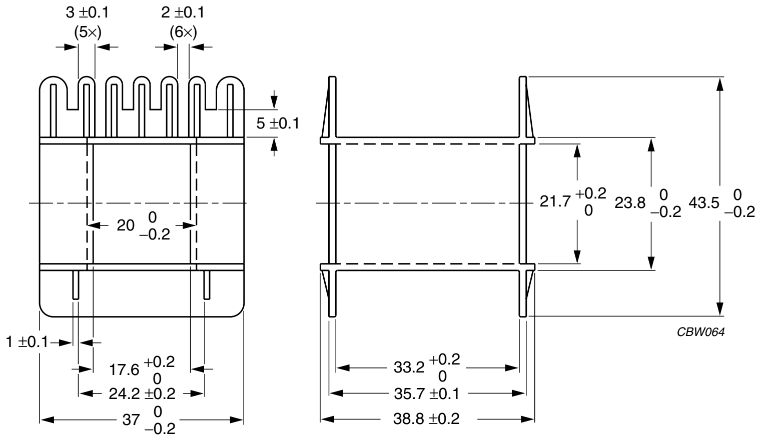
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

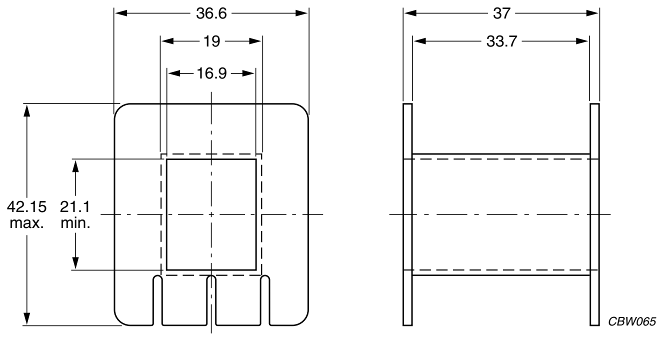
Fig.2 E55/28/21 coil former (E).

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

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

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

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



Dimensions in mm.

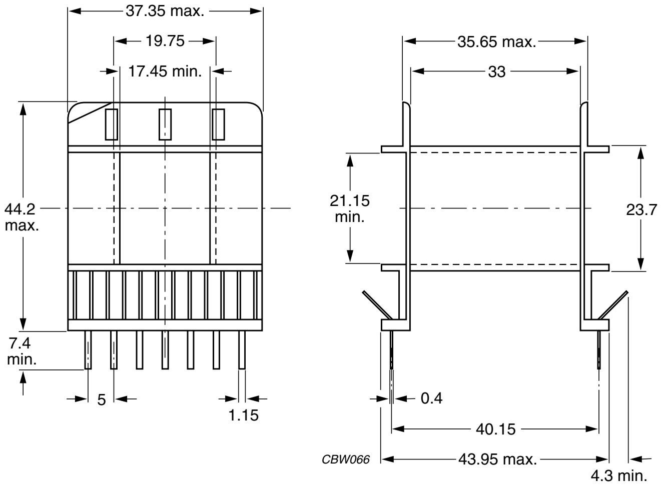
Fig.3 E55/28/21 coil former (A).

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

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

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

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



Dimensions in mm.

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

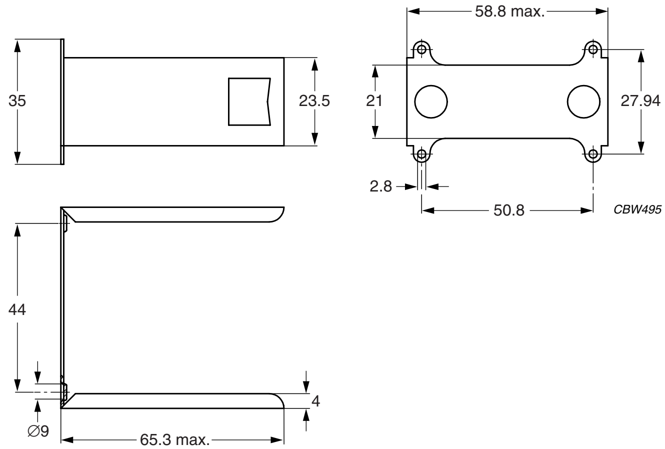
Winding data for 14-pins E55/28/21 coil former

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

MOUNTING PARTS

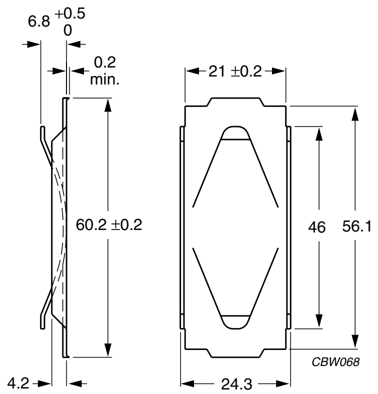
GENERAL DATA FOR MOUNTING PARTS

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



Dimensions in mm.

Fig.5 E55/28/21 clasp.



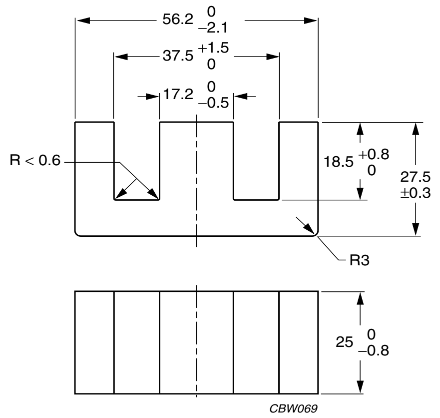
Dimensions in mm.

Fig.6 E55/28/21 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.239	mm^{-1}
V_e	effective volume	52000	mm^3
l_e	effective length	123	mm
A_e	effective area	420	mm^2
A_{min}	minimum area	411	mm^2
m	mass of core half	≈130	g



Dimensions in mm.

Fig.1 E55/28/25 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 23	≈ 5220	E55/28/25-3C90-E100
	160 ±5%(1)	≈ 37	≈ 2760	E55/28/25-3C90-E160
	250 ±5%(1)	≈ 58	≈ 1520	E55/28/25-3C90-E250
	315 ±5%(1)	≈ 73	≈ 1120	E55/28/25-3C90-E315
	400 ±8%(1)	≈ 93	≈ 830	E55/28/25-3C90-E400
	630 ±10%(1)	≈ 147	≈ 470	E55/28/25-3C90-E630
	8000 ±25%	≈ 1860	≈ 0	E55/28/25-3C90
3C94 des	8000 ±25%	≈ 1860	≈ 0	E55/28/25-3C94
3F3	100 ±5%(1)	≈ 23	≈ 5220	E55/28/25-3F3-E100
	160 ±5%(1)	≈ 37	≈ 2760	E55/28/25-3F3-E160
	250 ±5%(1)	≈ 58	≈ 1520	E55/28/25-3F3-E250
	315 ±5%(1)	≈ 73	≈ 1120	E55/28/25-3F3-E315
	400 ±8%(1)	≈ 93	≈ 830	E55/28/25-3F3-E400
	630 ±10%(1)	≈ 147	≈ 470	E55/28/25-3F3-E630
	7400 ±25%	≈ 1730	≈ 0	E55/28/25-3F3

Note

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

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 5.7	≤ 7.3	–	–
3C94	≥330	–	≤ 4.8	≤ 31	–
3F3	≥310	–	≤ 6.6	–	≤ 12.7

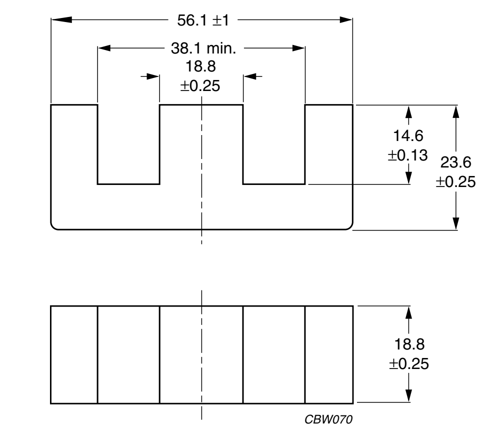
E cores and accessories

E56/24/19 (E75)

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 E56/24/19 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 25	≈ 3890	E56/24/19-3C81-E100
	160 ±5%(1)	≈ 40	≈ 2080	E56/24/19-3C81-E160
	250 ±5%(1)	≈ 63	≈ 1160	E56/24/19-3C81-E250
	315 ±5%(1)	≈ 80	≈ 860	E56/24/19-3C81-E315
	400 ±8%(1)	≈ 101	≈ 640	E56/24/19-3C81-E400
	630 ±10%(1)	≈ 159	≈ 370	E56/24/19-3C81-E630
	9500 ±25%	≈ 2400	≈ 0	E56/24/19-3C81
3C90	100 ±5%(1)	≈ 25	≈ 3890	E56/24/19-3C90-E100
	160 ±5%(1)	≈ 40	≈ 2080	E56/24/19-3C90-E160
	250 ±5%(1)	≈ 63	≈ 1160	E56/24/19-3C90-E250
	315 ±5%(1)	≈ 80	≈ 860	E56/24/19-3C90-E315
	400 ±8%(1)	≈ 101	≈ 640	E56/24/19-3C90-E400
	630 ±10%(1)	≈ 159	≈ 370	E56/24/19-3C90-E630
	6900 ±25%	≈ 1740	≈ 0	E56/24/19-3C90
3C91 prot	9500 ±25%	≈ 2400	≈ 0	E56/24/19-3C91
3C94 des	6900 ±25%	≈ 1740	≈ 0	E56/24/19-3C94

Note

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

E cores and accessories

E56/24/19 (E75)

Core halves of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	14580 ±25%	≈ 3680	≈ 0	E56/24/19-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 7.4	–	–	–
3C90	≥320	≤ 3.6	≤ 4.8	–	–
3C91	≥320	–	≤ 2.7(1)	≤ 16(1)	–
3C94	≥320	–	≤ 3.6	≤ 22	–

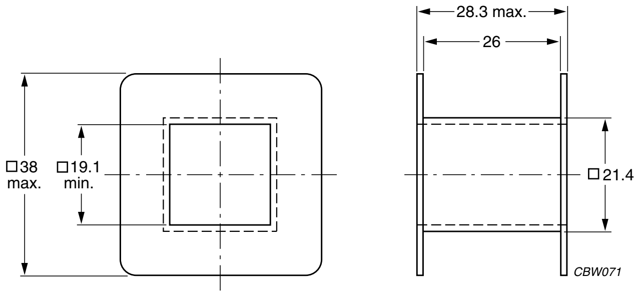
Note

1. Measured at 60 °C.

COIL FORMERS

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

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



Dimensions in mm.

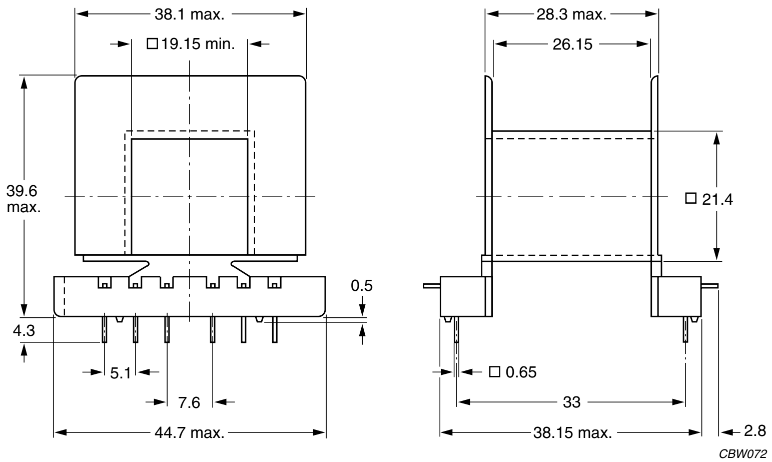
Fig.2 E56/24/19 coil former.

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

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	222	26.1	112	CP-E56/24/19-1S

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

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



Dimensions in mm.

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

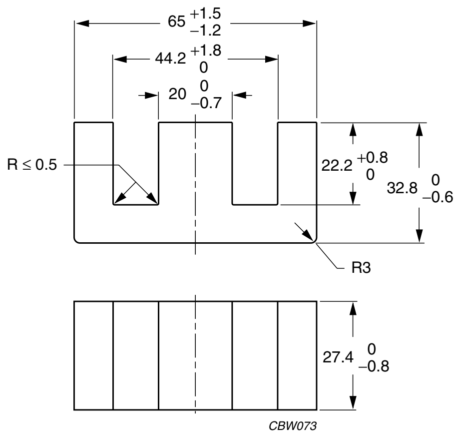
Winding data for 12-pins E56/24/19 coil former

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

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.274	mm^{-1}
V_e	effective volume	79000	mm^3
l_e	effective length	147	mm
A_e	effective area	540	mm^2
A_{min}	minimum area	530	mm^2
m	mass of core half	≈205	g



Dimensions in mm.

Fig.1 E65/32/27 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 22	≈ 7190	E65/32/27-3C90-E100
	160 ±5%(1)	≈ 35	≈ 3780	E65/32/27-3C90-E160
	250 ±5%(1)	≈ 54	≈ 2050	E65/32/27-3C90-E250
	315 ±5%(1)	≈ 68	≈ 1510	E65/32/27-3C90-E315
	400 ±8%(1)	≈ 87	≈ 1100	E65/32/27-3C90-E400
	630 ±10%(1)	≈ 136	≈ 620	E65/32/27-3C90-E630
	8600 ±25%	≈ 1860	≈ 0	E65/32/27-3C90
3C94 des	8600 ±25%	≈ 1860	≈ 0	E65/32/27-3C94
3F3	100 ±5%(1)	≈ 22	≈ 7190	E65/32/27-3F3-E100
	160 ±5%(1)	≈ 35	≈ 3780	E65/32/27-3F3-E160
	250 ±5%(1)	≈ 54	≈ 2050	E65/32/27-3F3-E250
	315 ±5%(1)	≈ 68	≈ 1510	E65/32/27-3F3-E315
	400 ±8%(1)	≈ 87	≈ 1100	E65/32/27-3F3-E400
	630 ±10%(1)	≈ 136	≈ 620	E65/32/27-3F3-E630
	7300 ±25%	≈ 1580	≈ 0	E65/32/27-3F3

Note

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

Core halves of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C11	16700 ±25%	≈ 3620	≈ 0	E65/32/27-3C11

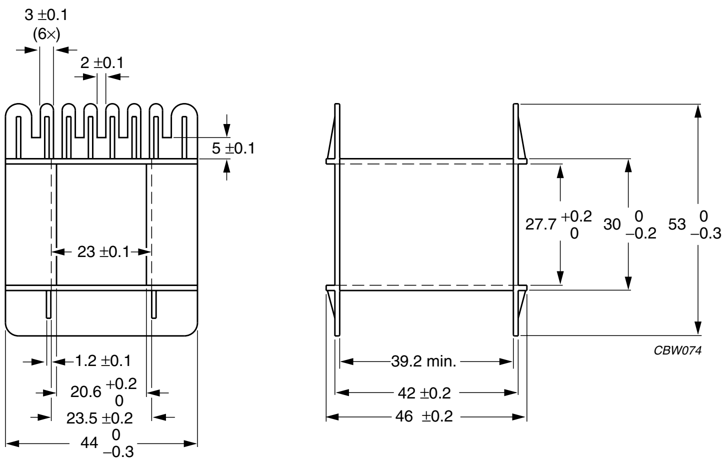
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 9.1	≤ 12	–	–
3C94	≥320	–	≤ 8.5	≤ 47	–
3F3	≥320	–	≤ 10.5	–	≤ 21

COIL FORMER

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

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



Dimensions in mm.

Fig.2 E65/32/27 coil former.

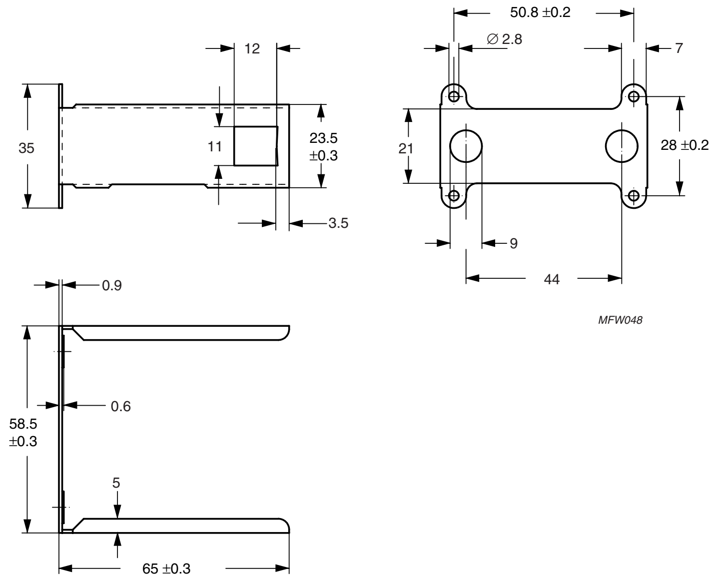
Winding data for E65/32/27 coil former without pins (E)

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	394	39.2	150	CP-E65/32/27-1S

MOUNTING PARTS

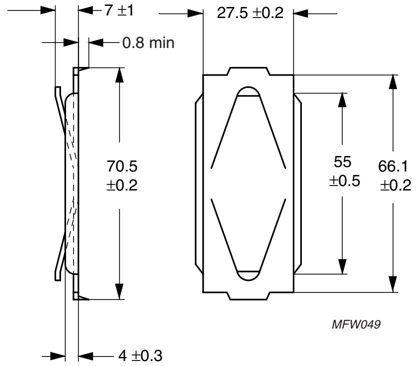
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, zinc (Zn) plated	3	CLA-E65/32/27
Spring	steel, zinc (Zn) plated	4	SPR-E65/32/27



Dimensions in mm.

Fig.3 E65/32/27 clasp.



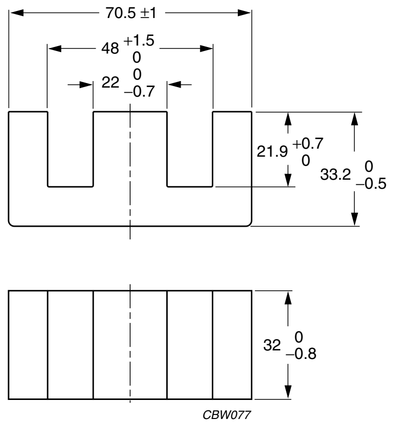
Dimensions in mm.

Fig.4 E65/32/27 spring.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.218	mm^{-1}
V_e	effective volume	102000	mm^3
l_e	effective length	149	mm
A_e	effective area	683	mm^2
A_{min}	minimum area	676	mm^2
m	mass of core half	≈ 260	g



Dimensions in mm.

Fig.1 E71/33/32 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±5%(1)	≈ 17	≈ 8900	E71/33/32-3C90-E100
	160 ±5%(1)	≈ 28	≈ 4810	E71/33/32-3C90-E160
	250 ±5%(1)	≈ 43	≈ 2640	E71/33/32-3C90-E250
	315 ±5%(1)	≈ 55	≈ 1950	E71/33/32-3C90-E315
	400 ±8%(1)	≈ 69	≈ 1430	E71/33/32-3C90-E400
	630 ±10%(1)	≈ 109	≈ 810	E71/33/32-3C90-E630
	10800 ±25%	≈ 1880	≈ 0	E71/33/32-3C90
3C94 des	10800 ±25%	≈ 1880	≈ 0	E71/33/32-3C94
3F3	100 ±5%(1)	≈ 17	≈ 8900	E71/33/32-3F3-E100
	160 ±5%(1)	≈ 28	≈ 4810	E71/33/32-3F3-E160
	250 ±5%(1)	≈ 43	≈ 2640	E71/33/32-3F3-E250
	315 ±5%(1)	≈ 55	≈ 1950	E71/33/32-3F3-E315
	400 ±8%(1)	≈ 69	≈ 1430	E71/33/32-3F3-E400
	630 ±10%(1)	≈ 109	≈ 810	E71/33/32-3F3-E630
	10000 ±25%	≈ 1740	≈ 0	E71/33/32-3F3

Note

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

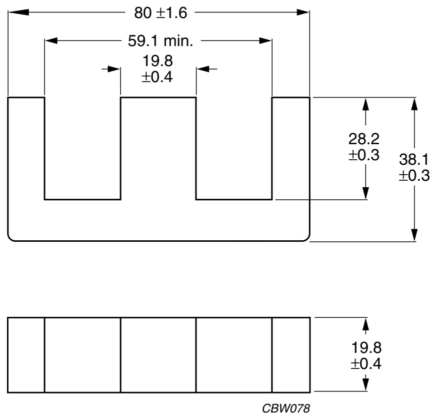
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 12	≤ 16.5	–	–
3C94	≥320	–	≤ 11.5	≤ 60	–
3F3	≥320	–	≤ 14	–	≤ 29

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.470	mm^{-1}
V_e	effective volume	72300	mm^3
l_e	effective length	184	mm
A_e	effective area	392	mm^2
A_{min}	minimum area	392	mm^2
m	mass of core half	≈ 180	g



Dimensions in mm.

Fig.1 E80/38/20 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±5%(1)	≈ 37	≈ 5600	E80/38/20-3C81-E100
	160 ±5%(1)	≈ 60	≈ 2770	E80/38/20-3C81-E160
	250 ±5%(1)	≈ 93	≈ 1450	E80/38/20-3C81-E250
	315 ±5%(1)	≈ 118	≈ 1060	E80/38/20-3C81-E315
	400 ±8%(1)	≈ 149	≈ 770	E80/38/20-3C81-E400
	630 ±10%(1)	≈ 235	≈ 430	E80/38/20-3C81-E630
	6730 ±25%	≈ 2510	≈ 0	E80/38/20-3C81
3C90	100 ±5%(1)	≈ 37	≈ 5600	E80/38/20-3C90-E100
	160 ±5%(1)	≈ 60	≈ 2770	E80/38/20-3C90-E160
	250 ±5%(1)	≈ 93	≈ 1450	E80/38/20-3C90-E250
	315 ±5%(1)	≈ 118	≈ 1060	E80/38/20-3C90-E315
	400 ±8%(1)	≈ 149	≈ 770	E80/38/20-3C90-E400
	630 ±10%(1)	≈ 235	≈ 430	E80/38/20-3C90-E630
	5070 ±25%	≈ 1890	≈ 0	E80/38/20-3C90
3C91 prot	6730 ±25%	≈ 2510	≈ 0	E80/38/20-3C91
3C94 des	5070 ±25%	≈ 1890	≈ 0	E80/38/20-3C94

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5%(1)	≈ 37	≈ 5600	E80/38/20-3F3-E100
	160 ±5%(1)	≈ 60	≈ 2770	E80/38/20-3F3-E160
	250 ±5%(1)	≈ 93	≈ 1450	E80/38/20-3F3-E250
	315 ±5%(1)	≈ 118	≈ 1060	E80/38/20-3F3-E315
	400 ±8%(1)	≈ 149	≈ 770	E80/38/20-3F3-E400
	630 ±10%(1)	≈ 235	≈ 430	E80/38/20-3F3-E630
	4590 ±25%	≈ 1710	≈ 0	E80/38/20-3F3

Note

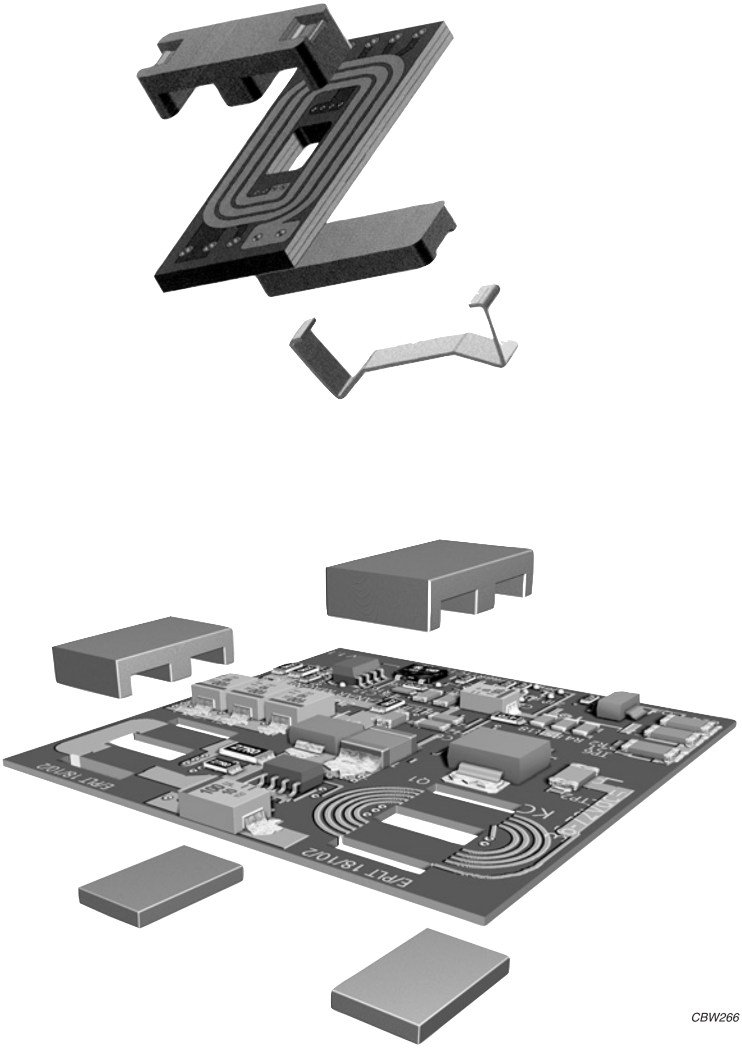
1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 60 ±20 N.

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 14.8	–	–	–
3C90	≥320	≤ 7.2	≤ 10	–	–
3C91	≥320	–	≤ 6.0(1)	≤ 32(1)	–
3C94	≥320	–	≤ 7.5	≤ 45	–

Note

1. Measured at 60 °C.



CBW266

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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Planar E cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
E14/3.5/5	300	14.5	0.6
PLT14/5/1.5	240	14.5	0.5
E14/3.5/5/R	–	–	0.6
PLT14/5/1.5/S	230	14.2	0.5
E18/4/10	960	39.5	2.4
PLT18/10/2	800	39.5	1.7
E18/4/10/R	–	–	2.4
PLT18/10/2/S	830	40.8	1.7
E22/6/16	2550	78.5	6.5
PLT22/16/2.5	2040	78.5	4.0
E22/6/16/R	–	–	6.5
PLT22/16/2.5/S	2100	80.4	4.0
E32/6/20	5380	129	13
PLT32/20/3	4560	129	10
E38/8/25	10200	194	25
PLT38/25/4	8460	194	18
E43/10/28	13900	225	35
PLT43/28/4	11500	225	24
E58/11/38	24600	305	62
PLT58/38/4	20800	305	44
E64/10/50	40700	511	100
PLT64/50/5	35500	511	78

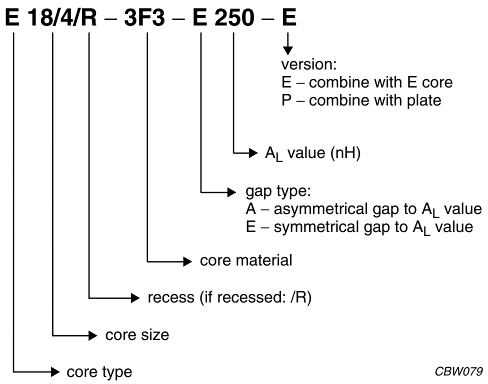


Fig.1 Type number structure for E cores.

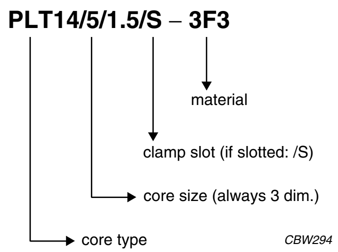


Fig.2 Type number structure for plates.

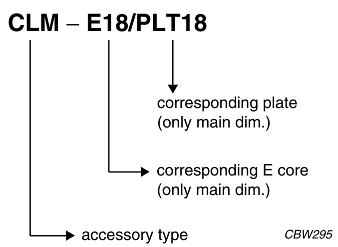
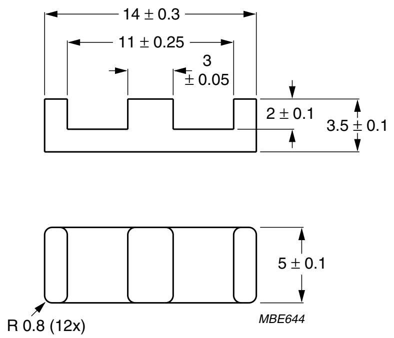


Fig.3 Type number structure for clamps.

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	14.3	mm^2
A_{min}	minimum area	14.3	mm^2
m	mass of core half	≈ 0.6	g



Dimensions in mm.

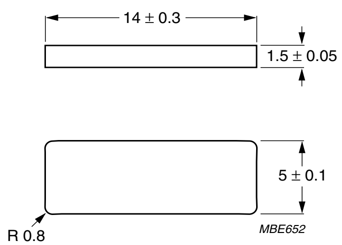
Fig.1 E14/3.5/5 core.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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
A_{min}	minimum area	14.5	mm^2
m	mass of plate	≈ 0.5	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT14/5/1.5-3C90
3C94 des	PLT14/5/1.5-3C94
3C96 prot	PLT14/5/1.5-3C96
3F3	PLT14/5/1.5-3F3
3F35 prot	PLT14/5/1.5-3F35
3F4 des	PLT14/5/1.5-3F4
3E6	PLT14/5/1.5-3E6



Dimensions in mm.

Fig.2 PLT14/5/1.5.

Planar E cores and accessories E14/3.5/5

Core halves for use in combination with an ungapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 10 ±5 N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈ 72	≈ 530	E14/3.5-3C90-A63-E
	100 ±5%	≈ 114	≈ 270	E14/3.5-3C90-A100-E
	160 ±8%	≈ 182	≈ 130	E14/3.5-3C90-A160-E
	1280 ±25%	≈ 1450	≈ 0	E14/3.5/5-3C90
3C94 des	63 ±3%	≈ 72	≈ 530	E14/3.5-3C94-A63-E
	100 ±5%	≈ 114	≈ 270	E14/3.5-3C94-A100-E
	160 ±8%	≈ 182	≈ 130	E14/3.5-3C94-A160-E
	1280 ±25%	≈ 1450	≈ 0	E14/3.5/5-3C94
3C96 prot	1200 ±25%	≈ 1360	≈ 0	E14/3.5/5-3C96
3F3	63 ±3%	≈ 72	≈ 530	E14/3.5-3F3-A63-E
	100 ±5%	≈ 114	≈ 270	E14/3.5-3F3-A100-E
	160 ±8%	≈ 182	≈ 130	E14/3.5-3F3-A160-E
	1100 ±25%	≈ 1250	≈ 0	E14/3.5/5-3F3
3F35 prot	900 ±25%	≈ 1020	≈ 0	E14/3.5/5-3F35
3F4 des	63 ±3%	≈ 72	≈ 530	E14/3.5-3F4-A63-E
	100 ±5%	≈ 114	≈ 270	E14/3.5-3F4-A100-E
	160 ±8%	≈ 182	≈ 130	E14/3.5-3F4-A160-E
	650 ±25%	≈ 740	≈ 0	E14/3.5/5-3F4
3E6	5600 +40/−30%	≈ 6360	≈ 0	E14/3.5/5-3E6

Planar E cores and accessories E14/3.5/5

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

A_L measured in combination with a plate (PLT) clamping force for A_L measurements, 10 ±5 N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈ 58	≈ 600	E14/3.5-3C90-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5-3C90-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5-3C90-A160-P
	1500 ±25%	≈ 1400	≈ 0	E14/3.5/5-3C90
3C94 des	63 ±3%	≈ 58	≈ 600	E14/3.5-3C94-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5-3C94-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5-3C94-A160-P
	1500 ±25%	≈1400	≈ 0	E14/3.5/5-3C94
3C96 prot	1350 ±25%	≈ 1260	≈ 0	E14/3.5/5-3C96
3F3	63 ±3%	≈ 58	≈ 600	E14/3.5-3F3-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5-3F3-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5-3F3-A160-P
	1300 ±25%	≈ 1200	≈ 0	E14/3.5/5-3F3
3F35 prot	1050 ±25%	≈ 980	≈ 0	E14/3.5/5-3F35
3F4 des	63 ±3%	≈ 58	≈ 600	E14/3.5-3F4-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5-3F4-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5-3F4-A160-P
	780 ±25%	≈ 720	≈ 0	E14/3.5/5-3F4
3E6	6400 +40/−30%	≈ 5900	≈ 0	E14/3.5/5-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E14-3C90	≥320	≤ 0.030	–	–
E+PLT14-3C90	≥320	≤ 0.026	–	–
E+E14-3C94	≥320	≤ 0.024	≤ 0.16	–
E+PLT14-3C94	≥320	≤ 0.021	≤ 0.15	–
E+E14-3C96	≥340	≤ 0.019	≤ 0.13	≤ 0.05
E+PLT14-3C96	≥340	≤ 0.016	≤ 0.12	≤ 0.045
E+E14-3F3	≥300	≤ 0.033	–	≤ 0.06
E+PLT14-3F3	≥300	≤ 0.027	–	≤ 0.047
E+E14-3F35	≥300	–	–	≤ 0.03
E+PLT14-3F35	≥300	–	–	≤ 0.024
E+E14-3F4	≥250	–	–	–
E+PLT14-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E14-3C90	≥320	–	–	–	–
E+PLT14-3C90	≥320	–	–	–	–
E+E14-3C94	≥320	–	–	–	–
E+PLT14-3C94	≥320	–	–	–	–
E+E14-3C96	≥340	≤ 0.11	–	–	–
E+PLT14-3C96	≥340	≤ 0.09	–	–	–
E+E14-3F3	≥300	–	–	–	–
E+PLT14-3F3	≥300	–	–	–	–
E+E14-3F35	≥300	≤ 0.05	≤ 0.35	–	–
E+PLT14-3F35	≥300	≤ 0.035	≤ 0.27	–	–
E+E14-3F4	≥250	–	–	≤ 0.09	≤ 0.15
E+PLT14-3F4	≥250	–	–	≤ 0.07	≤ 0.11

MOUNTING INFORMATION

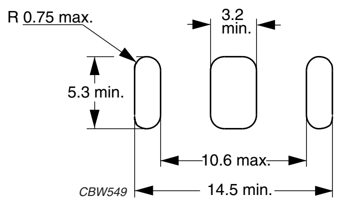
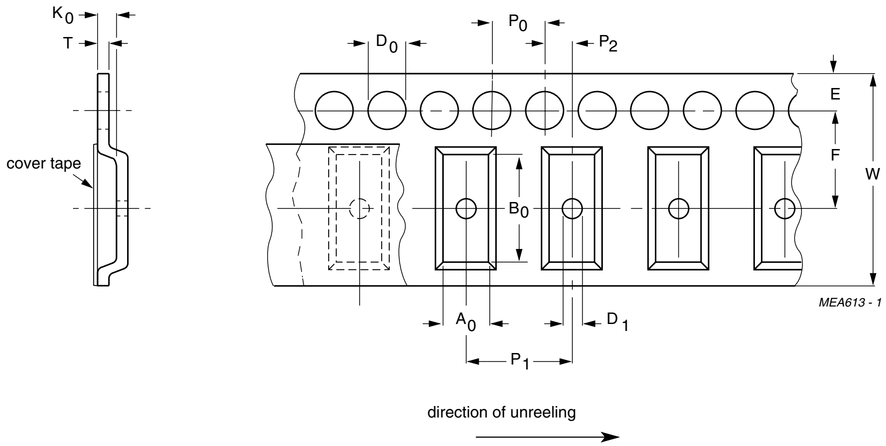


Fig.3 Recommended PCB cut-out for glued planar E14/3.5/5 cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.4 Blister tape.

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

SIZE	DIMENSIONS (mm)
A_0	5.4 ±0.2
B_0	14.6 ±0.2
K_0	4.0 ±0.2
T	0.3 ±0.05
W	24.0 ±0.3
E	1.75 ±0.1
F	11.5 ±0.1
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

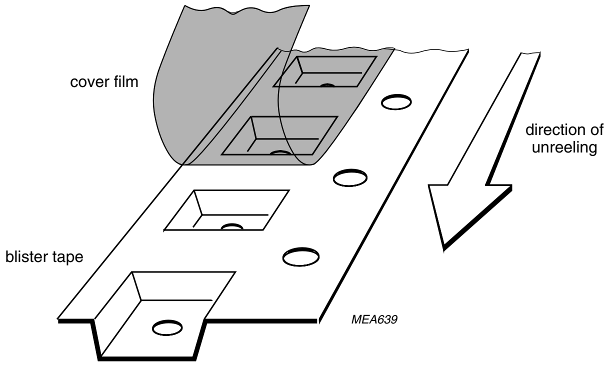
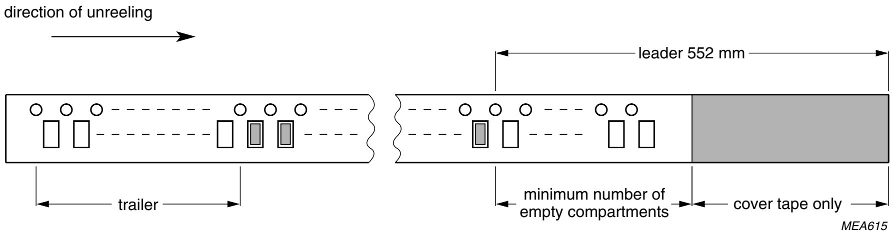


Fig.5 Construction of blister tape.

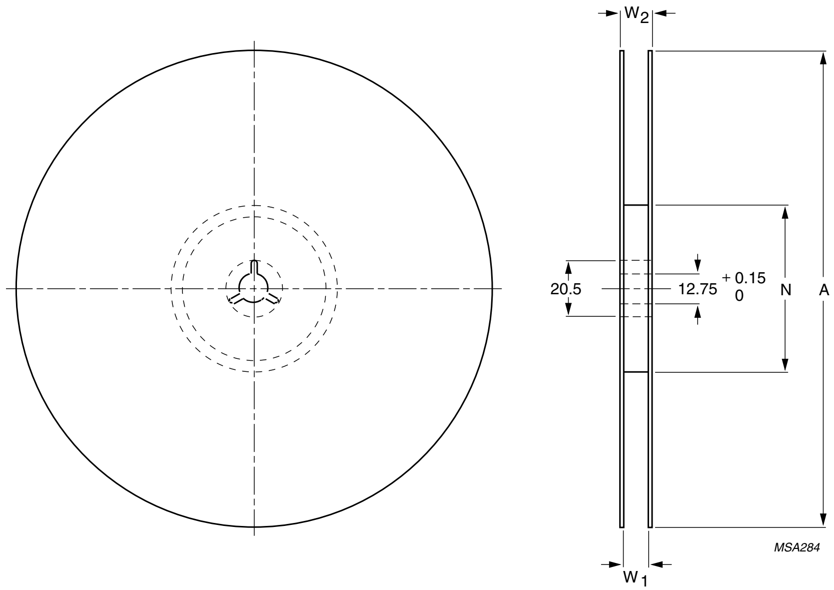


Leader: length of leader tape is 552 mm minimum covered with cover tape.

Trailer: 160 mm minimum (secured with tape).

Storage temperature range for tape: −25 to +45 °C.

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

Table 2 Reel dimensions; see Fig.7

SIZE	DIMENSIONS (mm)			
	A	**N**	**W_1**	**W_2**
24	330	100 ±5	24.4	≤28.4

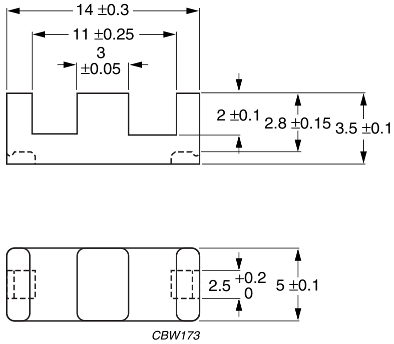
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.15	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	16.4	mm
A_e	effective area	14.2	mm^2
A_{min}	minimum area	10.9	mm^2
m	mass of E core half	≈ 0.6	g
m	mass of plate	≈ 0.5	g

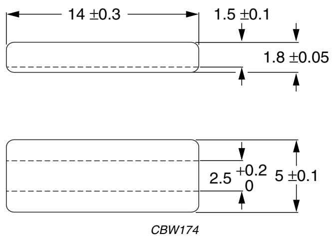
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT14/5/1.5/S-3C90
3C94 des	PLT14/5/1.5/S-3C94
3C96 prot	PLT14/5/1.5/S-3C96
3F3	PLT14/5/1.5/S-3F3
3F35 prot	PLT14/5/1.5/S-3F35
3F4 des	PLT14/5/1.5/S-3F4
3E6	PLT14/5/1.5/S-3E6



Dimensions in mm.

Fig.1 E14/3.5/5/R core.



Dimensions in mm.

Fig.2 PLT14/5/1.5/S.

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

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements 10 ±5 N; measurement coil as for E14/3.5/5.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈ 58	≈ 600	E14/3.5/R-3C90-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5/R-3C90-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5/R-3C90-A160-P
	1500 ±25%	≈ 1380	≈ 0	E14/3.5/5/R-3C90
3C94 des	63 ±3%	≈ 58	≈ 600	E14/3.5/R-3C94-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5/R-3C94-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5/R-3C94-A160-P
	1500 ±25%	≈ 1380	≈ 0	E14/3.5/5/R-3C94
3C96 prot	1350 ±25%	≈ 1240	≈ 0	E14/3.5/5/R-3C96
3F3	63 ±3%	≈ 58	≈ 600	E14/3.5/R-3F3-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5/R-3F3-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5/R-3F3-A160-P
	1300 ±25%	≈ 1200	≈ 0	E14/3.5/5/R-3F3
3F35 prot	1050 ±25%	≈ 970	≈ 0	E14/3.5/5/R-3F35
3F4 des	63 ±3%	≈ 58	≈ 600	E14/3.5/R-3F4-A63-P
	100 ±5%	≈ 92	≈ 300	E14/3.5/R-3F4-A100-P
	160 ±8%	≈ 148	≈ 150	E14/3.5/R-3F4-A160-P
	780 ±25%	≈ 710	≈ 0	E14/3.5/5/R-3F4
3E6	6400 +40/−30%	≈ 5900	≈ 0	E14/3.5/5/R-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	≤ 0.026	–	–
E14/R+PLT14/S-3C94	≥320	≤ 0.021	≤ 0.15	–
E14/R+PLT14/S-3C96	≥340	≤ 0.016	≤ 0.12	≤ 0.045
E14/R+PLT14/S-3F3	≥300	≤ 0.027	–	≤ 0.047
E14/R+PLT14/S-3F35	≥300	–	–	≤ 0.024
E14/R+PLT14/S-3F4	≥250	–	–	–

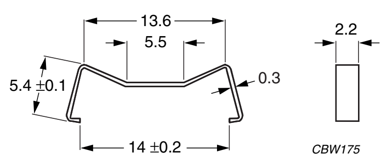
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	–	–	–	–
E14/R+PLT14/S-3C94	≥320	–	–	–	–
E14/R+PLT14/S-3C96	≥340	≤ 0.09	–	–	–
E14/R+PLT14/S-3F3	≥300	–	–	–	–
E14/R+PLT14/S-3F35	≥300	≤ 0.035	≤ 0.027	–	–
E14/R+PLT14/S-3F4	≥250	–	–	≤ 0.07	≤ 0.11

MOUNTING PARTS

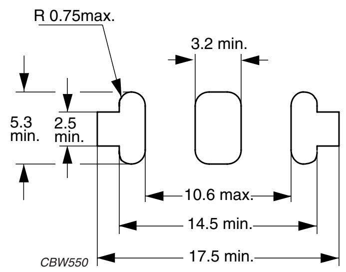
General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E14/PLT14



Dimensions in mm.

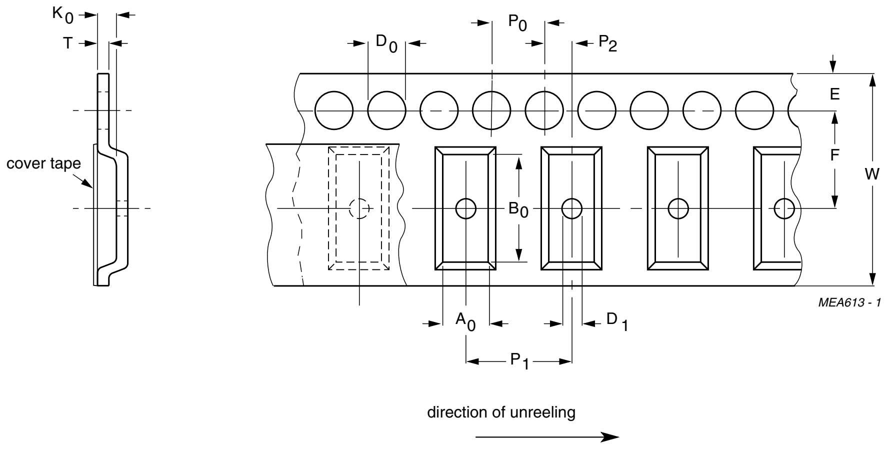
Fig.3 Clamp for E14/R+PLT14/S.



Dimensions in mm.

Fig.4 Recommended PCB cut-out for clamped cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.5 Blister tape.

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

SIZE	DIMENSIONS (mm)
A_0	5.4 ±0.2
B_0	14.6 ±0.2
K_0	4.0 ±0.2
T	0.3 ±0.05
W	24.0 ±0.3
E	1.75 ±0.1
F	11.5 ±0.1
D_0	1.5 +0.1
D_1	≥1.5
P_0	4.0 ±0.1
P_1	8.0 ±0.1
P_2	2.0 ±0.1

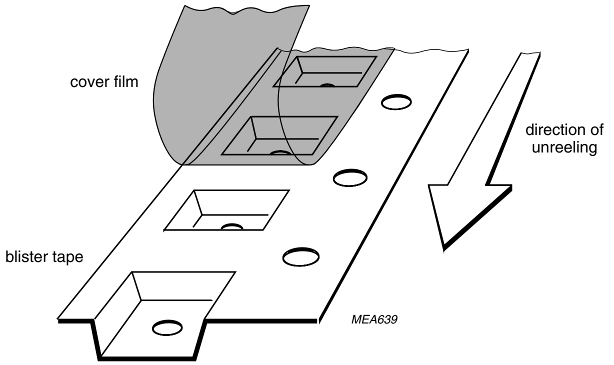
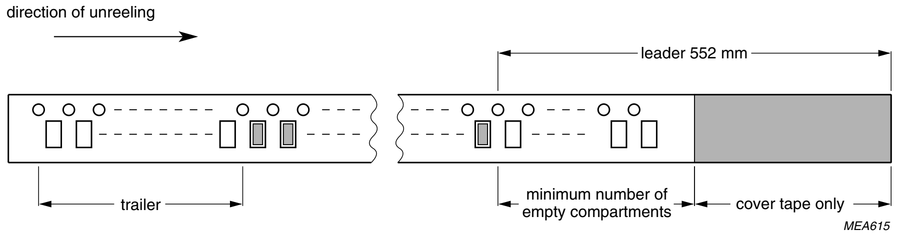


Fig.6 Construction of blister tape.

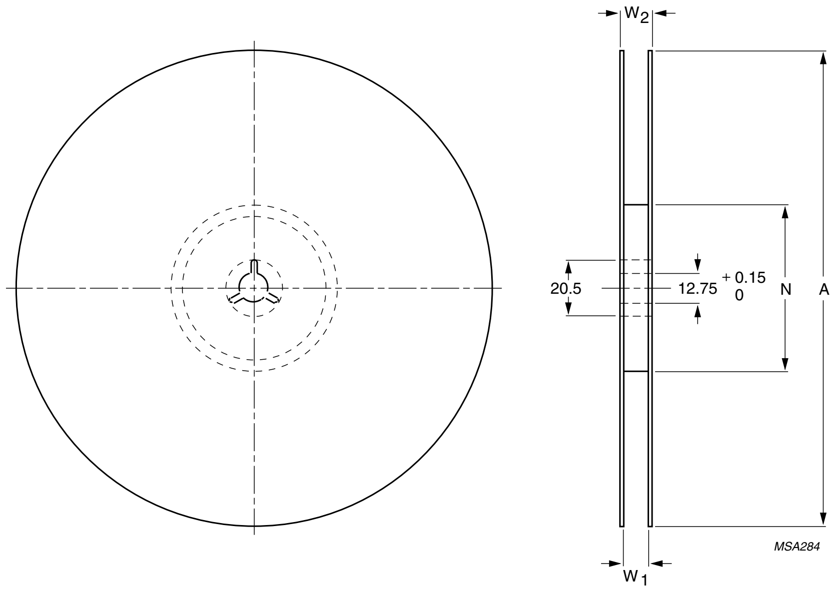


Leader: length of leader tape is 552 mm minimum covered with cover tape.

Trailer: 160 mm minimum (secured with tape).

Storage temperature range for tape: −25 to +45 °C.

Fig.7 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

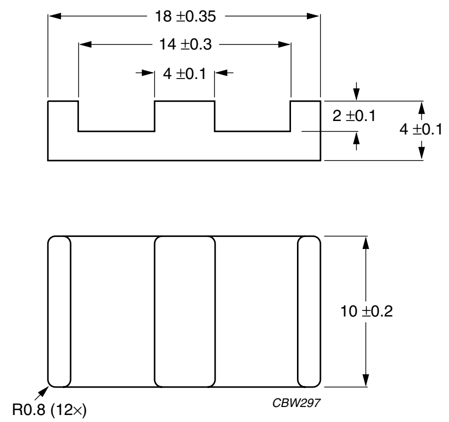
Table 2 Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
24	330	100 ±5	24.4	≤28.4

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.616	mm^{-1}
V_e	effective volume	960	mm^3
l_e	effective length	24.3	mm
A_e	effective area	39.3	mm^2
A_{min}	minimum area	39.3	mm^2
m	mass of core half	≈ 2.4	g



Dimensions in mm.

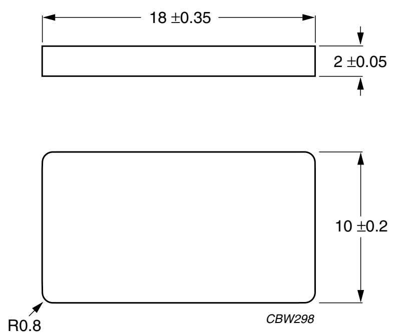
Fig.1 E18/4/10 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.514	mm^{-1}
V_e	effective volume	800	mm^3
l_e	effective length	20.3	mm
A_e	effective area	39.5	mm^2
A_{min}	minimum area	39.5	mm^2
m	mass of plate	≈ 1.7	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT18/10/2-3C90
3C94 des	PLT18/10/2-3C94
3C96 prot	PLT18/10/2-3C96
3F3	PLT18/10/2-3F3
3F35 prot	PLT18/10/2-3F35
3F4 des	PLT18/10/2-3F4
3E6	PLT18/10/2-3E6



Dimensions in mm.

Fig.2 PLT18/10/2.

Planar E cores and accessories E18/4/10

Core halves for use in combination with an non-gapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈ 49	≈ 800	E18/4-3C90-A100-E
	160 ±3%	≈ 78	≈ 420	E18/4-3C90-A160-E
	250 ±5%	≈ 123	≈ 220	E18/4-3C90-A250-E
	315 ±8%	≈ 154	≈ 170	E18/4-3C90-A315-E
	3200 ±25%	≈ 1560	≈ 0	E18/4/10-3C90
3C94 des	100 ±3%	≈ 49	≈ 800	E18/4-3C94-A100-E
	160 ±3%	≈ 78	≈ 420	E18/4-3C94-A160-E
	250 ±5%	≈ 123	≈ 220	E18/4-3C94-A250-E
	315 ±8%	≈ 154	≈ 170	E18/4-3C94-A315-E
	3200 ±25%	≈ 1560	≈ 0	E18/4/10-3C94
3C96 prot	2900 ±25%	≈ 1410	≈ 0	E18/4/10-3C96
3F3	100 ±3%	≈ 49	≈ 800	E18/4-3F3-A100-E
	160 ±3%	≈ 78	≈ 420	E18/4-3F3-A160-E
	250 ±5%	≈ 123	≈ 220	E18/4-3F3-A250-E
	315 ±8%	≈ 154	≈ 170	E18/4-3F3-A315-E
	2700 ±25%	≈ 1320	≈ 0	E18/4/10-3F3
3F35 prot	2200 ±25%	≈ 1070	≈ 0	E18/4/10-3F35
3F4 des	100 ±3%	≈ 49	≈ 800	E18/4-3F4-A100-E
	160 ±3%	≈ 78	≈ 420	E18/4-3F4-A160-E
	250 ±5%	≈ 123	≈ 220	E18/4-3F4-A250-E
	315 ±8%	≈ 154	≈ 170	E18/4-3F4-A315-E
	1550 ±25%	≈ 760	≈ 0	E18/4/10-3F4
3E6	13500 +40/-30%	≈ 6600	≈ 0	E18/4/10-3E6

Planar E cores and accessories — E18/4/10

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	A_L() (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈ 41	≈ 870	E18/4-3C90-A100-P
	160 ±3%	≈ 65	≈ 470	E18/4-3C90-A160-P
	250 ±5%	≈ 102	≈ 240	E18/4-3C90-A250-P
	315 ±8%	≈ 129	≈ 170	E18/4-3C90-A315-P
	3680 ±25%	≈ 1500	≈ 0	E18/4/10-3C90
3C94 des	100 ±3%	≈41	≈870	E18/4-3C94-A100-P
	160 ±3%	≈65	≈470	E18/4-3C94-A160-P
	250 ±5%	≈102	≈240	E18/4-3C94-A250-P
	315 ±8%	≈129	≈170	E18/4-C94-A315-P
	3680 ±25%	≈ 1500	≈ 0	E18/4/10-3C94
3C96 prot	3250 ±25%	≈ 1320	≈ 0	E18/4/10-3C96
3F3	100 ±3%	≈41	≈870	E18/4-3F3-A100-P
	160 ±3%	≈65	≈470	E18/4-3F3-A160-P
	250 ±5%	≈102	≈240	E18/4-3F3-A250-P
	315 ±8%	≈129	≈170	E18/4-3F3-A315-P
	3100 ±25%	≈ 1270	≈ 0	E18/4/10-3F3
3F35 prot	2500 ±25%	≈ 1020	≈ 0	E18/4/10-3F35
3F4 des	100 ±3%	≈41	≈870	E18/4-3F4-A100-P
	160 ±3%	≈65	≈470	E18/4-3F4-A160-P
	250 ±5%	≈102	≈240	E18/4-3F4-A250-P
	315 ±8%	≈129	≈170	E18/4-3F4-A315-P
	1800 ±25%	≈ 740	≈ 0	E18/4/10-3F4
3E6	15500 +40/-30%	≈ 6400	≈ 0	E18/4/10-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E18-3C90	≥320	≤ 0.105	–	–
E+PLT18-3C90	≥320	≤ 0.095	–	–
E+E18-3C94	≥320	≤ 0.085	≤ 0.6	–
E+PLT18-3C94	≥320	≤ 0.075	≤ 0.5	–
E+E18-3C96	≥320	≤ 0.065	≤ 0.45	≤ 0.18
E+PLT18-3C96	≥320	≤ 0.06	≤ 0.4	≤ 0.15
E+E18-3F3	≥300	≤ 0.11	–	≤ 0.19
E+PLT18-3F3	≥300	≤ 0.09	–	≤ 0.16
E+E18-3F35	≥300	–	–	≤ 0.09
E+PLT18-3F35	≥300	–	–	≤ 0.08
E+E18-3F4	≥250	–	–	–
E+PLT18-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E18-3C90	≥320	–	–	–	–
E+PLT18-3C90	≥320	–	–	–	–
E+E18-3C94	≥320	–	–	–	–
E+PLT18-3C94	≥320	–	–	–	–
E+E18-3C96	≥320	≤ 0.35	–	–	–
E+PLT18-3C96	≥320	≤ 0.3	–	–	–
E+E18-3F3	≥300	–	–	–	–
E+PLT18-3F3	≥300	–	–	–	–
E+E18-3F35	≥300	≤ 0.13	≤ 1.0	–	–
E+PLT18-3F35	≥300	≤ 0.12	≤ 0.9	–	–
E+E18-3F4	≥250	–	–	≤ 0.3	≤ 0.45
E+PLT18-3F4	≥250	–	–	≤ 0.24	≤ 0.39

MOUNTING INFORMATION

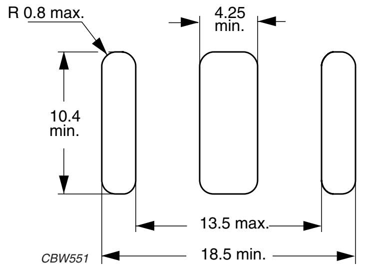
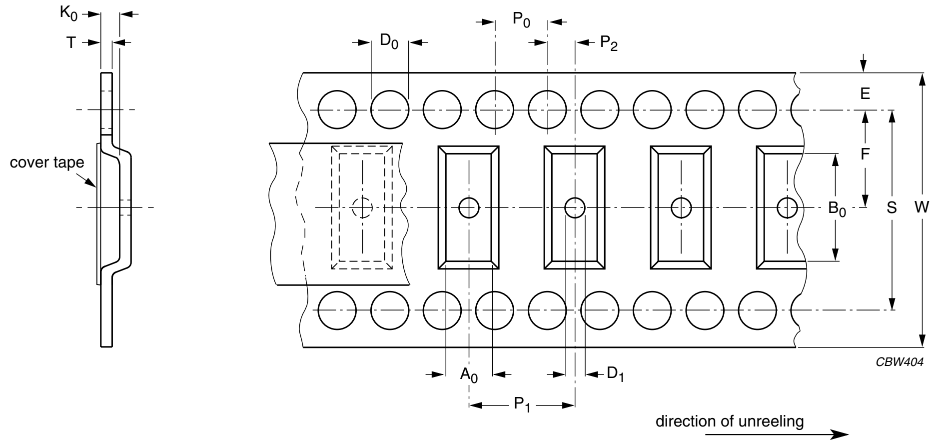


Fig.3 Recommended PCB cut-out for glued planar E18/4/10 cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.4 Blister tape.

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

SIZE	DIMENSIONS (mm)
A_0	10.5 ±0.2
B_0	18.7 ±0.2
K_0	4.5 ±0.2
T	0.3 ±0.05
W	32.0 ±0.3
E	1.75 ±0.1
F	14.2 ±0.1
D_0	1.5 +0.1
D_1	≥ 2.0
P_0	4.0 ±0.1
P_1	16.0 ±0.1
P_2	2.0 ±0.1
S	28.4 ±0.1

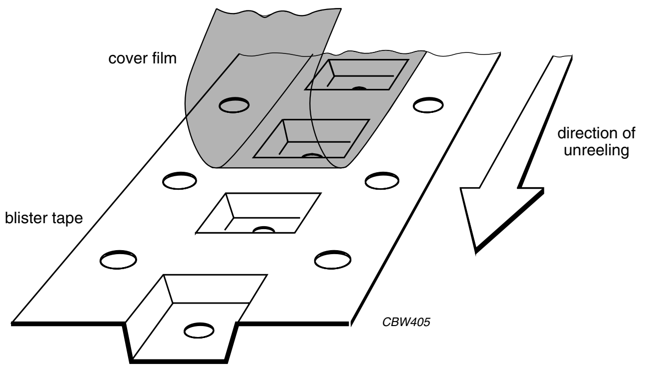
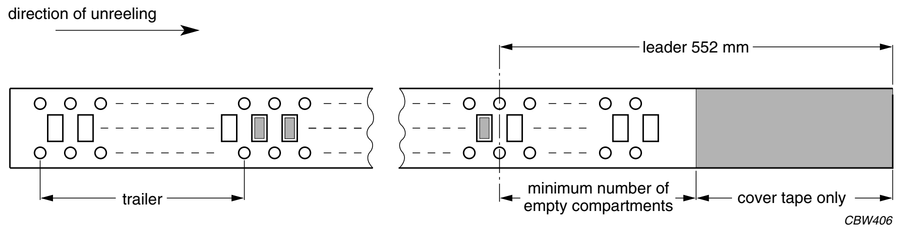


Fig.5 Construction of blister tape.

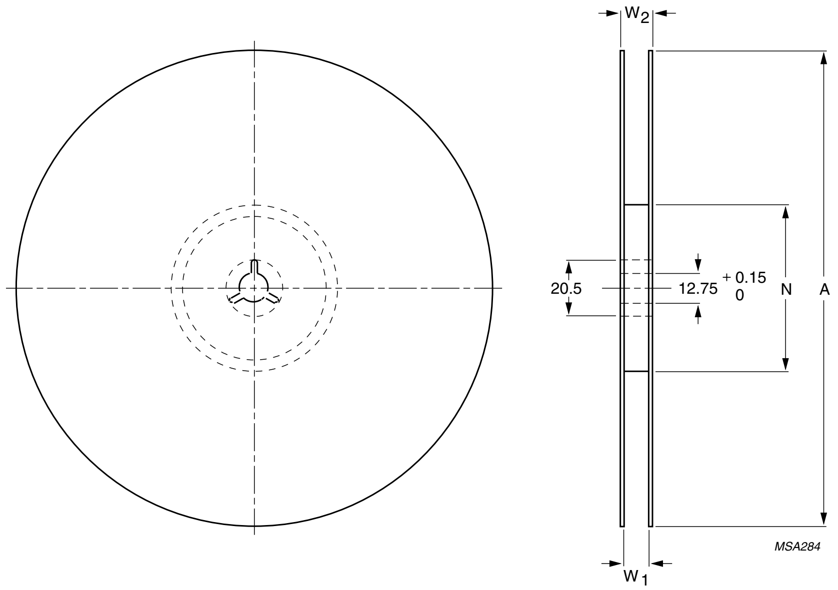


Leader: length of leader tape is 552 mm minimum covered with cover tape.

Trailer: 160 mm minimum (secured with tape).

Storage temperature range for tape: −25 to +45 °C.

Fig.6 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.7 Reel.

Table 2 Reel dimensions; see Fig.7

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
32	330	100 ±5	32.4	≤36.4

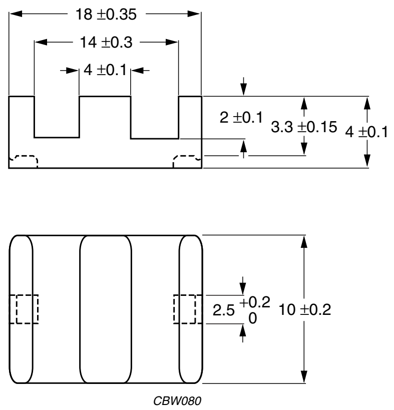
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.498	mm^{-1}
V_e	effective volume	830	mm^3
l_e	effective length	20.3	mm
A_e	effective area	39.5	mm^2
A_{min}	minimum area	35.9	mm^2
m	mass of E core half	≈ 2.4	g
m	mass of plate	≈ 1.7	g

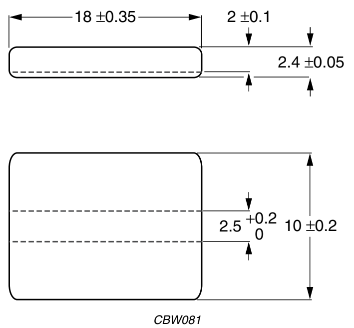
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT18/10/2/S-3C90
3C94 des	PLT18/10/2/S-3C94
3C96 prot	PLT18/10/2/S-3C96
3F3	PLT18/10/2/S-3F3
3F35 prot	PLT18/10/2/S-3F35
3F4 des	PLT18/10/2/S-3F4
3E6	PLT18/10/2/S-3E6



Dimensions in mm.

Fig.1 E18/4/10/R core half.



Dimensions in mm.

Fig.2 PLT 18/10/2.

Planar E cores and accessories E18/4/10/R

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

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements, 20 ±10 N; measurement coil as for E18/4/10.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈ 41	≈ 870	E18/4/R-3C90-A100-P
	160 ±3%	≈ 65	≈ 470	E18/4/R-3C90-A160-P
	250 ±5%	≈ 102	≈ 240	E18/4/R-3C90-A250-P
	315 ±8%	≈ 129	≈ 170	E18/4/R-3C90-A315-P
	3680 ±25%	≈ 1500	≈ 0	E18/4/10/R-3C90
3C94 des	100 ±3%	≈ 41	≈ 870	E18/4/R-3C94-A100-P
	160 ±3%	≈ 65	≈ 470	E18/4/R-3C94-A160-P
	250 ±5%	≈ 102	≈ 240	E18/4/R-3C94-A250-P
	315 ±8%	≈ 129	≈ 170	E18/4/R-3C94-A315-P
	3680 ±25%	≈ 1500	≈ 0	E18/4/10/R-3C94
3C96 prot	3250 ±25%	≈ 1320	≈ 0	E18/4/10/R-3C96
3F3	100 ±3%	≈ 41	≈ 870	E18/4/R-3F3-A100-P
	160 ±3%	≈ 65	≈ 470	E18/4/R-3F3-A160-P
	250 ±5%	≈ 102	≈ 240	E18/4/R-3F3-A250-P
	315 ±8%	≈ 129	≈ 170	E18/4/R-3F3-A315-P
	3100 ±25%	≈ 1270	≈ 0	E18/4/10/R-3F3
3F35 prot	2500 ±25%	≈ 1020	≈ 0	E18/4/10/R-3F35
3F4 des	100 ±3%	≈ 41	≈ 870	E18/4/R-3F4-A100-P
	160 ±3%	≈ 65	≈ 470	E18/4/R-3F4-A160-P
	250 ±5%	≈ 102	≈ 240	E18/4/R-3F4-A250-P
	315 ±8%	≈ 129	≈ 170	E18/4/R-3F4-A315-P
	1800 ±25%	≈ 740	≈ 0	E18/4/10/R-3F4
3E6	15500 +40/−30%	≈ 6400	≈ 0	E18/4/10/R-3E6

Planar E cores and accessories E18/4/10/R

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	≤ 0.095	–	–
E18/R+PLT18/S-3C94	≥320	≤ 0.075	≤ 0.5	–
E18/R+PLT18/S-3C96	≥320	≤ 0.06	≤ 0.4	≤ 0.15
E18/R+PLT18/S-3F3	≥300	≤ 0.09	–	≤ 0.16
E18/R+PLT18/S-3F35	≥300	–	–	≤ 0.08
E18/R+PLT18/S-3F4	≥250	–	–	–

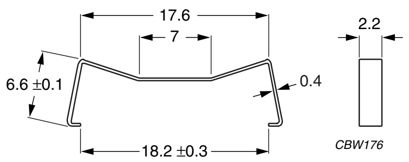
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	–	–	–	–
E18/R+PLT18/S-3C94	≥320	–	–	–	–
E18/R+PLT18/S-3C96	≥320	≤ 0.3	–	–	–
E18/R+PLT18/S-3F3	≥300	–	–	–	–
E18/R+PLT18/S-3F35	≥300	≤ 0.12	≤ 0.9	–	–
E18/R+PLT18/S-3F4	≥250	–	–	≤ 0.24	≤ 0.39

MOUNTING PARTS

General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E18/PLT18



Dimensions in mm.

Fig.3 Clamp for E18/R+PLT18/S.

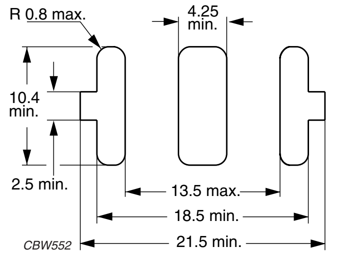
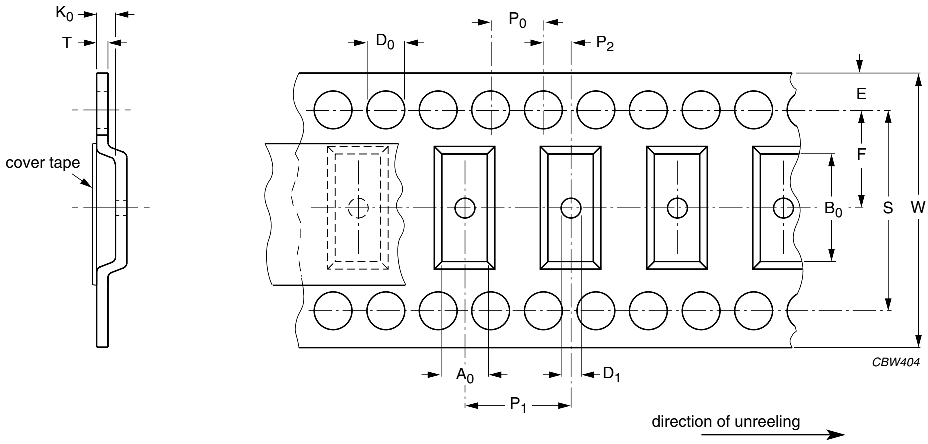


Fig.4 Recommended PCB cut-out for clamped cores.

BLISTER TAPE AND REEL DIMENSIONS prot



For dimensions see Table 1.

Fig.5 Blister tape.

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

SIZE	DIMENSIONS (mm)
A_0	10.5 ±0.2
B_0	18.7 ±0.2
K_0	4.5 ±0.2
T	0.3 ±0.05
W	32.0 ±0.3
E	1.75 ±0.1
F	14.2 ±0.1
D_0	1.5 +0.1
D_1	≥ 2.0
P_0	4.0 ±0.1
P_1	16.0 ±0.1
P_2	2.0 ±0.1
S	28.4 ±0.1

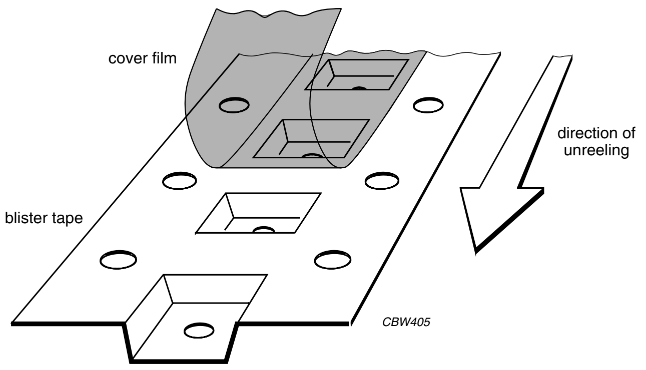
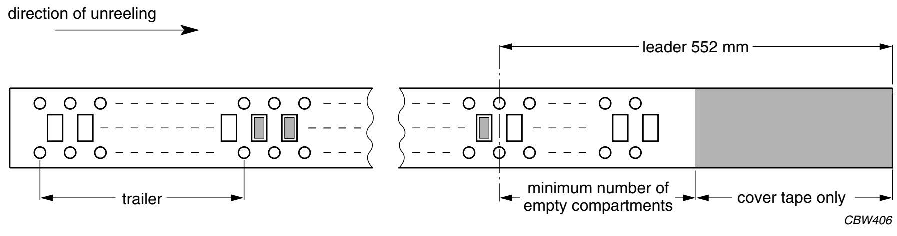
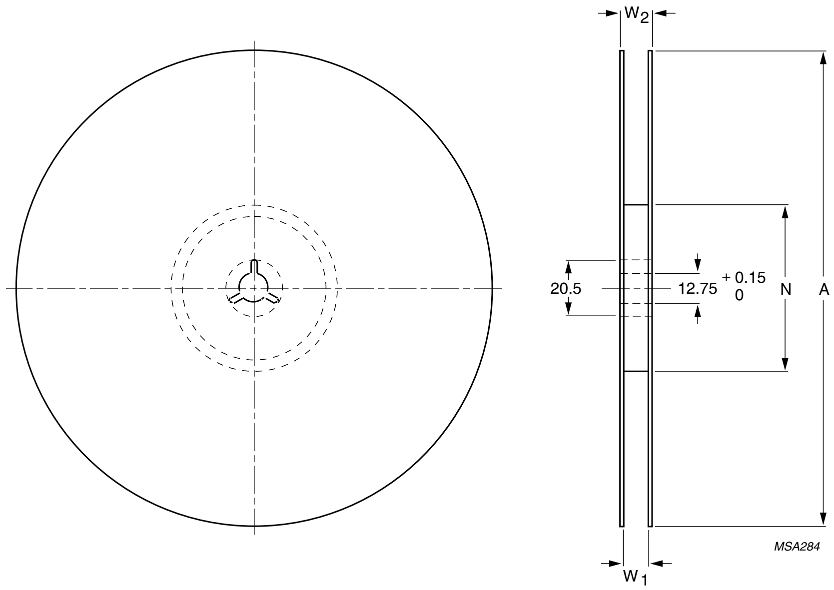


Fig.6 Construction of blister tape.



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

Fig.7 Leader/trailer tape.



Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

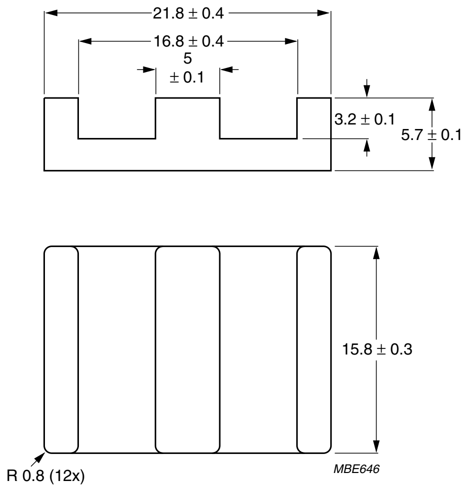
Table 2 Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
32	330	100 ±5	32.4	≤36.4

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.414	mm^{-1}
V_e	effective volume	2550	mm^3
I_e	effective length	32.5	mm
A_e	effective area	78.3	mm^2
A_{min}	minimum area	78.3	mm^2
m	mass of core half	≈ 6.5	g



Dimensions in mm.

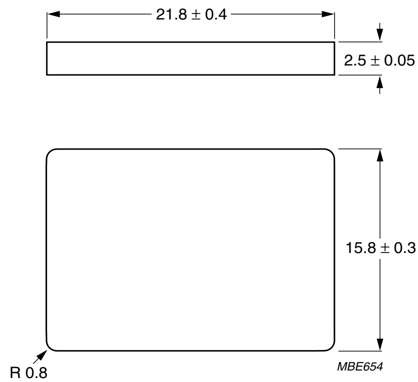
Fig.1 E22/6/16.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.332	mm^{-1}
V_e	effective volume	2040	mm^3
I_e	effective length	26.1	mm
A_e	effective area	78.5	mm^2
A_{min}	minimum area	78.5	mm^2
m	mass of plate	≈ 4	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT22/6/2.5-3C90
3C94 des	PLT22/6/2.5-3C94
3C96 prot	PLT22/6/2.5-3C96
3F3	PLT22/6/2.5-3F3
3F35 prot	PLT22/6/2.5-3F35
3F4 des	PLT22/6/2.5-3F4
3E6	PLT22/6/2.5-3E6



Dimensions in mm.

Fig.2 PLT22/16/2.5.

Planar E cores and accessories E22/6/16

Core halves for use in combination with an non-gapped E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 53	≈ 900	E22/6-3C90-A160-E
	250 ±3%	≈ 82	≈ 490	E22/6-3C90-A250-E
	315 ±3%	≈ 104	≈ 360	E22/6-3C90-A315-E
	400 ±5%	≈ 132	≈ 280	E22/6-3C90-A400-E
	630 ±8%	≈ 208	≈ 160	E22/6-3C90-A630-E
	5150 ±25%	≈ 1700	≈ 0	E22/6/16-3C90
3C94 des	160 ±3%	≈ 53	≈ 900	E22/6-3C94-A160-E
	250 ±3%	≈ 82	≈ 490	E22/6-3C94-A250-E
	315 ±3%	≈ 104	≈ 360	E22/6-3C94-A315-E
	400 ±5%	≈ 132	≈ 280	E22/6-3C94-A400-E
	630 ±8%	≈ 208	≈ 160	E22/6-3C94-A630-E
	5150 ±25%	≈ 1700	≈ 0	E22/6/16-3C94
3C96 prot	4600 ±25%	≈ 1520	≈ 0	E22/6/16-3C96
3F3	160 ±3%	≈ 53	≈ 900	E22/6-3F3-A160-E
	250 ±3%	≈ 82	≈ 490	E22/6-3F3-A250-E
	315 ±3%	≈ 104	≈ 360	E22/6-3F3-A315-E
	400 ±5%	≈ 132	≈ 280	E22/6-3F3-A400-E
	630 ±8%	≈ 208	≈ 160	E22/6-3F3-A630-E
	4300 ±25%	≈ 1420	≈ 0	E22/6/16-3F3
3F35 prot	3500 ±25%	≈ 1160	≈ 0	E22/6/16-3F35
3F4 des	160 ±3%	≈ 53	≈ 900	E22/6-3F4-A160-E
	250 ±3%	≈ 82	≈ 490	E22/6-3F4-A250-E
	315 ±3%	≈ 104	≈ 360	E22/6-3F4-A315-E
	400 ±5%	≈ 132	≈ 280	E22/6-3F4-A400-E
	630 ±8%	≈ 208	≈ 160	E22/6-3F4-A630-E
	2400 ±25%	≈ 790	≈ 0	E22/6/16-3F4
3E6	22000 +40/−30%	≈ 7250	≈ 0	E22/6/16-3E6

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 20 ±10 N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 42	≈ 950	E22/6-3C90-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6-3C90-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6-3C90-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6-3C90-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6-3C90-A630-P
	6150 ±25%	≈ 1620	≈ 0	E22/6/16-3C90
3C94 des	160 ±3%	≈ 42	≈ 950	E22/6-3C94-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6-3C94-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6-3C94-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6-3C94-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6-3C94-A630-P
	6150 ±25%	≈ 1620	≈ 0	E22/6/16-3C94
3C96 prot	5450 ±25%	≈ 1440	≈ 0	E22/6/16-3C96
3F3	160 ±3%	≈ 42	≈ 950	E22/6-3F3-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6-3F3-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6-3F3-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6-3F3-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6-3F3-A630-P
	5000 ±25%	≈ 1320	≈ 0	E22/6/16-3F3
3F35 prot	4100 ±25%	≈ 1080	≈ 0	E22/6/16-3F35
3F4 des	160 ±3%	≈ 42	≈ 950	E22/6-3F4-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6-3F4-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6-3F4-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6-3F4-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6-3F4-A630-P
	2900 ±25%	≈ 770	≈ 0	E22/6/16-3F4
3E6	26000 +40/–30%	≈ 6900	≈ 0	E22/6/16-3E6

Planar E cores and accessories E22/6/16

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E22-3C90	≥320	≤ 0.28	–	–
E+PLT22-3C90	≥320	≤ 0.23	–	–
E+E22-3C94	≥320	≤ 0.22	≤ 1.5	–
E+PLT22-3C94	≥320	≤ 0.18	≤ 1.25	–
E+E22-3C96	≥320	≤ 0.17	≤ 1.1	≤ 0.45
E+PLT22-3C96	≥320	≤ 0.14	≤ 1.0	≤ 0.38
E+E22-3F3	≥300	≤ 0.28	–	≤ 0.5
E+PLT22-3F3	≥300	≤ 0.23	–	≤ 0.40
E+E22-3F35	≥300	–	–	≤ 0.25
E+PLT22-3F35	≥300	–	–	≤ 0.2
E+E22-3F4	≥250	–	–	–
E+PLT22-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E22-3C90	≥320	–	–	–	–
E+PLT22-3C90	≥320	–	–	–	–
E+E22-3C94	≥320	–	–	–	–
E+PLT22-3C94	≥320	–	–	–	–
E+E22-3C96	≥320	≤ 1.0	–	–	–
E+PLT22-3C96	≥320	≤ 0.75	–	–	–
E+E22-3F3	≥300	–	–	–	–
E+PLT22-3F3	≥300	–	–	–	–
E+E22-3F35	≥300	≤ 0.4	≤ 3.0	–	–
E+PLT22-3F35	≥300	≤ 0.3	≤ 2.2	–	–
E+E22-3F4	≥250	–	–	≤ 0.8	≤ 1.2
E+PLT22-3F4	≥250	–	–	≤ 0.6	≤ 1.0

MOUNTING INFORMATION

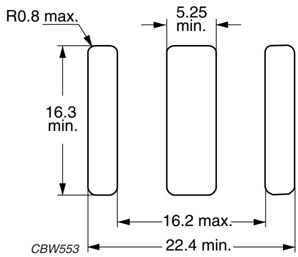


Fig.3 Recommended PCB cut-out for glued cores.

Planar E cores and accessories E22/6/16/R

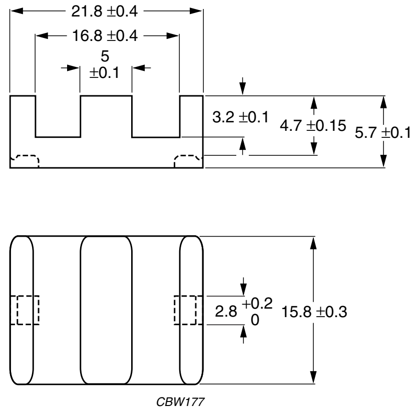
CORES

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.324	mm^{-1}
V_e	effective volume	2100	mm^3
l_e	effective length	26.1	mm
A_e	effective area	78.5	mm^2
A_{min}	minimum area	72.6	mm^2
m	mass of E core half	≈ 6.5	g
m	mass of plate	≈ 4	g

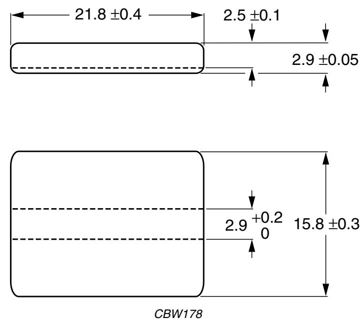
Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT22/16/2.5/S-3C90
3C94 des	PLT22/16/2.5/S-3C94
3C96 prot	PLT22/16/2.5/S-3C96
3F3	PLT22/16/2.5/S-3F3
3F35 prot	PLT22/16/2.5/S-3F35
3F4 des	PLT22/16/2.5/S-3F4
3E6	PLT22/16/2.5/S-3E6



Dimensions in mm.

Fig.1 E22/6/16/R.



Dimensions in mm.

Fig.2 PLT22/16/2.5/S.

Planar E cores and accessories E22/6/16/R

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

A_L measured in combination with a slotted plate (PLT/S) clamping force for A_L measurements, 20 ±10 N; measurement coil as for E22/6/16.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 42	≈ 950	E22/6/R-3C90-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6/R-3C90-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6/R-3C90-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6/R-3C90-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6/R-3C90-A630-P
	6150 ±25%	≈ 1620	≈ 0	E22/6/16/R-3C90
3C94 des	160 ±3%	≈ 42	≈ 950	E22/6/R-3C94-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6/R-3C94-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6/R-3C94-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6/R-3C94-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6/R-3C94-A630-P
	6150 ±25%	≈ 1620	≈ 0	E22/6/16/R-3C94
3C96 prot	5450 ±25%	≈ 1440	≈ 0	E22/6/16/R-3C96
3F3	160 ±3%	≈ 42	≈ 950	E22/6/R-3F3-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6/R-3F3-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6/R-3F3-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6/R-3F3-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6/R-3F3-A630-P
	5000 ±25%	≈ 1320	≈ 0	E22/6/16/R-3F3
3F35 prot	4100 ±25%	≈ 1080	≈ 0	E22/6/16/R-3F35
3F4 des	160 ±3%	≈ 42	≈ 950	E22/6/R-3F4-A160-P
	250 ±3%	≈ 66	≈ 550	E22/6/R-3F4-A250-P
	315 ±3%	≈ 83	≈ 400	E22/6/R-3F4-A315-P
	400 ±5%	≈ 106	≈ 280	E22/6/R-3F4-A400-P
	630 ±8%	≈ 166	≈ 160	E22/6/R-3F4-A630-P
	2900 ±25%	≈ 770	≈ 0	E22/6/16/R-3F4
3E6	26000 +40/−30%	≈ 6900	≈ 0	E22/6/16/R-3E6

Planar E cores and accessories E22/6/16/R

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E22/R+PLT22/S-3C90	≥320	≤ 0.23	–	–
E22/R+PLT22/S-3C94	≥320	≤ 0.18	≤ 1.25	–
E22/R+PLT22/S-3C96	≥320	≤ 0.14	≤ 1.0	≤ 0.38
E22/R+PLT22/S-3F3	≥300	≤ 0.23	–	≤ 0.4
E22/R+PLT22/S-3F35	≥300	–	–	≤ 0.2
E22/R+PLT22/S-3F4	≥250	–	–	–

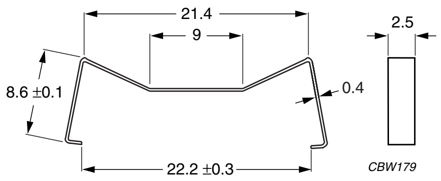
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E22/R+PLT22/S-3C90	≥320	–	–	–	–
E22/R+PLT22/S-3C94	≥320	–	–	–	–
E22/R+PLT22/S-3C96	≥320	≤ 0.75	–	–	–
E22/R+PLT22/S-3F3	≥300	–	–	–	–
E22/R+PLT22/S-3F35	≥300	≤ 0.3	≤ 2.2	–	–
E22/R+PLT22/S-3F4	≥250	–	–	≤ 0.6	≤ 1.0

MOUNTING PARTS

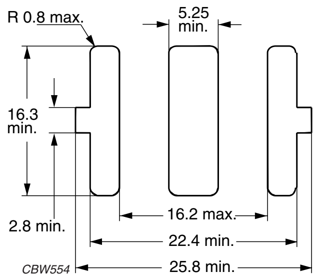
General data and ordering information

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E22/PLT22



Dimensions in mm.

Fig.3 Clamp for E22/R+PLT22/S.



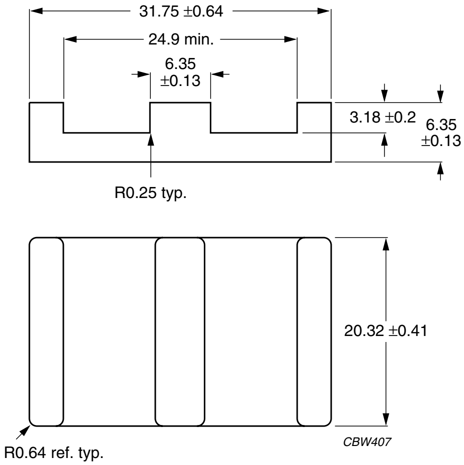
Dimensions in mm.

Fig.4 Recommended PCB cut-out for clamped cores.

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.323	mm^{-1}
V_e	effective volume	5380	mm^3
l_e	effective length	41.4	mm
A_e	effective area	130	mm^2
A_{min}	minimum area	130	mm^2
m	mass of core half	≈ 13	g



Dimensions in mm.

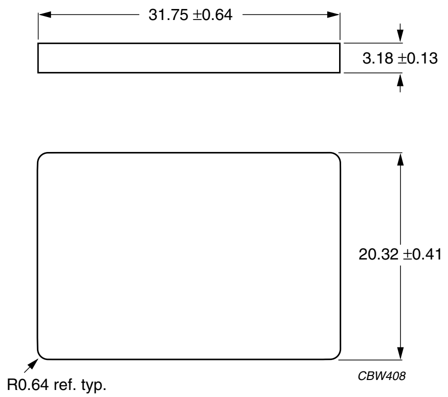
Fig.1 E32/6/20.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.278	mm^{-1}
V_e	effective volume	4560	mm^3
l_e	effective length	35.1	mm
A_e	effective area	130	mm^2
A_{min}	minimum area	130	mm^2
m	mass of plate	≈ 10	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT32/20/3-3C90
3C94 des	PLT32/20/3-3C94
3C96 prot	PLT32/20/3-3C96
3F3	PLT32/20/3-3F3
3F4 des	PLT32/20/3-3F4



Dimensions in mm.

Fig.2 PLT32/20/3.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 30 ±10 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%(1)	≈ 41	≈ 1200	E32/6-3C90-E160-E
	250 ±3%(1)	≈ 64	≈ 700	E32/6-3C90-E250-E
	315 ±3%	≈ 81	≈ 550	E32/6-3C90-A315-E
	400 ±5%	≈ 103	≈ 450	E32/6-3C90-A400-E
	630 ±8%	≈ 162	≈ 260	E32/6-3C90-A630-E
	6425 ±25%	≈ 1650	≈ 0	E32/6/20-3C90
3C94 des	160 ±3%(1)	≈ 41	≈ 1200	E32/6-3C94-E160-E
	250 ±3%(1)	≈ 64	≈ 700	E32/6-3C94-E250-E
	315 ±3%	≈ 81	≈ 550	E32/6-3C94-A315-E
	400 ±5%	≈ 103	≈ 450	E32/6-3C94-A400-E
	630 ±8%	≈ 162	≈ 260	E32/6-3C94-A630-E
	6425 ±25%	≈ 1650	≈ 0	E32/6/20-3C94
3C96 prot	6425 ±25%	≈ 1650	≈ 0	E32/6/20-3C96
3F3	160 ±3%(1)	≈ 41	≈ 1200	E32/6-3F3-E160-E
	250 ±3%(1)	≈ 64	≈ 700	E32/6-3F3-E250-E
	315 ±3%	≈ 81	≈ 550	E32/6-3F3-A315-E
	400 ±5%	≈ 103	≈ 450	E32/6-3F3-A400-E
	630 ±8%	≈ 162	≈ 260	E32/6-3F3-A630-E
	5900 ±25%	≈ 1520	≈ 0	E32/6/20-3F3
3F4 des	160 ±3%(1)	≈ 41	≈ 1200	E32/6-3F4-E160-E
	250 ±3%(1)	≈ 64	≈ 700	E32/6-3F4-E250-E
	315 ±3%	≈ 81	≈ 550	E32/6-3F4-A315-E
	400 ±5%	≈ 103	≈ 450	E32/6-3F4-A400-E
	630 ±8%	≈ 162	≈ 260	E32/6-3F4-A630-E
	3200 ±25%	≈ 820	≈ 0	E32/6/20-3F4

Note

1. Measured in combination with an equal gapped E core half, clamping force for A_L measurements, 30 ±10 N.

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 35	≈ 1200	E32/6-3C90-A160-P
	250 ±3%	≈ 55	≈ 700	E32/6-3C90-A250-P
	315 ±3%	≈ 69	≈ 550	E32/6-3C90-A315-P
	400 ±5%	≈ 87	≈ 450	E32/6-3C90-A400-P
	630 ±8%	≈ 138	≈ 260	E32/6-3C90-A630-P
	7350 ±25%	≈ 1610	≈ 0	E32/6/20-3C90
3C94 des	160 ±3%	≈ 35	≈ 1200	E32/6-3C94-A160-P
	250 ±3%	≈ 55	≈ 700	E32/6-3C94-A250-P
	315 ±3%	≈ 69	≈ 550	E32/6-3C94-A315-P
	400 ±5%	≈ 87	≈ 450	E32/6-3C94-A400-P
	630 ±8%	≈ 138	≈ 260	E32/6-3C94-A630-P
	7350 ±25%	≈ 1610	≈ 0	E32/6/20-3C94
3C96 prot	7350 ±25%	≈ 1610	≈ 0	E32/6/20-3C96
3F3	160 ±3%	≈ 35	≈ 1200	E32/6-3F3-A160-P
	250 ±3%	≈ 55	≈ 700	E32/6-3F3-A250-P
	315 ±3%	≈ 69	≈ 550	E32/6-3F3-A315-P
	400 ±5%	≈ 87	≈ 450	E32/6-3F3-A400-P
	630 ±8%	≈ 138	≈ 260	E32/6-3F3-A630-P
	6780 ±25%	≈ 1490	≈ 0	E32/6/20-3F3
3F4 des	160 ±3%	≈ 35	≈ 1200	E32/6-3F4-A160-P
	250 ±3%	≈ 55	≈ 700	E32/6-3F4-A250-P
	315 ±3%	≈ 69	≈ 550	E32/6-3F4-A315-P
	400 ±5%	≈ 87	≈ 450	E32/6-3F4-A400-P
	630 ±8%	≈ 138	≈ 260	E32/6-3F4-A630-P
	3700 ±25%	≈ 810	≈ 0	E32/6/20-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E32-3C90	≥320	≤ 0.65	–	–
E+PLT32-3C90	≥320	≤ 0.55	–	–
E+E32-3C94	≥320	≤ 0.48	≤ 3.4	–
E+PLT32-3C94	≥320	≤ 0.41	≤ 2.9	–
E+E32-3C96	≥320	≤ 0.36	≤ 2.6	≤ 0.9
E+PLT32-3C96	≥320	≤ 0.3	≤ 2.2	≤ 0.8
E+E32-3F3	≥300	≤ 0.65	–	≤ 1.0
E+PLT32-3F3	≥300	≤ 0.6	–	≤ 0.85
E+E32-3F4	≥250	–	–	–
E+PLT32-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

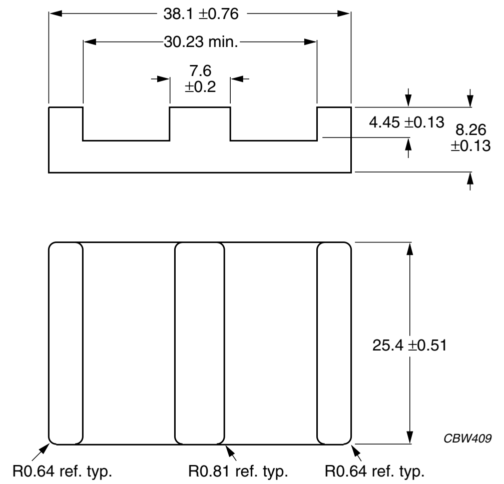
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E32-3C90	≥320	–	–	–	–
E+PLT32-3C90	≥320	–	–	–	–
E+E32-3C94	≥320	–	–	–	–
E+PLT32-3C94	≥320	–	–	–	–
E+E32-3C96	≥320	≤ 2.0	–	–	–
E+PLT32-3C96	≥320	≤ 1.7	–	–	–
E+E32-3F3	≥300	–	–	–	–
E+PLT32-3F3	≥300	–	–	–	–
E+E32-3F4	≥250	–	–	≤ 1.6	≤ 2.5
E+PLT32-3F4	≥250	–	–	≤ 1.36	≤ 2.2

Planar E cores and accessories E38/8/25

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.272	mm^{-1}
V_e	effective volume	10200	mm^3
l_e	effective length	52.4	mm
A_e	effective area	194	mm^2
A_{min}	minimum area	194	mm^2
m	mass of core half	≈ 25	g



Dimensions in mm.

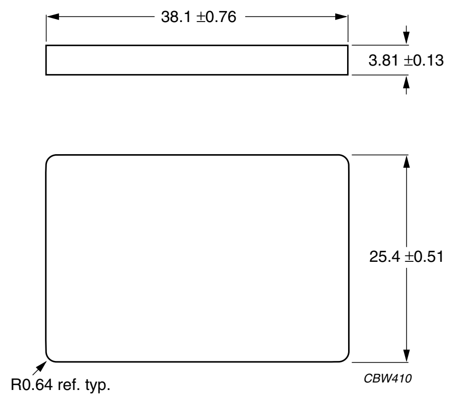
Fig.1 E38/8/25 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.226	mm^{-1}
V_e	effective volume	8460	mm^3
l_e	effective length	43.7	mm
A_e	effective area	194	mm^2
A_{min}	minimum area	194	mm^2
m	mass of plate	≈ 18	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT38/25/4-3C90
3C94 des	PLT38/25/4-3C94
3F3	PLT38/25/4-3F3
3F4 des	PLT38/25/4-3F4



Dimensions in mm.

Fig.2 PLT38/25/4.

Planar E cores and accessories — E38/8/25

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 40 ±15 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%(1)	≈ 54	≈ 1100	E38/8-3C90-E250-E
	315 ±3%(1)	≈ 68	≈ 850	E38/8-3C90-E315-E
	400 ±3%(1)	≈ 86	≈ 650	E38/8-3C90-E400-E
	630 ±5%	≈ 136	≈ 400	E38/8-3C90-A630-E
	1000 ±10%	≈ 216	≈ 250	E38/8-3C90-A1000-E
	7940 ±25%	≈ 1720	≈ 0	E38/8/25-3C90
3C94 des	250 ±3%(1)	≈ 54	≈ 1100	E38/8-3C94-E250-E
	315 ±3%(1)	≈ 68	≈ 850	E38/8-3C94-E315-E
	400 ±3%(1)	≈ 86	≈ 650	E38/8-3C94-E400-E
	630 ±5%	≈ 136	≈ 400	E38/8-3C94-A630-E
	1000 ±10%	≈ 216	≈ 250	E38/8-3C94-A1000-E
	7940 ±25%	≈ 1720	≈ 0	E38/8/25-3C94
3F3	250 ±3%(1)	≈ 54	≈ 1100	E38/8-3F3-E250-E
	315 ±3%(1)	≈ 68	≈ 850	E38/8-3F3-E315-E
	400 ±3%(1)	≈ 86	≈ 650	E38/8-3F3-E400-E
	630 ±5%	≈ 136	≈ 400	E38/8-3F3-A630-E
	1000 ±10%	≈ 216	≈ 250	E38/8-3F3-A1000-E
	7250 ±25%	≈ 1570	≈ 0	E38/8/25-3F3
3F4 des	250 ±3%(1)	≈ 54	≈ 1100	E38/8-3F4-E250-E
	315 ±3%(1)	≈ 68	≈ 850	E38/8-3F4-E315-E
	400 ±3%(1)	≈ 86	≈ 650	E38/8-3F4-E400-E
	630 ±5%	≈ 136	≈ 400	E38/8-3F4-A630-E
	1000 ±10%	≈ 216	≈ 250	E38/8-3F4-A1000-E
	3880 ±25%	≈ 840	≈ 0	E38/8/25-3F4

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 40 ±15 N.

Planar E cores and accessories — E38/8/25

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈ 45	≈ 1100	E38/8-3C90-A250-P
	315 ±3%	≈ 57	≈ 850	E38/8-3C90-A315-P
	400 ±3%	≈ 72	≈ 650	E38/8-3C90-A400-P
	630 ±5%	≈ 113	≈ 400	E38/8-3C90-A630-P
	1000 ±10%	≈ 180	≈ 250	E38/8-3C90-A1000-P
	9250 ±25%	≈ 1660	≈ 0	E38/8/25-3C90
3C94 des	250 ±3%	≈ 45	≈ 1100	E38/8-3C94-A250-P
	315 ±3%	≈ 57	≈ 850	E38/8-3C94-A315-P
	400 ±3%	≈ 72	≈ 650	E38/8-3C94-A400-P
	630 ±5%	≈ 113	≈ 400	E38/8-3C94-A630-P
	1000 ±10%	≈ 180	≈ 250	E38/8-3C94-A1000-P
	9250 ±25%	≈ 1660	≈ 0	E38/8/25-3C94
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
3F4 des	250 ±3%	≈ 45	≈ 1100	E38/8-3F4-A250-P
	315 ±3%	≈ 57	≈ 850	E38/8-3F4-A315-P
	400 ±3%	≈ 72	≈ 650	E38/8-3F4-A400-P
	630 ±5%	≈ 113	≈ 400	E38/8-3F4-A630-P
	1000 ±10%	≈ 180	≈ 250	E38/8-3F4-A1000-P
	4600 ±25%	≈830	≈0	E38/8/25-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E38-3C90	≥320	≤ 1.25	–	–
E+PLT38-3C90	≥320	≤ 1.05	–	–
E+E38-3C94	≥320	≤ 1.0	≤ 6.0	–
E+PLT38-3C94	≥320	≤ 0.85	≤ 5.0	–
E+E38-3F3	≥300	≤ 1.3	–	≤ 2.0
E+PLT38-3F3	≥300	≤ 1.1	–	≤ 1.65
E+E38-3F4	≥250	–	–	–
E+PLT38-3F4	≥250	–	–	–

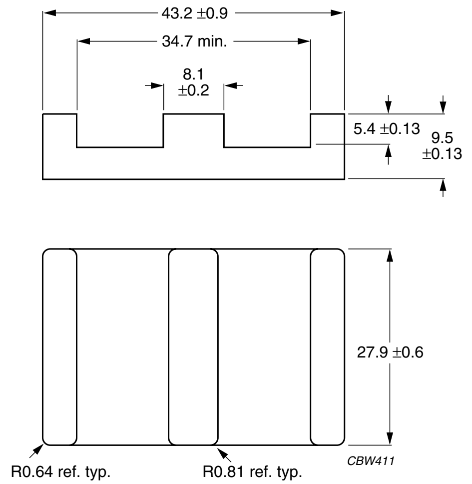
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E38-3C90	≥320	–	–	–	–
E+PLT38-3C90	≥320	–	–	–	–
E+E38-3C94	≥320	–	–	–	–
E+PLT38-3C94	≥320	–	–	–	–
E+E38-3F3	≥300	–	–	–	–
E+PLT38-3F3	≥300	–	–	–	–
E+E38-3F4	≥250	–	–	≤ 3.0	≤ 5.0
E+PLT38-3F4	≥250	–	–	≤ 2.5	≤ 4.0

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.276	mm^{-1}
V_e	effective volume	13900	mm^3
l_e	effective length	61.1	mm
A_e	effective area	229	mm^2
A_{min}	minimum area	229	mm^2
m	mass of core half	≈ 35	g



Dimensions in mm.

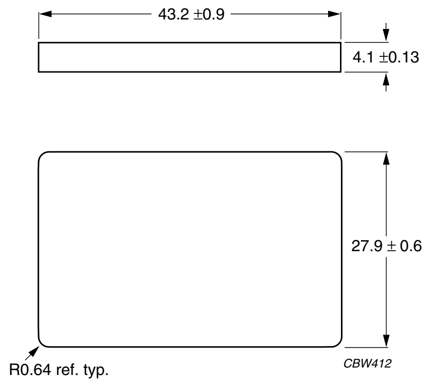
Fig.1 E43/10/28 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.226	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	50.4	mm
A_e	effective area	229	mm^2
A_{min}	minimum area	229	mm^2
m	mass of core half	≈ 24	g

Ordering information

GRADE	TYPE NUMBER
3C90	PLT43/28/4-3C90
3C94 des	PLT43/28/4-3C94
3F3	PLT43/28/4-3F3
3F4 des	PLT43/28/4-3F4



Dimensions in mm.

Fig.2 PLT43/28/4.

Planar E cores and accessories E43/10/28

Core halves for use in combination with an E core

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%(1)	≈ 55	≈ 1100	E43/10-3C90-E250-E
	315 ±3%(1)	≈ 69	≈ 800	E43/10-3C90-E315-E
	400 ±3%(1)	≈ 87	≈ 700	E43/10-3C90-E400-E
	630 ±5%	≈ 138	≈ 400	E43/10-3C90-A630-E
	1000 ±10%	≈ 219	≈ 250	E43/10-3C90-A1000-E
	8030 ±25%	≈ 1710	≈ 0	E43/10/28-3C90
3C94 des	250 ±3%(1)	≈ 55	≈ 1100	E43/10-3C94-E250-E
	315 ±3%(1)	≈ 69	≈ 800	E43/10-3C94-E315-E
	400 ±3%(1)	≈ 87	≈ 700	E43/10-3C94-E400-E
	630 ±5%	≈ 138	≈ 400	E43/10-3C94-A630-E
	1000 ±10%	≈ 219	≈ 250	E43/10-3C94-A1000-E
	8030 ±25%	≈ 1710	≈ 0	E43/10/28-3C94
3F3	250 ±3%(1)	≈ 55	≈ 1100	E43/10-3F3-E250-E
	315 ±3%(1)	≈ 69	≈ 800	E43/10-3F3-E315-E
	400 ±3%(1)	≈ 87	≈ 700	E43/10-3F3-E400-E
	630 ±5%	≈ 138	≈ 400	E43/10-3F3-A630-E
	1000 ±10%	≈ 219	≈ 250	E43/10-3F3-A1000-E
	7310 ±25%	≈ 1600	≈ 0	E43/10/28-3F3
3F4 des	250 ±3%(1)	≈ 55	≈ 1100	E43/10-3F4-E250-E
	315 ±3%(1)	≈ 69	≈ 800	E43/10-3F4-E315-E
	400 ±3%(1)	≈ 87	≈ 700	E43/10-3F4-E400-E
	630 ±5%	≈ 138	≈ 400	E43/10-3F4-A630-E
	1000 ±10%	≈ 219	≈ 250	E43/10-3F4-A1000-E
	3860 ±25%	≈ 850	≈ 0	E43/10/28-3F4

Note

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

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈ 45	≈ 1100	E43/10-3C90-A250-P
	315 ±3%	≈ 57	≈ 800	E43/10-3C90-A315-P
	400 ±3%	≈ 72	≈ 700	E43/10-3C90-A400-P
	630 ±5%	≈ 113	≈ 400	E43/10-3C90-A630-P
	1000 ±10%	≈ 180	≈ 250	E43/10-3C90-A1000-P
	9250 ±25%	≈ 1710	≈ 0	E43/10/28-3C90
3C94 des	250 ±3%	≈ 45	≈ 1100	E43/10-3C94-A250-P
	315 ±3%	≈ 57	≈ 800	E43/10-3C94-A315-P
	400 ±3%	≈ 72	≈ 700	E43/10-3C94-A400-P
	630 ±5%	≈ 113	≈ 400	E43/10-3C94-A630-P
	1000 ±10%	≈ 180	≈ 250	E43/10-3C94-A1000-P
	9250 ±25%	≈ 1710	≈ 0	E43/10/28-3C94
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
3F4 des	250 ±3%	≈ 45	≈ 1100	E43/10-3F4-A250-P
	315 ±3%	≈ 57	≈ 800	E43/10-3F4-A315-P
	400 ±3%	≈ 72	≈ 700	E43/10-3F4-A400-P
	630 ±5%	≈ 113	≈ 400	E43/10-3F4-A630-P
	1000 ±10%	≈ 180	≈ 250	E43/10-3F4-A1000-P
	4660 ±25%	≈ 850	≈ 0	E43/10/28-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E43-3C90	≥320	≤ 1.8	–	–
E+PLT43-3C90	≥320	≤ 1.5	–	–
E+E43-3C94	≥320	≤ 1.4	≤ 8.0	–
E+PLT43-3C94	≥320	≤ 1.2	≤ 7.0	–
E+E43-3F3	≥300	≤ 1.8	–	≤ 2.7
E+PLT43-3F3	≥300	≤ 1.5	–	≤ 2.25
E+E43-3F4	≥250	–	–	–
E+PLT43-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E43-3C90	≥320	–	–	–	–
E+PLT43-3C90	≥320	–	–	–	–
E+E43-3C94	≥320	–	–	–	–
E+PLT43-3C94	≥320	–	–	–	–
E+E43-3F3	≥300	–	–	–	–
E+PLT43-3F3	≥300	–	–	–	–
E+E43-3F4	≥250	–	–	≤ 4.2	≤ 6.5
E+PLT43-3F4	≥250	–	–	≤ 3.5	≤ 5.5

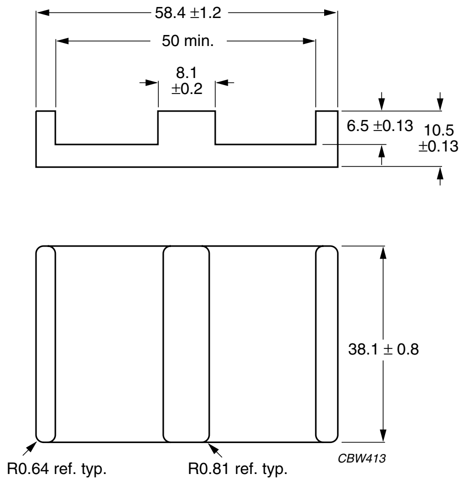
Planar E cores and accessories

E58/11/38

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.268	mm^{-1}
V_e	effective volume	24600	mm^3
l_e	effective length	80.6	mm
A_e	effective area	308	mm^2
A_{min}	minimum area	308	mm^2
m	mass of core half	≈ 62	g



Dimensions in mm.

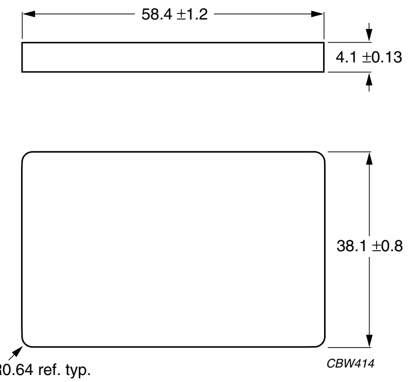
Fig.1 E58/11/38 core half.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.224	mm^{-1}
V_e	effective volume	20800	mm^3
l_e	effective length	67.7	mm
A_e	effective area	310	mm^2
A_{min}	minimum area	310	mm^2
m	mass of core half	≈ 44	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT58/38/4-3C90
3C94 des	PLT58/38/4-3C94
3F3	PLT58/38/4-3F3
3F4 des	PLT58/38/4-3F4



Dimensions in mm.

Fig.2 PLT 58/38/4.

Planar E cores and accessories — E58/11/38

Core halves for use in combination with an E core

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	315 ±3%(1)	≈ 67	≈ 1400	E58/11-3C90-E315-E
	400 ±3%(1)	≈ 85	≈ 1100	E58/11-3C90-E400-E
	630 ±5%(1)	≈ 134	≈ 650	E58/11-3C90-E630-E
	1000 ±5%	≈ 213	≈ 400	E58/11-3C90-A1000-E
	1600 ±10%	≈ 341	≈ 200	E58/11-3C90-A1600-E
	8480 ±25%	≈ 1800	≈ 0	E58/11/38-3C90
3C94 des	315 ±3%(1)	≈ 67	≈ 1400	E58/11-3C94-E315-E
	400 ±3%(1)	≈ 85	≈ 1100	E58/11-3C94-E400-E
	630 ±5%(1)	≈ 134	≈ 650	E58/11-3C94-E630-E
	1000 ±5%	≈ 213	≈ 400	E58/11-3C94-A1000-E
	1600 ±10%	≈ 341	≈ 200	E58/11-3C94-A1600-E
	8480 ±25%	≈ 1800	≈ 0	E58/11/38-3C94
3F3	315 ±3%(1)	≈ 67	≈ 1400	E58/11-3F3-E315-E
	400 ±3%(1)	≈ 85	≈ 1100	E58/11-3F3-E400-E
	630 ±5%(1)	≈ 134	≈ 650	E58/11-3F3-E630-E
	1000 ±5%	≈ 213	≈ 400	E58/11-3F3-A1000-E
	1600 ±10%	≈ 341	≈ 200	E58/11-3F3-A1600-E
	7710 ±25%	≈ 1640	≈ 0	E58/11/38-3F3
3F4 des	315 ±3%(1)	≈ 67	≈ 1400	E58/11-3F4-E315-E
	400 ±3%(1)	≈ 85	≈ 1100	E58/11-3F4-E400-E
	630 ±5%(1)	≈ 134	≈ 650	E58/11-3F4-E630-E
	1000 ±5%	≈ 213	≈ 400	E58/11-3F4-A1000-E
	1600 ±10%	≈ 341	≈ 200	E58/11-3F4-A1600-E
	4030 ±25%	≈ 860	≈ 0	E58/11/38-3F4

Note

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

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	315 ±3%	≈ 56	≈ 1400	E58/11-3C90-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11-3C90-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11-3C90-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11-3C90-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11-3C90-A1600-P
	9970 ±25%	≈ 780	≈ 0	E58/11/38-3C90
3C94 des	315 ±3%	≈ 56	≈ 1400	E58/11-3C94-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11-3C94-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11-3C94-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11-3C94-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11-3C94-A1600-P
	9970 ±25%	≈ 780	≈ 0	E58/11/38-3C94
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
3F4 des	315 ±3%	≈ 56	≈ 1400	E58/11-3F4-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11-3F4-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11-3F4-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11-3F4-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11-3F4-A1600-P
	4780 ±25%	≈ 850	≈ 0	E58/11/38-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E58-3C90	≥320	≤ 3.0	–	–
E+PLT58-3C90	≥320	≤ 2.6	–	–
E+E58-3C94	≥320	≤ 2.4	≤ 15	–
E+PLT58-3C94	≥320	≤ 2.0	≤ 13	–
E+E58-3F3	≥300	≤ 3.0	–	≤ 4.7
E+PLT58-3F3	≥300	≤ 2.6	–	≤ 4.0
E+E58-3F4	≥250	–	–	–
E+PLT58-3F4	≥250	–	–	–

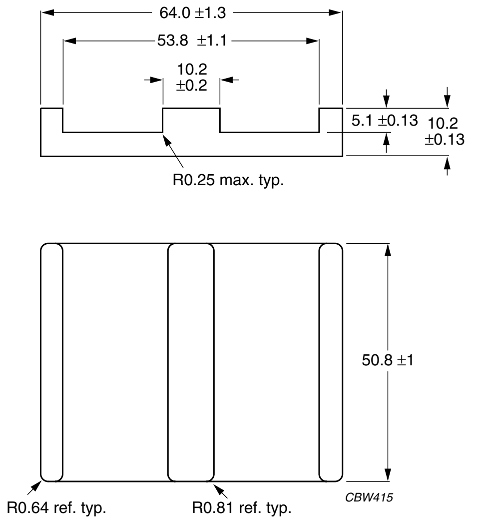
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E58-3C90	≥320	–	–	–	–
E+PLT58-3C90	≥320	–	–	–	–
E+E58-3C94	≥320	–	–	–	–
E+PLT58-3C94	≥320	–	–	–	–
E+E58-3F3	≥300	–	–	–	–
E+PLT58-3F3	≥300	–	–	–	–
E+E58-3F4	≥250	–	–	≤ 7.4	≤ 12
E+PLT58-3F4	≥250	–	–	≤ 6.25	≤ 10

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.156	mm^{-1}
V_e	effective volume	40700	mm^3
l_e	effective length	79.9	mm
A_e	effective area	519	mm^2
A_{min}	minimum area	519	mm^2
m	mass of core half	≈ 100	g



Dimensions in mm.

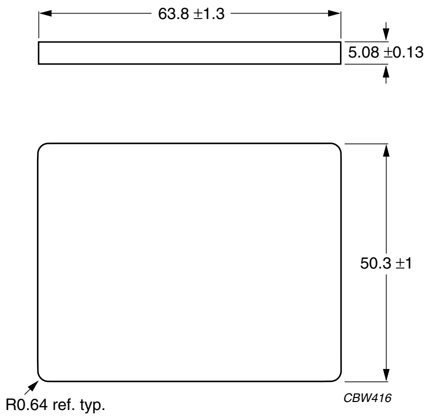
Fig.1 E64/10/50.

Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.136	mm^{-1}
V_e	effective volume	35500	mm^3
l_e	effective length	69.7	mm
A_e	effective area	519	mm^2
A_{min}	minimum area	519	mm^2
m	mass of plate	≈ 78	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT64/50/5-3C90
3C94 des	PLT64/50/5-3C94
3F3	PLT64/50/5-3F3
3F4 des	PLT64/50/5-3F4



Dimensions in mm.

Fig.2 PLT 64/50/5.

Core halves for use in combination with an E core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 100 ±30 N, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	630 ±3%(1)	≈ 78	≈ 1100	E64/10-3C90-E630-E
	1000 ±3%(1)	≈ 124	≈ 660	E64/10-3C90-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10-3C90-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10-3C90-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10-3C90-A3150-E
	14640 ±25%	≈ 1820	≈ 0	E64/10/50-3C90
3C94 des	630 ±3%(1)	≈ 78	≈ 1100	E64/10-3C94-E630-E
	1000 ±3%(1)	≈ 124	≈ 660	E64/10-3C94-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10-3C94-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10-3C94-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10-3C94-A3150-E
	14640 ±25%	≈ 1820	≈ 0	E64/10/50-3C94
3F3	630 ±3%(1)	≈ 78	≈ 1100	E64/10-3F3-E630-E
	1000 ±3%(1)	≈ 124	≈ 660	E64/10-3F3-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10-3F3-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10-3F3-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10-3F3-A3150-E
	13300 ±25%	≈ 1650	≈ 0	E64/10/50-3F3
3F4 des	630 ±3%(1)	≈ 78	≈ 1100	E64/10-3F4-E630-E
	1000 ±3%(1)	≈ 124	≈ 660	E64/10-3F4-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10-3F4-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10-3F4-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10-3F4-A3150-E
	6960 ±25%	≈ 860	≈ 0	E64/10/50-3F4

Note

1. Measured in combination with an equal-gapped core half, clamping force for A_L measurements, 100 ±30 N.

Planar E cores and accessories — E64/10/50

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 100 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	630 ±3%	≈ 78	≈ 1100	E64/10-3C90-A-630-P
	1000 ±3%	≈ 124	≈ 660	E64/10-3C90-A-1000-P
	1600 ±5%	≈ 199	≈ 385	E64/10-3C90-A-1600-P
	2500 ±10%	≈ 310	≈ 225	E64/10-3C90-A-2500-P
	3150 ±10%	≈ 391	≈ 170	E64/10-3C90-A-3150-P
	16540 ±25%	≈ 1790	≈ 0	E64/10/50-3C90
3C94 des	630 ±3%	≈ 78	≈ 1100	E64/10-3C94-A-630-P
	1000 ±3%	≈ 124	≈ 660	E64/10-3C94-A-1000-P
	1600 ±5%	≈ 199	≈ 385	E64/10-3C94-A-1600-P
	2500 ±10%	≈ 310	≈ 225	E64/10-3C94-A-2500-P
	3150 ±10%	≈ 391	≈ 170	E64/10-3C94-A-3150-P
	16540 ±25%	≈ 1790	≈ 0	E64/10/50-3C94
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
3F4 des	630 ±3%	≈ 78	≈ 1100	E64/10-3F4-A-630-P
	1000 ±3%	≈ 124	≈ 660	E64/10-3F4-A-1000-P
	1600 ±5%	≈ 199	≈ 385	E64/10-3F4-A-1600-P
	2500 ±10%	≈ 310	≈ 225	E64/10-3F4-A-2500-P
	3150 ±10%	≈ 391	≈ 170	E64/10-3F4-A-3150-P
	7920 ±25%	≈ 860	≈ 0	E64/10/50-3F4

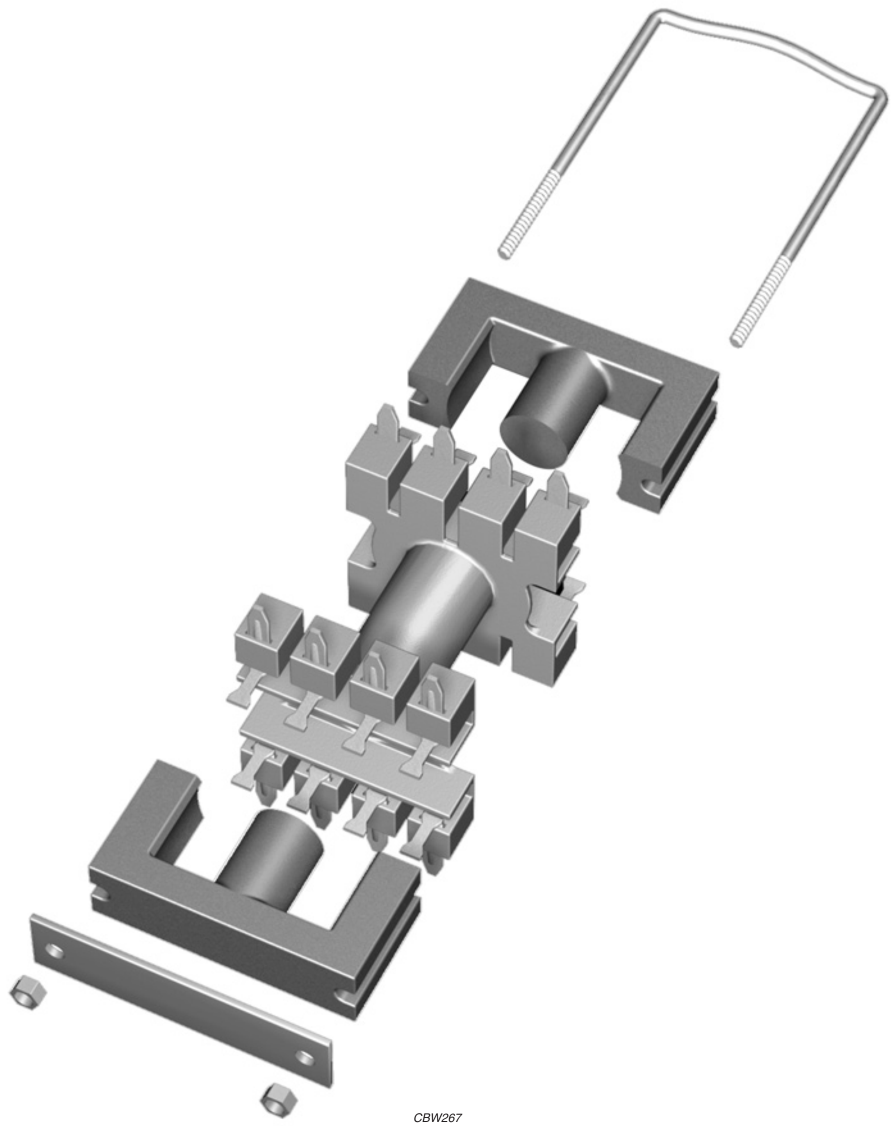
Planar E cores and accessories E64/10/50

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
E+E64-3C90	≥320	≤ 4.8	–	–
E+PLT64-3C90	≥320	≤ 4.2	–	–
E+E64-3C94	≥320	≤ 3.6	≤ 25	–
E+PLT64-3C94	≥320	≤ 3.2	≤ 23	–
E+E64-3F3	≥300	≤ 4.8	–	≤ 7.8
E+PLT64-3F3	≥300	≤ 4.2	–	≤ 6.8
E+E64-3F4	≥250	–	–	–
E+PLT64-3F4	≥250	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
E+E64-3C90	≥320	–	–	–	–
E+PLT64-3C90	≥320	–	–	–	–
E+E64-3C94	≥320	–	–	–	–
E+PLT64-3C94	≥320	–	–	–	–
E+E64-3F3	≥300	–	–	–	–
E+PLT64-3F3	≥300	–	–	–	–
E+E64-3F4	≥250	–	–	≤ 12	≤ 20
E+PLT64-3F4	≥250	–	–	≤ 10.5	≤ 17



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EC cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EC35	6530	84.3	19
EC41	10800	121	30
EC52	18800	180	56
EC70	40100	279	127

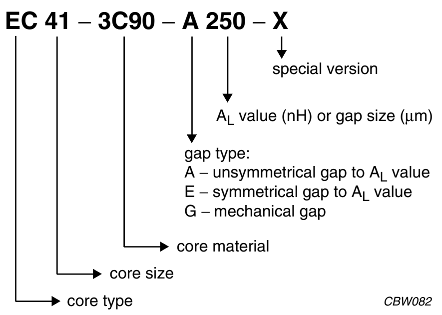


Fig.1 Type number structure for cores.

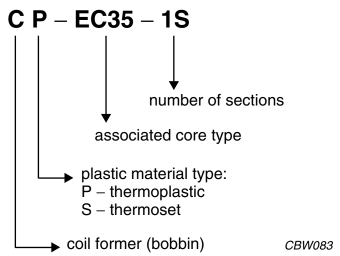
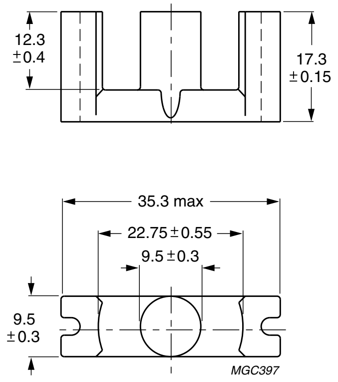


Fig.2 Type number structure for core sets.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 EC35 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	100 ± 3%(1)	≈ 73	≈ 1470	EC35-3C81-E100
	160 ± 3%(1)	≈ 117	≈ 820	EC35-3C81-E160
	250 ± 3%	≈ 184	≈ 470	EC35-3C81-A250
	315 ± 5%	≈ 231	≈ 350	EC35-3C81-A315
	400 ± 10%	≈ 290	≈ 260	EC35-3C81-A400
	≥ 2250	≥ 1640	≈ 0	EC35-3C81
3C90 sup	100 ± 3%(1)	≈ 73	≈ 1470	EC35-3C90-E100
	160 ± 3%(1)	≈ 117	≈ 820	EC35-3C90-E160
	250 ± 3%	≈ 184	≈ 470	EC35-3C90-A250
	315 ± 5%	≈ 231	≈ 350	EC35-3C90-A315
	400 ±10%	≈ 290	≈ 260	EC35-3C90-A400
	2100 ±25%	≈ 1530	≈ 0	EC35-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

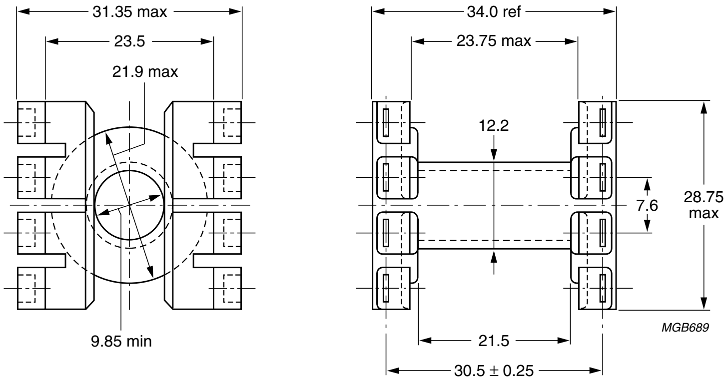
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤ 1.40	–
3C90	≥320	≤ 0.79	≤ 0.83

COIL FORMERS

General data 8-slots EC35 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085",* class B



Dimensions in mm.

Fig.2 EC35 coil former; 8-slots.

Winding data 8-slots EC35 coil former for insertable pins

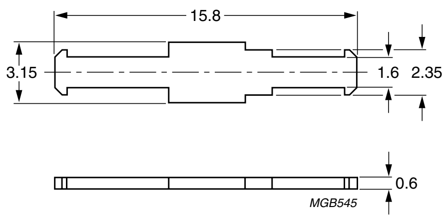
Coil formers with inserted pins are available on request.

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

MOUNTING PARTS

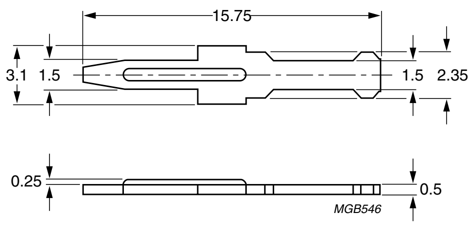
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1; material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
Base plate 2 holes	aluminium		5	BPL2-EC35
Base plate 4 holes	aluminium		6	BPL4-EC35
Clamp	copper-zinc alloy (CuZn)		7	CLM/U-EC35



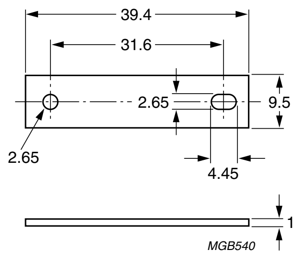
Dimensions in mm.

Fig.3 EC pin; general mount.



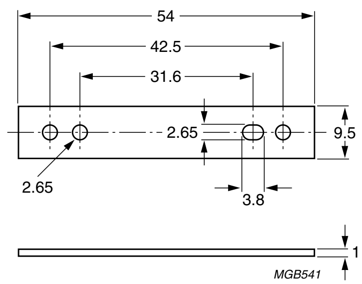
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



Dimensions in mm.

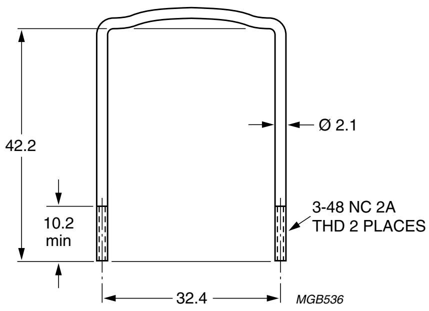
Fig.5 EC35 base plate; 2 holes.



Dimensions in mm.

Fig.6 EC35 base plate; 4 holes.

EC cores and accessories EC35



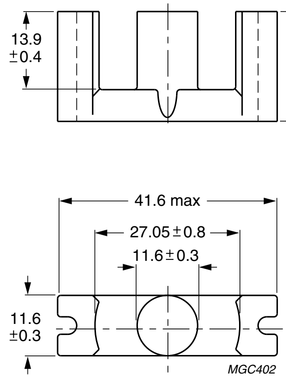
Dimensions in mm.

Fig.7 EC35 clamp.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 EC41 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	100 ± 3%(1)	≈ 59	≈ 2200	EC41-3C81-E100
	160 ± 3%(1)	≈ 94	≈ 1220	EC41-3C81-E160
	250 ± 3%(1)	≈ 147	≈ 705	EC41-3C81-E250
	315 ± 5%	≈ 186	≈ 530	EC41-3C81-A315
	400 ± 5%	≈ 236	≈ 390	EC41-3C81-A400
	≥ 2800	≥ 1640	≈ 0	EC41-3C81
3C90 sup	100 ± 3%(1)	≈ 59	≈ 2200	EC41-3C90-E100
	160 ± 3%(1)	≈ 94	≈ 1220	EC41-3C90-E160
	250 ± 3%(1)	≈ 147	≈ 705	EC41-3C90-E250
	315 ± 5%	≈ 186	≈ 530	EC41-3C90-A315
	400 ± 5%	≈ 236	≈ 390	EC41-3C90-A400
	2700 ± 25%	≈ 1580	≈ 0	EC41-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

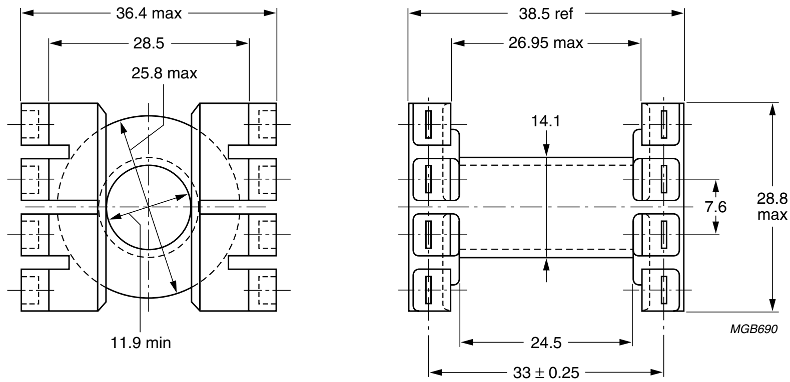
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤ 2.2	–
3C90	≥320	≤ 1.3	≤ 1.4

COIL FORMERS

General data 8-slots EC41 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085",* class B



Dimensions in mm.

Fig.2 EC41 coil former; 8-slots.

Winding data 8-slots EC41 coil former for insertable pins

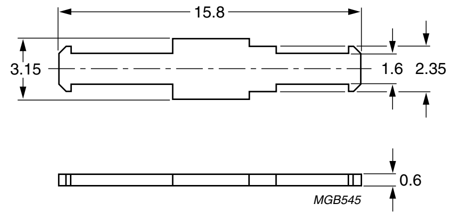
Coil formers with inserted pins are available on request.

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

MOUNTING PARTS

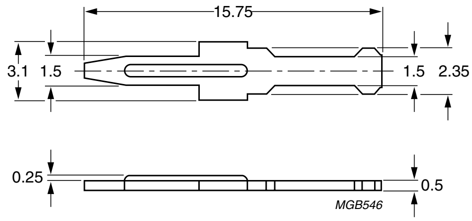
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC41
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC41
Base plate 4 holes	aluminium (Al)		7	BPL4-EC41



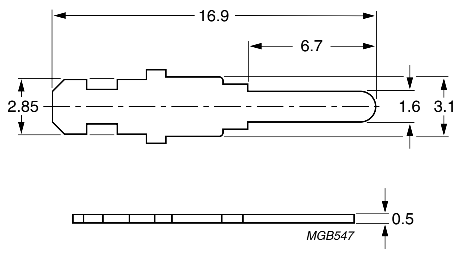
Dimensions in mm.

Fig.3 EC pin; general mount.



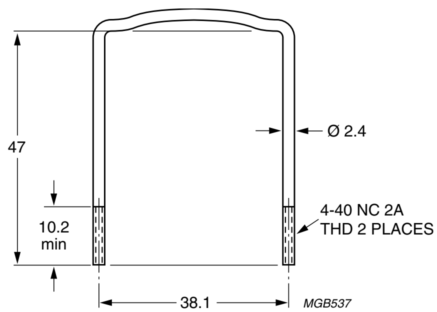
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



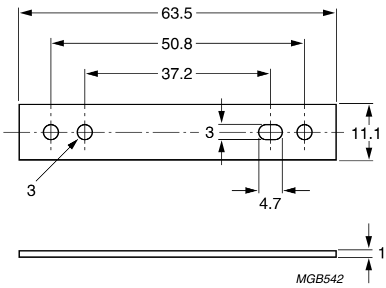
Dimensions in mm.

Fig.5 EC41 pin; vertical mount.



Dimensions in mm.

Fig.6 EC41 clamp.



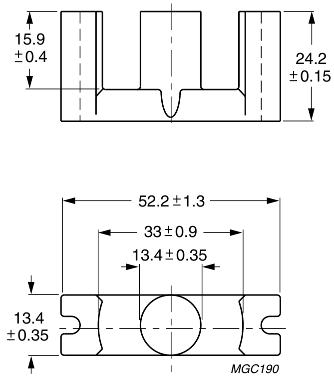
Dimensions in mm.

Fig.7 EC41 base plate; 4 holes.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 EC52 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	160 ± 3%(1)	≈ 74	≈ 1920	EC52-3C81-E160
	250 ± 3%(1)	≈ 116	≈ 1100	EC52-3C81-E250
	315 ± 3%(1)	≈ 147	≈ 830	EC52-3C81-E315
	400 ± 3%	≈ 185	≈ 620	EC52-3C81-A400
	630 ± 5%	≈ 290	≈ 350	EC52-3C81-A630
	≥ 3550	≥ 1640	≈ 0	EC52-3C81
3C90 sup	160 ± 3%(1)	≈ 74	≈ 1920	EC52-3C90-E160
	250 ± 3%(1)	≈ 116	≈ 1100	EC52-3C90-E250
	315 ± 3%(1)	≈ 147	≈ 830	EC52-3C90-E315
	400 ± 3%	≈ 185	≈ 620	EC52-3C90-A400
	630 ± 5%	≈ 290	≈ 350	EC52-3C90-A630
	3600 ± 25%	≈ 1660	≈ 0	EC52-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

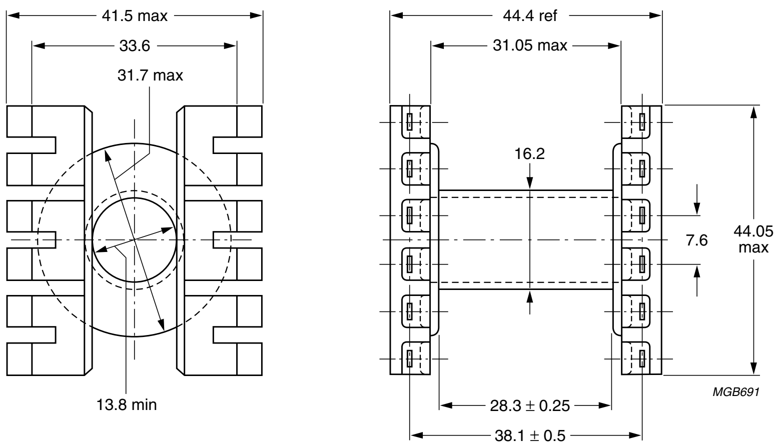
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤ 3.8	–
3C90	≥320	≤ 2.3	≤ 2.4

COIL FORMERS

General data 12-slots EC52 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(R)
Maximum operating temperature	130 °C, *"IEC 60085",* class B



Dimensions in mm.

Fig.2 EC52 coil former; 12-slots.

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

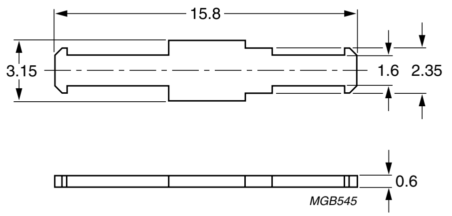
Coil formers with inserted pins are available on request.

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

MOUNTING PARTS

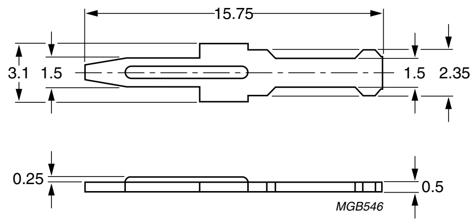
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC52
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC52
Base plate 4 holes	aluminium		7	BPL4-EC52



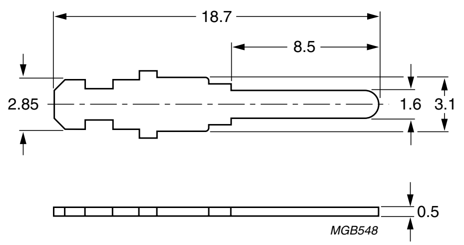
Dimensions in mm.

Fig.3 EC pin; general mount.



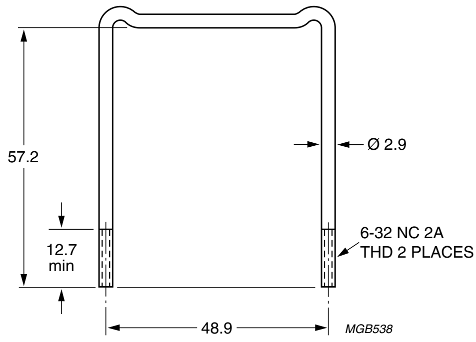
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



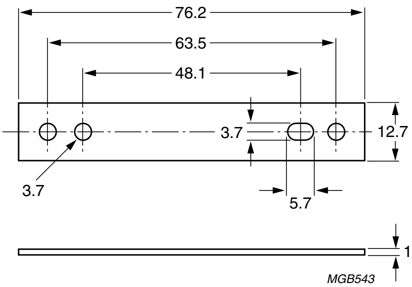
Dimensions in mm.

Fig.5 EC52 pin; vertical mount.



Dimensions in mm.

Fig.6 EC52 clamp.



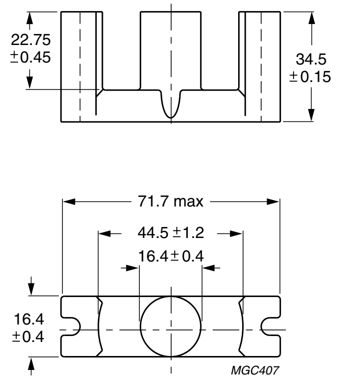
Dimensions in mm.

Fig.7 EC52 base plate; 4 holes.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 EC70 core half.

Core halves

A_L measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81 sup	250 ± 3%(1)	≈ 102	≈ 1830	EC70-3C81-E250
	315 ± 3%(1)	≈ 130	≈ 1370	EC70-3C81-E315
	400 ± 3%(1)	≈ 165	≈ 1020	EC70-3C81-E400
	630 ± 5%	≈ 256	≈ 580	EC70-3C81-A630
	1000 ± 10%	≈ 406	≈ 320	EC70-3C81-A1000
	≥ 4000	≥ 1620	≈ 0	EC70-3C81
3C90 sup	250 ± 3%(1)	≈ 102	≈ 1830	EC70-3C90-E250
	315 ± 3%(1)	≈ 130	≈ 1370	EC70-3C90-E315
	400 ± 3%(1)	≈ 165	≈ 1020	EC70-3C90-E400
	630 ± 5%	≈ 256	≈ 580	EC70-3C90-A630
	1000 ± 10%	≈ 406	≈ 320	EC70-3C90-A1000
	3900 ± 25%	≈ 1580	≈ 0	EC70-3C90

Note

1. Measured in combination with an equal gapped core half (symmetrical air gap).

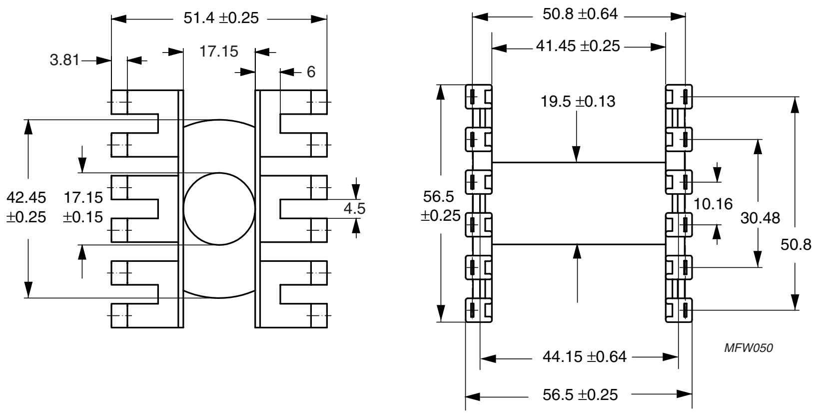
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥330	≤ 8.2	–
3C90	≥330	≤ 4.9	≤ 5.1

COIL FORMERS

General data 8-slots EC70 coil former for insertable pins

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E44716(M)
Maximum operating temperature	130 °C, *"IEC 60085",* class B



Dimensions in mm.

Fig.2 EC70 coil former; 8-slots.

Winding data 8-slots EC70 coil former for insertable pins; see note 1

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

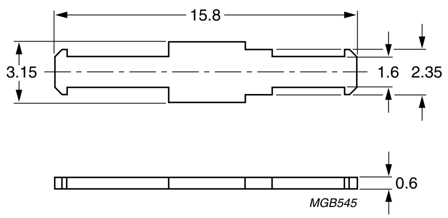
Note

1. Coil formers with inserted pins are available on request.

MOUNTING PARTS

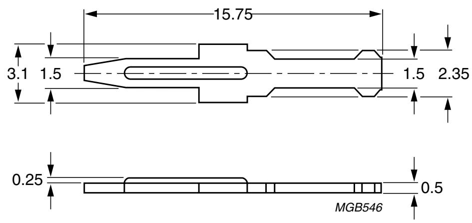
General data and ordering information

ITEM	REMARKS	MOUNT	FIGURE	TYPE NUMBER
Insertable pins	solderability: *"IEC 68-2-20"*, Part 2, Test Ta, method 1 material: copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated	general	3	PIN-EC
		horizontal	4	PIN/H-EC
		vertical	5	PIN/V-EC70
Clamp	copper-zinc alloy (CuZn)		6	CLM/U-EC70
Base plate 4 holes	aluminium		7	BPL4-EC70



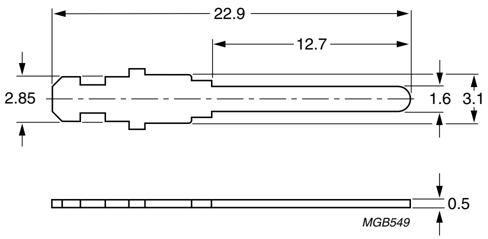
Dimensions in mm.

Fig.3 EC pin; general mount.



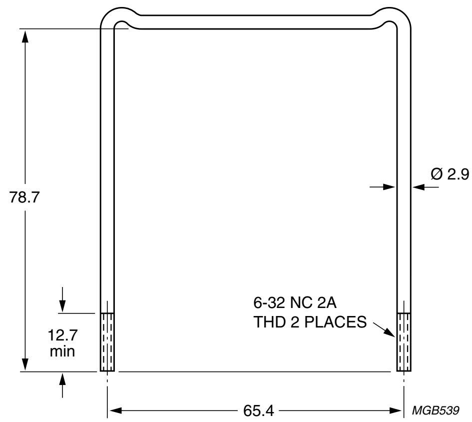
Dimensions in mm.

Fig.4 EC pin; horizontal mount.



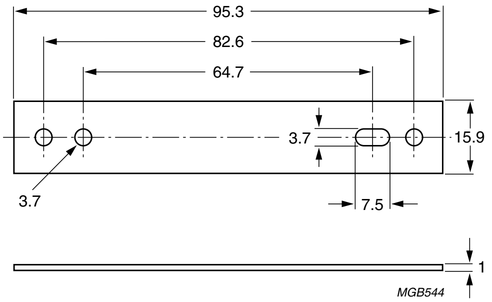
Dimensions in mm.

Fig.5 EC70 pin; vertical mount.



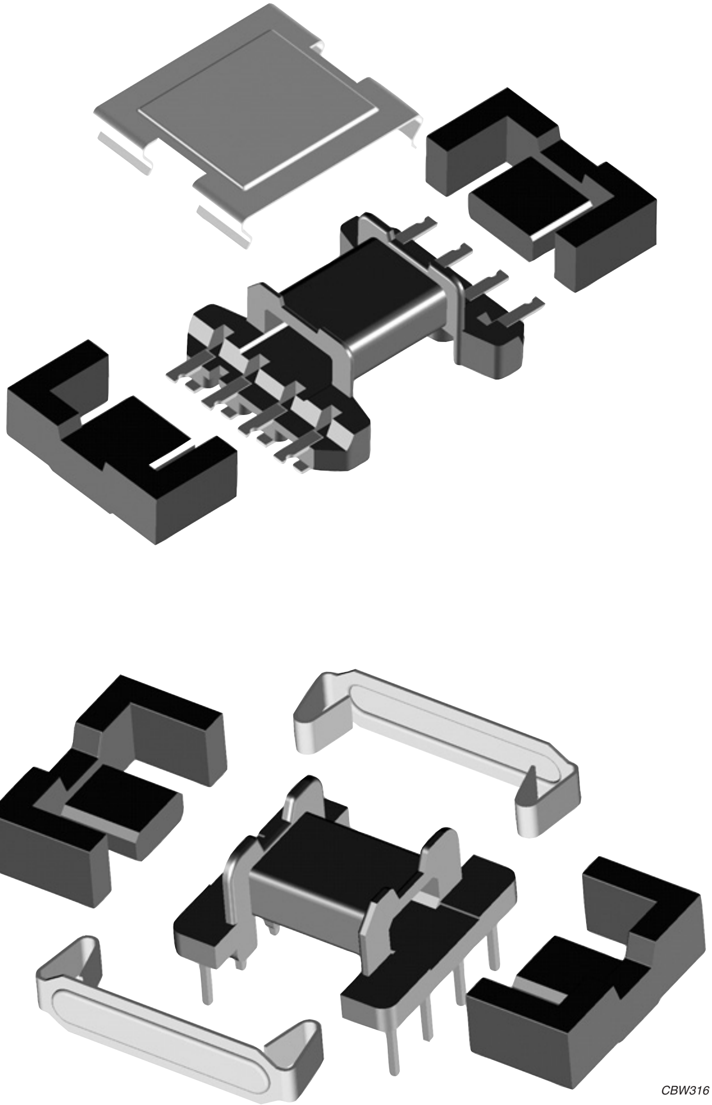
Dimensions in mm.

Fig.6 EC70 clamp.



Dimensions in mm.

Fig.7 EC70 base plate; 4-holes.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EFD cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EFD10	171	7.2	0.45
EFD12	325	11.4	0.9
EFD15	510	15.0	1.4
EFD20	1460	31.0	3.5
EFD25	3300	58.0	8
EFD30	4700	69.0	12

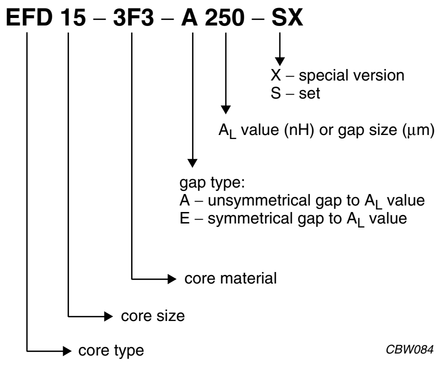


Fig.1 Type number structure for cores.

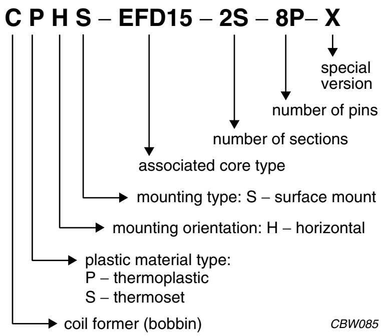


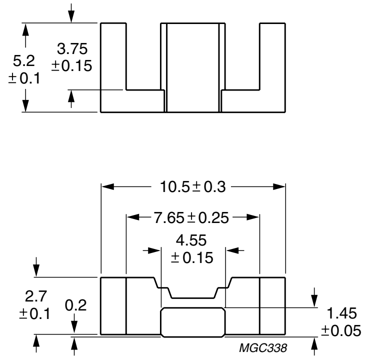
Fig.2 Type number structure for coil formers.

EFD cores and accessories EFD10

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.29	mm^{-1}
V_e	effective volume	171	mm^3
l_e	effective length	23.7	mm
A_e	effective area	7.2	mm^2
A_{min}	minimum area	6.5	mm^2
m	mass of core half	≈ 0.45	g



Dimensions in mm.

Fig.1 EFD10 core half.

Core sets

Clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	25 ±5%	≈ 66	≈ 610	EFD10-3C90-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10-3C90-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10-3C90-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10-3C90-S
3C94 des	25 ±5%	≈ 66	≈ 610	EFD10-3C94-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10-3C94-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10-3C94-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10-3C94-S
3C96 prot	525 ±25%	≈ 1360	≈ 0	EFD10-3C96-S
3F3	25 ±5%	≈ 66	≈ 610	EFD10-3F3-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10-3F3-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10-3F3-A63-S
	500 ±25%	≈ 1290	≈ 0	EFD10-3F3-S
3F35 prot	400 ±25%	≈ 1030	≈ 0	EFD10-3F35-S
3F4 des	25 ±5%	≈ 66	≈ 570	EFD10-3F4-A25-S
	40 ±8%	≈ 105	≈ 280	EFD10-3F4-A40-S
	63 ±10%	≈ 165	≈ 150	EFD10-3F4-A63-S
	280 ±25%	≈ 730	≈ 0	EFD10-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ± 5N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	2000 +40/−30%	≈ 5240	≈ 0	EFD10-3E5-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.019	−	−
3C94	≥320	≤ 0.015	≤ 0.09	−
3C96	≥340	≤ 0.01	≤ 0.07	≤ 0.03
3F35	≥300	−	−	≤ 0.015
3F3	≥315	≤ 0.020	−	≤ 0.035
3F4	≥250	−	−	−

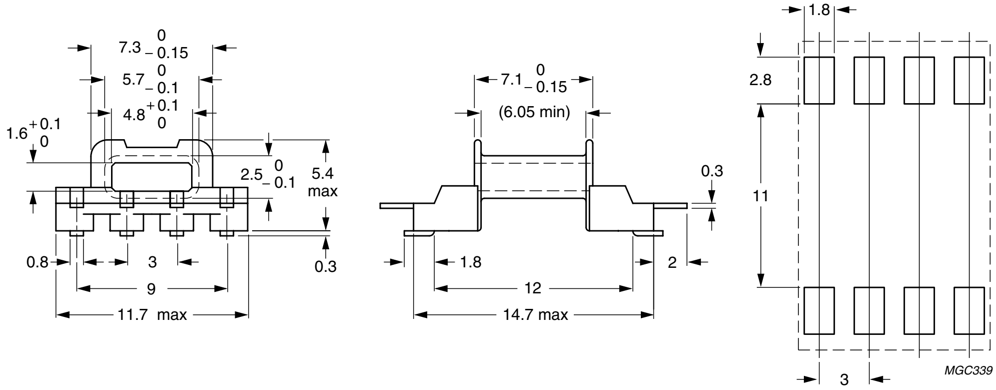
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	−	−	−	−
3C94	≥320	−	−	−	−
3C96	≥320	≤ 0.06	−	−	−
3F35	≥300	≤ 0.03	≤ 0.2	−	−
3F3	≥315	−	−	−	−
3F4	≥250	−	−	≤ 0.05	≤ 0.08

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

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

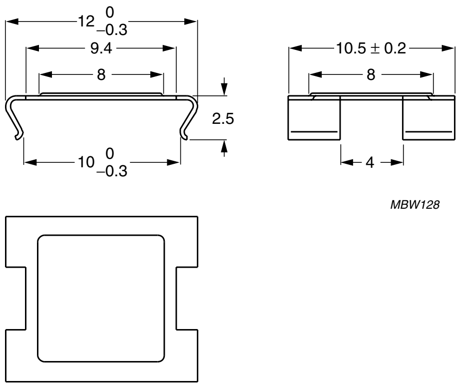
Winding data for EFD10 coil former (SMD) with 8-solder pads

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈15 N	3	CLM-EFD10



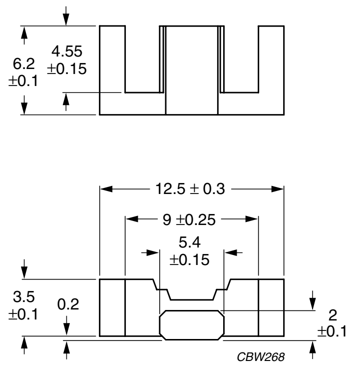
Dimensions in mm.

Fig.3 EFD10 mounting clamp.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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 sets

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	40 ±5%	≈ 80	≈ 540	EFD12-3C90-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12-3C90-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12-3C90-A100-S
	825 ±25%	≈ 1610	≈ 0	EFD12-3C90-S
3C94 des	40 ±5%	≈ 80	≈ 540	EFD12-3C94-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12-3C94-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12-3C94-A100-S
	825 ±25%	≈ 1610	≈ 0	EFD12-3C94-S
3C96 prot	750 ±25%	≈ 1460	≈ 0	EFD12-3C96-S
3F3	40 ±5%	≈ 80	≈ 540	EFD12-3F3-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12-3F3-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12-3F3-A100-S
	700 ±25%	≈ 1370	≈ 0	EFD12-3F3-S
3F35 prot	550 ±25%	≈ 1070	≈ 0	EFD12-3F35-S
3F4 des	40 ±5%	≈ 80	≈ 500	EFD12-3F4-A40-S
	63 ±8%	≈ 125	≈ 260	EFD12-3F4-A63-S
	100 ±10%	≈ 200	≈ 130	EFD12-3F4-A100-S
	380 ±25%	≈ 730	≈ 0	EFD12-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ± 5N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	2800 +40/−30%	≈ 5570	≈ 0	EFD12-3E5-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.036	−	−
3C94	≥320	≤ 0.029	≤ 0.2	−
3C96	≥340	≤ 0.022	≤ 0.15	≤ 0.06
3F35	≥300	−	−	≤ 0.03
3F3	≥315	≤ 0.04	−	≤ 0.065
3F4	≥250		−	−

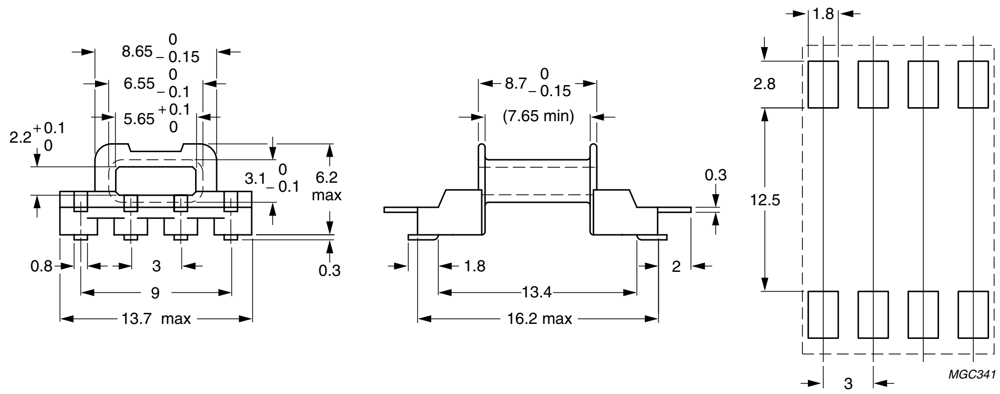
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	−	−	−	−
3C94	≥320	−	−	−	−
3C96	≥340	≤ 0.12	−	−	−
3F35	≥300	≤ 0.045	≤ 0.35	−	−
3F3	≥315	−	−	−	−
3F4	≥250	−	−	≤ 0.09	≤ 0.15

COIL FORMERS

General data

ITEM	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

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

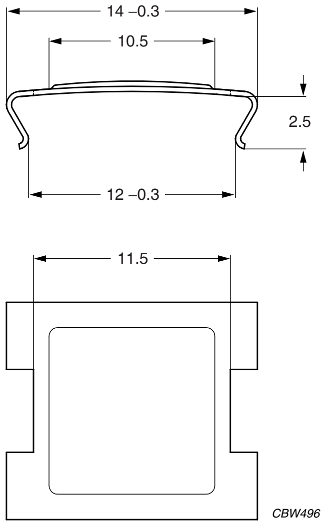
Winding data for EFD12 coil former (SMD) with 8-solder pads

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

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈20 N	3	CLM-EFD12



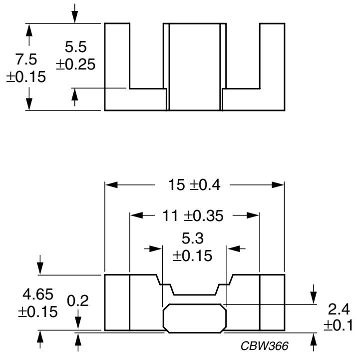
Dimensions in mm.

Fig.3 EFD12 mounting clamp.

CORES

Effective core parameters

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



Dimensions in mm.

Fig.1 EFD15 core half.

Core sets

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±5%	≈ 115	≈ 400	EFD15-3C90-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15-3C90-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15-3C90-A160-S
	950 ±25%	≈ 1700	≈ 0	EFD15-3C90-S
3C94 des	63 ±5%	≈ 115	≈ 400	EFD15-3C94-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15-3C94-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15-3C94-A160-S
	950 ±25%	≈ 1700	≈ 0	EFD15-3C94-S
3C96 prot	850 ±25%	≈ 1520	≈ 0	EFD15-3C96-S
3F3	63 ±5%	≈ 115	≈ 400	EFD15-3F3-A63-S
	100 ±8%	≈ 180	≈ 220	EFD15-3F3-A100-S
	160 ±10%	≈ 290	≈ 120	EFD15-3F3-A160-S
	780 ±25%	≈ 1400	≈ 0	EFD15-3F3-S
3F35 prot	630 ±25%	≈ 1130	≈ 0	EFD15-3F35-S
3F4 des	63 ±5%	≈ 115	≈ 360	EFD15-3F4-A63-S
	100 ±8%	≈ 180	≈ 190	EFD15-3F4-A100-S
	160 ±10%	≈ 290	≈ 90	EFD15-3F4-A160-S
	400 ±25%	≈ 720	≈ 0	EFD15-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ± 5N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	3600 +40/−30%	≈ 6500	≈ 0	EFD15-3E5-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.057	–	–
3C94	≥320	≤ 0.045	≤ 0.28	–
3C96	≥340	≤ 0.035	≤ 0.22	≤ 0.09
3F35	≥300	–	–	≤ 0.05
3F3	≥315	≤ 0.06	–	≤ 0.1
3F4	≥250		–	–

Properties of core sets under power conditions (continued)

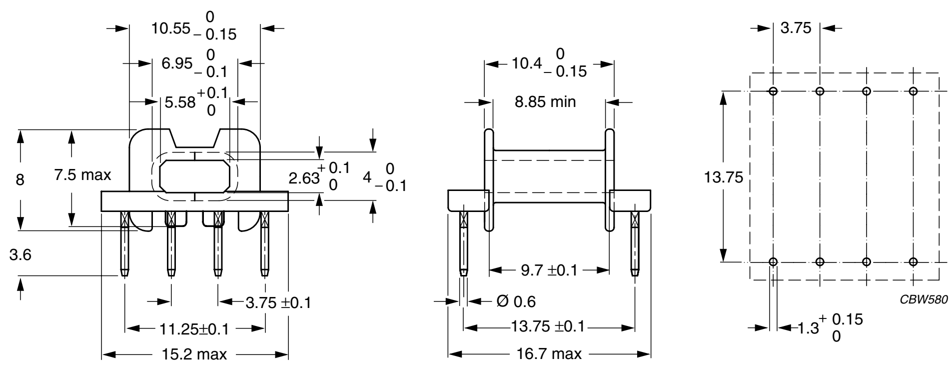
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.19	–	–	–
3F35	≥300	≤ 0.06	≤ 0.5	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤ 0.15	≤ 0.24

EFD cores and accessories EFD15

COIL FORMERS

General data

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



Dimensions in mm.

Fig.2 EFD15 coil former; 8-pins.

Winding data for EFD15 coil former with 8-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	14.8	8.85	26.3	CSH-EFD15-1S-8P; see note 1

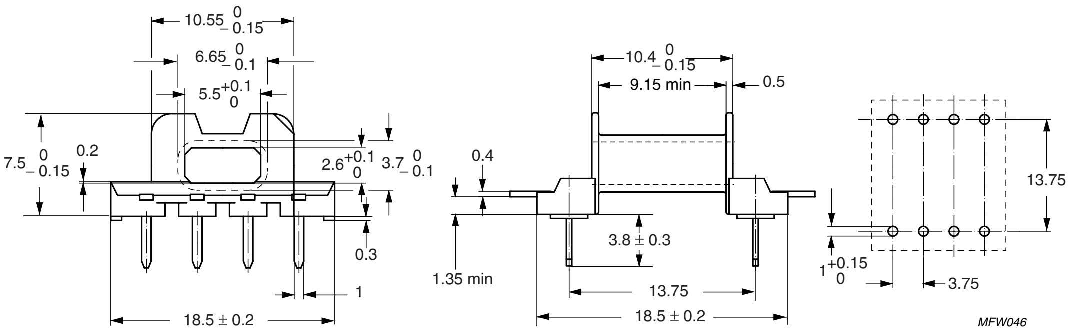
Note

1. Also available with post-inserted pins.

COIL FORMERS

General data

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



Dimensions in mm.

Fig.3 EFD15 coil former; 8-pins.

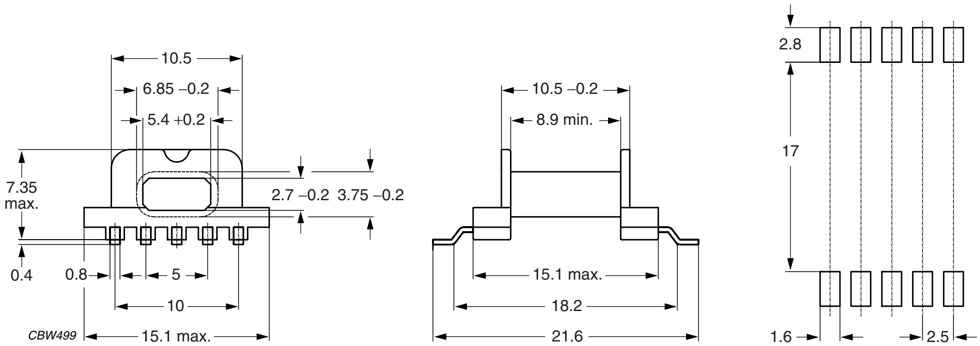
Winding data for EFD15 coil former (PCB) with 8-pins

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

COIL FORMERS

General data

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



Dimensions in mm.

Fig.4 EFD15 coil former (SMD); 10-solder pads.

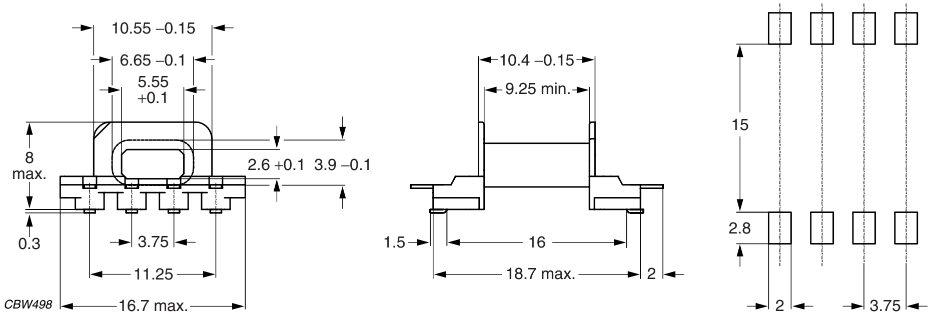
Winding data for EFD15 coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	10	16	8.9	26	CPHS-EFD15-1S-10P

COIL FORMERS

General data

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



Dimensions in mm.

Fig.5 EFD15 coil former (SMD).

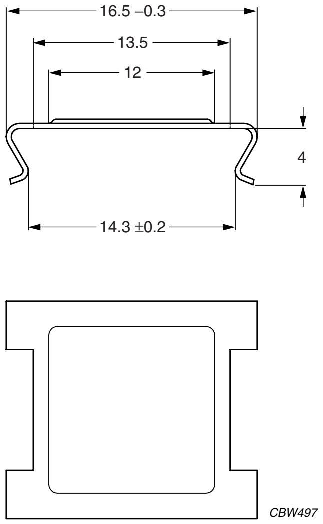
Winding data for EFD15 (SMD) coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.25	24.1	CSHS-EFD15-1S-8P-T

MOUNTING PARTS

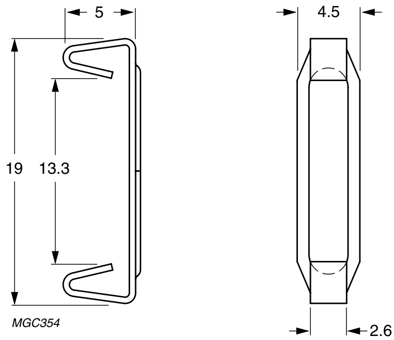
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈25 N	6	CLM-EFD15
Clip	stainless steel (CrNi); clamping force ≈12.5 N	7	CLI-EFD15



Dimensions in mm.

Fig.6 Clamp: CLM-EFD15.



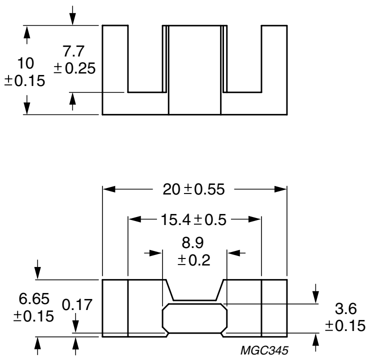
Dimensions in mm.

Fig.7 Clip: CLI-EFD15.

CORES

Effective core parameters

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

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

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	63 ±3%(1)	≈ 76	≈ 480	EFD20-3C90-E63
	100 ±3%	≈ 121	≈ 510	EFD20-3C90-A100
	160 ±5%	≈ 193	≈ 280	EFD20-3C90-A160
	250 ±8%	≈ 302	≈ 160	EFD20-3C90-A250
	315 ±10%	≈ 380	≈ 120	EFD20-3C90-A315
	1300 ±25%	≈ 1570	≈ 0	EFD20-3C90
3C94	63 ±3%(1)	≈ 76	≈ 480	EFD20-3C94-E63
	100 ±3%	≈ 121	≈ 510	EFD20-3C94-A100
	160 ±5%	≈ 193	≈ 280	EFD20-3C94-A160
	250 ±8%	≈ 302	≈ 160	EFD20-3C94-A250
	315 ±10%	≈ 380	≈ 120	EFD20-3C94-A315
	1300 ±25%	≈ 1570	≈ 0	EFD20-3C94
3C96 des	1200 ±25%	≈ 1450	≈ 0	EFD20-3C96
3F3	63 ±3%(1)	≈ 76	≈ 480	EFD20-3F3-E63
	100 ±3%	≈ 121	≈ 510	EFD20-3F3-A100
	160 ±5%	≈ 193	≈ 280	EFD20-3F3-A160
	250 ±8%	≈ 302	≈ 160	EFD20-3F3-A250
	315 ±10%	≈ 380	≈ 120	EFD20-3F3-A315
	1200 ±25%	≈ 1450	≈ 0	EFD20-3F3

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F35 des	920 ±25%	≈ 1110	≈ 0	EFD20-3F35
3F4 des	63 ±3%(1)	≈ 76	≈ 450	EFD20-3F4-E63
	100 ±3%	≈ 121	≈ 450	EFD20-3F4-A100
	160 ±5%	≈ 193	≈ 230	EFD20-3F4-A160
	250 ±8%	≈ 302	≈ 120	EFD20-3F4-A250
	315 ±10%	≈ 380	≈ 80	EFD20-3F4-A315
	650 ±25%	≈ 780	≈ 0	EFD20-3F4

Note

1. Measured in combination with an equal gapped core half, clamping force for A_L measurements, 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 = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.16	≤ 0.17	–	–
3C94	≥330	–	≤ 0.13	≤ 0.8	–
3C96	≥330	–	≤ 0.1	≤ 0.6	≤ 0.26
3F35	≥300	–	–	–	≤ 0.13
3F3	≥315	–	≤ 0.17	–	≤ 0.28
3F4	≥300	–	–	–	–

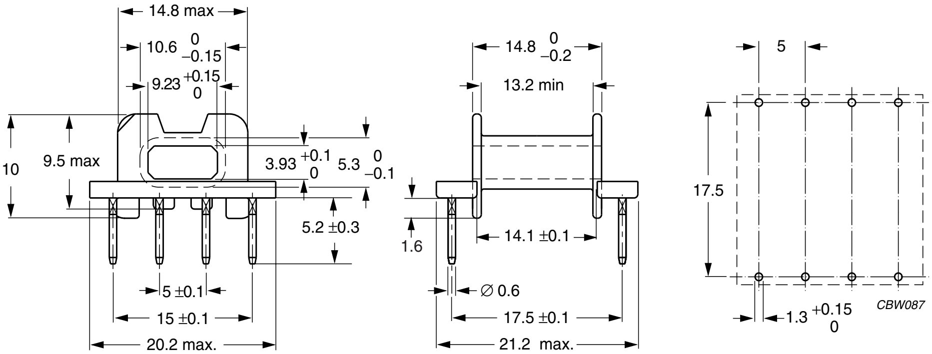
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥330	≤ 0.5	–	–	–
3F35	≥300	≤ 0.2	≤ 1.5	–	–
3F3	≥315	–	–	–	–
3F4	≥300	–	–	≤ 0.4	≤ 0.7

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), Ni flash, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 EFD20 coil former; 8-pins.

Winding data for EFD20 coil former with 8-pins

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

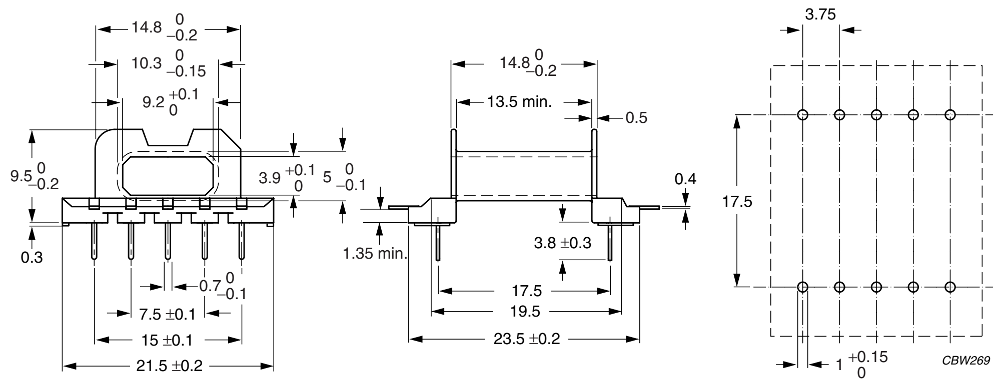
Note

1. Also available with post-inserted pins.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E54705 (M)
Pin material	copper-tin alloy (CuSn), Ni flash, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

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

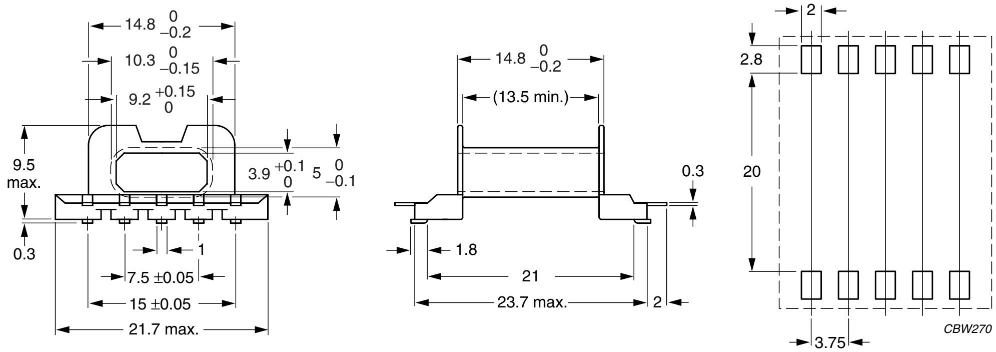
Winding data for EFD20 coil former (PCB) with 10-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.7	13.5	34.1	CPH-EFD20-1S-10P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E83005 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

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

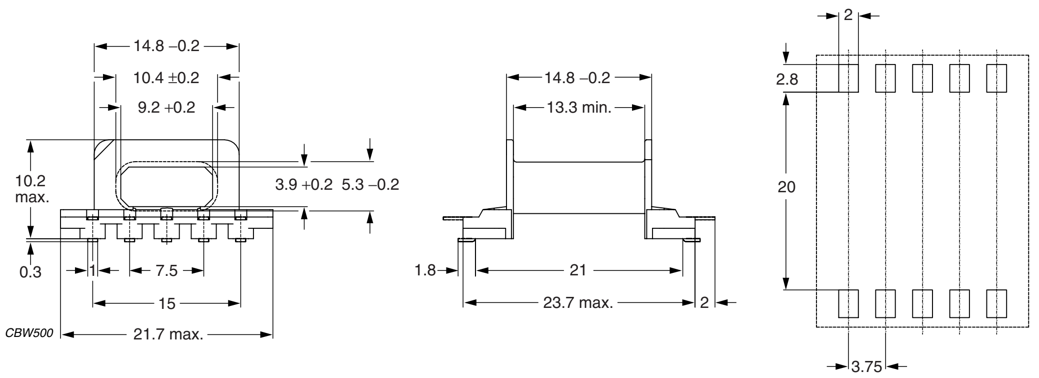
Winding data for EFD20 coil former (SMD) with 10-solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.7	13.5	34.1	CPHS-EFD20-1S-10P

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL94 V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	185 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.5 EFD20 coil former (SMD); 10-solder pads.

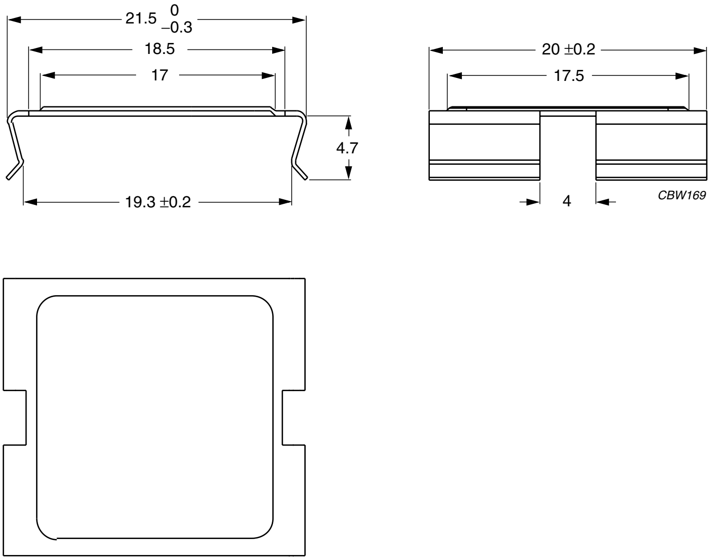
Winding data for EFD20 coil former (SMD) with 10-solder pads

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	10	27.2	13.3	34.9	CSHS-EFD20-1S-10P-T

MOUNTING PARTS

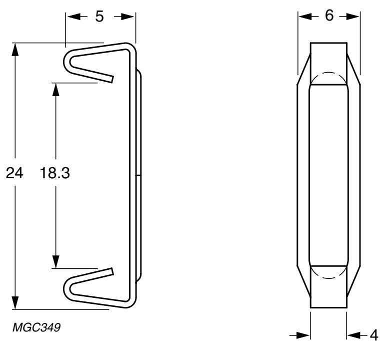
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 30 N	6	CLM-EFD20
Clip	stainless steel (CrNi); clamping force ≈ 20 N	7	CLI-EFD20



Dimensions in mm.

Fig.6 Clamp CLM-EFD20



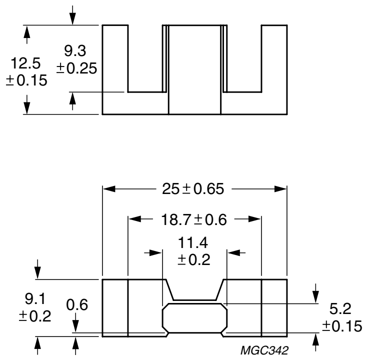
Dimensions in mm.

Fig.7 Clip CLI-EFD20.

CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.00	mm^{-1}
V_e	effective volume	3300	mm^3
I_e	effective length	57.0	mm
A_e	effective area	58.0	mm^2
A_{min}	minimum area	55.0	mm^2
m	mass of core half	≈ 8	g



Dimensions in mm.

Fig.1 EFD25 core half.

Core halves and sets

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 125	≈ 570	EFD25-3C90-A160
	250 ±3%	≈ 196	≈ 320	EFD25-3C90-A250
	315 ±5%	≈ 246	≈ 240	EFD25-3C90-A315
	400 ±8%	≈ 313	≈ 180	EFD25-3C90-A400
	630 ±10%	≈ 493	≈ 100	EFD25-3C90-A630
	2200 ±25%	≈ 1720	≈ 0	EFD25-3C90
3C94	160 ±3%	≈ 125	≈ 570	EFD25-3C94-A160
	250 ±3%	≈ 196	≈ 320	EFD25-3C94-A250
	315 ±5%	≈ 246	≈ 240	EFD25-3C94-A315
	400 ±8%	≈ 313	≈ 180	EFD25-3C94-A400
	630 ±10%	≈ 493	≈ 100	EFD25-3C94-A630
	2200 ±25%	≈ 1720	≈ 0	EFD25-3C94
3C96 des	2000 ±25%	≈ 1560	≈ 0	EFD25-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 125	≈ 570	EFD25-3F3-A160
	250 ±3%	≈ 196	≈ 320	EFD25-3F3-A250
	315 ±5%	≈ 246	≈ 240	EFD25-3F3-A315
	400 ±8%	≈ 313	≈ 180	EFD25-3F3-A400
	630 ±10%	≈ 493	≈ 100	EFD25-3F3-A630
	2000 ±25%	≈ 1560	≈ 0	EFD25-3F3
3F35 des	1500 ±25%	≈ 1170	≈ 0	EFD25-3F35
3F4 des	160 ±3%	≈ 125	≈ 500	EFD25-3F4-A160
	250 ±3%	≈ 196	≈ 270	EFD25-3F4-A250
	315 ±5%	≈ 246	≈ 290	EFD25-3F4-A315
	400 ±8%	≈ 313	≈ 130	EFD25-3F4-A400
	630 ±10%	≈ 493	≈ 60	EFD25-3F4-A630
	1000 ±25%	≈ 780	≈ 0	EFD25-3F4

Properties of core sets under power conditions

GRADE	B (mT) at		CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.35	≤ 0.38	–	–
3C94	≥330	–	≤ 0.30	≤ 1.8	–
3C96	≥330	–	≤ 0.22	≤ 1.4	≤ 0.6
3F35	≥300	–	–	–	≤ 0.28
3F3	≥315	–	≤ 0.38	–	≤ 0.66
3F4	≥300	–	–	–	–

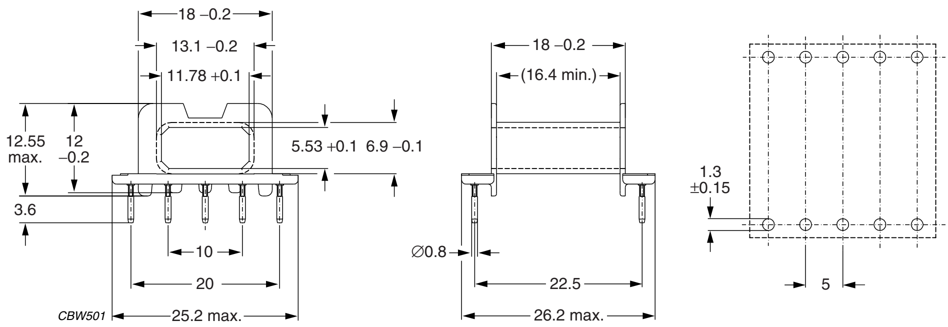
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥330	≤ 1.2	–	–	–
3F35	≥300	≤ 0.42	≤ 3.4	–	–
3F3	≥315	–	–	–	–
3F4	≥300	–	–	≤ 1.0	≤ 1.6

COIL FORMERS

General data

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



Dimensions in mm.

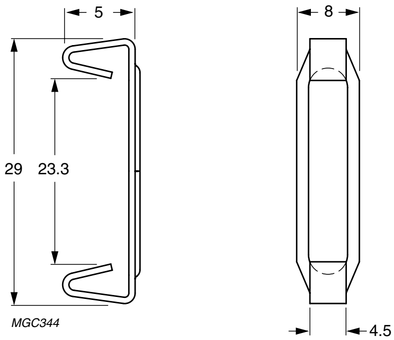
Fig.2 EFD25 coil former; 10-pins.

Winding data for EFD25 coil former with 10-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	40.2	16.4	46.4	CSH-EFD25-1S-10P; see note 1

Note

1. Also available with post-inserted pins.



Dimensions in mm.

Fig.3 EFD25 mounting clip.

MOUNTING PARTS

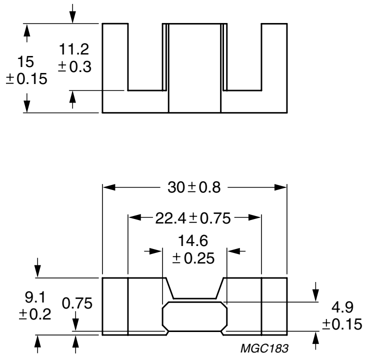
General data

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

CORES

Effective core parameters

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



Dimensions in mm.

Fig.1 EFD30 core half.

Core halves

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	160 ±3%	≈ 125	≈ 690	EFD30-3C90-A160
	250 ±3%	≈ 196	≈ 390	EFD30-3C90-A250
	315 ±5%	≈ 247	≈ 290	EFD30-3C90-A315
	400 ±8%	≈ 314	≈ 210	EFD30-3C90-A400
	630 ±10%	≈ 494	≈ 120	EFD30-3C90-A630
	2100 ±25%	≈ 1720	≈ 0	EFD30-3C90
3C94	160 ±3%	≈ 125	≈ 690	EFD30-3C94-A160
	250 ±3%	≈ 196	≈ 390	EFD30-3C94-A250
	315 ±5%	≈ 247	≈ 290	EFD30-3C94-A315
	400 ±8%	≈ 314	≈ 210	EFD30-3C94-A400
	630 ±10%	≈ 494	≈ 120	EFD30-3C94-A630
	2100 ±25%	≈ 1720	≈ 0	EFD30-3C94
3C96 des	1900 ±25%	≈ 1560	≈ 0	EFD30-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 125	≈ 690	EFD30-3F3-A160
	250 ±3%	≈ 196	≈ 390	EFD30-3F3-A250
	315 ±5%	≈ 247	≈ 290	EFD30-3F3-A315
	400 ±8%	≈ 314	≈ 210	EFD30-3F3-A400
	630 ±10%	≈ 494	≈ 120	EFD30-3F3-A630
	1900 ±25%	≈ 1560	≈ 0	EFD30-3F3
3F35 des	1450 ±25%	≈ 1170	≈ 0	EFD30-3F35
3F4 des	160 ±3%	≈ 125	≈ 620	EFD30-3F4-A160
	250 ±3%	≈ 196	≈ 320	EFD30-3F4-A250
	315 ±5%	≈ 247	≈ 230	EFD30-3F4-A315
	400 ±8%	≈ 314	≈ 160	EFD30-3F4-A400
	630 ±10%	≈ 494	≈ 65	EFD30-3F4-A630
	1050 ±25%	≈ 780	≈ 0	EFD30-3F4

Properties of core sets under power conditions

GRADE	B (mT) at		CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.50	≤ 0.54	–	–
3C94	≥330	–	≤ 0.43	≤ 2.6	–
3C96	≥340	–	≤ 0.32	≤ 2.0	≤ 0.82
3F35	≥300	–	–	–	≤ 0.4
3F3	≥315	–	≤ 0.54	–	≤ 0.91
3F4	≥300	–	–	–	–

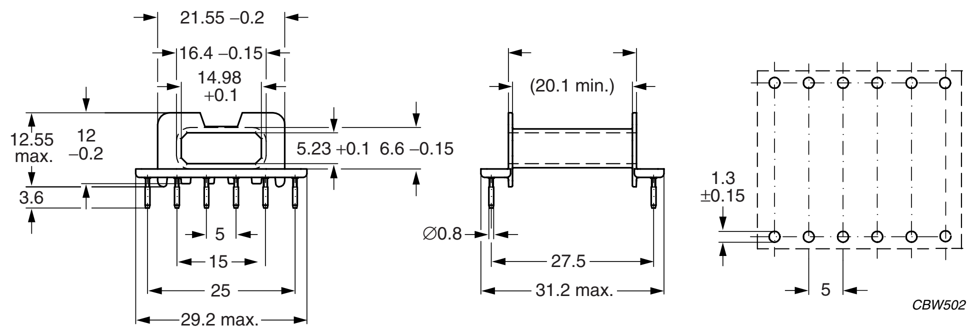
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.7	–	–	–
3F35	≥300	≤ 0.6	≤ 4.5	–	–
3F3	≥315	–	–	–	–
3F4	≥300	–	–	≤ 1.4	≤ 2.2

COIL FORMERS

General data

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



Dimensions in mm.

Fig.2 EFD30 coil former; 12-pins.

Winding data for EFD30 coil former with 12-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	52.3	20.1	52.9	CSH-EFD30-1S-12P; see note 1

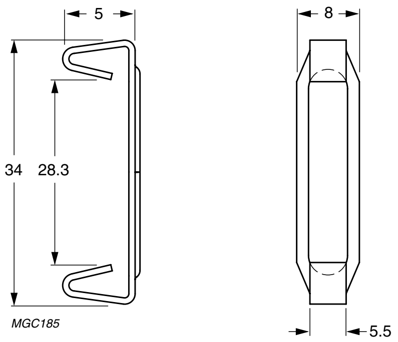
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

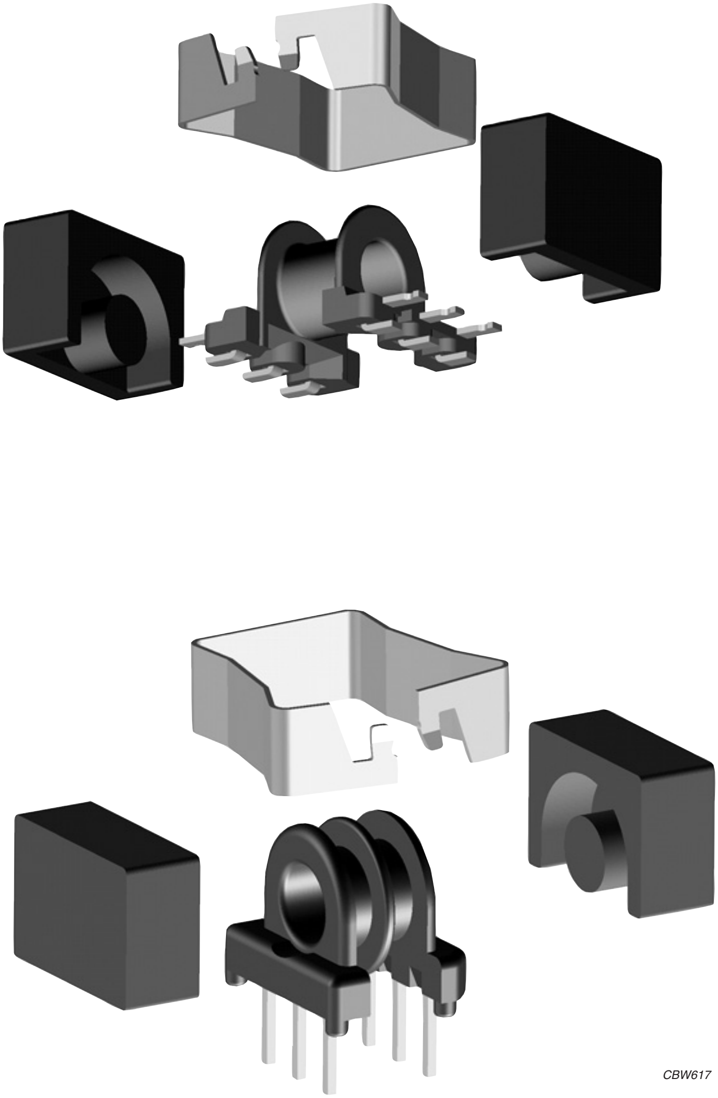
General data

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



Dimensions in mm.

Fig.3 EFD30 mounting clip.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EP cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EP5	28.7	3.0	0.5
EP7	165	10.7	1.4
EP10	215	11.3	2.8
EP13	472	19.5	4.7
EP13/LP	501	18.8	2.4
EP17	999	33.7	12
EP20	3230	78.7	27

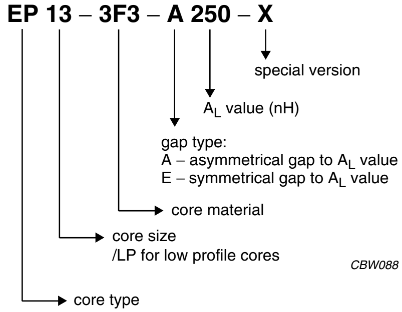


Fig.1 Type number structure for cores.

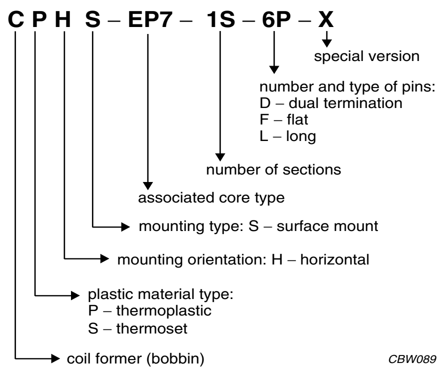
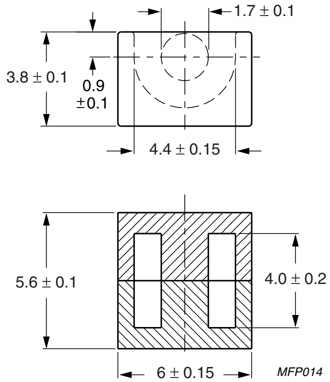


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	3.20	mm^{-1}
V_e	effective volume	28.7	mm^3
l_e	effective length	9.70	mm
A_e	effective area	3.00	mm^2
A_{min}	minimum area	2.27	mm^2
m	mass of core set	≈ 0.5	g



Dimensions in mm.

Fig. 1 EP5 core set.

Core sets for general purpose transformers and power applications
Clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	16 ± 3 %	≈ 41	≈ 320	EP5-3C94-A16
	25 ± 3 %	≈ 64	≈ 170	EP5-3C94-A25
	40 ± 5 %	≈ 102	≈ 90	EP5-3C94-A40
	63 ± 8 %	≈ 160	≈ 50	EP5-3C94-A63
	400 ± 25 %	≈ 1020	≈0	EP5-3C94
3C96 prot	380 ± 25 %	≈ 970	≈0	EP5-3C96
3F35 prot	16 ± 3 %	≈ 41	≈ 320	EP5-3F35-A16
	25 ± 3 %	≈ 64	≈ 170	EP5-3F35-A25
	40 ± 5 %	≈ 102	≈ 90	EP5-3F35-A40
	63 ± 8 %	≈ 160	≈ 50	EP5-3F35-A63
	320 ± 25 %	≈ 815	≈0	EP5-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 des	16 ± 3 %	≈ 41	≈ 320	EP5-3E55-A16
	25 ± 3 %	≈ 64	≈ 170	EP5-3E55-A25
	40 ± 5 %	≈ 102	≈ 90	EP5-3E55-A40
	63 ± 8 %	≈ 160	≈ 50	EP5-3E55-A63
	2000 + 40 / – 30 %	≈ 5100	≈0	EP5-3E55
3E6	2200 + 40 / – 30 %	≈ 5600	≈0	EP5-3E6

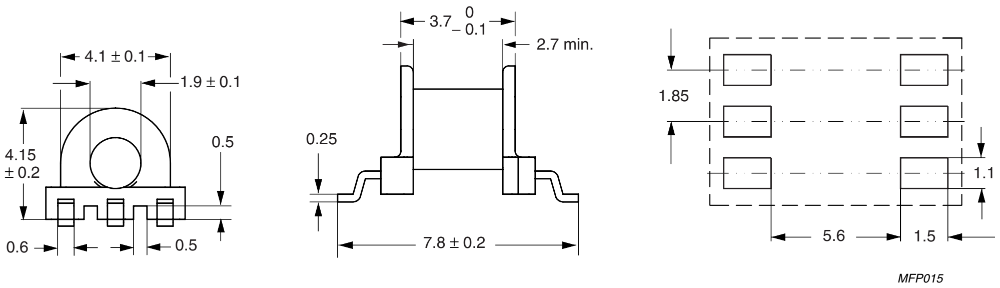
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C94	≥ 320	≤ 0.002	≤ 0.014	–	–
3C96	≥ 340	≤ 0.001	≤ 0.011	≤ 0.009	–
3F35	≥ 300	–	–	≤ 0.003	≤ 0.025

COIL FORMERS

General data

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



Dimensions in mm.

Fig. 2 EP5 coil former: 6-pads.

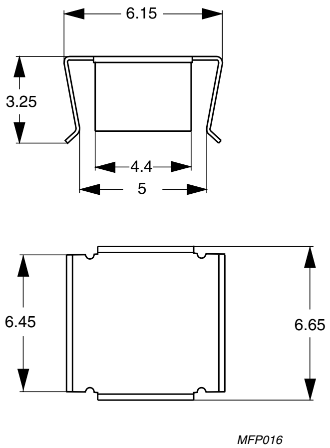
Winding data for 6-pads EP5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.89	2.7	10.5	CPHS-EP5-1S-6P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CPHS-EP5-1S-6P	3	CLI-EP5/6



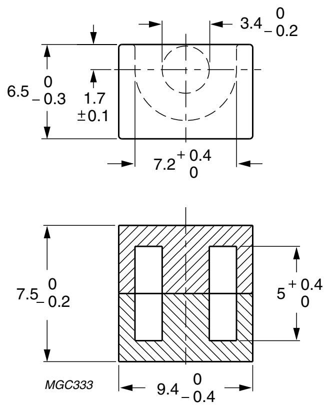
Dimensions in mm.

Fig. 3 Mounting clip CLI-EP5/6.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.45	mm^{-1}
V_e	effective volume	165	mm^3
l_e	effective length	15.5	mm
A_e	effective area	10.7	mm^2
A_{min}	minimum area	8.55	mm^2
m	mass of core set	≈ 1.4	g



Dimensions in mm.

Fig.1 EP7 core set.

Core sets for filter applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3	40 ±3%	≈ 48	≈ 450	EP7-3D3-A40
	63 ±3%	≈ 76	≈ 250	EP7-3D3-A63
	100 ±3%	≈ 121	≈ 130	EP7-3D3-A100
	530 ±25%	≈ 610	≈ 0	EP7-3D3
3H3	63 ±3%	≈ 73	≈ 270	EP7-3H3-A63
	100 ±3%	≈ 115	≈150	EP7-3H3-A100
	160 ±5%	≈ 184	≈ 90	EP7-3H3-A160
	1120 ±25%	≈ 1290	≈ 0	EP7-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	25 ±3%	≈ 29	≈ 880	EP7-3C81-E25
	40 ±3%	≈ 46	≈ 480	EP7-3C81-A40
	63 ±3%	≈ 73	≈ 270	EP7-3C81-A63
	100 ±3%	≈115	≈150	EP7-3C81-A100
	160 ±5%	≈184	≈ 90	EP7-3C81-A160
	1300 ±25%	≈ 1500	≈ 0	EP7-3C81

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C91 prot	1300 ±25%	≈ 1500	≈ 0	EP7-3C91
3C94 des	25 ±3%	≈ 29	≈ 880	EP7-3C94-E25
	40 ±3%	≈ 46	≈ 480	EP7-3C94-A40
	63 ±3%	≈ 73	≈ 270	EP7-3C94-A63
	100 ±3%	≈115	≈150	EP7-3C94-A100
	160 ±5%	≈184	≈ 90	EP7-3C94-A160
	1200 ±25%	≈ 1380	≈ 0	EP7-3C94
3C96 prot	1120 ±25%	≈ 1290	≈ 0	EP7-3C96
3F3	25 ±3%	≈ 29	≈ 880	EP7-3F3-E25
	40 ±3%	≈ 46	≈ 480	EP7-3F3-A40
	63 ±3%	≈ 73	≈ 270	EP7-3F3-A63
	100 ±3%	≈ 115	≈150	EP7-3F3-A100
	160 ±5%	≈ 184	≈ 90	EP7-3F3-A160
	1000 ±25%	≈ 1150	≈ 0	EP7-3F3
3F35 prot	850 ±25%	≈ 980	≈ 0	EP7-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	3400 ± 25%	≈ 3920	EP7-3E27
3E5	5200 +40/–30%	≈ 5990	EP7-3E5
3E55 des	5200 +40/–30%	≈ 5990	EP7-3E55
3E6	5800 +40/–30%	≈ 6680	EP7-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.04	–	–	–
3C91	≥320	–	≤ 0.11(1)	≤ 0.06(1)	–
3C94	≥320	–	≤ 0.014	≤ 0.08	–
3C96	≥340	–	≤ 0.011	≤ 0.06	≤ 0.025
3F35	≥320	–	–	–	≤ 0.015
3F3	≥315	–	≤ 0.02	–	≤ 0.035
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.055	–	–	–
3F35	≥320	≤ 0.02	≤ 0.15	–	–
3F3	≥315	–	–	–	–
3F4	≥250	–	–	≤ 0.04	≤ 0.07

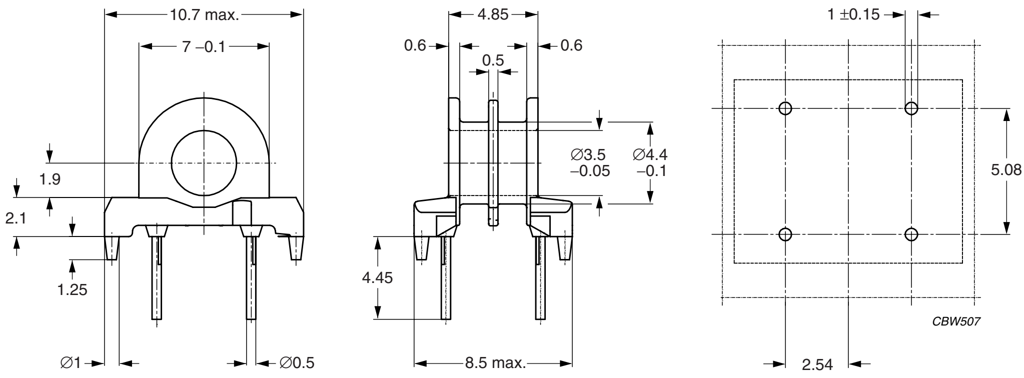
Note

1. Measured at 60 °C.

COIL FORMERS

General data

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



Dimensions in mm.

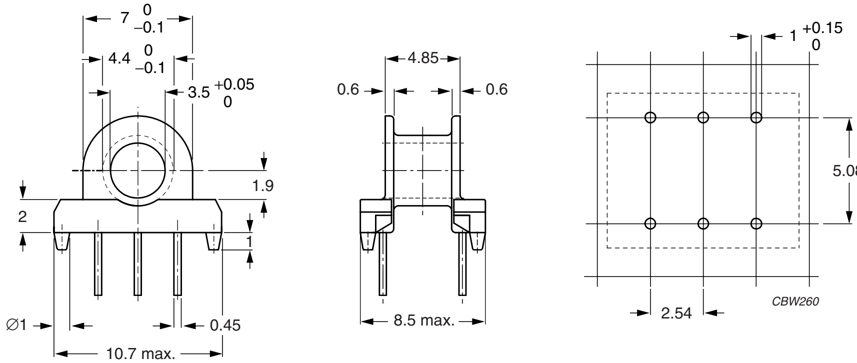
Fig.2 EP7 coil former: 4-pins.

Winding data for 4-pins EP7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 1.75	2 × 1.45	17.9	CSH-EP7-2S-4P-TA
1	4.3	3.4	17.9	CSH-EP7-1S-4P-TA

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

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



Dimensions in mm.

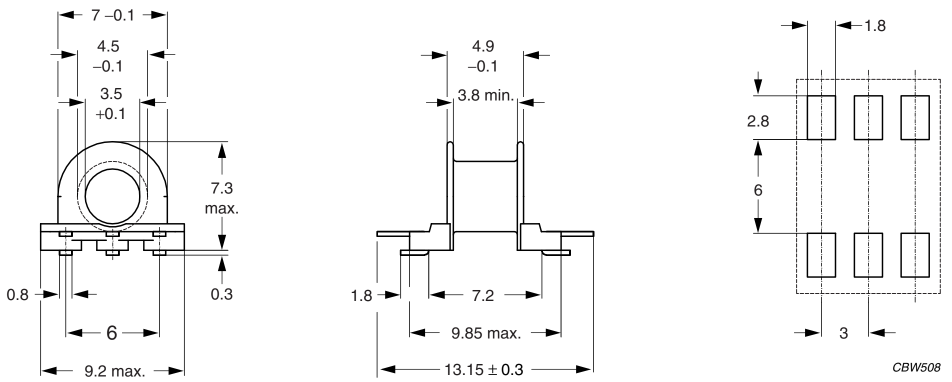
Fig.3 EP7 coil former: 6-pins.

Winding data for 4 and 6-pins EP7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.3	3.4	17.7	CSH-EP7-1S-6P-B
1	4.3	3.4	17.7	CSH-EP7-1S-4P-B

General data for 6-pads EP7 SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number: E41429 (M)
Solder pad material	copper-clad steel , tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

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

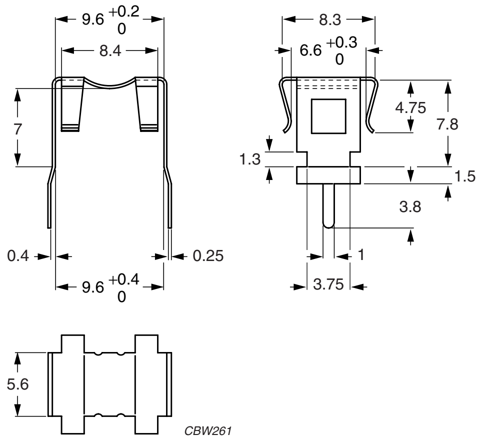
Winding data for 6-pads EP7 SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.7	3.9	17.9	CSHS-EP7-1S-6P

MOUNTING PARTS

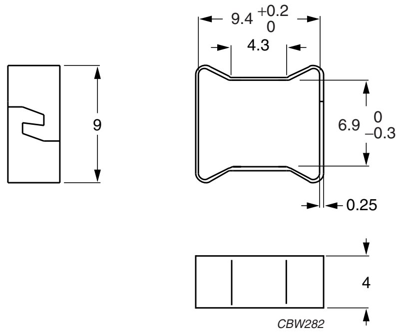
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CSH-EP7-1S-6P-B	5	CLI/P-EP7
Mounting clip	stainless steel (CrNi); clamping force ≈22 N	6	CLI-EP7



Dimensions in mm.

Fig.5 Mounting clip CLI/P-EP7.



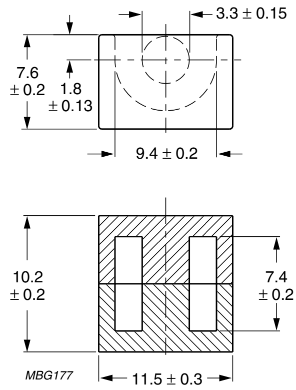
Dimensions in mm.

Fig.6 Mounting clip CLI-EP7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.70	mm^{-1}
V_e	effective volume	215	mm^3
l_e	effective length	19.3	mm
A_e	effective area	11.3	mm^2
A_{min}	minimum area	8.55	mm^2
m	mass of core set	≈ 2.8	g



Dimensions in mm.

Fig.1 EP10 core set.

Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3	40 ±3%	≈ 54	≈ 500	EP10-3D3-A40
	63 ±3%	≈ 86	≈ 260	EP10-3D3-A63
	100 ±3%	≈ 136	≈ 140	EP10-3D3-A100
	470 ±25%	≈ 640	≈ 0	EP10-3D3
3H3	40 ±3%	≈ 34	≈1010	EP10-3H3-A40
	63 ±3%	≈ 54	≈ 530	EP10-3H3-A63
	100 ±3%	≈ 86	≈ 290	EP10-3H3-A100
	160 ±5%	≈ 136	≈ 160	EP10-3H3-A160
	1000 ±25%	≈ 1350	≈ 0	EP10-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	25 ±3%	≈ 34	≈1010	EP10-3C81-E25
	40 ±3%	≈ 54	≈ 530	EP10-3C81-A40
	63 ±3%	≈ 86	≈ 290	EP10-3C81-A63
	100 ±3%	≈ 136	≈ 160	EP10-3C81-A100
	160 ±5%	≈ 217	≈ 90	EP10-3C81-A160
	1200 ±25%	≈ 1630	≈ 0	EP10-3C81
3C91 prot	1200 ±25%	≈ 1630	≈0	EP10-3C91
3C94 des	25 ±3%	≈ 34	≈1010	EP10-3C94-E25
	40 ±3%	≈ 54	≈ 530	EP10-3C94-A40
	63 ±3%	≈ 86	≈ 290	EP10-3C94-A63
	100 ±3%	≈ 136	≈ 160	EP10-3C94-A100
	160 ±5%	≈ 217	≈ 90	EP10-3C94-A160
	1140 ±25%	≈ 1550	≈ 0	EP10-3C94
3C96 prot	1000 ±25%	≈ 1350	≈ 0	EP10-3C96
3F3	25 ±3%	≈ 34	≈1010	EP10-3F3-E25
	40 ±3%	≈ 54	≈ 530	EP10-3F3-A40
	63 ±3%	≈ 86	≈ 290	EP10-3F3-A63
	100 ±3%	≈ 136	≈ 160	EP10-3F3-A100
	160 ±5%	≈ 217	≈ 90	EP10-3F3-A160
	1000 ±25%	≈1360	≈ 0	EP10-3F3
3F35 prot	800 ±25%	≈1090	≈ 0	EP10-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	3400 ± 25%	≈ 4630	≈ 0	EP10-3E27
3E5	4800 +40/−30%	≈ 6530	≈ 0	EP10-3E5
3E55 des	4800 +40/−30%	≈ 6530	≈ 0	EP10-3E55
3E6	5400 +40/−30%	≈ 7340	≈ 0	EP10-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 0.043	–	–	–
3C91	≥315	–	≤ 0.014(1)	≤ 0.08(1)	–
3C94	≥320	–	≤ 0.019	≤ 0.1	–
3C96	≥340	–	≤ 0.014	≤ 0.08	≤ 0.035
3F35	≥300	–	–	–	≤ 0.02
3F3	≥315	–	≤ 0.025	–	≤ 0.045

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.07	–	–	–
3F35	≥300	≤ 0.025	≤ 0.2	–	–
3F3	≥315	–	–	–	–

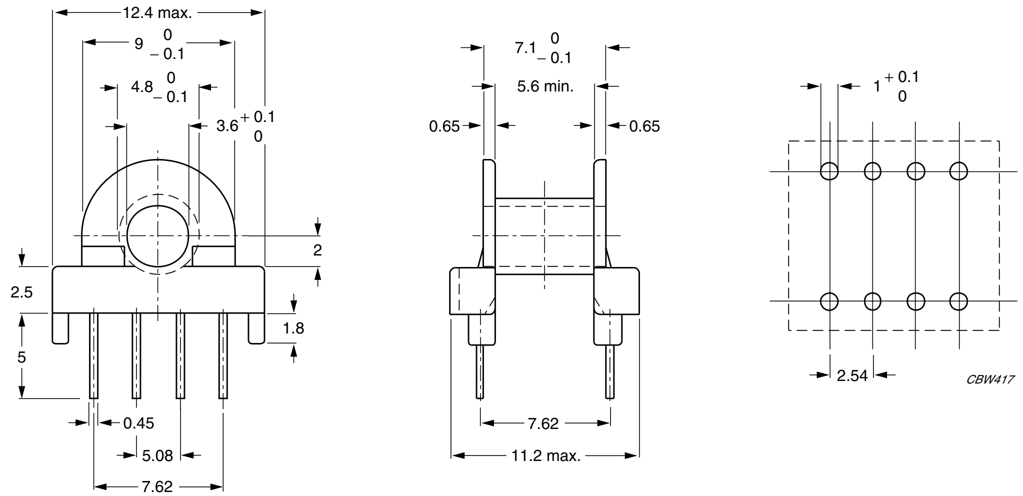
Note

1. Measured at 60 °C.

COIL FORMER

General data CSH-EP10-1S-8P

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



Dimensions in mm.

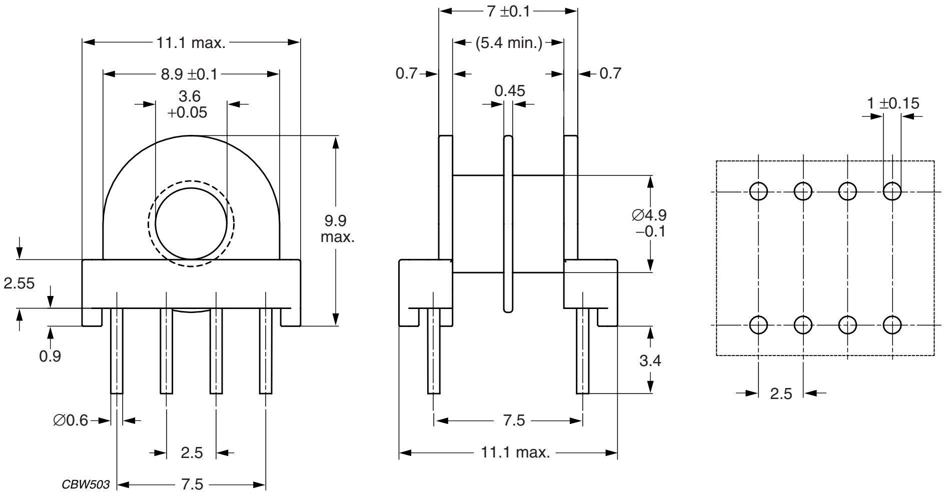
Fig.2 EP10 coil former: 8-pins.

Winding data for 8-pins EP10 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.4	5.6	21.5	CSH-EP10-1S-8P

General data CSH-EP10-2S-8P

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

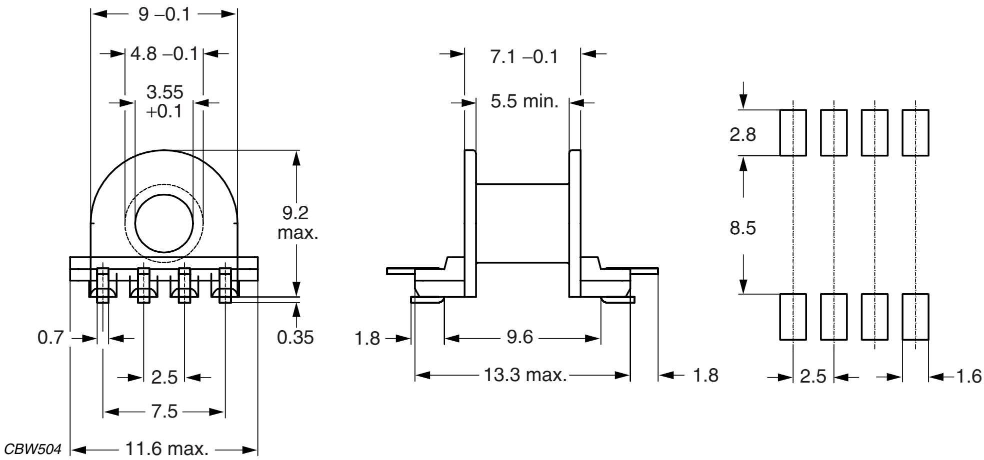
Fig.3 EP10 coil former.

Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 4.8	2 × 2.6	21.6	CSH-EP10-2S-8P

General data CSHS-EP10-1S-8P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.4 EP10 coil former.

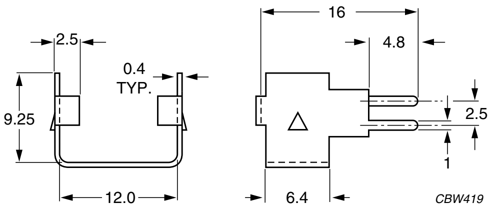
Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.3	5.5	21.5	CSHS-EP10-1S-8P-T

MOUNTING PARTS

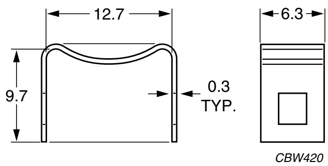
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	5	CLA-EP10
Spring	copper-nickel-zinc alloy (nickel silver)	6	SPR-EP10
Clip	stainless steel (CrNi); clamping force ≈27 N	7	CLI-EP10



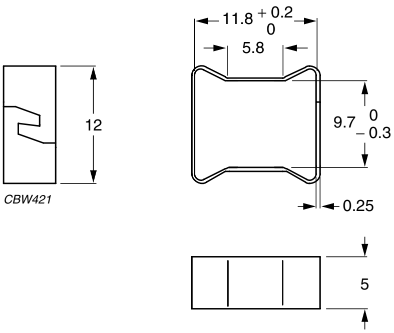
Dimensions in mm.

Fig.5 Mounting clasp CLA-EP10.



Dimensions in mm.

Fig.6 Mounting spring SPR-EP10.



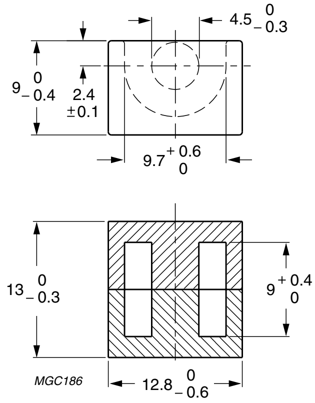
Dimensions in mm.

Fig.7 Mounting clip CLI-EP10.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.24	mm^{-1}
V_e	effective volume	472	mm^3
l_e	effective length	24.2	mm
A_e	effective area	19.5	mm^2
A_{min}	minimum area	14.9	mm^2
m	mass of core set	≈ 4.7	g



Dimensions in mm.

Fig.1 EP13 core set.

Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3	63 ±3%	≈ 62	≈500	EP13-3D3-A63
	100 ±3%	≈ 100	≈270	EP13-3D3-A100
	160 ±3%	≈ 160	≈140	EP13-3D3-A160
	670 ±25%	≈ 660	≈ 0	EP13-3D3
3H3	63 ±3%	≈ 62	≈ 540	EP13-3H3-A63
	100 ±3%	≈ 99	≈ 300	EP13-3H3-A100
	160 ±3%	≈ 158	≈ 170	EP13-3H3-A160
	1500 ±25%	≈ 1460	≈ 0	EP13-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	40 ±3%	≈ 40	≈ 1000	EP13-3C81-E40
	63 ±3%	≈ 62	≈ 540	EP13-3C81-A63
	100 ±3%	≈ 99	≈ 300	EP13-3C81-A100
	160 ±3%	≈ 158	≈ 170	EP13-3C81-A160
	250 ±5%	≈ 247	≈ 100	EP13-3C81-A250
	1700 ±25%	≈ 1680	≈ 0	EP13-3C81

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C91 prot	1700 ±25%	≈ 1680	≈0	EP13-3C91
3C94 des	40 ±3%	≈ 40	≈ 1000	EP13-3C94-E40
	63 ±3%	≈ 62	≈ 540	EP13-3C94-A63
	100 ±3%	≈ 99	≈ 300	EP13-3C94-A100
	160 ±3%	≈ 158	≈ 170	EP13-3C94-A160
	250 ±5%	≈ 247	≈ 100	EP13-3C94-A250
	1650 ±25%	≈ 1630	≈ 0	EP13-3C94
3C96 prot	1500 ±25%	≈ 1480	≈ 0	EP13-3C96
3F3	40 ±3%	≈ 40	≈ 1000	EP13-3F3-E40
	63 ±3%	≈ 62	≈ 540	EP13-3F3-A63
	100 ±3%	≈ 99	≈ 300	EP13-3F3-A100
	160 ±3%	≈ 158	≈ 170	EP13-3F3-A160
	250 ±5%	≈ 247	≈ 100	EP13-3F3-A250
	1325 ±25%	≈ 1310	≈ 0	EP13-3F3
3F35 prot	1100 ±25%	≈ 1090	≈ 0	EP13-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	4600 ± 25%	≈ 4540	≈ 0	EP13-3E27
3E5	7000 +40/-30%	≈ 6900	≈ 0	EP13-3E5
3E55 des	100 ±3%	≈ 99	≈ 310	EP13-3E55-A100
	160 ±3%	≈ 158	≈ 180	EP13-3E55-A160
	250 ±5%	≈ 247	≈ 110	EP13-3E55-A250
	315 ±5%	≈ 311	≈ 80	EP13-3E55-A315
	400 ±8%	≈ 395	≈ 65	EP13-3E55-A400
	630 ±15%	≈ 622	≈ 40	EP13-3E55-A630
	7000 +40/-30%	≈ 1630	≈ 0	EP13-3E55
3E6	8500 +40/-30%	≈ 8400	≈ 0	EP13-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 0.1	–	–	–
3C91	≥315	–	≤ 0.03(1)	≤ 0.17(1)	–
3C94	≥320	–	≤ 0.04	≤ 0.22	–
3C96	≥340	–	≤ 0.03	≤ 0.17	≤ 0.075
3F35	≥300	–	–	–	≤ 0.04
3F3	≥315	–	≤ 0.05	–	≤ 0.1

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.15	–	–	–
3F35	≥300	≤ 0.06	≤ 0.45	–	–
3F3	≥315	–	–	–	–

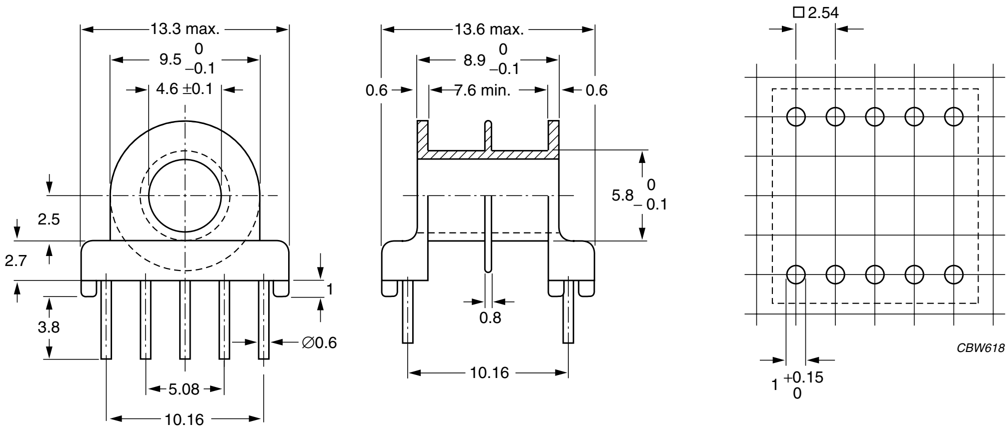
Note

1. Measured at 60 °C.

COIL FORMERS

General data

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



Dimensions in mm.

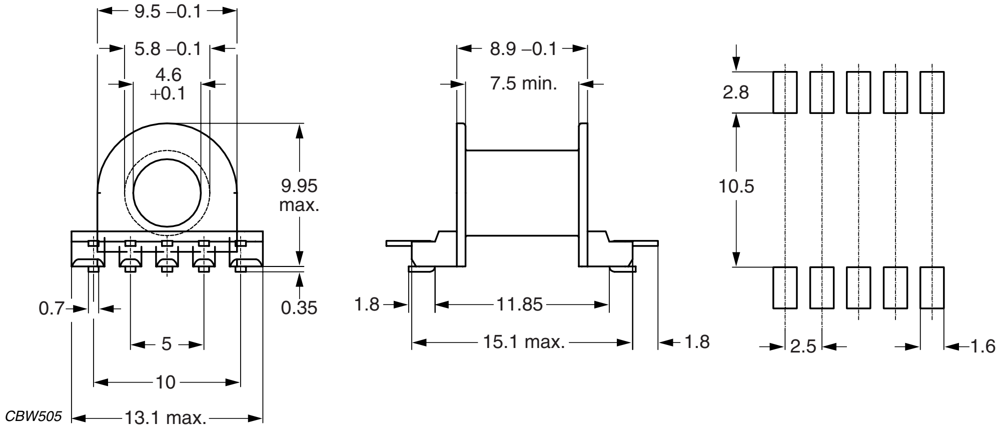
Fig.2 EP13 coil former; 10-pins.

Winding data for 10-pins EP13 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	13.6	7.6	23.8	CSH-EP13-1S-10P
2	2 × 6.1	2 × 3.4	23.8	CSH-EP13-2S-10P

General data CSHS-EP13-1S-10P-T

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 EP13 coil former.

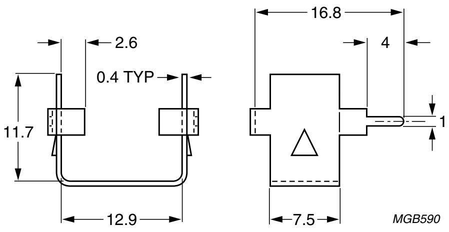
Winding data for EP13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	13.5	7.5	23.8	CSHS-EP13-1S-10P-T

MOUNTING PARTS

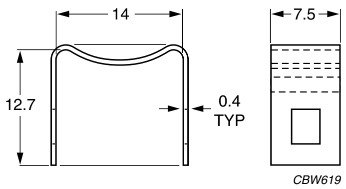
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	4	CLA-EP13
Spring	copper-nickel-zinc alloy (nickel silver)	5	SPR-EP13
Clip	stainless steel (CrNi); clamping force ≈32 N	6	CLI-EP13



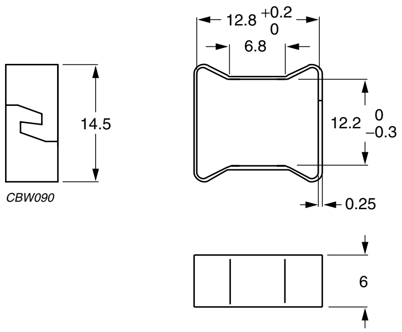
Dimensions in mm.

Fig.4 Mounting clasp CLA-EP13.



Dimensions in mm.

Fig.5 Mounting spring SPR-EP13.



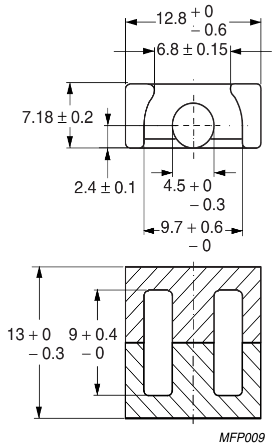
Dimensions in mm.

Fig.6 Mounting clip CLI-EP13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.42	mm^{-1}
V_e	effective volume	501	mm^3
l_e	effective length	26.7	mm
A_e	effective area	18.8	mm^2
A_{min}	minimum area	14.9	mm^2
m	mass of core set	≈ 2.4	g



Dimensions in mm.

Fig. 1 EP13/LP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1400 ± 3 %	≈ 1580	≈0	EP13/LP-3C94
3C96 prot	1200 ± 3 %	≈ 1360	≈0	EP13/LP-3C96
3F35 prot	950 ± 3 %	≈ 1070	≈0	EP13/LP-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 des	100 ± 3 %	≈ 113	≈ 300	EP13/LP-3E55-A100
	160 ± 3 %	≈ 181	≈ 170	EP13/LP-3E55-A160
	250 ± 5 %	≈ 282	≈ 100	EP13/LP-3E55-A250
	315 ± 5 %	≈ 356	≈ 80	EP13/LP-3E55-A315
	400 ± 8 %	≈ 452	≈ 60	EP13/LP-3E55-A400
	630 ± 15 %	≈ 712	≈ 35	EP13/LP-3E55-A630
	6000 + 40 / − 30 %	≈ 6780	≈0	EP13/LP-3E55
3E6	6700 + 40 / − 30 %	≈ 7570	≈0	EP13/LP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C94	≥ 320	≤ 0.04	≤ 0.25	–	–
3C96	≥ 340	≤ 0.03	≤ 0.2	≤ 0.16	–
3F35	≥ 300	–	–	≤ 0.06	≤ 0.5

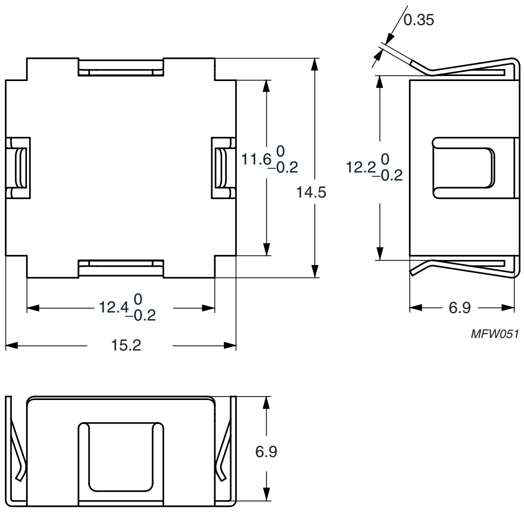
BOBBINS AND ACCESSORIES

For bobbins, winding data and other mounting parts, see data sheet, *"EP13"*.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈ 32 N	2	CLI-EP13/LP



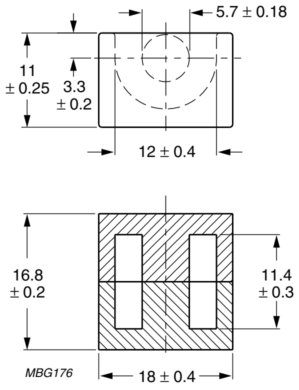
Dimensions in mm.

Fig.2 Mounting clip for CLI-EP13/LP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.870	mm^{-1}
V_e	effective volume	999	mm^3
l_e	effective length	29.5	mm
A_e	effective area	33.7	mm^2
A_{min}	minimum area	25.5	mm^2
m	mass of set	≈ 12	g



Dimensions in mm.

Fig.1 EP17 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈ 44	≈ 1020	EP17-3C81-E63
	100 ±3%	≈ 70	≈ 560	EP17-3C81-A100
	160 ±3%	≈ 111	≈ 310	EP17-3C81-A160
	250 ±3%	≈ 174	≈ 180	EP17-3C81-A250
	315 ±5%	≈ 219	≈ 135	EP17-3C81-A315
	2670 ±25%	≈ 1860	≈ 0	EP17-3C81
3C91 prot	2670 ±25%	≈ 1860	≈ 0	EP17-3C91
3C94 des	63 ±3%	≈ 44	≈ 1020	EP17-3C94-E63
	100 ±3%	≈ 70	≈ 560	EP17-3C94-A100
	160 ±3%	≈ 111	≈ 310	EP17-3C94-A160
	250 ±3%	≈ 174	≈ 180	EP17-3C94-A250
	315 ±5%	≈ 219	≈ 135	EP17-3C94-A315
	2500 ±25%	≈ 1740	≈ 0	EP17-3C94
3C96 prot	2200 ±25%	≈ 1530	≈ 0	EP17-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	63 ±3%	≈ 44	≈ 1020	EP17-3F3-E63
	100 ±3%	≈ 70	≈ 560	EP17-3F3-A100
	160 ±3%	≈ 111	≈ 310	EP17-3F3-A160
	250 ±3%	≈ 174	≈ 180	EP17-3F3-A250
	315 ±5%	≈ 219	≈ 135	EP17-3F3-A315
	2200 ±25%	≈ 1530	≈ 0	EP17-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	7100 ± 25%	≈ 4950	≈0	EP17-3E27
3E5	10000 +40/-30%	≈ 6970	≈0	EP17-3E5

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 0.23	–	–	–
3C91	≥315	–	≤ 0.06(1)	≤ 0.36(1)	–
3C94	≥320	–	≤ 0.08	≤ 0.45	–
3C96	≥340	–	≤ 0.06	≤ 0.36	≤ 0.15
3F3	≥315	–	≤ 0.15	–	≤ 0.2

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.3	–	–	–
3F3	≥315	–	–	–	–

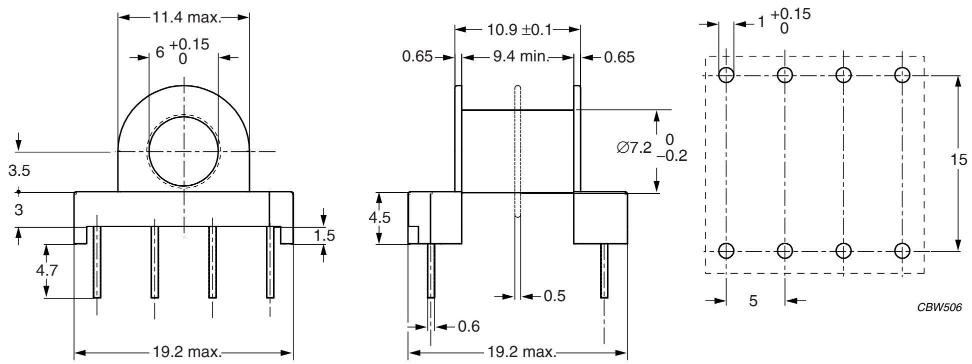
Note

1. Measured at 60 °C.

COIL FORMER

General data

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



Dimensions in mm.

Fig.2 EP17 coil former: 8-pins.

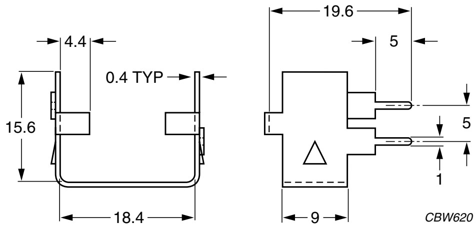
Winding data for 8-pins EP17 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	18.0	9.45	28.9	CSH-EP17-1S-8P
2	2 × 8.3	2 × 4.6	28.9	CSH-EP17-2S-8P

MOUNTING PARTS

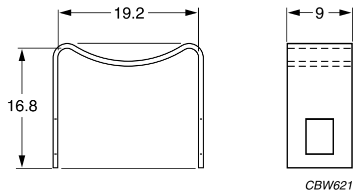
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP17
Spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP17



Dimensions in mm.

Fig.3 Mounting clasp CLA-EP17.



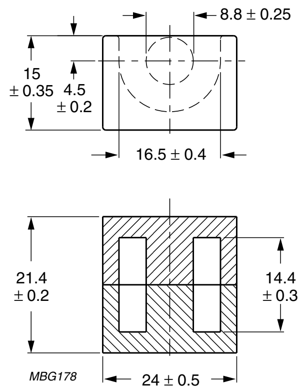
Dimensions in mm.

Fig.4 Mounting spring SPR-EP17.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.520	mm^{-1}
V_e	effective volume	3230	mm^3
l_e	effective length	41.1	mm
A_e	effective area	78.7	mm^2
A_{min}	minimum area	60.8	mm^2
m	mass of set	≈27	g



Dimensions in mm.

Fig.1 EP20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 67	≈ 790	EP20-3C81-E160
	250 ±3%	≈ 104	≈ 460	EP20-3C81-A250
	315 ±3%	≈ 131	≈ 350	EP20-3C81-A315
	400 ±3%	≈ 166	≈ 260	EP20-3C81-A400
	630 ±5%	≈ 262	≈ 150	EP20-3C81-A630
	4900 ±25%	≈ 2040	≈ 0	EP20-3C81
3C91 prot	4900 ±25%	≈ 2040	≈ 0	EP20-3C91
3C94 des	160 ±3%	≈ 67	≈ 790	EP20-3C94-E160
	250 ±3%	≈ 104	≈ 460	EP20-3C94-A250
	315 ±3%	≈ 131	≈ 350	EP20-3C94-A315
	400 ±3%	≈ 166	≈ 260	EP20-3C94-A400
	630 ±5%	≈ 262	≈ 150	EP20-3C94-A630
	4435 ±25%	≈ 1840	≈ 0	EP20-3C94
3C96 prot	3850 ±25%	≈ 1600	≈ 0	EP20-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 67	≈ 790	EP20-3F3-E160
	250 ±3%	≈ 104	≈ 460	EP20-3F3-A250
	315 ±3%	≈ 131	≈ 350	EP20-3F3-A315
	400 ±3%	≈ 166	≈ 260	EP20-3F3-A400
	630 ±5%	≈ 262	≈ 150	EP20-3F3-A630
	3550 ±25%	≈ 1480	≈ 0	EP20-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	11600 ± 25%	≈ 4820	≈ 0	EP20-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 0.75	–	–	–
3C91	≥315	–	≤ 0.2(1)	≤ 1.3(1)	–
3C94	≥320	–	≤ 0.25	≤ 1.6	–
3C96	≥340	–	≤ 0.2	≤ 1.3	≤ 0.5
3F3	≥315	–	≤ 0.36	–	≤ 0.62

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 1.0	–	–	–
3F3	≥315	–	–	–	–

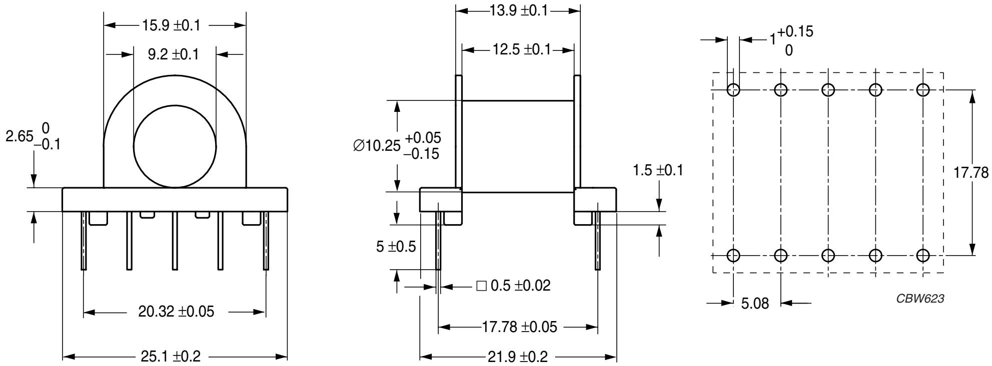
Note

1. Measured at 60 °C.

COIL FORMER

General data

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



Dimensions in mm.

Fig.2 EP20 coil former: 10-pins.

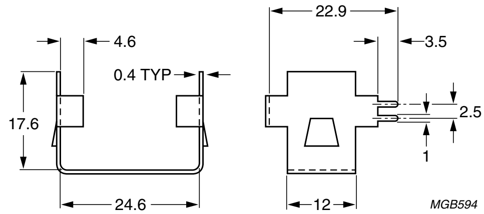
Winding data for 10-pins EP20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	40.3	12.4	39.4	CSH-EP20-1S-10P-T

MOUNTING PARTS

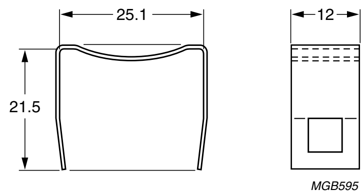
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP20
Spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP20



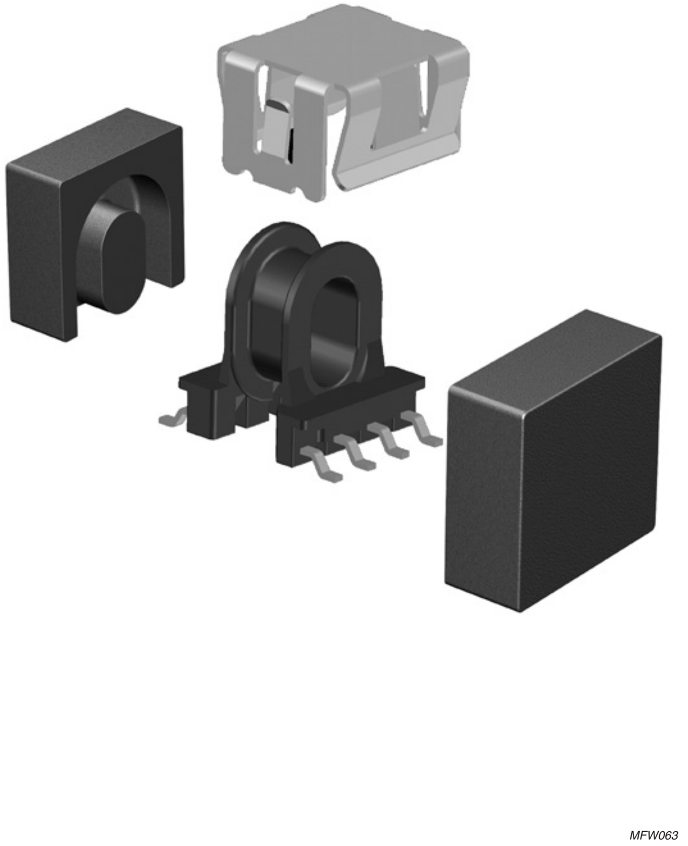
Dimensions in mm.

Fig.3 Mounting clasp CLA-EP20.



Dimensions in mm.

Fig.4 Mounting spring SPR-EP20.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EPX cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EPX7	255	16.5	1.2
EPX9	304	16.3	1.4
EPX10	325	15.0	1.5

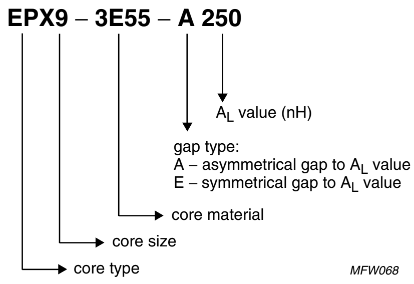


Fig.1 Type number structure for cores.

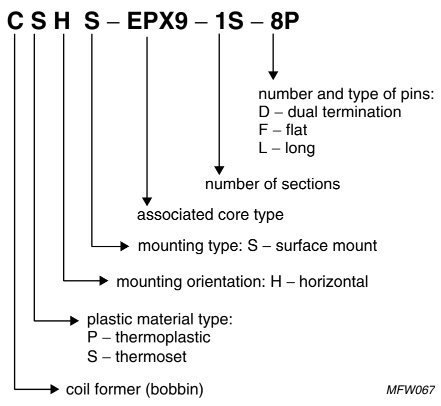
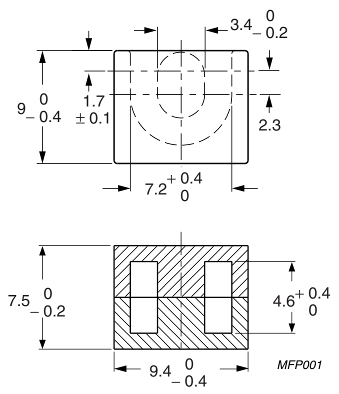


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.931	mm^{-1}
V_e	effective volume	255	mm^3
l_e	effective length	15.4	mm
A_e	effective area	16.5	mm^2
A_{min}	minimum area	14.5	mm^2
m	mass of core set	≈1.2	g



Dimensions in mm.

Fig.1 EPX7 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1950 ± 25 %	≈ 1440	≈0	EPX7-3C94
3C96 prot	1750 ± 25 %	≈ 1300	≈0	EPX7-3C96
3F35 prot	1400 ± 25 %	≈ 1040	≈0	EPX7-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 des	63 ± 3 %	≈ 47	≈ 450	EPX7-3E55-A63
	100 ± 3 %	≈ 74	≈ 250	EPX7-3E55-A100
	160 ± 3 %	≈ 119	≈ 150	EPX7-3E55-A160
	250 ± 5 %	≈ 185	≈ 90	EPX7-3E55-A250
	315 ± 5 %	≈ 233	≈ 70	EPX7-3E55-A315
	400 ± 8 %	≈ 296	≈ 50	EPX7-3E55-A400
	8400 + 40 / − 30 %	≈ 6220	≈0	EPX7-3E55
3E6	9300 + 40 / − 30 %	≈ 6890	≈0	EPX7-3E6

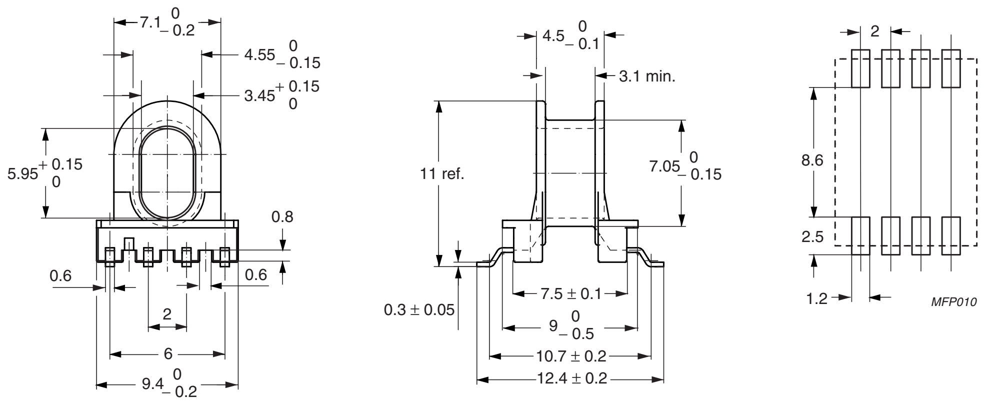
Properties under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C94	≥ 320	≤ 0.02	≤ 0.13	–	–
3C96	≥ 340	≤ 0.015	≤ 0.1	≤ 0.08	–
3F35	≥ 300	–	–	≤ 0.03	≤ 0.25

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0";* UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), nickel flash, gold plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

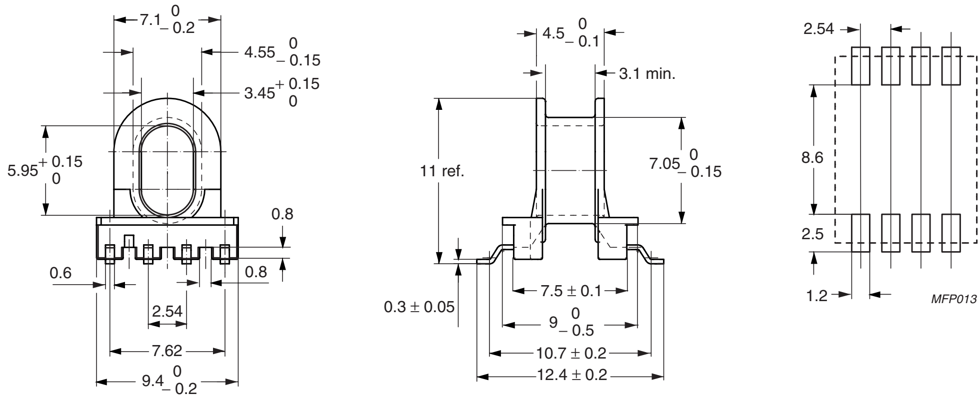
Fig.2 EPX7 coil former: 8-pads, 2 mm pad distance.

Winding data for 8-pads EPX7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.64	3.4	23.3	CSHS-EPX7-1S-8P-T

General data CSHS-EPX7-1S-8P

PARMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), nickel flash, gold plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 EPX7 coil former: 8-pads, 2.54 mm pad distance.

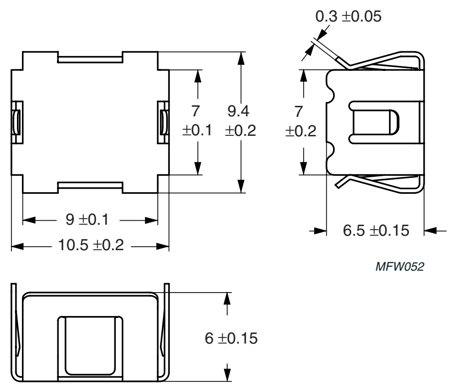
Winding data for 8-pads EPX7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.64	3.4	23.3	CSHS-EPX7-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clamp	stainless steel (CrNi); to be used in combination with CSHS-EPX7-1S-8P or CSHS-EPX7-1S-8P-T	4	CLM-EPX7



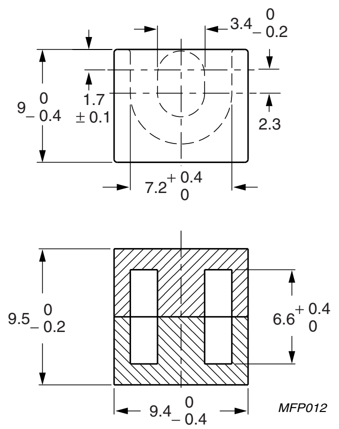
Dimensions in mm.

Fig.4 Mounting clamp CLM-EPX7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.15	mm^{-1}
V_e	effective volume	304	mm^3
l_e	effective length	18.7	mm
A_e	effective area	16.3	mm^2
A_{min}	minimum area	14.5	mm^2
m	mass of core set	≈ 1.4	g



Dimensions in mm.

Fig.1 EPX9 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1700 ± 25 %	≈ 1560	≈ 0	EPX9-3C94
3C96 prot	1550 ± 25 %	≈ 1420	≈ 0	EPX9-3C96
3F35 prot	1200 ± 25 %	≈ 1100	≈ 0	EPX9-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 des	63 ± 3 %	≈ 58	≈ 440	EPX9-3E55-A63
	100 ± 3 %	≈ 92	≈ 250	EPX9-3E55-A100
	160 ± 3 %	≈ 146	≈ 150	EPX9-3E55-A160
	250 ± 5 %	≈ 229	≈ 90	EPX9-3E55-A250
	315 ± 5 %	≈ 288	≈ 70	EPX9-3E55-A315
	400 ± 8 %	≈ 366	≈ 50	EPX9-3E55-A400
	7300 + 40 / − 30 %	≈ 6680	≈ 0	EPX9-3E55
3E6	8200 + 40 / − 30 %	≈ 7500	≈ 0	EPX9-3E6

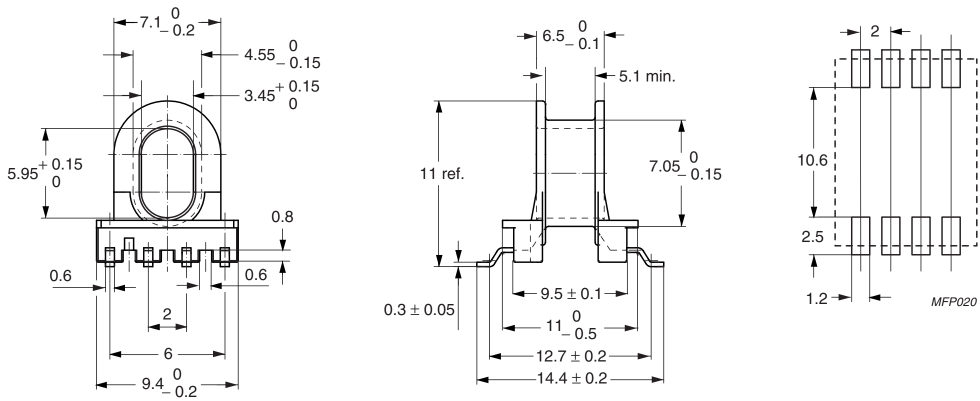
Properties under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C94	≥ 320	≤ 0.023	≤ 0.15	–	–
3C96	≥ 340	≤ 0.018	≤ 0.12	≤ 0.1	–
3F35	≥ 300	–	–	≤ 0.035	≤ 0.3

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0";* UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), nickel flash, gold plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

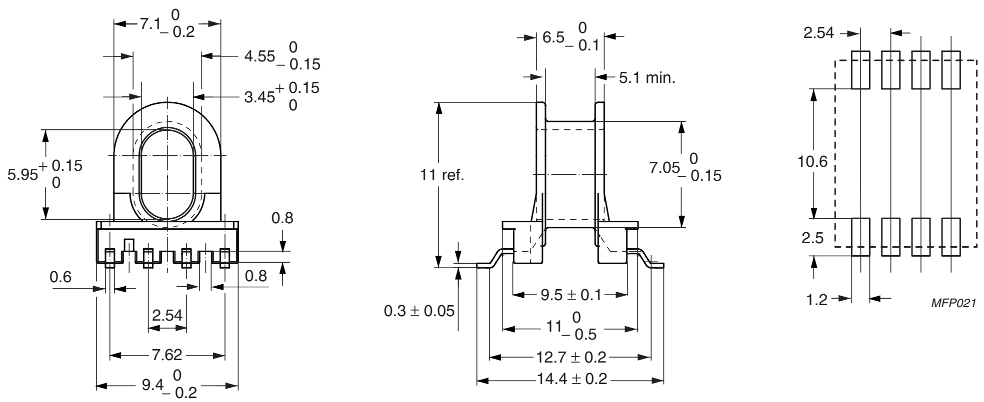
Fig.2 EPX9 coil former: 8-pads, 2 mm pad distance.

Winding data for 8-pads EPX9 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.99	5.4	23.3	CSHS-EPX9-1S-8P-T

General data CSHS-EPX9-1S-8P

PARMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), nickel flash, gold plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 EPX9 coil former: 8-pads, 2.54 mm pad distance.

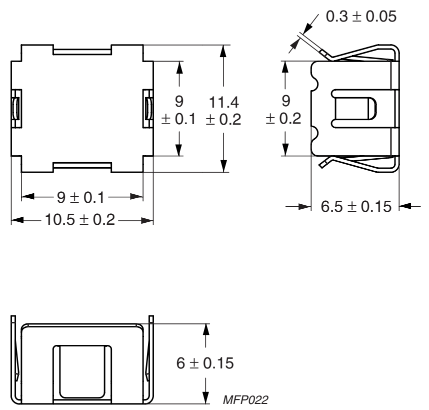
Winding data for 8-pads EPX9 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.99	5.4	23.3	CSHS-EPX9-1S-8P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clamp	stainless steel (CrNi); to be used in combination with CSHS-EPX9-1S-8P or CSHS-EPX9-1S-8P-T	4	CLM-EPX9



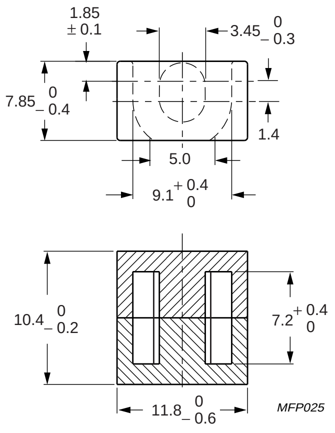
Dimensions in mm.

Fig.4 Mounting clamp CLM-EPX9.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.45	mm^{-1}
V_e	effective volume	325	mm^3
l_e	effective length	21.7	mm
A_e	effective area	15.0	mm^2
A_{min}	minimum area	12.5	mm^2
m	mass of core set	≈1.5	g



Dimensions in mm.

Fig.1 EPX10 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1400 ± 25 %	≈ 1620	≈0	EPX10-3C94
3C96 prot	1250 ± 25 %	≈ 1440	≈0	EPX10-3C96
3F35 prot	950 ± 25 %	≈ 1100	≈0	EPX10-3F35

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E55 des	63 ± 3 %	≈ 73	≈ 410	EPX10-3E55-A63
	100 ± 3 %	≈ 115	≈ 230	EPX10-3E55-A100
	160 ± 3 %	≈ 185	≈ 135	EPX10-3E55-A160
	250 ± 5 %	≈ 288	≈ 80	EPX10-3E55-A250
	315 ± 5 %	≈ 363	≈ 60	EPX10-3E55-A315
	400 ± 8 %	≈ 462	≈ 50	EPX10-3E55-A400
	6000 + 40 / − 30 %	≈ 6920	≈0	EPX10-3E55
3E6	6600 + 40 / − 30 %	≈ 7620	≈0	EPX10-3E6

EPX cores and accessories EPX10

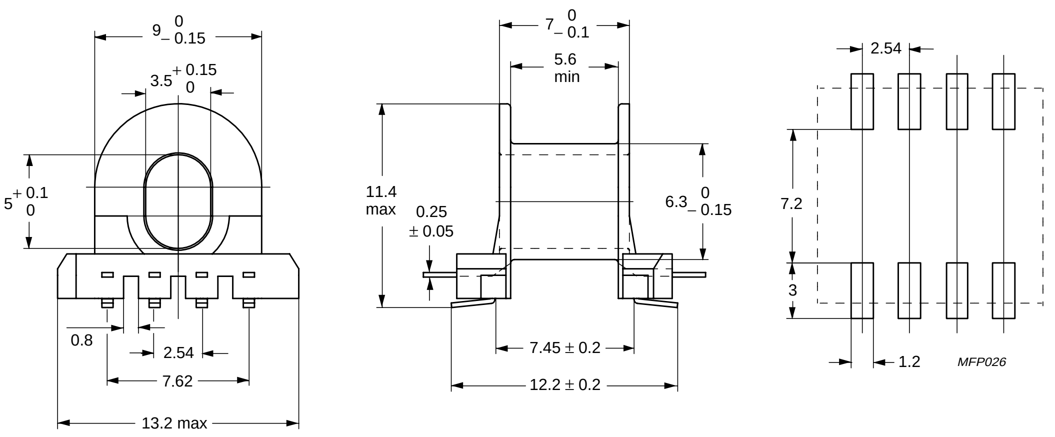
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C94	≥ 320	≤ 0.025	≤ 0.16	–	–
3C96	≥ 340	≤ 0.018	≤ 0.13	≤ 0.1	–
3F35	≥ 300	–	–	≤ 0.04	≤ 0.3

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	Sumikasuper E4008 (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0";* UL file number E54705
Pin material	copper-tin alloy (CuSn), nickel flash, tin-lead (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.2 EPX10 coil former: 8-pads, 2.54 mm pad distance.

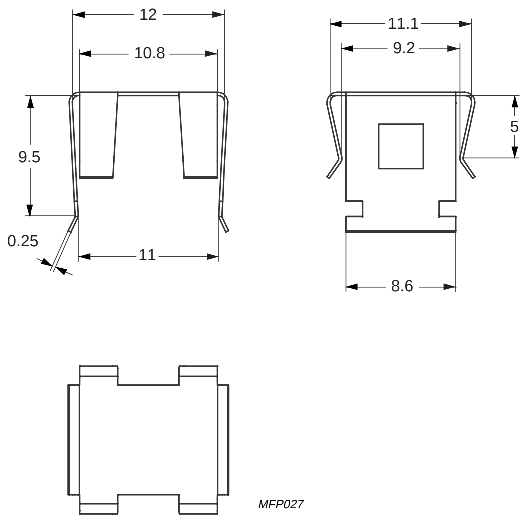
Winding data for 8-pads EPX10 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	11.6	5.9	24.6	CPHS-EPX10-1S-8P

MOUNTING PARTS

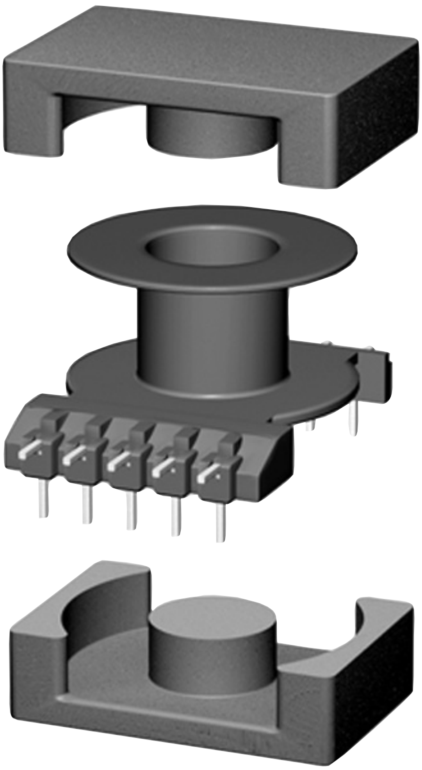
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clamp	stainless steel (CrNi); to be used in combination with CPHS-EPX10-1S-8P	3	CLM-EPX10



Dimensions in mm.

Fig.3 Mounting clamp CLM-EPX10.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Overview EQ cores and plates (PLT)

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
EQ13	348	19.9	0.9
PLT13	315	19.8	0.6
EQ20/R	1960	59.0	5.5
PLT20/S	1500	59.8	3.0
EQ25	4145	100	12
EQ25/LP(1)	2370	89.7	5
EQ30	4970	108	13.5
PLT30	3400	108	8

Note:
(1) In combination with PLT25

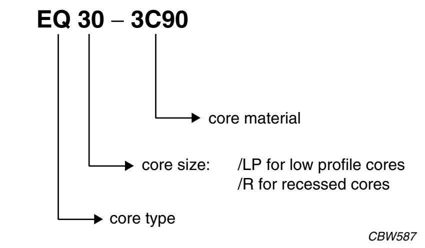


Fig.1 Type number structure for cores.

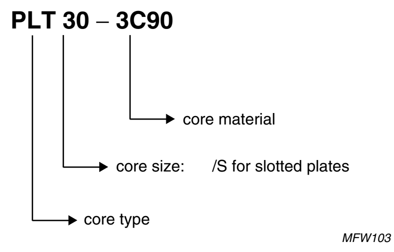


Fig.2 Type number structure for plates.

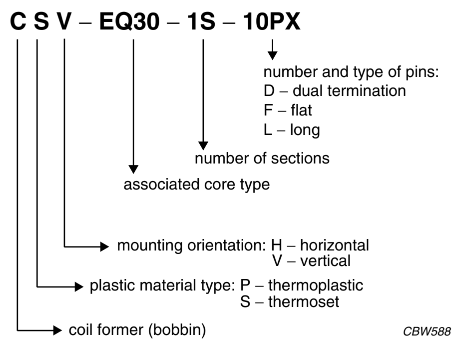
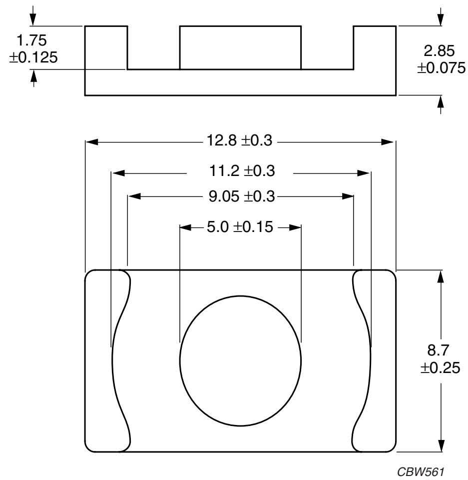


Fig. 3 Type number structure for coil formers.

CORES

Effective core parameters of a set of EQ cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.911	mm^{-1}
V_e	effective volume	348	mm^3
I_e	effective length	17.5	mm
A_e	effective area	19.9	mm^2
A_{min}	minimum area	19.2	mm^2
m	mass of core set	≈ 0.9	g



Dimensions in mm.

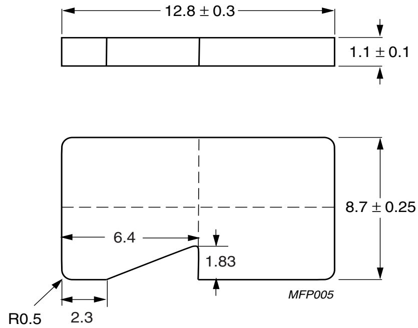
Fig.1 EQ13 core.

Effective core parameters of an EQ/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.803	mm^{-1}
V_e	effective volume	315	mm^3
I_e	effective length	15.9	mm
A_e	effective area	19.8	mm^2
A_{min}	minimum area	19.2	mm^2
m	mass of core set	≈ 0.6	g

Ordering information for plates

GRADE	TYPE NUMBER
3C94 des	PLT13/9/1-3C94
3C96 prot	PLT13/9/1-3C96
3F35 prot	PLT13/9/1-3F35
3F4 des	PLT13/9/1-3F4



Dimensions in mm.

Fig.2 PLT13/9/1.

Core halves for use in combination with an EQ core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1700 ± 25 %	≈ 1230	≈ 0	EQ13-3C94
3C96 prot	1600 ± 25 %	≈ 1160	≈ 0	EQ13-3C96
3F35 prot	1300 ± 25 %	≈ 942	≈ 0	EQ13-3F35
3F4 des	950 ± 25 %	≈ 689	≈ 0	EQ13-3F4

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 10 ± 5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	1800 ± 25 %	≈ 1150	≈ 0	EQ13-3C94
3C96 prot	1700 ± 25 %	≈ 1085	≈ 0	EQ13-3C96
3F35 prot	1350 ± 25 %	≈ 863	≈ 0	EQ13-3F35
3F4 des	1000 ± 25 %	≈ 639	≈ 0	EQ13-3F4

Properties of core sets under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
EQ+EQ13-3C94	≥ 320	≤ 0.031	≤ 0.21	–
EQ+PLT13-3C94	≥ 320	≤ 0.028	≤ 0.19	–
EQ+EQ13-3C96	≥ 340	≤ 0.023	≤ 0.16	≤ 0.13
EQ+PLT13-3C96	≥ 340	≤ 0.021	≤ 0.14	≤ 0.12
EQ+EQ13-3F35	≥ 300	–	–	≤ 0.047
EQ+PLT13-3F35	≥ 300	–	–	≤ 0.043

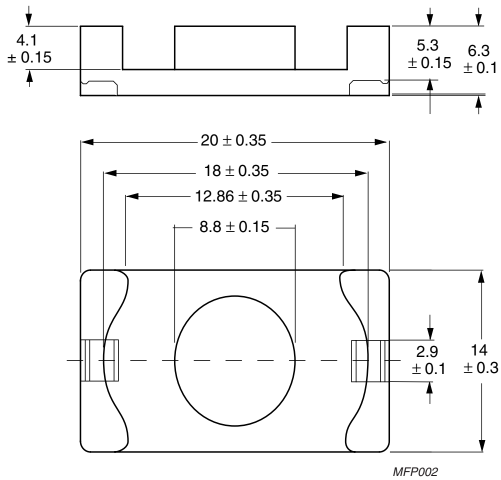
Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
EQ+EQ13-3F35	≥ 300	≤ 0.36	–	–
EQ+PLT13-3F35	≥ 300	≤ 0.33	–	–
EQ+EQ13-3F4	≥ 300	–	≤ 0.1	≤ 0.17
EQ+PLT13-3F4	≥ 300	–	≤ 0.095	≤ 0.15

CORES

Effective core parameters of a set of EQ cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.563	mm^{-1}
V_e	effective volume	1960	mm^3
I_e	effective length	33.2	mm
A_e	effective area	59.0	mm^2
A_{min}	minimum area	55.0	mm^2
m	mass of core set	≈ 5.5	g



Dimensions in mm.

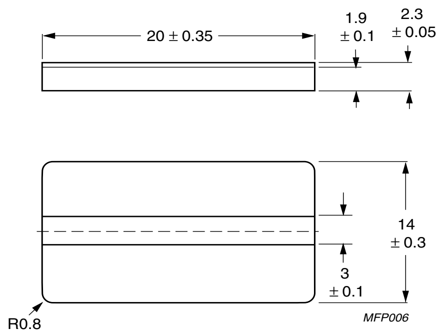
Fig.1 EQ20/R core.

Effective core parameters of an EQ/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.420	mm^{-1}
V_e	effective volume	1500	mm^3
I_e	effective length	25.1	mm
A_e	effective area	59.8	mm^2
A_{min}	minimum area	55.0	mm^2
m	mass of core set	≈ 3	g

Ordering information for plates

GRADE		TYPE NUMBER
3C94	des	PLT20/14/2/S-3C94
3C96	prot	PLT20/14/2/S-3C96
3F35	prot	PLT20/14/2/S-3F35
3F4	des	PLT20/14/2/S-3F4



Dimensions in mm.

Fig.2 PLT20/14/2/S.

Core halves for use in combination with an EQ core

A_L measured in combination with a non-gapped core half, clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	3500 ± 25 %	≈ 1570	≈ 0	EQ20/R-3C94
3C96 prot	3150 ± 25 %	≈ 1410	≈ 0	EQ20/R-3C96
3F35 prot	2400 ± 25 %	≈ 1075	≈ 0	EQ20/R-3F35
3F4 des	1700 ± 25 %	≈ 762	≈ 0	EQ20/R-3F4

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 30 ± 10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	4750 ± 25 %	≈ 1590	≈ 0	EQ20/R-3C94
3C96 prot	4350 ± 25 %	≈ 1450	≈ 0	EQ20/R-3C96
3F35 prot	3300 ± 25 %	≈ 1100	≈ 0	EQ20/R-3F35
3F4 des	2200 ± 25 %	≈ 735	≈ 0	EQ20/R-3F4

Properties of core sets under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
EQ+EQ20/R-3C94	≥ 320	≤ 0.17	≤ 1.2	–
EQ+PLT20/S-3C94	≥ 320	≤ 0.13	≤ 0.9	–
EQ+EQ20/R-3C96	≥ 340	≤ 0.13	≤ 0.9	≤ 0.74
EQ+PLT20/S-3C96	≥ 340	≤ 0.091	≤ 0.68	≤ 0.56
EQ+EQ20/R-3F35	≥ 300	–	–	≤ 0.27
EQ+PLT20/S-3F35	≥ 300	–	–	≤ 0.2

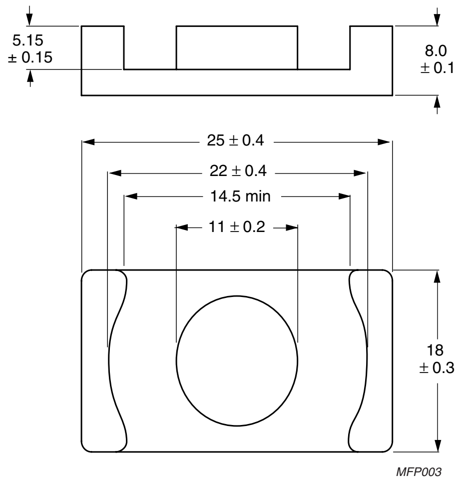
Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
EQ+EQ20/R-3F35	≥ 300	≤ 2.1	–	–
EQ+PLT20/S-3F35	≥ 300	≤ 1.6	–	–
EQ+EQ20/R-3F4	≥ 300	–	≤ 0.6	≤ 0.94
EQ+PLT20/S-3F4	≥ 300	–	≤ 0.45	≤ 0.72

CORES

Effective core parameters of a set of EQ cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.414	mm^{-1}
V_e	effective volume	4145	mm^3
l_e	effective length	41.4	mm
A_e	effective area	100	mm^2
A_{min}	minimum area	95.0	mm^2
m	mass of core set	≈ 12	g



Dimensions in mm.

Fig.1 EQ25 core.

Core halves for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ± 20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	4800 ± 25 %	≈ 1580	≈ 0	EQ25-3C94
3C96 prot	4400 ± 25 %	≈ 1450	≈ 0	EQ25-3C96
3F35 prot	3350 ± 25 %	≈ 1100	≈ 0	EQ25-3F35
3F4 des	2300 ± 25 %	≈ 758	≈ 0	EQ25-3F4

Properties of core sets under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
EQ+EQ25-3C94	≥ 320	≤ 0.37	≤ 2.5	–
EQ+EQ25-3C96	≥ 340	≤ 0.28	≤ 1.9	≤ 1.5
EQ+EQ25-3F35	≥ 300	–	–	≤ 0.56

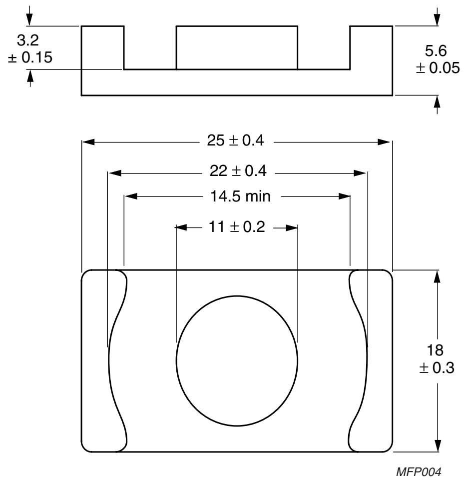
Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
EQ+EQ25-3F35	≥ 300	≤ 4.3	–	–
EQ+EQ25-3F4	≥ 300	–	≤ 1.25	≤ 2.0

CORES

Effective core parameters of a EQ/LP/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.294	mm^{-1}
V_e	effective volume	2370	mm^3
l_e	effective length	26.4	mm
A_e	effective area	89.7	mm^2
A_{min}	minimum area	82.8	mm^2
m	mass of core set	≈ 5	g

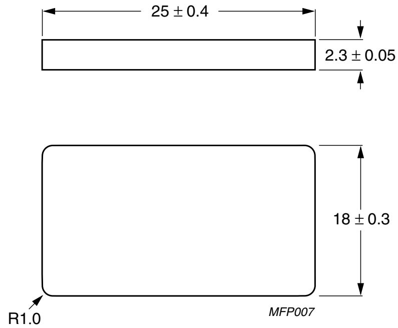


Dimensions in mm.

Fig.1 EQ25/LP core.

Ordering information for plates

GRADE	TYPE NUMBER
3C94 des	PLT25/18/2-3C94
3C96 prot	PLT25/18/2-3C96
3F35 prot	PLT25/18/2-3F35
3F4 des	PLT25/18/2-3F4



Dimensions in mm.

Fig.2 PLT25/18/2.

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	6100 ± 25 %	≈ 1430	≈ 0	EQ25/LP-3C94
3C96 prot	5600 ± 25 %	≈ 1310	≈ 0	EQ25/LP-3C96
3F35 prot	4350 ± 25 %	≈ 1020	≈ 0	EQ25/LP-3F35
3F4 des	3100 ± 25 %	≈ 725	≈ 0	EQ25/LP-3F4

Properties of core sets under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
EQ/LP+PLT25-3C94	≥ 320	≤ 0.21	≤ 1.4	–
EQ/LP+PLT25-3C96	≥ 340	≤ 0.16	≤ 1.1	≤ 0.89
EQ/LP+PLT25-3F35	≥ 300	–	–	≤ 0.32

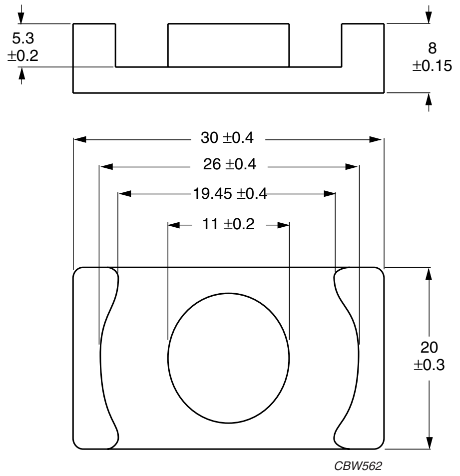
Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
EQ/LP+PLT25-3F35	≥ 300	≤ 2.5	–	–
EQ/LP+PLT25-3F4	≥ 300	–	≤ 0.71	≤ 1.14

CORES

Effective core parameters of a set of EQ cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.426	mm^{-1}
V_e	effective volume	4970	mm^3
l_e	effective length	46.0	mm
A_e	effective area	108	mm^2
A_{min}	minimum area	95.0	mm^2
m	mass of core set	≈ 13.5	g



Dimensions in mm.

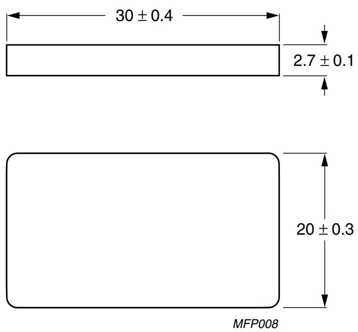
Fig.1 EQ30 core.

Effective core parameters of an EQ/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.292	mm^{-1}
V_e	effective volume	3400	mm^3
l_e	effective length	31.5	mm
A_e	effective area	108	mm^2
A_{min}	minimum area	95.0	mm^2
m	mass of core set	≈ 8	g

Ordering information for plates

GRADE	TYPE NUMBER
3C94 des	PLT30/20/3-3C94
3C96 prot	PLT30/20/3-3C96
3F35 prot	PLT30/20/3-3F35
3F4 des	PLT30/20/3-3F4



Dimensions in mm.

Fig.2 PLT30/20/3.

Core halves for use in combination with an EQ core

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

GRADE		A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94	des	4300 ± 25 %	≈ 1460	≈ 0	EQ30-3C94
3C96	prot	3900 ± 25 %	≈ 1320	≈ 0	EQ30-3C96
3F35	prot	3050 ± 25 %	≈ 1030	≈ 0	EQ30-3F35
3F4	des	2150 ± 25 %	≈ 729	≈ 0	EQ30-3F4

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

A_L measured in combination with a plate (PLT), clamping force for A_L measurements, 40 ± 20 N.

GRADE		A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94	des	6550 ± 25 %	≈ 1520	≈ 0	EQ30-3C94
3C96	prot	6000 ± 25 %	≈ 1395	≈ 0	EQ30-3C96
3F35	prot	4600 ± 25 %	≈ 1070	≈ 0	EQ30-3F35
3F4	des	3200 ± 25 %	≈ 744	≈ 0	EQ30-3F4

Properties of core sets under power conditions

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
EQ+EQ30-3C94	≥ 320	≤ 0.45	≤ 3.0	–
EQ+PLT30-3C94	≥ 320	≤ 0.3	≤ 2.0	–
EQ+EQ30-3C96	≥ 340	≤ 0.34	≤ 2.3	≤ 1.9
EQ+PLT30-3C96	≥ 340	≤ 0.23	≤ 1.5	≤ 1.3
EQ+EQ30-3F35	≥ 300	–	–	≤ 0.67
EQ+PLT30-3F35	≥ 300	–	–	≤ 0.46

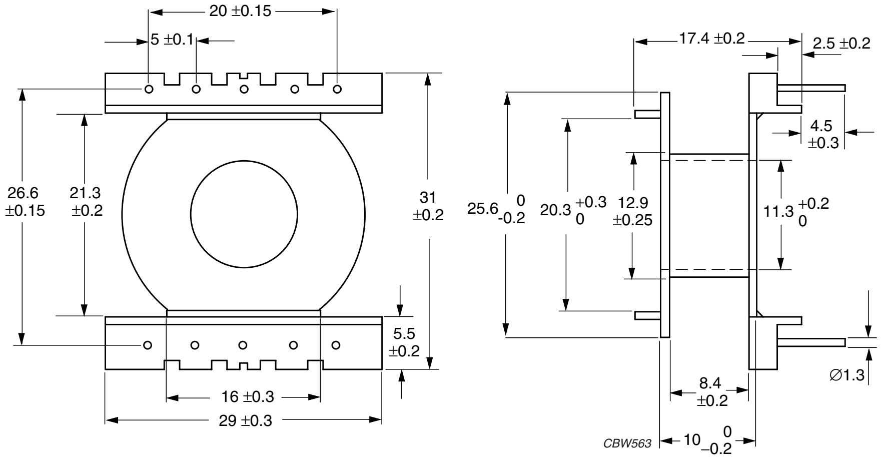
Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
EQ+EQ30-3F35	≥ 300	≤ 5.2	–	–
EQ+PLT30-3F35	≥ 300	≤ 3.6	–	–
EQ+EQ30-3F4	≥ 300	–	≤ 1.5	≤ 2.4
EQ+PLT30-3F4	≥ 300	–	≤ 1.0	≤ 1.6

COIL FORMERS

General data

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

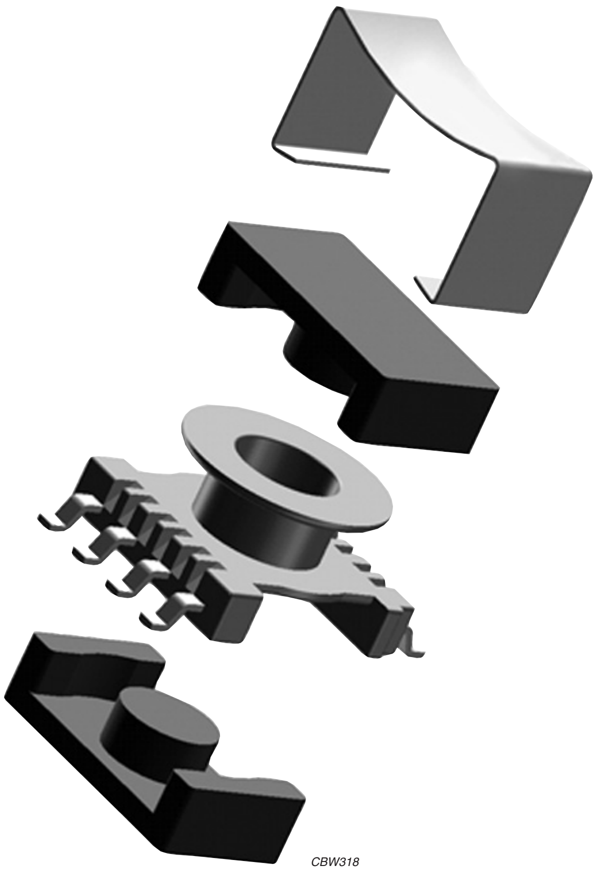


Dimensions in mm.

Fig. 3 EQ30 coil former; 10-pins.

Winding data for EQ30 coil former with 10 pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.2	8.2	60	CSV-EQ30-1S-10P



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ER cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
ER9.5	120	8.47	0.35
ER11	174	11.9	0.5
ER14.5	333	17.6	0.9
ER28	5260	81.4	14
ER28L	6140	81.4	16
ER35	9710	107	23
ER35W	9548	103	27
ER40	14600	149	37
ER42	19200	194	48
ER42A	16800	170	45
ER48	25500	255	64
ER54	23000	250	61

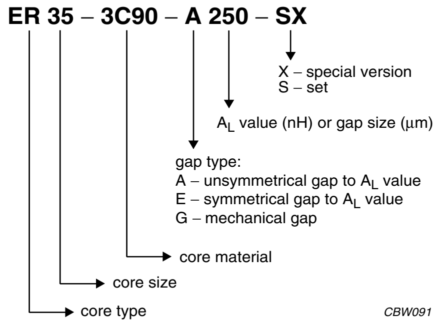


Fig.1 Type number structure for cores.

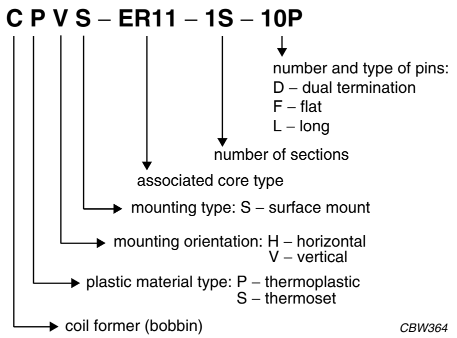


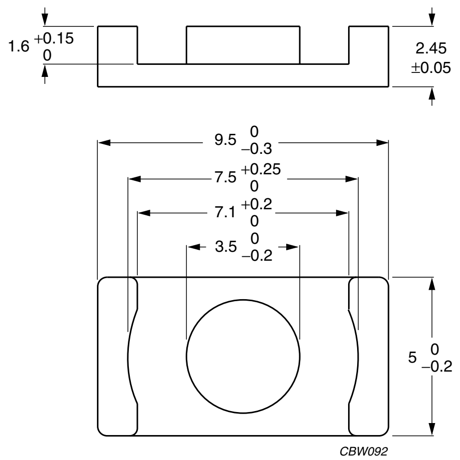
Fig.2 Type number structure for coil formers.

ER cores and accessories — ER9.5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.67	mm^{-1}
V_e	effective volume	120	mm^3
l_e	effective length	14.2	mm
A_e	effective area	8.47	mm^2
A_{min}	minimum area	7.60	mm^2
m	mass of core half	≈ 0.35	g



Dimensions in mm.

Fig.1 ER9.5 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C94 des	63 ±3%	≈ 84	≈ 200	ER9.5-3C94-A63-S
	100 ±3%	≈ 133	≈ 120	ER9.5-3C94-A100-S
	160 ±10%	≈ 213	≈ 70	ER9.5-3C94-A160-S
	1000 ±25%	≈ 1330	≈ 0	ER9.5-3C94-S
3C96 prot	900 ±25%	≈ 1200	≈ 0	ER9.5-3C96-S
3F3	63 ±3%	≈ 84	≈ 200	ER9.5-3F3-A63-S
	100 ±3%	≈ 133	≈ 120	ER9.5-3F3-A100-S
	160 ±10%	≈ 213	≈ 70	ER9.5-3F3-A160-S
	850 ±25%	≈ 1130	≈ 0	ER9.5-3F3-S
3F35 prot	700 ±25%	≈ 930	≈ 0	ER9.5-3F35-S
3F4 des	40 ±3%	≈ 53	≈ 340	ER9.5-3F4-A40-S
	63 ±5%	≈ 84	≈ 190	ER9.5-3F4-A63-S
	100 ±5%	≈ 133	≈ 100	ER9.5-3F4-A100-S
	525 ±25%	≈ 700	≈ 0	ER9.5-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N, flux density $\hat{B}$ ≤ 0.1 mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	3600 +40/−30%	≈ 4800	≈ 0	ER9.5-3E5-S
3E6	4800 +40/−30%	≈ 6400	≈ 0	ER9.5-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.011	≤ 0.072	−
3C96	≥340	≤ 0.0085	≤ 0.058	≤ 0.018
3F3	≥300	≤ 0.015	−	≤ 0.025
3F35	≥300	−	−	≤ 0.011
3F4	≥250	−	−	−

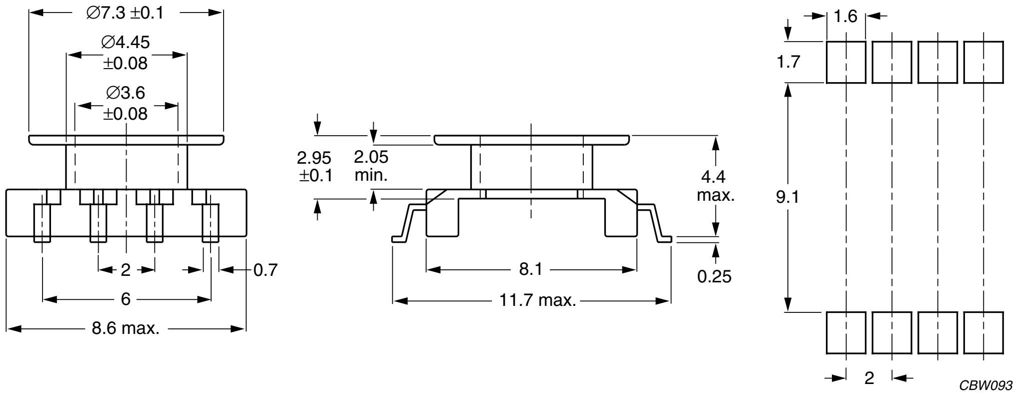
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	−	−	−	−
3C96	≥340	≤ 0.045	−	−	−
3F3	≥300	−	−	−	−
3F35	≥300	≤ 0.016	≤ 0.13	−	−
3F4	≥250	−	−	≤ 0.036	≤ 0.056

COIL FORMERS

General data

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



Dimensions in mm.

Fig.2 ER9.5 coil former (SMD); 8-solder pads.

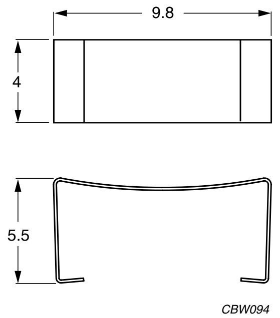
Table 1 Winding data for ER9.5 coil former (SMD) with 8 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	2.05	18.4	CPVS-ER9.5-1S-8P

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈ 20 N	3	CLM-ER9.5



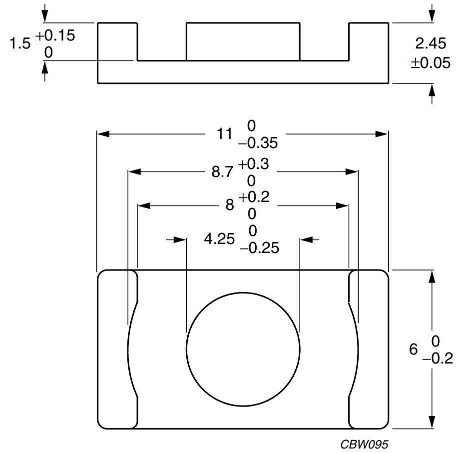
Dimensions in mm.

Fig.3 ER9.5 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	174	mm^3
l_e	effective length	14.7	mm
A_e	effective area	11.9	mm^2
A_{min}	minimum area	10.3	mm^2
m	mass of core half	≈ 0.5	g



Dimensions in mm.

Fig.1 ER11 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	100 ±3%	≈ 98	≈ 170	ER11-3C94-A100-S
	160 ±3%	≈ 157	≈ 100	ER11-3C94-A160-S
	250 ±10%	≈ 246	≈ 60	ER11-3C94-A250-S
	1400 ±25%	≈ 1370	≈ 0	ER11-3C94-S
3C96 prot	1250 ±25%	≈ 1220	≈ 0	ER11-3C96-S
3F3	100 ±3%	≈ 98	≈ 170	ER11-3F3-A100-S
	160 ±3%	≈ 157	≈ 100	ER11-3F3-A160-S
	250 ±10%	≈ 246	≈ 60	ER11-3F3-A250-S
	1200 ±25%	≈ 1170	≈ 0	ER11-3F3-S
3F35 prot	1000 ±25%	≈ 980	≈ 0	ER11-3F35-S
3F4 des	63 ±3%	≈ 62	≈ 280	ER11-3F4-A63-S
	100 ±5%	≈ 98	≈ 160	ER11-3F4-A100-S
	160 ±8%	≈ 157	≈ 85	ER11-3F4-A160-S
	725 ±25%	≈ 710	≈ 0	ER11-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements,15 ±5 N, flux density $\hat{B} \leq 0.1$ mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	5000 +40/–30%	≈ 4920	≈ 0	ER11-3E5-S
3E6	6700 +40/–30%	≈ 6590	≈ 0	ER11-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.018	≤ 0.1	–
3C96	≥340	≤ 0.014	≤ 0.08	≤ 0.033
3F3	≥300	≤ 0.025	–	≤ 0.04
3F35	≥300	–	–	≤ 0.016
3F4	≥250	–	–	–

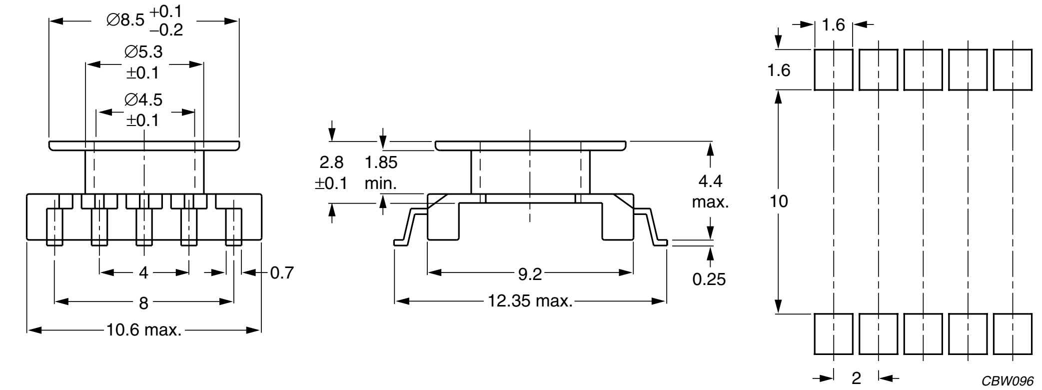
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.065	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.023	≤ 0.18	–	–
3F4	≥250	–	–	≤ 0.052	≤ 0.084

COIL FORMERS

General data

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



Dimensions in mm.

Fig.2 ER11 coil former (SMD); 10-solder pads.

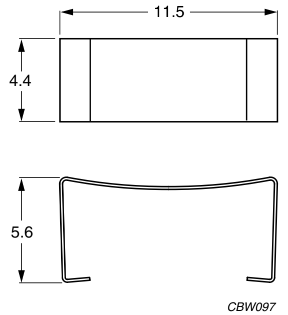
Winding data for ER11 coil former (SMD)

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	1.85	21.6	CPVS-ER11-1S-10P
1	2.8	1.85	21.6	CPVS-ER11-1S-12P

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force ≈25 N	3	CLM-ER11



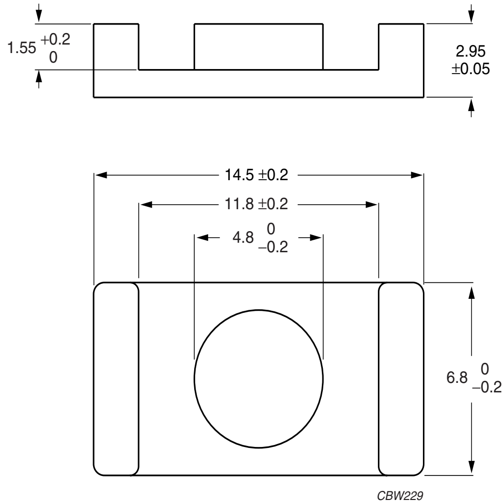
Dimensions in mm.

Fig.3 ER11 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	333	mm^3
l_e	effective length	19.0	mm
A_e	effective area	17.6	mm^2
A_{min}	minimum area	17.3	mm^2
m	mass of core half	≈ 0.9	g



Dimensions in mm.

Fig.1 ER14.5 core half.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C94 des	100 ±3%	≈ 86	≈ 250	ER14.5-3C94-A100-S
	160 ±3%	≈ 137	≈ 150	ER14.5-3C94-A160-S
	250 ±8%	≈ 215	≈ 90	ER14.5-3C94-A250-S
	1600 ±25%	≈ 1370	≈ 0	ER14.5-3C94-S
3C96 prot	1500 ±25%	≈ 1290	≈ 0	ER14.5-3C96-S
3F3	100 ±3%	≈ 86	≈ 250	ER14.5-3F3-A100-S
	160 ±3%	≈ 137	≈ 150	ER14.5-3F3-A160-S
	250 ±8%	≈ 215	≈ 90	ER14.5-3F3-A250-S
	1400 ±25%	≈ 1200	≈ 0	ER14.5-3F3-S
3F35 prot	1150 ±25%	≈ 990	≈ 0	ER14.5-3F35-S
3F4 des	100 ±3%	≈ 86	≈ 240	ER14.5-3F4-A100-S
	160 ±5%	≈ 137	≈ 130	ER14.5-3F4-A160-S
	250 ±8%	≈ 215	≈ 70	ER14.5-3F4-A250-S
	850 ±25%	≈ 730	≈ 0	ER14.5-3F4-S

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N, flux density $\hat{B}$ ≤ 0.1 mT.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E6	7900 +40/–30%	≈ 6800	≈ 0	ER14.5-3E6-S

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C94	≥320	≤ 0.032	≤ 0.2	–
3C96	≥340	≤ 0.025	≤ 0.16	≤ 0.06
3F3	≥300	≤ 0.043	–	≤ 0.061
3F35	≥300	–	–	≤ 0.03
3F4	≥250	–	–	–

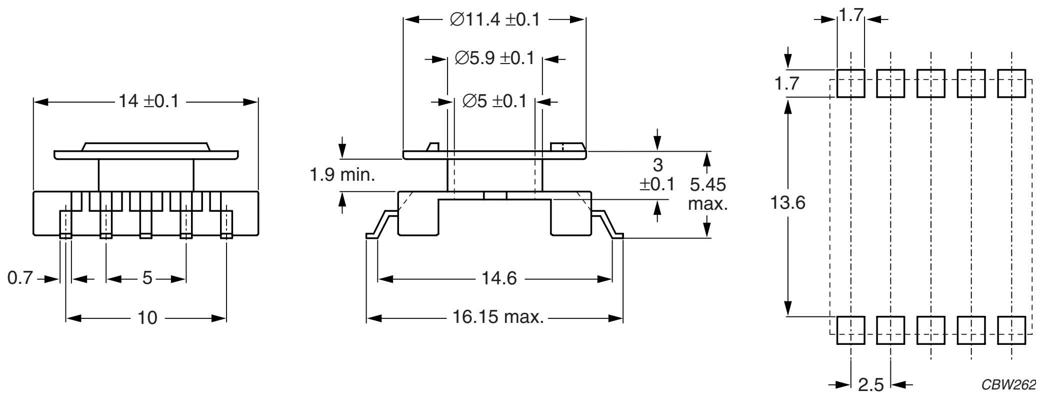
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.13	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.045	≤ 0.35	–	–
3F4	≥250	–	–	≤ 0.1	≤ 0.16

COIL FORMERS

General data

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



Dimensions in mm.

Fig.2 ER14.5 coil former (SMD); 10-solder pads.

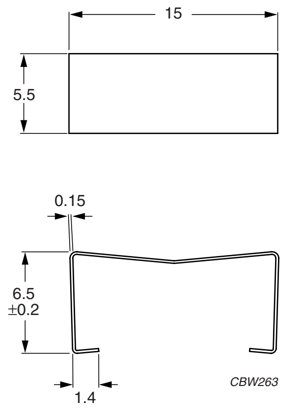
Winding data for ER14.5 coil former (SMD) with 10 solder pads

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.1	1.9	27	CPVS-ER14.5-1S-10P

MOUNTING PARTS

General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-ER14.5



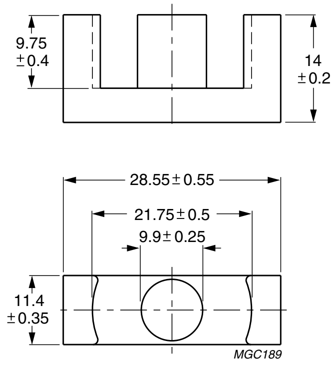
Dimensions in mm.

Fig.3 ER11 clamp.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.786	mm^{-1}
V_e	effective volume	5260	mm^3
l_e	effective length	64.0	mm
A_e	effective area	81.4	mm^2
A_{min}	minimum area	77.0	mm^2
m	mass of core half	≈ 14	g



Dimensions in mm.

Fig.1 ER28 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2900 ±25%	≈1800	≈ 0	ER28-3C90
3C94 des	2900 ±25%	≈1800	≈ 0	ER28-3C94

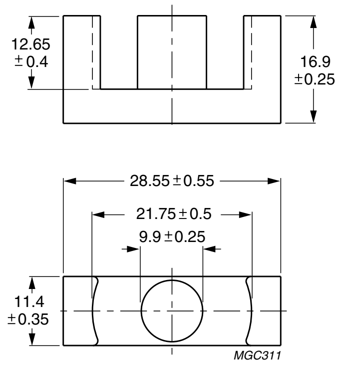
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.63	≤ 0.67	–
3C94	≥320	–	≤ 0.5	≤ 3.2

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.928	mm^{-1}
V_e	effective volume	6140	mm^3
l_e	effective length	75.5	mm
A_e	effective area	81.4	mm^2
A_{min}	minimum area	77.0	mm^2
m	mass of core half	≈ 16	g



Dimensions in mm.

Fig.1 ER28L core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2500 ±25%	≈ 1900	≈ 0	ER28L-3C90
3C94 des	2500 ±25%	≈ 1900	≈ 0	ER28L-3C94

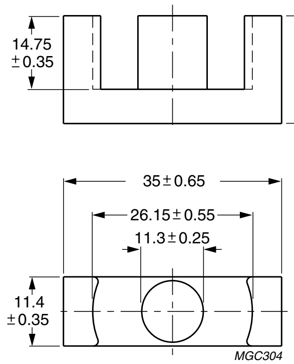
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.74	≤ 0.77	–
3C94	≥320	–	≤ 0.58	≤ 3.7

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.849	mm^{-1}
V_e	effective volume	9710	mm^3
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

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2800 ±25%	≈ 1900	≈ 0	ER35-3C90
3C94 des	2800 ±25%	≈ 1900	≈ 0	ER35-3C94

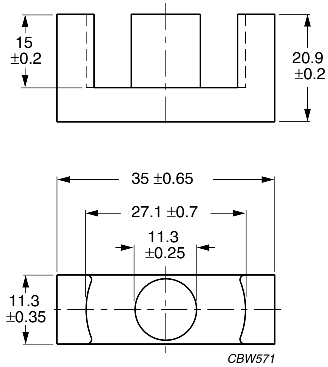
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 1.2	≤ 1.3	–
3C94	≥320	–	≤ 0.95	≤ 5.8

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.900	mm^{-1}
V_e	effective volume	9548	mm^3
l_e	effective length	92.7	mm
A_e	effective area	103	mm^2
A_{min}	minimum area	100	mm^2
m	mass of core half	≈ 27	g



Dimensions in mm.

Fig.1 ER35W core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	3000 ±25%	≈ 2150	≈ 0	ER35W-3C90

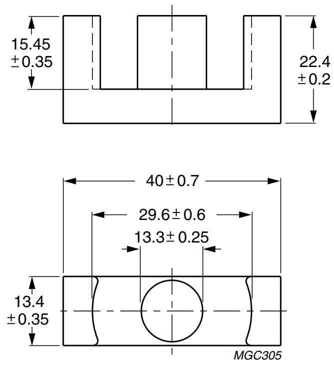
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 1.2	≤ 1.3

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.658	mm^{-1}
V_e	effective volume	14600	mm^3
l_e	effective length	98.0	mm
A_e	effective area	149	mm^2
A_{min}	minimum area	139	mm^2
m	mass of core half	≈ 37	g



Dimensions in mm.

Fig.1 ER40 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3600 ±25%	≈ 1900	≈ 0	ER40-3C90
3C94 des	3600 ±25%	≈ 1900	≈ 0	ER40-3C94

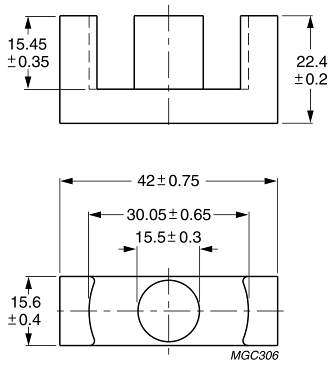
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 1.8	≤ 1.9	–
3C94	≥320	–	≤ 1.45	≤ 8.7

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.509	mm^{-1}
V_e	effective volume	19200	mm^3
l_e	effective length	98.8	mm
A_e	effective area	194	mm^2
A_{min}	minimum area	189	mm^2
m	mass of core half	≈ 48	g



Dimensions in mm.

Fig.1 ER42 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4600 ±25%	≈ 1900	≈ 0	ER42-3C90
3C94 des	4600 ±25%	≈ 1900	≈ 0	ER42-3C94

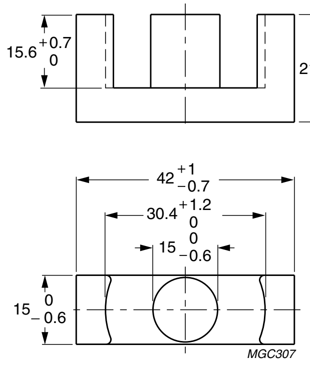
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 2.3	≤ 2.4	–
3C94	≥320	–	≤ 1.8	≤ 11

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.582	mm^{-1}
V_e	effective volume	16800	mm^3
l_e	effective length	99.0	mm
A_e	effective area	170	mm^2
A_{min}	minimum area	170	mm^2
m	mass of core half	≈ 45	g



Dimensions in mm.

Fig.1 ER42A core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4000 ±25%	≈ 1900	≈ 0	ER42A-3C90
3C94 des	4000 ±25%	≈ 1900	≈ 0	ER42A-3C94

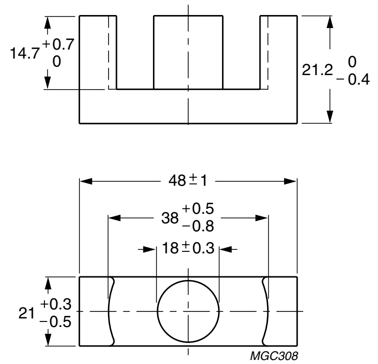
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 2.0	≤ 2.1	–
3C94	≥320	–	≤ 1.6	≤ 9.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.392	mm^{-1}
V_e	effective volume	25500	mm^3
l_e	effective length	100	mm
A_e	effective area	255	mm^2
A_{min}	minimum area	248	mm^2
m	mass of core half	≈ 64	g



Dimensions in mm.

Fig.1 ER48 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	5700 ±25%	≈ 1900	≈ 0	ER48-3C90
3C94 des	5700 ±25%	≈ 1900	≈ 0	ER48-3C94

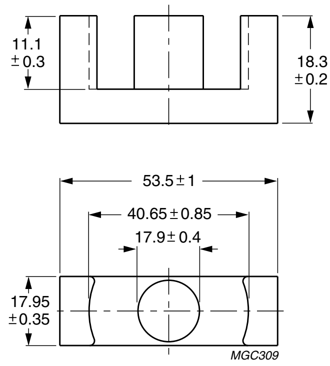
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 3.1	≤ 3.3	−
3C94	≥320	−	≤ 2.6	≤ 15

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.370	mm^{-1}
V_e	effective volume	23000	mm^3
l_e	effective length	91.8	mm
A_e	effective area	250	mm^2
A_{min}	minimum area	240	mm^2
m	mass of core half	≈ 61	g



Dimensions in mm.

Fig.1 ER54 core half.

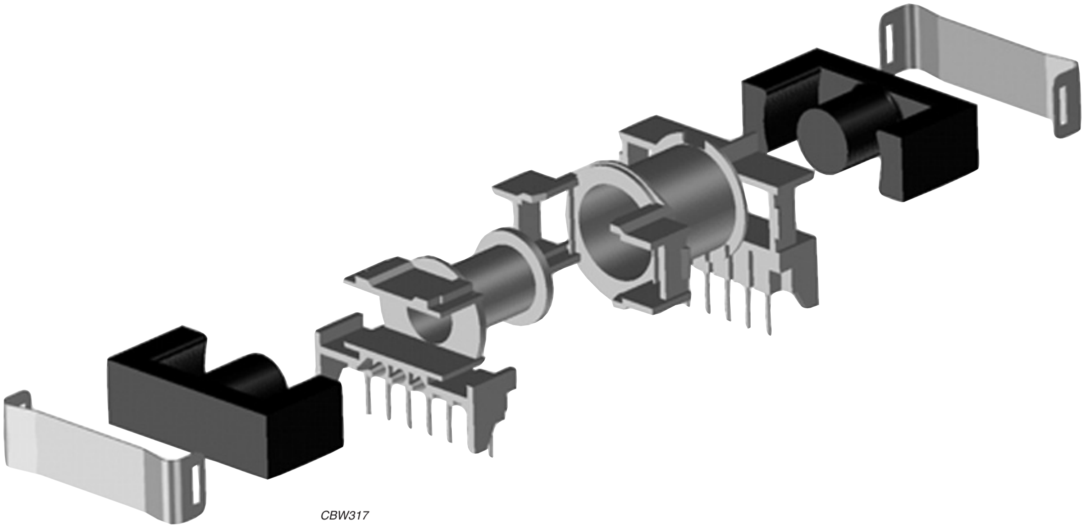
Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	6100 ±25%	≈ 1800	≈ 0	ER54-3C90
3C94 des	6100 ±25%	≈ 1800	≈ 0	ER54-3C94

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 2.8	≤ 2.9	–
3C94	≥320	–	≤ 2.3	≤ 12.5



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ETD cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
ETD29	5470	76.0	14
ETD34	7640	97.1	20
ETD39	11500	125	30
ETD44	17800	173	47
ETD49	24000	211	62
ETD54	35500	280	90
ETD59	51500	368	130

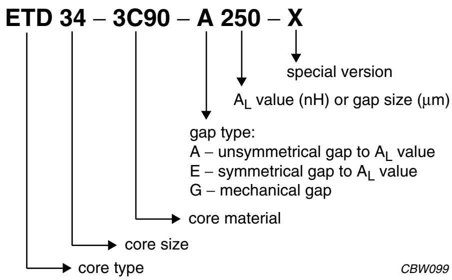


Fig.1 Type number structure for cores.

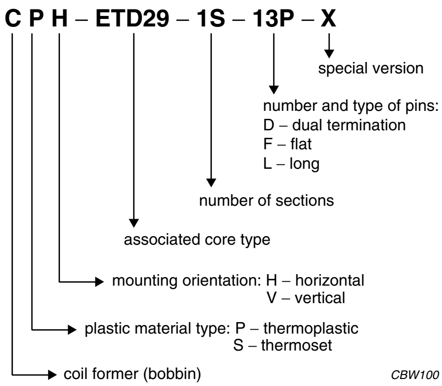
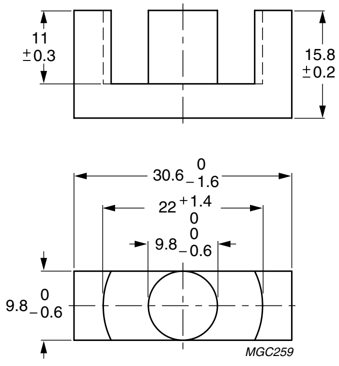


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.947	mm^{-1}
V_e	effective volume	5470	mm^3
l_e	effective length	72.0	mm
A_e	effective area	76.0	mm^2
A_{min}	minimum area	71.0	mm^2
m	mass of core half	≈ 14	g



Dimensions in mm.

Fig.1 ETD29 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	2350 ±25%	≈ 1770	≈ 0	ETD29-3C90
3C94 des	2350 ±25%	≈ 1770	≈ 0	ETD29-3C94
3C96 prot	2200 ±25%	≈ 1660	≈ 0	ETD29-3C96
3F3	2200 ±25%	≈ 1660	≈ 0	ETD29-3F3
3F35 prot	1600 ±25%	≈ 1210	≈ 0	ETD29-3F35

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.66	≤ 0.69	–	–
3C94	≥330	–	≤ 0.5	≤ 3.0	–
3C96	≥340	–	≤ 0.37	≤ 2.4	–
3F3	≥320	–	≤ 0.65	–	≤ 1.1
3F35	≥300	–	–	–	–

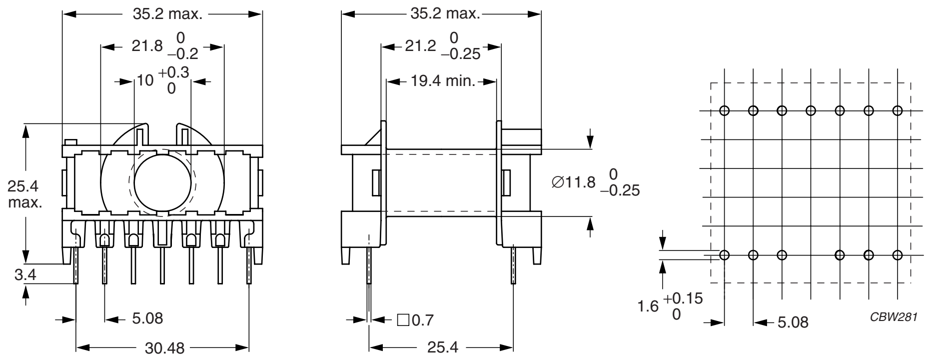
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 2.0	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.74	≤ 5.7	–	–

COIL FORMER

General data 13-pins ETD29 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD29 coil former; 13-pins.

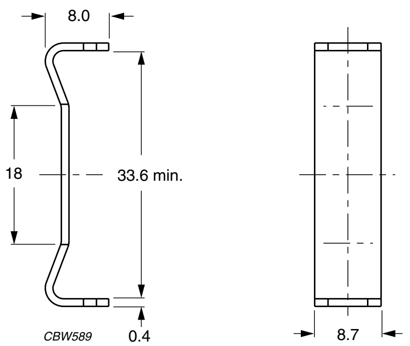
Winding data for 13-pins ETD29 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	95	19.4	53	CPH-ETD29-1S-13P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD29



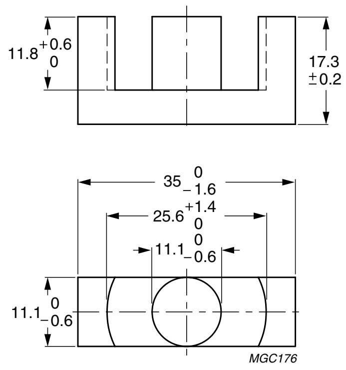
Dimensions in mm.

Fig.3 Mounting clip for ETD29.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.810	mm^{-1}
V_e	effective volume	7640	mm^3
l_e	effective length	78.6	mm
A_e	effective area	97.1	mm^2
A_{min}	minimum area	91.6	mm^2
m	mass of core half	≈ 20	g



Dimensions in mm.

Fig.1 ETD34 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2700 ±25%	≈ 1740	≈ 0	ETD34-3C90
3C94 des	2700 ±25%	≈ 1740	≈ 0	ETD34-3C94
3C96 prot	2500 ±25%	≈ 1610	≈ 0	ETD34-3C96
3F3	2500 ±25%	≈ 1610	≈ 0	ETD34-3F3
3F35 prot	1850 ±25%	≈ 1190	≈ 0	ETD34-3F35

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 0.92	≤ 0.97	–	–
3C94	≥330	–	≤ 0.73	≤ 4.2	–
3C96	≥340	–	≤ 0.55	≤ 3.4	–
3F3	≥320	–	≤ 0.9	–	≤ 1.6
3F35	≥300	–	–	–	–

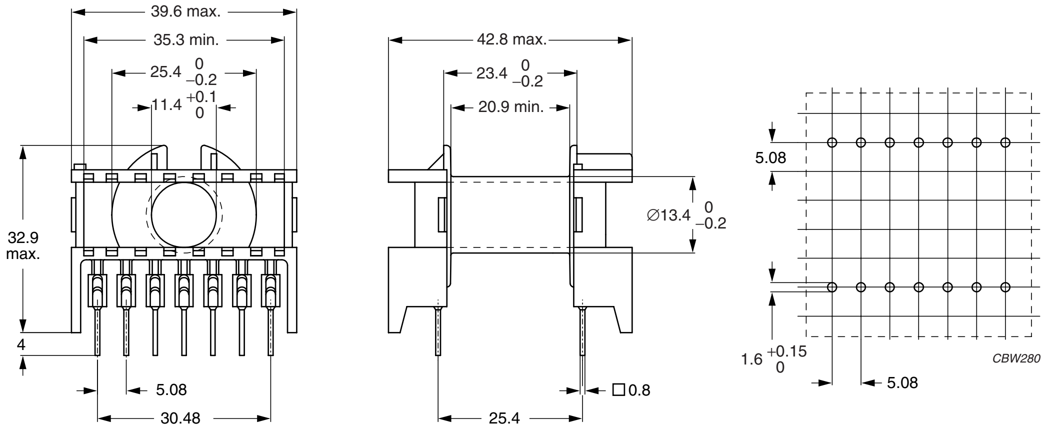
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 2.8	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 1.0	≤ 8.0	–	–

COIL FORMERS

General data 14-pins ETD34 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *“UL 94V-0”*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *“IEC 60085”*, class F
Resistance to soldering heat	*“IEC 60068-2-20”*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*“IEC 60068-2-20”*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD34 coil former; 14-pins.

Winding data for 14-pins ETD34 coil former

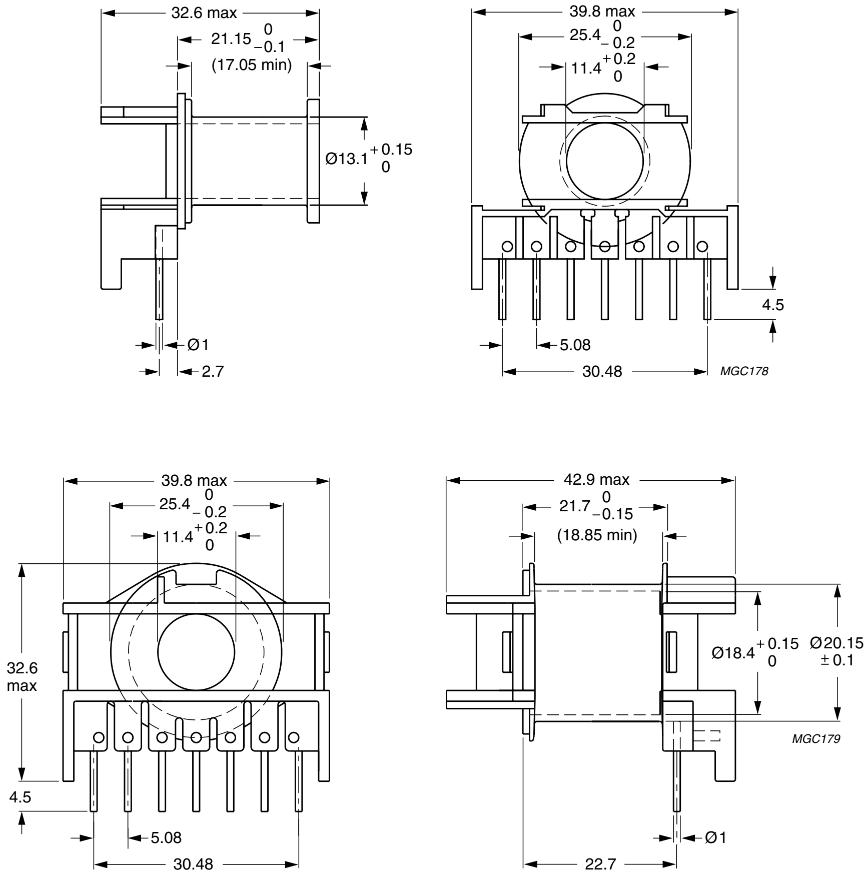
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	123	20.9	60	CPH-ETD34-1S-14P(1)

Note

1. Also available with ∅1.0 mm pins.

General data 14-pins coaxial ETD34 coil former

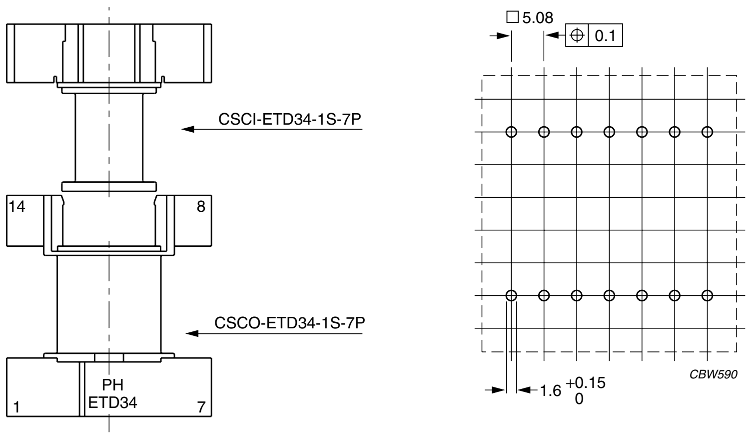
PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance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



Dimensions in mm.

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

Fig.3 Coaxial ETD34 coil former; 14-pins.



Dimensions in mm.

This coil former incorporates 8 mm creepage distance between primary and secondary windings, as well as between primary and all other conductive parts (in accordance with IEC 380 safety regulations).

Fig.4 Mounting grid and method of fitting.

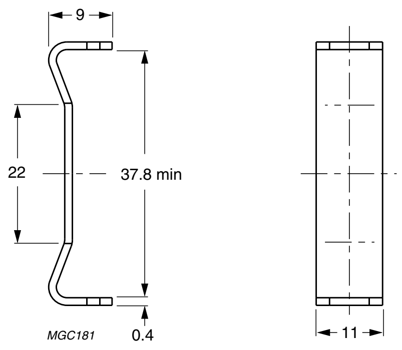
Winding data for coaxial ETD34 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	42.6	17.05	49.4	CSCI-ETD34-1S-7P
1	46.6	18.85	71.4	CSCO-ETD34-1S-7P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	5	CLI-ETD34



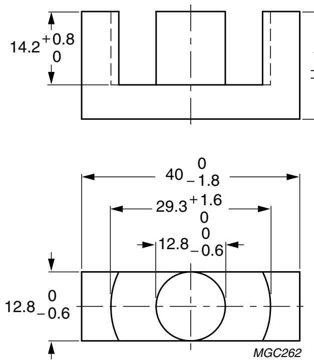
Dimensions in mm.

Fig.5 Mounting clip for ETD34.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.737	mm^{-1}
V_e	effective volume	11500	mm^3
l_e	effective length	92.2	mm
A_e	effective area	125	mm^2
A_{min}	minimum area	123	mm^2
m	mass of core half	≈ 30	g



Dimensions in mm.

Fig.1 ETD39 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3000 ±25%	≈ 1760	≈ 0	ETD39-3C90
3C94 des	3000 ±25%	≈ 1760	≈ 0	ETD39-3C94
3F3	2800 ±25%	≈ 1640	≈ 0	ETD39-3F3

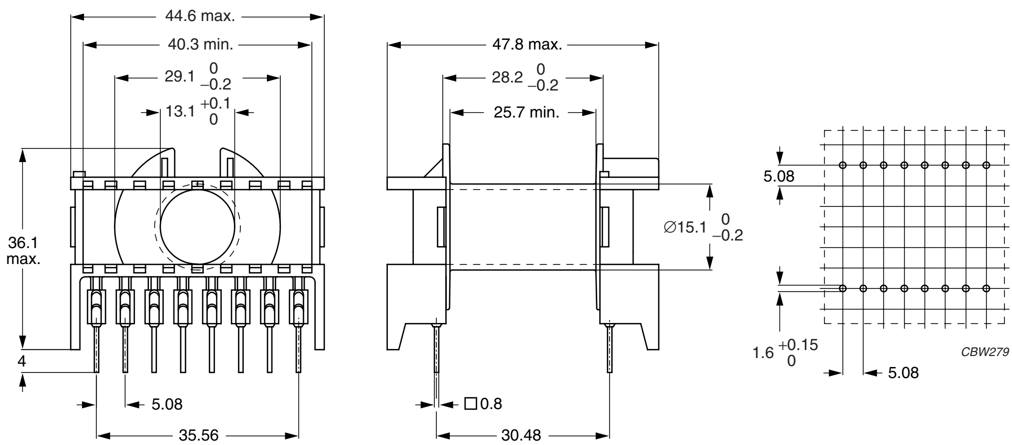
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 1.4	≤ 1.5	–	–
3C94	≥330	–	≤ 1.2	≤ 6.0	–
3F3	≥320	–	≤ 1.4	–	≤ 2.5

COIL FORMER

General data 16-pins ETD39 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *“UL 94V-0”*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *“IEC 60085”*, class F
Resistance to soldering heat	*“IEC 60068-2-20”*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*“IEC 60068-2-20”*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD39 coil former; 16-pins.

Winding data for 16-pins ETD39 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	177	25.7	69	CPH-ETD39-1S-16P(1)

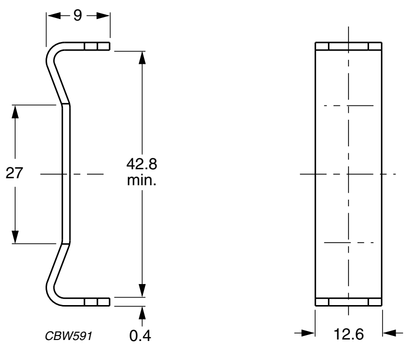
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD39



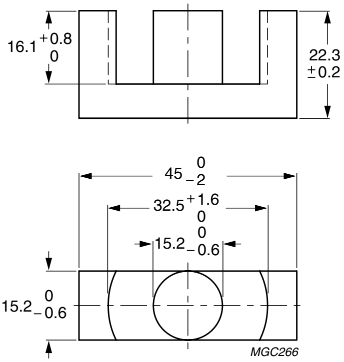
Dimensions in mm.

Fig.3 Mounting clip for ETD39.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.589	mm^{-1}
V_e	effective volume	17800	mm^3
l_e	effective length	103	mm
A_e	effective area	173	mm^2
A_{min}	minimum area	172	mm^2
m	mass of core half	≈ 47	g



Dimensions in mm.

Fig.1 ETD44 core half.

Core halves

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

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	3800 ±25%	≈ 1800	≈ 0	ETD44-3C90
3C94 des	3800 ±25%	≈ 1800	≈ 0	ETD44-3C94
3F3	3500 ±25%	≈ 1660	≈ 0	ETD44-3F3

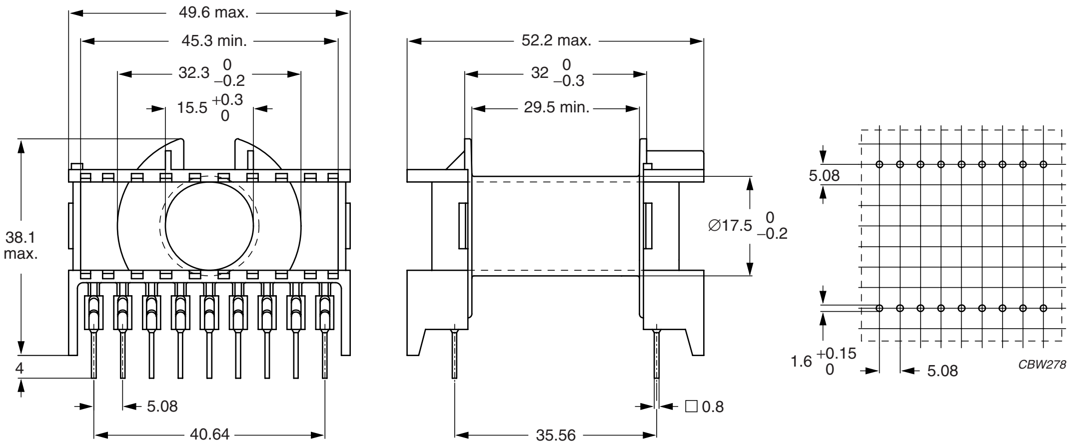
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 2.2	≤ 2.3	–	–
3C94	≥330	–	≤ 1.7	≤ 9.4	–
3F3	≥320	–	≤ 2.2	–	≤ 3.9

COIL FORMERS

General data 18-pins ETD44 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD44 coil former; 18-pins.

Winding data for 18-pins ETD44 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	214	29.5	77	CPH-ETD44-1S-18P(1)

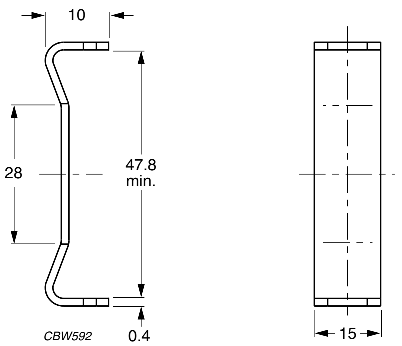
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD44



Dimensions in mm.

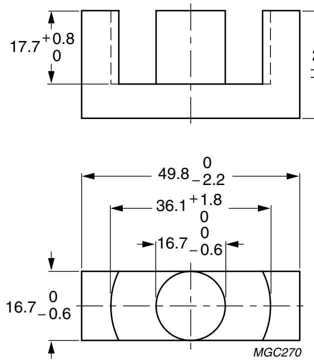
Fig.3 Mounting clip for ETD44.

ETD cores and accessories ETD49

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.534	mm^{-1}
V_e	effective volume	24000	mm^3
l_e	effective length	114	mm
A_e	effective area	211	mm^2
A_{min}	minimum area	209	mm^2
m	mass of core half	≈ 62	g



Dimensions in mm.

Fig.1 ETD49 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4200 ±25%	≈ 1810	≈ 0	ETD49-3C90
3C94 des	4200 ±25%	≈ 1810	≈ 0	ETD49-3C94
3F3	3900 ±25%	≈ 1680	≈ 0	ETD49-3F3

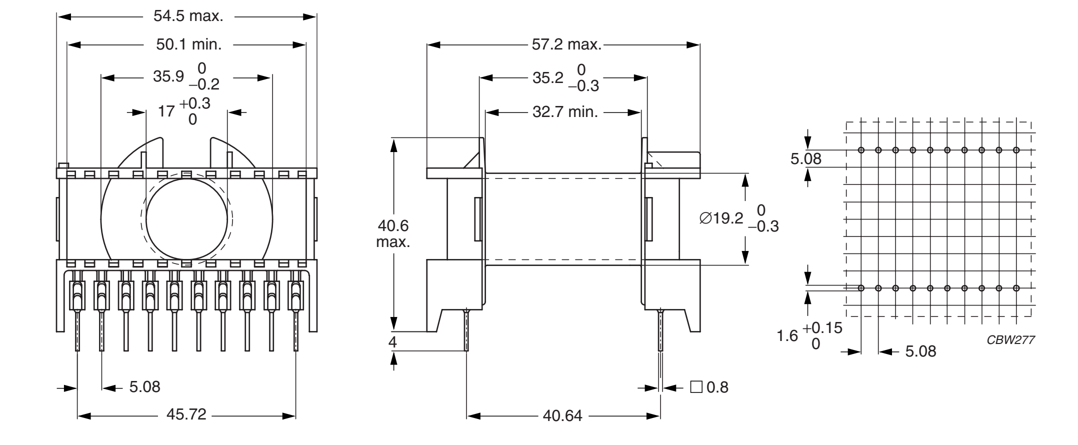
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 2.9	≤ 3.1	–	–
3C94	≥330	–	≤ 2.3	≤ 12.4	–
3F3	≥320	–	≤ 3.0	–	≤ 5.4

COIL FORMERS

General data 20-pins ETD49 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD49 coil former; 20-pins.

Winding data for 20-pins ETD49 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	273	32.7	85	CPH-ETD49-1S-20P(1)

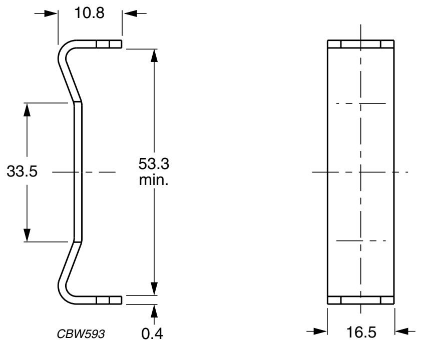
Note

1. Also available with ∅1.0 mm pins.

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD49



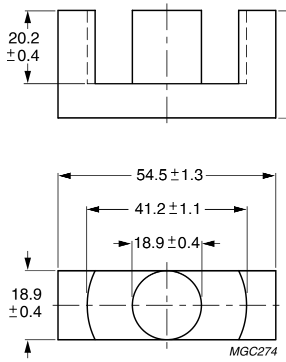
Dimensions in mm.

Fig.3 Mounting clip for ETD49.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.454	mm^{-1}
V_e	effective volume	35500	mm^3
l_e	effective length	127	mm
A_e	effective area	280	mm^2
A_{min}	minimum area	270	mm^2
m	mass of core half	≈ 90	g



Dimensions in mm.

Fig.1 ETD54 core half.

Core halves

Clamping force for A_L measurements, 50 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	5000 ±25%	≈ 1810	≈ 0	ETD54-3C90
3C94 des	5000 ±25%	≈ 1810	≈ 0	ETD54-3C94
3F3	4600 ±25%	≈ 1660	≈ 0	ETD54-3F3

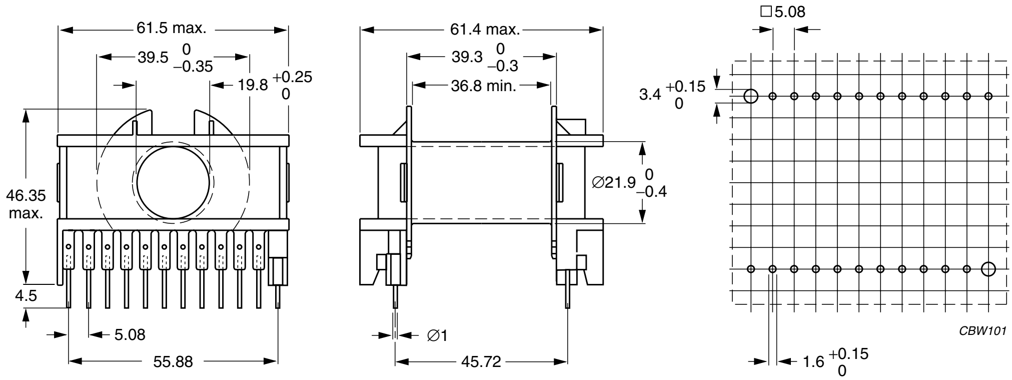
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 4.3	≤ 4.8	–	–
3C94	≥330	–	≤ 3.6	≤ 21	–
3F3	≥320	–	≤ 4.5	–	≤ 8.5

COIL FORMERS

General data 22-pins ETD54 coil former

ITEM	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD54 coil former; 22-pins.

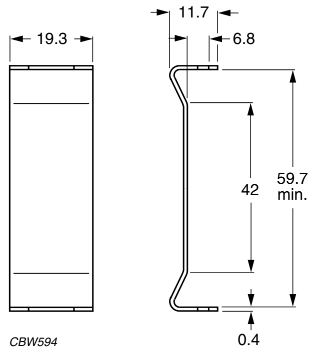
Winding data for 22-pins ETD54 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	316	36.8	96	CPH-ETD54-1S-22P

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD54



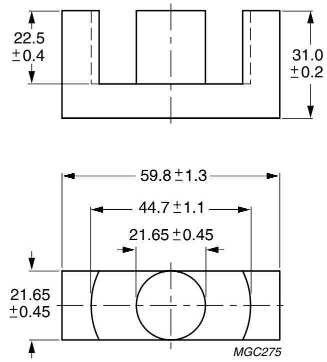
Dimensions in mm.

Fig.3 Mounting clip for ETD54.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.378	mm^{-1}
V_e	effective volume	51500	mm^3
l_e	effective length	139	mm
A_e	effective area	368	mm^2
A_{min}	minimum area	360	mm^2
m	mass of core half	≈130	g



Dimensions in mm.

Fig.1 ETD59 core half.

Core halves

Clamping force for A_L measurements, 70 ±20 N. Gapped cores are available on request.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	6000 ±25%	≈ 1800	≈ 0	ETD59-3C90
3C94 des	6000 ±25%	≈ 1800	≈ 0	ETD59-3C94
3F3	5600 ±25%	≈ 1680	≈ 0	ETD59-3F3

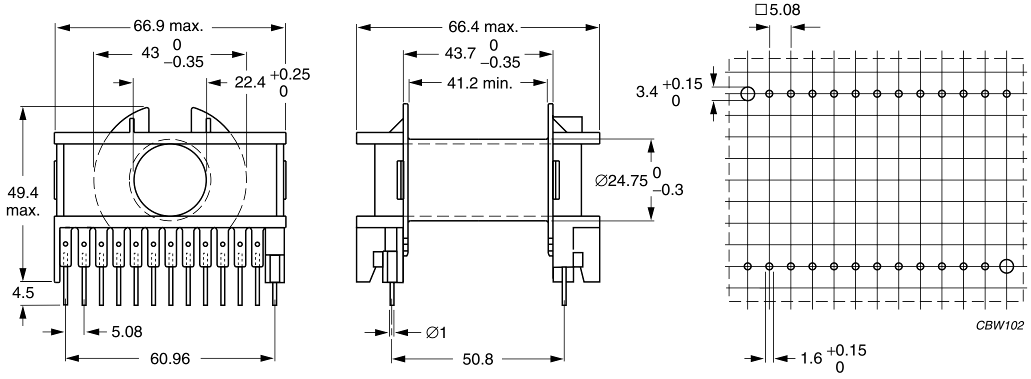
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥330	≤ 6.2	≤ 7.3	–	–
3C94	≥330	–	≤ 5.2	≤ 31	–
3F3	≥320	–	≤ 6.7	–	≤ 12.8

COIL FORMER

General data 24-pins ETD59 coil former

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 ETD59 coil former; 24-pins.

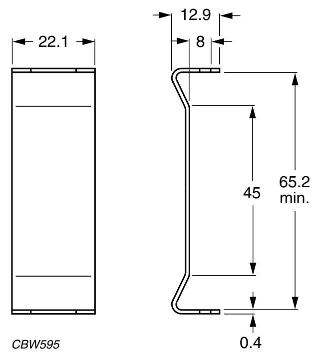
Winding data for 24-pins ETD59 coil former

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

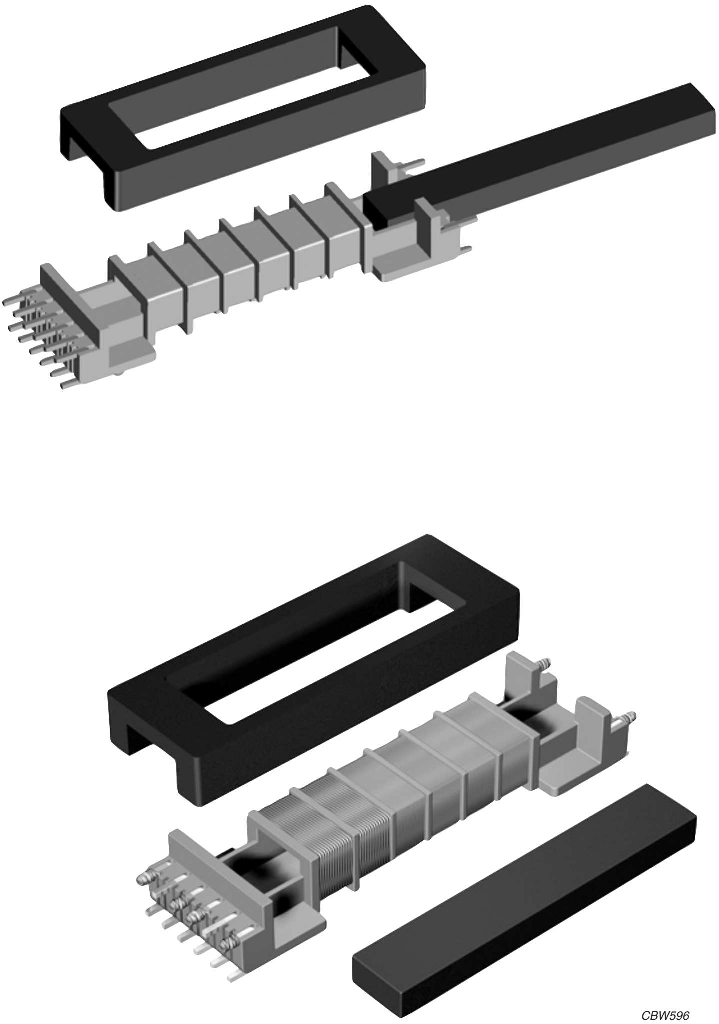
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD59



Dimensions in mm.

Fig.3 Mounting clip for ETD59.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Frame and Bar cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
FRM 20/5/15	655	14	2.1
BAR 20/3/5.5	655	14	1.5
FRM 21/4/12	312	7.9	1.5
BAR 22/2/6	312	7.9	1.0
FRM 24/3.5/10	348	7.6	1.2
BAR 25/2.2/4	370	8.1	1.2
FRM 27/3.8/9	504	9.7	1.6
BAR 28/3.8/2.3	504	9.7	1.2

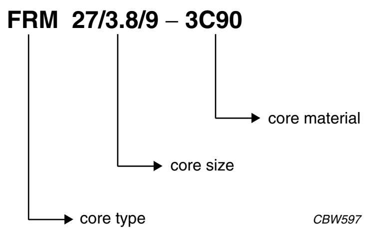


Fig.1 Type number structure for cores.

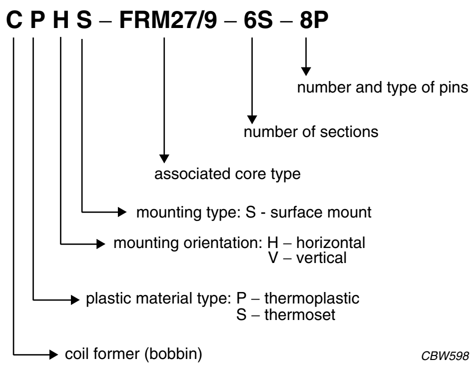
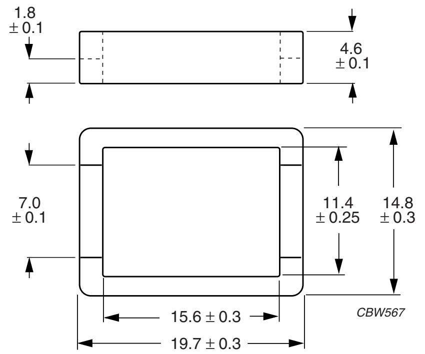


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.29	mm^{-1}
V_e	effective volume	655	mm^3
l_e	effective length	46	mm
A_e	effective area	14	mm^2
A_{min}	minimum area	7.4	mm^2
m	mass of frame	≈ 2.1	g
m	mass of bar	≈ 1.5	g

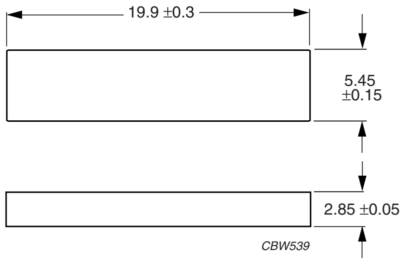


Dimensions in mm.

Fig.1 FRM20/5/15.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR20/3/5.5-3C90
3C91	BAR20/3/5.5-3C91



Dimensions in mm.

Fig.2 BAR20/3/5.5.

Frame cores for use in combination with matching bar cores

A_L measured in combination with bar core

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	500 ±25%	≈ 1310	≈ 0	FRM20/5/15-3C90
3C91	600 ±25%	≈ 1570	≈ 0	FRM20/5/15-3C91

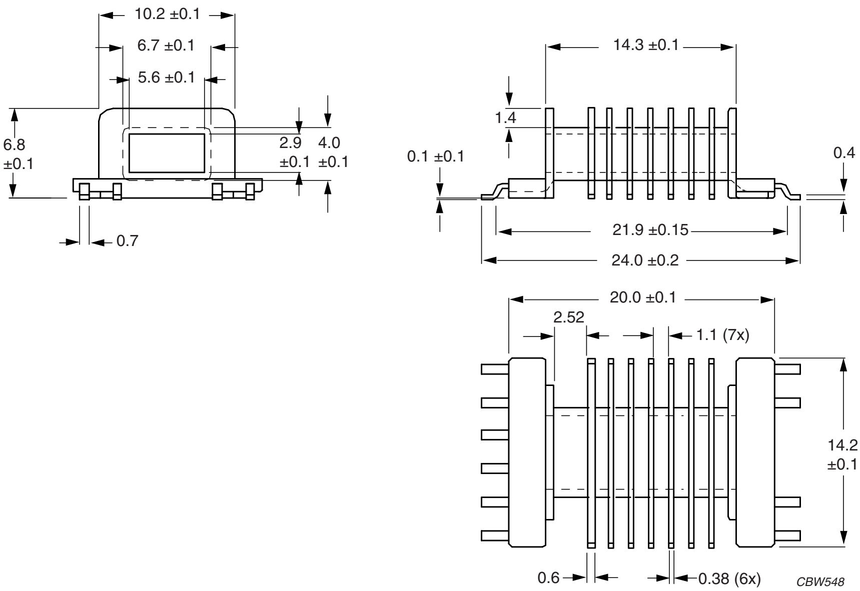
Properties of Frame and Bar combinations under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 60 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 60 °C
3C90	≥ 320	≤ 0.073	≤ 0.080	–	–
3C91	≥ 320	–	–	≤ 0.033	≤ 0.26

COIL FORMERS

General data

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



Dimensions in mm.

Fig.3 SMD coil former for FRM20/5/15.

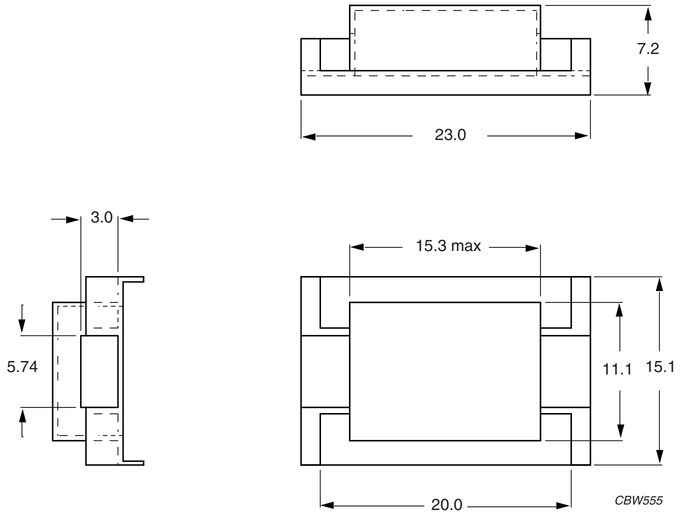
Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
8	10	3.5 + 7 × 1.5	2.52 + 7 × 1.1	27	CPHS-FRM20/15-8S-10P

MOUNTING PARTS

General data

PARAMETER	SPECIFICATION
Cover material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E54705(M)
Maximum operating temperature	155 °C, *"IEC 60085",* class F



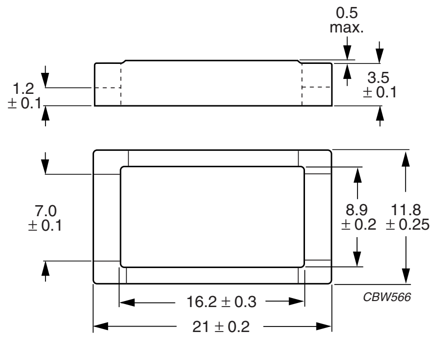
Dimensions in mm.

Fig.4 Cover for FRM20/5/15.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.06	mm^{-1}
V_e	effective volume	312	mm^3
l_e	effective length	40	mm
A_e	effective area	7.9	mm^2
A_{min}	minimum area	5.7	mm^2
m	mass of frame	≈ 1.5	g
m	mass of bar	≈ 1.0	g

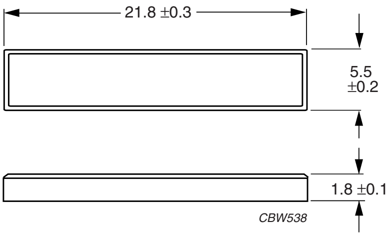


Dimensions in mm.

Fig.1 FRM21/4/12.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR22/2/6-3C90
3C91	BAR22/2/6-3C91



Dimensions in mm.

Fig.2 BAR22/2/6.

Frame and Bar cores and accessories FRM21/4/12

Frame cores for use in combination with matching bar cores

A_L measured in combination with bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	400 ±25%	≈ 1610	≈ 0	FRM21/4/12-3C90
3C91	470 ±25%	≈ 1890	≈ 0	FRM21/4/12-3C91

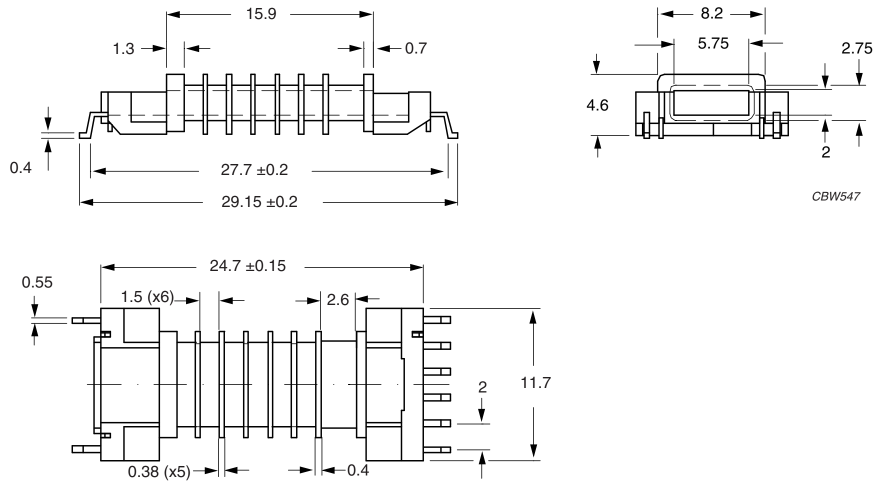
Properties of Frame and Bar combinations under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 60 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 60 °C
3C90	≥320	≤ 0.034	≤ 0.037	–	–
3C91	≥320	–	–	≤ 0.020	≤ 0.14

COIL FORMERS

General data

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



Dimensions in mm.

Fig.3 SMD coil former for FRM21/4/12.

Winding data

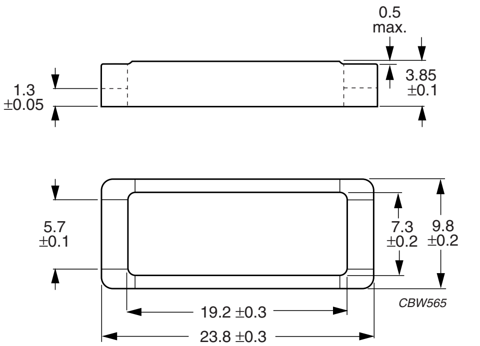
NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
7	8	2.3 + 6 × 1.35	2.6 + 6 × 1.5	21	CPHS-FRM21/12-7S-8P

Frame and Bar cores and accessories FRM24/3.9/10

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.65	mm^{-1}
V_e	effective volume	370	mm^3
l_e	effective length	45.8	mm
A_e	effective area	8.1	mm^2
A_{min}	minimum area	6.0	mm^2
m	mass of frame	≈ 1.3	g
m	mass of bar	≈ 1.2	g

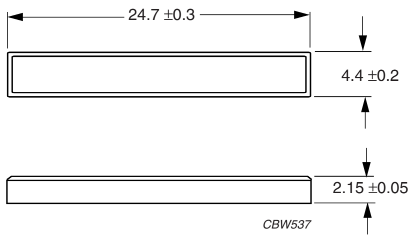


Dimensions in mm.

Fig.1 FRM24/3.9/10 core.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR25/2.2/4-3C90
3C91	BAR25/2.2/4-3C91



Dimensions in mm.

Fig.2 BAR25/2.2/4.

Frame and Bar cores and accessories FRM24/3.9/10

Frame cores for use in combination with matching bar cores

AL measured in combination with bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	370 ±25%	≈ 1660	≈ 0	FRM24/3.5/10-3C90
3C91	440 ±25%	≈ 1970	≈ 0	FRM24/3.5/10-3C91

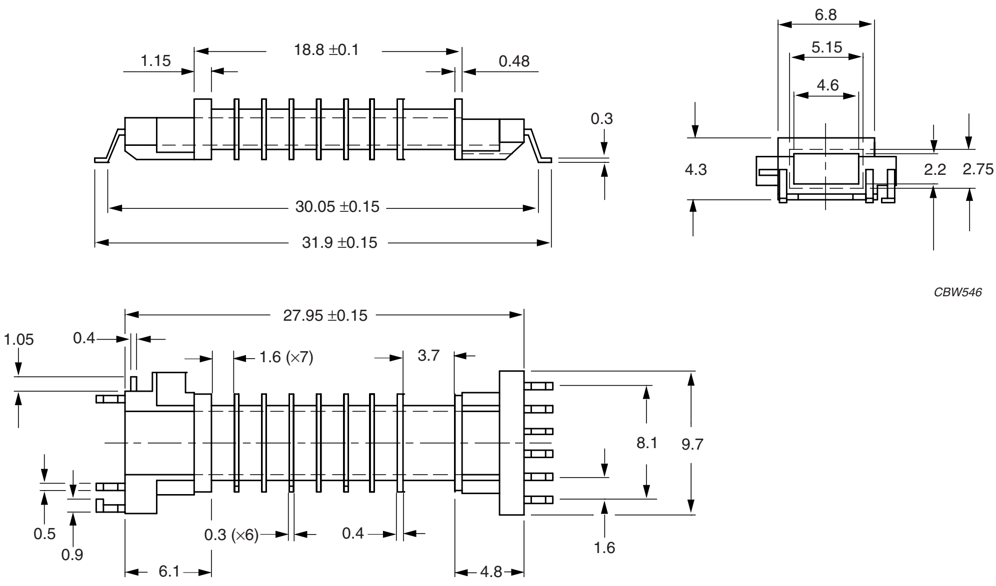
Properties of Frame and Bar combinations under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 60 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 60 °C
3C90	≥320	≤ 0.041	≤ 0.044	–	–
3C91	≥320	–	–	≤ 0.019	≤ 0.15

COIL FORMERS

General data

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



Dimensions in mm.

Fig.3 SMD coil former for FRM24/3.9/10.

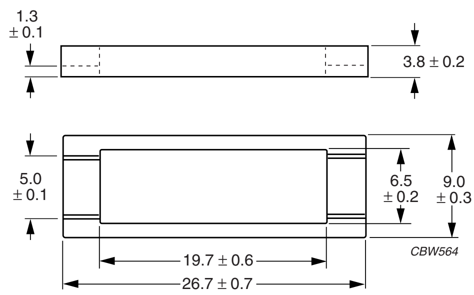
Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm²)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
8	9	2.9 + 7 × 1.24	3.7 + 7 × 1.6	17.3	CPHS-FRM24/10-8S-9P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.56	mm^{-1}
V_e	effective volume	504	mm^3
l_e	effective length	52.1	mm
A_e	effective area	9.7	mm^2
A_{min}	minimum area	8.7	mm^2
m	mass of frame	≈ 1.6	g
m	mass of bar	≈ 1.2	g

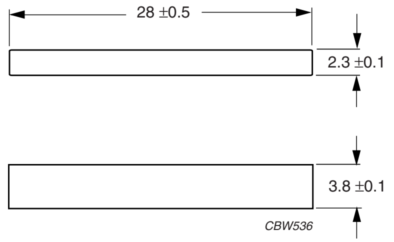


Dimensions in mm.

Fig.1 FRM27/3.8/9 core.

Ordering information for bar cores

GRADE	TYPE NUMBER
3C90	BAR28/2.3/3.8-3C90
3C91	BAR28/2.3/3.8-3C91



Dimensions in mm.

Fig.2 BAR28/2.3/3.8

Frame and Bar cores and accessories FRM27/3.8/9

Frame cores for use in combination with matching bar cores

A_L measured in combination with a bar core.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	350 ±20%	≈ 1550	≈ 0	FRM27/3.8/9-3C90
3C91	420 ±20%	≈ 1860	≈ 0	FRM27/3.8/9-3C91

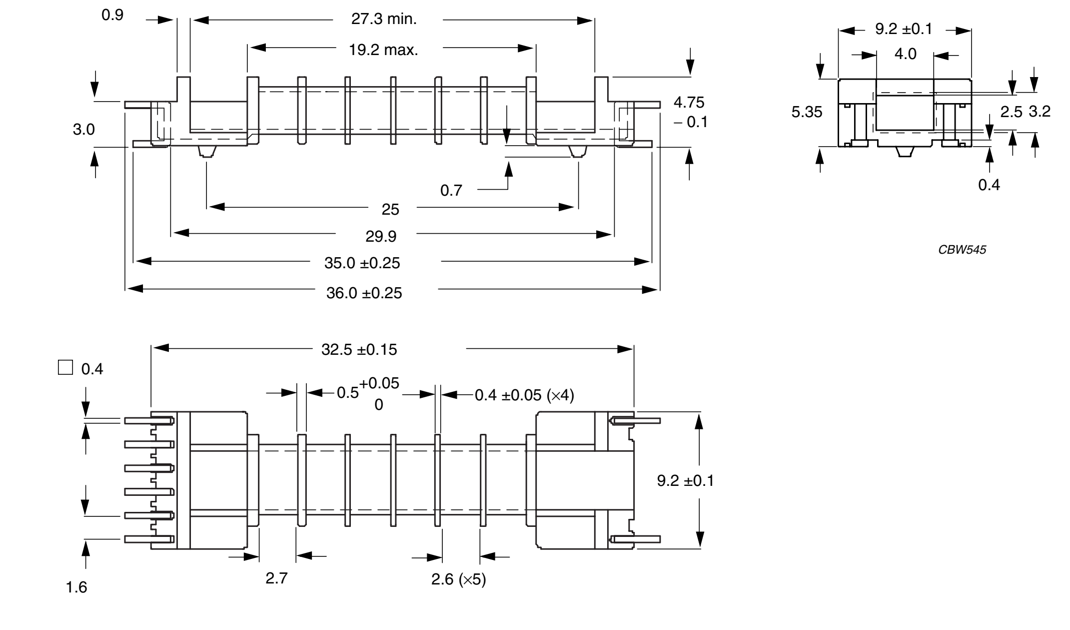
Properties of Frame and Bar combinations under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 60 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 60 °C
3C90	≥320	≤ 0.056	≤ 0.060	–	–
3C91	≥320	–	–	≤ 0.025	≤ 0.2

COIL FORMERS

General data

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

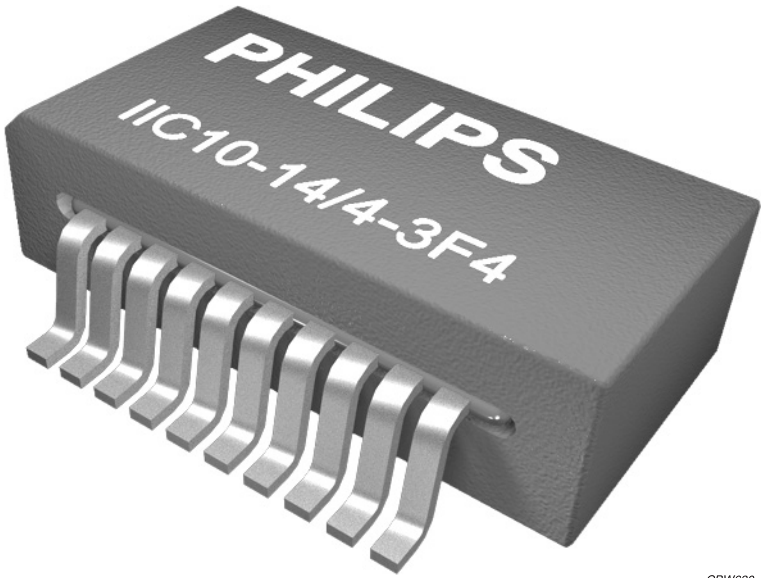


Dimensions in mm.

Fig.3 SMD coil former for FRM27/3.8/9.

Winding data

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
6	8	1.75 + 5 × 1.7	2.7 + 5 × 2.6	18.5	CPHS-FRM27/9-6S-8P



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview IIC

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
IIC10-14/4	33.8	11.7	≈1.85
IIC10P-14/4	33.8	11.7	≈1.85

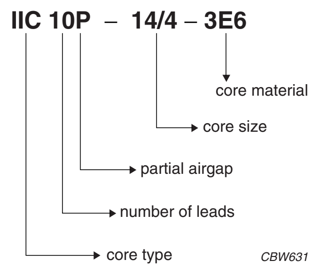


Fig.1 Type number structure.

IIC10P-14/4

Effective core parameters

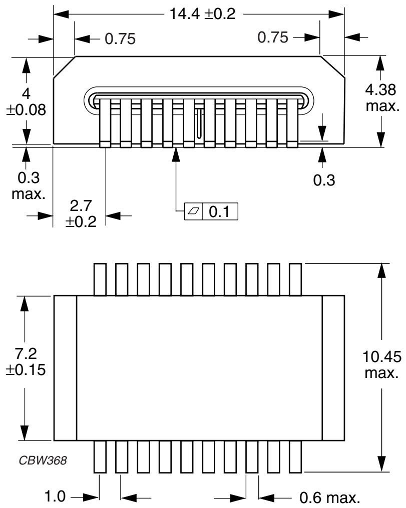
SYMBOL	PARAMETER	VALUE	UNIT
Σ(l/A)	core factor (C1)	2.47	mm^{-1}
V_e	effective volume	338	mm^3
l_e	effective length	28.9	mm
A_e	effective area	11.7	mm^2
m	mass of core half	≈1.85	g

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Partial air gap to resist saturation.
- Number of turns can be adpated by track layout.

APPLICATIONS

- Power inductor
- Output choke
- EMI choke with bias current.



Dimensions in mm.

Fig.1 IIC10P-14/4 outline.

IICs with partial air gap for use as power inductors

GRADE	L (μH) FOR 10 TURNS NO BIAS CURRENT			L (μH) FOR 10 TURNS WITH A BIAS CURRENT OF 1 A			TYPE NUMBER
	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	
3C30 des	92 ±25%	–	–	≥5	–	–	IIC10P-14/4-3C30
3F4 des	–	–	45 ±25%	–	–	≥5	IIC10P-14/4-3F4
3F35 des	–	70 ±25%	–	–	≥5	–	IIC10P-14/4-3F35

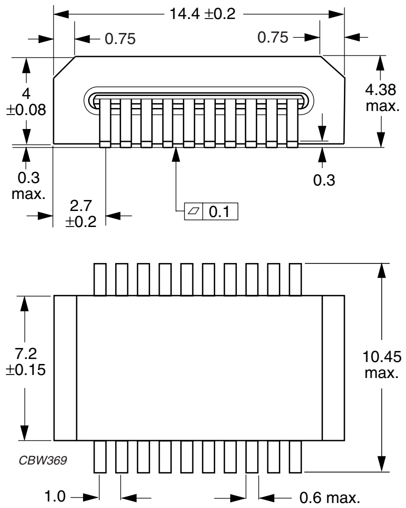
IICs with partial air gap under power conditions

GRADE	CORE LOSS (mW) at			TYPE NUMBER
	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	
3C30	≤30	–	–	IIC10P-14/4-3C30
3F4	–	–	≤70	IIC10P-14/4-3F4
3F35	–	≤40	–	IIC10P-14/4-3F35

IIC10-14/4

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.47	mm^{-1}
V_e	effective volume	338	mm^3
l_e	effective length	28.9	mm
A_e	effective area	11.7	mm^2
m	mass of core half	≈1.85	g



Dimensions in mm.

Fig.2 IIC10-14/4 outline.

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Several magnetic functions, depending on track layout.

APPLICATIONS

- Common-mode choke
- Mutli-line choke
- Power transformers
- Signal transformers
- Saturable inductor.

IICs for use as transformer or common-mode chokes

GRADE	A_L (nH) at			CORE LOSS (mW) at		TYPE NUMBER
	f = 10 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	
3F4 des	–	–	450 ±25%	–	≤70	IIC10-14/4-3F4
3E6 des	6000 ±30%	–	–	–	–	IIC10-14/4-3E6
3F35 des	–	700 ±25%	–	≤40	–	IIC10-14/4-3F35

IIC for use as a common-mode choke or multi-line choke

GRADE	$\lvert Z_{typ}\rvert$ Ω for 1 turn at f = 100 MHz; T = 25 °C(1)	TYPE NUMBER
3S4 des	≈35	IIC10-14/4-3S4

Note

1. Minimum value, $\lvert Z\rvert_{min}$ is –20%.

IIC with rectangular hysteresis loop for use in magnetic regulators

GRADE	E·t product (V.μs) at		TYPE NUMBER
	f = 100 kHz; H = 800 A/m; T = 100 °C; I_{reset} = 70 mA; 10 turns	f = 100 kHz; H = 800 A/m; T = 100 °C; I_{reset} = 0 mA; 10 turns	
3R1 des	≥33	≤12	IIC10-14/4-3R1

GENERAL DATA

ITEM	SPECIFICATION
Leadframe material	copper (Cu), tin-lead (SnPb) plated
Moulding material	liquid crystal polymer (LCP), flame retardant in accordance with *"ULV94-0"*
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-3"* and *"EIA 481-1"*

R_{dc}

≈65 mΩ (25 °C) and ≈85 mΩ (100 °C) for 10 turns including 20 solder joints (assuming 70 µm Cu PCB tracks).

Isolation voltage

>500 V (DC) between leads and between leads and ferrite core.

Isolation resistance

>100 MΩ between leads.

Inter winding capacitance

2 windings of 5 turns:

unifilar ≈5 pF

bifilar ≈10 pF.

(depending on track layout; see Figs 1 and 2)

Leakage inductance

2 windings of 5 turns:

unifilar ≈1.8 µH

bifilar ≈0.2 µH.

Maximum continuous current (DC)

4 A (depending on copper track thickness on PCB).

Maximum peak current

10 A.

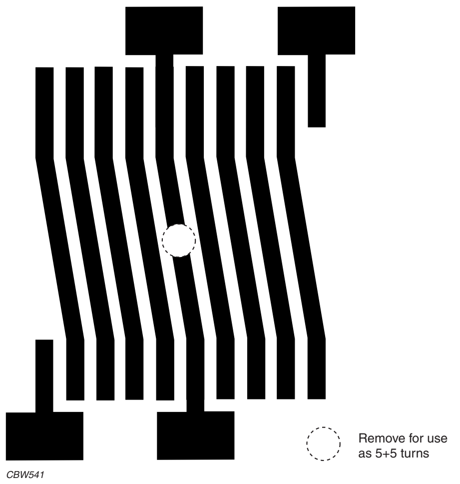


Fig.3 Unifilar track pattern.

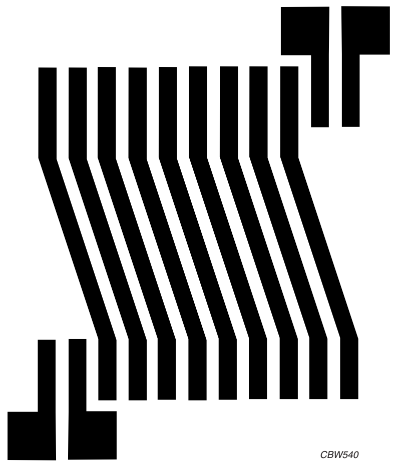


Fig.4 Bifilar track pattern.

MOUNTING

Soldering information

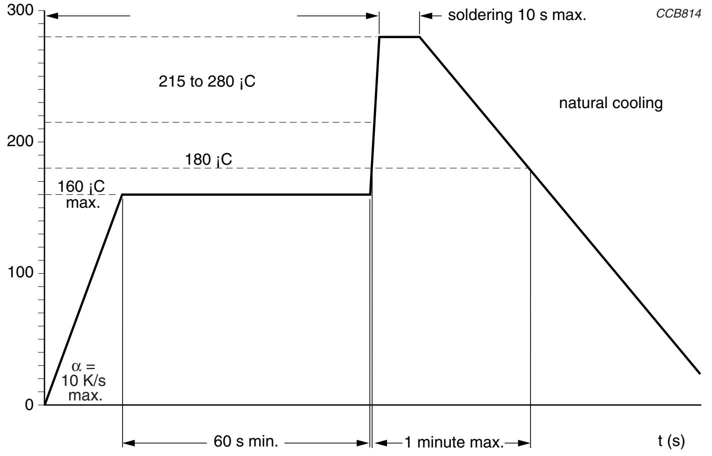


Fig.5 Recommended temperature profile for reflow soldering.

RECOMMENDED SOLDER LANDS

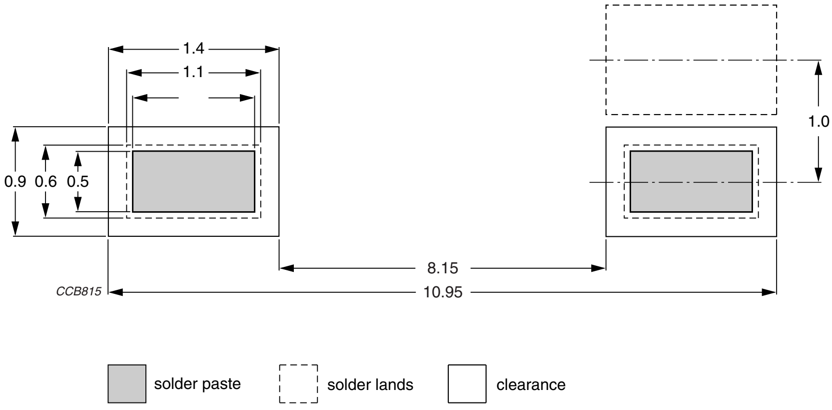


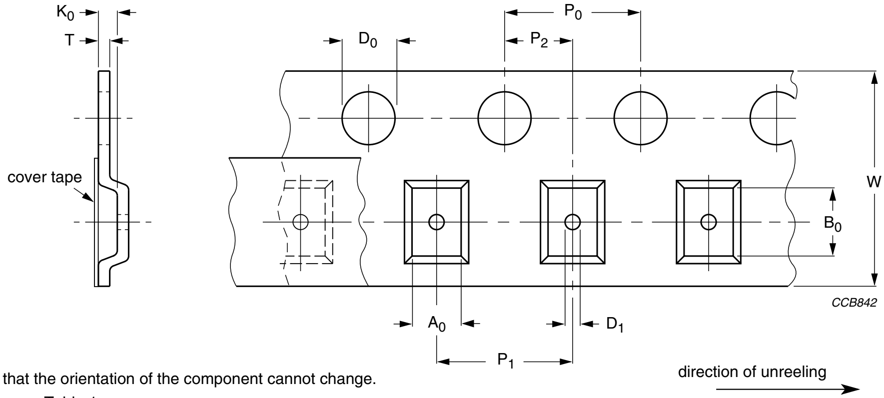
Fig.6 Recommended solder lands

PACKAGING

Tape and reel specifications

All tape and reel specifications are in accordance with the second edition of *"IEC 60286-3"*. Basic dimensions are given in Figs 7 and 8, and Table 1.

Blister tape



K_0: chosen so that the orientation of the component cannot change.
For dimensions see Table 1.

Fig.7 Blister tape.

Table 1 Dimensions of blister tape; see Fig.7

SYMBOL	DIMENSIONS	TOL.	UNIT
A_0	10.6	±0.1	mm
B_0	14.75	±0.1	mm
K_0	4.75	±0.1	mm
W	24	±0.3	mm
D_0	1.5	±0.1	mm
D_1	1.5	±0.25	mm
P_0; note 1	4	±0.1	mm
P_1	12	±0.1	mm
P_2	6	±0.1	mm
T	0.3	±0.1	mm

Note

1. P_0 pitch tolerance over any 10 pitches is ±0.2 mm.

Reel specifications

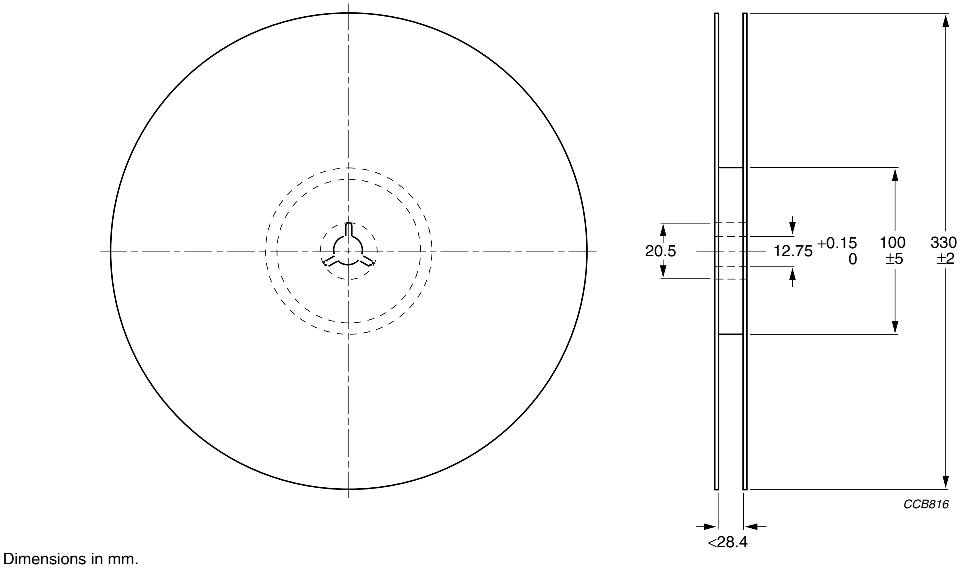
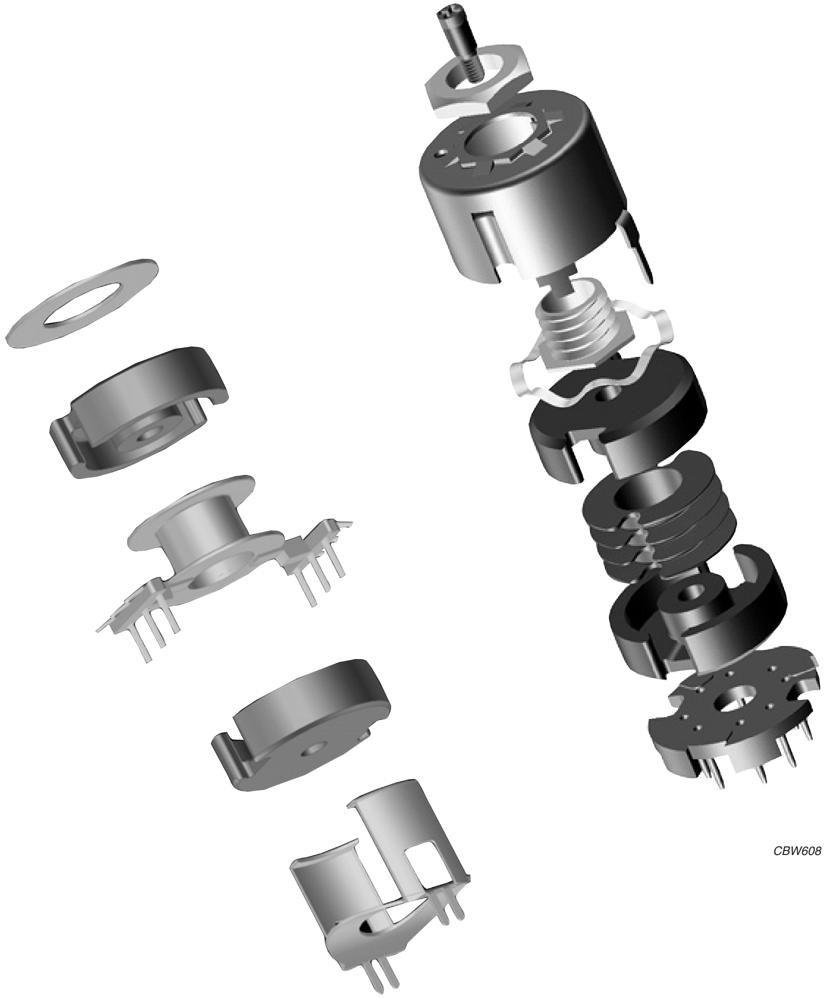


Fig.8 Reel.

Storage requirements

These storage requirements should be observed in order to ensure the soldering of the exposed electrode:

- Maximum ambient temperature shall not exceed 40 °C. Storage temperature higher than 40 °C could result in the deformation of packaging materials.
- Maximum relative humidity recommended for storage is 70% RH. High humidity with high temperature can accelerate the oxidation of the tin-lead plating on the termination and reduce the solderability of the components.
- Products shall not be stored in environments with the presence of harmful gases containing sulfur or chlorine.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview P cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
P9/5	126	10.1	0.8
P11/7	251	16.2	1.8
P11/7/I	309	19.0	1.9
P14/8	495	25.1	3.2
P14/18/I	628	29.9	3.5
P18/11	1120	43.3	6.0
P18/11/I	1270	47.5	7
P22/13	2000	63.4	12
P22/13/I	2460	73.4	13
P26/16	3530	93.9	20
P26/16/I	4370	110	21
P30/19	6190	137	34
P36/22	10700	202	54
P42/29	18200	265	104
P66/56	88200	717	550

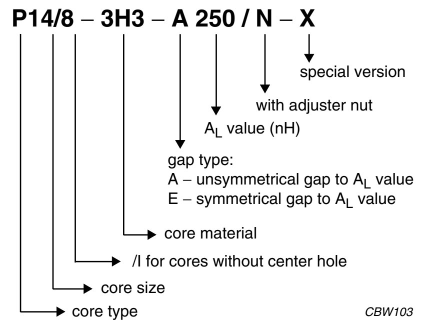


Fig.1 Type number structure for cores.

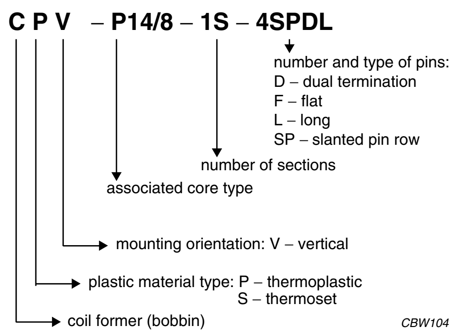


Fig.2 Type number structure for coil formers.

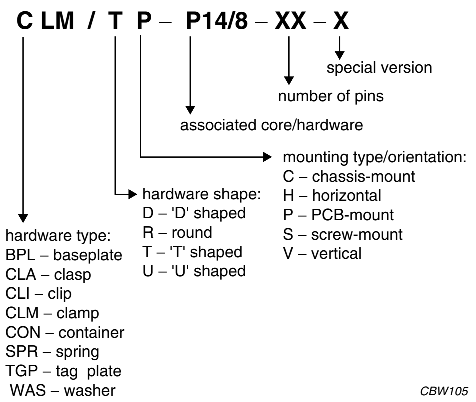


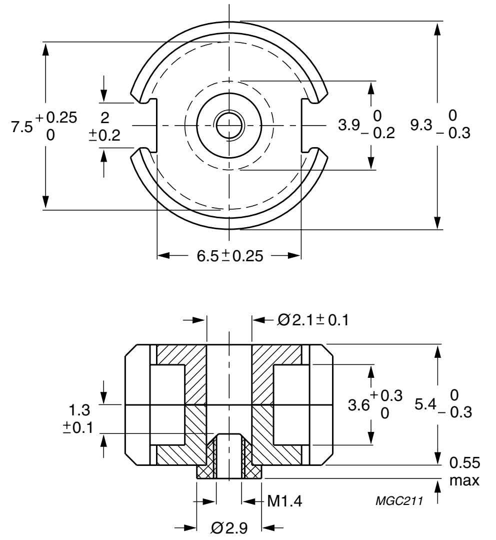
Fig.3 Type number structure for hardware.

P cores and accessories P9/5

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.24	mm^{-1}
V_e	effective volume	126	mm^3
l_e	effective length	12.5	mm
A_e	effective area	10.1	mm^2
A_{min}	minimum area	7.9	mm^2
m	mass of set	≈ 0.8	g



Dimensions in mm.

Fig.1 P9/5 core set.

Core sets for filter applications

Clamping force for A_L measurements, 25 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈ 39	≈ 410	P9/5-3D3-E40/N	P9/5-3D3-E40
	63 ±3%	≈ 62	≈ 230	P9/5-3D3-A63/N	P9/5-3D3-A63
	630 ±25%	≈ 620	≈ 0	−	P9/5-3D3
3H3 sup	40 ±3%	≈ 39	≈ 430	P9/5-3H3-E40/N	P9/5-3H3-E40
	63 ±3%	≈ 62	≈ 250	P9/5-3H3-A63/N	P9/5-3H3-A63
	1100 ±25%	≈ 1080	≈ 0	−	P9/5-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	1350 ±25%	≈ 1200	≈ 0	P9/5-3C81
3C91 prot	1350 ±25%	≈ 1200	≈ 0	P9/5-3C91
3F3	1100 ±25%	≈ 1080	≈ 0	P9/5-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 25 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	2300 ±25%	≈ 2020	≈ 0	P9/5-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.035	–	–	–
3C91	≥315	–	≤ 0.008(1)	≤ 0.06(1)	–
3F3	≥315	–	≤ 0.015	–	≤ 0.03

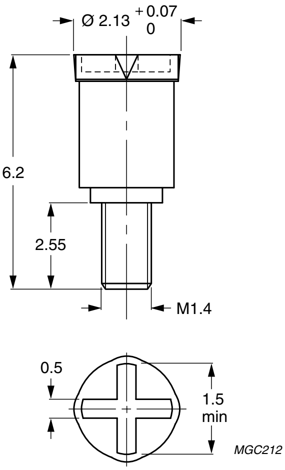
Note

1. Measured at 60 °C.

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 (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1)
3D3	40	–	–	ADJ-P9/P11-YELLOW	11	–	–
	63	–	–	–	18	ADJ-P9/P11-BROWN	31

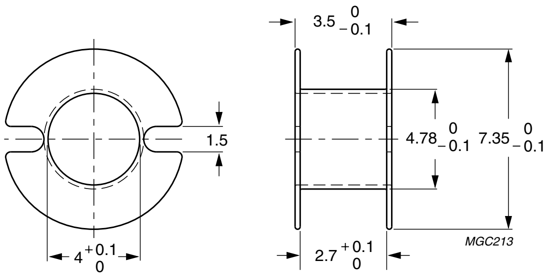
Note

1. Maximum adjustment range.

COIL FORMERS

General data for coil former CP-P9/5-1S

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



Dimensions in mm.

Fig.3 Coil former: CP-P9/5-1S.

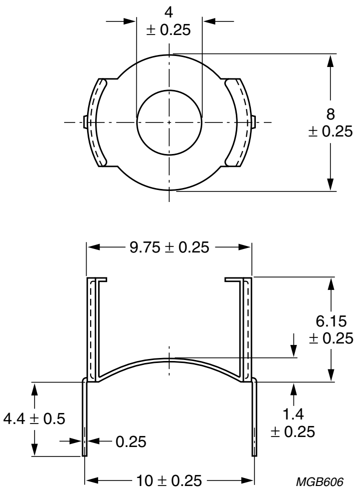
Winding data for coil former CP-P9/5-1S

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.1	2.5	18.9	CP-P9/5-1S

MOUNTING PARTS

General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	spring steel, tin plated	4	CLM/TP-P9/5



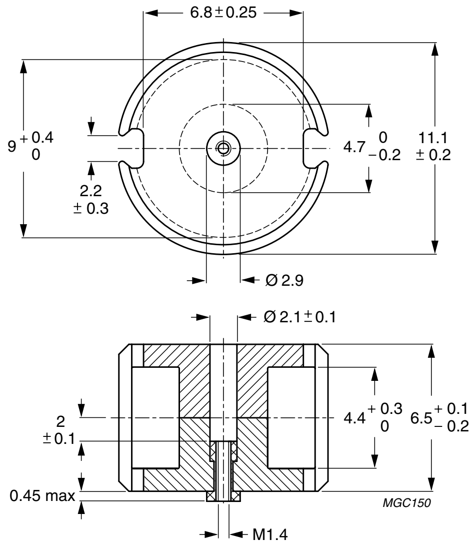
Dimensions in mm.

Fig.4 Clamp: CLM/TP-P9/5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.956	mm^{-1}
V_e	effective volume	251	mm^3
l_e	effective length	15.5	mm
A_e	effective area	16.2	mm^2
A_{min}	minimum area	13.2	mm^2
m	mass of set	≈ 1.8	g



Dimensions in mm.

Fig.1 P11/7 core set.

Core sets for filter applications

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	16 ±3%	≈ 12	≈ 2210	P11/7-3D3-E16/N	P11/7-3D3-E16
	25 ±3%	≈ 19	≈ 1280	P11/7-3D3-E25/N	P11/7-3D3-E25
	40 ±3%	≈ 31	≈ 710	P11/7-3D3-E40/N	P11/7-3D3-E40
	63 ±3%	≈ 48	≈ 400	P11/7-3D3-E63/N	P11/7-3D3-E63
	100 ±3%	≈ 76	≈ 220	P11/7-3D3-A100/N	P11/7-3D3-A100
	800 ±25%	≈ 610	≈ 0	–	P11/7-3D3
3H3 sup	160 ±3%	≈ 122	≈ 140	P11/7-3H3-A160/N	P11/7-3H3-A160
	250 ±3%	≈ 190	≈ 80	P11/7-3H3-A250/N	P11/7-3H3-A250
	1650 ±25%	≈ 1260	≈ 0	–	P11/7-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 76	≈ 240	P11/7-3C81-A100
	160 ±3%	≈ 122	≈ 140	P11/7-3C81-A160
	250 ±3%	≈ 190	≈ 85	P11/7-3C81-A250
	2050 ±25%	≈ 1560	≈ 0	P11/7-3C81

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C91 prot	2050 ±25%	≈ 1560	≈ 0	P11/7-3C91
3F3	100 ±3%	≈ 76	≈ 240	P11/7-3F3-A100
	160 ±3%	≈ 122	≈ 140	P11/7-3F3-A160
	250 ±5%	≈ 190	≈ 80	P11/7-3F3-A250
	1650 ±25%	≈ 1260	≈ 0	P11/7-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 35 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	3400 ±25%	≈ 2600	≈ 0	P11/7-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.05	–	–	–
3C91	≥315	–	≤ 0.015(1)	≤ 0.12(1)	–
3F3	≥315	–	≤ 0.03	–	≤ 0.05

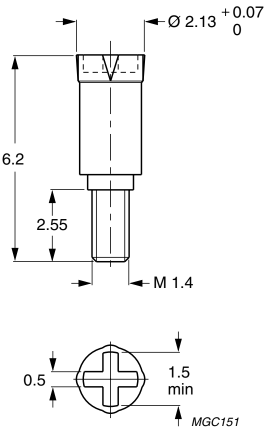
Note

1. Measured at 60 °C.

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P11/7 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L$ (1)	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L$ (1)	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L$ (1)
3H3	100	–	–	ADJ-P9/P11-YELLOW	13	ADJ-P9/P11-BROWN	24
	160	ADJ-P9/P11-YELLOW	8	ADJ-P9/P11-BROWN	15	ADJ-P9/P11-GREY	22
	250	ADJ-P9/P11-BROWN	9	ADJ-P9/P11-GREY	14	–	–
3D3	16	–	–	ADJ-P9/P11-YELLOW	19	–	–
	25	–	–	–	–	ADJ-P9/P11-YELLOW	30
	40	–	–	–	–	ADJ-P9/P11-YELLOW	24
	63	–	–	ADJ-P9/P11-YELLOW	18	–	–
	100	–	–	ADJ-P9/P11-YELLOW	11	–	–

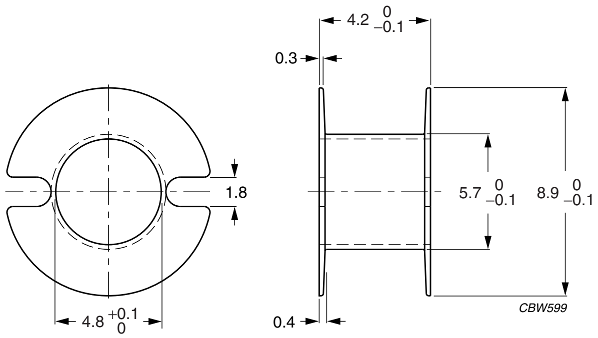
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P11/7-1S coil former

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



Dimensions in mm.

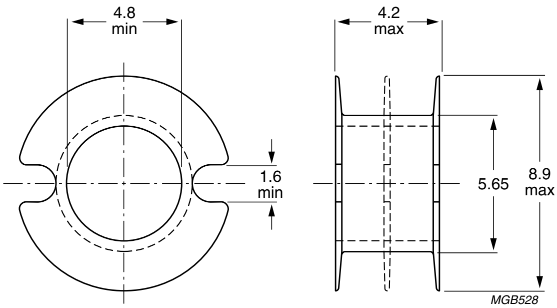
Fig.3 Coil former: CP-P11/7-1S.

Winding data for CP-P11/7-1S coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.8	3.1	22.6	CP-P11/7-1S

General data for CP-P11/7-A coil former

PARAMETER	SPECIFICATION
Coil former material	acetal (POM), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E66288(R)
Maximum operating temperature	105 °C



Dimensions in mm.

Fig.4 Coil former: CP-P11/7-A.

Winding data for CP-P11/7-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 2.00	2 × 1.52	22.7	CP-P11/7-2S-A
3	3 × 1.16	3 × 0.91	22.7	CP-P11/7-3S-A[1]

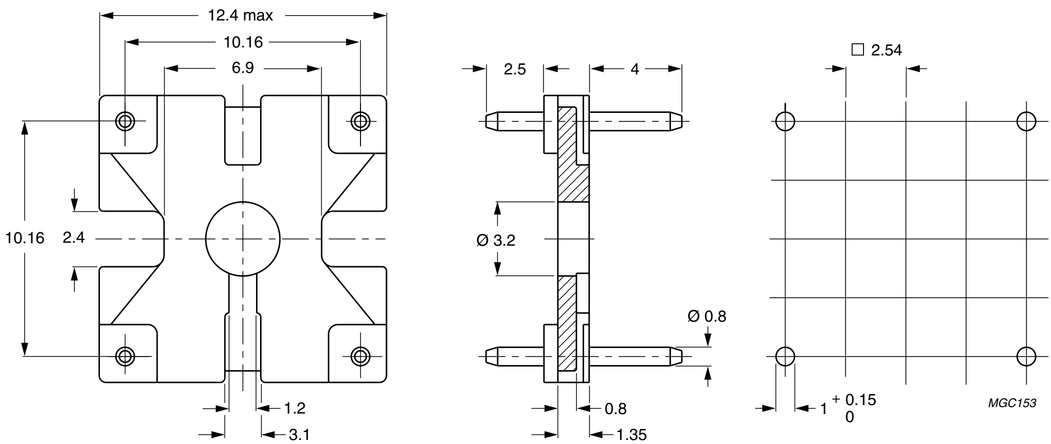
Note

1. UL file number E93370(M).

MOUNTING PARTS

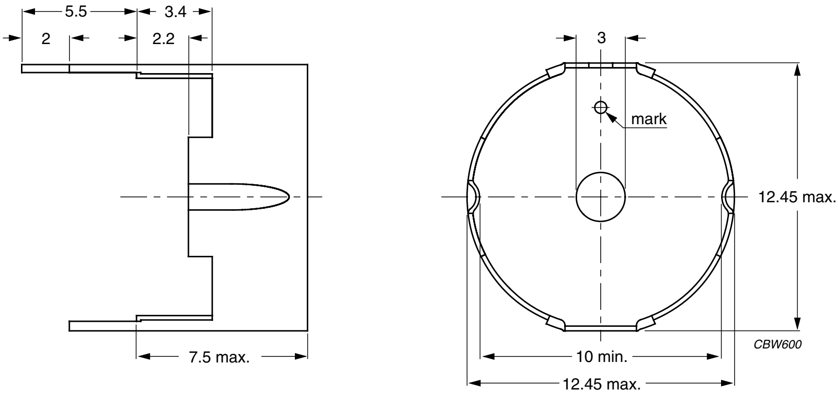
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P11/7-4P
	flame retardant: in accordance with *"UL 94V-0"*; file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P11/7
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P11/7
	spring force: ≈35 N when mounted		
Clamp	spring steel, tin-plated	8	CLM/TP-P11/7



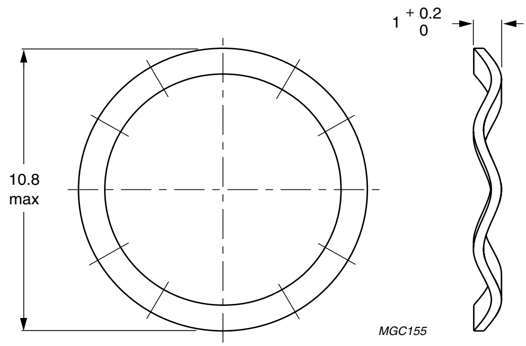
Dimensions in mm.

Fig.5 P11/7 tag plate.



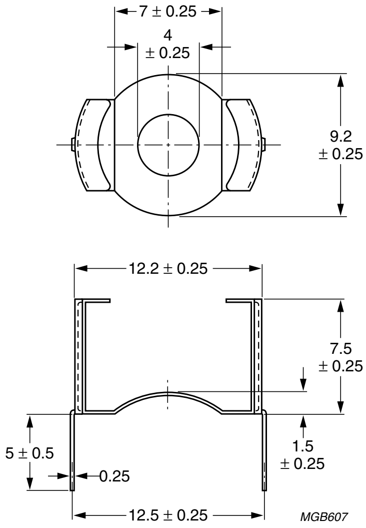
Dimensions in mm.

Fig.6 Container: CON-P11/7.



Dimensions in mm.

Fig.7 Spring: SPR-P11/7.



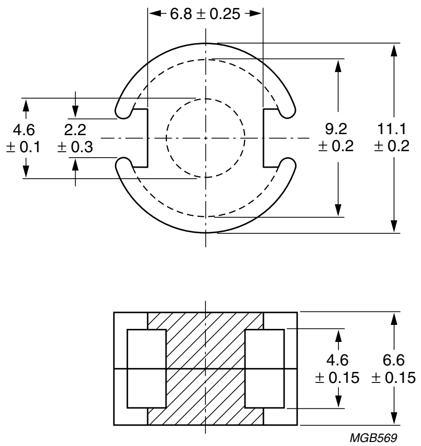
Dimensions in mm.

Fig.8 Clamp: CLM/TP-P11/7.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.860	mm^{-1}
V_e	effective volume	309	mm^3
I_e	effective length	16.3	mm
A_e	effective area	19.0	mm^2
A_{min}	minimum area	13.7	mm^2
m	mass of set	≈ 1.9	g



Dimensions in mm.

Fig.1 P11/7/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	63 ±3%	≈ 43	≈ 500	P11/7/I-3C81-A63
	100 ±3%	≈ 68	≈ 290	P11/7/I-3C81-A100
	160 ±3%	≈ 109	≈ 170	P11/7/I-3C81-A160
	250 ±5%	≈ 171	≈ 100	P11/7/I-3C81-A250
	315 ±5%	≈ 215	≈ 75	P11/7/I-3C81-A315
	2100 ±25%	≈ 1430	≈ 0	P11/7/I-3C81
3C91 prot	2100 ±25%	≈ 1430	≈ 0	P11/7/I-3C91
3F3	63 ±3%	≈ 43	≈ 500	P11/7/I-3F3-A63
	100 ±3%	≈ 68	≈ 290	P11/7/I-3F3-A100
	160 ±3%	≈ 109	≈ 170	P11/7/I-3F3-A160
	250 ±5%	≈ 171	≈ 100	P11/7/I-3F3-A250
	315 ±5%	≈ 215	≈ 75	P11/7/I-3F3-A315
	1750 ±25%	≈ 1195	≈ 0	P11/7/I-3F3

P cores and accessories

P11/7/I

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤ 0.07	–	–	–
3C91	≥315	–	≤ 0.016(1)	≤ 0.12(1)	–
3F3	≥315	–	≤ 0.04	–	≤ 0.06

Note

1. Measured at 60 °C.

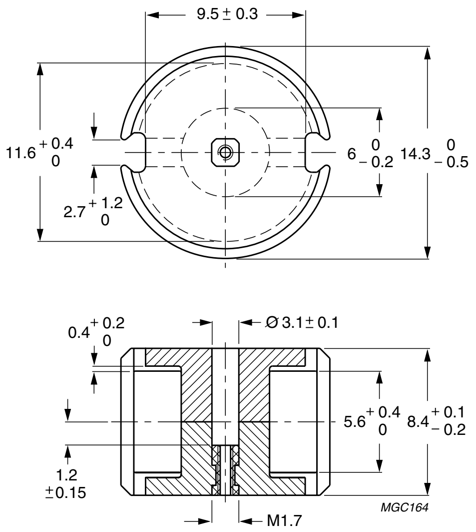
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"P11/7"*.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P14/8 core set.

Core sets for filter applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈ 25	≈ 1170	P14/8-3D3-E40/N	P14/8-3D3-E40
	63 ±3%	≈ 40	≈ 650	P14/8-3D3-E63/N	P14/8-3D3-E63
	100 ±3%	≈ 63	≈ 360	P14/8-3D3-E100/N	P14/8-3D3-E100
	1000 ±25%	≈ 630	≈ 0	−	P14/8-3D3
3H3 sup	160 ±3%	≈ 100	≈ 220	P14/8-3H3-A160/N	P14/8-3H3-A160
	250 ±3%	≈ 157	≈ 130	P14/8-3H3-A250/N	P14/8-3H3-A250
	315 ±3%	≈ 198	≈ 100	P14/8-3H3-A315/N	P14/8-3H3-A315
	400 ±3%	≈ 251	≈ 75	P14/8-3H3-A400/N	P14/8-3H3-A400
	2150 ±25%	≈ 1350	≈ 0	−	P14/8-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈ 40	≈ 680	P14/8-3C81-E63
	100 ±3%	≈ 63	≈ 390	P14/8-3C81-A100
	160 ±3%	≈ 100	≈ 220	P14/8-3C81-A160
	250 ±3%	≈ 157	≈ 130	P14/8-3C81-A250
	315 ±3%	≈ 198	≈ 100	P14/8-3C81-A315
	2800 ±25%	≈ 1760	≈ 0	P14/8-3C81
3C91 prot	2800 ±25%	≈ 1760	≈ 0	P14/8-3C91
3F3	63 ±3%	≈ 40	≈ 680	P14/8-3F3-E63
	100 ±3%	≈ 63	≈ 390	P14/8-3F3-A100
	160 ±3%	≈ 100	≈ 220	P14/8-3F3-A160
	250 ±3%	≈ 157	≈ 130	P14/8-3F3-A250
	315 ±3%	≈ 198	≈ 100	P14/8-3F3-A315
	2000 ±25%	≈ 1260	≈ 0	P14/8-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	5750 ±25%	≈ 3610	≈ 0	P14/8-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.1	–	–	–
3C91	≥315	–	≤ 0.03(1)	≤ 0.22(1)	–
3F3	≥315	–	≤ 0.06	–	≤ 0.1

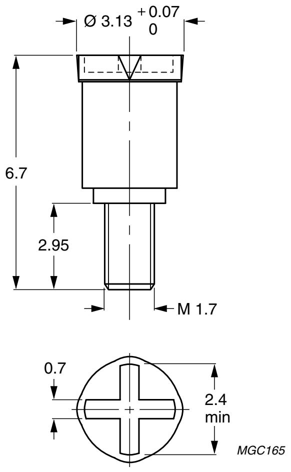
Note

1. Measured at 60 °C.

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P14/8 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L$(1)	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L$(1)	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L$(1)
3H3	100	–	–	ADJ-P14-ORANGE	14	–	–
	160	–	–	ADJ-P14-WHITE	17	ADJ-P14-BROWN	24
	250	ADJ-P14-WHITE	10	ADJ-P14-BROWN	15	–	–
	315	ADJ-P14-WHITE	8	–	–	–	–
	400	ADJ-P14-BROWN	9	–	–	–	–
	630	ADJ-P14-BROWN	4	–	–	–	–
3D3	40	–	–	–	–	ADJ-P14-ORANGE	24
	63	–	–	–	–	ADJ-P14-ORANGE	20
	100	ADJ-P14-ORANGE	11	–	–	–	–

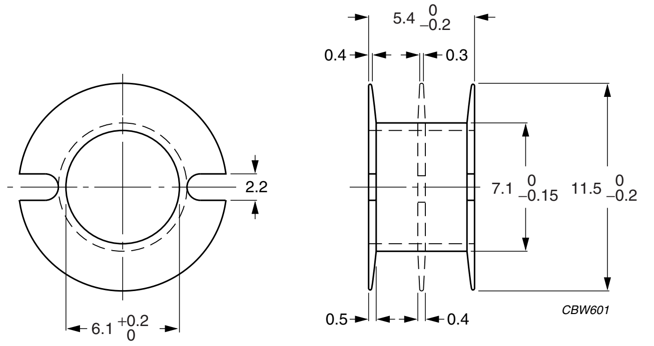
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P14/8 coil former

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



Dimensions in mm.

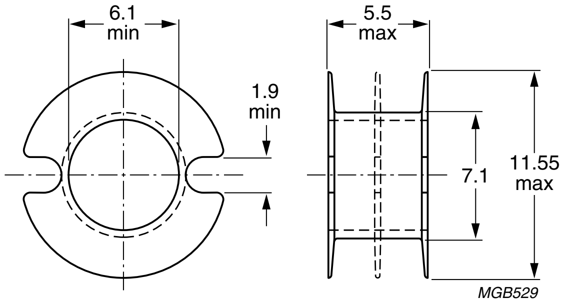
Fig.3 Coil former CP-P14/8.

Winding data for CP-P14/8 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8.8	4.1	28.9	CP-P14/8-1S
2	2 × 4.0	2 × 1.85	28.9	CP-P14/8-2S

General data for CP-P14/8-A coil former

PARAMETER	SPECIFICATION
Coil former material	acetal (POM), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E66288(R)
Maximum operating temperature	105 °C, *"IEC 60085"*, class F



Dimensions in mm.

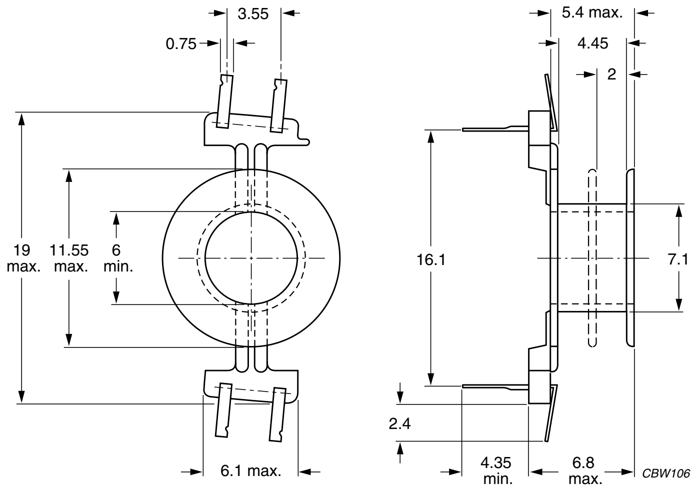
Fig.4 Coil former CP-P14/8-A.

Winding data for CP-P14/8-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
3	3 × 2.19	3 × 1.2	29.3	CP-P14/8-3S-A

General data 4-pins P14/8 coil former for PCB mounting

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



Dimensions in mm.

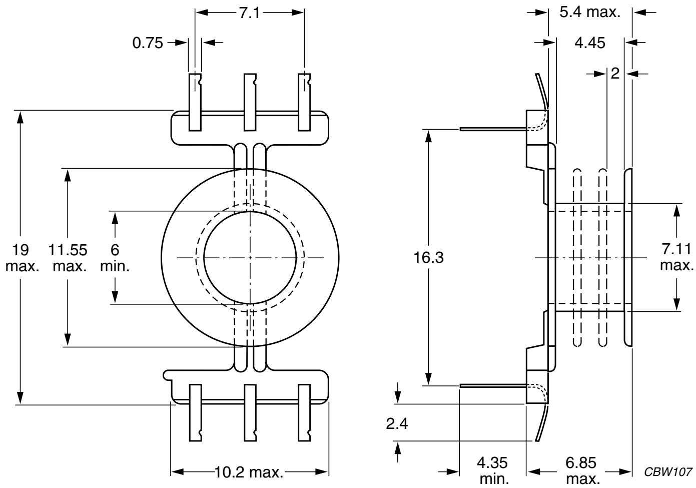
Fig.5 P14/8 coil former for PCB mounting; 4-pins.

Data for 4-pins P14/8 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	8.65	4.4	29.0	4.4	CPV-P14/8-1S-4SPD
1	8.65	4.4	29.0	6.8	CPV-P14/8-1S-4SPDL
2	2 × 3.87	2 × 2.0	29.0	4.4	CPV-P14/8-2S-4SPD
2	2 × 3.87	2 × 2.0	29.0	6.8	CPV-P14/8-2S-4SPDL

General data 6-pins P14/8 coil former for PCB mounting

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



Dimensions in mm.

Fig.6 P14/8 coil former for PCB mounting; 6-pins.

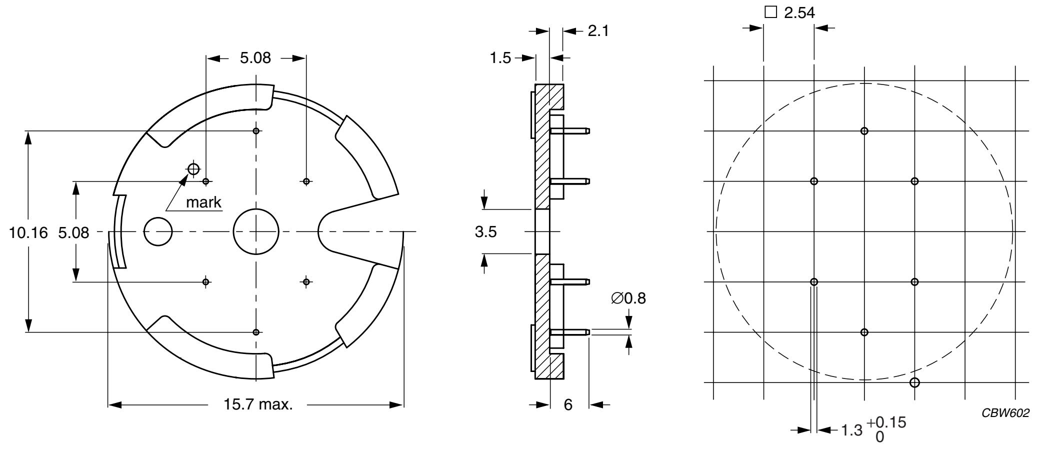
Data for 6-pins P14/8 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	8.65	4.4	29.0	4.4	CPV-P14/8-1S-6PD
1	8.65	4.4	29.0	6.8	CPV-P14/8-1S-6PDL
2	2 × 3.87	2 × 2.0	29.0	4.4	CPV-P14/8-2S-6PD
2	2 × 3.87	2 × 2.0	29.0	6.8	CPV-P14/8-2S-6PDL

MOUNTING PARTS

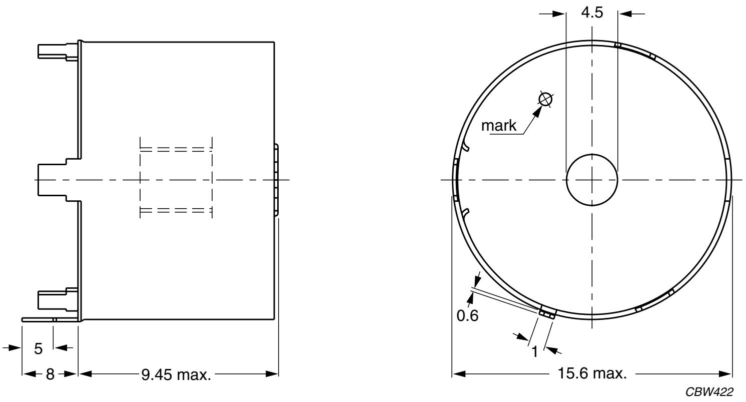
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	7	TGP-P14/8-6P
	flame retardant: in accordance with *“UL 94V-0”*; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, *“IEC 60085”*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *“IEC 60068-2-20”*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *“IEC 60068-2-20”*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	8	CON-P14/8
	earth pins: presoldered		
Spring	CrNi-steel	9	SPR-P14/8
	spring force: ≈60 N when mounted		
Clamp	spring steel, tin-plated	10	CLM/TP-P14/8
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TP-P14/8



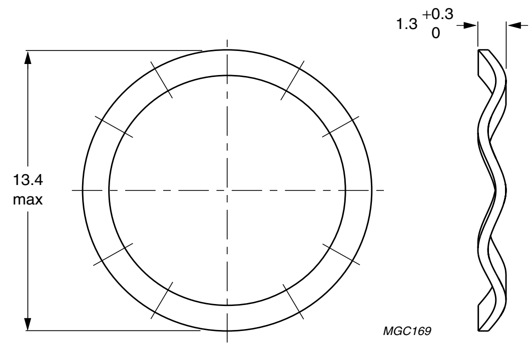
Dimensions in mm.

Fig.7 Tag plate: TGP-P14/8.



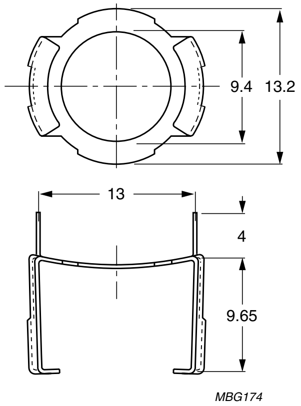
Dimensions in mm.

Fig.8 Container: CON-P14/8.



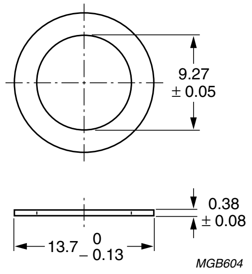
Dimensions in mm.

Fig.9 Spring: SPR-P14/8.



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P14/8.



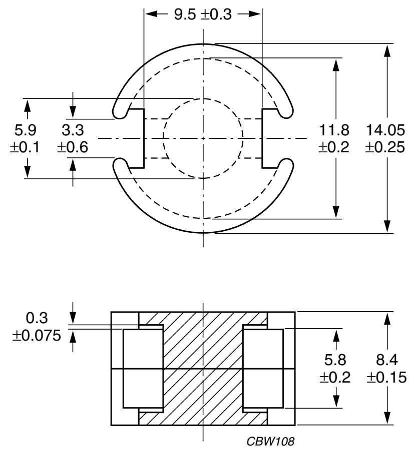
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TP-P14/8.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.700	mm^{-1}
V_e	effective volume	628	mm^3
l_e	effective length	21.0	mm
A_e	effective area	29.9	mm^2
A_{min}	minimum area	23.6	mm^2
m	mass of set	≈ 3.5	g



Dimensions in mm.

Fig.1 P14/8/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 56	≈ 470	P14/8/I-3C81-A100
	160 ±3%	≈ 89	≈ 270	P14/8/I-3C81-A160
	250 ±3%	≈ 140	≈ 160	P14/8/I-3C81-A250
	315 ±5%	≈ 176	≈ 120	P14/8/I-3C81-A315
	400 ±5%	≈ 224	≈ 95	P14/8/I-3C81-A400
	2900 ±25%	≈ 1620	≈ 0	P14/8/I-3C81
3C91 prot	2900 ±25%	≈ 1620	≈ 0	P14/8/I-3C91
3F3	100 ±3%	≈ 56	≈ 470	P14/8/I-3F3-A100
	160 ±3%	≈ 89	≈ 270	P14/8/I-3F3-A160
	250 ±3%	≈ 140	≈ 160	P14/8/I-3F3-A250
	315 ±5%	≈ 176	≈ 120	P14/8/I-3F3-A315
	400 ±5%	≈ 224	≈ 95	P14/8/I-3F3-A400
	2400 ±25%	≈ 1340	≈ 0	P14/8/I-3F3

P cores and accessories P14/8/I

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.15	–	–	–
3C91	≥315	–	≤ 0.032[1]	≤ 0.24[1]	–
3F3	≥315	–	≤ 0.07	–	≤ 0.12

Note

1. Measured at 60 °C.

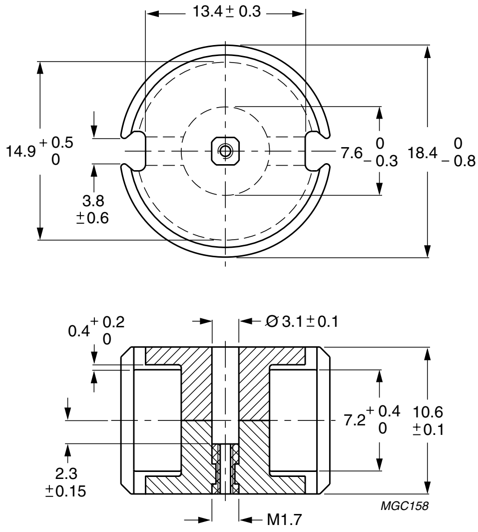
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"P14/8"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.597	mm^{-1}
V_e	effective volume	1120	mm^3
l_e	effective length	25.8	mm
A_e	effective area	43.3	mm^2
A_{min}	minimum area	36.0	mm^2
m	mass of set	≈6.0	g



Dimensions in mm.

Fig.1 P18/11 core set.

Core sets for filter applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	63 ±3%	≈ 30	≈ 1210	P18/11-3D3-E63/N	P18/11-3D3-E63
	100 ±3%	≈ 47	≈ 670	P18/11-3D3-E100/N	P18/11-3D3-E100
	160 ±3%	≈ 76	≈ 370	P18/11-3D3-E160/N	P18/11-3D3-E160
	1400 ±25%	≈ 665	≈ 0	−	P18/11-3D3
3H3 sup	160 ±3%	≈ 76	≈ 400	P18/11-3H3-E160/N	P18/11-3H3-E160
	250 ±3%	≈ 119	≈ 240	P18/11-3H3-A250/N	P18/11-3H3-A250
	315 ±3%	≈ 149	≈ 180	P18/11-3H3-A315/N	P18/11-3H3-A315
	400 ±3%	≈ 190	≈ 140	P18/11-3H3-A400/N	P18/11-3H3-A400
	630 ±5%	≈ 299	≈ 80	P18/11-3H3-A630/N	P18/11-3H3-A630
	3100 ±25%	≈ 1470	≈ 0	−	P18/11-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 47	≈ 710	P18/11-3C81-E100
	160 ±3%	≈ 76	≈ 400	P18/11-3C81-A160
	250 ±3%	≈ 119	≈ 240	P18/11-3C81-A250
	315 ±3%	≈ 149	≈ 180	P18/11-3C81-A315
	400 ±3%	≈ 190	≈ 140	P18/11-3C81-A400
	4000 ±25%	≈ 1900	≈ 0	P18/11-3C81
3C91 prot	4000 ±25%	≈ 1900	≈ 0	P18/11-3C91
3F3	100 ±3%	≈ 47	≈ 710	P18/11-3F3-E100
	160 ±3%	≈ 76	≈ 400	P18/11-3F3-A160
	250 ±3%	≈ 119	≈ 240	P18/11-3F3-A250
	315 ±3%	≈ 149	≈ 180	P18/11-3F3-A315
	400 ±3%	≈ 190	≈ 140	P18/11-3F3-A400
	2850 ±25%	≈ 1350	≈ 0	P18/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	7500 ±25%	≈ 3560	≈ 0	P18/11-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.26	–	–	–
3C91	≥315	–	≤ 0.07(1)	≤ 0.45(1)	–
3F3	≥315	–	≤ 0.13	–	≤ 0.22

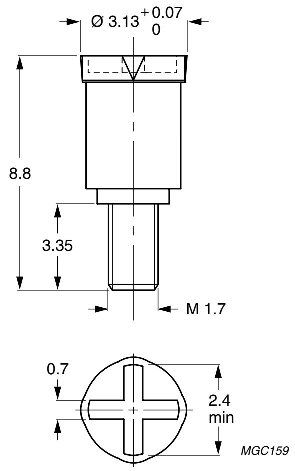
Note

1. Measured at 60 °C.

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 sup(applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L(1)	types for medium adjustment	ΔL/L(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L(1)
3H3	63	–	–	ADJ-P18-YELLOW	16	–	–
	100	–	–	–	–	ADJ-P18-BROWN	42
	160	ADJ-P18-YELLOW	9	ADJ-P18-RED	18	ADJ-P18-BROWN	28
	250	ADJ-P18-RED	11	ADJ-P18-WHITE	14	ADJ-P18-BROWN	18
	315	ADJ-P18-RED	8	ADJ-P18-BROWN	14	ADJ-P18-VIOLET	20
	400	ADJ-P18-WHITE	8	ADJ-P18-VIOLET	16	–	–
	630	ADJ-P18-VIOLET	8	–	–	–	–
	1000	ADJ-P18-VIOLET	5	–	–	–	–
	1250	–	–	–	–	–	–
3D3	40	–	–	–	–	ADJ-P18-YELLOW	19
	63	–	–	ADJ-P18-YELLOW	17	–	–
	100	–	–	–	–	ADJ-P18-RED	26
	160	–	–	ADJ-P18-RED	15	–	–

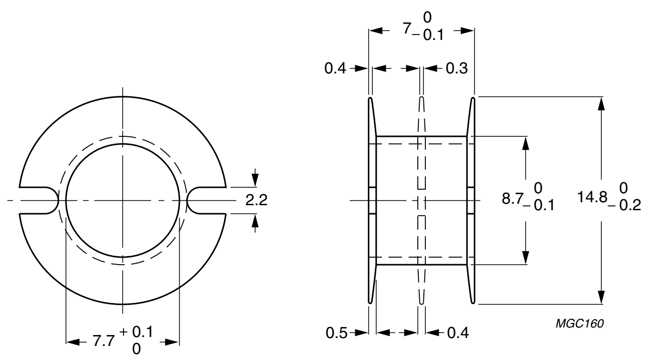
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P18/11

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



Dimensions in mm.

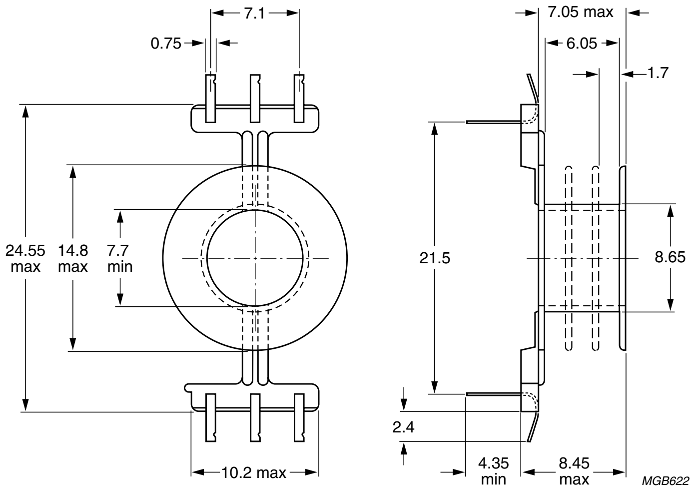
Fig.3 CP-P18/11 coil former.

Winding data for CP-P18/11 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	17.1	5.7	36.6	CP-P18/11-1S
2	2 × 7.95	2 × 2.65	36.6	CP-P18/11-2S
3	3 × 4.95	3 × 1.6	36.6	CP-P18/11-3S

General data 6-pins P18/11 coil former for PCB mounting

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



Dimensions in mm.

Fig.4 P18/11 coil former for PCB mounting; 6-pins.

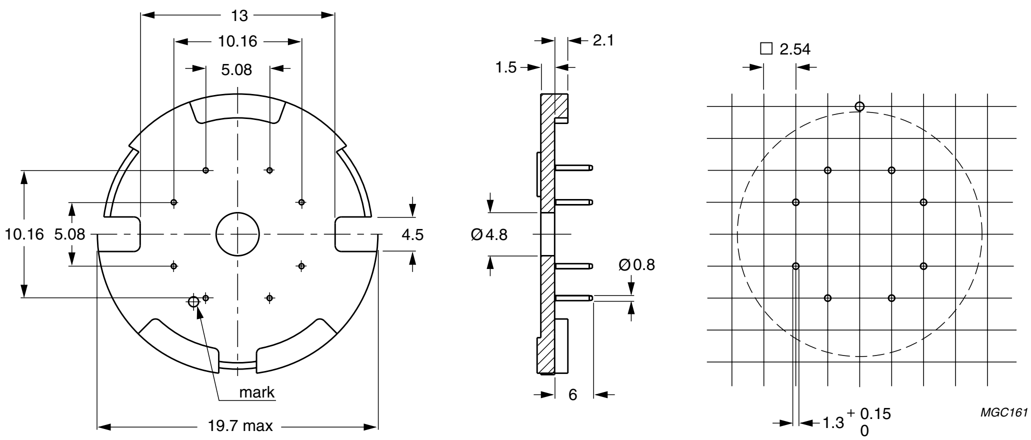
Data for 6-pins P18/11 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	16.8	6.0	36.7	4.4	CPV-P18/11-1S-6PD
1	16.8	6.0	36.7	6.8	CPV-P18/11-1S-6PDL
2	2 × 7.61	2 × 2.8	36.7	4.4	CPV-P18/11-2S-6PD
2	2 × 7.61	2 × 2.8	36.7	6.8	CPV-P18/11-2S-6PDL
3	3 × 4.58	3 × 1.7	36.7	4.4	CPV-P18/11-3S-6PD
3	3 × 4.58	3 × 1.7	36.7	6.8	CPV-P18/11-3S-6PDL

MOUNTING PARTS

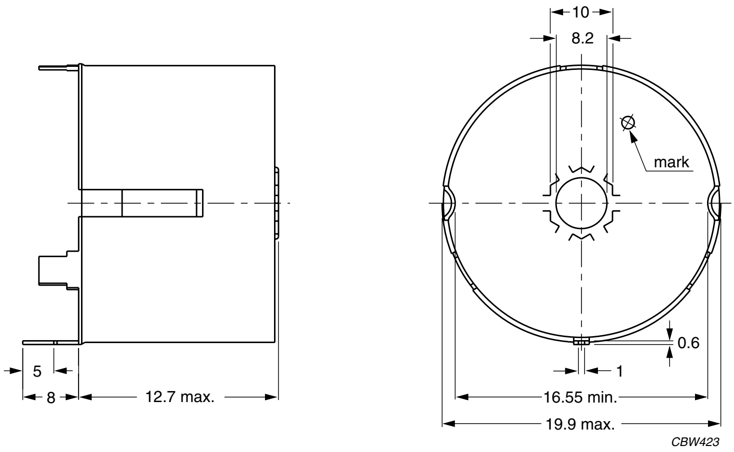
General data for mounting parts

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P18/11-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P18/11
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P18/11
	spring force: ≈100 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	nickel-plated copper-zinc alloy	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TP-P18/11
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TP-P18/11



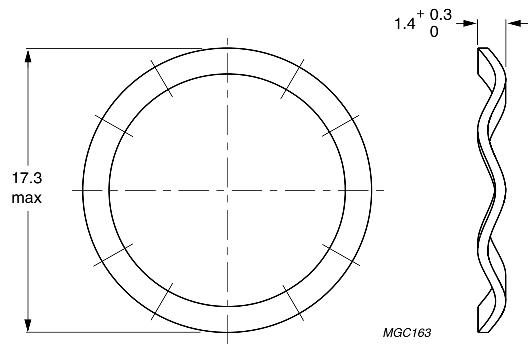
Dimensions in mm.

Fig.5 Tag plate: TGP-P18/11-8P.



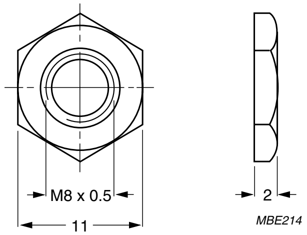
Dimensions in mm.

Fig.6 Container: CON-P18/11.



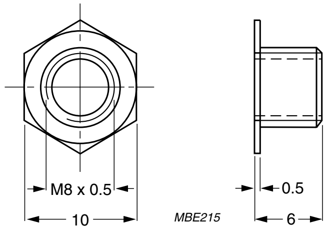
Dimensions in mm.

Fig.7 Spring: SPR-P18/11.



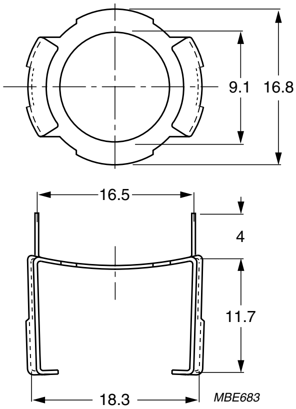
Dimensions in mm.

Fig.8 Fixing nut: NUT.



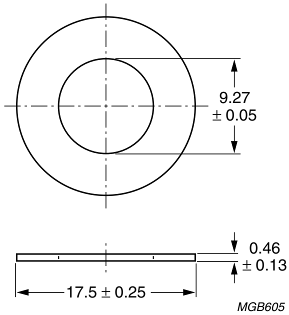
Dimensions in mm.

Fig.9 Fixing bush: FIB.



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P18/11.



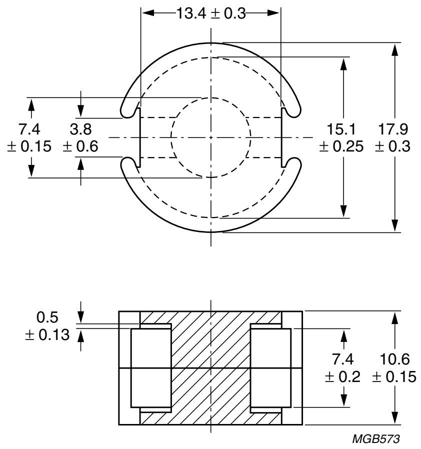
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TP-P18/11.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.560	mm^{-1}
V_e	effective volume	1270	mm^3
l_e	effective length	26.7	mm
A_e	effective area	47.5	mm^2
A_{min}	minimum area	37.5	mm^2
m	mass of set	≈ 7	g



Dimensions in mm.

Fig.1 P18/11/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 72	≈ 450	P18/11/I-3C81-A160
	250 ±3%	≈ 112	≈ 260	P18/11/I-3C81-A250
	315 ±3%	≈ 141	≈ 200	P18/11/I-3C81-A315
	400 ±3%	≈ 179	≈ 150	P18/11/I-3C81-A400
	630 ±5%	≈ 282	≈ 90	P18/11/I-3C81-A630
	4200 ±25%	≈ 1880	≈ 0	P18/11/I-3C81
3C91 prot	4200 ±25%	≈ 1880	≈ 0	P18/11/I-3C91
3F3	160 ±3%	≈ 72	≈ 450	P18/11/I-3F3-A160
	250 ±3%	≈ 112	≈ 260	P18/11/I-3F3-A250
	315 ±3%	≈ 141	≈ 200	P18/11/I-3F3-A315
	400 ±3%	≈ 179	≈ 150	P18/11/I-3F3-A400
	630 ±5%	≈ 282	≈ 90	P18/11/I-3F3-A630
	3110 ±25%	≈ 1390	≈ 0	P18/11/I-3F3

P cores and accessories P18/11/I

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	**f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C**	**f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C**	**f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C**
3C81	≥320	≤ 0.3	–	–	–
3C91	≥315	–	≤ 0.08(1)	≤ 0.5(1)	–
3F3	≥315	–	≤ 0.14	–	≤ 0.24

Note

1. Measured at 60 °C.

BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"P18/11"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.497	mm^{-1}
V_e	effective volume	2000	mm^3
l_e	effective length	31.5	mm
A_e	effective area	63.4	mm^2
A_{min}	minimum area	50.9	mm^2
m	mass of set	≈ 12	g

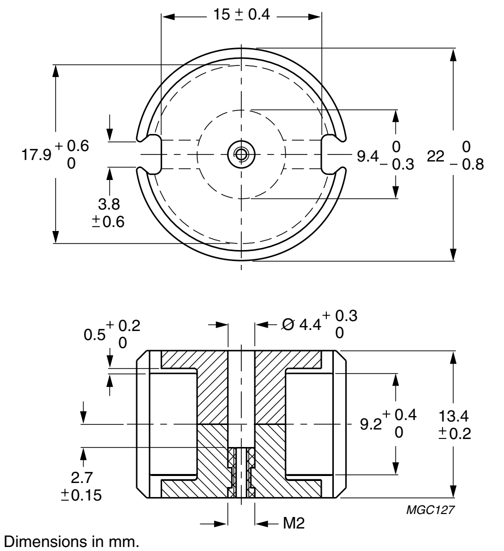


Fig.1 P22/13 core set.

Core sets for filter applications

Clamping force for A_L measurements, 140 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈ 16	≈ 3360	P22/13-3D3-E40/N	P22/13-3D3-E40
	63 ±3%	≈ 25	≈ 1890	P22/13-3D3-E63/N	P22/13-3D3-E63
	100 ±3%	≈ 40	≈ 1040	P22/13-3D3-E100/N	P22/13-3D3-E100
	160 ±3%	≈ 63	≈ 570	P22/13-3D3-E160/N	P22/13-3D3-E160
	1700 ±25%	≈ 670	≈ 0	−	P22/13-3D3
3H3 sup	160 ±3%	≈ 64	≈ 610	P22/13-3H3-E160/N	P22/13-3H3-E160
	250 ±3%	≈ 100	≈ 360	P22/13-3H3-E250/N	P22/13-3H3-E250
	315 ±3%	≈ 125	≈ 270	P22/13-3H3-E315/N	P22/13-3H3-E315
	400 ±3%	≈ 158	≈ 210	P22/13-3H3-A400/N	P22/13-3H3-A400
	630 ±3%	≈ 249	≈ 120	P22/13-3H3-A630/N	P22/13-3H3-A630
	3900 ±25%	≈ 1540	≈ 0	−	P22/13-3H3

P cores and accessories P22/13

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 140 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 63	≈ 610	P22/13-3C81-A160
	250 ±3%	≈ 99	≈ 360	P22/13-3C81-A250
	315 ±3%	≈ 125	≈ 280	P22/13-3C81-A315
	400 ±3%	≈ 158	≈ 210	P22/13-3C81-A400
	630 ±3%	≈ 249	≈ 120	P22/13-3C81-A630
	5200 ±25%	≈ 2060	≈ 0	P22/13-3C81
3C91 prot	5200 ±25%	≈ 2060	≈ 0	P22/13-3C91
3F3	160 ±3%	≈ 63	≈ 610	P22/13-3F3-A160
	250 ±3%	≈ 99	≈ 360	P22/13-3F3-A250
	315 ±3%	≈ 125	≈ 280	P22/13-3F3-A315
	400 ±3%	≈ 158	≈ 210	P22/13-3F3-A400
	630 ±3%	≈ 249	≈ 120	P22/13-3F3-A630
	3550 ±25%	≈ 1410	≈ 0	P22/13-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 140 ± 30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	9250 ±25%	≈ 3660	≈ 0	P22/13-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.46	–	–	–
3C91	≥315	–	≤ 0.12(1)	≤ 0.9(1)	–
3F3	≥315	–	≤ 0.22	–	≤ 0.4

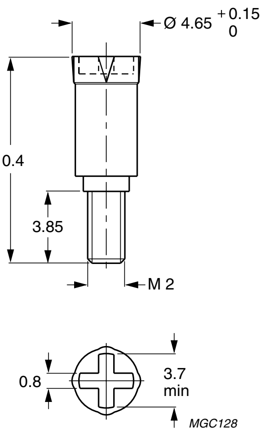
Note

1. Measured at 60 °C.

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P22/13 inductance adjuster.

Inductance adjuster selection chart sup(applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L (1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L (1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L (1)
3H3	100	–	–	ADJ-P22/RM8-RED	16	ADJ-P22/RM8-ORANGE	21
	160	ADJ-P22/RM8-RED	11	ADJ-P22/RM8-YELLOW	18	ADJ-P22/RM8-WHITE	27
	250	ADJ-P22/RM8-YELLOW	12	ADJ-P22/RM8-WHITE	18	–	–
	315	ADJ-P22/RM8-YELLOW	9	–	–	ADJ-P22/RM8-BROWN	22
	400	ADJ-P22/RM8-WHITE	11	ADJ-P22/RM8-BROWN	17	ADJ-P22/RM8-BLACK	30
	630	ADJ-P22/RM8-BROWN	10	ADJ-P22/RM8-BLACK	18	–	–
	1000	ADJ-P22/RM8-BROWN	6	ADJ-P22/RM8-BLACK	12	–	–
	1250	ADJ-P22/RM8-BROWN	4	ADJ-P22/RM8-BLACK	7	–	–
3D3	40	–	–	–	–	ADJ-P22/RM8-ORANGE	27
	63	–	–	–	–	ADJ-P22/RM8-ORANGE	26
	100	–	–	ADJ-P22/RM8RED	16	ADJ-P22/RM8-YELLOW	27
	160	ADJ-P22/RM8-RED	10	ADJ-P22/RM8-YELLOW	17	–	–
	250	ADJ-P22/RM8-YELLOW	–	–	–	–	–

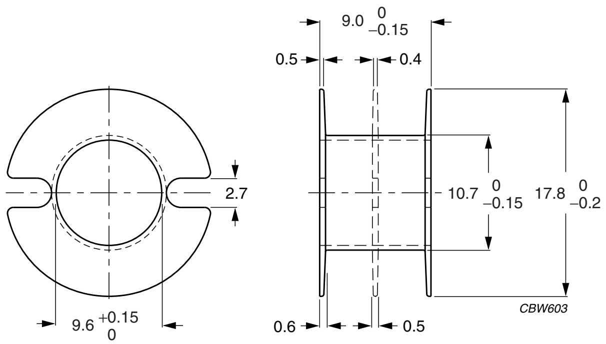
Note

1. Maximum adjustment range.

COIL FORMERS

General data CP-P22/13 coil former

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



Dimensions in mm.

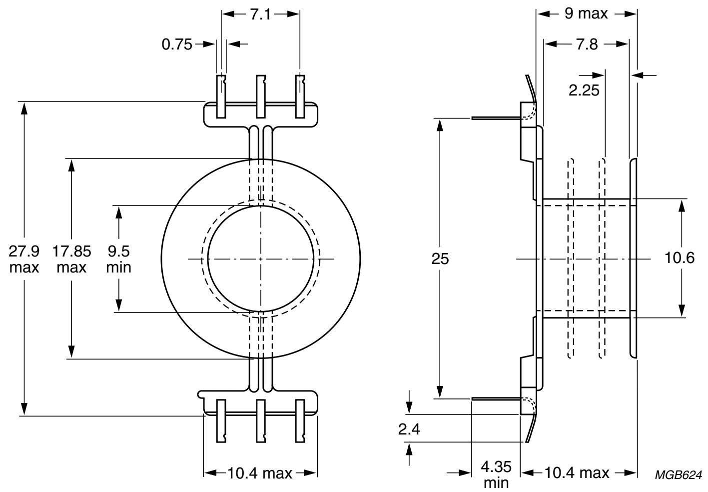
Fig.3 Coil former: CP-P22/13.

Winding data for CP-P22/13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	26.2	7.5	44.5	CP-P22/13-1S
2	2 × 12.2	2 × 3.45	44.5	CP-P22/13-2S
3	3 × 7.6	3 × 2.1	44.5	CP-P22/13-3S

General data 6-pins P22/13 coil former for PCB mounting

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



Dimensions in mm.

Fig.4 P22/13 coil former for PCB mounting; 6-pins.

Data for 6-pins P22/13 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	25.2	7.8	44.5	4.4	CPV-P22/13-1S-6PD
1	25.2	7.8	44.5	6.8	CPV-P22/13-1S-6PDL
2	2 × 11.7	2 × 3.6	44.5	4.4	CPV-P22/13-2S-6PD
2	2 × 11.7	2 × 3.6	44.5	6.8	CPV-P22/13-2S-6PDL
3	3 × 7.03	3 × 2.2	44.5	4.4	CPV-P22/13-3S-6PD(1)
3	3 × 7.03	3 × 2.2	44.5	6.8	CPV-P22/13-3S-6PDL(1)

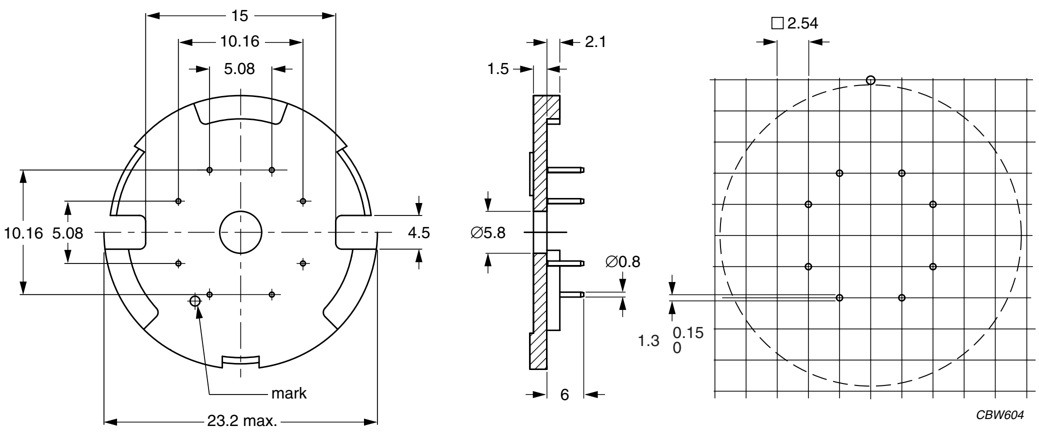
Note

1. In accordance with *"UL 94-HB"*.

MOUNTING PARTS

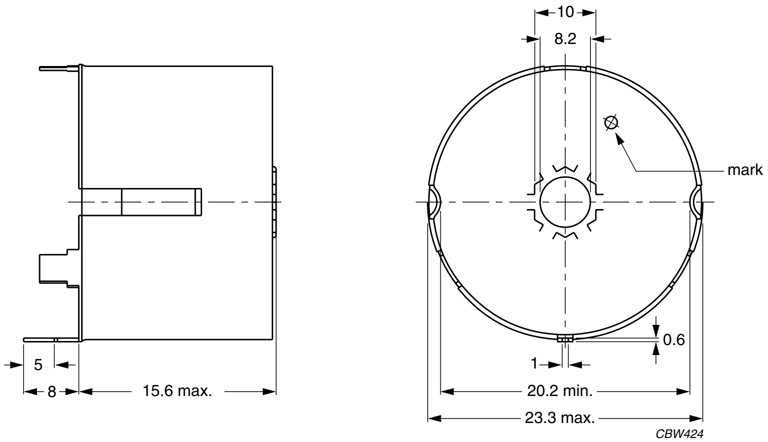
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P22/13-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	6	CON-P22/13
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P22/13
	spring force: ≈140 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TS-P22/13
Washer	phenolformaldehyde (PF)	11	WAS-CLM/TS-P22/13



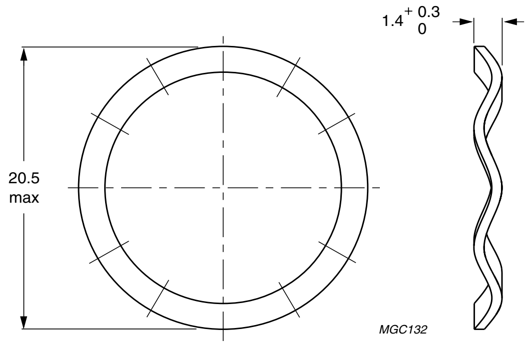
Dimensions in mm.

Fig.5 Tag plate: TGP-P22/13-8P.



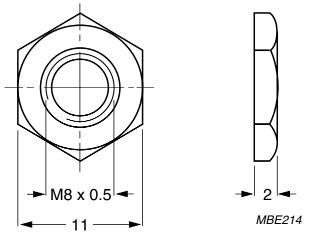
Dimensions in mm.

Fig.6 Container: CON-P22/13.



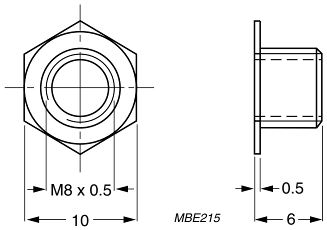
Dimensions in mm.

Fig.7 Spring: SPR-P22/13.



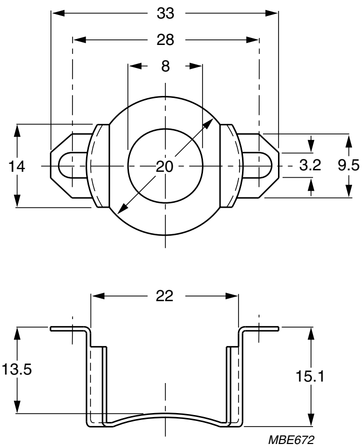
Dimensions in mm.

Fig.8 Fixing nut.



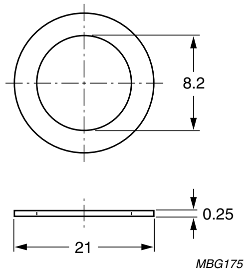
Dimensions in mm.

Fig.9 Fixing bush.



Dimensions in mm.

Fig.10 Clamp: CLM/S-P22/13.



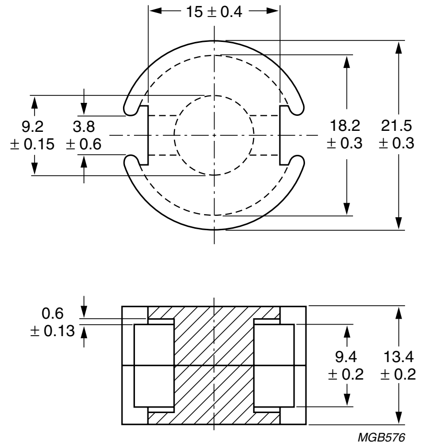
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TS-P22/13.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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	58.1	mm^2
m	mass of set	≈ 13	g



Dimensions in mm.

Fig.1 P22/13/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 40 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈ 90	≈ 420	P22/13/I-3C81-A250
	315 ±3%	≈ 114	≈ 320	P22/13/I-3C81-A315
	400 ±3%	≈ 144	≈ 250	P22/13/I-3C81-A400
	630 ±3%	≈ 227	≈ 145	P22/13/I-3C81-A630
	1000 ±5%	≈ 361	≈ 85	P22/13/I-3C81-A1000
	5330 ±25%	≈ 1920	≈ 0	P22/13/I-3C81
3C91 prot	5330 ±25%	≈ 1920	≈ 0	P22/13/I-3C91
3F3	250 ±3%	≈ 90	≈ 420	P22/13/I-3F3-A250
	315 ±3%	≈ 114	≈ 320	P22/13/I-3F3-A315
	400 ±3%	≈ 144	≈ 250	P22/13/I-3F3-A400
	630 ±3%	≈ 227	≈ 145	P22/13/I-3F3-A630
	1000 ±5%	≈ 361	≈ 85	P22/13/I-3F3-A1000
	4070 ±25%	≈ 1470	≈ 0	P22/13/I-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.57	–	–	–
3C91	≥315	–	≤ 0.13(1)	≤ 0.92(1)	–
3F3	≥315	–	≤ 0.27	–	≤ 0.47

Note

1. Measured at 60 °C.

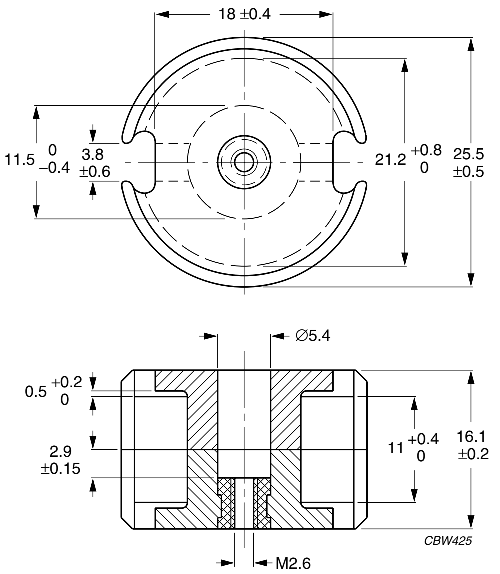
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"P22/13"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.400	mm^{-1}
V_e	effective volume	3530	mm^3
l_e	effective length	37.6	mm
A_e	effective area	93.9	mm^2
A_{min}	minimum area	77.4	mm^2
m	mass of set	≈20	g



Dimensions in mm.

Fig.1 P26/16 core set.

Core sets for filter applications

Clamping force for A_L measurements, 200 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	100 ±3%	≈ 32	≈ 1630	P26/16-3D3-E100/N	P26/16-3D3-E100
	160 ±3%	≈ 51	≈ 890	P26/16-3D3-E160/N	P26/16-3D3-E160
	250 ±3%	≈ 80	≈ 510	P26/16-3D3-E250/N	P26/16-3D3-E250
	2150 ±25%	≈ 685	≈ 0	−	P26/16-3D3
3H3 sup	160 ±3%	≈ 51	≈ 940	P26/16-3H3-E160/N	P26/16-3H3-E160
	250 ±3%	≈ 80	≈ 550	P26/16-3H3-E250/N	P26/16-3H3-E250
	315 ±3%	≈ 100	≈ 420	P26/16-3H3-E315/N	P26/16-3H3-E315
	400 ±3%	≈ 127	≈ 310	P26/16-3H3-E400/N	P26/16-3H3-E400
	630 ±3%	≈ 201	≈ 180	P26/16-3H3-A630/N	P26/16-3H3-A630
	5000 ±25%	≈ 1590	≈ 0	−	P26/16-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 200 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 51	≈ 950	P26/16-3C81-E160
	250 ±3%	≈ 80	≈ 560	P26/16-3C81-A250
	315 ±3%	≈ 100	≈ 420	P26/16-3C81-A315
	400 ±3%	≈ 127	≈ 320	P26/16-3C81-A400
	630 ±3%	≈ 200	≈ 190	P26/16-3C81-A630
	6700 ±25%	≈ 2130	≈ 0	P26/16-3C81
3C91 prot	6700 ±25%	≈ 2130	≈ 0	P26/16-3C91
3F3	160 ±3%	≈ 51	≈ 950	P26/16-3F3-E160
	250 ±3%	≈ 80	≈ 560	P26/16-3F3-A250
	315 ±3%	≈ 100	≈ 420	P26/16-3F3-A315
	400 ±3%	≈ 127	≈ 320	P26/16-3F3-A400
	630 ±3%	≈ 200	≈ 190	P26/16-3F3-A630
	4600 ±25%	≈ 1470	≈ 0	P26/16-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 200 ± 50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	12000 ±25%	≈ 3820	≈ 0	P26/16-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.82	–	–	–
3C91	≥315	–	≤ 0.21(1)	≤ 1.6(1)	–
3F3	≥315	–	≤ 0.4	–	≤ 0.65

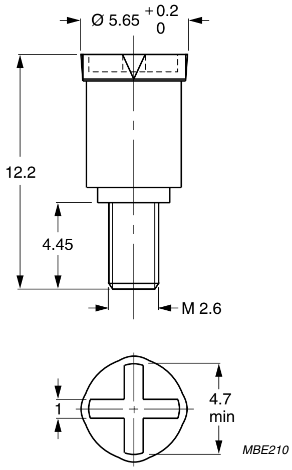
Note

1. Measured at 60 °C.

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 P26/16 inductance adjuster.

Inductance adjuster selection chart sup (applies to all types)

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L[1]	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L[1]	TYPES FOR HIGH ADJUSTMENT	ΔL/L[1]
3H3	63	–	–	–	–	ADJ-P26-RED	25
	100	–	–	–	–	ADJ-P26-RED	22
	160	–	–	ADJ-P26-RED	15	–	–
	250	ADJ-P26-RED	10	–	–	ADJ-P26-BROWN	23
	315	ADJ-P26-RED	8	–	–	ADJ-P26-BROWN	18
	400	ADJ-P26-RED	6	ADJ-P26-BROWN	13	ADJ-P26-GREY	25
	630	ADJ-P26-BROWN	8	ADJ-P26-GREY	16	–	–
	1000	ADJ-P26-BROWN	5	ADJ-P26-GREY	9	–	–
	1600	–	–	ADJ-P26-GREY	5	–	–
3D3	100	–	–	–	–	ADJ-P26-RED	21
	160	–	–	ADJ-P26-RED	14	–	–
	250	ADJ-P26-RED	9	–	–	ADJ-P26-GREY	35
	400	–	8	ADJ-P26-GREY	17	–	–

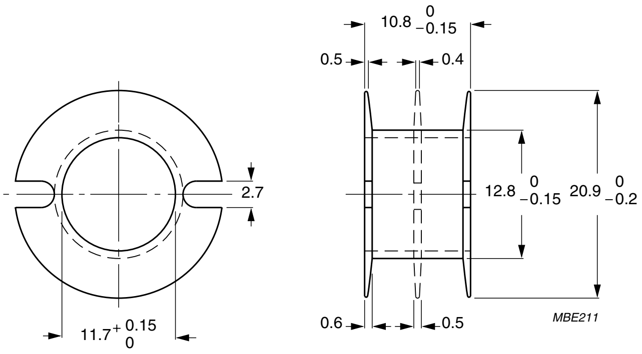
Note

1. Maximum adjustment range.

COIL FORMERS

General data for CP-P26/16 coil former

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



Dimensions in mm.

Fig.3 Coil former CP-P26/16.

Winding data for CP-P26/16 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	37.1	9.3	52.6	CP-P26/16-1S
2	2 × 17.5	2 × 4.35	52.6	CP-P26/16-2S
3	3 × 11	3 × 2.7	52.6	CP-P26/16-3S

General data 6-pins P26/16 coil former for PCB mounting

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

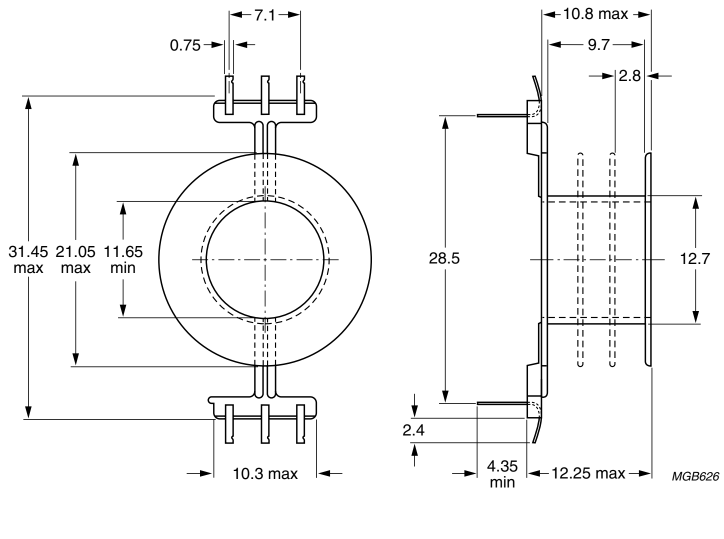


Fig.4 P26/16 coil former for PCB mounting; 6-pins.

Data for 6-pins P26/16 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	36.7	9.7	52.7	4.4	CPV-P26/16-1S-6PD
1	36.7	9.7	52.7	6.8	CPV-P26/16-1S-6PDL
2	2 × 16.6	2 × 4.5	52.7	4.4	CPV-P26/16-2S-6PD
2	2 × 16.6	2 × 4.5	52.7	6.8	CPV-P26/16-2S-6PDL
3	3 × 10.3	3 × 2.8	52.7	4.4	CPV-P26/16-3S-6PD(1)
3	3 × 10.3	3 × 2.8	52.7	6.8	CPV-P26/16-3S-6PDL(1)

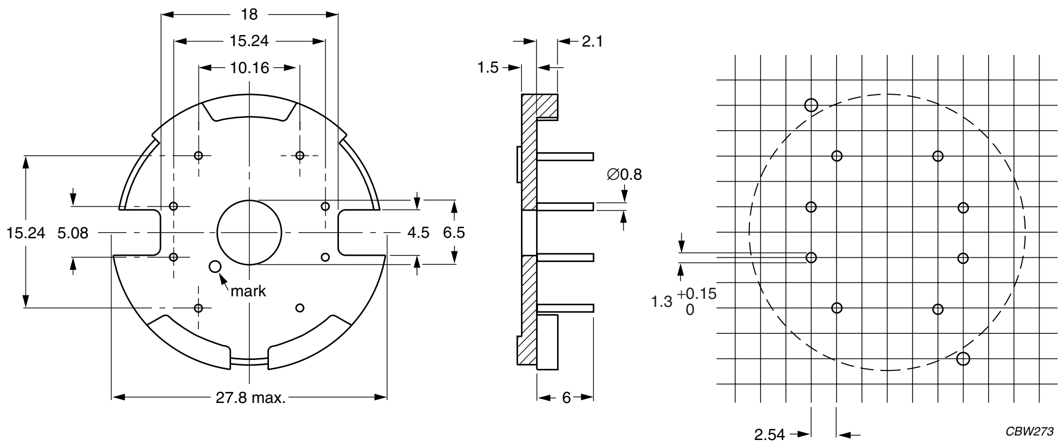
Note

1. In accordance with *"UL 94-HB"*.

MOUNTING PARTS

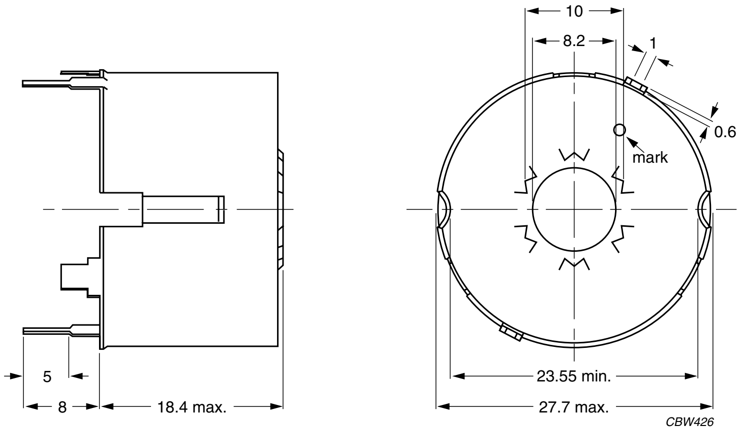
General data

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P26/16-8P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy, SnPb-plated	6	CON-P26/16
	earth pins: presoldered		
Spring	CrNi-steel	7	SPR-P26/16
	spring force: ≈200 N when mounted		
Nut	copper-zinc alloy, nickel-plated	8	NUT
Bush	copper-zinc alloy, nickel-plated	9	FIB
Clamp	spring steel, tin-plated	10	CLM/TP-P26/16



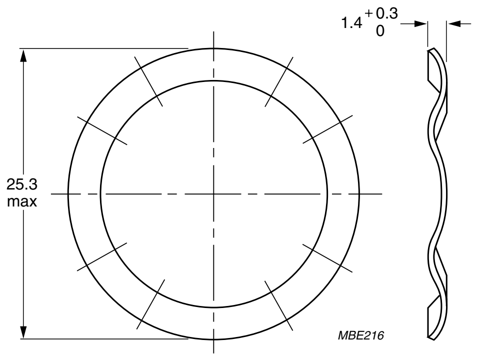
Dimensions in mm.

Fig.5 P26/16 tag plate.



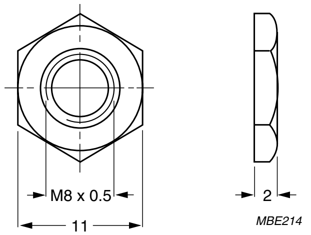
Dimensions in mm.

Fig.6 P26/16 container.



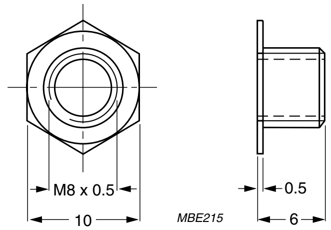
Dimensions in mm.

Fig.7 P26/16 spring.



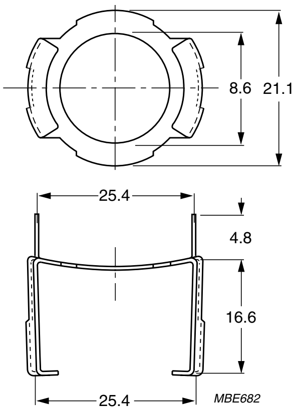
Dimensions in mm.

Fig.8 Fixing nut.



Dimensions in mm.

Fig.9 Fixing bush.



Dimensions in mm.

Fig.10 Clamp: CLM/TP-P26/16.

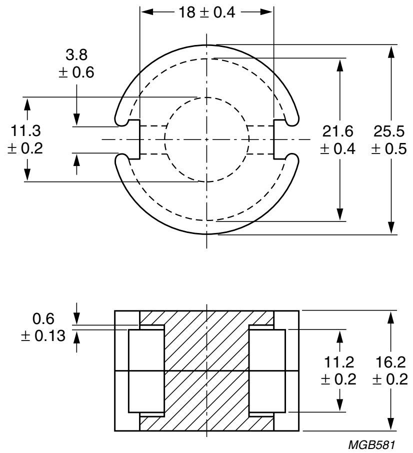
P cores and accessories

P26/16/I

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.360	mm^{-1}
V_e	effective volume	4370	mm^3
l_e	effective length	39.6	mm
A_e	effective area	110	mm^2
A_{min}	minimum area	87.0	mm^2
m	mass of set	≈ 21	g



Dimensions in mm.

Fig.1 P26/16/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 50 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈ 72	≈ 660	P26/16/I-3C81-E250
	315 ±3%	≈ 90	≈ 500	P26/16/I-3C81-A315
	400 ±3%	≈ 115	≈ 380	P26/16/I-3C81-A400
	630 ±3%	≈ 180	≈ 230	P26/16/I-3C81-A630
	1000 ±3%	≈ 286	≈ 130	P26/16/I-3C81-A1000
	7000 ±25%	≈ 2010	≈ 0	P26/16/I-3C81
3C91 prot	7000 ±25%	≈ 2010	≈ 0	P26/16/I-3C91
3F3	250 ±3%	≈ 72	≈ 660	P26/16/I-3F3-E250
	315 ±3%	≈ 90	≈ 500	P26/16/I-3F3-A315
	400 ±3%	≈ 115	≈ 380	P26/16/I-3F3-A400
	630 ±3%	≈ 180	≈ 230	P26/16/I-3F3-A630
	1000 ±3%	≈ 286	≈ 130	P26/16/I-3F3-A1000
	5250 ±25%	≈ 1505	≈ 0	P26/16/I-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.0	–	–	–
3C91	≥315	–	≤ 0.22(1)	≤ 1.6(1)	–
3F3	≥315	–	≤ 0.48	–	≤ 0.83

Note

1. Measured at 60 °C.

BOBBINS AND ACCESSORIES

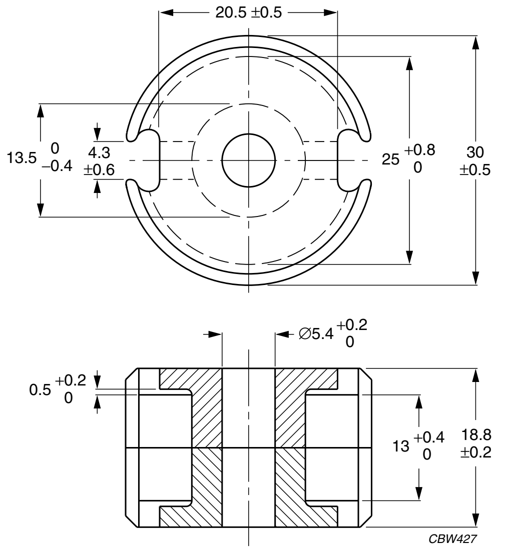
For coil formers, winding data and mounting parts, see data sheet, *"P26/16"*.

P cores and accessories P30/19

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	116	mm^2
m	mass of set	≈ 34	g



Dimensions in mm.

Fig.1 P30/19 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 250 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈ 66	≈ 840	P30/19-3C81-E250
	315 ±3%	≈ 83	≈ 640	P30/19-3C81-A315
	400 ±3%	≈ 105	≈ 480	P30/19-3C81-A400
	630 ±3%	≈ 165	≈ 290	P30/19-3C81-A630
	1000 ±3%	≈ 263	≈ 170	P30/19-3C81-A1000
	8300 ±25%	≈ 2180	≈ 0	P30/19-3C81
3C91 prot	8300 ±25%	≈ 2180	≈ 0	P30/19-3C91
3F3	250 ±3%	≈ 66	≈ 840	P30/19-3F3-E250
	315 ±3%	≈ 83	≈ 640	P30/19-3F3-A315
	400 ±3%	≈ 105	≈ 480	P30/19-3F3-A400
	630 ±3%	≈ 165	≈ 290	P30/19-3F3-A630
	1000 ±3%	≈ 263	≈ 170	P30/19-3F3-A1000
	5750 ±25%	≈ 1510	≈ 0	P30/19-3F3

P cores and accessories — P30/19

Core sets of high permeability grades

Clamping force for A_L measurements, 250 ± 50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	15100 ±25%	≈ 3960	≈ 0	P30/19-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.43	–	–	–
3C91	≥315	–	≤ 0.37(1)	≤ 2.6(1)	–
3F3	≥315	–	≤ 0.7	–	≤ 1.2

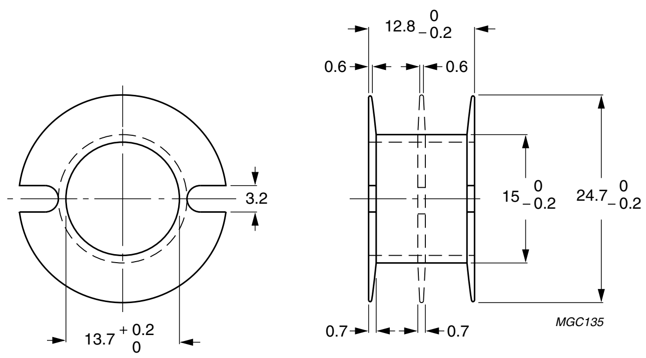
Note

1. Measured at 60 °C.

COIL FORMERS

General data CP-P30/19 coil former

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



Dimensions in mm.

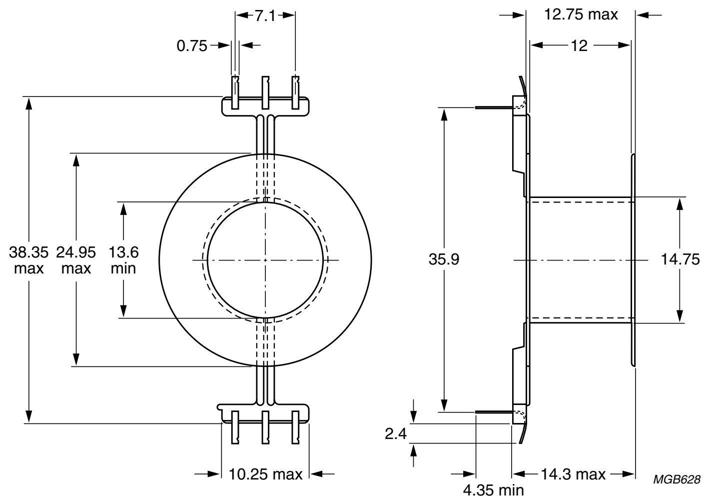
Fig.2 Coil former: CP-P30/19.

Winding data for P30/19 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	53.2	11.1	62	CP-P30/19-1S
2	2 × 24.9	2 × 5.15	62	CP-P30/19-2S
3	3 × 15.5	3 × 3.2	62	CP-P30/19-3S

General data 6-pins P30/19 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with *"UL 94-HB"*; UL file number E41938(M)
Maximum operating temperature	130 °C, *"IEC 60085"*, class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 1, Test Tb, method 1B, 350 °C, 3.5 s. For connection of wire to pins: 430 °C, 2 seconds
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1, 235 °C, 2 s



Dimensions in mm.

Fig.3 P30/19 coil former for PCB mounting; 6-pins.

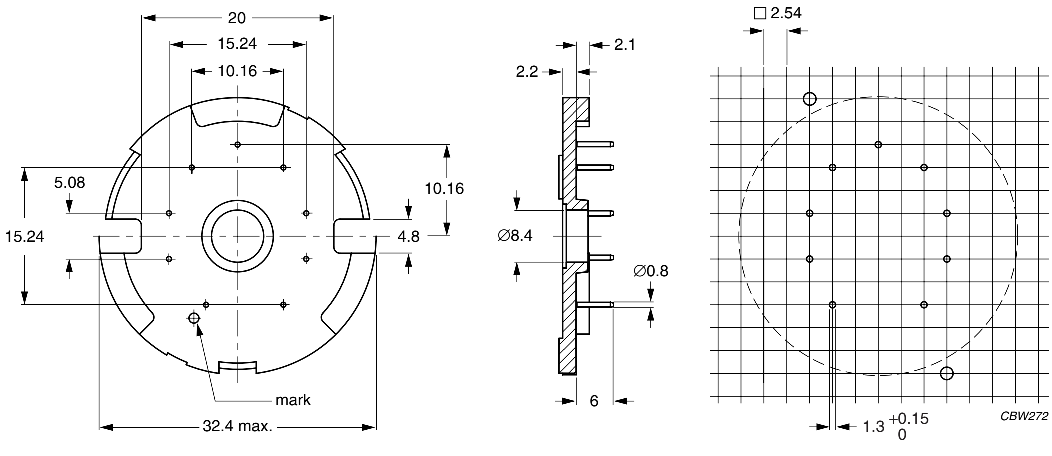
Data for 6-pins P30/19 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	55.2	12.8	62.2	4.4	CPV-P30/19-1S-6PD
1	55.2	12.8	62.2	6.8	CPV-P30/19-1S-6PDL

MOUNTING PARTS

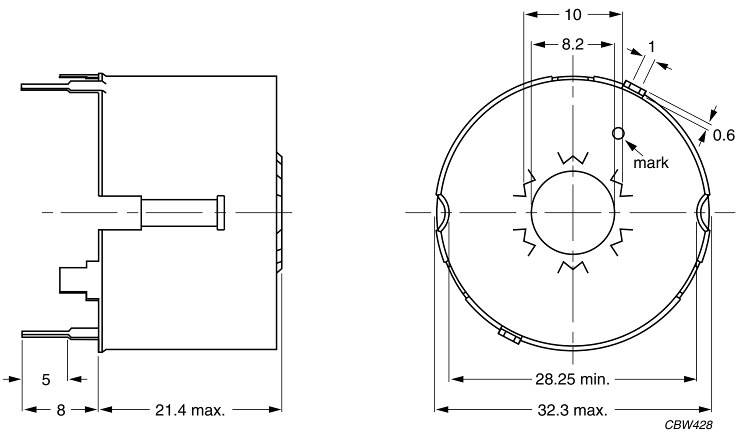
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	4	TGP-P30/19-9P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	5	CON-P30/19
	earth pins: presoldered		
Spring	CrNi-steel	6	SPR-P30/19
	spring force: ≈250 N when mounted		
Nut	copper-zinc alloy, nickel-plated	7	NUT
Bush	copper-zinc alloy, nickel-plated	8	FIB
Clamp	spring steel, tin-plated	9	CLM/TS-P30/19



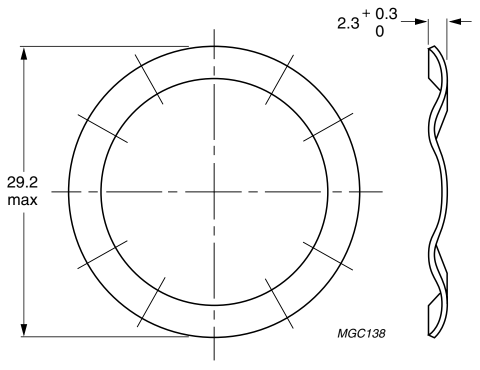
Dimensions in mm.

Fig.4 P30/19 tag plate.



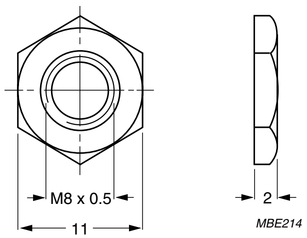
Dimensions in mm.

Fig.5 P30/19 container.



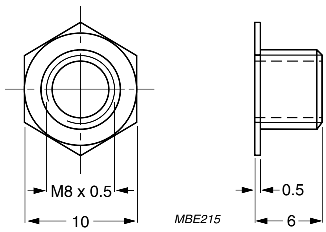
Dimensions in mm.

Fig.6 P30/19 spring.



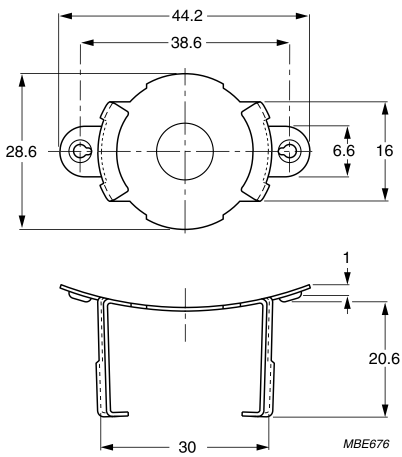
Dimensions in mm.

Fig.7 Fixing nut.



Dimensions in mm.

Fig.8 Fixing bush.



Dimensions in mm.

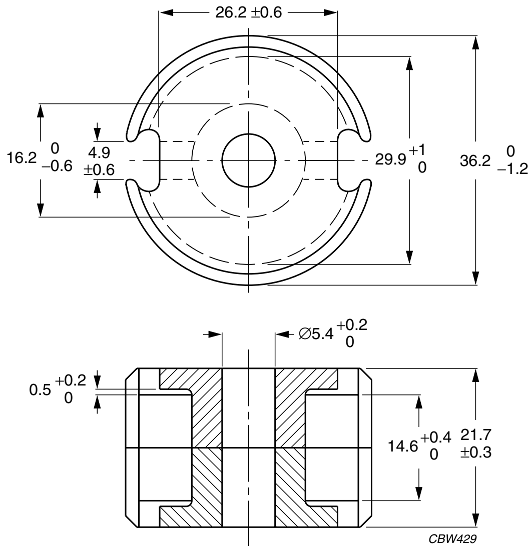
Fig.9 Clamp CLM/TS-P30/19.

P cores and accessories P36/22

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P36/22 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 350 ±50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈ 66	≈ 970	P36/22-3C81-E315
	400 ±3%	≈ 84	≈ 730	P36/22-3C81-E400
	630 ±3%	≈ 132	≈ 430	P36/22-3C81-A630
	1000 ±3%	≈ 210	≈ 250	P36/22-3C81-A1000
	1600 ±5%	≈ 335	≈ 150	P36/22-3C81-A1600
	10800 ±25%	≈ 2260	≈ 0	P36/22-3C81
3C91 prot	10800 ±25%	≈ 2260	≈ 0	P36/22-3C91
3F3	250 ±3%	≈ 66	≈ 970	P36/22-3F3-E250
	315 ±3%	≈ 84	≈ 730	P36/22-3F3-E315
	400 ±3%	≈ 132	≈ 430	P36/22-3F3-E400
	630 ±3%	≈ 210	≈ 250	P36/22-3F3-A630
	1000 ±3%	≈ 335	≈ 150	P36/22-3F3-A1000
	1600 ±5%	≈ 66	≈ 970	P36/22-3F3-A1600
	7350 ±25%	≈ 1540	≈ 0	P36/22-3F3

P cores and accessories P36/22

Core sets of high permeability grades

Clamping force for A_L measurements, 350 ± 50 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	17500 ±25%	≈ 3670	≈ 0	P36/22-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 2.5	–	–	–
3C91	≥315	–	≤ 0.6(1)	≤ 4.5(1)	–
3F3	≥315	–	≤ 1.2	–	≤ 2.0

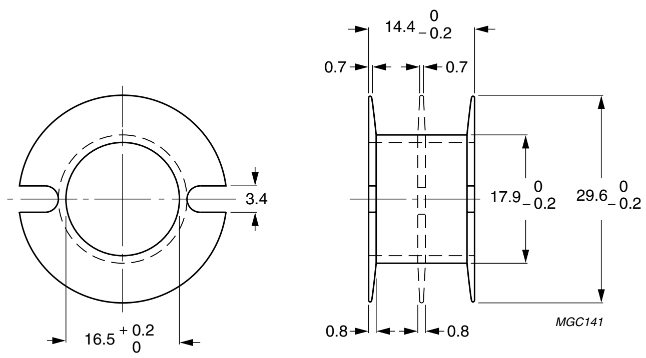
Note

1. Measured at 60 °C.

COIL FORMERS

General data for coil former CP-P36/22

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



Dimensions in mm.

Fig.2 Coil former CP-P36/22.

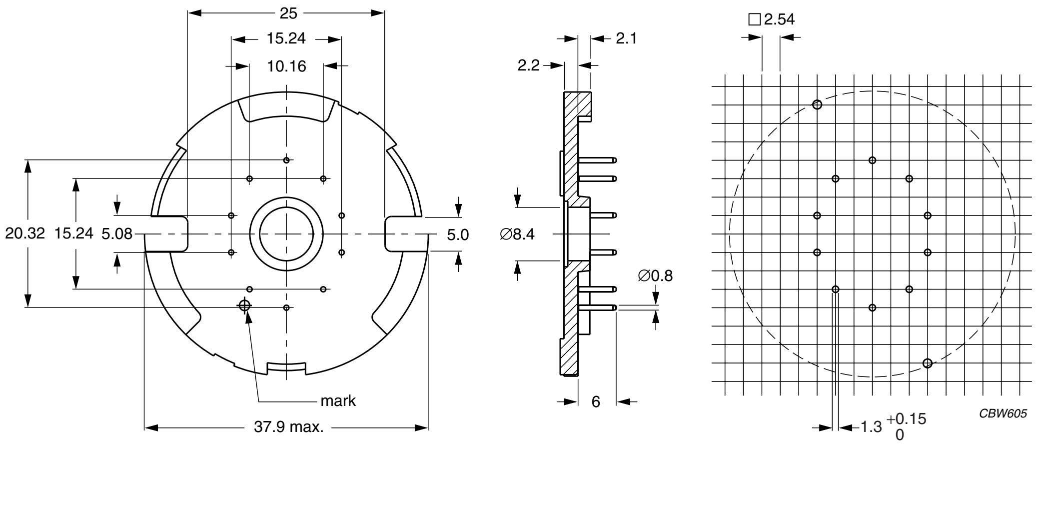
Winding data for coil former CP-P36/22

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	72.4	12.5	74.3	CP-P36/22-1S
2	2 × 33.9	2 × 5.8	74.3	CP-P36/22-2S
3	3 × 21.0	3 × 3.6	74.3	CP-P36/22-3S

MOUNTING PARTS

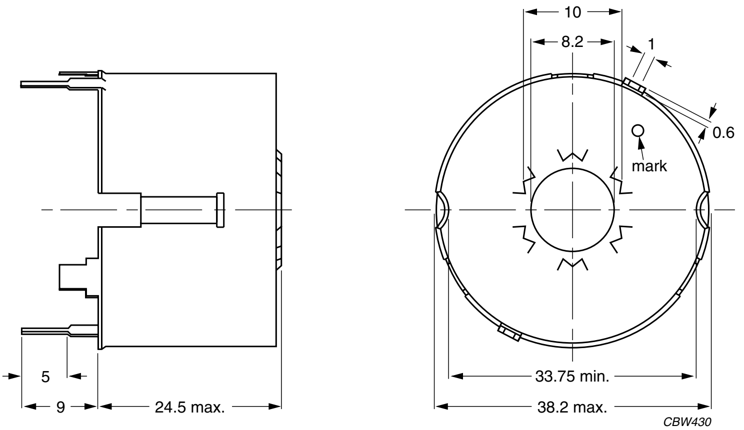
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	3	TGP-P36/22-10P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	4	CON-P36/22
	earth pins: presoldered		
Spring	CrNi-steel	5	SPR-P36/22
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	6	NUT
Bush	copper-zinc alloy, nickel-plated	7	FIB



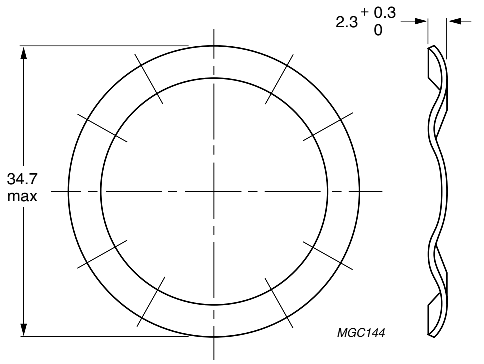
Dimensions in mm.

Fig.3 P36/22 tag plate.



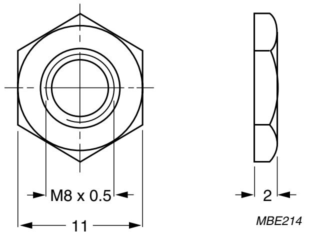
Dimensions in mm.

Fig.4 P36/22 container.



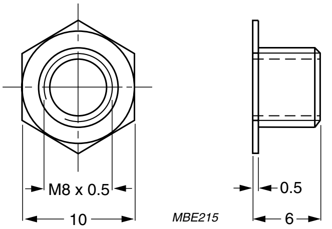
Dimensions in mm.

Fig.5 P36/22 spring.



Dimensions in mm.

Fig.6 Fixing nut.



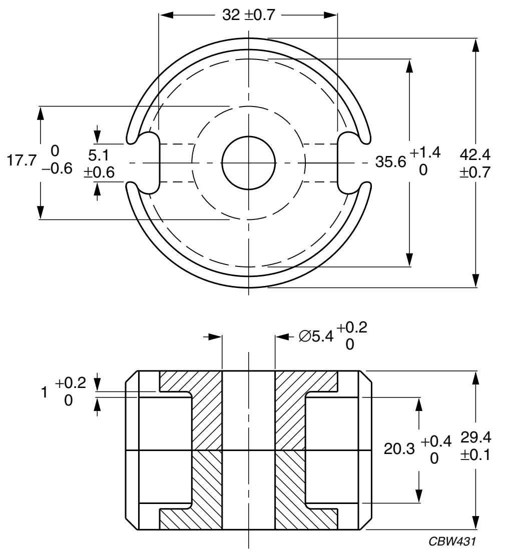
Dimensions in mm.

Fig.7 Fixing bush.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 P42/29 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 550 ±100 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈ 65	≈ 1320	P42/29-3C81-E315
	400 ±3%	≈ 82	≈ 990	P42/29-3C81-E400
	630 ±3%	≈ 130	≈ 580	P42/29-3C81-A630
	1000 ±3%	≈ 206	≈ 340	P42/29-3C81-A1000
	1600 ±5%	≈ 330	≈ 190	P42/29-3C81-A1600
	11500 ±25%	≈ 2370	≈ 0	P42/29-3C81
3C91 prot	11500 ±25%	≈ 2370	≈ 0	P42/29-3C91
3F3	315 ±3%	≈ 65	≈ 1320	P42/29-3F3-E315
	400 ±3%	≈ 82	≈ 990	P42/29-3F3-E400
	630 ±3%	≈ 130	≈ 580	P42/29-3F3-A630
	1000 ±3%	≈ 206	≈ 340	P42/29-3F3-A1000
	1600 ±5%	≈ 330	≈ 190	P42/29-3F3-A1600
	7700 ±25%	≈ 1590	≈ 0	P42/29-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 550 ± 100 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	19000 ±25%	≈ 3910	≈ 0	P42/29-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 4.2	–	–	–
3C91	≥315	–	≤ 0.9(1)	≤ 7.0(1)	–
3F3	≥315	–	≤ 2.0	–	≤ 3.5

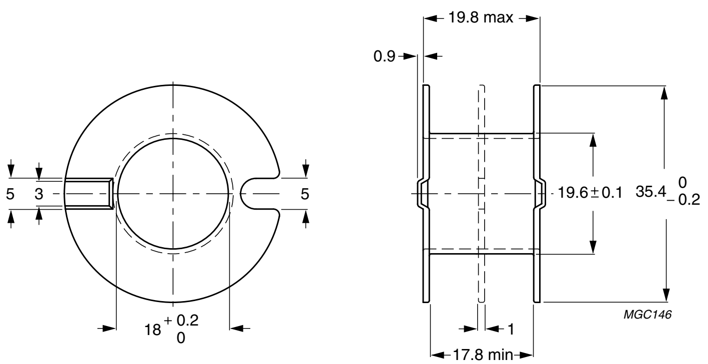
Note

1. Measured at 60 °C.

COIL FORMERS

General data CP-P42/29 coil former

PARAMETER	SPECIFICATION
Coil former material	polycarbonate (PC), glass reinforced, flame retardant in accordance with *"UL 94V-2"*; UL file number E41613(M)
Maximum operating temperature	115 °C



Dimensions in mm.

Fig.2 Coil former: CP-P42/29.

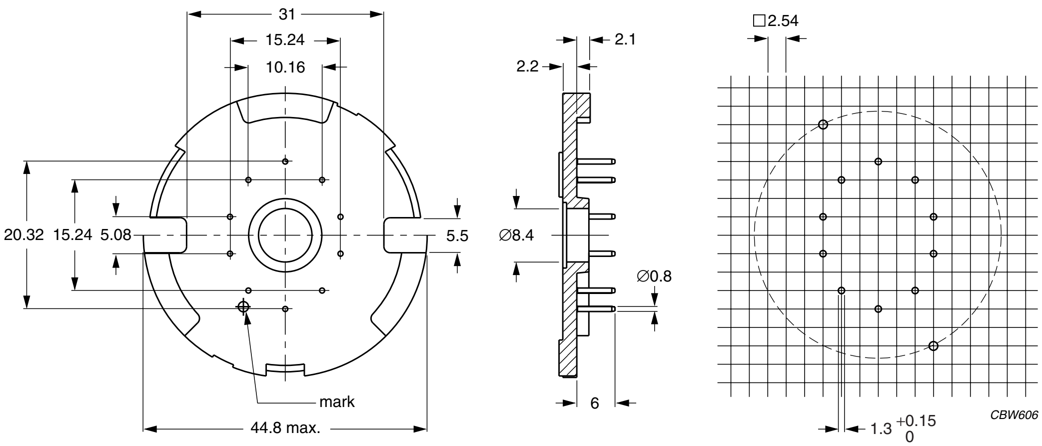
Winding data for CP-P42/29 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	140	17.8	86	CP-P42/29-1S
2	2 × 63	2 × 8	86	CP-P42/29-2S

MOUNTING PARTS

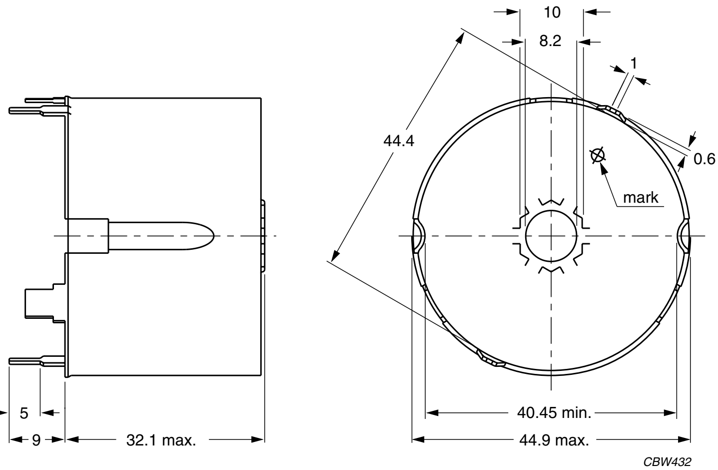
General data and ordering information

ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	3	TGP-P42/29-10P
	flame retardant: in accordance with *"UL 94V-0"*; UL file number E167521(M)		
	maximum operating temperature: 180 °C, *"IEC 60085"*, class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated		
	resistance to soldering heat in accordance with *"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s		
	solderability in accordance with *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s		
Container	copper-zinc alloy (CuZn), SnPb-plated	4	CON-P42/29
	earth pins: presoldered		
Spring	CrNi-steel	5	SPR-P42/29
	spring force: ≈350 N when mounted		
Nut	copper-zinc alloy, nickel-plated	6	NUT
Bush	copper-zinc alloy, nickel-plated	7	FIB



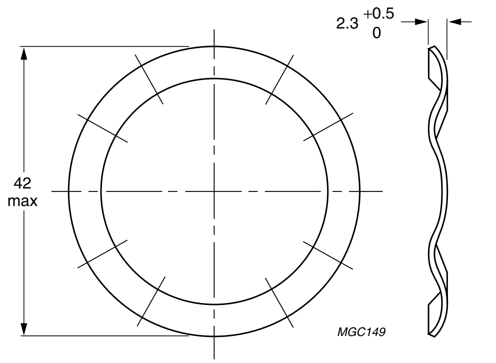
Dimensions in mm.

Fig.3 P42/29 tag plate.



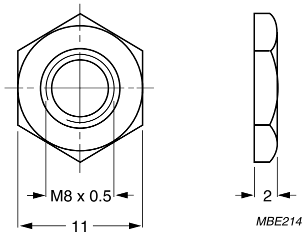
Dimensions in mm.

Fig.4 P42/29 container.



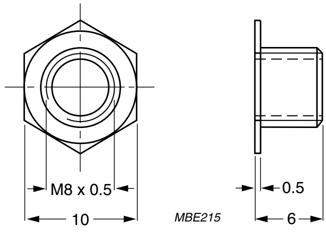
Dimensions in mm.

Fig.5 P42/29 spring.



Dimensions in mm.

Fig.6 Fixing nut: NUT.



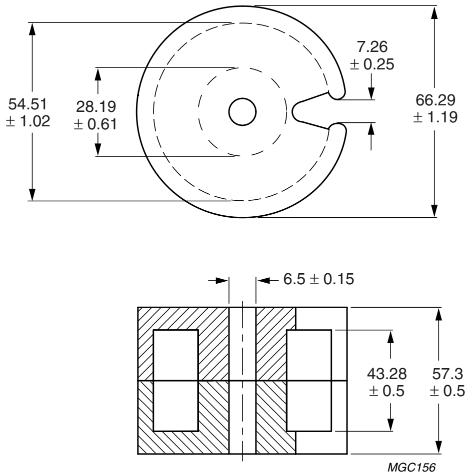
Dimensions in mm.

Fig.7 Fixing bush: FIB.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.172	mm^{-1}
V_e	effective volume	88200	mm^3
I_e	effective length	123	mm
A_e	effective area	717	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

Clamping force for A_L measurements, 1000 ±300 N.

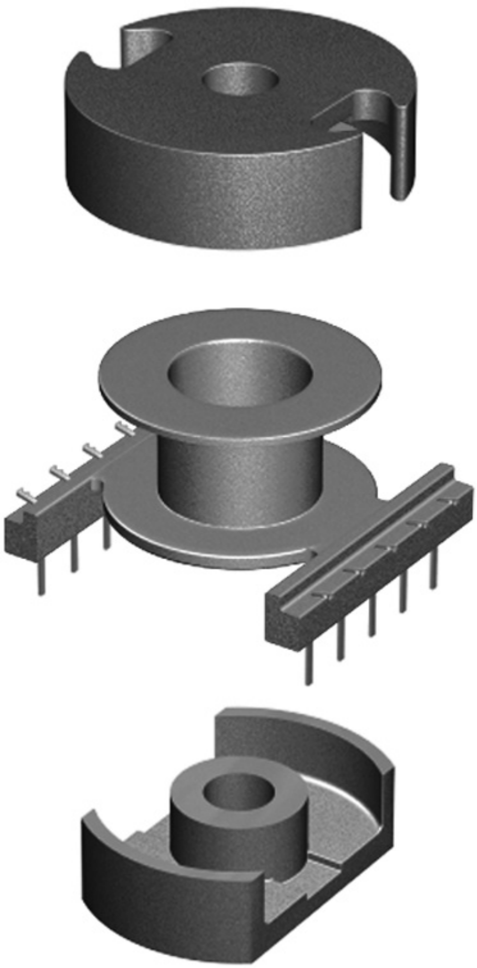
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	18200 ±25%	≈ 2490	≈ 0	P66/56-3C81
3C91 prot	18200 ±25%	≈ 2490	≈ 0	P66/56-3C91
3F3	12350 ±25%	≈ 1690	≈ 0	P66/56-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 25	–	–	–
3C91	≥315	–	≤ 4.7(1)	≤ 33(1)	–
3F3	≥315	–	≤ 10	–	≤ 20

Note

1. Measured at 60 °C.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PT, PTS cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
PT14/8	492	23.3	2.8
PTS14/8	495	22.0	2.5
PT18/11	1110	40.6	6.0
PTS18/11	1070	37.2	5.0
PT23/11	1740	61.0	10.5
PTS23/11	1810	57.2	9.0
PT23/18	2590	62.2	14
PTS23/18	2630	58.3	13

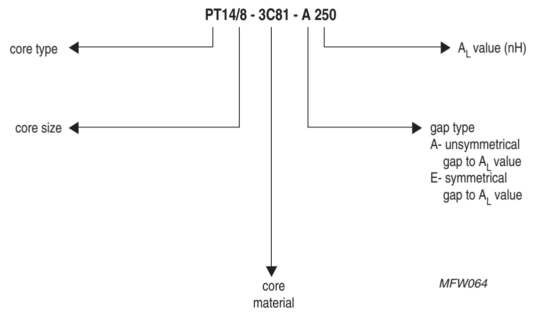


Fig.1 Type number structure for cores.

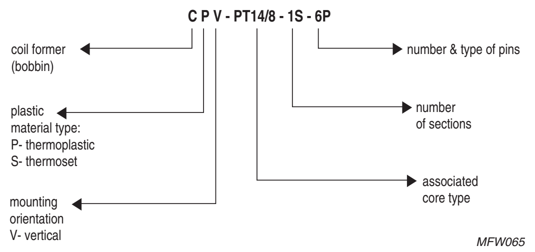


Fig.2 Type number structure for coil formers.

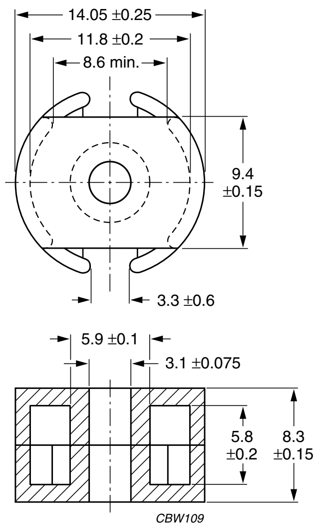
PT, PTS cores and accessories

PT14/8 (1408TS)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.910	mm^{-1}
V_e	effective volume	492	mm^3
l_e	effective length	21.1	mm
A_e	effective area	23.3	mm^2
A_{min}	minimum area	19.9	mm^2
m	mass of set	≈ 2.8	g



Dimensions in mm.

Fig.1 PT14/8 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 15 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈ 45	≈ 630	PT14/8-3C81-A63
	100 ±3%	≈ 72	≈ 360	PT14/8-3C81-A100
	160 ±3%	≈ 115	≈ 210	PT14/8-3C81-A160
	250 ±3%	≈ 180	≈ 120	PT14/8-3C81-A250
	315 ±5%	≈ 227	≈ 90	PT14/8-3C81-A315
	2400 ±25%	≈ 1730	≈ 0	PT14/8-3C81
3C91 prot	2400 ±25%	≈ 1730	≈ 0	PT14/8-3C91
3F3	63 ±3%	≈ 45	≈ 630	PT14/8-3F3-A63
	100 ±3%	≈ 72	≈ 360	PT14/8-3F3-A100
	160 ±3%	≈ 115	≈ 210	PT14/8-3F3-A160
	250 ±3%	≈ 180	≈ 120	PT14/8-3F3-A250
	315 ±5%	≈ 227	≈ 90	PT14/8-3F3-A315
	1650 ±25%	≈1190	≈ 0	PT14/8-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	4500 ±25%	≈ 3240	≈ 0	PT14/8-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.11	–	–	–
3C91	≥320	–	≤ 0.03(1)	≤ 0.22(1)	–
3F3	≥315	–	≤ 0.06	–	≤ 0.1

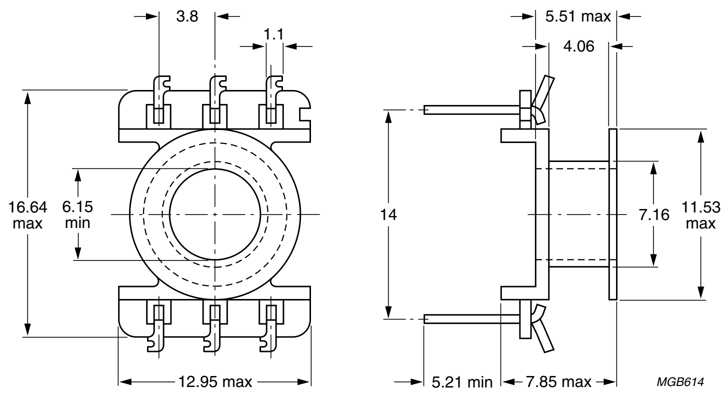
Note

1. Measured at 60 °C.

COIL FORMERS

General data 6-pins PT14/8 coil former

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



Dimensions in mm.

Fig.2 PT14/8 coil former; 6-pins.

Winding data for 6-pins PT14/8 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	7.9	4.1	29.2	CPV-PT14/8-1S-6P

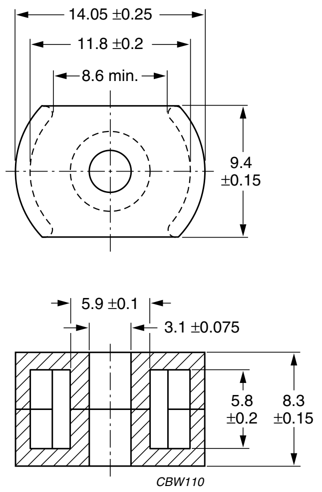
Note

1. For additional coil formers and mounting parts, see data sheet, *"P14/8"*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	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

Clamping force for A_L measurements, 15 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	63 ±3%	≈ 51	≈ 590	PTS14/8-3C81-A63
	100 ±3%	≈ 81	≈ 340	PTS14/8-3C81-A100
	160 ±3%	≈ 130	≈ 190	PTS14/8-3C81-A160
	250 ±3%	≈ 204	≈ 110	PTS14/8-3C81-A250
	315 ±5%	≈ 257	≈ 90	PTS14/8-3C81-A315
	2330 ±25%	≈ 1900	≈ 0	PTS14/8-3C81
3C91 prot	2330 ±25%	≈ 1900	≈ 0	PTS14/8-3C91
3F3	63 ±3%	≈ 51	≈ 590	PTS14/8-3F3-A63
	100 ±3%	≈ 81	≈ 340	PTS14/8-3F3-A100
	160 ±3%	≈ 130	≈ 190	PTS14/8-3F3-A160
	250 ±3%	≈ 204	≈ 110	PTS14/8-3F3-A250
	315 ±5%	≈ 257	≈ 90	PTS14/8-3F3-A315
	1625 ±25%	≈ 1320	≈ 0	PTS14/8-3F3

PT, PTS cores and accessories

PTS14/8 (1408THS)

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	4370 ±25%	≈ 3540	≈ 0	PTS14/8-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.1	–	–	–
3C91	≥320	–	≤ 0.026(1)	≤ 0.19(1)	–
3F3	≥315	–	≤ 0.054	–	≤ 0.94

Note

1. Measured at 60 °C.

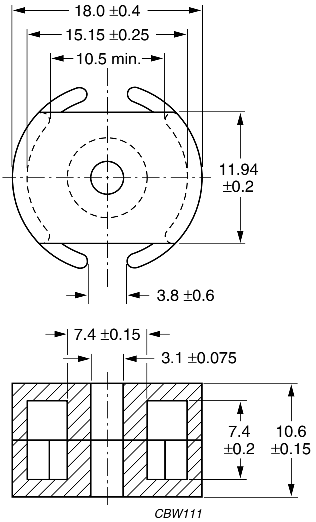
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *“P14/8”* and *“PT14/8”*.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	≈ 6.0	g



Dimensions in mm.

Fig.1 PT18/11 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 53	≈ 660	PT18/11-3C81-A100
	160 ±3%	≈ 85	≈ 380	PT18/11-3C81-A160
	250 ±3%	≈ 133	≈ 220	PT18/11-3C81-A250
	315 ±3%	≈ 168	≈ 170	PT18/11-3C81-A315
	400 ±5%	≈ 213	≈ 130	PT18/11-3C81-A400
	3130 ±25%	≈ 1670	≈ 0	PT18/11-3C81
3C91 prot	3130 ±25%	≈ 1670	≈ 0	PT18/11-3C91
3F3	100 ±3%	≈ 53	≈ 660	PT18/11-3F3-A100
	160 ±3%	≈ 85	≈ 380	PT18/11-3F3-A160
	250 ±3%	≈ 133	≈ 220	PT18/11-3F3-A250
	315 ±3%	≈ 168	≈ 170	PT18/11-3F3-A315
	400 ±5%	≈ 213	≈ 130	PT18/11-3F3-A400
	2500 ±25%	≈ 1340	≈ 0	PT18/11-3F3

PT, PTS cores and accessories

PT18/11 (1811TS)

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	5760 ±25%	≈ 3075	≈ 0	PT18/11-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.23	–	–	–
3C91	≥320	–	≤ 0.06(1)	≤ 0.5(1)	–
3F3	≥315	–	≤ 0.12	–	≤ 0.21

Note

1. Measured at 60 °C.

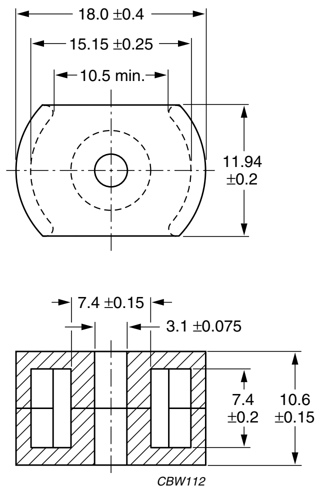
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *“P18/11”* .

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/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
A_{min}	minimum area	31.0	mm^2
m	mass of set	≈ 5.0	g



Dimensions in mm.

Fig.1 PTS18/11 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 61	≈ 600	PTS18/11-3C81-A100
	160 ±3%	≈ 98	≈ 340	PTS18/11-3C81-A160
	250 ±3%	≈ 153	≈ 200	PTS18/11-3C81-A250
	315 ±3%	≈ 193	≈ 150	PTS18/11-3C81-A315
	400 ±5%	≈ 245	≈ 120	PTS18/11-3C81-A400
	3000 ±25%	≈ 1830	≈ 0	PTS18/11-3C81
3C91 prot	3000 ±25%	≈ 1830	≈ 0	PTS18/11-3C91
3F3	100 ±3%	≈ 61	≈ 600	PTS18/11-3F3-A100
	160 ±3%	≈ 98	≈ 340	PTS18/11-3F3-A160
	250 ±3%	≈ 153	≈ 200	PTS18/11-3F3-A250
	315 ±3%	≈ 193	≈ 150	PTS18/11-3F3-A315
	400 ±5%	≈ 245	≈ 120	PTS18/11-3F3-A400
	2225 ±25%	≈ 1365	≈ 0	PTS18/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 15 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	5140 ±25%	≈ 3150	≈ 0	PTS18/11-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.22	–	–	–
3C91	≥320	–	≤ 0.055(1)	≤ 0.4(1)	–
3F3	≥315	–	≤ 0.12	–	≤ 0.2

Note

1. Measured at 60 °C.

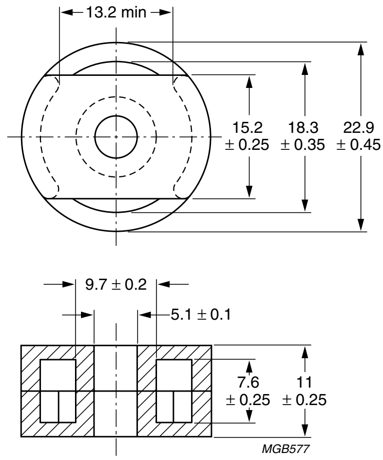
BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"P18/11"* .

CORE SETS

Effective core parameters

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

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	160 ±3%	≈ 60	≈ 580	PT23/11-3C81-A160
	250 ±3%	≈ 93	≈ 350	PT23/11-3C81-A250
	315 ±3%	≈ 118	≈ 270	PT23/11-3C81-A315
	400 ±3%	≈ 149	≈ 200	PT23/11-3C81-A400
	630 ±5%	≈ 235	≈ 120	PT23/11-3C81-A630
	5500 ±25%	≈ 2050	≈ 0	PT23/11-3C81
3C91 prot	5500 ±25%	≈ 2050	≈ 0	PT23/11-3C91
3F3	160 ±3%	≈ 60	≈ 580	PT23/11-3F3-A160
	250 ±3%	≈ 93	≈ 350	PT23/11-3F3-A250
	315 ±3%	≈ 118	≈ 270	PT23/11-3F3-A315
	400 ±3%	≈ 149	≈ 200	PT23/11-3F3-A400
	630 ±5%	≈ 235	≈ 120	PT23/11-3F3-A630
	3700 ±25%	≈ 1380	≈ 0	PT23/11-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	8400 ±25%	≈ 3130	≈ 0	PT23/11-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.4	–	–	–
3C91	≥320	–	≤ 0.09(1)	≤ 0.7(1)	–
3F3	≥315	–	≤ 0.19	–	≤ 0.33

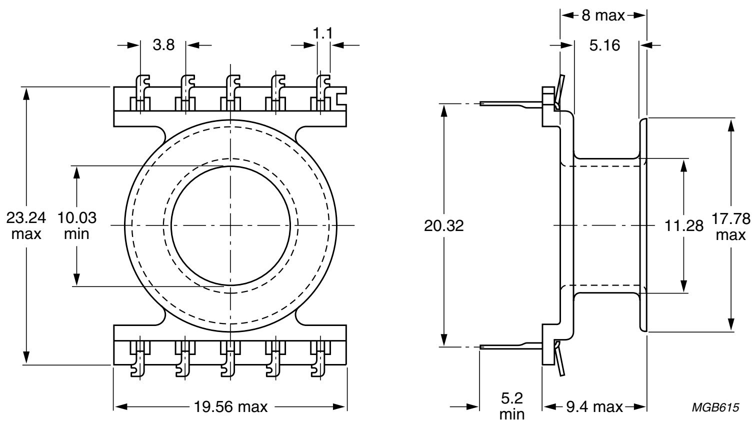
Note

1. Measured at 60 °C.

COIL FORMERS

General data 10-pins PT23/11 coil former

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41938(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	130 °C, *"IEC 60085"* class B
Resistance to soldering heat	*"IEC 68-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 68-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PT23/11 coil former; 10-pins.

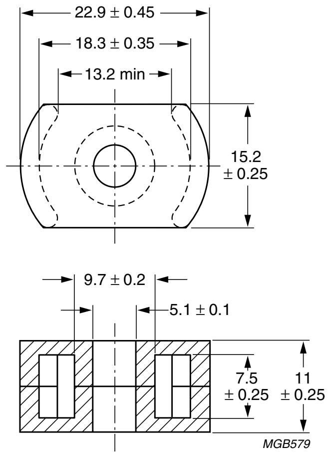
Winding data for 10-pins PT23/11 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.1	5.2	45.2	CPV-PT23/11-1S-10P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	≈ 9.0	g



Dimensions in mm.

Fig.1 PTS23/11 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 70	≈ 540	PTS23/11-3C81-A160
	250 ±3%	≈ 110	≈ 320	PTS23/11-3C81-A250
	315 ±3%	≈ 138	≈ 250	PTS23/11-3C81-A315
	400 ±3%	≈ 175	≈ 190	PTS23/11-3C81-A400
	630 ±5%	≈ 276	≈ 110	PTS23/11-3C81-A630
	4890 ±25%	≈ 2150	≈ 0	PTS23/11-3C81
3C91 prot	4890 ±25%	≈ 2150	≈ 0	PTS23/11-3C91
3F3	160 ±3%	≈ 70	≈ 540	PTS23/11-3F3-A160
	250 ±3%	≈ 110	≈ 320	PTS23/11-3F3-A250
	315 ±3%	≈ 138	≈ 250	PTS23/11-3F3-A315
	400 ±3%	≈ 175	≈ 190	PTS23/11-3F3-A400
	630 ±5%	≈ 276	≈ 110	PTS23/11-3F3-A630
	3280 ±25%	≈ 1510	≈ 0	PTS23/11-3F3

PT, PTS cores and accessories

PTS23/11 (2311THS)

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	7250 ±25%	≈ 3190	≈ 0	PTS23/11-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.37	–	–	–
3C91	≥320	–	≤ 0.09(1)	≤ 0.7(1)	–
3F3	≥315	–	≤ 0.2	–	≤ 0.35

Note

1. Measured at 60 °C.

BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *“PT23/11”*.

PT, PTS cores and accessories

PT23/18 (2318TS)

CORE SETS

Effective core parameters

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

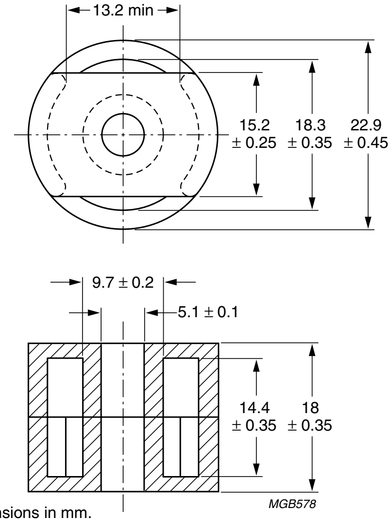


Fig.1 PT23/18 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 85	≈ 620	PT23/18-3C81-A160
	250 ±3%	≈ 133	≈ 360	PT23/18-3C81-A250
	315 ±3%	≈ 168	≈ 270	PT23/18-3C81-A315
	400 ±3%	≈ 213	≈ 200	PT23/18-3C81-A400
	630 ±5%	≈ 335	≈ 120	PT23/18-3C81-A630
	4100 ±25%	≈ 2180	≈ 0	PT23/18-3C81
3C91 prot	4100 ±25%	≈ 2180	≈ 0	PT23/18-3C91
3F3	160 ±3%	≈ 85	≈ 620	PT23/18-3F3-A160
	250 ±3%	≈ 133	≈ 360	PT23/18-3F3-A250
	315 ±3%	≈ 168	≈ 270	PT23/18-3F3-A315
	400 ±3%	≈ 213	≈ 200	PT23/18-3F3-A400
	630 ±5%	≈ 335	≈ 120	PT23/18-3F3-A630
	2750 ±25%	≈ 1460	≈ 0	PT23/18-3F3

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	6400 ±25%	≈ 3410	≈ 0	PT23/18-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.6	–	–	–
3C91	≥320	–	≤ 0.13(1)	≤ 1.0(1)	–
3F3	≥315	–	≤ 0.29	–	≤ 0.49

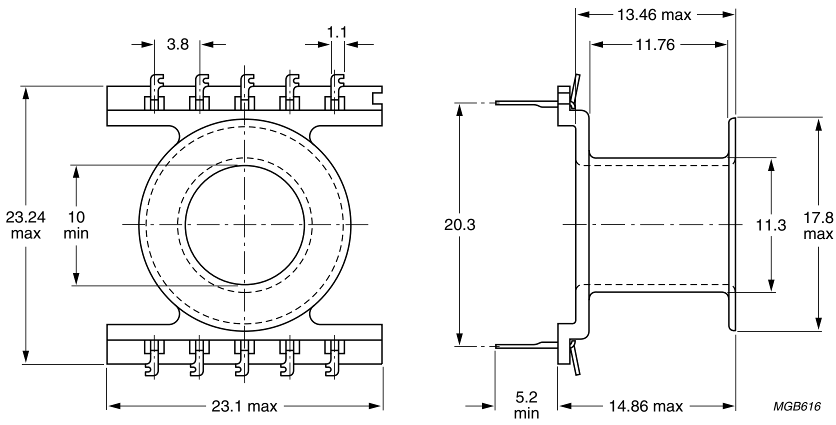
Note

1. Measured at 60 °C.

COIL FORMER

General data 10-pins PT23/18 coil former

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



Dimensions in mm.

Fig.2 PT23/18 coil former; 10-pins.

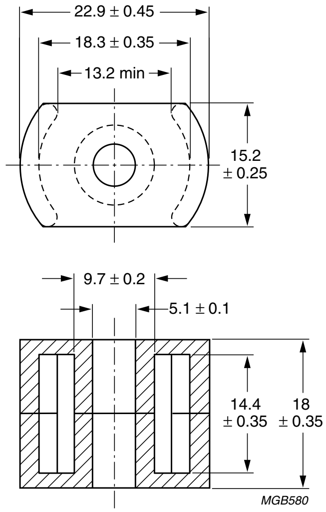
Winding data for 10-pins PT23/18 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	36.0	11.8	45.2	CPV-PT23/18-1S-10P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.770	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

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 98	≈ 570	PTS23/18-3C81-A160
	250 ±3%	≈ 154	≈ 330	PTS23/18-3C81-A250
	315 ±3%	≈ 194	≈ 250	PTS23/18-3C81-A315
	400 ±3%	≈ 246	≈ 190	PTS23/18-3C81-A400
	630 ±5%	≈ 387	≈ 110	PTS23/18-3C81-A630
	3800 ±25%	≈ 2320	≈ 0	PTS23/18-3C81
3C91 prot	3800 ±25%	≈ 2320	≈ 0	PTS23/18-3C91
3F3	160 ±3%	≈ 98	≈ 570	PTS23/18-3F3-A160
	250 ±3%	≈ 154	≈ 330	PTS23/18-3F3-A250
	315 ±3%	≈ 194	≈ 250	PTS23/18-3F3-A315
	400 ±3%	≈ 246	≈ 190	PTS23/18-3F3-A400
	630 ±5%	≈ 387	≈ 110	PTS23/18-3F3-A630
	2500 ±25%	≈ 1500	≈ 0	PTS23/18-3F3

PT, PTS cores and accessories

PTS23/18 (2318THS)

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E27	5945 ±25%	≈ 3630	≈ 0	PTS23/18-3E27

Properties of core sets under power conditions

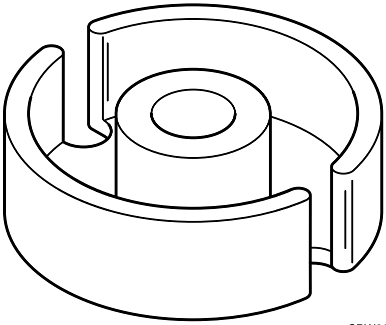
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.54	–	–	–
3C91	≥320	–	≤ 0.14[(1)]	≤ 1.0[(1)]	–
3F3	≥315	–	≤ 0.29	–	≤ 0.5

Note

1. Measured at 60 °C.

BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, *"PT23/18"*.


CBW363

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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PH cores

CORE TYPE
PH5.6/3.6
PH7.4/3.9
PH9.4/4.8
PH14/7.5
PH26/9.2

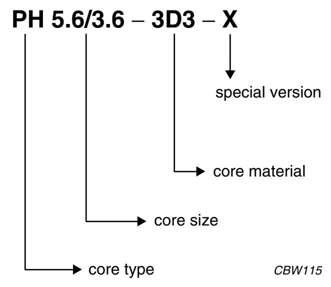
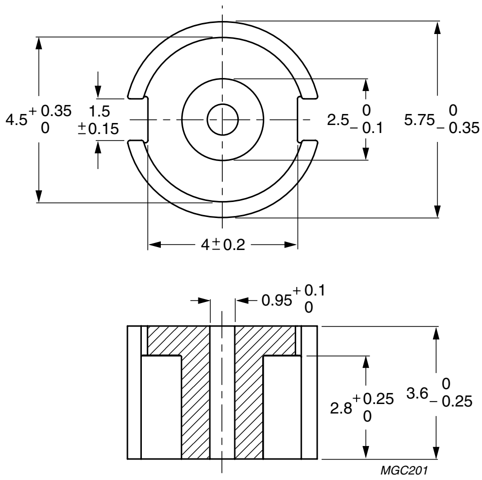


Fig.1 Type number structure for cores.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH5.6/3.6-3D3



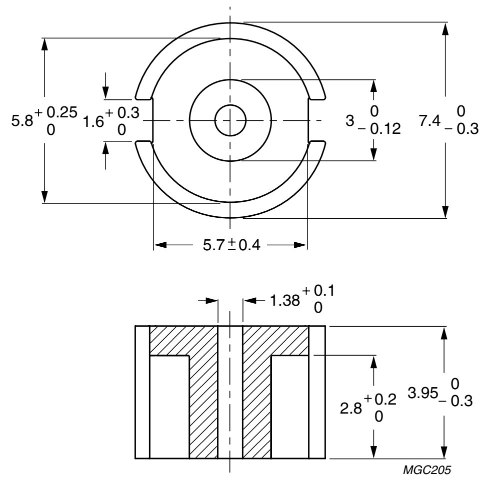
Dimensions in mm.

Fig.1 PH5.6/3.6 core half.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH7.4/3.9-3D3



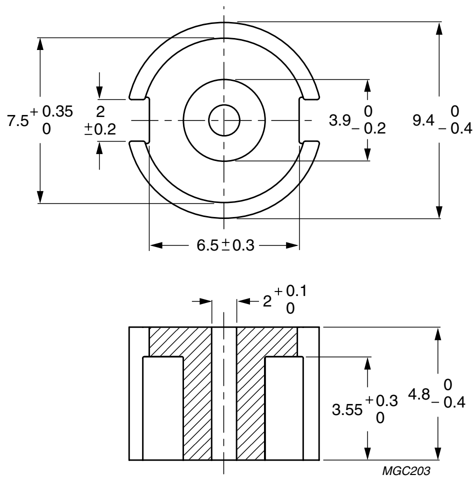
Dimensions in mm.

Fig.1 PH7.4/3.9 core half.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH9.4/4.8-3D3



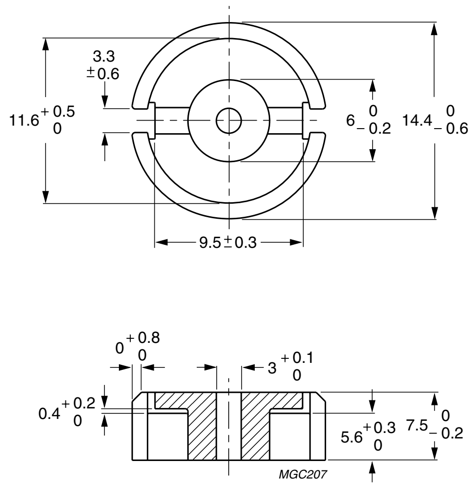
Dimensions in mm.

Fig.1 PH9.4/4.8 core half.

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH14/7.5-3D3



Dimensions in mm.

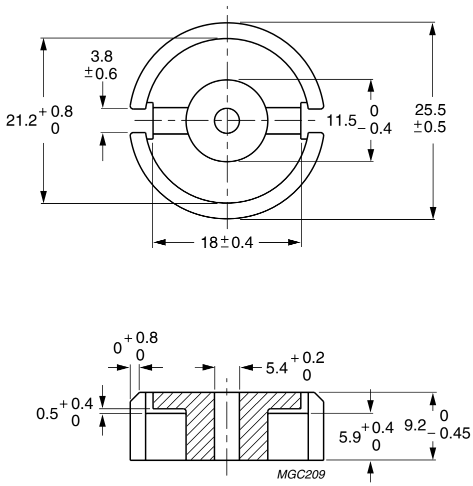
Fig.1 PH14/7.5 core half.

PH cores PH26/9.2

CORE HALF

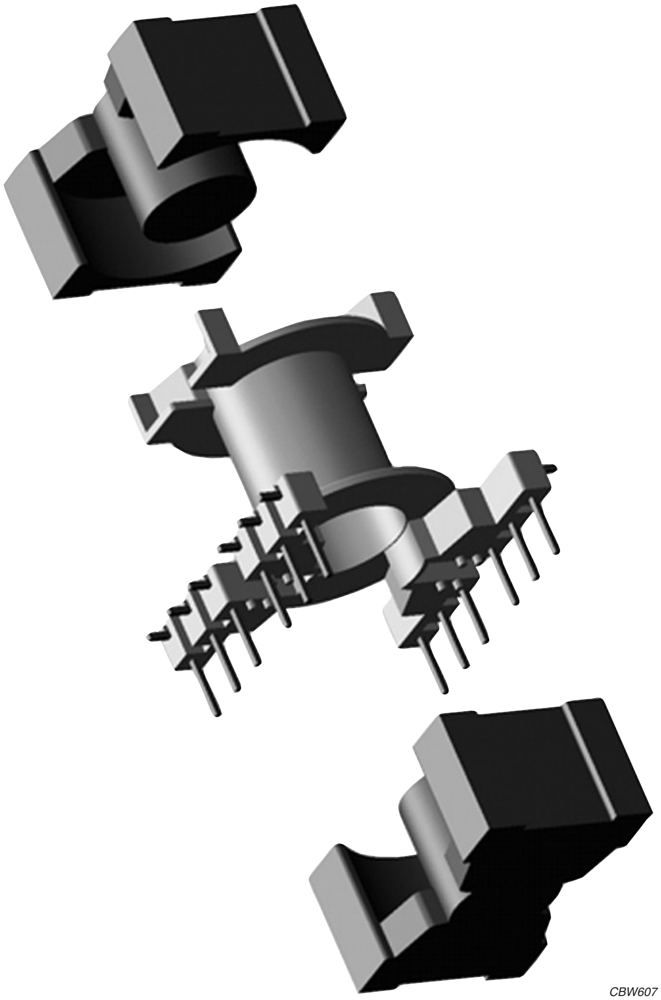
Ordering information

GRADE	TYPE NUMBER
3D3	PH26/9.2-3D3



Dimensions in mm.

Fig.1 PH26/9.2 core half.



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PQ cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
PQ20/16	2330	61.9	11
PQ20/20	2850	62.6	14
PQ26/20	5820	121	29
PQ26/25	6530	120	32
PQ32/20	9440	169	47
PQ32/30	12500	167	62
PQ35/35	16300	190	80
PQ40/40	20500	201	95
PQ50/50	37100	328	195

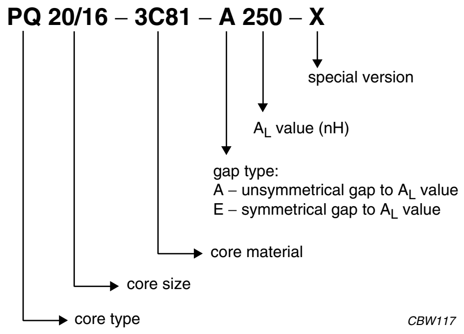


Fig.1 Type number structure for cores.

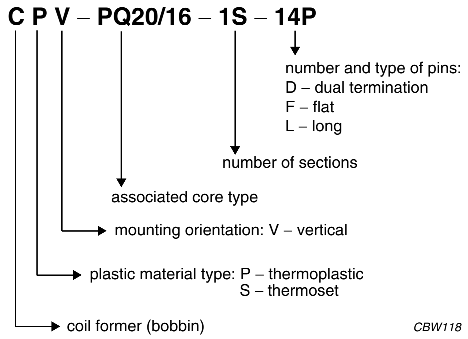
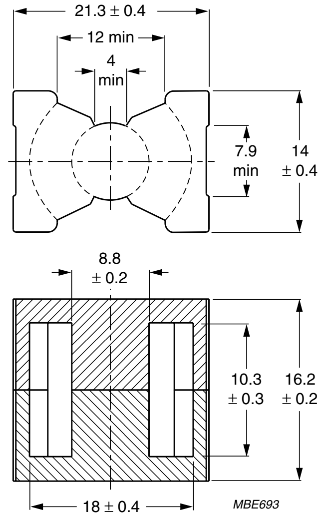


Fig.2 Type number structure for coil formers.

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

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C81	160 ±3%	≈ 77	≈ 600	PQ20/16-3C81-A160
	250 ±3%	≈ 121	≈ 350	PQ20/16-3C81-A250
	315 ±3%	≈ 152	≈ 270	PQ20/16-3C81-A315
	400 ±3%	≈ 193	≈ 200	PQ20/16-3C81-A400
	630 ±5%	≈ 305	≈ 120	PQ20/16-3C81-A630
	4080 ±25%	≈ 1970	≈ 0	PQ20/16-3C81
3C90	160 ±3%	≈ 77	≈ 600	PQ20/16-3C90-A160
	250 ±3%	≈ 121	≈ 350	PQ20/16-3C90-A250
	315 ±3%	≈ 152	≈ 270	PQ20/16-3C90-A315
	400 ±3%	≈ 193	≈ 200	PQ20/16-3C90-A400
	630 ±5%	≈ 305	≈ 120	PQ20/16-3C90-A630
	3250 ±25%	≈ 1570	≈ 0	PQ20/16-3C90
3C91 prot	4080 ±25%	≈ 1970	≈ 0	PQ20/16-3C91
3C94 des	3600 ±25%	≈ 1740	≈ 0	PQ20/16-3C94
3C96 prot	3250 ±25%	≈ 1570	≈ 0	PQ20/16-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 77	≈ 600	PQ20/16-3F3-A160
	250 ±3%	≈ 121	≈ 350	PQ20/16-3F3-A250
	315 ±3%	≈ 152	≈ 270	PQ20/16-3F3-A315
	400 ±3%	≈ 193	≈ 200	PQ20/16-3F3-A400
	630 ±5%	≈ 305	≈ 120	PQ20/16-3F3-A630
	3080 ±25%	≈ 1490	≈ 0	PQ20/16-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.54	–	–	–
3C90	≥320	≤ 0.28	≤ 0.3	–	–
3C91	≥320	–	≤ 0.16(1)	≤ 1.1(1)	–
3C94	≥320	–	≤ 0.22	≤ 1.4	–
3C96	≥340	–	≤ 0.16	≤ 1.1	≤ 0.43
3F3	≥320	–	≤ 0.26	–	≤ 0.44

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.9	–	–	–
3F3	≥320	–	–	–	–

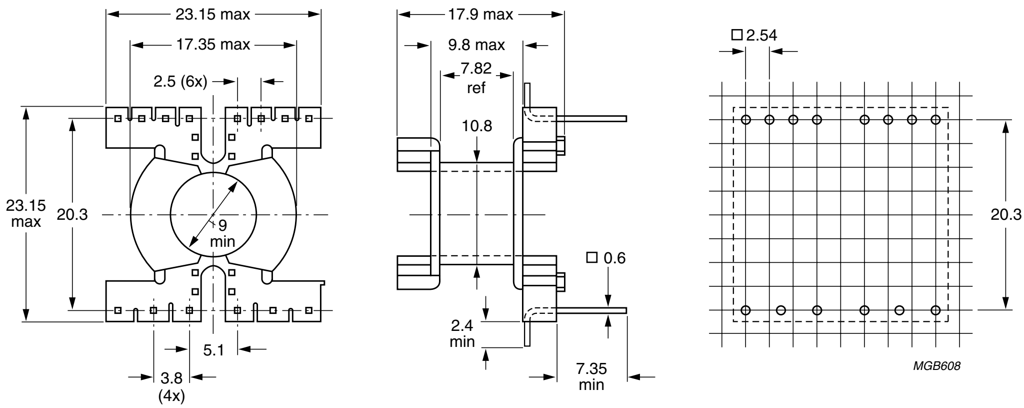
Note

1. Measured at 60 °C.

COIL FORMER

General data 14-pins PQ20/16 coil former

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



Dimensions in mm.

Fig.2 PQ20/16 coil former; 14-pins.

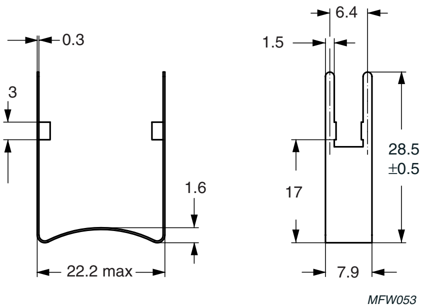
Winding data for 14-pins PQ20/16 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	23.5	7.95	44.0	CPV-PQ20/16-1S-14P
1	23.5	7.95	44.0	CPV-PQ20/16-1S-14PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ20/16



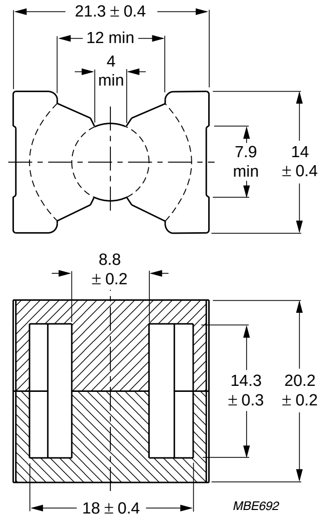
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ20/16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.731	mm^{-1}
V_e	effective volume	2850	mm^3
l_e	effective length	45.7	mm
A_e	effective area	62.6	mm^2
A_{min}	minimum area	59.1	mm^2
m	mass of set	≈ 14	g



Dimensions in mm.

Fig.1 PQ20/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 93	≈ 620	PQ20/20-3C81-A160
	250 ±3%	≈ 145	≈ 360	PQ20/20-3C81-A250
	315 ±3%	≈ 183	≈ 270	PQ20/20-3C81-A315
	400 ±3%	≈ 232	≈ 200	PQ20/20-3C81-A400
	630 ±5%	≈ 366	≈ 120	PQ20/20-3C81-A630
	3580 ±25%	≈ 2080	≈ 0	PQ20/20-3C81
3C90	160 ±3%	≈ 93	≈ 620	PQ20/20-3C90-A160
	250 ±3%	≈ 145	≈ 360	PQ20/20-3C90-A250
	315 ±3%	≈ 183	≈ 270	PQ20/20-3C90-A315
	400 ±3%	≈ 232	≈ 200	PQ20/20-3C90-A400
	630 ±5%	≈ 366	≈ 120	PQ20/20-3C90-A630
	2820 ±25%	≈ 1640	≈ 0	PQ20/20-3C90
3C91 prot	3580 ±25%	≈ 2080	≈ 0	PQ20/20-3C91
3C94 des	3150 ±25%	≈ 1830	≈ 0	PQ20/20-3C94
3C96 prot	2820 ±25%	≈ 1640	≈ 0	PQ20/20-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 93	≈ 620	PQ20/20-3F3-A160
	250 ±3%	≈ 145	≈ 360	PQ20/20-3F3-A250
	315 ±3%	≈ 183	≈ 270	PQ20/20-3F3-A315
	400 ±3%	≈ 232	≈ 200	PQ20/20-3F3-A400
	630 ±5%	≈ 366	≈ 120	PQ20/20-3F3-A630
	2650 ±25%	≈ 1540	≈ 0	PQ20/20-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.66	–	–	–	–
3C90	≥320	≤ 0.35	≤ 0.37	–	–	–
3C91	≥320	–	≤ 0.2[(1)]	≤ 1.3[(1)]	–	–
3C94	≥320	–	≤ 0.27	≤ 1.7	–	–
3C96	≥340	–	≤ 0.2	≤ 1.3	≤ 0.53	≤ 1.1
3F3	≥320	–	≤ 0.31	–	≤ 0.54	–

Note

1. Measured at 60 °C.

COIL FORMER

General data 14-pins PQ20/20 coil former

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

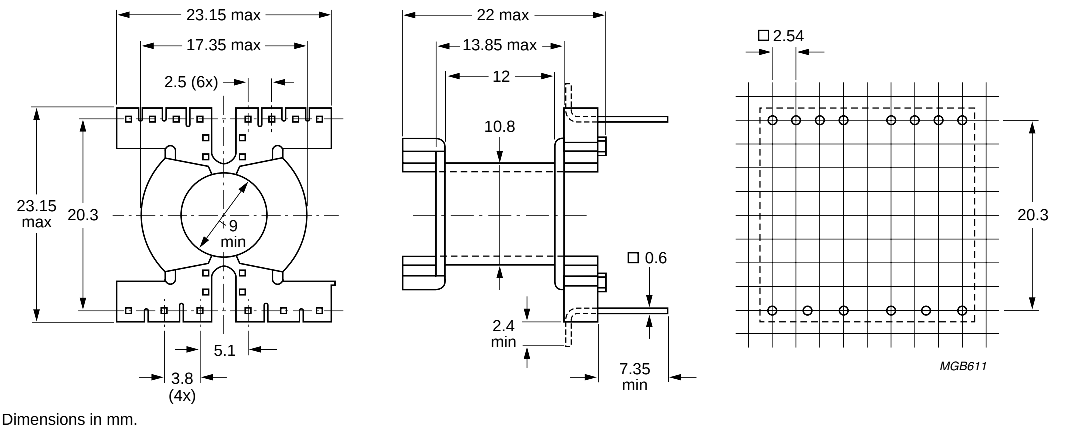


Fig.2 PQ20/20 coil former; 14-pins.

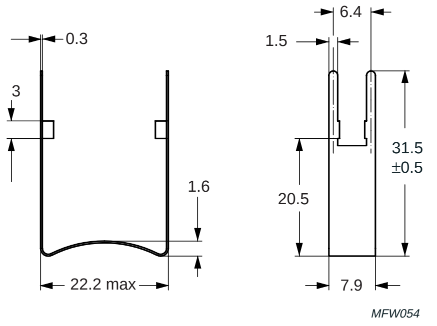
Winding data for 14-pins PQ20/20 coil former

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	CPV-PQ20/20-1S-14P
1	36.0	12.0	44.0	CPV-PQ20/20-1S-14PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ20/20



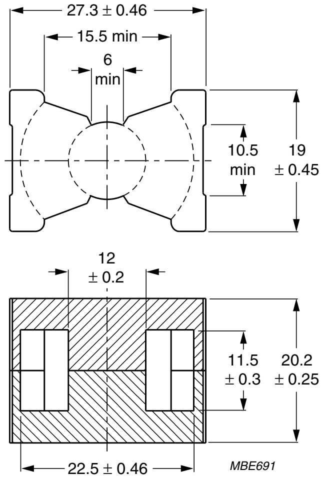
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ20/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.372	mm^{-1}
V_e	effective volume	5470	mm^3
l_e	effective length	45.0	mm
A_e	effective area	121	mm^2
A_{min}	minimum area	109	mm^2
m	mass of set	≈ 29	g



Dimensions in mm.

Fig.1 PQ26/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈ 74	≈ 730	PQ26/20-3C81-E250
	315 ±3%	≈ 93	≈ 550	PQ26/20-3C81-A315
	400 ±3%	≈ 118	≈ 420	PQ26/20-3C81-A400
	630 ±3%	≈ 186	≈ 250	PQ26/20-3C81-A630
	1000 ±5%	≈ 296	≈ 140	PQ26/20-3C81-A1000
	7020 ±25%	≈ 2080	≈ 0	PQ26/20-3C81
3C90	250 ±3%	≈ 74	≈ 730	PQ26/20-3C90-E250
	315 ±3%	≈ 93	≈ 550	PQ26/20-3C90-A315
	400 ±3%	≈ 118	≈ 420	PQ26/20-3C90-A400
	630 ±3%	≈ 186	≈ 250	PQ26/20-3C90-A630
	1000 ±5%	≈ 296	≈ 140	PQ26/20-3C90-A1000
	5530 ±25%	≈ 1640	≈ 0	PQ26/20-3C90
3C91 prot	7020 ±25%	≈ 2080	≈ 0	PQ26/20-3C91
3C94 des	6200 ±25%	≈ 1640	≈ 0	PQ26/20-3C94
3C96 prot	5530 ±25%	≈ 1640	≈ 0	PQ26/20-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%	≈ 74	≈ 730	PQ26/20-3F3-E250
	315 ±3%	≈ 93	≈ 550	PQ26/20-3F3-A315
	400 ±3%	≈ 118	≈ 420	PQ26/20-3F3-A400
	630 ±3%	≈ 186	≈ 250	PQ26/20-3F3-A630
	1000 ±5%	≈ 296	≈ 140	PQ26/20-3F3-A1000
	5200 ±25%	≈ 1540	≈ 0	PQ26/20-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.3	–	–	–
3C90	≥320	≤ 0.66	≤ 0.7	–	–
3C91	≥320	–	≤ 0.42(1)	≤ 2.5(1)	–
3C94	≥320	–	≤ 0.52	≤ 3.3	–
3C96	≥340	–	≤ 0.42	≤ 2.5	≤ 1.0
3F3	≥320	–	≤ 0.64	–	≤ 1.1

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 2.1	–	–	–
3F3	≥320	–	–	–	–

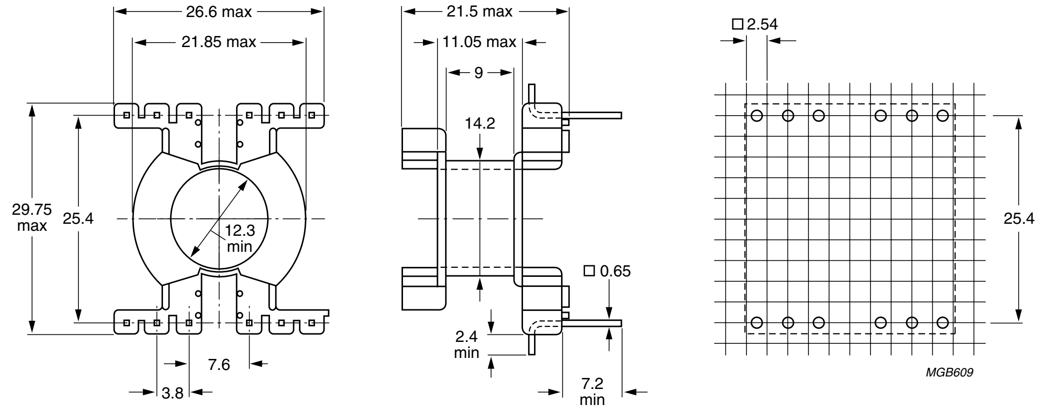
Note

1. Measured at 60 °C.

COIL FORMER

General data 12-pins PQ26/20 coil former

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



Dimensions in mm.

Fig.2 PQ26/20 coil former; 12-pins.

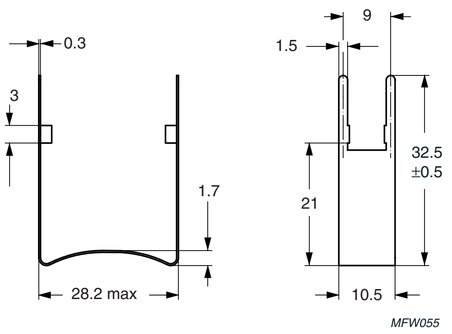
Winding data for 12-pins PQ26/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	31.1	9.0	56.4	CPV-PQ26/20-1S-12P
1	31.1	9.0	56.4	CPV-PQ26/20-1S-12PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ26/20



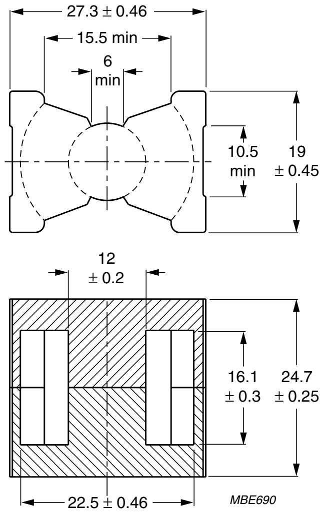
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ26/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.451	mm^{-1}
V_e	effective volume	6530	mm^3
I_e	effective length	54.3	mm
A_e	effective area	120	mm^2
A_{min}	minimum area	108	mm^2
m	mass of set	≈ 32	g



Dimensions in mm.

Fig.1 PQ26/25 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±15 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	250 ±3%	≈ 90	≈ 730	PQ26/25-3C81-E250
	315 ±3%	≈ 113	≈ 550	PQ26/25-3C81-A315
	400 ±3%	≈ 144	≈ 420	PQ26/25-3C81-A400
	630 ±3%	≈ 227	≈ 240	PQ26/25-3C81-A630
	1000 ±5%	≈ 360	≈ 140	PQ26/25-3C81-A1000
	6010 ±25%	≈ 2160	≈ 0	PQ26/25-3C81
3C90	250 ±3%	≈ 90	≈ 730	PQ26/25-3C90-E250
	315 ±3%	≈ 113	≈ 550	PQ26/25-3C90-A315
	400 ±3%	≈ 144	≈ 420	PQ26/25-3C90-A400
	630 ±3%	≈ 227	≈ 240	PQ26/25-3C90-A630
	1000 ±5%	≈ 360	≈ 140	PQ26/25-3C90-A1000
	4700 ±25%	≈ 1690	≈ 0	PQ26/25-3C90
3C91 prot	6010 ±25%	≈ 2160	≈ 0	PQ26/25-3C91
3C94 des	5250 ±25%	≈ 1890	≈ 0	PQ26/25-3C94
3C96 prot	4700 ±25%	≈ 1690	≈ 0	PQ26/25-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	250 ±3%	≈ 90	≈ 730	PQ26/25-3F3-E250
	315 ±3%	≈ 113	≈ 550	PQ26/25-3F3-A315
	400 ±3%	≈ 144	≈ 420	PQ26/25-3F3-A400
	630 ±3%	≈ 227	≈ 240	PQ26/25-3F3-A630
	1000 ±5%	≈ 360	≈ 140	PQ26/25-3F3-A1000
	4390 ±25%	≈ 1574	≈ 0	PQ26/25-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.5	–	–	–
3C90	≥320	≤ 0.79	≤ 0.83	–	–
3C91	≥320	–	≤ 0.5(1)	≤ 3.2(1)	–
3C94	≥320	–	≤ 0.62	≤ 4.0	–
3C96	≥340	–	≤ 0.5	≤ 3.2	≤ 1.15
3F3	≥320	–	≤ 0.72	–	≤ 1.2

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 2.5	–	–	–
3F3	≥320	–	–	–	–

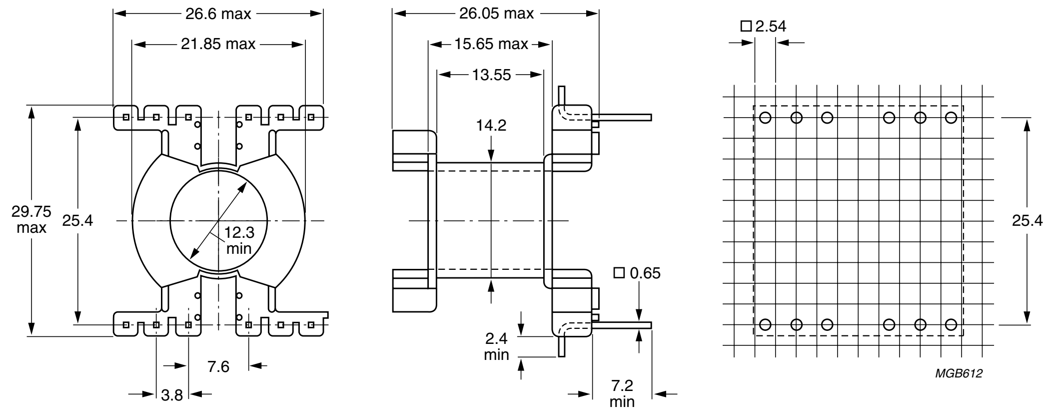
Note

1. Measured at 60 °C.

COIL FORMER

General data 12-pins PQ26/25 coil former

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



Dimensions in mm.

Fig.2 PQ26/25 coil former; 12-pins.

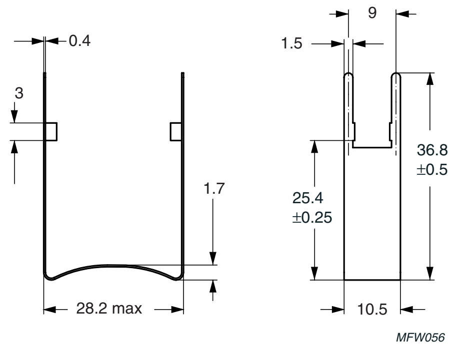
Winding data for 12-pins PQ26/25 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	47.5	13.6	56.4	CPV-PQ26/25-1S-12P
1	47.5	13.6	56.4	CPV-PQ26/25-1S-12PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ26/25



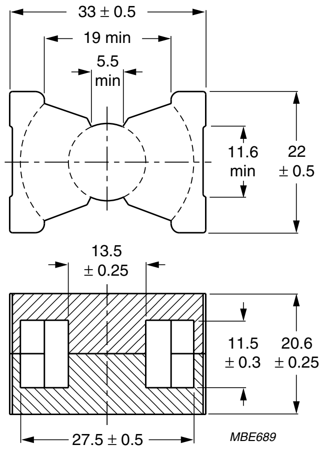
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ26/25

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.331	mm^{-1}
V_e	effective volume	9440	mm^3
l_e	effective length	55.9	mm
A_e	effective area	169	mm^2
A_{min}	minimum area	142	mm^2
m	mass of set	≈ 47	g



Dimensions in mm.

Fig.1 PQ32/20 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈ 83	≈ 790	PQ32/20-3C81-E315
	400 ±3%	≈ 105	≈ 600	PQ32/20-3C81-A400
	630 ±3%	≈ 166	≈ 350	PQ32/20-3C81-A630
	1000 ±3%	≈ 263	≈ 210	PQ32/20-3C81-A1000
	1600 ±5%	≈ 421	≈ 120	PQ32/20-3C81-A1600
	7560 ±25%	≈ 1990	≈ 0	PQ32/20-3C81
3C90	315 ±3%	≈ 83	≈ 790	PQ32/20-3C90-E315
	400 ±3%	≈ 105	≈ 600	PQ32/20-3C90-A400
	630 ±3%	≈ 166	≈ 350	PQ32/20-3C90-A630
	1000 ±3%	≈ 263	≈ 210	PQ32/20-3C90-A1000
	1600 ±5%	≈ 421	≈ 120	PQ32/20-3C90-A1600
	6000 ±25%	≈ 1580	≈ 0	PQ32/20-3C90
3C91 prot	7560 ±25%	≈ 1990	≈ 0	PQ32/20-3C91
3C94 des	6800 ±25%	≈ 1790	≈ 0	PQ32/20-3C94
3C96 prot	6000 ±25%	≈ 1580	≈ 0	PQ32/20-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈ 83	≈ 790	PQ32/20-3F3-E315
	400 ±3%	≈ 105	≈ 600	PQ32/20-3F3-A400
	630 ±3%	≈ 166	≈ 350	PQ32/20-3F3-A630
	1000 ±3%	≈ 263	≈ 210	PQ32/20-3F3-A1000
	1600 ±5%	≈ 421	≈ 120	PQ32/20-3F3-A1600
	6000 ±25%	≈ 1580	≈ 0	PQ32/20-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 1.9	–	–	–
3C90	≥320	≤ 1.2	≤ 1.3	–	–
3C91	≥320	–	≤ 0.7[(1)]	≤ 4.4[(1)]	–
3C94	≥320	–	≤ 0.9	≤ 5.5	–
3C96	≥340	–	≤ 0.7	≤ 4.4	≤ 1.7
3F3	≥320	–	≤ 1.0	–	≤ 1.8

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 3.5	–	–	–
3F3	≥320	–	–	–	–

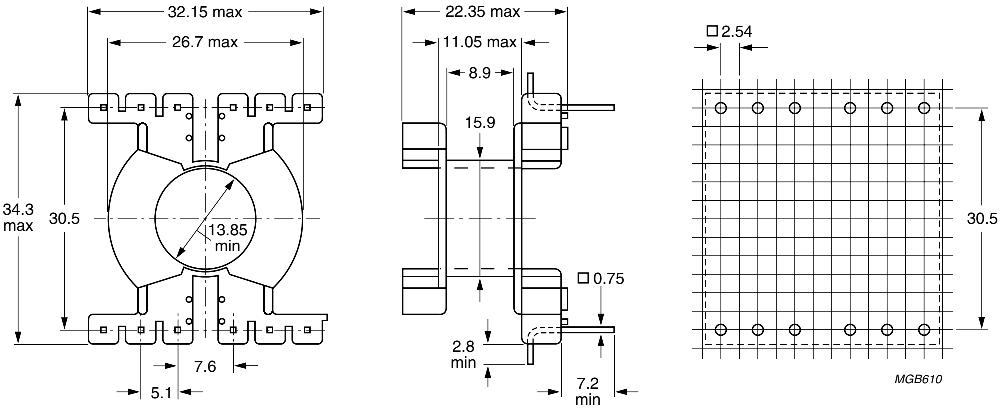
Note

1. Measured at 60 °C.

COIL FORMER

General data 12-pins PQ32/20 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 94 V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 6068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ32/20 coil former; 12-pins.

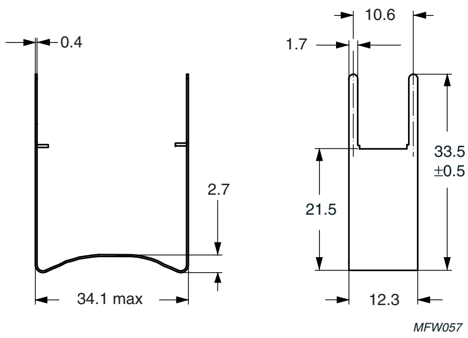
Winding data for 12-pins PQ32/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm^2)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	44.8	8.9	66.7	CPV-PQ32/20-1S-12P
1	44.8	8.9	66.7	CPV-PQ32/20-1S-12PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ32/20



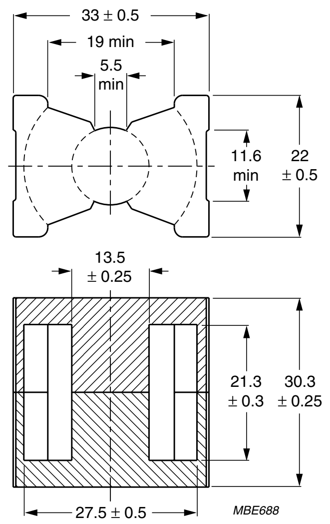
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ32/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.447	mm^{-1}
V_e	effective volume	12500	mm^3
l_e	effective length	74.7	mm
A_e	effective area	167	mm^2
A_{min}	minimum area	142	mm^2
m	mass of set	≈ 62	g



Dimensions in mm.

Fig.1 PQ32/30 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈ 112	≈ 800	PQ32/30-3C81-E315
	400 ±3%	≈ 142	≈ 600	PQ32/30-3C81-A400
	630 ±3%	≈ 224	≈ 350	PQ32/30-3C81-A630
	1000 ±3%	≈ 356	≈ 200	PQ32/30-3C81-A1000
	1600 ±5%	≈ 570	≈ 110	PQ32/30-3C81-A1600
	6570 ±25%	≈ 2340	≈ 0	PQ32/30-3C81
3C90	315 ±3%	≈ 112	≈ 800	PQ32/30-3C90-E315
	400 ±3%	≈ 142	≈ 600	PQ32/30-3C90-A400
	630 ±3%	≈ 224	≈ 350	PQ32/30-3C90-A630
	1000 ±3%	≈ 356	≈ 200	PQ32/30-3C90-A1000
	1600 ±5%	≈ 570	≈ 110	PQ32/30-3C90-A1600
	5040 ±25%	≈ 1790	≈ 0	PQ32/30-3C90
3C91 prot	6570 ±25%	≈ 2340	≈ 0	PQ32/30-3C91
3C94 des	5600 ±25%	≈ 1990	≈ 0	PQ32/30-3C94
3C96 prot	5040 ±25%	≈ 1790	≈ 0	PQ32/30-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈ 112	≈ 800	PQ32/30-3F3-E315
	400 ±3%	≈ 142	≈ 600	PQ32/30-3F3-A400
	630 ±3%	≈ 224	≈ 350	PQ32/30-3F3-A630
	1000 ±3%	≈ 356	≈ 200	PQ32/30-3F3-A1000
	1600 ±5%	≈ 570	≈ 110	PQ32/30-3F3-A1600
	4580 ±25%	≈ 1630	≈ 0	PQ32/30-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 2.6	–	–	–
3C90	≥320	≤ 1.5	≤ 1.6	–	–
3C91	≥320	–	≤ 0.9(1)	≤ 6.0(1)	–
3C94	≥320	–	≤ 1.2	≤ 7.5	–
3C96	≥340	–	≤ 0.9	≤ 6.0	≤ 2.3
3F3	≥320	–	≤ 1.4	–	≤ 2.4

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 4.7	–	–	–
3F3	≥320	–	–	–	–

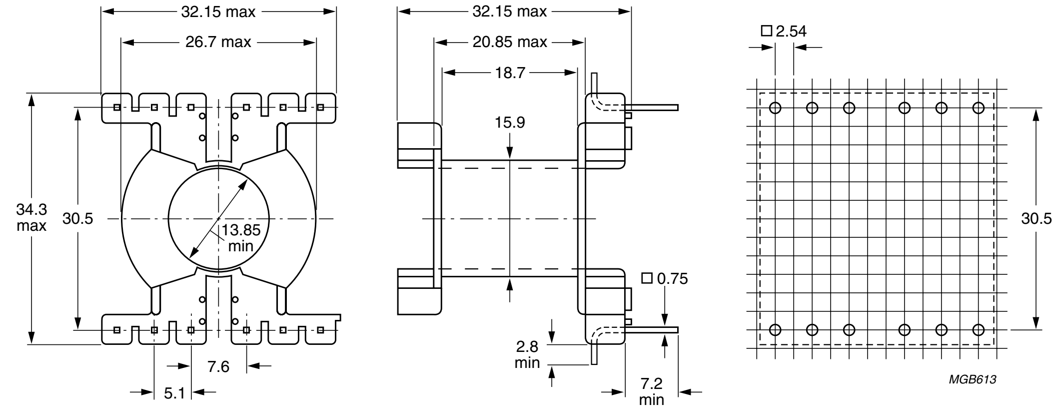
Note

1. Measured at 60 °C.

COIL FORMER

General data 14-pins PQ32/30 coil former

PARAMETER	SPECIFICATION
Coil former material	thermoplastic polyester, glass-reinforced, flame retardant in accordance with *"UL 60094V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 PQ32/30 coil former; 12-pins.

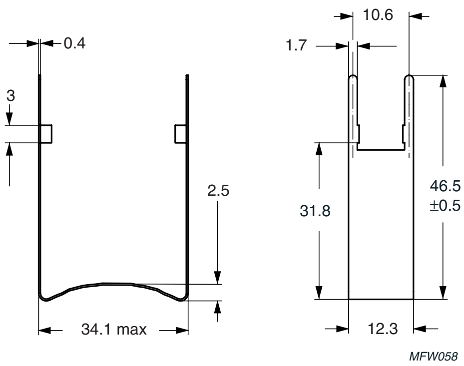
Winding data for 12-pins PQ32/30 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm²)	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	53.0	18.7	66.7	CPV-PQ32/30-1S-12P
1	53.0	18.7	66.7	CPV-PQ32/30-1S-12PD

MOUNTING PARTS

General data

ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to *"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ32/30



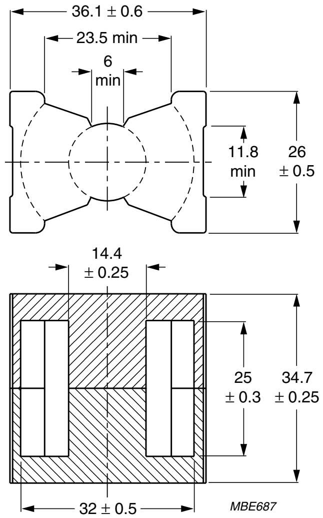
Dimensions in mm.

Fig.3 Clamp CLM/P-PQ32/30

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.454	mm^{-1}
V_e	effective volume	16300	mm^3
l_e	effective length	86.1	mm
A_e	effective area	190	mm^2
A_{min}	minimum area	162	mm^2
m	mass of set	≈ 80	g



Dimensions in mm.

Fig.1 PQ35/35 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	315 ±3%	≈ 114	≈ 920	PQ35/35-3C81-E315
	400 ±3%	≈ 144	≈ 690	PQ35/35-3C81-E400
	630 ±3%	≈ 227	≈ 400	PQ35/35-3C81-A630
	1000 ±3%	≈ 361	≈ 230	PQ35/35-3C81-A1000
	1600 ±5%	≈ 577	≈ 120	PQ35/35-3C81-A1600
	6000 ±25%	≈ 2160	≈ 0	PQ35/35-3C81
3C90	315 ±3%	≈ 114	≈ 920	PQ35/35-3C90-E315
	400 ±3%	≈ 144	≈ 690	PQ35/35-3C90-E400
	630 ±3%	≈ 227	≈ 400	PQ35/35-3C90-A630
	1000 ±3%	≈ 361	≈ 230	PQ35/35-3C90-A1000
	1600 ±5%	≈ 577	≈ 120	PQ35/35-3C90-A1600
	5200 ±25%	≈ 1880	≈ 0	PQ35/35-3C90
3C91 prot	6000 ±25%	≈ 2160	≈ 0	PQ35/35-3C91
3C94 des	5200 ±25%	≈ 1880	≈ 0	PQ35/35-3C94
3C96 prot	4700 ±25%	≈ 1700	≈ 0	PQ35/35-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	315 ±3%	≈ 114	≈ 920	PQ35/35-3F3-E315
	400 ±3%	≈ 144	≈ 690	PQ35/35-3F3-E400
	630 ±3%	≈ 227	≈ 400	PQ35/35-3F3-A630
	1000 ±3%	≈ 361	≈ 230	PQ35/35-3F3-A1000
	1600 ±5%	≈ 577	≈ 120	PQ35/35-3F3-A1600
	4570 ±25%	≈ 1650	≈ 0	PQ35/35-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 3.8	–	–	–
3C90	≥320	≤ 2.0	≤ 2.1	–	–
3C91	≥320	–	≤ 1.2(1)	≤ 8.0(1)	–
3C94	≥320	–	≤ 1.6	≤ 10	–
3C96	≥340	–	≤ 1.2	≤ 8.0	≤ 3.0
3F3	≥320	–	≤ 1.8	–	≤ 3.1

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 6.1	–	–	–
3F3	≥320	–	–	–	–

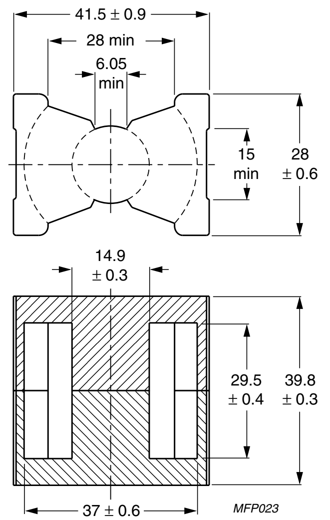
Note

1. Measured at 60 °C.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.507	mm^{-1}
V_e	effective volume	20500	mm^3
l_e	effective length	102	mm
A_e	effective area	201	mm^2
A_{min}	minimum area	175	mm^2
m	mass of set	≈ 95	g



Dimensions in mm.

Fig.1 PQ40/40 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ± 20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C91 prot	6100 ± 25 %	≈ 2460	≈ 0	PQ40/40-3C91
3C94 des	4900 ± 25 %	≈ 1980	≈ 0	PQ40/40-3C94
3C96 prot	4200 ± 25 %	≈ 1690	≈ 0	PQ40/40-3C96

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C91	≥ 320	≤ 1.65(1)	≤ 10(1)	–
3C94	≥ 320	≤ 2.1	≤ 12.6	–
3C96	≥ 340	≤ 1.65	≤ 10	≤ 8.0

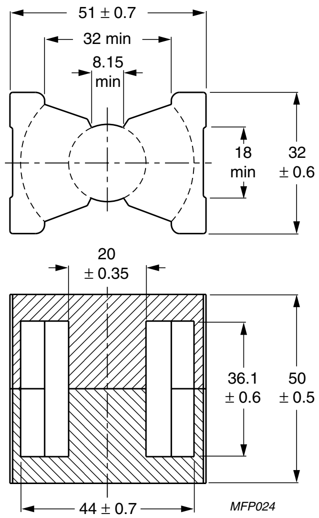
Note

1. Measured at 60 °C.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.345	mm^{-1}
V_e	effective volume	37100	mm^3
l_e	effective length	113	mm
A_e	effective area	328	mm^2
A_{min}	minimum area	314	mm^2
m	mass of set	≈ 195	g



Dimensions in mm.

Fig.1 PQ50/50 core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ± 20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C91 prot	9200 ± 25 %	≈ 2530	≈ 0	PQ50/50-3C91
3C94 des	7400 ± 25 %	≈ 2030	≈ 0	PQ50/50-3C94
3C96 prot	6300 ± 25 %	≈ 1730	≈ 0	PQ50/50-3C96

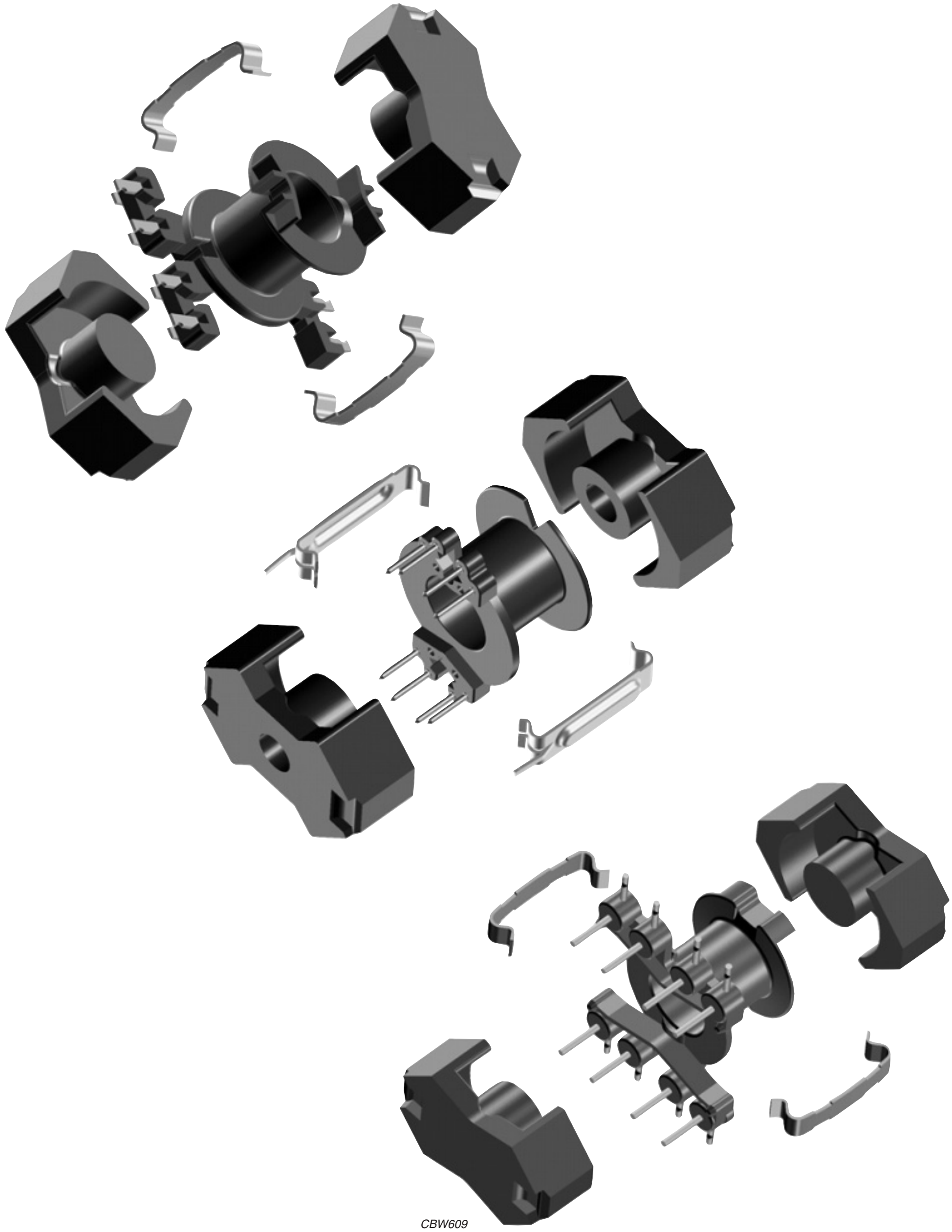
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C91	≥ 320	≤ 2.9(1)	≤ 18(1)	–
3C94	≥ 320	≤ 3.8	≤ 23	–
3C96	≥ 340	≤ 2.9	≤ 18	≤ 14

Note

1. Measured at 60 °C.

RM, RM/I, RM/ILP cores and accessories



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

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview RM cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
RM4	230	11.0	2.5
RM4/I	322	13.8	2.8
RM4/ILP	251	14.5	1.5
RM5	450	21.2	3.0
RM5/I	574	24.8	3.3
RM5/ILP	430	24.5	2.2
RM6S	840	31.4	4.5
RM6S/I	1090	37.0	4.9
RM6S/ILP	820	37.5	4.2
RM6R	810	32.0	4.5
RM7/I	1325	44.1	7.7
RM7/ILP	1060	45.3	6.0
RM8	1850	52.0	10.9
RM8/I	2440	63.0	12.0
RM8/ILP	1860	64.9	10.0
RM10/I	4310	96.6	22
RM10/ILP	3360	99.1	17
RM12/I	8340	146	45
RM12/ILP	6195	148	34
RM14/I	13900	198	74
RM14/ILP	10230	201	55

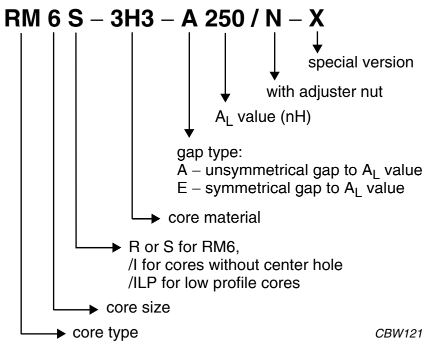


Fig.1 Type number structure for cores.

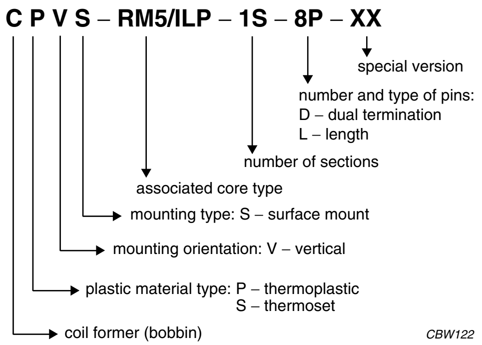
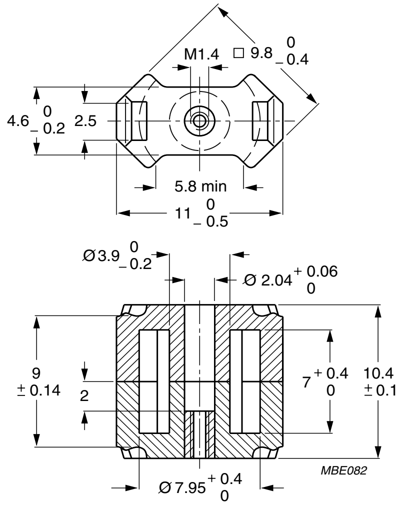


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.94	mm^{-1}
V_e	effective volume	230	mm^3
l_e	effective length	21.3	mm
A_e	effective area	11.0	mm^2
A_{min}	minimum area	8.1	mm^2
m	mass of set	≈ 1.4	g



Dimensions in mm.

Fig.1 RM4 core set.

Core sets for filter applications

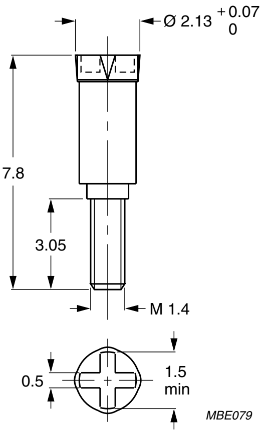
Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	40 ±3%	≈ 62	≈ 470	RM4-3D3-E40/N	RM4-3D3-E40
	63 ±3%	≈ 97	≈ 250	RM4-3D3-A63/N	RM4-3D3-A63
	400 ±25%	≈ 616	≈ 0	−	RM4-3D3
3H3	63 ±3%	≈ 97	≈ 280	RM4-3H3-A63/N	RM4-3H3-A63
	100 ±3%	≈ 154	≈ 160	RM4-3H3-A100/N	RM4-3H3-A100
	160 ±3%	≈ 247	≈ 85	RM4-3H3-A160/N	RM4-3H3-A160
	900 ±25%	≈ 1390	≈ 0	−	RM4-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM4 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L %(1)	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L %(1)	TYPES FOR HIGH ADJUSTMENT	ΔL/L %(1)
3H3; 3D3	63	–	–	–	–	ADJ-RM4/RM5-RED	27
	100	–	–	ADJ-RM4/RM5-RED	17	ADJ-RM4/RM5-BROWN	25
	160	ADJ-RM4/RM5-GREEN	5	ADJ-RM4/RM5-BROWN	14	ADJ-RM4/RM5-GREY	26
	250	ADJ-RM4/RM5-RED	5	ADJ-RM4/RM5-GREY	12	ADJ-RM4/RM5-BLACK	17

Note

1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

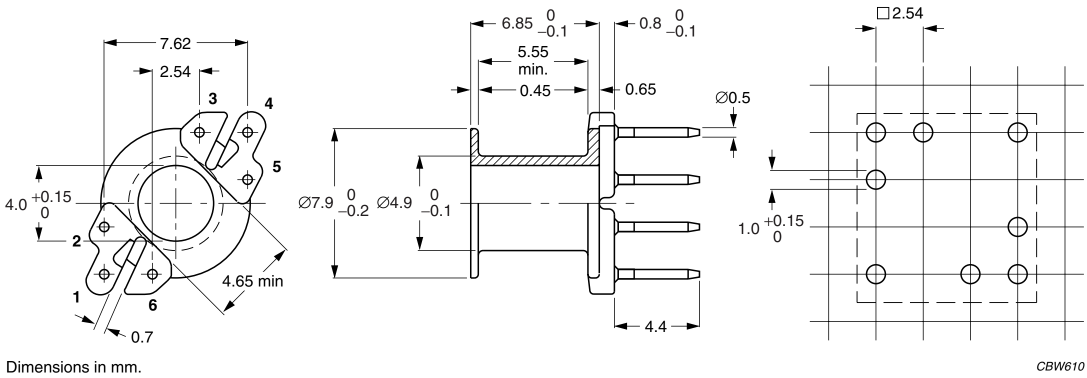


Fig.2 RM4 coil former.

Winding data for RM4 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	6	all	20	7.4	5.55	CSV-RM4-1S-6P(1)
1	5	1, 2, 4, 5, 6	20	7.4	5.55	CSV-RM4-1S-5P(1)

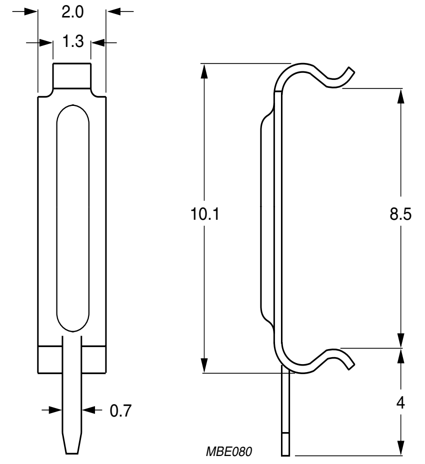
Note

1. Also avilable with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20",* Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



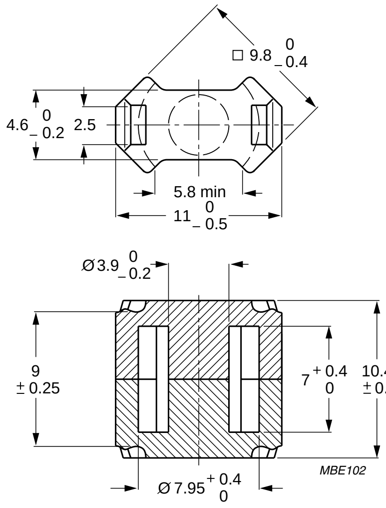
Dimensions in mm.

Fig.3 Mounting clip for RM4.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.69	mm^{-1}
V_e	effective volume	322	mm^3
l_e	effective length	23.3	mm
A_e	effective area	13.8	mm^2
A_{min}	minimum area	11.5	mm^2
m	mass of set	≈ 1.7	g



Dimensions in mm.

Fig.1 RM4/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	1125 ±25%	≈ 1510	≈ 0	RM4/I-3C90
3C94 des	1125 ±25%	≈ 1510	≈ 0	RM4/I-3C94
3C96 prot	1000 ±25%	≈ 1340	≈ 0	RM4/I-3C96
3F3	100 ±3%	≈ 134	≈ 200	RM4/I-3F3-A100
	160 ±3%	≈ 215	≈ 110	RM4/I-3F3-A160
	250 ±10%	≈ 336	≈ 60	RM4/I-3F3-A250
	950 ±25%	≈ 1280	≈ 0	RM4/I-3F3
3F35 prot	800 ±25%	≈ 1080	≈ 0	RM4/I-3F35
3F4 des	100 ±3%	≈ 134	≈ 180	RM4/I-3F4-A100
	160 ±3%	≈ 215	≈ 95	RM4/I-3F4-A160
	250 ±10%	≈ 336	≈ 45	RM4/I-3F4-A250
	560 ±25%	≈ 750	≈ 0	RM4/I-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E5	3500 +40/−30%	≈ 4700	RM4/I-3E5

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.04	≤ 0.04	–	–
3C94	≥320	–	≤ 0.03	≤ 0.2	–
3C96	≥340	–	≤ 0.025	≤ 0.15	≤ 0.07
3F3	≥300	–	≤ 0.05	–	≤ 0.07
3F35	≥300	–	–	–	≤ 0.04
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.15	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.05	≤ 0.4	–	–
3F4	≥250	–	–	≤ 0.07	≤ 0.12

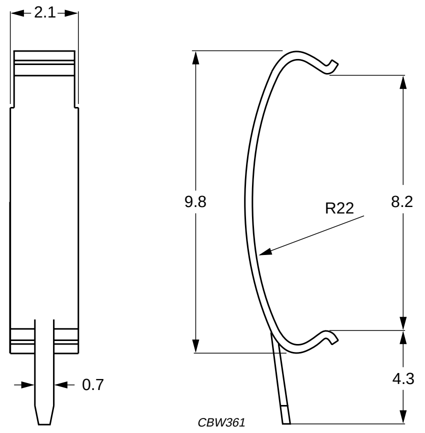
COIL FORMERS

For the information on coil formers suitable for RM4/I, see data sheet *"RM4"*

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈ 5 N
Clip material	stainless steel (CrNi)
Clip plating	lead tin alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

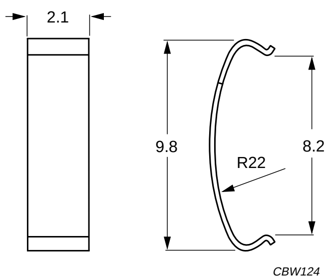


Dimensions in mm.

Fig.2 Mounting clip with earth pin for RM4/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈ 5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/I



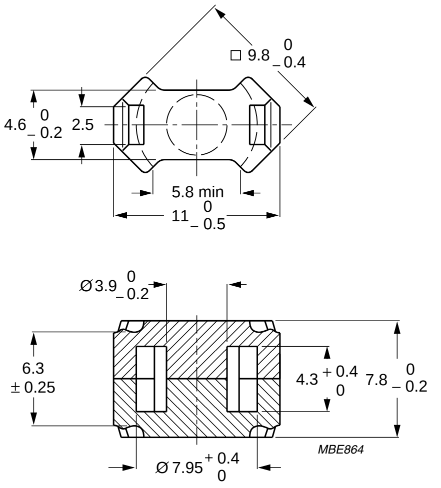
Dimensions in mm.

Fig.3 Mounting clip without earth pin for RM4/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	1.19	mm^{-1}
V_e	effective volume	251	mm^3
l_e	effective length	17.3	mm
A_e	effective area	14.5	mm^2
A_{min}	minimum area	11.3	mm^2
m	mass of set	≈ 1.5	g



Dimensions in mm.

Fig.1 RM4/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	1400 ±25%	≈ 1330	≈ 0	RM4/ILP-3C90
3C94 des	1400 ±25%	≈ 1330	≈ 0	RM4/ILP-3C94
3C96 prot	1250 ±25%	≈ 1190	≈ 0	RM4/ILP-3C96
3F3	1200 ±25%	≈ 1140	≈ 0	RM4/ILP-3F3
3F35 prot	1000 ±25%	≈ 950	≈ 0	RM4/ILP-3F35
3F4 des	750 ±25%	≈ 710	≈ 0	RM4/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 10 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	5000 +40/–30%	≈ 4750	≈ 0	RM4/ILP-3E5
3E6	6000 +40/–30%	≈ 5700	≈ 0	RM4/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.04	≤ 0.04	–	–
3C94	≥320	–	≤ 0.024	≤ 0.13	–
3C96	≥340	–	≤ 0.018	≤ 0.1	≤ 0.06
3F3	≥300	–	≤ 0.04	–	≤ 0.06
3F35	≥300	–	–	–	≤ 0.03
3F4	≥250	–	–	–	–

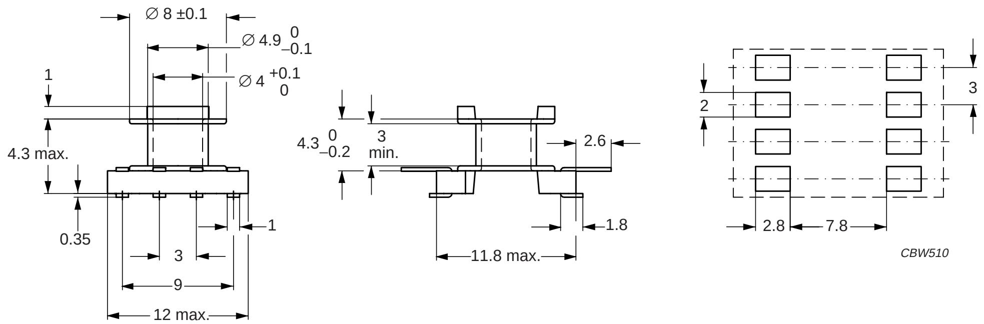
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.1	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.04	≤ 0.3	–	–
3F4	≥250	–	–	≤ 0.08	≤ 0.12

COIL FORMERS

General data SMD coil former

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



Dimensions in mm.

Fig.2 SMD coil former for RM4/ILP.

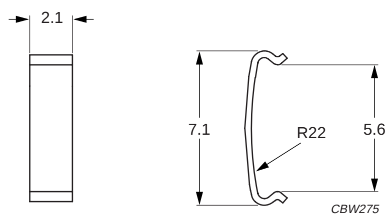
Winding data for RM4/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	3.75	3.0	20.7	CSVS-RM4/LP-1S-8PL

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



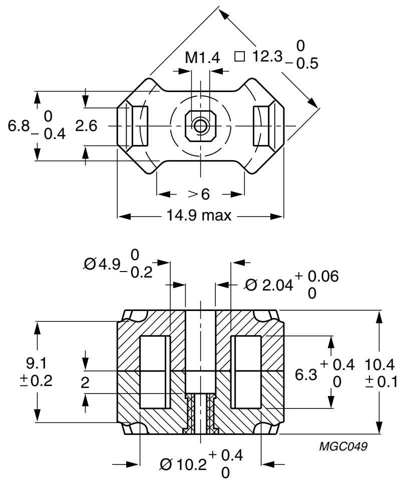
Dimensions in mm.

Fig.3 Mounting clip for RM4/ILP.

CORE SETS

Effective core parameters

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



Dimensions in mm.

Fig.1 RM5 core set.

Core sets for filter applications

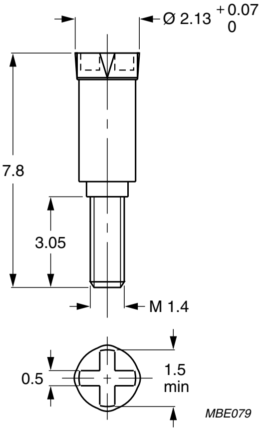
Clamping force for A_L measurements, 25 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	40 ±3%	≈32	≈990	RM5-3D3-E40/N	RM5-3D3-E40
	63 ±3%	≈51	≈540	RM5-3D3-E63/N	RM5-3D3-E63
	100 ±3%	≈80	≈300	RM5-3D3-E100/N	RM5-3D3-E100
	800 ±25%	≈640	≈0	–	RM5-3D3
3H3	160 ±3%	≈129	≈180	RM5-3H3-A160/N	RM5-3H3-A160
	250 ±3%	≈201	≈110	RM5-3H3-A250/N	RM5-3H3-A250
	315 ±3%	≈253	≈80	RM5-3H3-A315/N	RM5-3H3-A315
	400 ±5%	≈321	≈60	RM5-3H3-A400/N	RM5-3H3-A400
	1650 ±25%	≈1310	≈0	–	RM5-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



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)
3H3	63	–	–	–	–	ADJ-RM4/RM5-RED	23
	100	–	–	ADJ-RM4/RM5-RED	15	ADJ-RM4/RM5-BROWN	24
	160	ADJ-RM4/RM5-RED	11	ADJ-RM4/RM5-BROWN	15	ADJ-RM4/RM5-GREY	28
	250	ADJ-RM4/RM5-RED	6	ADJ-RM4/RM5-BROWN	10	ADJ-RM4/RM5-GREY	17
	315	ADJ-RM4/RM5-BROWN	7	ADJ-RM4/RM5-GREY	13	–	–
	400	ADJ-RM4/RM5-BROWN	5	ADJ-RM4/RM5-BLACK	14	–	–
3D3	40	–	–	ADJ-RM4/RM5-GREEN	15	ADJ-RM4/RM5-RED	30
	63	–	–	–	–	ADJ-RM4/RM5-RED	20
	100	–	–	ADJ-RM4/RM5-RED	14	–	–

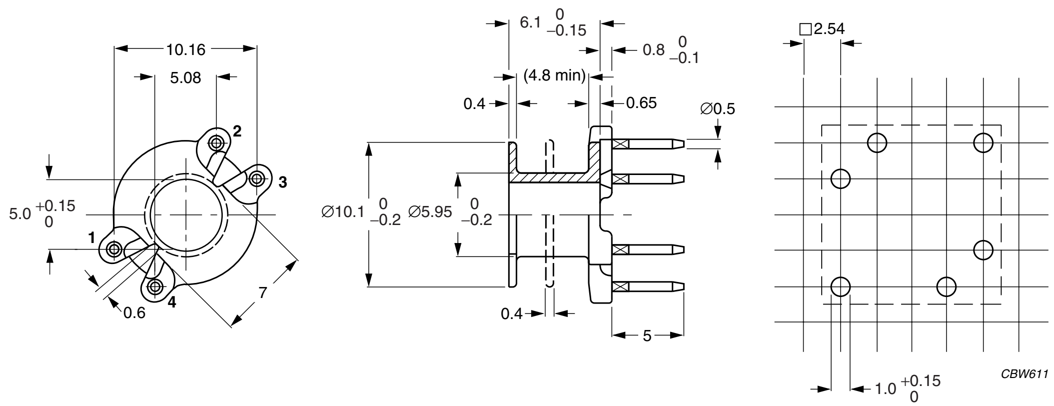
Note

1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"* , class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

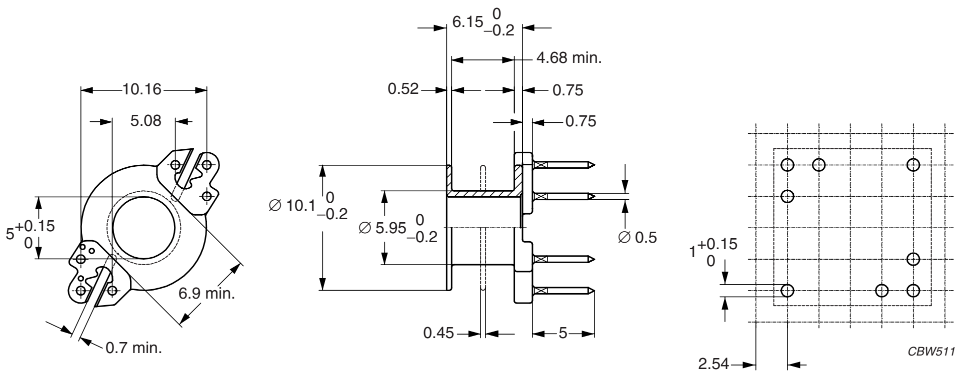
Fig.3 RM5 coil former; 4-pins.

Winding data for 4-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4	all	9.5	4.8	25	CSV-RM5-1S-4P
2	4	all	2 × 4.35	2 × 2.2	25	CSV-RM5-2S-4P

General data coil former

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-tin alloy CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085",* class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 Coil former for RM5; 6-pins

Winding data for 6-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	9.2	4.68	24.9	CSV-RM5-1S-6P-G(1)
1	5	1, 2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-5P-G(1)
1	4	2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-4P-G(1)
2	6	all	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-6P-G(1)
2	5	1, 2, 3, 5, 6	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-5P-G(1)

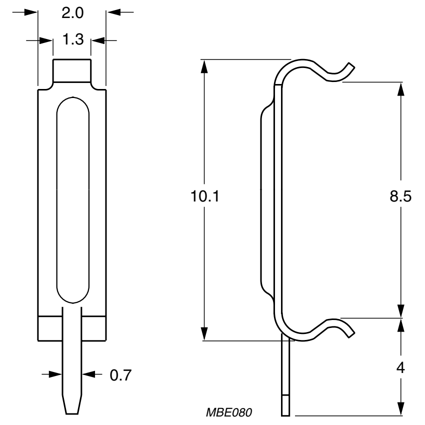
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈12 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5



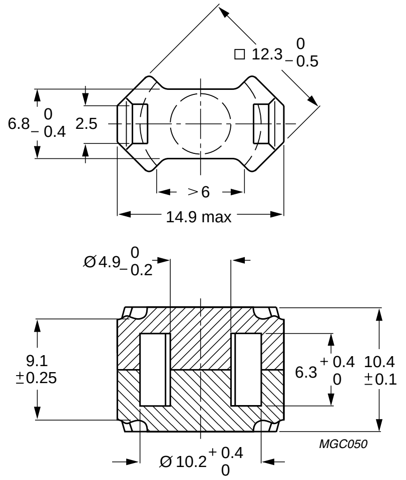
Dimensions in mm.

Fig.5 Mounting clip for RM5.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.935	mm^{-1}
V_e	effective volume	574	mm^3
l_e	effective length	23.2	mm
A_e	effective area	24.8	mm^2
A_{min}	minimum area	18.1	mm^2
m	mass of set	≈ 3.3	g



Dimensions in mm.

Fig.1 RM5/I core set.

Core sets for general purpose

Clamping force for A_L measurements, 12 ±5 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	63 ±3%	≈ 47	≈ 680	RM5/I-3C90-A63
	100 ±3%	≈ 74	≈ 380	RM5/I-3C90-A100
	160 ±3%	≈ 119	≈ 220	RM5/I-3C90-A160
	250 ±3%	≈ 186	≈ 130	RM5/I-3C90-A250
	315 ±5%	≈ 234	≈ 100	RM5/I-3C90-A315
	2000 ±25%	≈ 1490	≈ 0	RM5/I-3C90
3C94 des	63 ±3%	≈ 47	≈ 680	RM5/I-3C94-A63
	100 ±3%	≈ 74	≈ 380	RM5/I-3C94-A100
	160 ±3%	≈ 119	≈ 220	RM5/I-3C94-A160
	250 ±3%	≈ 186	≈ 130	RM5/I-3C94-A250
	315 ±5%	≈ 234	≈ 100	RM5/I-3C94-A315
	2000 ±25%	≈ 1490	≈ 0	RM5/I-3C94
3C96 prot	1800 ±25%	≈ 1340	≈ 0	RM5/I-3C96
3F3	63 ±3%	≈ 47	≈ 680	RM5/I-3F3-A63
	100 ±3%	≈ 74	≈ 380	RM5/I-3F3-A100
	160 ±3%	≈ 119	≈ 220	RM5/I-3F3-A160
	250 ±3%	≈ 186	≈ 130	RM5/I-3F3-A250
	315 ±5%	≈ 234	≈ 100	RM5/I-3F3-A315
	1700 ±25%	≈ 1270	≈ 0	RM5/I-3F3

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F35 prot	1300 ±25%	≈ 970	≈ 0	RM5/I-3F35
3F4 des	100 ±3%	≈ 74	≈ 360	RM5/I-3F4-A100
	160 ±3%	≈ 119	≈ 200	RM5/I-3F4-A160
	250 ±3%	≈ 186	≈ 110	RM5/I-3F4-A250
	900 ±25%	≈ 670	≈ 0	RM5/I-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 12 ±5 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	4975 ± 25%	≈ 3700	RM5/I-3E27
3E5	6700 +40/–30%	≈ 4990	RM5/I-3E5
3E6	8500 +40/–30%	≈ 6330	RM5/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.07	≤ 0.08	–	–
3C94	≥320	–	≤ 0.06	≤ 0.32	–
3C96	≥340	–	≤ 0.04	≤ 0.24	≤ 0.11
3F3	≥315	–	≤ 0.08	–	≤0.11
3F35	≥300	–	–	–	≤ 0.06
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

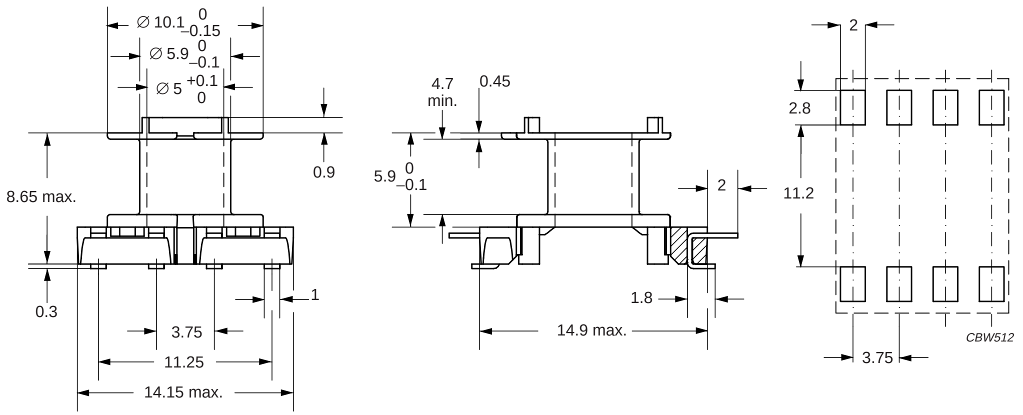
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ =10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.22	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.08	≤ 0.7	–	–
3F4	≥250	–	–	≤ 0.15	≤ 0.25

COIL FORMERS

For the information on other coil formers suitable for RM5/I, see data sheet *"RM5"*

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 SMD coil former for RM5/I.

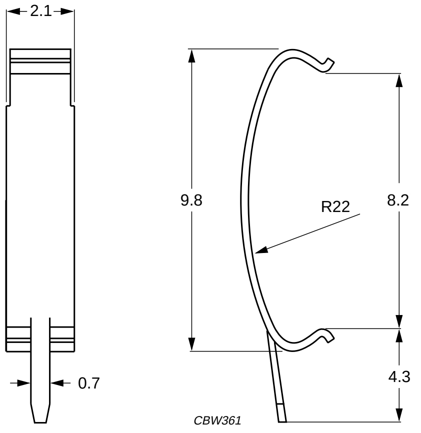
Winding data for RM5/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm²)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	9.5	4.7	24.9	CSVS-RM5-1S-8P

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈6 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I

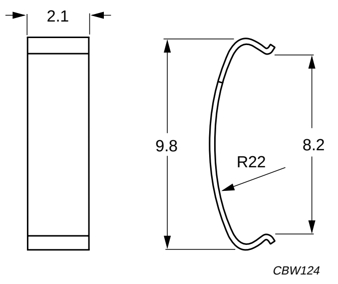


Dimensions in mm.

Fig.3 Mounting clip with earth pin for RM5/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/I



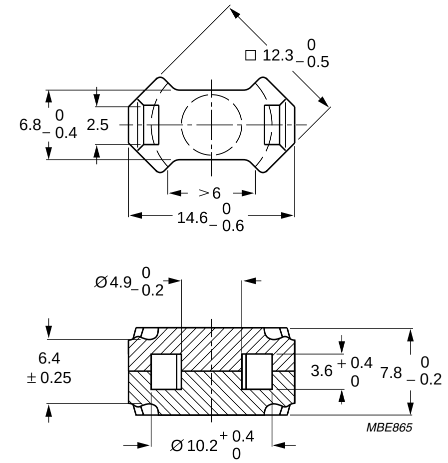
Dimensions in mm.

Fig.4 Mounting clip without earth pin for RM5/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.710	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	17.5	mm
A_e	effective area	24.5	mm^2
A_{min}	minimum area	18.1	mm^2
m	mass of set	≈ 2.2	g



Dimensions in mm.

Fig.1 RM5/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	2350 ±25%	≈ 1340	≈ 0	RM5/ILP-3C90
3C94 des	2350 ±25%	≈ 1340	≈ 0	RM5/ILP-3C94
3C96 prot	2100 ±25%	≈ 1190	≈ 0	RM5/ILP-3C96
3F3	2000 ±25%	≈ 1140	≈ 0	RM5/ILP-3F3
3F35 prot	1700 ±25%	≈ 970	≈ 0	RM5/ILP-3F35
3F4 des	1250 ±25%	≈ 710	≈ 0	RM5/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	8500 +40/−30%	≈ 4830	≈ 0	RM5/ILP-3E5
3E6	10000 +40/−30%	≈ 5680	≈ 0	RM5/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.06	≤ 0.06	–	–
3C94	≥320	–	≤ 0.04	≤ 0.26	–
3C96	≥340	–	≤ 0.03	≤ 0.2	≤ 0.08
3F3	≥300	–	≤ 0.06	–	≤ 0.08
3F35	≥300	–	–	–	≤ 0.06
3F4	≥250	–	–	–	–

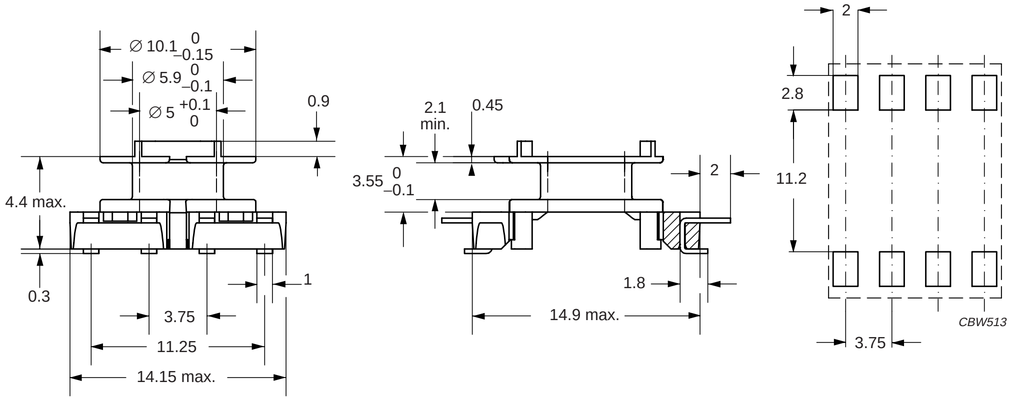
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.16	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.09	≤ 0.6	–	–
3F4	≥250	–	–	≤ 0.12	≤ 0.2

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *“UL 94V-0”*; UL file number: E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *“IEC 60085”,* class F
Resistance to soldering heat	*“IEC 60068-2-20”*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*“IEC 60068-2-20”*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 RM5/ILP SMD coil former.

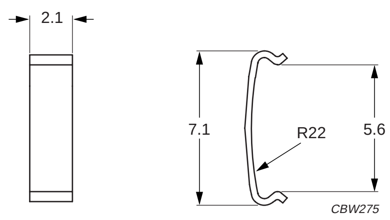
Winding data for 8-pads RM5/ILP SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.6	2.1	24.9	CSVS-RM5/LP-1S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



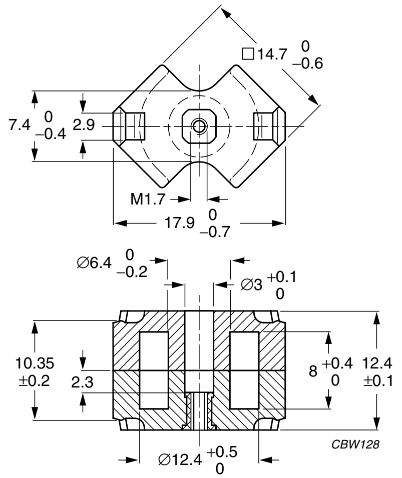
Dimensions in mm.

Fig.3 Mounting clip for RM5/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.810	mm^{-1}
V_e	effective volume	810	mm^3
l_e	effective length	25.6	mm
A_e	effective area	32.0	mm^2
A_{min}	minimum area	23.8	mm^2
m	mass of set	≈ 4.5	g



Dimensions in mm.

Fig.1 RM6R core set.

Core sets for filter applications

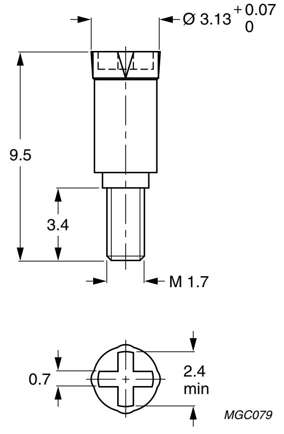
Clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 sup	40 ±3%	≈ 26	≈ 1200	RM6R-3D3-E40/N	RM6R-3D3-E40
	63 ±3%	≈ 41	≈ 700	RM6R-3D3-E63/N	RM6R-3D3-E63
	100 ±3%	≈ 65	≈ 400	RM6R-3D3-E100/N	RM6R-3D3-E100
	160 ±3%	≈ 103	≈ 200	RM6R-3D3-A160/N	RM6R-3D3-A160
	1000 ±25%	≈ 650	≈ 0	−	RM6R-3D3
3H3 sup	160 ±3%	≈ 103	≈ 230	RM6R-3H3-A160/N	RM6R-3H3-A160
	250 ±3%	≈ 161	≈ 110	RM6R-3H3-A250/N	RM6R-3H3-A250
	315 ±3%	≈ 203	≈ 90	RM6R-3H3-A315/N	RM6R-3H3-A315
	400 ±3%	≈ 258	≈ 70	RM6R-3H3-A400/N	RM6R-3H3-A400
	2200 ±25%	≈ 1420	≈ 0	−	RM6R-3H3

INDUCTANCE ADJUSTER

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



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)] %
3H3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	10	ADJ-RM6-RED	16	–	–
	160	ADJ-RM6-GREEN	6	ADJ-RM6-RED	10	ADJ-RM6-WHITE	19
	200	ADJ-RM6-RED	8	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	18
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	20
	315	ADJ-RM6-WHITE	9	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	22
	400	ADJ-RM6-VIOLET	8	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	30
	630	ADJ-RM6-BLACK	9	ADJ-RM6-GREY	15	–	–
	1000	ADJ-RM6-BLACK	5	ADJ-RM6-GREY	8	–	–
	1250	–	–	ADJ-RM6-GREY	5	–	–
3D3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	23
	100	ADJ-RM6-GREEN	9	ADJ-RM6-RED	16	ADJ-RM6-WHITE	28
	160	ADJ-RM6-RED	10	ADJ-RM6-WHITE	17	–	–

Note

1. Maximum adjustment range.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

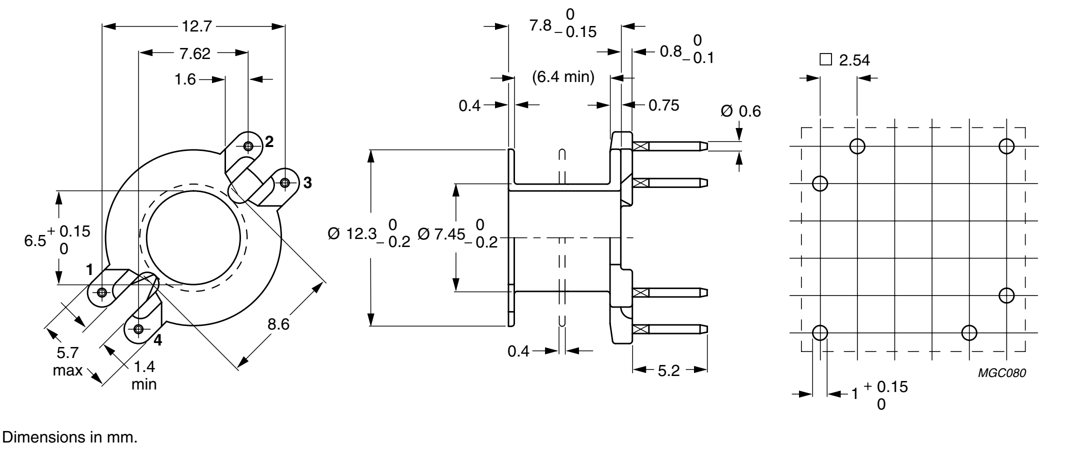
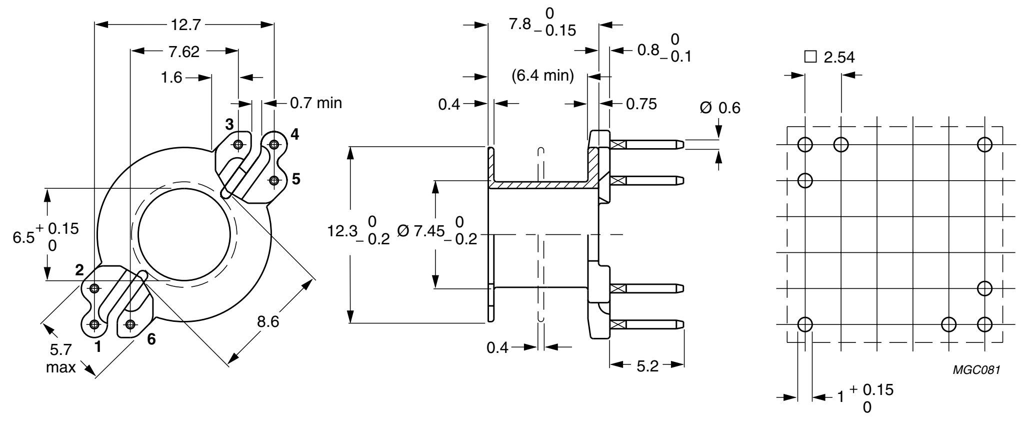


Fig.3 RM6R coil former; 4-pins.

Winding data for 4-pins RM6R coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	4	all	30	15	6.4	CSV-RM6S/R-1S-4P
2	4	all	30	2 × 7.0	2 × 3.0	CSV-RM6S/R-2S-4P



Dimensions in mm.

Fig.4 RM6R coil former; 6-pins.

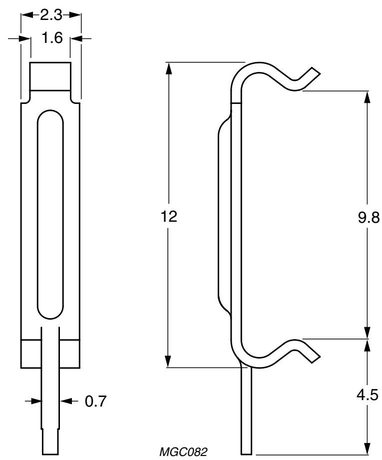
Winding data for 6-pins RM6R coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	6	all	30	15	6.4	CSV-RM6R-1S-6P
2	6	all	30	2 × 7.0	2 × 3.0	CSV-RM6R-2S-6P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



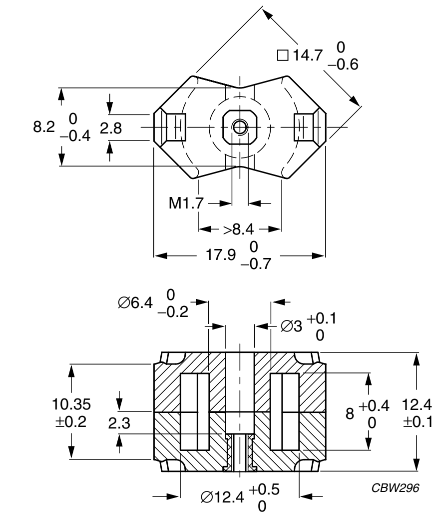
Dimensions in mm.

Fig.5 Mounting clip for RM6R.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.863	mm^{-1}
V_e	effective volume	840	mm^3
l_e	effective length	27.3	mm
A_e	effective area	31.0	mm^2
A_{min}	minimum area	23.8	mm^2
m	mass of set	≈ 4.5	g



Dimensions in mm.

Fig.1 RM6S core set.

Core sets for filter applications

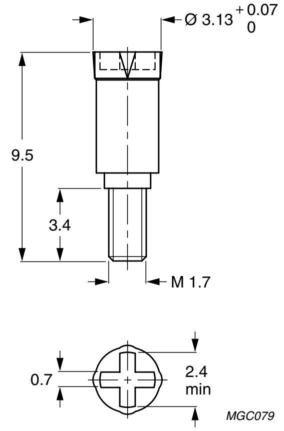
Clamping force for A_L measurements, 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	63 ±3%	≈ 44	≈ 850	RM6S-3D3-E63/N	RM6S-3D3-E63
	100 ±3%	≈ 70	≈ 460	RM6S-3D3-E100/N	RM6S-3D3-E100
	160 ±3%	≈ 112	≈ 250	RM6S-3D3-A160/N	RM6S-3D3-A160
	950 ±25%	≈ 670	≈ 0	–	RM6S-3D3
3H3	160 ±3%	≈ 112	≈ 280	RM6S-3H3-A160/N	RM6S-3H3-A160
	250 ±3%	≈ 175	≈ 160	RM6S-3H3-A250/N	RM6S-3H3-A250
	315 ±3%	≈ 221	≈ 120	RM6S-3H3-A315/N	RM6S-3H3-A315
	400 ±3%	≈ 280	≈ 90	RM6S-3H3-A400/N	RM6S-3H3-A400
	2100 ±25%	≈ 1470	≈ 0	–	RM6S-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM6S inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L$(1) %	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L$(1) %	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L$(1) %
3H3	40	–	–	–	–	ADJ-RM6-GREEN	20
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	10	ADJ-RM6-RED	16	–	–
	160	ADJ-RM6-GREEN	6	ADJ-RM6-RED	11	ADJ-RM6-WHITE	19
	200	ADJ-RM6-RED	9	ADJ-RM6-WHITE	15	ADJ-RM6-VIOLET	19
	250	ADJ-RM6-WHITE	12	ADJ-RM6-VIOLET	14	ADJ-RM6-BROWN	20
	315	ADJ-RM6-WHITE	9	ADJ-RM6-BROWN	15	ADJ-RM6-BLACK	23
	400	ADJ-RM6-VIOLET	8	ADJ-RM6-BLACK	16	ADJ-RM6-GREY	26
	630	ADJ-RM6-BLACK	9	ADJ-RM6-GREY	15	–	–
	1000	ADJ-RM6-BLACK	5	ADJ-RM6-GREY	9	–	–
	1250	–	–	ADJ-RM6-GREY	5	–	–
3D3	40	–	–	–	–	ADJ-RM6-GREEN	19
	63	–	–	ADJ-RM6-GREEN	14	ADJ-RM6-RED	22
	100	ADJ-RM6-GREEN	9	ADJ-RM6-RED	15	ADJ-RM6-WHITE	27
	160	ADJ-RM6-RED	9	ADJ-RM6-WHITE	16	–	–

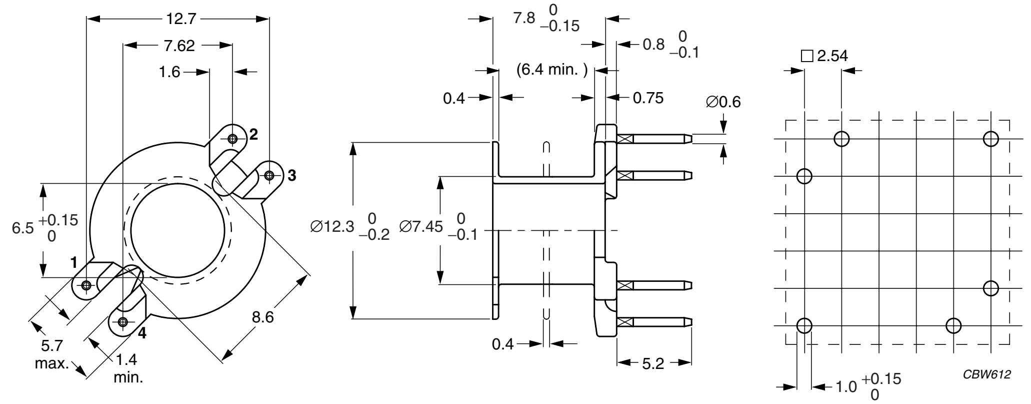
Note

1. Maximum adjustment range.

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"* , class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

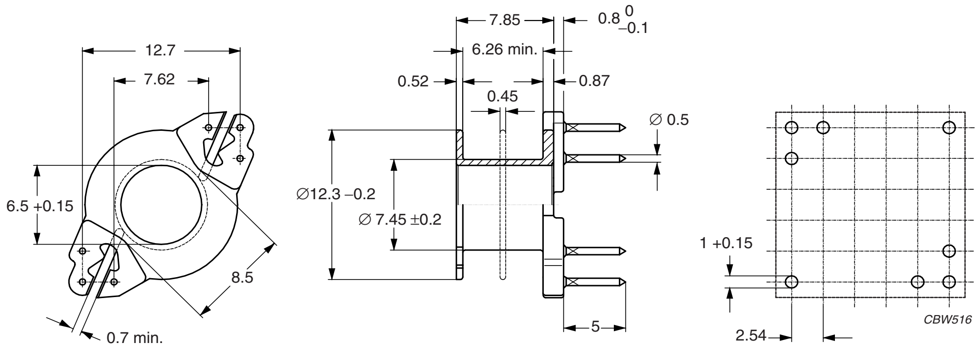
Fig.3 RM6S coil former; 4-pins.

Winding data for 4-pins RM6S coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4	all	15	6.4	30	CSV-RM6S/R-1S-4P
2	4	all	2 × 7.0	2 × 3.0	30	CSV-RM6S/R-2S-4P

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-tin alloy CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 Coil former for RM6S; 6-pins.

Winding data for RM6S coil former

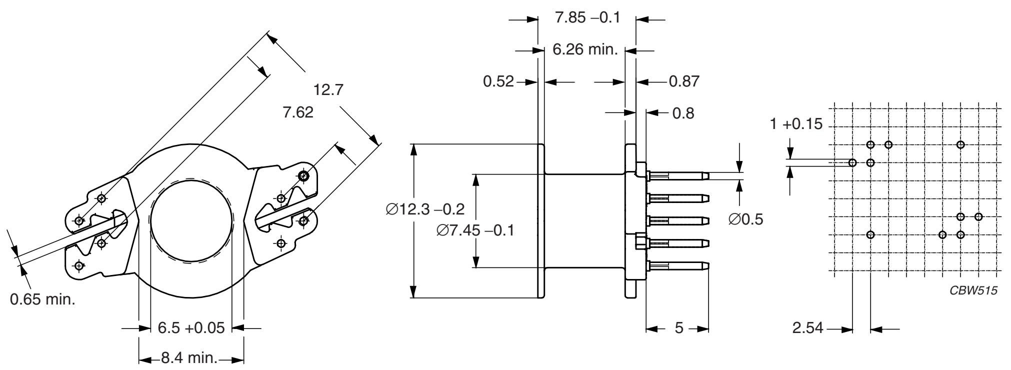
NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	15.0	6.3	30.0	CSV-RM6S-1S-6P-G(1)
1	5	1, 2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-5P-G(1)
1	4	2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-4P-G(1)
2	6	all	2 × 7	2 × 3	30.0	CSV-RM6S-2S-6P-G(1)

Note

1. Also available with post-inserted pins.

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085",* class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.5 Coil former for RM6S; 8-pins.

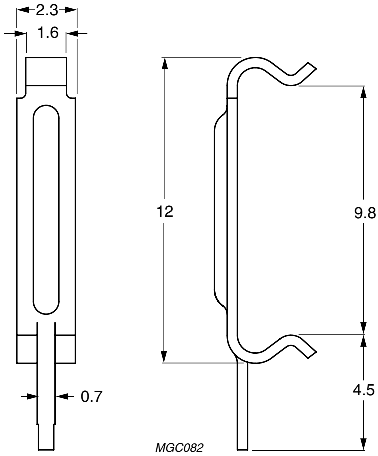
Winding data for RM6S coil former

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14.5	6.26	30.7	CSV-RM6S-1S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6



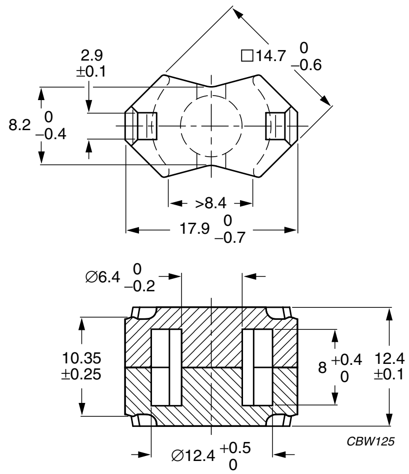
Dimensions in mm.

Fig.6 Mounting clip for RM6S.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.784	mm^{-1}
V_e	effective volume	1090	mm^3
l_e	effective length	29.2	mm
A_e	effective area	37.0	mm^2
A_{min}	minimum area	31.2	mm^2
m	mass of set	≈ 4.9	g



Dimensions in mm.

Fig.1 RM6S/I core set.

Core sets for filter applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	160 ±3%	≈ 100	≈ 300	RM6S/I-3D3-A160
	250 ±5%	≈ 156	≈ 170	RM6S/I-3D3-A250
	315 ±8%	≈ 197	≈ 120	RM6S/I-3D3-A315
	1050 ±25%	≈ 655	≈ 0	RM6S/I-3D3
3H3 des	315 ±3%	≈ 198	≈ 150	RM6S/I-3H3-A315
	400 ±3%	≈ 251	≈ 110	RM6S/I-3H3-A400
	630 ±5%	≈ 396	≈ 65	RM6S/I-3H3-A630
	2350 ±25%	≈ 1470	≈ 0	RM6S/I-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	63 ±3%	≈ 40	≈ 1080	RM6S/I-3C81-E63
	100 ±3%	≈ 63	≈ 600	RM6S/I-3C81-A100
	160 ±3%	≈ 100	≈ 340	RM6S/I-3C81-A160
	250 ±3%	≈ 157	≈ 200	RM6S/I-3C81-A250
	315 ±3%	≈ 198	≈ 150	RM6S/I-3C81-A315
	3000 ±25%	≈ 1870	≈ 0	RM6S/I-3C81

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	63 ±3%	≈ 40	≈ 1080	RM6S/I-3C90-A63
	100 ±3%	≈ 63	≈ 600	RM6S/I-3C90-A100
	160 ±3%	≈ 100	≈ 340	RM6S/I-3C90-A160
	250 ±3%	≈ 157	≈ 200	RM6S/I-3C90-A250
	315 ±3%	≈ 198	≈ 150	RM6S/I-3C90-A315
	400 ±3%	≈ 251	≈ 110	RM6S/I-3C90-A400
	630 ±5%	≈ 396	≈ 65	RM6S/I-3C90-A630
	2600 ±25%	≈ 1630	≈ 0	RM6S/I-3C90
3C91 prot	3000 ±25%	≈ 1880	≈ 0	RM6S/I-3C91
3C94	63 ±3%	≈ 40	≈ 1080	RM6S/I-3C94-A63
	100 ±3%	≈ 63	≈ 600	RM6S/I-3C94-A100
	160 ±3%	≈ 100	≈ 340	RM6S/I-3C94-A160
	250 ±3%	≈ 157	≈ 200	RM6S/I-3C94-A250
	315 ±3%	≈ 198	≈ 150	RM6S/I-3C94-A315
	400 ±3%	≈ 251	≈ 110	RM6S/I-3C94-A400
	630 ±5%	≈ 396	≈ 65	RM6S/I-3C94-A630
	2600 ±25%	≈ 1630	≈ 0	RM6S/I-3C94
3C96 des	2350 ±25%	≈ 1470	≈ 0	RM6S/I-3C96
3F3	63 ±3%	≈ 40	≈ 1080	RM6S/I-3F3-A63
	100 ±3%	≈ 63	≈ 600	RM6S/I-3F3-A100
	160 ±3%	≈ 100	≈ 340	RM6S/I-3F3-A160
	250 ±3%	≈ 157	≈ 200	RM6S/I-3F3-A250
	315 ±3%	≈ 198	≈ 150	RM6S/I-3F3-A315
	2150 ±25%	≈ 1350	≈ 0	RM6S/I-3F3
3F35 prot	1750 ±25%	≈ 1100	≈ 0	RM6S/I-3F35
3F4 des	63 ±3%	≈ 39	≈ 1040	RM6S/I-3F4-A63
	100 ±3%	≈ 62	≈ 570	RM6S/I-3F4-A100
	160 ±3%	≈ 100	≈ 310	RM6S/I-3F4-A160
	250 ±3%	≈ 156	≈ 170	RM6S/I-3F4-A250
	315 ±3%	≈ 197	≈ 130	RM6S/I-3F4-A315
	1250 ±25%	≈ 780	≈ 0	RM6S/I-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	6000 ± 25%	≈ 3770	RM6S/I-3E27
3E5	8600 +40/–30%	≈ 5400	RM6S/I-3E5
3E6	11000 +40/–30%	≈ 6910	RM6S/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.25	–	–	–
3C90	≥320	≤ 0.13	≤ 0.14	–	–
3C91	≥315	–	≤ 0.08(1)	≤ 0.4(1)	–
3C94	≥320	–	≤ 0.11	≤ 0.6	–
3C96	≥340	–	≤ 0.08	≤ 0.4	≤ 0.2
3F3	≥315	–	≤ 0.14	–	≤ 0.2
3F35	≥315	–	–	–	≤ 0.12
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.5	–	–	–
3F3	≥315	–	–	–	–
3F35	≥315	≤ 0.16	≤ 1.3	–	–
3F4	≥250	–	–	≤ 0.3	≤ 0.5

Note

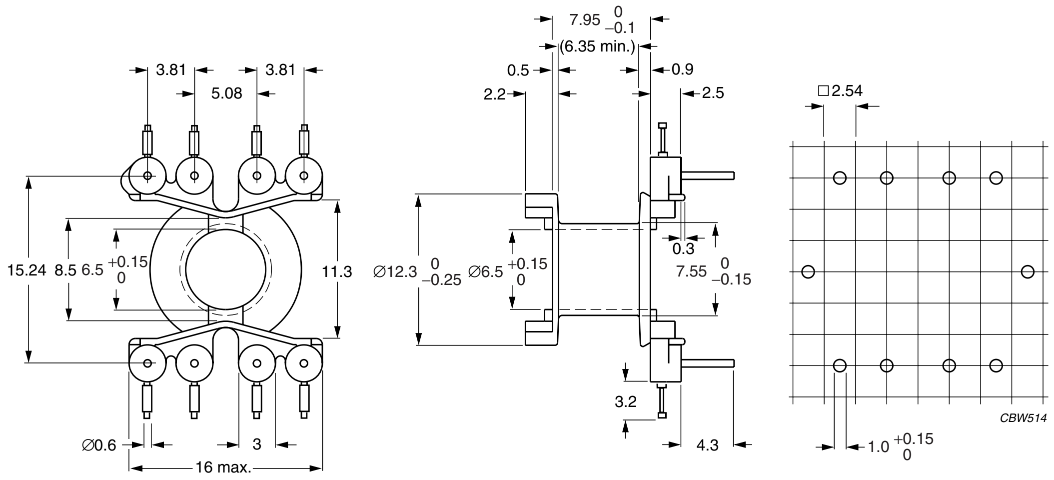
1. Measured at 60 °C.

COIL FORMERS

General data

For the information on other coil formers suitable for RM6S/I, see data sheet *"RM6S"*.

PARAMETER	DESCRIPTION
Coil former material	polybutyleneterephthalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

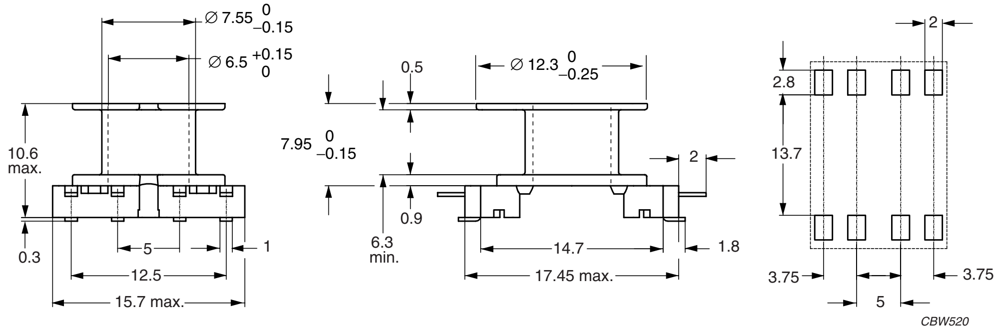
Fig.2 RM6S/I coil former; 8-pins (DIL).

Winding data for 8-pins RM6S/I coil former (DIL)

NUMBER OF SECTIONS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.7	6.2	31	CPV-RM6S/I-1S-8PD

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

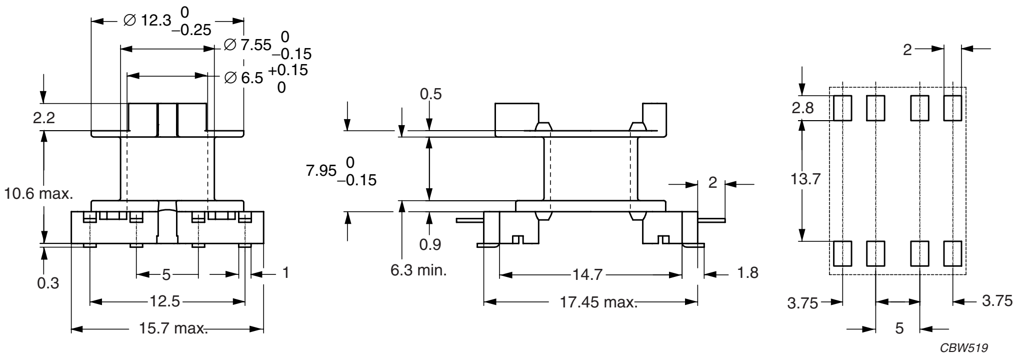
Fig.3 SMD coil former for RM6S/I.

Winding data for RM6S/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14	6.3	31	CSVS-RM6S-1S-8P

General data SMD coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.4 SMD coil former for RM6S/I.

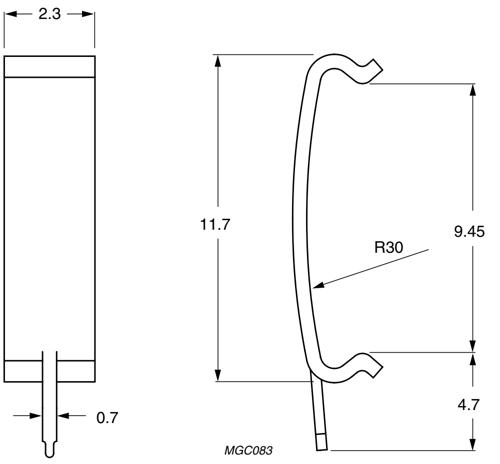
Winding data for RM6S/I coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14.2	6.3	31.4	CSVS-RM6S-1S-8P-B

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM6/I

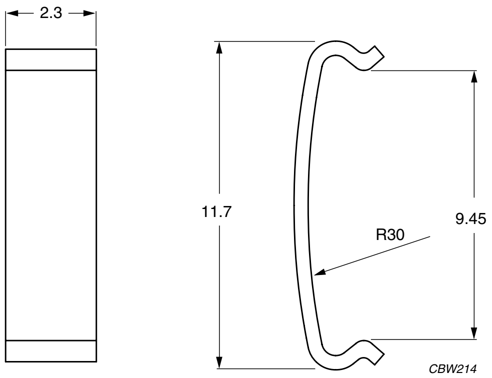


Dimensions in mm.

Fig.5 Mounting clip with earth pin for RM6/I.

General data mounting clip without earth pin

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/I



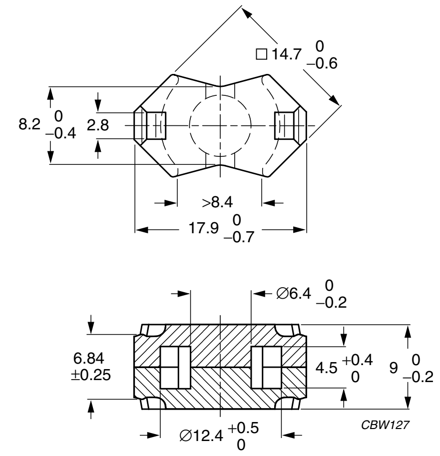
Dimensions in mm.

Fig.6 Mounting clip without earth pin for RM6/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.580	mm^{-1}
V_e	effective volume	820	mm^3
l_e	effective length	21.8	mm
A_e	effective area	37.5	mm^2
A_{min}	minimum area	31.2	mm^2
m	mass of set	≈ 4.2	g



Dimensions in mm.

Fig.1 RM6S/ILP core set.

Core sets for filter applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	160 ±3%	≈74	≈310	RM6S/ILP-3D3-A160
	250 ±5%	≈116	≈180	RM6S/ILP-3D3-A250
	315 ±5%	≈146	≈130	RM6S/ILP-3D3-A315
	1350 ±25%	≈625	≈0	RM6S/ILP-3D3
3H3 des	315 ±3%	≈146	≈150	RM6S/ILP-3H3-A315
	400 ±5%	≈185	≈120	RM6S/ILP-3H3-A400
	630 ±8%	≈291	≈70	RM6S/ILP-3H3-A630
	2900 ±25%	≈1340	≈0	RM6S/ILP-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3175 ±25%	≈1470	≈0	RM6S/ILP-3C90
3C94 des	3175 ±25%	≈1470	≈0	RM6S/ILP-3C94
3C96 prot	2900 ±25%	≈1340	≈0	RM6S/ILP-3C96
3F3	2700 ±25%	≈1250	≈0	RM6S/ILP-3F3
3F35 prot	2200 ±25%	≈1020	≈0	RM6S/ILP-3F35
3F4 des	1600 ±25%	≈740	≈0	RM6S/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 20 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5	10500 +40/–30%	≈ 4860	≈ 0	RM6S/ILP-3E5
3E6	13000 +40/–30%	≈ 6010	≈ 0	RM6S/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.10	≤ 0.11	–	–
3C94	≥320	–	≤ 0.08	≤ 0.45	–
3C96	≥340	–	≤ 0.06	≤ 0.35	≤ 0.15
3F3	≥300	–	≤ 0.10	–	≤ 0.15
3F35	≥300	–	–	–	≤ 0.08
3F4	≥250	–	–	–	–

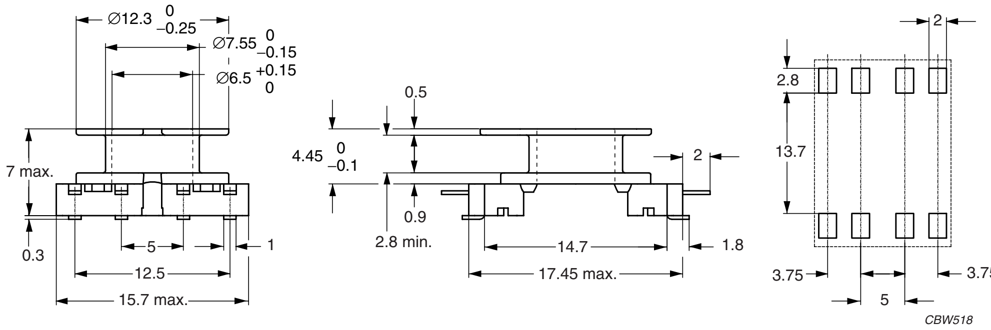
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.3	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.15	≤ 1.0	–	–
3F4	≥250	–	–	≤ 0.25	≤ 0.4

COIL FORMERS

General data

PARAMETER	DESCRIPTION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

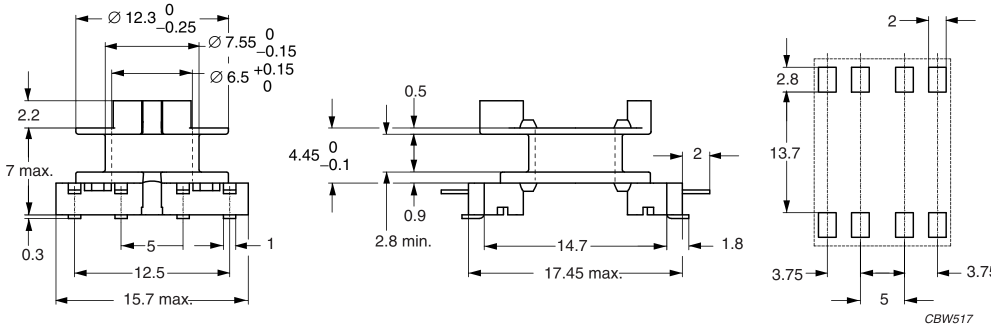
Fig.2 SMD coil former for RM6S/ILP.

Winding data for RM6S/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.3	2.85	31.0	CSVS-RM6S/LP-1S-8P

General data (continued)

PARAMETER	DESCRIPTION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 SMD coil former for RM6S/ILP.

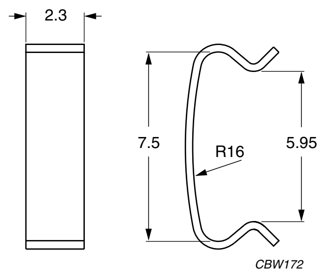
Winding data for RM6S/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.4	2.85	31.4	CSVS-RM6S/LP-1S-8P-B

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/ILP



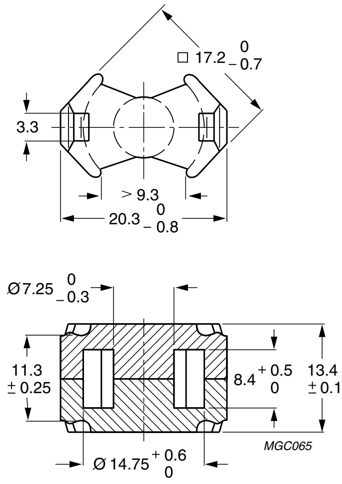
Dimensions in mm.

Fig.4 Mounting clip for RM6/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.680	mm^{-1}
V_e	effective volume	1325	mm^3
l_e	effective length	30.0	mm
A_e	effective area	44.1	mm^2
A_{min}	minimum area	39.6	mm^2
m	mass of set	≈ 7.7	g



Dimensions in mm.

Fig.1 RM7/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	100 ±3%	≈ 54	≈ 730	RM7/I-3C90-A100
	160 ±3%	≈ 87	≈ 410	RM7/I-3C90-A160
	250 ±3%	≈ 135	≈ 240	RM7/I-3C90-A250
	3000 ±25%	≈ 1620	≈ 0	RM7/I-3C90
3F3	100 ±3%	≈ 54	≈ 730	RM7/I-3F3-A100
	160 ±3%	≈ 87	≈ 410	RM7/I-3F3-A160
	250 ±3%	≈ 135	≈ 240	RM7/I-3F3-A250
	2500 ±25%	≈ 1350	≈ 0	RM7/I-3F3

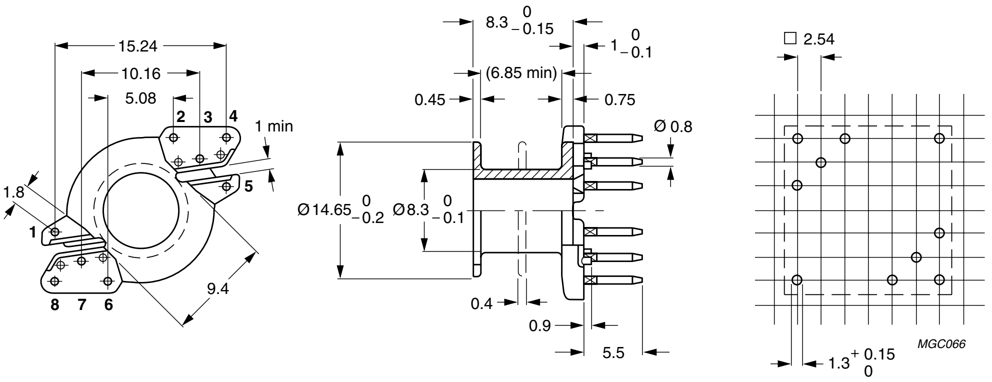
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.16	≤ 0.17	–
3F3	≥315	–	≤ 0.15	≤ 0.25

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085",* class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM7/I coil former.

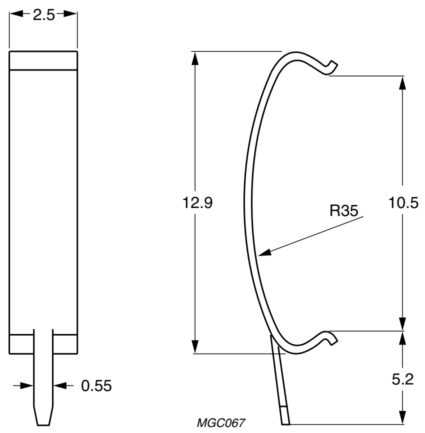
Winding data for RM7/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	4	1, 2, 5, 6	35	21	6.85	CSV-RM7-1S-4P
1	8	all	35	21	6.85	CSV-RM7-1S-8P
2	8	all	35	2 × 9.8	2 × 3.2	CSV-RM7-2S-8P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM7



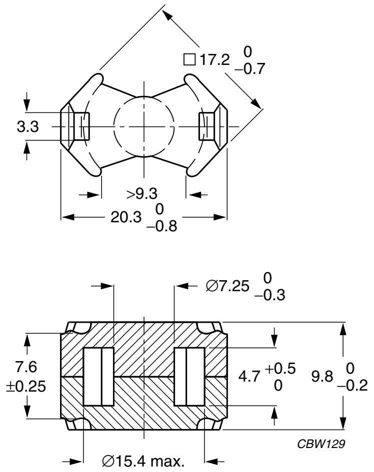
Dimensions in mm.

Fig.3 Mounting clip for RM7/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.520	mm^{-1}
V_e	effective volume	1 060	mm^3
l_e	effective length	23.5	mm
A_e	effective area	45.3	mm^2
A_{min}	minimum area	39.6	mm^2
m	mass of set	≈ 6.0	g



Dimensions in mm.

Fig.1 RM7/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements 40 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	3650 ±25%	≈ 1510	≈ 0	RM7/ILP-3C90
3F3	3100 ±25%	≈ 1280	≈ 0	RM7/ILP-3F3
3F4 des	1800 ±25%	≈ 740	≈ 0	RM7/ILP-3F4

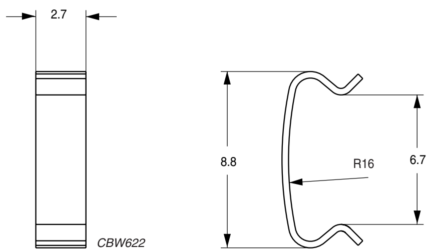
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	≤ 0.13	≤ 0.14	–	–	–
3F3	≥300	–	≤ 0.12	≤ 0.20	–	–
3F4	≥250	–	–	–	≤ 0.3	≤ 0.5

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI-RM7/ILP



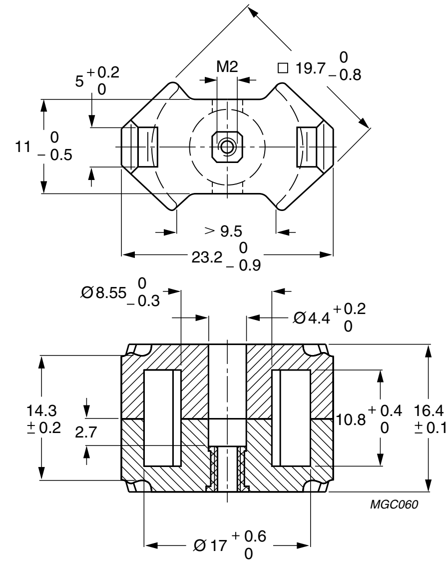
Dimensions in mm.

Fig.2 Mounting clip for RM7/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.683	mm^{-1}
V_e	effective volume	1850	mm^3
l_e	effective length	35.5	mm
A_e	effective area	52.0	mm^2
A_{min}	minimum area	39.5	mm^2
m	mass of set	≈ 10.9	g



Dimensions in mm.

Fig.1 RM8 core set.

Core sets for filter applications

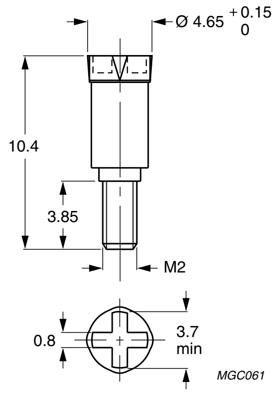
Clamping force for A_L measurements, 60 ±30 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3	100 ±3%	≈ 54	≈ 840	RM8-3D3-E100/N	RM8-3D3-E100
	160 ±3%	≈ 87	≈ 450	RM8-3D3-E160/N	RM8-3D3-E160
	1240 ±25%	≈ 675	≈ 0	–	RM8-3D3
3H3	250 ±3%	≈ 136	≈ 290	RM8-3H3-A250/N	RM8-3H3-A250
	315 ±3%	≈ 171	≈ 220	RM8-3H3-A315/N	RM8-3H3-A315
	400 ±3%	≈ 217	≈ 160	RM8-3H3-A400/N	RM8-3H3-A400
	630 ±5%	≈ 342	≈ 90	RM8-3H3-A630/N	RM8-3H3-A630
	2850 ±25%	≈ 1550	≈ 0	–	RM8-3H3

INDUCTANCE ADJUSTERS

General data

PARAMETER	SPECIFICATION
Material of head and thread	polypropylene (PP), glass fibre reinforced
Maximum operating temperature	125 °C



Dimensions in mm.

Fig.2 RM8 inductance adjuster.

Inductance adjuster selection chart

GRADE	A_L (nH)	TYPES FOR LOW ADJUSTMENT	∆L/L %(1)	TYPES FOR MEDIUM ADJUSTMENT	∆L/L %(1)	TYPES FOR HIGH ADJUSTMENT	∆L/L %(1)
3H3	63	–	–	–	–	ADJ-P22/RM8-RED	24
	100	–	–	ADJ-P22/RM8-RED	16	ADJ-P22/RM8-ORANGE	21
	160	–	–	ADJ-P22/RM8-ORANGE	14	ADJ-P22/RM8-YELLOW	18
	250	ADJ-P22/RM8-RED	7	ADJ-P22/RM8-YELLOW	12	ADJ-P22/RM8-WHITE	18
	315	ADJ-P22/RM8-YELLOW	9	ADJ-P22/RM8-WHITE	13	ADJ-P22/RM8-BROWN	21
	400	ADJ-P22/RM8-YELLOW	7	ADJ-P22/RM8-WHITE	10	ADJ-P22/RM8-BROWN	15
	630	ADJ-P22/RM8-YELLOW	4	ADJ-P22/RM8-BROWN	8	ADJ-P22/RM8-BLACK	13
3D3	63	–	–	–	–	ADJ-P22/RM8-RED	23
	100	–	–	ADJ-P22/RM8-RED	15	ADJ-P22/RM8-ORANGE	22
	160	–	–	ADJ-P22/RM8-ORANGE	14	ADJ-P22/RM8-YELLOW	17

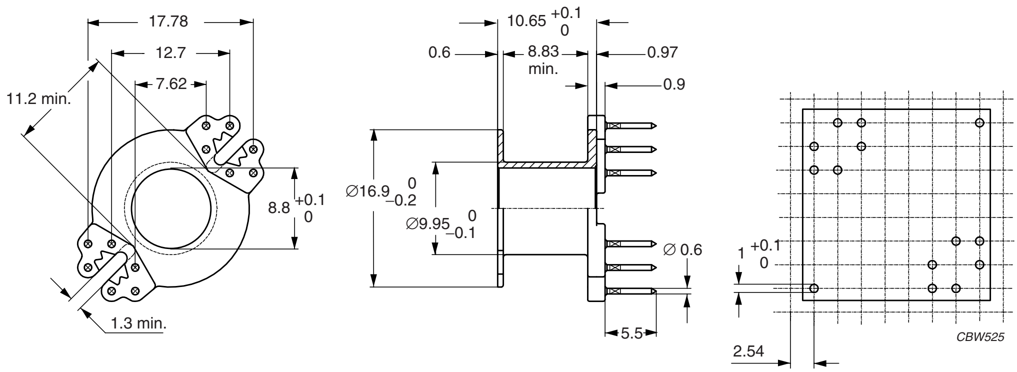
Note

1. Maximum adjustment range.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	unsaturated polyester (UP), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E61040 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"* , class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM8 coil former.

Winding data for RM8 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	8	1, 2, 5, 6, 7, 8, 11, 12	42	30	9.1	CSV-RM8-1S-8P-G(1)
1	12	all	42	30	9.1	CSV-RM8-1S-12P-G(1)
2	8	1, 2, 5, 6, 7, 8, 11, 12	42	2 × 13.5	2 × 4.3	CSV-RM8-2S-8P-G
2	12	all	42	2 × 13.5	2 × 4.3	CSV-RM8-2S-12P-G

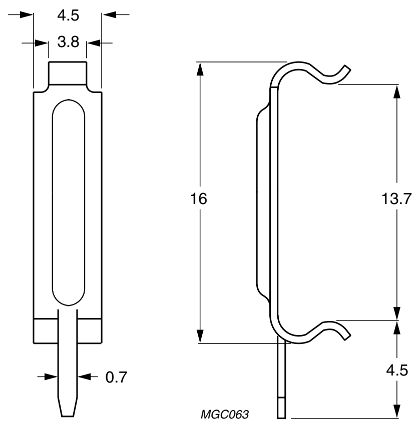
Note

1. Also available with post-inserted pins.

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8



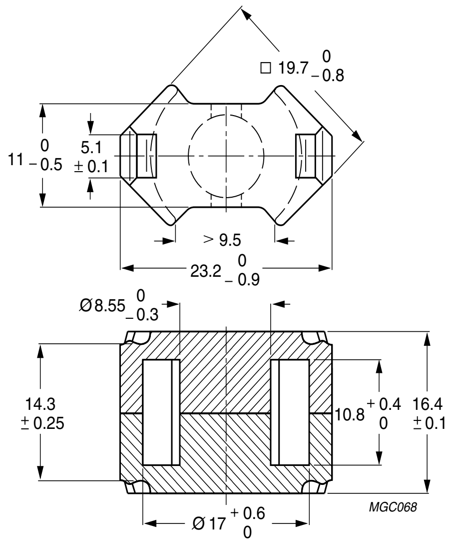
Dimensions in mm.

Fig.4 Mounting clip for RM8.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.604	mm^{-1}
V_e	effective volume	2440	mm^3
l_e	effective length	38.4	mm
A_e	effective area	63.0	mm^2
A_{min}	minimum area	55.4	mm^2
m	mass of set	≈ 12.0	g



Dimensions in mm.

Fig.1 RM8/I core set.

Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	250 ±3%	≈ 121	≈ 360	RM8/I-3D3-A250
	315 ±5%	≈ 153	≈ 270	RM8/I-3D3-A315
	400 ±5%	≈ 194	≈ 200	RM8/I-3D3-A400
	1400 ±25%	≈ 675	≈ 0	RM8/I-3D3
3H3 des	400 ±3%	≈ 194	≈ 200	RM8/I-3H3-A400
	630 ±5%	≈ 306	≈ 115	RM8/I-3H3-A630
	1000 ±10%	≈ 485	≈ 65	RM8/I-3H3-A1000
	3250 ±25%	≈ 1560	≈ 0	RM8/I-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	100 ±3%	≈ 49	≈ 1100	RM8/I-3C81-E100
	160 ±3%	≈ 78	≈ 610	RM8/I-3C81-A160
	250 ±3%	≈ 121	≈ 360	RM8/I-3C81-A250
	315 ±3%	≈ 153	≈ 270	RM8/I-3C81-A315
	400 ±3%	≈ 194	≈ 200	RM8/I-3C81-A400
	4100 ±25%	≈ 1990	≈ 0	RM8/I-3C81
3C90	100 ±3%	≈ 49	≈ 1100	RM8/I-3C90-A100
	160 ±3%	≈ 78	≈ 610	RM8/I-3C90-A160
	250 ±3%	≈ 121	≈ 360	RM8/I-3C90-A250
	315 ±3%	≈ 153	≈ 270	RM8/I-3C90-A315
	400 ±3%	≈ 194	≈ 200	RM8/I-3C90-A400
	3300 ±25%	≈ 1600	≈ 0	RM8/I-3C90
3C91 prot	4100 ±25%	≈ 1990	≈ 0	RM8/I-3C91
3C94 des	100 ±3%	≈ 49	≈ 1100	RM8/I-3C94-A100
	160 ±3%	≈ 78	≈ 610	RM8/I-3C94-A160
	250 ±3%	≈ 121	≈ 360	RM8/I-3C94-A250
	315 ±3%	≈ 153	≈ 270	RM8/I-3C94-A315
	400 ±3%	≈ 194	≈ 200	RM8/I-3C94-A400
	3300 ±25%	≈ 1600	≈ 0	RM8/I-3C94
3C96 prot	3000 ±25%	≈ 1440	≈ 0	RM8/I-3C96
3F3	100 ±3%	≈ 49	≈ 1100	RM8/I-3F3-A100
	160 ±3%	≈ 78	≈ 610	RM8/I-3F3-A160
	250 ±3%	≈ 121	≈ 360	RM8/I-3F3-A250
	315 ±3%	≈ 153	≈ 270	RM8/I-3F3-A315
	400 ±3%	≈ 194	≈ 200	RM8/I-3F3-A400
	3000 ±25%	≈ 1440	≈ 0	RM8/I-3F3
3F35 prot	2400 ±25%	≈ 1150	≈ 0	RM8/I-3F35
3F4 des	100 ±3%	≈ 49	≈ 1100	RM8/I-3F4-A100
	160 ±3%	≈ 78	≈ 610	RM8/I-3F4-A160
	250 ±3%	≈ 121	≈ 360	RM8/I-3F4-A250
	315 ±3%	≈ 153	≈ 270	RM8/I-3F4-A315
	400 ±3%	≈ 194	≈ 200	RM8/I-3F4-A400
	1700 ±25%	≈ 820	≈ 0	RM8/I-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	8000 ± 25%	≈ 3880	RM8/I-3E27
3E5	12500 +40/–30%	≈ 6060	RM8/I-3E5
3E6	15500 +40/–30%	≈ 7520	RM8/I-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 0.56	–	–	–
3C90	≥320	≤ 0.30	≤ 0.31	–	–
3C91	≥315	–	≤ 0.17(1)	≤ 1.0(1)	–
3C94	≥320	–	≤ 0.23	≤ 1.2	–
3C96	≥340	–	≤ 0.17	≤ 1.0	≤ 0.43
3F3	≥315	–	≤ 0.27	–	≤ 0.47
3F35	≥315	–	–	–	≤ 0.25
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.9	–	–	–
3F3	≥315	–	–	–	–
3F35	≥315	≤ 0.37	≤ 2.6	–	–
3F4	≥250	–	–	≤ 0.7	≤ 1.1

Note

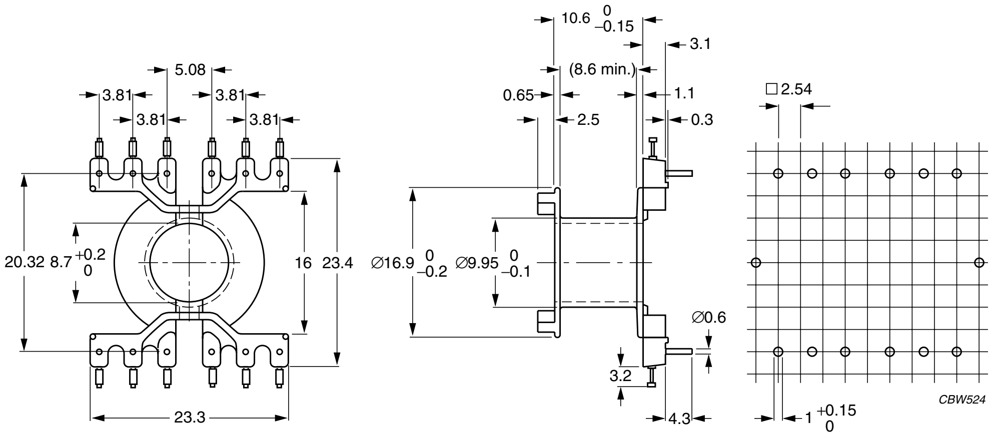
1. Measured at 60 °C.

COIL FORMER

General data

For the information on another coil former suitable for RM8/I, see *"Data sheet: RM8"*.

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM8/I coil former (DIL).

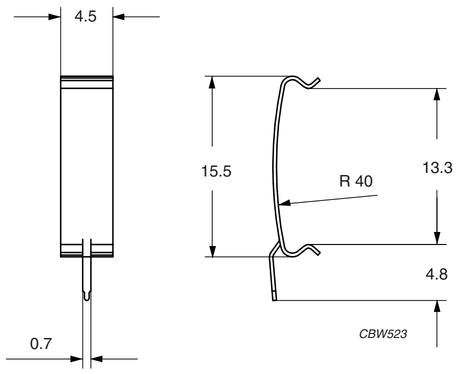
Winding data for RM8/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	42	30.9	8.6	CPV-RM8/I-1S-12PD

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8/I

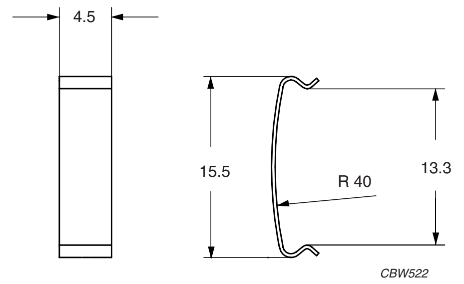


Dimensions in mm.

Fig.3 Mounting clip with earth pin for RM8/I.

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Type number	CLI-RM8/I



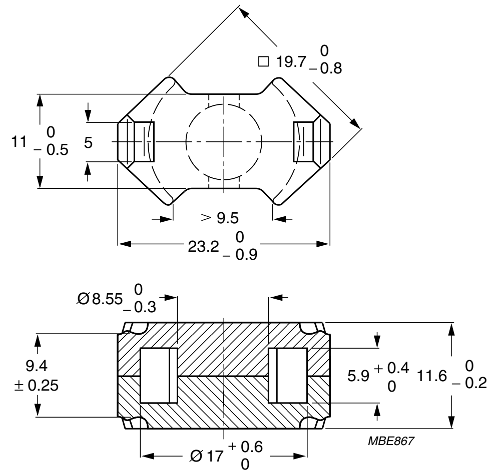
Dimensions in mm.

Fig.4 Mounting clip without earth pin for RM8/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.440	mm^{-1}
V_e	effective volume	1860	mm^3
l_e	effective length	28.7	mm
A_e	effective area	64.9	mm^2
A_{min}	minimum area	55.4	mm^2
m	mass of set	≈ 10	g



Dimensions in mm.

Fig.1 RM8/ILP core set.

Core sets for filter applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	250 ±3%	≈ 88	≈ 330	RM8/ILP-3D3-A250
	315 ±3%	≈ 111	≈ 250	RM8/ILP-3D3-A315
	400 ±5%	≈ 141	≈ 180	RM8/ILP-3D3-A400
	1850 ±25%	≈ 650	≈ 0	RM8/ILP-3D3
3H3 des	400 ±3%	≈ 141	≈ 210	RM8/ILP-3H3-A400
	630 ±5%	≈ 222	≈ 120	RM8/ILP-3H3-A630
	1000 ±8%	≈ 352	≈ 70	RM8/ILP-3H3-A1000
	4100 ±25%	≈ 1440	≈ 0	RM8/ILP-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	4100 ±25%	≈ 1440	≈ 0	RM8/ILP-3C90
3C94 des	4100 ±25%	≈ 1440	≈ 0	RM8/ILP-3C94
3C96 prot	3800 ±25%	≈ 1330	≈ 0	RM8/ILP-3C96
3F3	3800 ±25%	≈ 1330	≈ 0	RM8/ILP-3F3
3F35 prot	3100 ±25%	≈ 1090	≈ 0	RM8/ILP-3F35
3F4 des	2200 ±25%	≈ 770	≈ 0	RM8/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 30 ±10 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5 des	16000 +40/–30%	≈ 5600	≈ 0	RM8/ILP-3E5
3E6 des	19500 +40/–30%	≈ 6800	≈ 0	RM8/ILP-3E6

Properties of core sets under power conditions

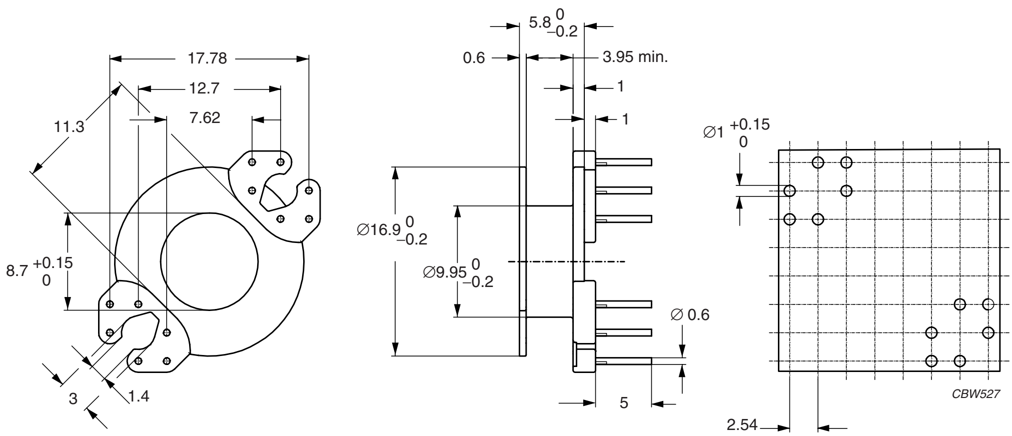
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.23	≤ 0.24	–	–
3C94	≥320	–	≤ 0.18	≤ 0.92	–
3C96	≥340	–	≤ 0.14	≤ 0.73	≤ 0.32
3F3	≥315	–	≤ 0.21	–	≤ 0.36
3F35	≥300	–	–	–	≤ 0.2
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.7	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.3	≤ 2.2	–	–
3F4	≥250	–	–	≤ 0.55	≤ 0.9

General data coil former

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 Coil former for RM8/ILP; 12 pins.

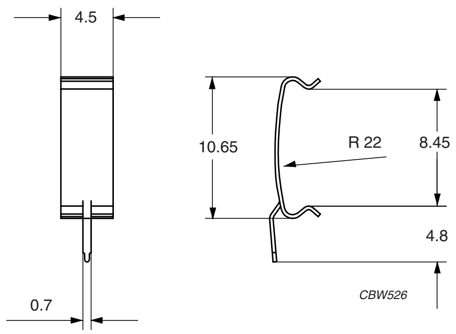
Winding data for RM8/ILP coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm^2)	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	12	all	13.3	3.95	41.8	CSV-RM8/ILP-1S-12P
1	10	1, 2, 3, 4, 6, 7, 8, 9, 10, 11	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P
1	10	1, 2, 3, 4, 6, 8, 9, 10, 11, 12	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P-T

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM8/ILP



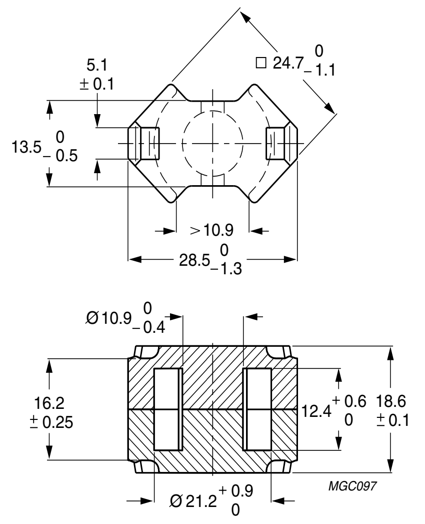
Dimensions in mm.

Fig.3 Mounting clip for RM8/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.462	mm^{-1}
V_e	effective volume	4310	mm^3
l_e	effective length	44.6	mm
A_e	effective area	96.6	mm^2
A_{min}	minimum area	89.1	mm^2
m	mass of set	≈ 22	g



Dimensions in mm.

Fig.1 RM10/I core set.

Core sets for filter applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	315 ±3%	≈ 116	≈ 380	RM10/I-3D3-A315
	400 ±5%	≈ 147	≈ 280	RM10/I-3D3-A400
	630 ±8%	≈ 232	≈ 140	RM10/I-3D3-A630
	1900 ±25%	≈ 700	≈ 0	RM10/I-3D3
3H3 des	400 ±3%	≈ 147	≈ 330	RM10/I-3H3-A400
	630 ±3%	≈ 232	≈ 190	RM10/I-3H3-A630
	1000 ±10%	≈ 367	≈ 110	RM10/I-3H3-A1000
	4400 ±25%	≈ 1620	≈ 0	RM10/I-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C81	160 ±3%	≈ 59	≈ 980	RM10/I-3C81-E160
	250 ±3%	≈ 92	≈ 570	RM10/I-3C81-A250
	315 ±3%	≈ 116	≈ 430	RM10/I-3C81-A315
	400 ±3%	≈ 147	≈ 330	RM10/I-3C81-A400
	630 ±3%	≈ 232	≈ 190	RM10/I-3C81-A630
	5500 ±25%	≈ 2020	≈ 0	RM10/I-3C81

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 59	≈ 980	RM10/I-3C90-A160
	250 ±3%	≈ 92	≈ 570	RM10/I-3C90-A250
	315 ±3%	≈ 116	≈ 430	RM10/I-3C90-A315
	400 ±3%	≈ 147	≈ 330	RM10/I-3C90-A400
	630 ±3%	≈ 232	≈ 190	RM10/I-3C90-A630
	4500 ±25%	≈ 1650	≈ 0	RM10/I-3C90
3C91 prot	5500 ±25%	≈ 2020	≈ 0	RM10/I-3C91
3C94 des	160 ±3%	≈ 59	≈ 980	RM10/I-3C94-A160
	250 ±3%	≈ 92	≈ 570	RM10/I-3C94-A250
	315 ±3%	≈ 116	≈ 430	RM10/I-3C94-A315
	400 ±3%	≈ 147	≈ 330	RM10/I-3C94-A400
	630 ±3%	≈ 232	≈ 190	RM10/I-3C94-A630
	4500 ±25%	≈ 1650	≈ 0	RM10/I-3C94
3C96 prot	4050 ±25%	≈1680	≈ 0	RM10/I-3C96
3F3	160 ±3%	≈ 59	≈ 980	RM10/I-3F3-A160
	250 ±3%	≈ 92	≈ 570	RM10/I-3F3-A250
	315 ±3%	≈ 116	≈ 430	RM10/I-3F3-A315
	400 ±3%	≈ 147	≈ 330	RM10/I-3F3-A400
	630 ±3%	≈ 232	≈ 190	RM10/I-3F3-A630
	4050 ±25%	≈ 1490	≈ 0	RM10/I-3F3
3F35 prot	3100 ±25%	≈1190	≈ 0	RM10/I-3F35

Core sets of high permeability grades

Clamping force for AL measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E27	10700 ± 25%	≈ 3930	RM10/I-3E27
3E5	16000 +40/–30%	≈ 5880	RM10/I-3E5

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥315	≤ 1.0	–	–	–
3C90	≥320	≤ 0.52	≤ 0.55	–	–
3C91	≥315	–	≤ 0.3[1]	≤ 1.8[1]	–
3C94	≥320	–	≤ 0.41	≤ 2.3	–
3C96	≥340	–	≤ 0.3	≤ 1.8	≤ 0.77
3F3	≥315	–	≤ 0.48	–	≤ 0.82
3F35	≥315	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 1.5	–	–	–
3F3	≥315	–	–	–	–
3F35	≥315	≤ 0.6	≤ 4.5	–	–

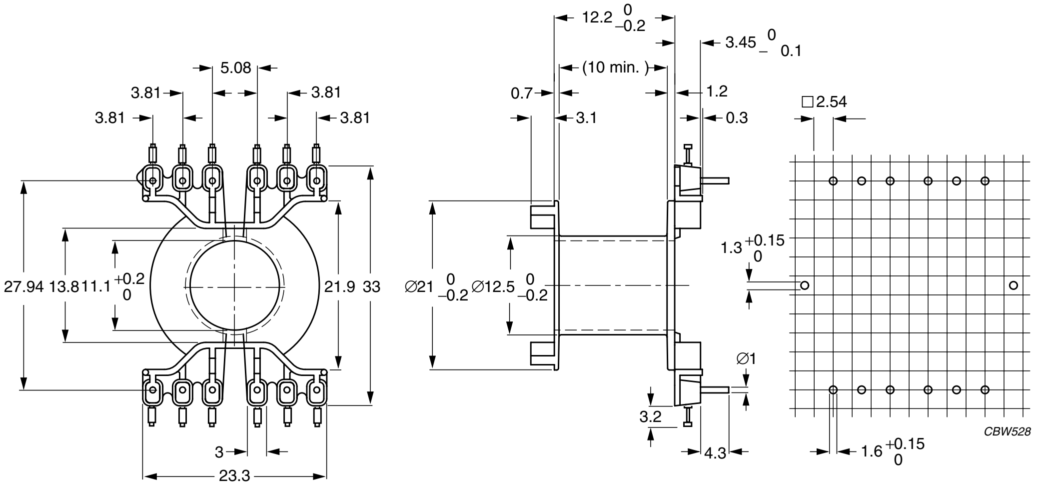
Note

1. Measured at 60 °C.

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM10/I coil former (DIL).

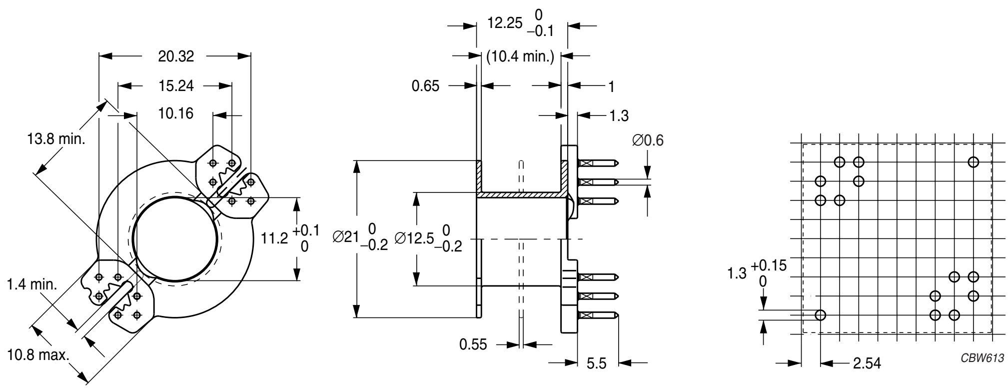
Winding data for RM10 coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	52	44.2	10.0	CPV-RM10-1S-12PD

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polyester (UP), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E61040(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM10/I coil former.

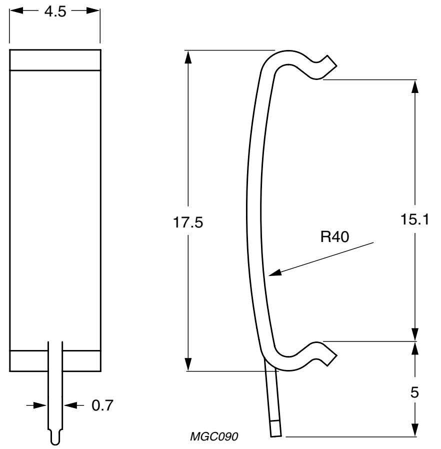
Winding data for RM10/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	12	all	52.3	42.7	10.3	CSV-RM10-1S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/I



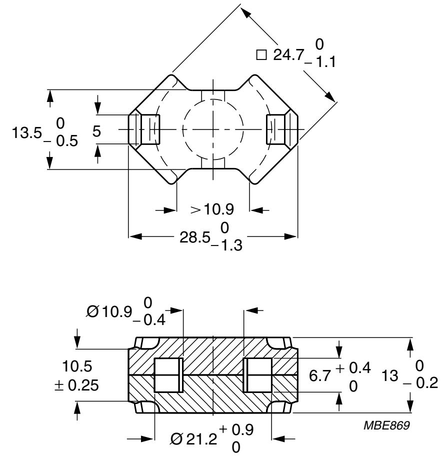
Dimensions in mm.

Fig.4 Mounting clip for RM10/I.

CORE SETS

Effective core parametersRM10/ILP

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.340	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	33.9	mm
A_e	effective area	99.1	mm^2
A_{min}	minimum area	89.1	mm^2
m	mass of set	≈ 17	g



Dimensions in mm.

Fig.1 RM10/ILP core set.

Core sets for filter applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3D3 des	315 ±3%	≈ 86	≈ 400	RM10/ILP-3D3-A315
	400 ±3%	≈ 109	≈ 300	RM10/ILP-3D3-A400
	630 ±5%	≈ 171	≈ 160	RM10/ILP-3D3-A630
	2500 ±25%	≈ 675	≈ 0	RM10/ILP-3D3
3H3 des	400 ±3%	≈ 109	≈ 330	RM10/ILP-3H3-A400
	630 ±3%	≈ 171	≈ 200	RM10/ILP-3H3-A630
	1000 ±5%	≈ 272	≈ 110	RM10/ILP-3H3-A1000
	5600 ±25%	≈ 1510	≈ 0	RM10/ILP-3H3

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	5600 ±25%	≈ 1510	≈ 0	RM10/ILP-3C90
3C94 des	5600 ±25%	≈ 1510	≈ 0	RM10/ILP-3C94
3C96 prot	5200 ±25%	≈ 1400	≈ 0	RM10/ILP-3C96
3F3	5200 ±25%	≈ 1410	≈ 0	RM10/ILP-3F3
3F35 prot	4000 ±25%	≈ 1080	≈ 0	RM10/ILP-3F35
3F4 des	3000 ±25%	≈ 810	≈ 0	RM10/ILP-3F4

Core sets of high permeability grades

Clamping force for A_L measurements, 60 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3E5 des	22000 +40/– 30%	≈ 5950	≈ 0	RM10/ILP-3E5
3E6 des	27000 +40/– 30%	≈ 7300	≈ 0	RM10/ILP-3E6

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.41	≤ 0.43	–	–
3C94	≥320	–	≤ 0.32	≤ 1.7	–
3C96	≥340	–	≤ 0.24	≤ 1.4	≤ 0.6
3F3	≥300	–	≤ 0.37	–	≤ 0.64
3F35	≥300	–	–	–	–
3F4	≥250	–	–	–	–

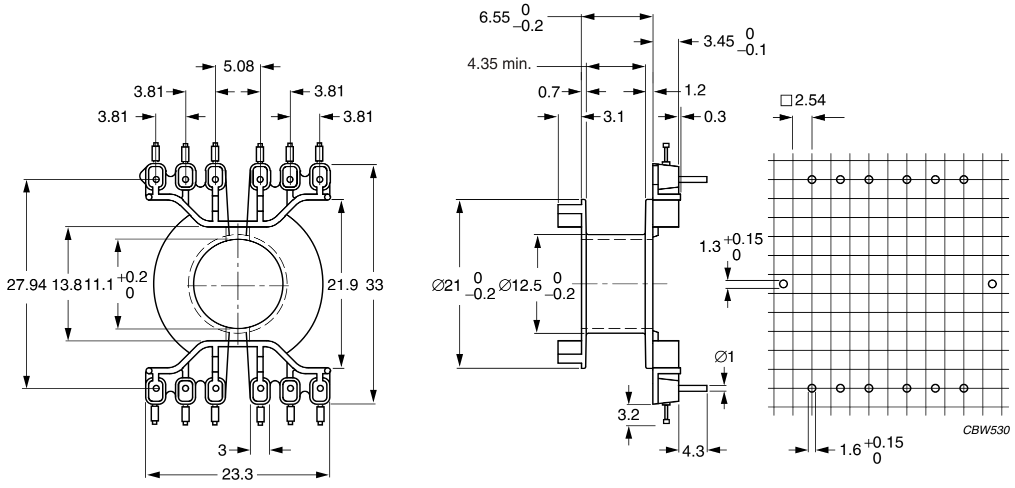
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 1.2	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.45	≤ 3.5	–	–
3F4	≥250	–	–	≤ 1.0	≤ 1.6

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM10/ILP coil former (DIL).

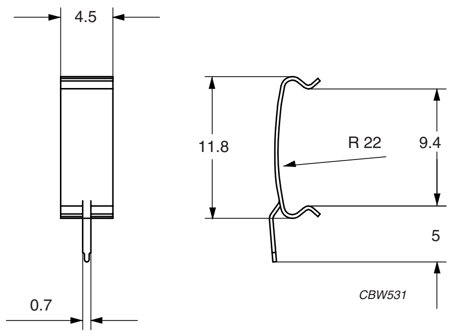
Winding data for RM10/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	52	21.0	4.35	CPV-RM10/ILP-1S-12PD

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM10/ILP



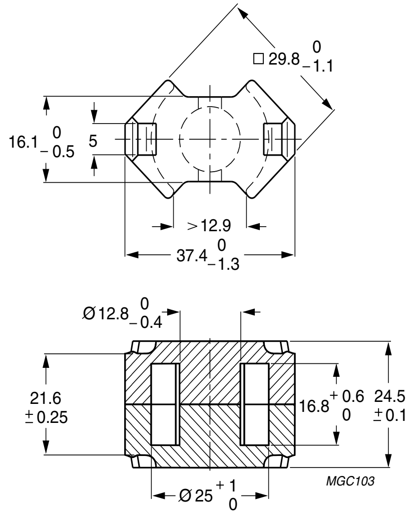
Dimensions in mm.

Fig.3 Mounting clip for RM10/ILP.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.388	mm^{-1}
V_e	effective volume	8340	mm^3
l_e	effective length	56.6	mm
A_e	effective area	146	mm^2
A_{min}	minimum area	125	mm^2
m	mass of set	≈ 45	g



Dimensions in mm.

Fig.1 RM12/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (µm)	TYPE NUMBER
3C90	160 ±3%	≈ 49	≈ 1570	RM12/I-3C90-A160
	250 ±3%	≈ 77	≈ 900	RM12/I-3C90-A250
	315 ±5%	≈ 97	≈ 680	RM12/I-3C90-A315
	400 ±5%	≈ 123	≈ 510	RM12/I-3C90-A400
	630 ±5%	≈ 194	≈ 300	RM12/I-3C90-A630
	5600 ±25%	≈ 1730	≈ 0	RM12/I-3C90
3C94 des	160 ±3%	≈ 49	≈ 1570	RM12/I-3C94-A160
	250 ±3%	≈ 77	≈ 900	RM12/I-3C94-A250
	315 ±5%	≈ 97	≈ 680	RM12/I-3C94-A315
	400 ±5%	≈ 123	≈ 510	RM12/I-3C94-A400
	630 ±5%	≈ 194	≈ 300	RM12/I-3C94-A630
	5600 ±25%	≈ 1730	≈ 0	RM12/I-3C94
3C96 prot	5050 ±25%	≈ 1560	≈ 0	RM12/I-3C96

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3F3	160 ±3%	≈ 49	≈ 1570	RM12/I-3F3-A160
	250 ±3%	≈ 77	≈ 900	RM12/I-3F3-A250
	315 ±5%	≈ 97	≈ 680	RM12/I-3F3-A315
	400 ±5%	≈ 123	≈ 510	RM12/I-3F3-A400
	630 ±5%	≈ 194	≈ 300	RM12/I-3F3-A630
	5050 ±25%	≈ 1560	≈ 0	RM12/I-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤ 1.0	≤ 1.1	–	–
3C94	≥315	–	≤ 0.8	≤ 4.5	–
3C96	≥340	–	≤ 0.6	≤ 3.6	≤ 1.5
3F3	≥315	–	≤0.92	–	≤1.6

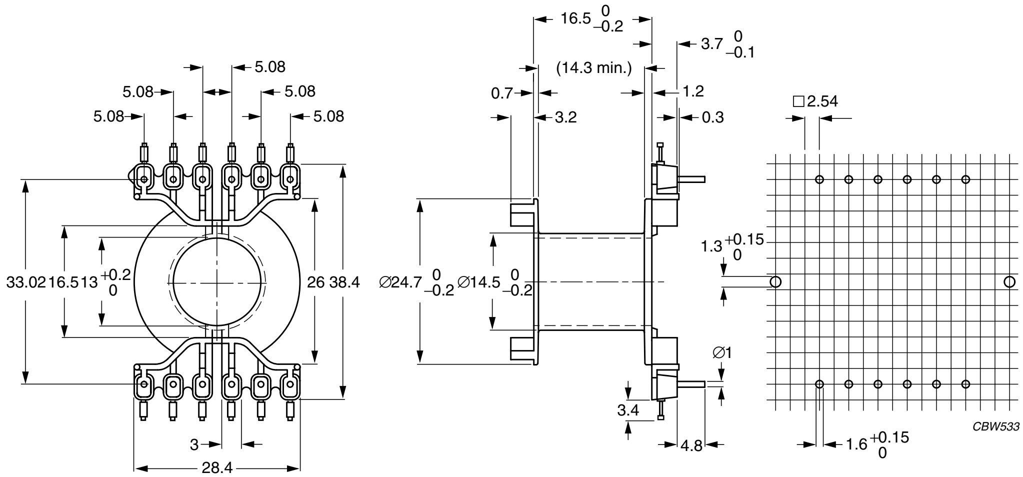
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 3.0	–	–	–
3F3	≥315	–	–	–	–

COIL FORMER

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with UL 94V-0; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.2 RM12/I coil former (DIL).

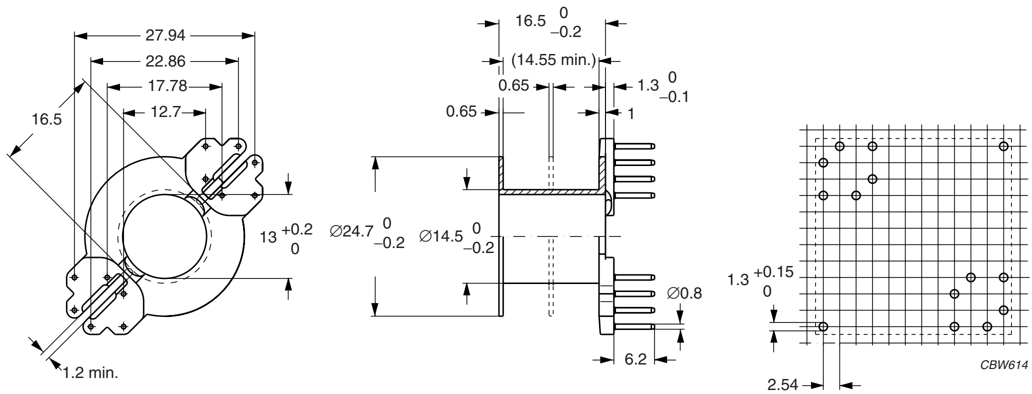
Winding data for RM12/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	61	75.0	14.3	CPV-RM12/I-1S-12PD

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.3 RM12/I coil former; 12-pins.

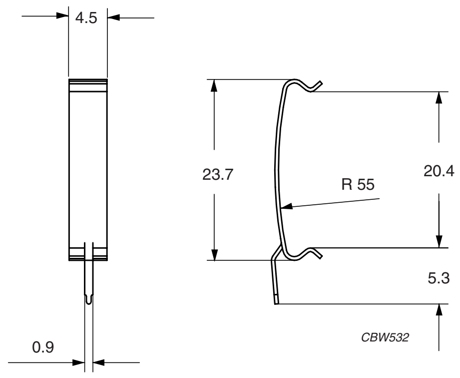
Winding data for RM12/I coil former with 12-pins

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	72	14.4	61	CSV-RM12-1S-12P

MOUNTING PARTS

General data

ITEM	SPECIFICATION
Clamping force	≈ 35 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1
Type number	CLI/P-RM12/I



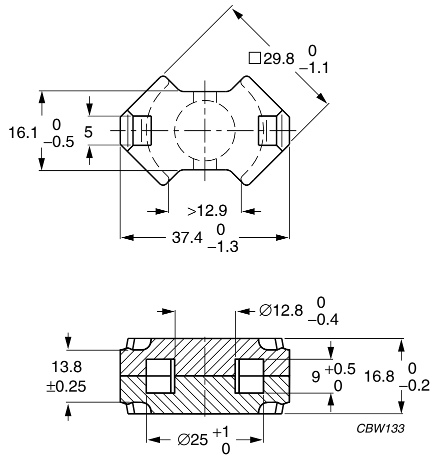
Dimensions in mm.

Fig.4 Mounting clip for RM12/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.280	mm^{-1}
V_e	effective volume	6200	mm^3
l_e	effective length	42	mm
A_e	effective area	148	mm^2
A_{min}	minimum area	125	mm^2
m	mass of set	≈ 34	g



Dimensions in mm.

Fig.1 RM12/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 70 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	7100 ±25%	≈1600	≈ 0	RM12/ILP-3C90
3C94 des	7100 ±25%	≈1600	≈ 0	RM12/ILP-3C94
3C96 prot	6700 ±25%	≈1510	≈ 0	RM12/ILP-3C96
3F3	6700 ±25%	≈1510	≈ 0	RM12/ILP-3F3
3F35 prot	5000 ±25%	≈ 1110	≈ 0	RM12/ILP-3F35
3F4 des	3600 ±25%	≈ 810	≈ 0	RM12/ILP-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤ 0.75	≤ 0.79	–	–
3C94	≥315	–	≤ 0.62	≤ 3.3	–
3C96	≥315	–	≤ 0.49	≤ 2.6	≤ 1.1
3F3	≥300	–	≤ 0.68	–	≤ 1.2
3F35	≥300	–	–	–	–
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥315	–	–	–	–
3C94	≥315	–	–	–	–
3C96	≥315	≤ 2.2	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 0.85	≤ 6.5	–	–
3F4	≥250	–	–	≤ 1.8	≤ 3.0

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.353	mm^{-1}
V_e	effective volume	13900	mm^3
l_e	effective length	70.0	mm
A_e	effective area	198	mm^2
A_{min}	minimum area	168	mm^2
m	mass of set	≈ 74	g

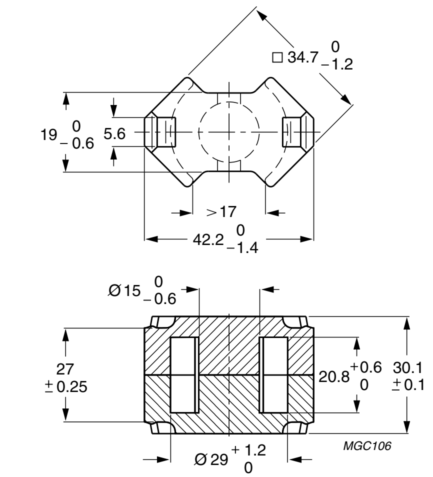


Fig.1 RM14/I core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	250 ±3%	≈ 70	≈ 1270	RM14/I-3C90-A250
	315 ±3%	≈ 89	≈ 950	RM14/I-3C90-A315
	400 ±3%	≈ 113	≈ 710	RM14/I-3C90-A400
	630 ±5%	≈ 177	≈ 410	RM14/I-3C90-A630
	1000 ±5%	≈ 281	≈ 240	RM14/I-3C90-A1000
	6600 ±25%	≈ 1850	≈ 0	RM14/I-3C90
3C94 des	250 ±3%	≈ 70	≈ 1270	RM14/I-3C94-A250
	315 ±3%	≈ 89	≈ 950	RM14/I-3C94-A315
	400 ±3%	≈ 113	≈ 710	RM14/I-3C94-A400
	630 ±5%	≈ 177	≈ 410	RM14/I-3C94-A630
	1000 ±5%	≈ 281	≈ 240	RM14/I-3C94-A1000
	6600 ±25%	≈ 1850	≈ 0	RM14/I-3C94
3C96 prot	5700 ±25%	≈ 1600	≈ 0	RM14/I-3C96
3F3	250 ±3%	≈ 70	≈ 1270	RM14/I-3F3-A250
	315 ±3%	≈ 89	≈ 950	RM14/I-3F3-A315
	400 ±3%	≈ 113	≈ 710	RM14/I-3F3-A400
	630 ±5%	≈ 177	≈ 410	RM14/I-3F3-A630
	1000 ±5%	≈ 281	≈ 240	RM14/I-3F3-A1000
	5700 ±25%	≈ 1600	≈ 0	RM14/I-3F3

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤ 1.67	≤ 1.76	–	–
3C94	≥315	–	≤ 1.4	≤ 7.4	–
3C96	≥340	–	≤ 1.1	≤ 5.6	≤ 2.6
3F3	≥315	–	≤ 1.55	–	≤ 2.65

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥320	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 5.2	–	–	–
3F3	≥315	–	–	–	–

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	180 °C, *"IEC 60085"*, class H
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

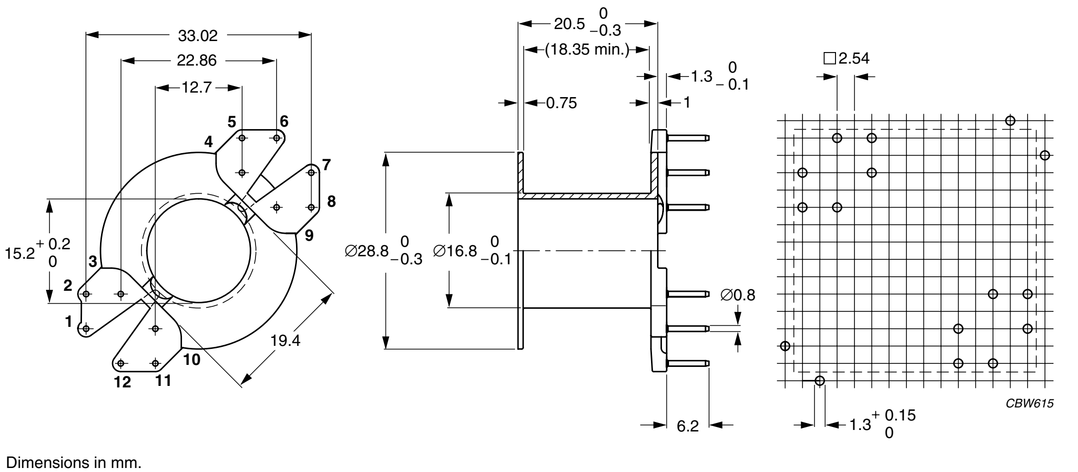


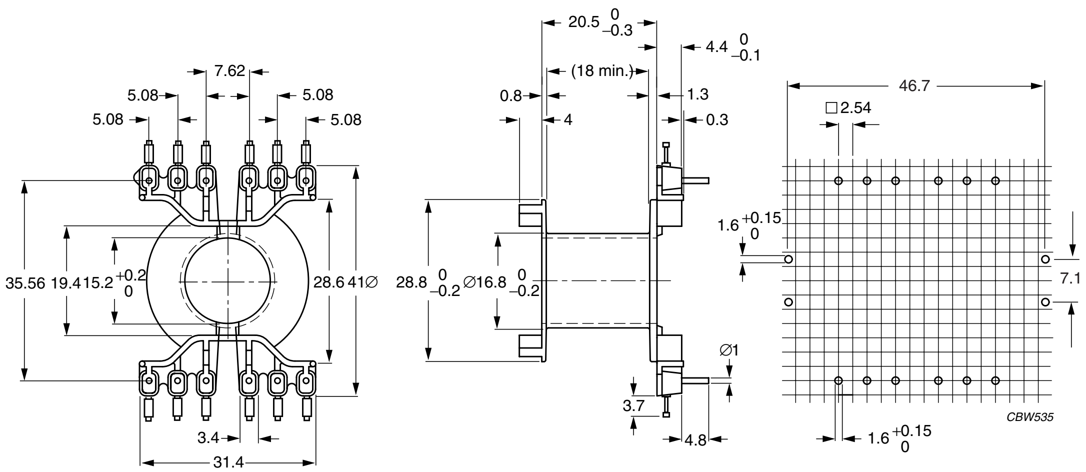
Fig.2 RM14/I coil former; 12-pins.

Winding data for 12-pins RM14/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	10	1, 2, 3, 4, 6, 7, 9, 10, 11, 12	71	112	18.4	CSV-RM14-1S-10P
1	12	all	71	112	18.4	CSV-RM14-1S-12P

General data

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardent in accordance with *"UL 94V-0"*; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1



Dimensions in mm.

Fig.3 RM14/I coil former; 12-pins (DIL).

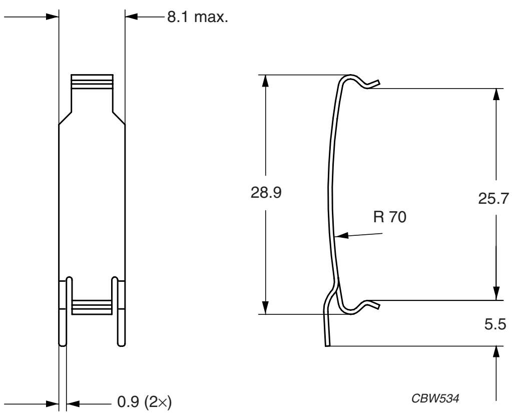
Winding data for 12-pins RM14/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm^2)	WINDING WIDTH (mm)	TYPE NUMBER
1	71	111	18.0	CPV-RM14/I-1S-12PD

MOUNTING PARTS

General data mounting clip with earth pin

ITEM	SPECIFICATION
Clamping force	≈40 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb)
Solderability	*“IEC 60068-2-20”*, Part 2, Test Ta, method 1
Type number	CLI/P-RM14/I



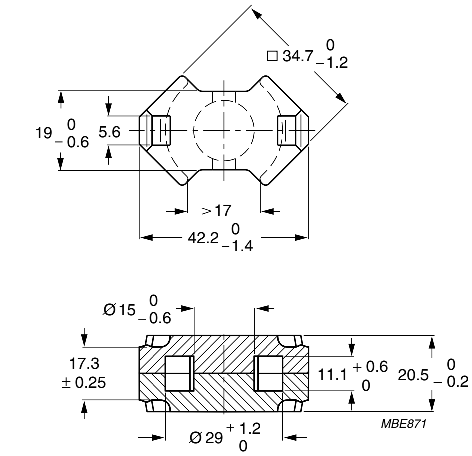
Dimensions in mm.

Fig.4 Mounting clip for RM14/I.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.250	mm^{-1}
V_e	effective volume	10230	mm^3
l_e	effective length	50.9	mm
A_e	effective area	201	mm^2
A_{min}	minimum area	168	mm^2
m	mass of set	≈ 55	g



Dimensions in mm.

Fig.1 RM14/ILP core set.

Core sets for general purpose transformers and power applications

Clamping force for A_L measurements, 80 ±20 N.

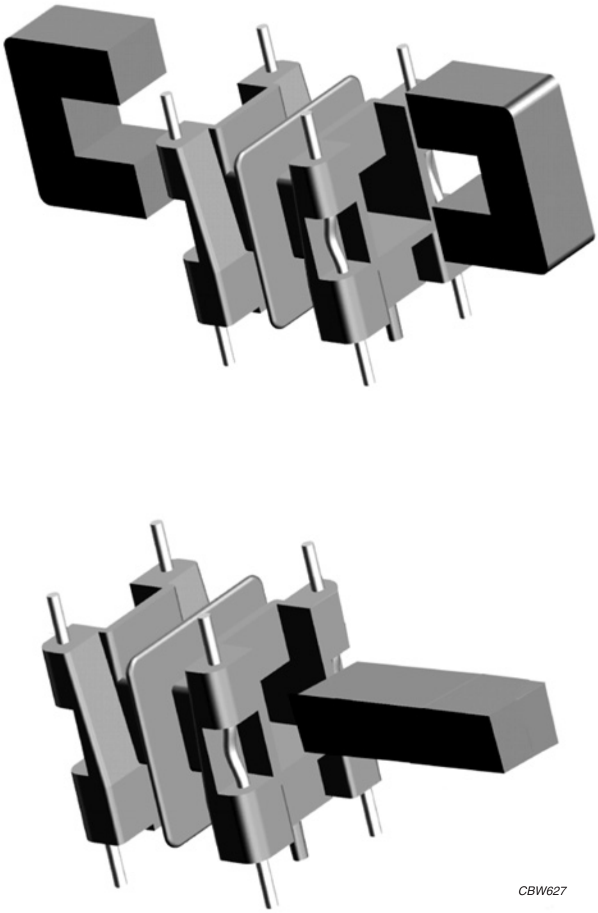
GRADE	A_L (nH)	μ_e	AIR GAP (μm)	TYPE NUMBER
3C90	8400 ±25%	≈ 1690	≈ 0	RM14/ILP-3C90
3C94 des	8400 ±25%	≈ 1690	≈ 0	RM14/ILP-3C94
3C96 prot	7700 ±25%	≈ 1550	≈ 0	RM14/ILP-3C96
3F3	7700 ±25%	≈ 1550	≈ 0	RM14/ILP-3F3
3F35 prot	5800 ±25%	≈ 1150	≈ 0	RM14/ILP-3F35
3F4 des	4200 ±25%	≈ 850	≈ 0	RM14/ILP-3F4

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥315	≤ 1.3	≤ 1.4	–	–
3C94	≥315	–	≤ 1.1	≤ 5.5	–
3C96	≥340	–	≤ 0.82	≤ 4.4	≤ 1.9
3F3	≥300	–	≤ 1.2	–	≤ 2.0
3F35	≥300	–	–	–	–
3F4	≥250	–	–	–	–

Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; $\hat{B}$ = 50 mT; T = 100 °C	f = 500 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B}$ = 30 mT; T = 100 °C	f = 3 MHz; $\hat{B}$ = 10 mT; T = 100 °C
3C90	≥315	–	–	–	–
3C94	≥315	–	–	–	–
3C96	≥340	≤ 3.8	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤ 1.4	≤ 11	–	–
3F4	≥250	–	–	≤ 3.0	≤ 4.9



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For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview U, I cores

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
U10/8/3	309	8.07	0.9
U11/8/5	501	12.5	1.5
U15/11/6	1680	32.3	4
U16/9.8/6	1255	24.6	3.6
U20/16/7	3800	56	9
I20/6/5	–	–	3
U25/16/6	3380	40.3	8
I25/6/6	2590	40.3	4.5
U25/20/13	9180	104	23.5
I25/7/7	–	–	6
U30/25/16	17900	161	43
U33/22/9	9490	86.5	24
U67/27/14	35200	204	85
U93/76/16	159000	448	400
I93/28/16	115000	447	200
U93/52/30	217000	840	560
U93/76/30	297000	840	760
I93/28/30	175000	836	370
U100/57/25	199000	645	500
I100/25/25	158000	645	300

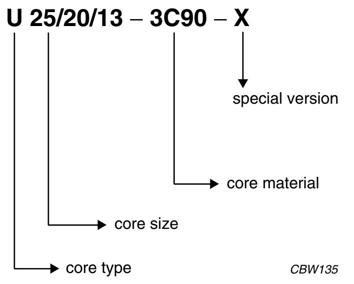


Fig.1 Type number structure for cores.

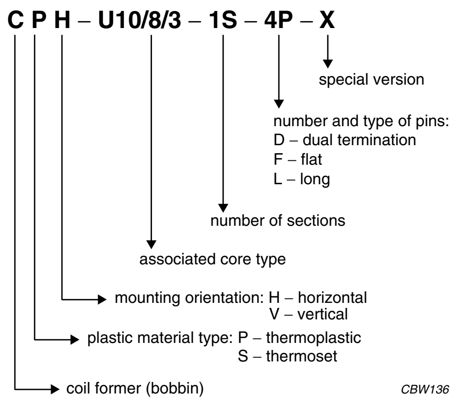
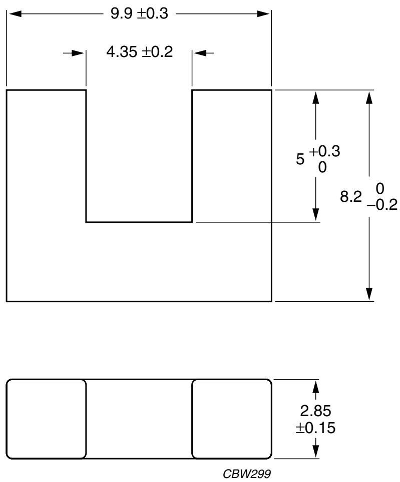


Fig.2 Type number structure for coil formers.

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	4.74	mm^{-1}
V_e	effective volume	309	mm^3
l_e	effective length	38.3	mm
A_e	effective area	8.07	mm^2
A_{min}	minimum area	7.91	mm^2
m	mass of core half	≈ 0.9	g



Dimensions in mm.

Fig.1 U10/8/3 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	420 ±25%	≈ 1590	U10/8/3-3C90
3C94 des	470 ±25%	≈ 1770	U10/8/3-3C94

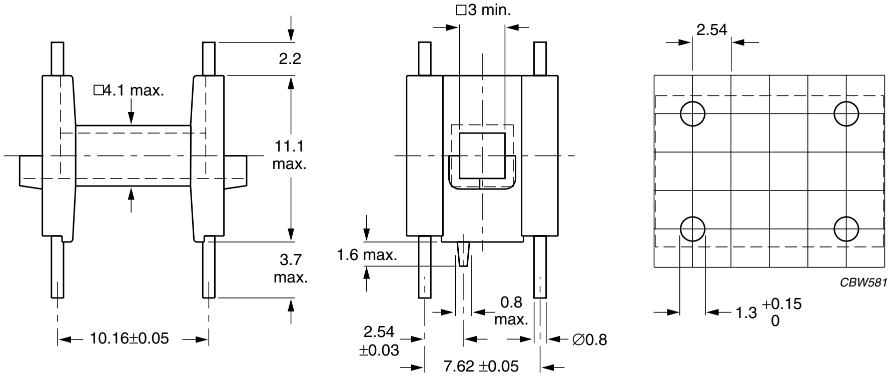
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.04	≤ 0.04	–
3C94	≥320	–	≤ 0.03	≤ 0.18

COIL FORMERS

General data 4-pins U10/8/3 coil former

PARAMETER	SPECIFICATION
Coil former material	polybuteleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085"*, class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 U10/8/3 coil former; 4-pins.

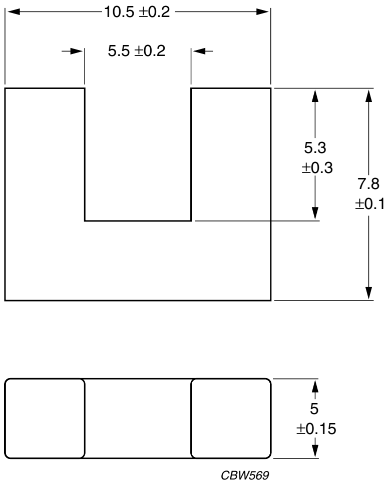
Winding data for 4-pins U10/8/3 coil former

NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	28	8	30	CPH-U10/8/3-1S-4P

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.20	mm^{-1}
V_e	effective volume	501	mm^3
l_e	effective length	40	mm
A_e	effective area	12.5	mm^2
A_{min}	minimum area	12.5	mm^2
m	mass of core half	≈ 1.5	g



Dimensions in mm.

Fig.1 U11/8/5 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	680 ±25%	≈ 1730	U11/8/5-3C90
3C94 des	680 ±25%	≈ 1730	U11/8/5-3C94
3E27	1200 ±25%	≈ 3050	U11/8/5-3E27

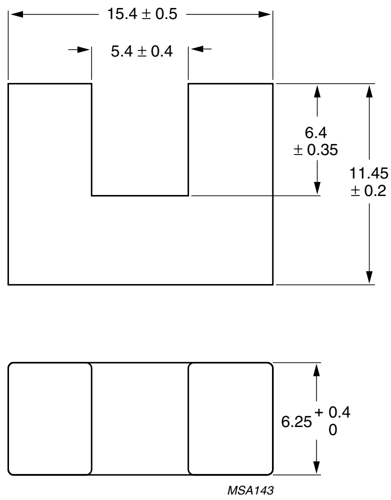
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.08	≤ 0.095	–
3C94	≥320	–	≤ 0.07	≤ 0.3

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.60	mm^{-1}
V_e	effective volume	1680	mm^3
l_e	effective length	52	mm
A_e	effective area	32.3	mm^2
m	mass of core half	≈ 4	g



Dimensions in mm.

Fig.1 U15/11/6 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	1400 ±25%	≈ 1900	U15/11/6-3C90
3C94 des	1400 ±25%	≈ 1900	U15/11/6-3C94
3C11	2400 ±25%	≈ 3080	U15/11/6-3C11
3E27	3400 ±25%	≈ 4300	U15/11/6-3E27

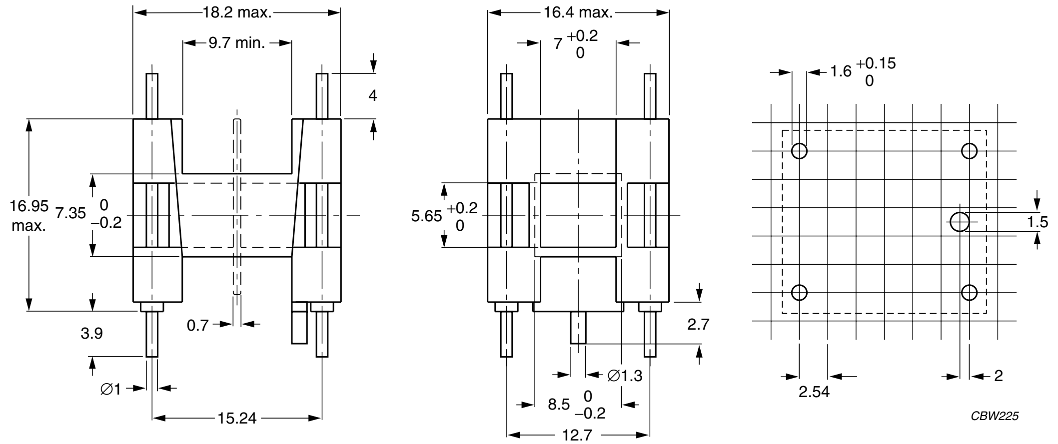
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.2	≤ 0.22	–
3C94	≥320	–	≤ 0.17	≤ 1.0

COIL FORMERS

General data 4-pins U15/11/6 coil former

PARAMETER	SPECIFICATION
Coil former material	polyethyleneterephtalate (PET), glass-reinforced, flame retardant in accordance with *"UL 94V-0"*; UL file number E69578 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *"IEC 60085",* class F
Resistance to soldering heat	*"IEC 60068-2-20"*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

Fig.2 U15/11/6 coil former; 4-pins.

Winding data for 4-pins U15/11/6 coil former

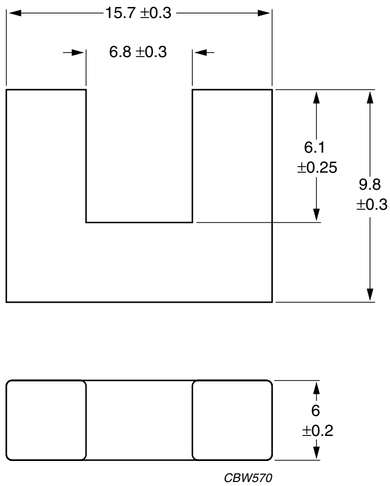
NUMBER OF SECTIONS	WINDING AREA (mm^2)	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	38.7	9.7	46.6	CPH-U15/11/6-1S-4P
2	2 × 17.9	2 × 4.45	46.6	CPH-U15/11/6-2S-4P

U cores and accessories U16/9.8/6

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.07	mm^{-1}
V_e	effective volume	1255	mm^3
l_e	effective length	51	mm
A_e	effective area	24.6	mm^2
A_{min}	minimum area	22.2	mm^2
m	mass of core half	≈ 3.6	g



Dimensions in mm.

Fig.1 U16/9.8/6 core half.

Core halves

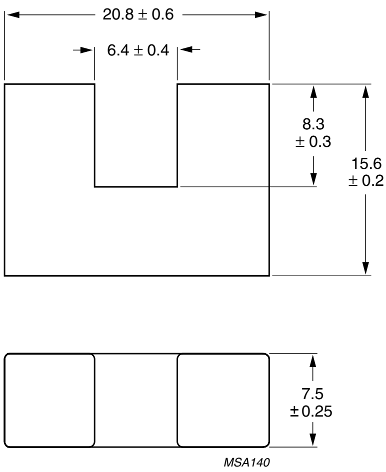
A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3E26	3860 ±25%	≈ 6370	U16/9.8/6-3E26

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.21	mm^{-1}
V_e	effective volume	3800	mm^3
l_e	effective length	68	mm
A_e	effective area	56	mm^2
m	mass of core half	≈ 9	g



Dimensions in mm.

Fig.1 U20/16/7 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	1900 ±25%	≈ 1950	U20/16/7-3C90
3C94 des	1900 ±25%	≈ 1950	U20/16/7-3C94
3C11	3100 ±25%	≈ 3000	U20/16/7-3C11
3E27	4800 ±25%	≈ 4600	U20/16/7-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 0.46	≤ 0.48	–
3C94	≥320	–	≤ 0.36	≤ 2.3

I cores and accessories

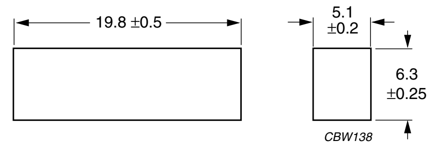
I20/6/5

CORE

Ordering information

GRADE	TYPE NUMBER
3C90	I20/6/5-3C90

Remark: To be used as bar core (without counter part).



Dimensions in mm.

Fig.1 I20/6/5 core.

COIL FORMER

For coil former data, see data sheet, *"U15/11/6"*.

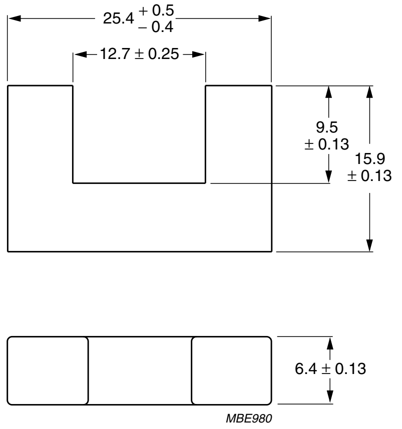
U cores and accessories

U25/16/6 (376U250)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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	≈ 8.0	g



Dimensions in mm.

Fig.1 U25/16/6 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	1400 ±25%	≈ 2300	U25/16/6-3C81
3C90	1200 ±25%	≈ 2300	U25/16/6-3C90
3C91 prot	1400 ±25%	≈ 2300	U25/16/6-3C91
3C94 des	1200 ±25%	≈ 2300	U25/16/6-3C94
3C11	2050 ±25%	≈ 3380	U25/16/6-3C11
3E27	2500 ±25%	≈ 4130	U25/16/6-3E27

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.78	–	–	–
3C90	≥320	≤ 0.4	≤ 0.4	–	–
3C91	≥320	–	≤ 0.23(1)	≤ 1.6(1)	–
3C94	≥320	–	≤ 0.3	≤ 2.0	–

Note

1. Measured at 60 °C.

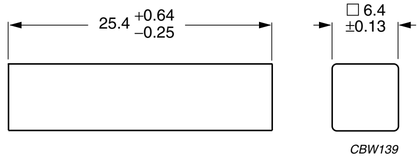
I cores and accessories

I25/6/6 (376B250)

CORE SETS

Effective core parameters measured in combination with U25/16/6

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.59	mm^{-1}
V_e	effective volume	2590	mm^3
l_e	effective length	64.3	mm
A_e	effective area	40.3	mm^2
m	mass of I core	≈ 4.5	g



Dimensions in mm.

Fig.1 I25/6/6 core.

Core halves

A_L measured in combination with *"U25/16/6"*.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	1750 ±25%	≈ 2210	I25/6/6-3C81
3C90	1500 ±25%	≈ 1900	I25/6/6-3C90
3C91 prot	1750 ±25%	≈ 2210	I25/6/6-3C91
3C94 des	1500 ±25%	≈ 1900	I25/6/6-3C94
3C11	2500 ±25%	≈ 3160	I25/6/6-3C11
3E27	3000 ±25%	≈ 3800	I25/6/6-3E27

Properties of core sets under power conditions

Measured in combination with *"U25/16/6"*.

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤ 0.6	–	–
3C90	≥320	≤ 0.3	≤ 0.3	–
3C91	≥320	–	≤ 0.18(1)	≤ 1.2(1)
3C94	≥320	–	≤ 0.23	≤ 1.6

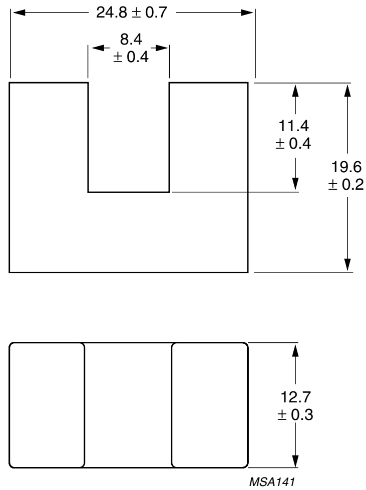
Note

1. Measured at 60 °C.

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

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	2900 ±25%	≈ 2000	U25/20/13-3C90
3C94 des	2900 ±25%	≈ 2000	U25/20/13-3C94
3C11	5000 ±25%	≈ 3400	U25/20/13-3C11
3E27	6300 ±25%	≈ 4300	U25/20/13-3E27

Properties of core sets under power conditions

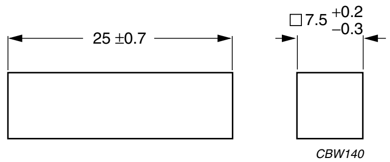
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥320	≤ 1.1	≤ 1.2	–
3C94	≥320	–	≤ 0.9	≤ 5.5

I cores and accessories I25/7/7

CORE

Ordering information

GRADE	TYPE NUMBER
3C90	I25/7/7-3C90



Dimensions in mm.

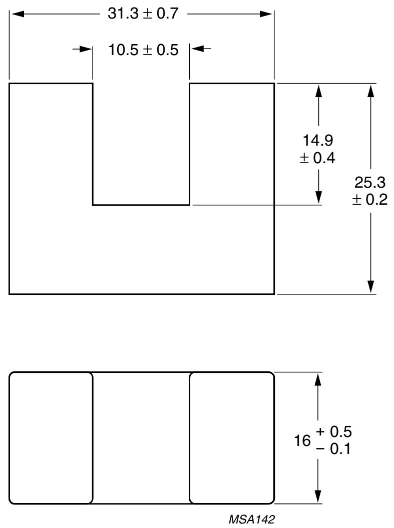
Fig.1 I25/7/7 core.

U cores and accessories U30/25/16

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	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

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	3700 ±25%	≈ 2030	U30/25/16-3C90
3C94 des	3700 ±25%	≈ 2030	U30/25/16-3C94

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C90	≥ 320	≤ 2.2	≤ 2.3	–
3C94	≥ 320	–	≤ 1.8	≤ 11

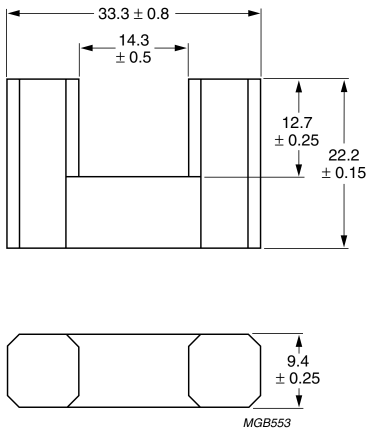
U cores and accessories

U33/22/9 (1F30)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.27	mm^{-1}
V_e	effective volume	9490	mm^3
I_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

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	2300 ±25%	≈ 2320	U33/22/9-3C81
3C91 prot	2300 ±25%	≈ 2320	U33/22/9-3C91

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤ 2.2	–	–
3C91	≥320	–	≤ 0.57(1)	≤ 4.3(1)

Note

1. Measured at 60 °C.

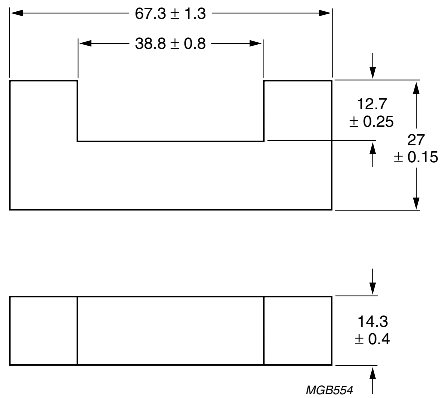
U cores and accessories

U67/27/14 (1F10)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C81	3800 ±25%	≈ 2570	U67/27/14-3C81
3C91 prot	3800 ±25%	≈ 2570	U67/27/14-3C91

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤ 8.1	–	–
3C91	≥320	–	≤ 2.1[(1)]	≤ 16[(1)]

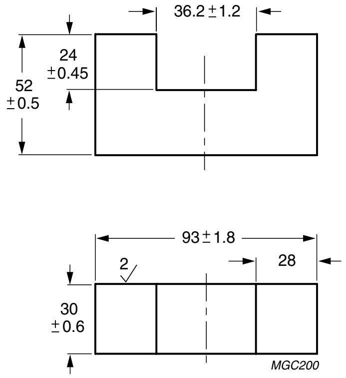
Note

1. Measured at 60 °C.

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.307	mm^{-1}
V_e	effective volume	217000	mm^3
l_e	effective length	258	mm
A_e	effective area	840	mm^2
m	mass of core half	≈ 560	g



Dimensions in mm.

Fig.1 U93/52/30 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	8700 ±25%	≈ 2100	U93/52/30-3C90
3C94 des	8700 ±25%	≈ 2100	U93/52/30-3C94

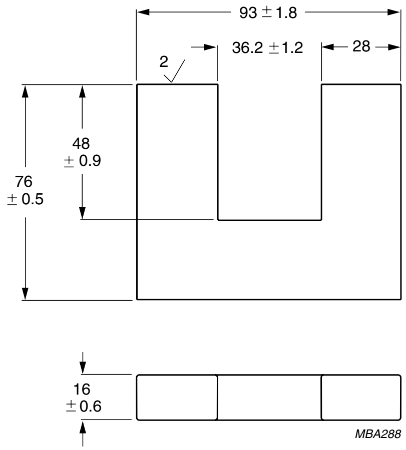
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥ 320	≤ 26	≤ 28
3C94	≥ 320	–	≤ 22

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.790	mm^{-1}
V_e	effective volume	159000	mm^3
l_e	effective length	354	mm
A_e	effective area	448	mm^2
m	mass of core half	≈ 400	g



Dimensions in mm.

Fig.1 U93/76/16 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	3400 ±25%	≈ 2200	U93/76/16-3C90
3C94 des	3400 ±25%	≈ 2200	U93/76/16-3C94

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥ 320	≤ 19	≤ 21
3C94	≥ 320	–	≤ 17

I cores and accessories — I93/28/16

CORE SETS

Effective core parameters in combination with U93/76/16

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.576	mm^{-1}
V_e	effective volume	115000	mm^3
l_e	effective length	258	mm
A_e	effective area	447	mm^2
m	mass of core	≈ 200	g

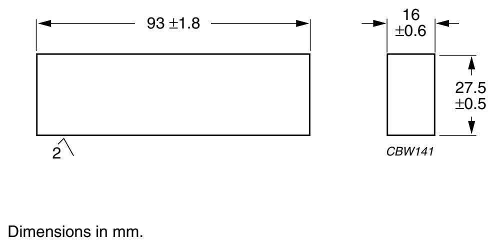


Fig.1 I93/28/16 core.

Core data

A_L measured in combination with *"U93/76/16"*.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	4600 ±25%	≈ 2100	I93/28/16-3C90
3C94 des	4600 ±25%	≈ 2100	I93/28/16-3C94

Properties of core sets under power conditions

Measured in combination with *"U93/76/16"*.

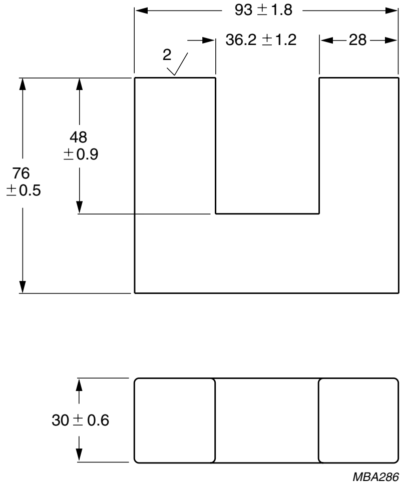
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 14	≤ 15
3C94	≥320	–	≤ 12

U cores and accessories U93/76/30

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.421	mm^{-1}
V_e	effective volume	297000	mm^3
l_e	effective length	354	mm
A_e	effective area	840	mm^2
m	mass of core half	≈ 760	g



Dimensions in mm.

Fig.1 U93/76/30 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	6400 ±25%	≈ 2200	U93/76/30-3C90
3C94 des	6400 ±25%	≈ 2200	U93/76/30-3C94

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥ 320	≤ 35	≤ 38
3C94	≥ 320	–	≤ 29

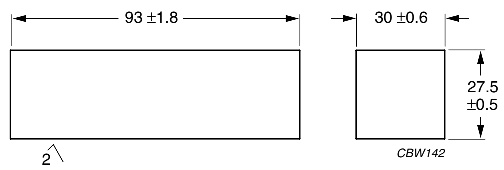
CORE SETS

Effective core parameters in combination with U93/52/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.251	mm^{-1}
V_e	effective volume	175000	mm^3
l_e	effective length	210	mm
A_e	effective area	836	mm^2
m	mass of core	≈ 370	g

Effective core parameters in combination with U93/76/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.307	mm^{-1}
V_e	effective volume	217000	mm^3
l_e	effective length	258	mm
A_e	effective area	840	mm^2
m	mass of core	≈ 370	g



Dimensions in mm.

Fig.1 I93/28/30 core.

Core data

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	10700 ±25%(1)	≈ 2150	I93/28/30-3C90
	8700 ±25%(2)	≈ 2150	
3C94 des	10700 ±25%(1)	≈ 2150	I93/28/30-3C94
	8700 ±25%(2)	≈ 2150	

Notes

1. Measured in combination with *"U93/52/30"*.
2. Measured in combination with *"U93/76/30"*.

Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥330	≤ 21(1)	≤ 23(1)
	≥330	≤ 25(2)	≤ 28(2)
3C94	≥330	–	≤ 18(1)
	≥330	–	≤ 21(2)

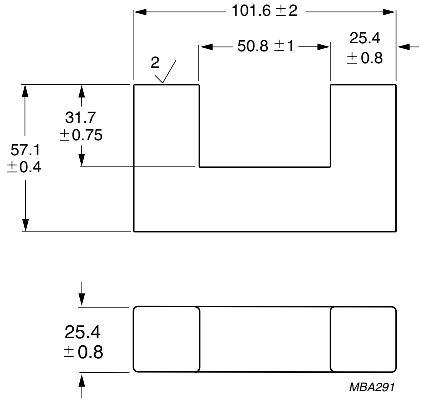
Notes

1. Measured in combination with *"U93/52/30"*.
2. Measured in combination with *"U93/76/30"*.

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.478	mm^{-1}
V_e	effective volume	199 000	mm^3
l_e	effective length	308	mm
A_e	effective area	645	mm^2
m	mass of core half	≈ 500	g



Dimensions in mm.

Fig.0 U100/57/25 core half.

Core halves

A_L measured on a combination of 2 U cores.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	5500 ±25%	≈ 2200	U100/57/25-3C90
3C94 des	5500 ±25%	≈ 2200	U100/57/25-3C94

Properties of core sets under power conditions

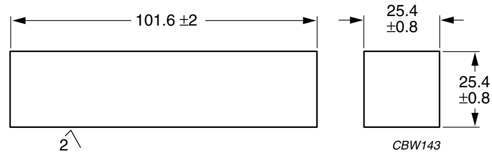
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥ 320	≤ 23	≤ 26
3C94	≥ 320	–	≤ 20

I cores and accessories I100/25/25

CORE SETS

Effective core parameters in combination with U100/57/25

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.379	mm^{-1}
V_e	effective volume	158000	mm^3
l_e	effective length	245	mm
A_e	effective area	645	mm^2
m	mass of core	≈ 300	g



Dimensions in mm.

Fig.1 I100/25/25 core.

Core data

A_L measured in combination with *"U100/57/25"*.

GRADE	A_L (nH)	μ_e	TYPE NUMBER
3C90	6700 ±25%	≈ 2150	I100/25/25-3C90
3C94 des	6700 ±25%	≈ 2150	I100/25/25-3C94

Properties of core sets under power conditions

Core loss measured in combination with *"U100/57/25"*.

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥ 330	≤ 19	≤ 20
3C94	≥ 330	–	≤ 16

UR cores

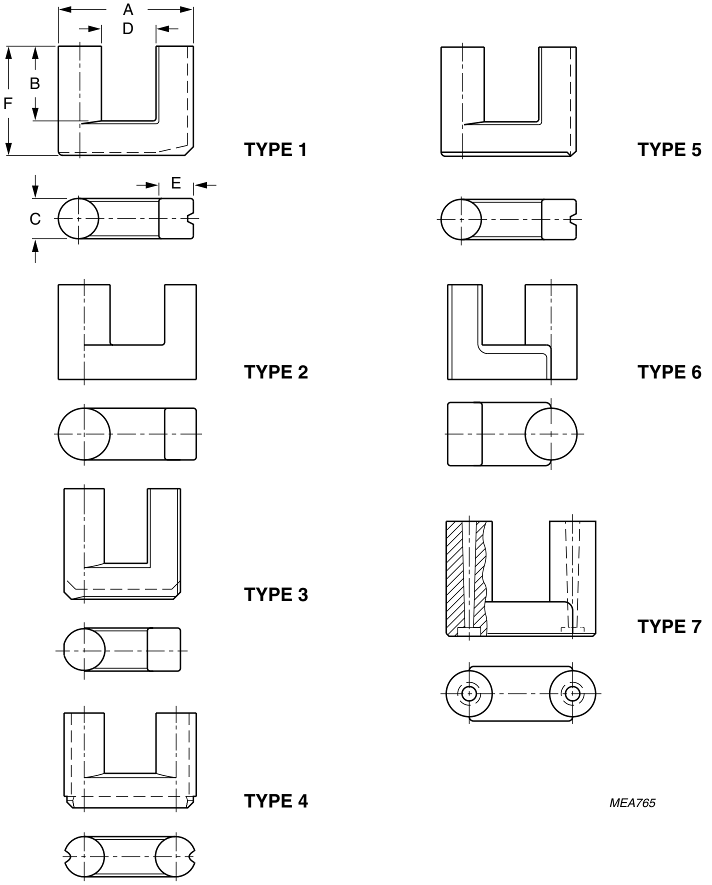
UR cores

CBW628

For more information on Product Status Definitions, see page 3.

PRESENT TYPES

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.

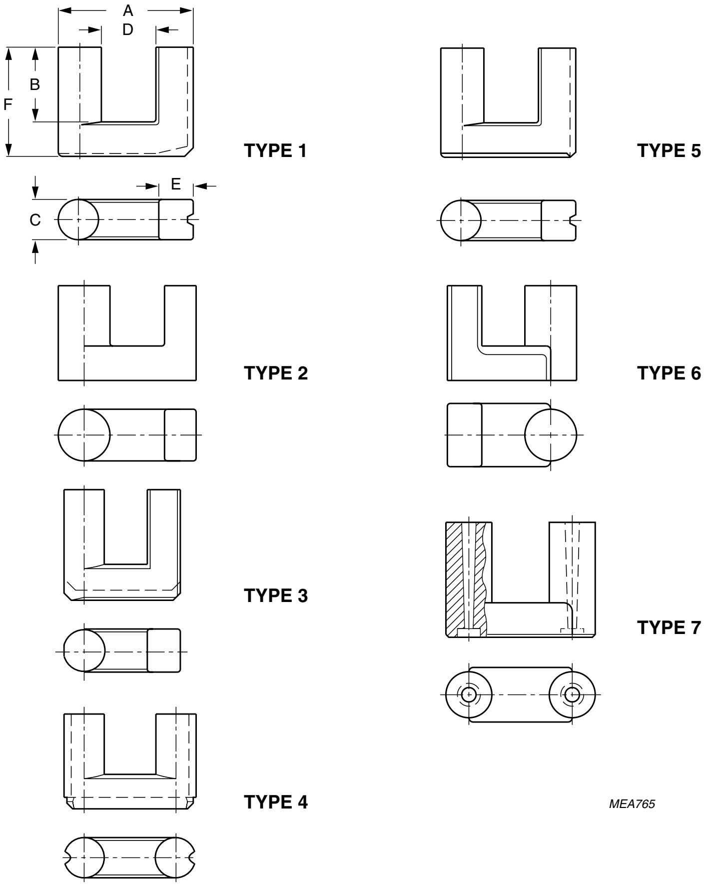


For dimensions see Table 1.

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^2)	MASS (g)
UR20/14/13	6	19.8	10.6	12.9	9.8	3.0	13.8	2.07	2956	782	37.8	8
UR28/20/14	6	28.3	13.0	11.2	8.5	7.5	20.4	0.990	9460	97	98	25
UR35/28/13	5	35.2	18.8	12.7	13.1	9.3	28.3	1.100	15900	132	120	42
UR39/35/15	3	38.7	24.8	14.9	15.0	9.1	35.2	1.094	24300	163	149	64
UR42/21/12	4	41.8	11.1	11.9	18.2	11.9	20.6	1.09	11800	113	104	31
UR42/32/15	5	42.5	20.2	15.2	14.4	12.0	31.8	0.832	26670	149	179	69
UR43/34/16	2	42.1	24.0	15.8	15.7	9.6	34.0	0.982	27100	163	166	71
UR44/36/15	1	43.8	24.45	14.65	16.65	11.8	35.9	1.006	28700	170	169	71
UR47/36/16	5	47.55	23.8	15.95	18.25	12.6	35.7	0.900	33800	174	194	86
UR48/39/17	5	48.0	26.9	17.0	17.4	13.0	39.4	0.865	39990	186	215	99
UR64/29/14	4	64.0	18.1	13.8	36.1	13.8	29.5	1.26	27000	185	147	71
UR64/40/20	7	64.0	26.5	20.0	23.2	20.0	40.5	0.726	61000	210	290	160



For type numbers see Table 2.

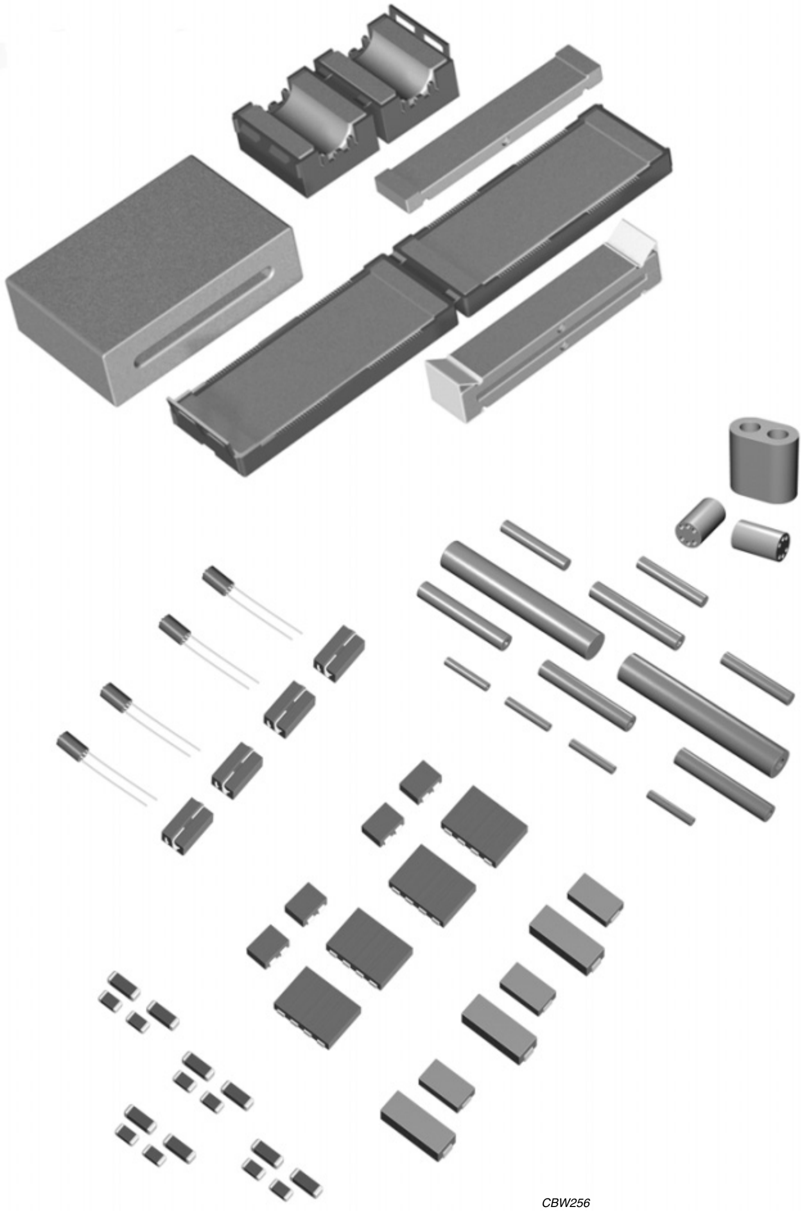
Fig.2 UR cores for line output transformers.

Table 2 Type numbers

SHAPE	MATERIAL GRADE	
	3C81/3F3	3C30
6	–	UR20/14/13-3C30 des
6	–	UR28/20/14-3C30 des
5	–	UR35/28/13-3C30 des
3	–	UR39/35/15-3C30 des
4	UR42/21/12-3C81	–
5	–	UR42/32/15-3C30 des
2	–	UR43/34/16-3C30 des
1	–	UR44/36/15-3C30 des
5	–	UR47/36/16-3C30 des
5	–	UR48/39/17-3C30 des
4	UR64/29/14-3C81	–
7	–	–
7	UR64/40/20-3F3	–

Soft Ferrites

EMI-suppression products


CBW256

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EMI-suppression products

CORE TYPE	DESCRIPTION
BC	bobbin core
CMS	common mode choke SMD
CSA	cable shield arcade
CSA-EN	cable shield arcade encapsulated
CSC	cable shield C-shape
CSC-EN	cable shield C-shape encapsulated
CSU	cable shield U-shape
CSU-EN	cable shield U-shape encapsulated
CSF	cable shield flat
CST	cable shield tubular
BD	bead
BDS	bead SMD
BDW	bead on wire
MHB	multihole core binocular
MHC	multihole core circular
MHR	multihole core rectangular
MLI, MLH	mutilayer inductor
MLS, MLP, MLN	mutilayer suppressor
ROD	rod
WBC	wideband choke
WBS	wideband choke SMD
TUB	tube
T	toroid (ring core)
TC	toroid coated with parylene C
TL	toroid coated with lacquer
TN	toroid coated with nylon
TX	toroid coated with epoxy

BOBBIN CORES

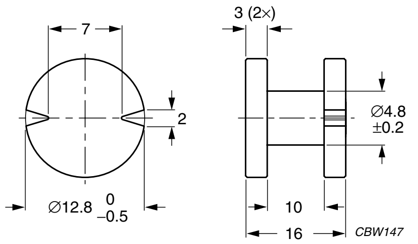
Type BC13/4.8/16

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	50	BC13/4.8/16-3C90 sup

Winding data for BC13/4.8/16

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
38.8	27.3



Dimensions in mm.

Fig.1 BC13/4.8/16.

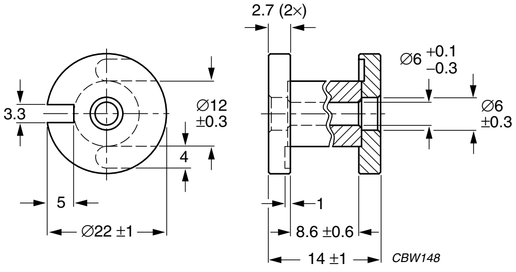
Type BC22/12/14

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	86	BC22/12/14-3C90 sup

Winding data for BC22/12/14

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
43.0	53.4



Dimensions in mm.

Fig.2 BC22/12/14.

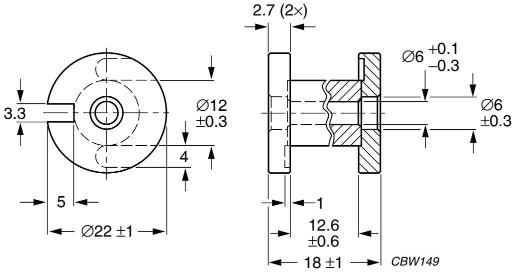
Type BC22/12/18

A_L measured with fully wound bobbin.

GRADE	A_L (nH)	TYPE NUMBER
3C90	85	BC22/12/18-3C90 sup

Winding data for BC22/12/18

WINDING AREA (mm²)	AVERAGE LENGTH OF TURN (mm)
63.0	53.4



Dimensions in mm.

Fig.3 BC22/12/18.

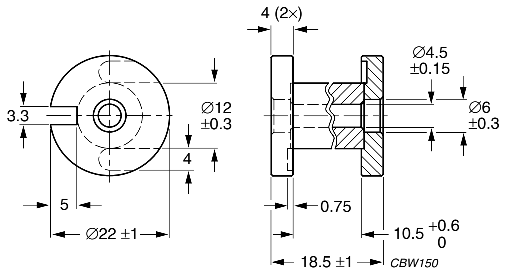
Type BC22/12/19

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	94	BC22/12/19-3C90 sup

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.

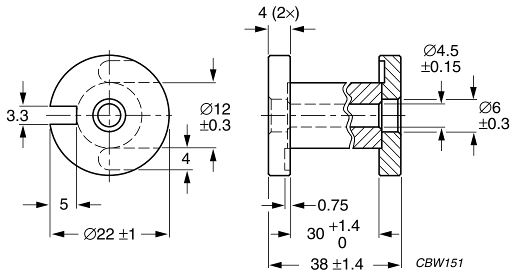
Type BC22/12/38

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	74	BC22/12/38-3C90 sup

Winding data for BC22/12/38

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
150	53.4



Dimensions in mm.

Fig.5 BC22/12/38.

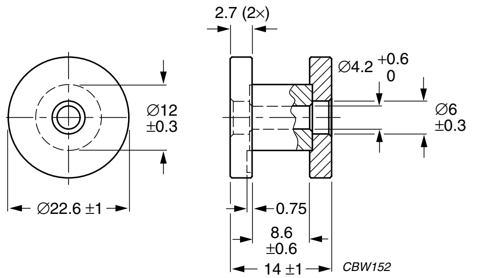
Type BC23/12/14

A_L measured with fully wound bobbin.

GRADE	A_L(nH)	TYPE NUMBER
3C90	92	BC23/12/14-3C90 sup

Winding data for BC23/12/14

WINDING AREA (mm^2)	AVERAGE LENGTH OF TURN (mm)
45.6	54.3

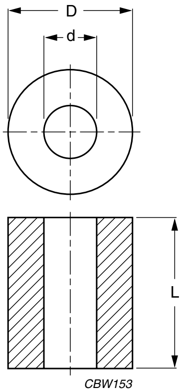


Dimensions in mm.

Fig.6 BC23/12/14.

CABLE SHIELDS FOR EMI-SUPPRESSION

Tubular cable shields



For dimensions see Table 1.

Fig.1 Tubular cable shield.

Table 1 Type numbers, dimensions and parameters; see Fig.1

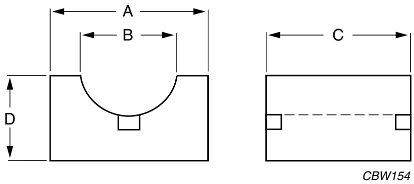
TYPE NUMBER		DIMENSIONS			$\mid Z_{typ} \mid^{(1)}$ (Ω) at	
		D	d	L	25 MHz	100 MHz
CST7.8/5.3/9.8-3S4	des	7.8 ±0.2	5.3 +0.3	9.8 ±0.2	33	50
CST8/5.3/10-3S4	des	8 −0.4	5.3 +0.3	10 −0.4	36(2)	50
CST8.3/3.5/10-3S4	des	8.3 −0.4	3.5 +0.3	10 −0.6	70	96
CST9.5/4.8/4.8-4S2	des	9.5 ±0.25	4.75 ±0.25	4.8 ±0.2	18	35
CST9.5/4.8/6.4-4S2	des	9.5 ±0.25	4.75 ±0.25	6.35 ±0.35	23	50
CST9.5/4.8/9.5-4S2	des	9.5 ±0.25	4.75 ±0.15	9.5 ±0.3	40	70
CST9.5/4.8/10-4S2	des	9.5 ±0.25	4.75 ±0.15	10.4 ±0.25	53	80
CST9.5/4.8/13-4S2	des	9.5 ±0.25	4.75 ±0.15	12.7 ±0.5	60	95
CST9.5/4.8/19-4S2	des	9.5 ±0.25	4.75 ±0.15	19.05 ±0.7	100	145
CST9.5/5.1/15-3S4	des	9.5 ±0.3	5.1 ±0.15	14.5 ±0.45	66	110
CST9.5/5.1/15-4S2	des	9.5 ±0.3	5.1 ±0.15	14.5 ±0.45	66	110
CST9.7/5/5.1-4S2	des	9.65 ±0.25	5 ±0.2	5.05 −0.45	26	43
CST14/6.4/5.3-4S2	des	14.3 ±0.45	6.35 ±0.25	5.3 −0.45	35	60
CST14/6.4/10-4S2	des	14.3 ±0.45	6.35 ±0.25	10.1 ±0.4	70	105
CST14/6.4/14-4S2	des	14.3 ±0.45	6.35 ±0.25	13.8 ±0.4	90	150
CST14/6.4/15-4S2	des	14.3 ±0.45	6.35 ±0.25	15 ±0.45	100	170
CST14/6.4/29-4S2	des	14.3 ±0.45	6.35 ±0.25	28.6 ±0.75	170	250
CST14/7.3/29-4S2	des	14.3 ±0.45	7.25 ±0.15	28.6 ±0.75	143	215
CST16/7.9/14-4S2	des	16.25 −0.75	7.9 ±0.25	14.3 ±0.35	70	113
CST16/7.9/29-4S2	des	16.25 −0.75	7.9 ±0.25	28.6 ±0.75	130	213
CST17/9.5/13-3S4	des	17.45 ±0.35	9.53 ±0.25	12.7 ±0.5	55	90
CST17/9.5/13-4S2	des	17.45 ±0.4	9.5 ±0.25	12.7 ±0.5	55	88

TYPE NUMBER		DIMENSIONS			$\lvert Z_{typ} \rvert$[(1)] (Ω) at	
		D	d	L	25 MHz	100 MHz
CST17/9.5/29-3S4	des	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	200
CST17/9.5/29-4S2	des	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	250
CST17/11/60-3S4	des	17.2 −1.2	11 ±0.5	60 −2.5	200	320
CST19/10/15-4S2	des	19 −0.65	10.15 ±0.25	14.65 −0.75	70	110
CST19/10/29-4S2	des	19 −0.65	10.15 ±0.25	28.6 ±0.75	128	196
CST19/11/12-3S4	des	19 ±0.4	10.6 ±0.3	11.5 ±0.4	50	75
CST26/13/21-4S2	des	25.9 ±0.75	12.8 ±0.25	21.3 ±0.5	110	180
CST26/13/29-4S2	des	25.9 ±0.75	12.8 ±0.25	28.6 ±0.8	145	225
CST29/19/7.5-4S2	des	29 ±0.75	19 ±0.5	7.5 ±0.25	28	47

Note

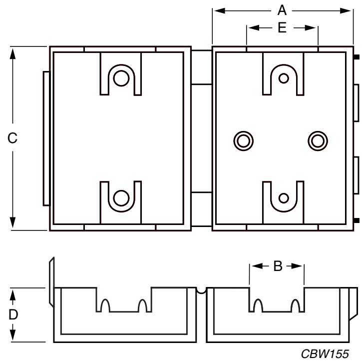
1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ −20%.
2. At 30 MHz.

Round cable shields (split)



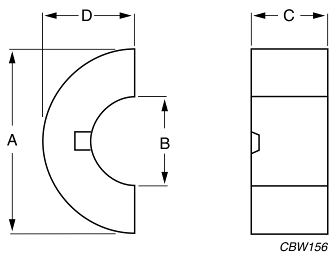
For dimensions see Table 2.

Fig.2 Shield (CSA) outline.



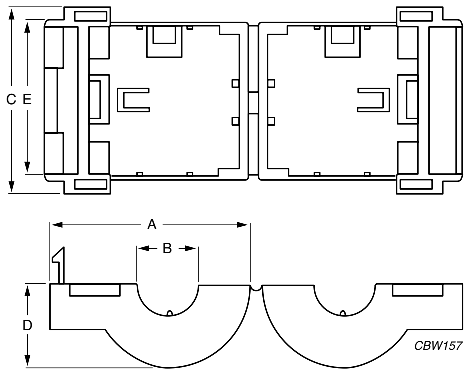
For dimensions see Table 2.

Fig.3 Nylon case.



For dimensions see Table 2.

Fig.4 Shield (CSC) outline.



For dimensions see Table 2.

Fig.5 Nylon case.

General data

ITEM	SPECIFICATION
Case material	polyamide (PA66), glass reinforced, flame retardant in accordance with *"UL94V-0"*, grade A82, colour black

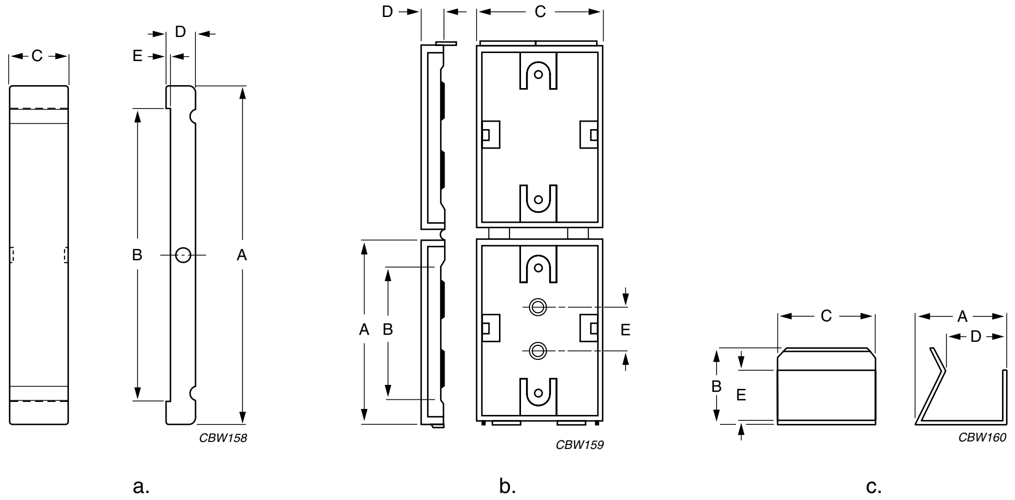
Table 2 Type numbers, dimensions and parameters; see Figs 2 to 5

TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z_{typ} \rvert^{(1)}$ (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Round cable shields								
CSA15/7.5/29-4S2 des	2	15 ±0.25	6.6 ±0.3	28.6 ±0.8	7.5 ±0.15	–	165	275
CSA19/9.4/29-4S2 des	2	18.65 ±0.4	10.15 ±0.3	28.6 ±0.8	9.4 ±0.15	–	140	225
CSA26/13/29-4S2 des	2	25.9 ±0.5	13.05 ±0.3	28.6 ±0.8	12.8 ±0.25	–	155	250
CSC16/7.9/14-4S2 des	4	15.9 ±0.4	7.9 ±0.3	14.3 ±0.4	7.95 ±0.2	–	50	113
Round cable shields in matching nylon cases								
CSA15/7.5/29-4S2-EN des	2+3	17.9	7.0	32.3	9.2	9.0	165	275
Nylon case	3	17.9	7.0	32.3	9.2	9.0	–	–
CSA19/9.4/29-4S2-EN des	2+3	22.1	10.2	32.3	11.7	9.0	140	225
Nylon case	3	22.1	10.2	32.3	11.7	9.0	–	–
CSA26/13/29-4S2-EN des	2+3	29	13.4	32.5	14.8	18.0	155	250
Nylon case	3	29	13.4	32.5	14.8	18.0	–	–
CSC16/7.9/14-4S2-EN des	4+5	24.7	7.6	22.8	10.2	17.8	50	113
Nylon case	5	24.7	7.6	22.8	10.2	17.8	–	–

Note

1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ –20%.

Flat cable shields (split)



For dimensions see Table 3.

Fig.6 Outlines of flat cable shields (split) and accessories.

General data

ITEM	SPECIFICATION
Case material	polyamide (PA66), glass reinforced, flame retardant in accordance with *"UL94V-0"*, grade A82, colour black
Clip material	spring steel (0.5 mm), zinc plated

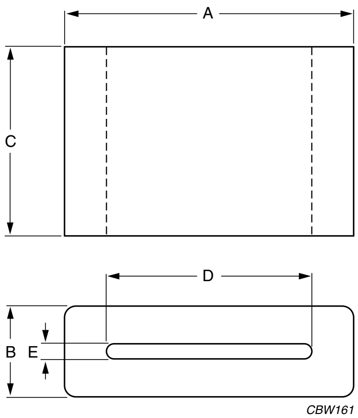
Table 3 Type numbers, dimensions and parameters; see Fig.6

TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z_{typ} \rvert$(1) (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Flat cable shields (split)								
CSU45/6.4/29-4S2 des	6a	45.1 ±0.75	34.4 ±0.7	28.6 ±0.7	6.35 ±0.25	0.85 ±0.2	96	225
CSU76/6.4/13-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	12.7 ±0.4	6.35 ±0.25	0.85 ±0.2	36	110
CSU76/6.4/15-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	15.0 ±0.6	6.35 ±0.25	0.85 ±0.2	50	159
CSU76/6.4/29-4S2 des	6a	76.2 ±1.5	65.3 ±1.3	28.6 ±0.8	6.35 ±0.25	0.85 ±0.2	75	215
CSU76/6.4/29-3S4 des	6a	76.2 ±1.5	65.3 ±1.3	28.6 ±0.8	6.35 ±0.25	0.85 ±0.2	70	235
CLI-CSU6.4 des	6c	16.1	11.0	12.7	11.4	8.0	–	–
Flat cable shields in matching nylon cases								
CSU45/6.4/29-4S2-EN des	6a+b	49.5	34.3	32.3	8.1	20	96	225
Nylon case	6b	49.5	34.3	32.3	8.1	20	–	–
CSU76/6.4/29-4S2-EN des	6a+b	80.8	65.5	32.3	8.1	50.8	75	215
Nylon case	6b	80.8	65.5	32.3	8.1	50.8	–	–

Note

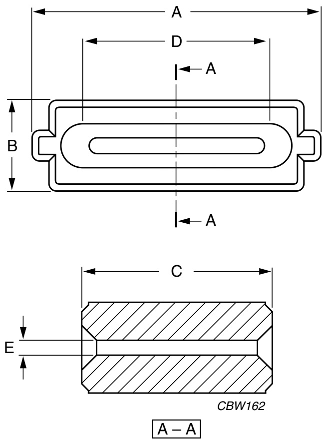
1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ –20%.

Flat cable shields



For dimensions see Table 4.

Fig.7 CSF38/12/25 outline.



For dimensions see Table 4.

Fig.8 CSF38/12/25-S outline.

Table 4 Type numbers, dimensions and parameters; see Figs 7 and 8

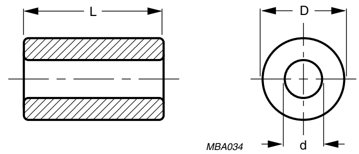
TYPE NUMBER	FIG.	DIMENSIONS					$\lvert Z_{typ} \rvert$(1) (Ω) at	
		A	B	C	D	E	25 MHz	100 MHz
Flat cable shields								
CSF38/12/25-3S4 des	7	38.1 ±1.0	12.1 ±0.35	25.4 ±0.75	26.7 ±0.75	1.9 ±0.35	110	215
CSF38/12/25-3S4-S des	8	38.5 ±0.6	12.1 ±0.4	25.4 ±0.8	26.8 ±0.8	1.9 ±0.4	98	196

Note

1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ −20%.

EMI-SUPPRESSION BEADS

Colour marking: 4S2 has a flash of yellow paint.



For dimensions see Table 1.

Fig.1 EMI suppression bead.

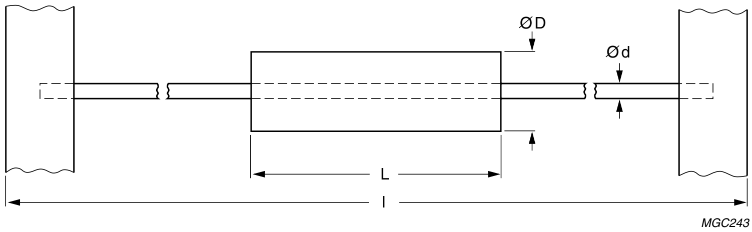
Note

1. Typical values at 100 MHz, $\lvert Z \rvert_{min}$ is −20%.

Table 1 Grades, parameters and type numbers; see Fig.1

GRADE	$\lvert Z_{typ} \rvert$ (Ω)(1) at frequency (MHz)							DIMENSIONS (mm)			TYPE NUMBER
	1	3	10	25	30	100	300	D	d	L	
3S1	24	48	49	–	39	33	29	3 ±0.1	0.7 +0.1	4 ±0.2	BD3/0.7/4-3S1 sup
	41	90	91	–	74	63	55	3 ±0.1	1 +0.1/–0.05	10 ±0.3	BD3/1/10-3S1 sup
	34	65	66	–	53	45	40	5.1 –0.3	0.75 +0.1	4 ±0.2	BD5.1/0.8/4-3S1 sup
	88	156	160	–	113	88	63	5.1 –0.3	0.75 +0.1	10 ±0.3	BD5.1/0.8/10-3S1
	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 sup
	13	23	30	–	25	21	19	5.1 –0.3	2 +0.2	4 ±0.2	BD5.1/2/4-3S1
	36	64	76	–	61	53	46	5.1 –0.3	2 +0.2	10 ±0.3	BD5.1/2/10-3S1 sup
4S2	7	20	35	–	54	69	76	1.9 +0.2	0.8 +0.2	9.75 –0.2	BD1.9/0.8/9.8-4S2 sup
	3	10	28	–	40	63	68	3 ±0.1	0.7 +0.1	4 ±0.2	BD3/0.7/4-4S2
	11	38	69	–	101	156	169	3 ±0.1	0.75 +0.1	10 ±0.3	BD3/0.8/10-4S2
	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
	–	–	–	27	–	40	–	3.5 ±0.2	1.3 ±0.1	3.25 ±0.25	BD3.5/1.3/3.3-4S2
	–	–	–	47	–	60	–	3.5 ±0.2	1.3 ±0.1	6 ±0.25	BD3.5/1.3/6-4S2
	–	–	–	89	–	125	–	3.5 ±0.2	1.3 ±0.1	12.7 ±0.35	BD3.5/1.3/13-4S2
	6	19	38	–	55	85	96	5.1 –0.3	0.75 +0.1	4 ±0.2	BD5.1/0.8/4-4S2
	15	50	94	–	138	213	238	5.1 –0.3	0.75 +0.1	10 ±0.3	BD5.1/0.8/10-4S2 sup
	4	13	25	–	34	51	59	5.1 –0.3	1.5 +0.15	4 ±0.2	BD5.1/1.5/4-4S2
	9	31	56	–	85	130	145	5.1 –0.3	1.5 +0.15	10 ±0.3	BD5.1/1.5/10-4S2
	3	10	19	–	25	40	45	5.1 –0.3	2 +0.2	4 ±0.2	BD5.1/2/4-4S2
	–	–	34	–	–	78	–	5.1 –0.3	2 +0.2	7.1 ±0.2	BD5.1/2/7.1-4S2
	8	19	38	–	64	100	111	5.1 –0.3	2 +0.2	10 ±0.3	BD5.1/2/10-4S2 sup
	–	–	–	135	–	200	–	6.35 ±0.15	2.95 +0.45	25.4 ±0.75	BD6.4/3/25-4S2
	–	–	–	63	–	92	–	7.65 –0.25	2.25 +0.25	7.55 ±0.25	BD7.7/2.3/7.6-4S2
	5	18	34	–	48	71	81	8 ±0.2	1.5 +0.15	4 ±0.2	BD8/1.5/4-4S2
	13	43	88	–	116	181	201	8 ±0.2	1.5 +0.15	10 ±0.3	BD8/1.5/10-4S2
	5	13	25	–	39	61	69	8 ±0.2	2 +0.2	4 ±0.2	BD8/2/4-4S2
	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

BEADS ON WIRE FOR EMI-SUPPRESSION



For dimensions, see Table 1.
Taping standard in accordance with *"IEC 60286, part 1"* and *"EIA-RS-296-D"*.

Fig.1 Bead on wire.

Table 1 Grades, parameters and type numbers; see Fig.1

GRADE	$\lvert Z_{typ}\rvert$ (Ω)(1) at frequency (MHz)							DIMENSIONS (mm)				TYPE NUMBER
	1	3	10	25	30	100	300	∅D	L	l	∅d	
4S2	4	13	24	–	36	58	65	3.5 ±0.2	3.5 –0.5	64.4	0.64	BDW3.5/3.5-4S2
	5	16	33	–	49	75	88	3.5 ±0.2	4.7 –0.5	64.4	0.64	BDW3.5/4.7-4S2
	–	–	–	54	–	82	–	3.5 ±0.25	5.25 ±0.25	64.4	0.64	BDW3.5/5.3-4S2
	6	21	44	–	66	100	119	3.5 ±0.2	6.0 ±0.25	64.4	0.64	BDW3.5/6-4S2
	8	25	49	–	74	110	131	3.5 ±0.2	6.7 ±0.25	64.4	0.64	BDW3.5/6.7-4S2
	9	28	55	–	84	131	150	3.5 ±0.2	7.6 ±0.35	64.4	0.64	BDW3.5/7.6-4S2
	10	33	65	–	98	146	175	3.5 ±0.2	8.9 ±0.35	64.4	0.64	BDW3.5/8.9-4S2
	–	–	–	96	–	150	–	3.5 ±0.25	9.5 ±0.3	64.4	0.64	BDW3.5/9.5-4S2
	–	–	–	117	–	180	–	3.5 ±0.25	11.4 ±0.4	64.4	0.64	BDW3.5/11-4S2
	–	–	–	143	–	220	–	3.5 ±0.25	13.8 ±0.5	64.4	0.64	BDW3.5/14-4S2

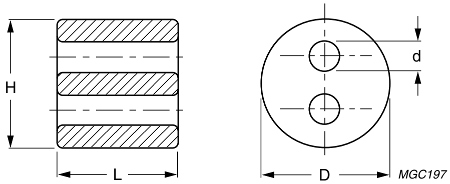
Note

1. Typical values at 25 and 100 MHz, $\lvert Z\rvert_{min}$ is –20%. Other impedance values are for reference only.

MULTIHOLE CORES

Table 1 MHC2 grades, parameters and type numbers

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
	6.6 −0.6	1.05 +0.3	5 ±0.2	MHC2-6.6/5-4B1

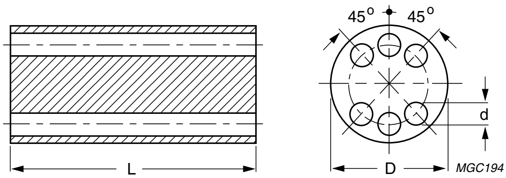


For dimensions see Table 2.

Fig.1 Multihole core circular (MHC2).

Table 2 MHC6 grades, parameters and type numbers

GRADE	DIMENSIONS (mm)			TYPE NUMBER
	D	d	L	
3S4	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-3S4
4B1	6 ±0.3	0.7 +0.2	10 ±0.5	MHC6-6/10-4B1 sup
	6 ±0.3	0.7 +0.2	5 −0.2	MHC6-6/5-4B1



For dimensions see Table 2.

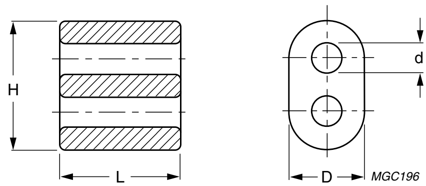
Fig.2 Multihole core circular (MHC6).

Table 3 MHB2 grades, parameters and type numbers

GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
4B1	8.5 − 0.5	3.5 +0.5	8 ± 0.3	14 ± 0.5	MHB2-14/8.5/8-4B1 sup
	8.5 − 0.5	3.5 +0.5	14 ± 0.4	14 ± 0.5	MHB2-14/8.5/14-4B1 sup
	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	MHB2-13/8/6-4B1(1)
3C90	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	MHB2-13/8/6-3C90(1)
4A11	8.0 ± 0.3	4.2 ± 0.3	21 ± 1	14 ± 0.5	MHB2-14/8/21-4A11

Note

1. Chamfered holes and sides.

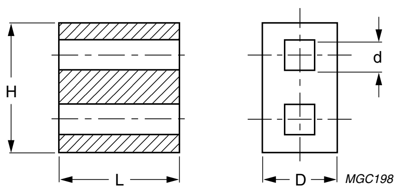


For dimensions see Table 3.

Fig.3 Multihole core binocular (MHB2).

Table 4 MHR2 grades, parameters and type numbers

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
3C90	5.4 ± 0.3	2.0 ± 0.3	10.9 ± 0.4	10.8 ± 0.3	MHR2-11/5.4/11-3C90

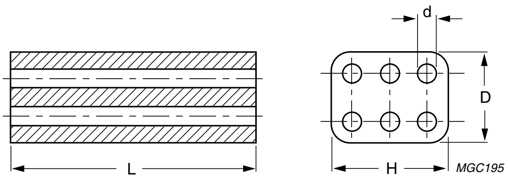


For dimensions see Table 4.

Fig.4 Multihole core rectangular (MHR2).

Table 5 MHR6 grades, parameters and type numbers

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).

MULTILAYER SUPPRESSORS

Multilayer suppressors are a powerful solution for EMI/RFI attenuation for electronic equipment. Supplied in seven standard sizes (0402, 0603, 0805, 1206, 1210, 1806 and 1812), they have impedances between 6 and 2 000 Ω at 100 MHz.

When installed in series with signal and/or power circuits, high frequency noise is suppressed. There is no need for ground termination, which makes these devices very suitable for circuits with difficult ground. Typical suppression frequencies range from 10 MHz to 1 000 MHz and rated currents are between 0.1 and 6 A.

Multilayer suppressors are specially designed to reduce noise in low impedance circuits while keeping the signal free from distortion. This is because at the interfering frequencies these components behave as a resistor. The high frequency noise is converted into heat rather than reflected to the source. This dissipation prevents ringing and parasitic oscillations.

These characteristics can be used for many different purposes:

- Absorption of generated noise.
- Filtering and wave-shape correction of digital signals from high speed clock oscillators.
- Prevention of high frequency interference entering circuit electronics.

Features

- Monolithic structure for closed magnetic path and highreliability
- Standard EIA and EIAJ sizes:
  0402, 0603, 0805, 1206, 1210, 1806 and 1812
- High impedance per volume which leads to effective high density circuits
- Suitable for wave and reflow soldering
- Wide range of impedance values
- Superior physical properties
- Available in standard EIA and EIAJ tape-and-reel
- Operating temperature -40°C to +125°C
- 100% sorting out on impedance

Main applications areas for multilayer suppressors are:

- computer and peripheral equipment: mother board, notebook, CD-Rom, DVD-Rom, CD-RW, scanner, hard disc, VGA card, sound card, LCD monitor, printer, PC server thumb drive, PCMCIA card, graphic card, etc.
- network: LAN card, hub, switcher, router set top box, etc.
- telecom: cell phone, ADSL, wired modem, cable modem, ISDN, GPS satellite receiver, etc.
- consumer: walkman, walkdisc, digital still camera (DSC), sound system, HDTV, projector, DVD player, VCD player, tuner for TV, cable modem, etc.

To help designers in the trial and error process of finding the most suitable suppression component, we offer a sample box with a selection of products.

Ordering code: SAMPLEBOX12

TYPE NUMBER STRUCTURE

Type numbers for these products consist of the following:

- Product type
- Size
- Impedance.

Product type

MLS: Multilayer Suppressor.

MLP: Multilayer Power Beads.

MLN: Multilayer Narrow Band.

Size

0402: 1.0 × 0.5 × 0.5 mm

0603: 1.6 × 0.8 × 0.8 mm

0805: 2.0 × 1.25 × 0.9 mm

1206: 3.2 × 1.6 × 1.1 mm

1210: 3.2 × 2.5 × 1.3 mm

1806: 4.5 × 1.6 × 1.6 mm

1812: 4.5 × 3.2 × 1.5 mm.

Impedance value

Expressed in ohms (Ω)

First two digits are significant figures

Last digit is the number of zeros to follow.

EXAMPLES

600: 60 Ω

101: 100 Ω

121: 120 Ω

151: 150 Ω

301: 300 Ω

102: 1000 Ω

Multilayer Suppressor MLS0603-4S7-600

TYPE	SIZE	INTERNAL CODE	IMPEDANCE
MLS	0603	4S7	60

Multilayer Power Bead MLP0603-121

TYPE	SIZE	IMPEDANCE
MLP	0603	120

Multilayer Narrow Band MLN0603-601

TYPE	SIZE	IMPEDANCE
MLN	0603	600

Standard products are delivered taped on reel and have a tolerance on impedance of 25%.

MULTILAYER SUPPRESSORS

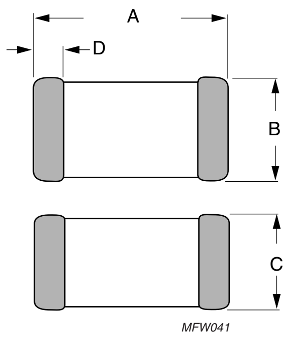


Fig.0 Outline of MLS-MLP-MLN.

Product dimensions of Multilayer Suppressors MLS - MLP - MLN

SIZE	A	B	C	D	mass (mg)
0402	1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15	0.25 ± 0.15	≈ 1
0603	1.6 ± 0.20	0.8 ± 0.15	0.8 ± 0.15	0.4 ± 0.20	≈ 5
0805	2.0 ± 0.20	1.25 ± 0.20	0.9 ± 0.20	0.5 ± 0.30	≈ 11
1206	3.2 ± 0.20	1.6 ± 0.20	1.1 ± 0.20	0.5 ± 0.30	≈ 28
1210	3.2 ± 0.20	2.5 ± 0.20	1.3 ± 0.20	0.5 ± 0.30	≈ 50
1806	4.5 ± 0.25	1.6 ± 0.20	1.6 ± 0.20	0.5 ± 0.30	≈ 55
1812	4.5 ± 0.25	3.2 ± 0.20	1.5 ± 0.20	0.5 ± 0.30	≈ 100

Product specifications Multilayer Suppressors MLS

SIZE	$|Z_{typ}|$ at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
0402	6 ± 25%	0.05	500	MLS0402-4S4-060 des
	10 ± 25%	0.05	500	MLS0402-4S4-100 des
	40 ± 25%	0.3	300	MLS0402-4S4-400 des
	80 ± 25%	0.4	200	MLS0402-4S4-800 des
	120 ± 25%	0.5	200	MLS0402-4S4-121 des
	240 ± 25%	0.5	200	MLS0402-4S4-241 des
	480 ± 25%	0.8	100	MLS0402-4S4-481 des
0603	11 ± 25%	0.05	500	MLS0603-4S4-110 des
	19 ± 25%	0.08	500	MLS0603-4S4-190 des
	30 ± 25%	0.1	400	MLS0603-4S7-300 des
	40 ± 25%	0.1	400	MLS0603-4S7-400 des
	60 ± 25%	0.1	300	MLS0603-4S7-600 des
	80 ± 25%	0.15	300	MLS0603-4S7-800 des
	100 ± 25%	0.25	250	MLS0603-4S7-101 des
	120 ± 25%	0.3	250	MLS0603-4S7-121 des
	150 ± 25%	0.3	250	MLS0603-4S7-151 des
	220 ± 25%	0.3	200	MLS0603-4S7-221 des
	300 ± 25%	0.35	230	MLS0603-4S7-301 des
	450 ± 25%	0.5	200	MLS0603-4S7-451 des
	600 ± 25%	0.45	210	MLS0603-4S7-601 des
	750 ± 25%	0.7	200	MLS0603-4S7-751 des
	1000 ± 25%	0.6	190	MLS0603-4S7-102 des
	1500 ± 25%	1	50	MLS0603-4S4-152 des
0805	7 ± 25%	0.1	600	MLS0805-4S4-070 des
	9 ± 25%	0.1	600	MLS0805-4S4-090 des
	11 ± 25%	0.1	600	MLS0805-4S4-110 des
	17 ± 25%	0.1	500	MLS0805-4S4-170 des
	30 ± 25%	0.1	600	MLS0805-4S4-300 des
	60 ± 25%	0.1	600	MLS0805-4S4-600 des
	70 ± 25%	0.15	500	MLS0805-4S7-700 des
	80 ± 25%	0.15	500	MLS0805-4S7-800 des
	120 ± 25%	0.2	400	MLS0805-4S7-121 des
	150 ± 25%	0.25	200	MLS0805-4S7-151 des
	220 ± 25%	0.3	300	MLS0805-4S7-221 des
	300 ± 25%	0.3	200	MLS0805-4S7-301 des
	400 ± 25%	0.3	300	MLS0805-4S7-401 des
	500 ± 25%	0.4	300	MLS0805-4S7-501 des
	600 ± 25%	0.3	200	MLS0805-4S7-601 des
	750 ± 25%	0.5	200	MLS0805-4S4-751 des

SIZE	$\lvert Z_{typ} \rvert$ at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
0805	1000 ± 25%	0.5	200	MLS0805-4S7-102 des
	1500(1) ± 25%	0.6	200	MLS0805-4S7-152 des
	2000 ± 25%	0.8	100	MLS0805-4S4-202 des
1206	19 ± 25%	0.05	600	MLS1206-4S4-190 des
	26 ± 25%	0.05	600	MLS1206-4S4-260 des
	30 ± 25%	0.1	600	MLS1206-4S4-300 des
	50 ± 25%	0.1	500	MLS1206-4S4-500 des
	60 ± 25%	0.1	500	MLS1206-4S4-600 des
	70 ± 25%	0.1	600	MLS1206-4S4-700 des
	90 ± 25%	0.15	500	MLS1206-4S4-900 des
	120 ± 25%	0.15	500	MLS1206-4S4-121 des
	150 ± 25%	0.15	500	MLS1206-4S4-151 des
	200 ± 25%	0.2	400	MLS1206-4S4-201 des
	400 ± 25%	0.2	400	MLS1206-4S4-401 des
	500 ± 25%	0.2	400	MLS1206-4S4-501 des
	600 ± 25%	0.3	400	MLS1206-4S4-601 des
	1000 ± 25%	0.4	200	MLS1206-4S7-102 des
	1200(1) ± 25%	0.4	200	MLS1206-4S7-122 des
	2000(2) ± 25%	0.6	200	MLS1206-4S7-202 des
1210	32 ± 25%	0.2	500	MLS1210-4S4-320 des
	60 ± 25%	0.2	500	MLS1210-4S4-600 des
	90 ± 25%	0.2	500	MLS1210-4S4-900 des
1806	50 ± 25%	0.2	600	MLS1806-4S4-500 des
	60 ± 25%	0.2	600	MLS1806-4S4-600 des
	80 ± 25%	0.1	600	MLS1806-4S4-800 des
	100 ± 25%	0.3	500	MLS1806-4S4-101 des
	150 ± 25%	0.2	500	MLS1806-4S4-151 des
	170 ± 25%	0.3	500	MLS1806-4S4-171 des
1812	70 ± 25%	0.3	500	MLS1812-4S4-700 des
	120 ± 25%	0.3	500	MLS1812-4S4-121 des

Note

1. at 50 MHz
2. at 30 MHz

- RDC: Resistance of component for DC current.
- Maximum rated current: measure of current capacity of the component. When the maximum rated current is applied, temperature rise shall not exceed 20°C.
- Standard tolerance on impedance is ±25%.
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

Product specifications Multilayer Power Beads MLP

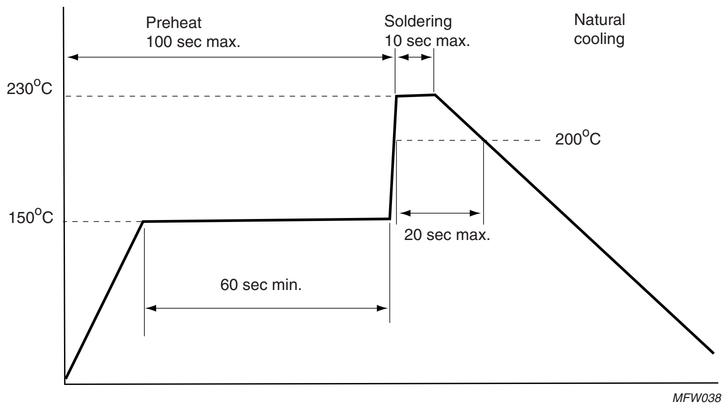
SIZE	$\|Z_{typ}\|$ at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
0603	11 ± 25%	0.02	4000	MLP0603-110 des
	25 ± 25%	0.03	3000	MLP0603-250 des
	40 ± 25%	0.035	3000	MLP0603-400 des
	60 ± 25%	0.04	2500	MLP0603-600 des
	120 ± 25%	0.05	1800	MLP0603-121 des
	300 ± 25%	0.1	2000	MLP0603-301 des
	500 ± 25%	0.15	1500	MLP0603-501 des
	600 ± 25%	0.2	1000	MLP0603-601 des
	1000 ± 25%	0.25	800	MLP0603-102 des
0805	11 ± 25%	0.01	6000	MLP0805-110 des
	17 ± 25%	0.02	5000	MLP0805-170 des
	30 ± 25%	0.02	4000	MLP0805-300 des
	60 ± 25%	0.03	3000	MLP0805-600 des
	80 ± 25%	0.04	3000	MLP0805-800 des
	120 ± 25%	0.04	3000	MLP0805-121 des
	200 ± 25%	0.05	2500	MLP0805-201 des
	300 ± 25%	0.08	2000	MLP0805-301 des
	600 ± 25%	0.1	2000	MLP0805-601 des
	1000 ± 25%	0.12	1500	MLP0805-102 des
1206	19 ± 25%	0.015	6000	MLP1206-190 des
	32 ± 25%	0.015	4000	MLP1206-320 des
	50 ± 25%	0.02	4000	MLP1206-500 des
	70 ± 25%	0.025	3000	MLP1206-700 des
	80 ± 25%	0.025	3000	MLP1206-800 des
	100 ± 25%	0.03	2500	MLP1206-101 des
	300 ± 25%	0.06	2000	MLP1206-301 des
	600 ± 25%	0.1	1800	MLP1206-601 des
	1000 (1) ± 25%	0.15	1500	MLP1206-102 des
	1200 (1) ± 25%	0.18	1500	MLP1206-122 des
	1500 (1) ± 25%	0.2	1200	MLP1206-152 des
1210	60 ± 25%	0.025	4000	MLP1210-600 des
	90 ± 25%	0.025	3000	MLP1210-900 des
1806	50 ± 25%	0.02	6000	MLP1806-500 des
	60 ± 25%	0.02	5000	MLP1806-600 des
	80 ± 25%	0.025	4000	MLP1806-800 des
	150 ± 25%	0.1	2000	MLP1806-151 des
1812	70 ± 25%	0.03	6000	MLP1812-700 des
	120 ± 25%	0.03	4000	MLP1812-121 des

Product specifications Multilayer Narrow Band MLN

SIZE	$\lvert Z_{typ} \rvert$ at 100 MHz (Ω)	R_{DC} MAX. (Ω)	I MAX. (mA)	TYPE NUMBER
0603	6 ± 25%	0.05	500	MLN0603-060 des
	10 ± 25%	0.07	400	MLN0603-100 des
	40 ± 25%	0.30	300	MLN0603-400 des
	80 ± 25%	0.40	300	MLN0603-800 des
	120 ± 25%	0.40	300	MLN0603-121 des
	240 ± 25%	0.40	200	MLN0603-241 des
	300 ± 25%	0.50	200	MLN0603-301 des
	480 ± 25%	0.60	150	MLN0603-481 des
	600 ± 25%	0.60	100	MLN0603-601 des
0805	6 ± 25%	0.07	800	MLN0805-060 des
	11 ± 25%	0.10	700	MLN0805-110 des
	26 ± 25%	0.20	600	MLN0805-260 des
	32 ± 25%	0.20	600	MLN0805-320 des
	60 ± 25%	0.30	500	MLN0805-600 des
	75 ± 25%	0.30	500	MLN0805-750 des
	90 ± 25%	0.30	500	MLN0805-900 des
	120 ± 25%	0.40	400	MLN0805-121 des
	150 ± 25%	0.40	400	MLN0805-151 des
	170 ± 25%	0.50	400	MLN0805-171 des
	220 ± 25%	0.50	300	MLN0805-221 des
	300 ± 25%	0.50	300	MLN0805-301 des
	400 ± 25%	0.50	300	MLN0805-401 des
	500 ± 25%	0.50	200	MLN0805-501 des
	600 ± 25%	0.50	200	MLN0805-601 des
	1000 ± 25%	0.60	100	MLN0805-102 des
	1200 ± 25%	0.70	100	MLN0805-122 des
	1500 ± 25%	0.70	100	MLN0805-152 des
1206	32 ± 25%	0.20	600	MLN1206-320 des
	60 ± 25%	0.30	500	MLN1206-600 des
	80 ± 25%	0.30	500	MLN1206-800 des
	90 ± 25%	0.30	500	MLN1206-900 des
	120 ± 25%	0.40	400	MLN1206-121 des
	150 ± 25%	0.40	400	MLN1206-151 des
	200 ± 25%	0.50	300	MLN1206-201 des
	220 ± 25%	0.50	300	MLN1206-221 des
	350 ± 25%	0.60	300	MLN1206-351 des
	400 ± 25%	0.60	300	MLN1206-401 des
	600 ± 25%	0.80	300	MLN1206-601 des
	1200 ± 25%	1.00	200	MLN1206-122 des

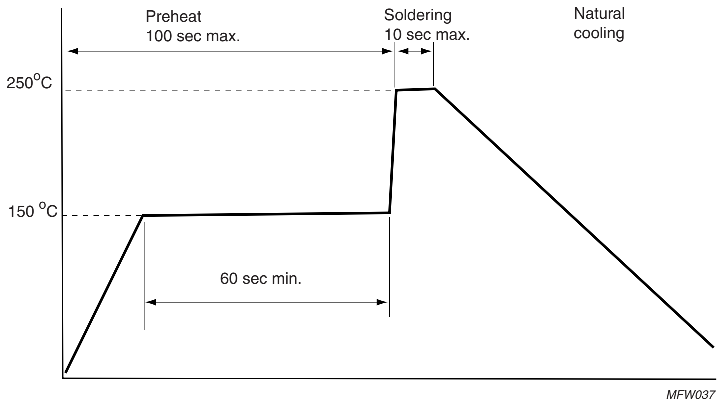
MOUNTING

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

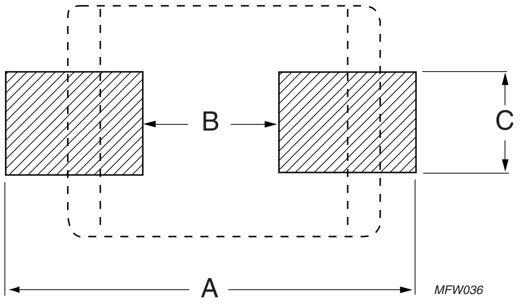
Fig.1 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.2 Double wave soldering.

Dimensions of solderlands



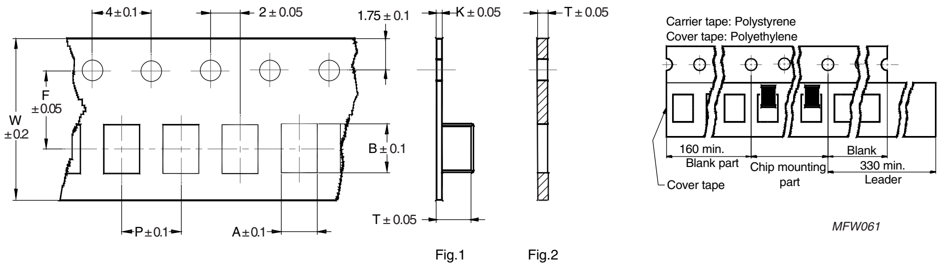
For dimensions see Table 1.

Fig.3 Recommended dimensions of solder lands.

Table 1 Solder land dimensions for MLS, MLP and MLN types; see Fig.3

SIZE	FOOTPRINT DIMENSIONS (mm)		
	A	B	C
0402	1.2 – 1.4	0.4	0.4
0603	2.4 – 3.4	0.8	0.6
0805	3.0 – 4.0	1.2	1.0
1206	4.2 – 5.2	2.0	1.2
1210	5.5 – 6.5	2.0	1.8
1806	5.5 – 6.5	3.0	1.2
1812	5.5 – 6.5	3.0	2.4

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 2.

Fig.4 Blister tape.

Table 2 Dimensions of blister tape for relevant product size code; see Fig.4

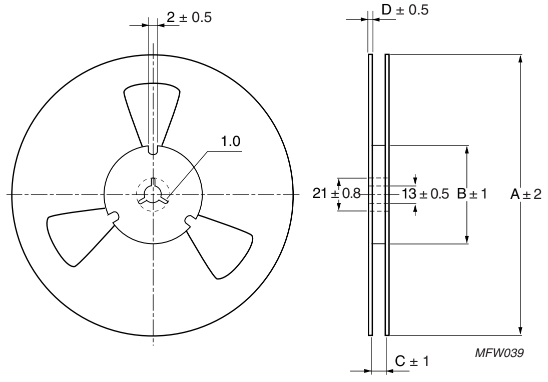
DIMENSION	PRODUCT SIZE CODE						
	0402	**0603**	**0805**	**1206**	**1210**	**1806**	**1812**
A	0.65	0.975	1.54	1.94	2.80	1.94	3.64
B	1.15	1.8	2.32	3.54	3.42	4.94	4.94
T	0.7	1.05	1.15	1.29	1.64	1.90	1.80
W	8.0	8.0	8.0	8.0	8.0	12	12
P	2.0	4.0	4.0	4.0	4.0	4.0	8.0
F	3.5	3.5	3.5	3.5	3.5	5.5	5.5
K	-	-	0.2	0.2	0.2	0.3	0.3
Tape fig.	2	2	1	1	1	1	1

MATERIAL BLISTER TAPE:

- Sizes 0402 and 0603: paper
- Other sizes: Polystyrene

MATERIAL COVER FILM:

- Polyethylene



Dimensions in mm.
For dimensions see Table 3.

Fig.5 Reel.

Table 3 Reel dimensions; see Fig.5

DIMENSION	PRODUCT SIZE CODE						
	0402	**0603**	**0805**	**1206**	**1210**	**1806**	**1812**
A	178	178	178	178	178	178	178
B	60	60	60	60	60	60	60
C	10	10	10	10	10	14	14
D	2	2	2	2	2	2	2

Table 4 Packing quantities

	PRODUCT SIZE CODE						
	0402	**0603**	**0805**	**1206**	**1210**	**1806**	**1812**
Pcs./reel	10 000	4 000	4 000	3 000	2 500	2 000	1 000

MULTILAYER INDUCTORS

Our range of multilayer inductors offers magnetic shielding, in five standard sizes (0402, 0603, 0805, 080505 and 1206), which are specially designed for miniaturized electronic products. It offers minimum flux leakage thus eliminating cross talk. They have inductances between 1 nH and 18 mH.

Main applications areas for multilayer inductors are:

- computer and peripheral equipment: mother board, notebook, CD-Rom, DVD-Rom, CD-RW, scanner, hard disc, VGA card, sound card, LCD monitor, printer, PC server thumb drive, PCMCIA card, graphic card, etc.
- network: LAN card, hub, switcher, router set top box, etc.
- telecom: cell phone, ADSL, wired modem, cable modem, ISDN, GPS satellite receiver, etc.
- consumer: walkman, walkdisc, digital still camera (DSC), sound system, HDTV, projector, DVD player, VCD player, tuner for TV, cable modem, etc.

Main high frequency application for multilayer inductor MLH are:

- cell phone, dect phone, wireless LAN card, wireless micro-phone, TV tuner, RF receiver, cable modem, RF amplifier, security remote control, wireless mouse, wireless keyboard pager, set top box.

To help designers in the trial and error process of finding the most suitable component, we offer a sample box with a selection of products.

Ordering code: SAMPLEBOX13

Features

- Monolithic structure for closed magnetic path and high reliability.
- Standard EIA and EIAJ sizes: 0402, 0603, 0805, 080505, 1206.
- This multilayer chip inductor results in magnetic shielding: the absence of leakage flux makes it most suitable for high density mounting.
- Suitable for wave and reflow soldering.
- Wide range of inductance values.
- Superior physical properties.
- Available in standard EIA and EIAJ tape-and-reel.
- Operating temperature -40ºC to +125ºC.
- 100% sorting out on inductance.Product construction

TYPE NUMBER STRUCTURE

Type numbers for these products consist of the following:

- Product type
- Size
- Inductance
- Tolerance

Product type

MLI: Multilayer Inductor.

MLH: Multilayer inductor High frequency.

Size

0402: 1.0 × 0.5 × 0.5mm
0603: 1.6 × 0.8 × 0.8mm
0805: 2.0 × 1.25 × 0.9mm
080505: 2.0 × 1.25 × 1.25mm
1206: 3.2 × 1.6 × 1.1mm

Inductance values

Expressed in nH or µH
Different ways to indicate the values are used.

EXAMPLES

4N7: 4.7 nH
82N: 82 nH

R10: 0.1 µH
1R8: 1.8 µH

820: 82 µH
151: 150 µH

Tolerance

The last 2 digits represent the tolerance:
05%, 10% or 20%

In MLH ‘03’ the tolerance has the absolute value of
± 0.3 nH.

Multilayer Inductor MLI 0805-R68-10

TYPE	SIZE	INDUCTANCE	TOLERANCE
MLI	0805	0.68 µH	± 10%

Multilayer Inductor High frequency MLH 0402-4N7-03

TYPE	SIZE	INDUCTANCE	TOLERANCE
MLH	0402	4.7 nH	± 0.3 nH

MULTILAYER INDUCTORS

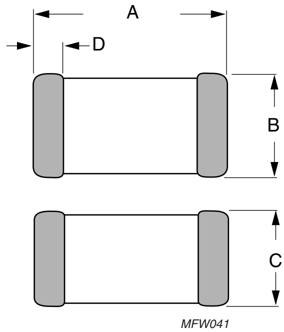


Fig.2 Outline of MLI and MLH.

Product dimensions of Multilayer Inductors MLI

SIZE	A	B	C	D	mass (mg)
0603	1.6 ± 0.15	0.8 ± 0.15	0.8 ± 0.15	0.3 ± 0.20	≈ 5
0805	2.0 ± 0.20	1.25 ± 0.20	0.9 ± 0.20	0.5 ± 0.30	≈ 11
080505	2.0 ± 0.20	1.25 ± 0.20	1.25 ± 0.20	0.5 ± 0.30	≈ 15
1206	3.2 ± 0.20	1.6 ± 0.20	1.1 ± 0.20	0.5 ± 0.30	≈ 28

Product dimensions of Multilayer High frequency Inductors MLH

SIZE	A	B	C	D	mass (mg)
0402	1.0 ± 0.15	0.5 ± 0.15	0.5 ± 0.15	0.25 ± 0.15	≈ 1
0603	1.6 ± 0.20	0.8 ± 0.15	0.8 ± 0.15	0.3 ± 0.20	≈ 5
0805	2.0 ± 0.20	1.25 ± 0.20	0.9 ± 0.20[1]	0.5 ± 0.30	≈ 11

Note: [1]
1.2 ± 0.3 for types with L ≥ 180 nH

Product specifications Multilayer Inductors MLI

SIZE	L (μH)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
0603	0.047	± 20%	20	50	260	0.3	50	MLI0603-47N-20 des
	0.068	± 20%	20	50	250	0.3	50	MLI0603-68N-20 des
	0.082	± 20%	20	50	245	0.3	50	MLI0603-82N-20 des
	0.1	± 10%	30	25	240	0.5	50	MLI0603-R10-10 des
	0.12	± 10%	30	25	205	0.5	50	MLI0603-R12-10 des
	0.15	± 10%	30	25	180	0.6	50	MLI0603-R15-10 des
	0.18	± 10%	30	25	165	0.6	50	MLI0603-R18-10 des
	0.22	± 10%	30	25	150	0.8	50	MLI0603-R22-10 des
	0.27	± 10%	30	25	136	0.8	50	MLI0603-R27-10 des
	0.33	± 10%	30	25	125	0.85	35	MLI0603-R33-10 des
	0.39	± 10%	30	25	110	1	35	MLI0603-R39-10 des
	0.47	± 10%	30	25	105	1.35	35	MLI0603-R47-10 des
	0.56	± 10%	30	25	95	1.55	35	MLI0603-R56-10 des
	0.68	± 10%	30	25	85	1.7	35	MLI0603-R68-10 des
	0.82	± 10%	30	25	75	2.1	35	MLI0603-R82-10 des
	1.0	± 10%	35	10	65	0.6	25	MLI0603-1R0-10 des
	1.2	± 10%	35	10	60	0.8	25	MLI0603-1R2-10 des
	1.5	± 10%	35	10	55	0.8	25	MLI0603-1R5-10 des
	1.8	± 10%	35	10	50	0.95	25	MLI0603-1R8-10 des
	2.2	± 10%	35	10	45	1.15	15	MLI0603-2R2-10 des
	2.7	± 10%	35	10	40	1.35	15	MLI0603-2R7-10 des
	3.3	± 10%	35	10	38	1.55	15	MLI0603-3R3-10 des
	3.9	± 10%	35	10	36	1.7	15	MLI0603-3R9-10 des
	4.7	± 10%	35	10	33	2.1	15	MLI0603-4R7-10 des
	5.6	± 10%	35	4	22	1.55	5	MLI0603-5R6-10 des
	6.8	± 10%	35	4	20	1.7	5	MLI0603-6R8-10 des
	8.2	± 10%	30	4	18	2.1	5	MLI0603-8R2-10 des
	10	± 10%	30	2	17	2.55	5	MLI0603-100-10 des
0805	0.047	± 20%	25	50	320	0.2	300	MLI0805-47N-20 des
	0.068	± 20%	25	50	280	0.2	300	MLI0805-68N-20 des
	0.082	± 20%	25	50	255	0.2	300	MLI0805-82N-20 des
	0.1	± 10%	30	25	235	0.3	250	MLI0805-R10-10 des
	0.12	± 10%	30	25	220	0.3	250	MLI0805-R12-10 des
	0.15	± 10%	30	25	200	0.4	250	MLI0805-R15-10 des
	0.18	± 10%	30	25	185	0.4	250	MLI0805-R18-10 des
	0.22	± 10%	30	25	170	0.5	250	MLI0805-R22-10 des
	0.27	± 10%	30	25	150	0.5	250	MLI0805-R27-10 des
	0.33	± 10%	30	25	145	0.55	250	MLI0805-R33-10 des
	0.9	± 10%	30	25	135	0.65	250	MLI0805-R39-10 des

SIZE	L (μH)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
0805	0.47	± 10%	30	25	125	0.65	250	MLI0805-R47-10 des
	0.56	± 10%	30	25	115	0.75	150	MLI0805-R56-10 des
	0.68	± 10%	30	25	105	0.8	150	MLI0805-R68-10 des
	0.82	± 10%	30	25	100	1	150	MLI0805-R82-10 des
	1.0	± 10%	45	10	75	0.45	50	MLI0805-1R0-10 des
	1.2	± 10%	45	10	65	0.5	50	MLI0805-1R2-10 des
	1.5	± 10%	45	10	60	0.5	50	MLI0805-1R5-10 des
	1.8	± 10%	45	10	55	0.6	50	MLI0805-1R8-10 des
	2.2	± 10%	45	10	50	0.65	30	MLI0805-2R2-10 des
080505	2.7	± 10%	45	10	45	0.75	30	MLI080505-2R7-10 des
	3.3	± 10%	45	10	41	0.8	30	MLI080505-3R3-10 des
	3.9	± 10%	45	10	38	0.9	30	MLI080505-3R9-10 des
	4.7	± 10%	45	10	35	1	30	MLI080505-4R7-10 des
	5.6	± 10%	45	4	32	0.9	15	MLI080505-5R6-10 des
	6.8	± 10%	45	4	29	1	15	MLI080505-6R8-10 des
	8.2	± 10%	45	4	26	1.1	15	MLI080505-8R2-10 des
	10	± 10%	45	2	24	1.15	15	MLI080505-100-10 des
	12	± 10%	45	2	22	1.25	15	MLI080505-120-10 des
	15	± 10%	30	1	19	0.8	5	MLI080505-150-10 des
	18	± 10%	30	1	18	0.9	5	MLI080505-180-10 des
1206	0.047	± 20%	25	50	320	0.15	300	MLI1206-47N-20 des
	0.068	± 20%	25	50	280	0.25	300	MLI1206-68N-20 des
	0.1	± 10%	30	25	235	0.25	250	MLI1206-R10-10 des
	0.12	± 10%	30	25	220	0.3	250	MLI1206-R12-10 des
	0.15	± 10%	30	25	200	0.3	250	MLI1206-R15-10 des
	0.18	± 10%	30	25	185	0.4	250	MLI1206-R18-10 des
	0.22	± 10%	30	25	170	0.4	250	MLI1206-R22-10 des
	0.27	± 10%	30	25	150	0.5	250	MLI1206-R27-10 des
	0.33	± 10%	30	25	145	0.6	250	MLI1206-R33-10 des
	0.39	± 10%	30	25	135	0.5	200	MLI1206-R39-10 des
	0.47	± 10%	30	25	125	0.6	200	MLI1206-R47-10 des
	0.56	± 10%	30	25	115	0.7	150	MLI1206-R56-10 des
	0.68	± 10%	30	25	105	0.8	150	MLI1206-R68-10 des
	0.82	± 10%	30	25	100	0.9	150	MLI1206-R82-10 des
	1.0	± 10%	45	10	110	0.4	100	MLI1206-1R0-10 des
	1.2	± 10%	45	10	100	0.5	100	MLI1206-1R2-10 des
	1.5	± 10%	45	10	90	0.5	80	MLI1206-1R5-10 des
	1.8	± 10%	45	10	80	0.5	70	MLI1206-1R8-10 des
	2.2	± 10%	45	10	70	0.6	60	MLI1206-2R2-10 des

SIZE	L (μH)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
1206	2.7	± 10%	45	10	70	0.6	60	MLI1206-2R7-10 des
	3.3	± 10%	45	10	60	0.7	60	MLI1206-3R3-10 des
	3.9	± 10%	45	10	55	0.8	50	MLI1206-3R9-10 des
	4.7	± 10%	45	10	50	0.9	50	MLI1206-4R7-10 des
	5.6	± 10%	45	4	32	0.7	25	MLI1206-5R6-10 des
	6.8	± 10%	45	4	29	0.8	25	MLI1206-6R8-10 des
	8.2	± 10%	45	4	26	0.9	25	MLI1206-8R2-10 des
	10	± 10%	45	2	24	1	25	MLI1206-100-10 des
	12	± 10%	45	2	22	1.05	15	MLI1206-120-10 des
	15	± 10%	35	1	19	0.7	5	MLI1206-150-10 des
	18	± 10%	35	1	18	0.75	5	MLI1206-180-10 des

- RDC: Resistance of component for DC current.
- Maximum rated current: measure of current capacity of the component. When the maximum rated current is applied, temperature rise shall not exceed 20°C.
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

Product specifications Multilayer High frequency Inductors MLH

SIZE	L (nH) 100 (MHz)	L tol.	Q min 100 (MHz)	Q typ 100 (MHz)	Q typ 800 (MHz)	SRF min. (MHz)	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
0402	1.0	± 0.3	8	9	28	6000	0.10	300	MLH0402-1N0-03 des
	1.2	± 0.3	8	9	28	6000	0.10	300	MLH0402-1N2-03 des
	1.5	± 0.3	8	10	28	6000	0.10	300	MLH0402-1N5-03 des
	1.8	± 0.3	8	10	28	6000	0.10	300	MLH0402-1N8-03 des
	2.2	± 0.3	8	10	29	6000	0.12	300	MLH0402-2N2-03 des
	2.7	± 0.3	8	11	30	6000	0.12	300	MLH0402-2N7-03 des
	3.3	± 0.3	8	11	30	5200	0.15	300	MLH0402-3N3-03 des
	3.9	± 0.3	8	11	31	5150	0.15	300	MLH0402-3N9-03 des
	4.7	± 0.3	8	11	31	4800	0.18	300	MLH0402-4N7-03 des
	5.6	± 0.3	8	11	31	4100	0.20	300	MLH0402-5N6-03 des
	6.8	± 5%	8	11	33	3800	0.25	300	MLH0402-6N8-5 des
	8.2	± 5%	8	12	32	3500	0.25	300	MLH0402-8N2-5 des
	10.0	± 5%	8	12	32	3300	0.30	300	MLH0402-10N-5 des
	12.0	± 5%	8	12	31	2600	0.30	300	MLH0402-12N-5 des
	15.0	± 5%	8	12	30	2300	0.40	300	MLH0402-15N-5 des
	18.0	± 5%	8	12	29	2050	0.50	300	MLH0402-18N-5 des
	22.0	± 5%	8	12	28	1900	0.60	300	MLH0402-22N-5 des
	27.0	± 5%	8	12	27	1700	0.70	300	MLH0402-27N-5 des
	33.0	± 5%	8	10	25	1550	1.5	200	MLH0402-33N-5 des
	39.0	± 5%	8	10	25	1450	1.8	200	MLH0402-39N-5 des
	47.0	± 5%	8	9	22	1300	2.0	200	MLH0402-47N-5 des
	56.0	± 5%	8	10	21	1250	2.0	200	MLH0402-56N-5 des
0603	1.0	± 0.3	10	12	50	6000	0.10	500	MLH0603-1N0-03 des
	1.2	± 0.3	10	13	65	6000	0.10	500	MLH0603-1N2-03 des
	1.5	± 0.3	10	13	47	6000	0.10	500	MLH0603-1N5-03 des
	1.8	± 0.3	10	13	51	6000	0.10	500	MLH0603-1N8-03 des
	2.2	± 0.3	11	13	46	6000	0.10	500	MLH0603-2N2-03 des
	2.7	± 0.3	11	13	45	6000	0.10	500	MLH0603-2N7-03 des
	3.3	± 0.3	11	13	51	5900	0.12	500	MLH0603-3N3-03 des
	3.9	± 0.3	11	13	52	5600	0.14	500	MLH0603-3N9-03 des
	4.7	± 0.3	11	13	41	4800	0.16	500	MLH0603-4N7-03 des
	5.6	± 0.3	11	13	41	4350	0.18	500	MLH0603-5N6-5 des
	6.8	± 5%	11	13	44	3750	0.22	500	MLH0603-6N8-5 des
	8.2	± 5%	11	13	44	3300	0.24	500	MLH0603-8N2-5 des
	10.0	± 5%	11	13	45	2850	0.26	400	MLH0603-10N-5 des
	12.0	± 5%	13	15	46	2500	0.28	400	MLH0603-12N-5 des
	15.0	± 5%	13	15	48	2150	0.32	400	MLH0603-15N-5 des
	18.0	± 5%	13	15	48	2100	0.35	400	MLH0603-18N-5 des
	22.0	± 5%	15	17	45	1850	0.40	400	MLH0603-22N-5 des

SIZE	L (nH) 100 (MHz)	L tol.	Q min 100 (MHz)	Q typ 100 (MHz)	Q typ 800 (MHz)	SRF min. (MHz)	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
603	27.0	± 5%	15	17	43	1680	0.45	400	MLH0603-27N-5 des
	33.0	± 5%	15	18	39	1580	0.55	400	MLH0603-33N-5 des
	39.0	± 5%	15	18	37[1]	1400	0.60	300	MLH0603-39N-5 des
	47.0	± 5%	15	18	35[1]	1200	0.70	300	MLH0603-47N-5 des
	56.0	± 5%	15	18	32[1]	1100	0.75	300	MLH0603-56N-5 des
	68.0	± 5%	15	18	34[1]	1050	0.85	300	MLH0603-68N-5 des
	82.0	± 5%	15	18	32[1]	900	1.0	300	MLH0603-82N-5 des
	100	± 5%	15	18	20[1]	850	1.2	300	MLH0603-R10-5 des
	120	± 5%	8[3]	16[3]	23[2]	730	1.6	250	MLH0603-R12-5 des
	150	± 5%	8[3]	14[3]	23[2]	650	2.0	250	MLH0603-R15-5 des
	180	± 5%	8[3]	14[3]	21[2]	570	2.4	250	MLH0603-R18-5 des
	220	± 5%	8[3]	13[3]	20[2]	530	2.8	200	MLH0603-R22-5 des
0805	1.5	± 0.3	11	13	40	6000	0.10	500	MLH0805-1N5-03 des
	1.8	± 0.3	11	13	45	6000	0.10	500	MLH0805-1N8-03 des
	2.2	± 0.3	11	13	48	6000	0.10	500	MLH0805-2N2-03 des
	2.7	± 0.3	11	13	40	6000	0.10	500	MLH0805-2N7-03 des
	3.3	± 0.3	13	15	56	6000	0.13	500	MLH0805-3N3-03 des
	3.9	± 0.3	13	15	54	5400	0.15	500	MLH0805-3N9-03 des
	4.7	± 0.3	13	15	50	4500	0.20	500	MLH0805-4N7-03 des
	5.6	± 0.3	13	15	53	4000	0.23	500	MLH0805-5N6-03 des
	6.8	± 5%	13	15	51	3650	0.25	500	MLH0805-6N8-5 des
	8.2	± 5%	13	15	53	3000	0.28	500	MLH0805-8N2-5 des
	10.0	± 5%	14	16	45	2500	0.30	500	MLH0805-10N-5 des
	12.0	± 5%	14	16	48	2450	0.35	400	MLH0805-12N-5 des
	15.0	± 5%	15	17	48	2000	0.40	400	MLH0805-15N-5 des
	18.0	± 5%	15	17	43	1750	0.45	400	MLH0805-18N-5 des
	22.0	± 5%	15	17	47	1700	0.50	400	MLH0805-22N-5 des
	27.0	± 5%	16	18	38	1550	0.55	400	MLH0805-27N-5 des
	33.0	± 5%	17	19	35	1350	0.60	400	MLH0805-33N-5 des
	39.0	± 5%	19	21	40	1300	0.65	400	MLH0805-39N-5 des
	47.0	± 5%	19	21	38	1200	0.70	400	MLH0805-47N-5 des
	56.0	± 5%	16	21	31	1150	0.75	400	MLH0805-56N-5 des
	68.0	± 5%	19	21	28	1000	0.80	400	MLH0805-68N-5 des
	82.0	± 5%	20	22	16	850	0.90	400	MLH0805-82N-5 des
	100	± 5%	21	23	-	730	1.0	400	MLH0805-R10-5 des
	120(1)	± 5%	13[1]	22	-	650	1.2	300	MLH0805-R12-5 des
	150(1)	± 5%	13[1]	22	-	550	1.4	300	MLH0805-R15-5 des
	180(1)	± 5%	13[1]	23	-	500	1.6	300	MLH0805-R18-5 des
	220(1)	± 5%	12[1]	20	-	450	1.8	300	MLH0805-R22-5 des

SIZE	L (nH) 100 (MHz)	L tol.	Q min 100 (MHz)	Q typ 100 (MHz)	Q typ 800 (MHz)	SRF min. (MHz)	R_{DC} max. (Ω)	I max. (mA)	TYPE NUMBER
0805	270(1)	± 5%	12(1)	20	-	400	2.0	300	MLH0805-R27-5 des
	330(1)	± 5%	12(1)	22	-	380	3.0	300	MLH0805-R33-5 des
	390(1)	± 5%	10(1)	17	-	330	3.5	300	MLH0805-R39-5 des
	470(1)	± 5%	10(1)	17	-	300	4.0	300	MLH0805-R47-5 des

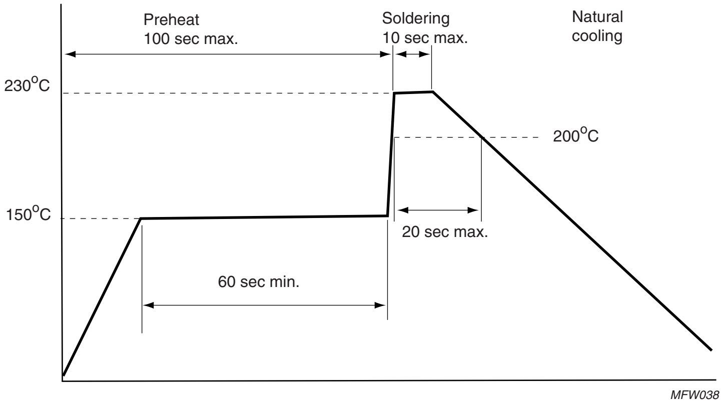
Note

1. at 500 MHz
2. at 300 MHz
3. at 50 MHz

- RDC: Resistance of component for DC current.
- Maximum rated current: measure of current capacity of the component. When the maximum rated current is applied, temperature rise shall not exceed 20°C.
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

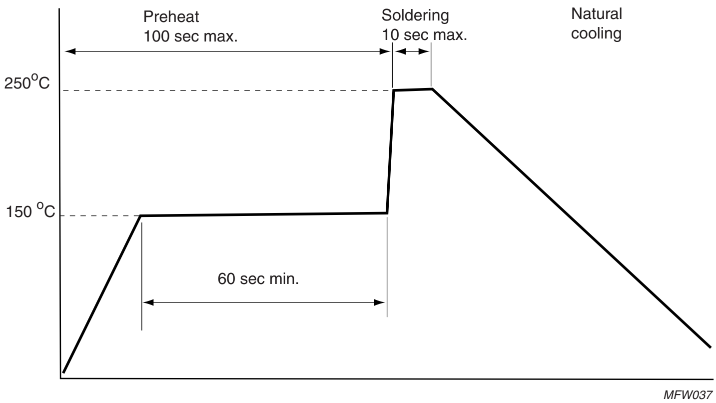
MOUNTING

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

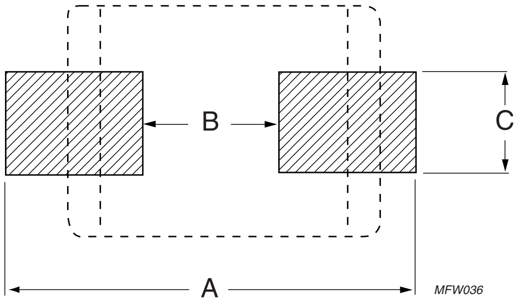
Fig.3 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.4 Double wave soldering.

Dimensions of solderlands



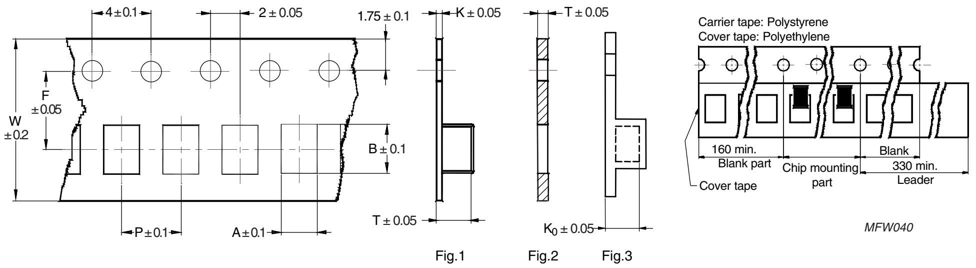
For dimensions see Table 1.

Fig.5 Recommended dimensions of solder lands.

Table 1 Solder land dimensions for MLI and MLH types; see Fig.5

SIZE	FOOTPRINT DIMENSIONS (mm)		
	A	**B**	**C**
0402	1.2 – 1.4	0.4	0.4
0603	2.4 – 3.4	0.8	0.6
0805	3.0 – 4.0	1.2	1.0
080505	3.0 – 4.0	1.2	1.0
1206	4.2 – 5.2	2.0	1.2

BLISTER TAPE AND REEL DIMENSIONS



For dimensions see Table 2.

Fig.6 Blister tape.

Table 2 Dimensions of blister tape for relevant product size code; see Fig.6

DIMENSION	PRODUCT SIZE CODE						
	MLH0402	**MLI0603**	**MLH0603**	**MLI0805**	**MLH0805**	**MLI080505**	**MLI1206**
A	0.65	1.1	1.1	1.54	1.42	1.54	1.94
B	1.15	1.9	1.9	2.32	2.25	2.32	3.54
T	0.6	0.95	0.95	1.15	(1)	1.35	1.29
W	8	8	8	8	8	8	8
P	2	4	4	4	4	4	4
F	3.5	3.5	3.5	3.5	3.5	3.5	3.5
K_0	0.6	--	0.95	0.2	0.22	0.2	0.2
Tape fig.	3	2	3	1	3	1	1

Note 1):

K_0 = 1.04 for L < 180 nH

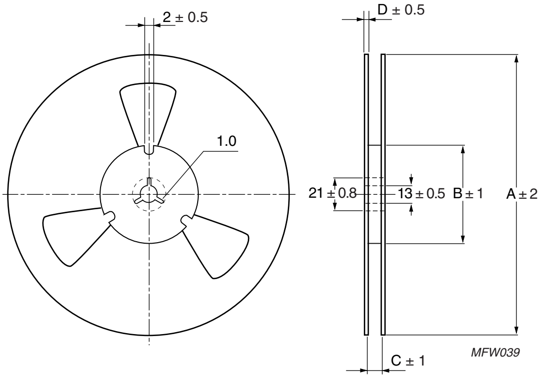
K_0 = 1.4 for L ≥ 180 nH

MATERIAL BLISTER TAPE:

- Sizes 0402 and 0603: paper
- Other sizes: Polystyrene

MATERIAL COVER FILM:

- Polyethylene



Dimensions in mm.
For dimensions see Table 3.

Fig.7 Reel.

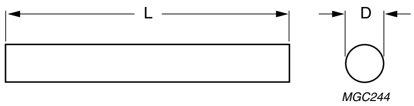
Table 3 Reel dimensions; see Fig.7

DIMENSION	PRODUCT SIZE CODE						
	MLH0402	**MLI0603**	**MLH0603**	**MLI0805**	**MLH0805**	**MLI080505**	**MLI1206**
A	178	178	178	178	178	178	178
B	60	60	60	60	60	60	60
C	12	10	12	10	12	10	10
D	1.5	2	1.5	2	1.5	2	2

Table 4 Packing quantities

	PRODUCT SIZE CODE				
	0402	**0603**	**0805**	**080505**	**1206**
Pcs./reel	10 000	4 000	4 000	3 000	3 000

RODS



For dimensions see Table 1.

Fig.1 Rod.

Table 1 Grades, parameters and type numbers; see Fig.1

DIMENSIONS (mm)		TYPE NUMBER		
D	**L**	**3B1**	**3S3**	**4B1**
1.6 ±0.05	9 ±0.2	ROD1.6/9-3B1-D	–	ROD1.6/9-4B1-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 –0.3	20 ±0.4	–	ROD3/20-3S3	–
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	–
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	20 ±0.5	–	ROD5/20-3S3	ROD5/20-4B1
5 –0.05	20 –0.9	ROD5/20-3B1-D	–	ROD5/20-4B1-D
5 –0.30	25 –1.0	–	ROD5/25-3S3	–
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 –0.3	18 ±0.3	–	ROD5.3/18-3S3	–
6 –0.30	25 ±0.6	–	ROD6/25-3S3	–
6 –0.30	30 ±0.9	–	ROD6/30-3S3	–
6 –0.10	30 –1.2	ROD6/30-3B1-D	–	ROD6/30-4B1-D
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	ROD6.5/25-4B1
8 –0.5	25 ±0.75	–	ROD8/25-3S3	–
8 –0.5	32 –2	–	ROD8/32-3S3	ROD8/32-4B1
8 –0.40	50 ±1.0	ROD8/50-3B1	–	ROD8/50-4B1
8 –0.40	150 ±3	ROD8/150-3B1	–	ROD8/150-4B1
8 –0.40	200 ±4	ROD8/200-3B1	–	ROD8/200-4B1
10 –0.50	200 ±4	ROD10/200-3B1	–	ROD10/200-4B1

SMD BEADS FOR EMI SUPPRESSION

General data

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-3"* , *"EIA 481-1"* and *"EIA 481-2"*

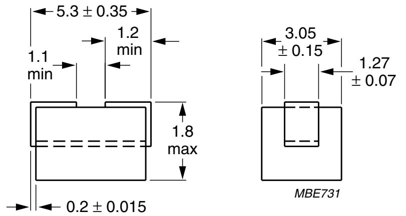
Grades, parameters and type numbers

GRADE	$\lvert Z_{typ}\rvert$[1] (Ω)	at f (MHz)	TYPE NUMBER
BDS 3/1.8/5.3; mass ≈0.1 g [2]			
3S1	28	10	BDS 3/1.8/5.3-3S1
	33	25	
	25	100	
4S2	25	25	BDS 3/1.8/5.3-4S2
	38	100	
	45	300	
BDS 3/3/4.6; mass ≈0.15 g [2]			
3S1	25	3	BDS3/3/4.6-3S1
	45	10	
	35	25	
4S2	30	25	BDS3/3/4.6-4S2
	50	100	
	55	300	
BDS 3/3/8.9; mass ≈0.3 g [3]			
3S1	55	3	BDS 3/3/8.9-3S1
	80	10	
	55	25	
4S2	65	25	BDS 3/3/8.9-4S2
	100	100	
	110	300	
BDS 4.6/3/8.9; mass ≈0.5 g [3]			
4S2	65	25	BDS 4.6/3/8.9-4S2
	100	100	
	110	300	

Note

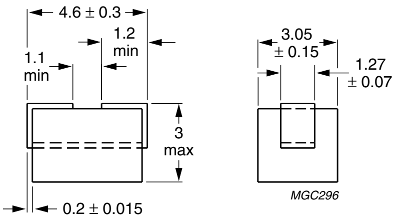
1. Typical values, $\lvert Z\rvert_{min}$ is −20%.
2. DC resistance <0.6 mΩ.
3. DC resistance <1.0 mΩ

Mechanical data



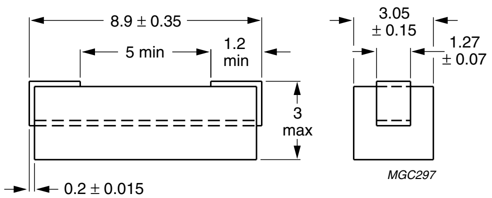
Dimensions in mm.

Fig.1 BDS 3/1.8/5.3.



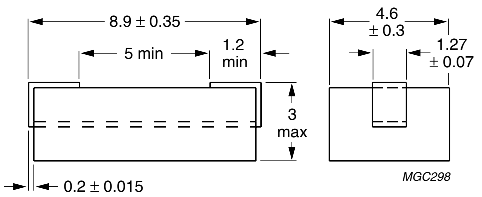
Dimensions in mm.

Fig.2 BDS 3/3/4.6.



Dimensions in mm.

Fig.3 BDS 3/3/8.9.



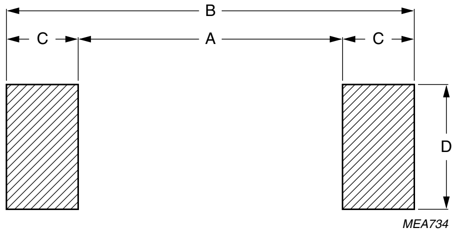
Dimensions in mm.

Fig.4 BDS 4.6/3/8.9.

RECOMMENDED DIMENSIONS OF SOLDER LANDS

Table 1 Reflow soldering

SIZE	DIMENSIONS (mm)			
	A	B	C	D
BDS 3/1.8/5.3	2.8	7.2	2.2	3.3
BDS 3/3/4.6	2.8	6.4	1.8	3.3
BDS 3/3/8.9	7.0	10.8	1.9	3.3
BDS 4.6/3/8.9	7.0	10.8	1.9	3.3



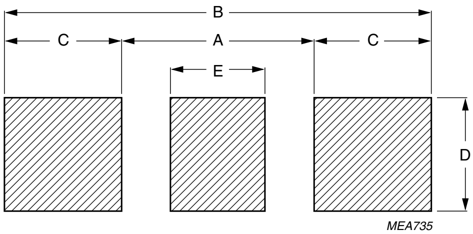
For dimensions see Table 1.

Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

Fig.5 Reflow and vapour phase soldering.

Table 2 Wave soldering

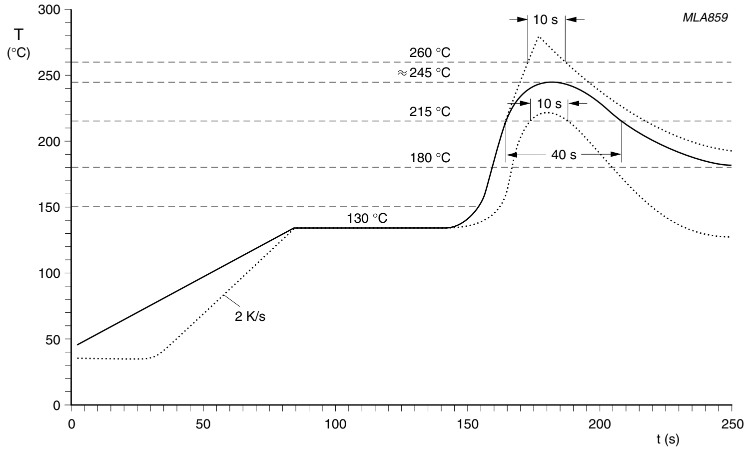
SIZE	DIMENSIONS (mm)				
	A	B	C	D	E
BDS 3/1.8/5.3	2.0	7.2	2.6	3.0	0.8
BDS 3/3/4.6	2.0	6.4	2.2	3.0	0.8
BDS 3/3/8.9	6.0	12.2	3.1	3.0	2.5
BDS 4.6/3/8.9	6.0	12.2	3.1	3.0	2.5



For dimensions see Table 2.

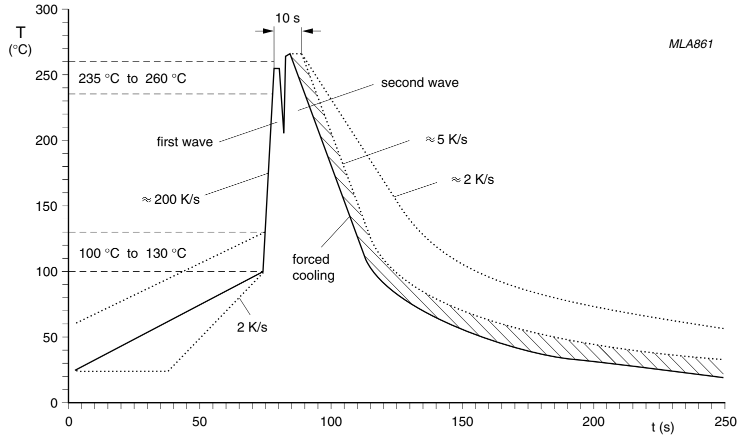
Fig.6 Wave soldering.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

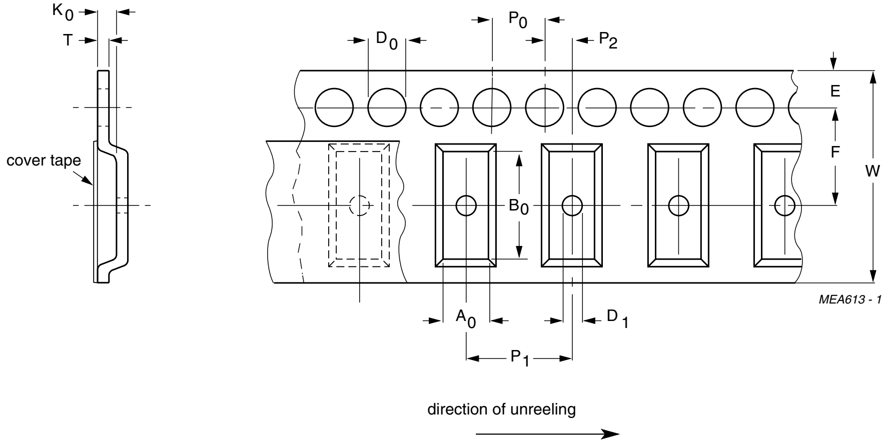
Fig.7 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.8 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

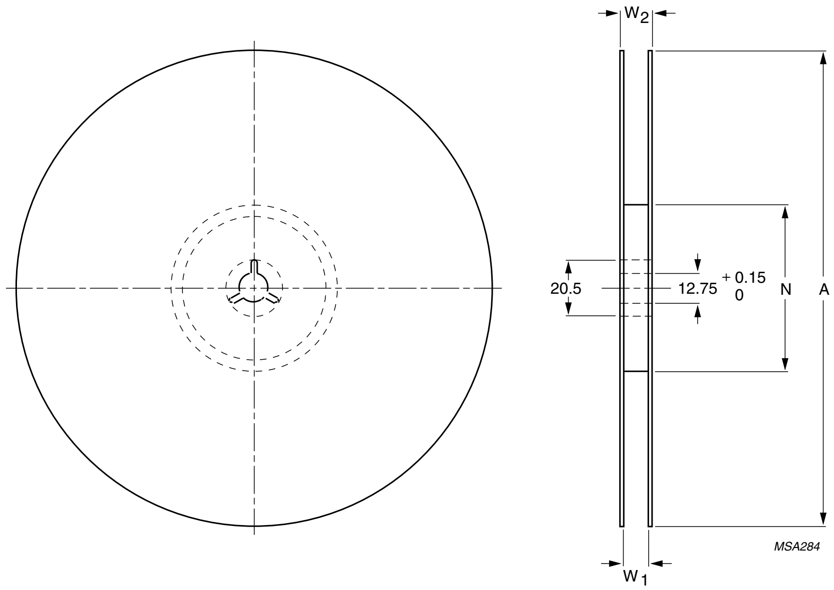


For dimensions see Table 3.

Fig.9 Blister tape.

Table 3 Physical dimensions of blister tape; see Fig.9

SIZE	DIMENSIONS (mm)			
	BDS3/1.8/5.3	**BDS3/3/4.6**	**BDS3/3/8.9**	**BDS4.6/3/8.9**
A_0	3.25 ±0.1	3.45 ±0.1	3.45 ±0.1	5.1 ±0.1
B_0	5.85 ±0.1	5.1 ±0.1	9.4 ±0.1	9.4 ±0.1
K_0	2.0 ±0.1	3.1 ±0.1	3.1 ±0.1	3.1 ±0.1
T	0.3 ±0.05	0.25 ±10%	0.35 ±0.05	0.3 ±0.05
W	12.0 ±0.3	12.0 ±0.3	16.0 ±0.3	16.0 ±0.3
E	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1	1.75 ±0.1
F	5.5 ±0.05	5.5 ±0.05	7.5 ±0.1	7.5 ±0.1
D_0	1.5 +0.1	1.5 +0.1	1.5 +0.1	1.5 +0.1
D_1	≥1.5	≥1.5	≥1.5	≥1.5
P_0	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1	4.0 ±0.1
P_1	8.0 ±0.1	8.0 ±0.1	8.0 ±0.1	8.0 ±0.1
P_2	2.0 ±0.1	2.0 ±0.05	2.0 ±0.1	2.0 ±0.1



Dimensions in mm.
For dimensions see Table 4.

Fig.10 Reel.

Table 4 Reel dimensions; see Fig.10

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4

SMD COMMON MODE CHOKES FOR EMI-SUPPRESSION

General data

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Taping method	*"IEC 60286-3"* , *"EIA 481-1-A"* and *"EIA 481-2"*

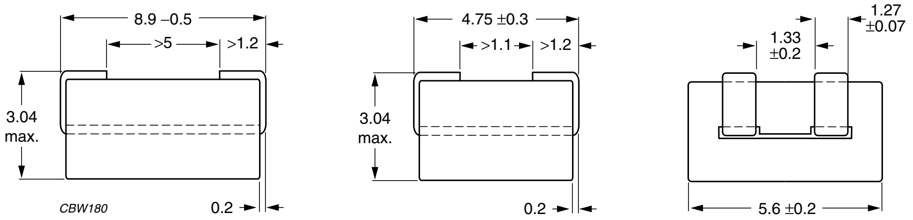
Grades, parameters and type numbers

GRADE	$\lvert Z_{typ}\rvert$(1) (Ω)	at f (MHz)	TYPE NUMBER
CMS2-5.6/3/4.8; mass ≈0.3 g			
4S2	21	25	CMS2-5.6/3/4.8-4S2
	35	100	
	50	300	
CMS2-5.6/3/8.9; mass ≈0.6 g			
4S2	38	25	CMS2-5.6/3/8.9-4S2
	60	100	
CMS4-11/3/4.8; mass ≈0.6 g			
4S2 inner channel	12	25	CMS4-11/3/4.8-4S2
	23	100	
	42	300	
4S2 outer channel	15	25	
	30	100	
	50	300	
CMS4-11/3/8.9; mass ≈1.1 g			
4S2 inner channel	23	25	CMS4-11/3/8.9-4S2
	45	100	
	82	300	
4S2 outer channel	27	25	
	58	100	
	97	300	

Note

1. Typical values, $\lvert Z\rvert_{min}$ is −20%.
   DC resistance <0.6 mΩ.

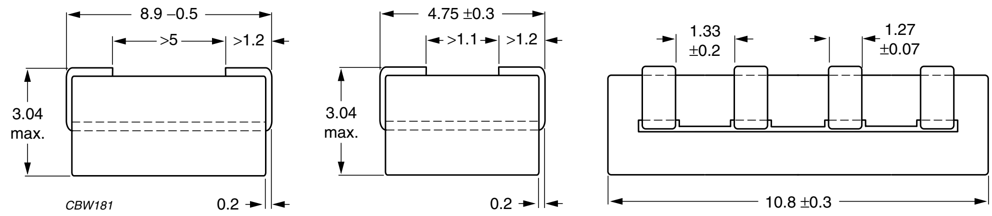
Mechanical data



a. CMS2-5.6/3/8.9 (side view). b. CMS2-5.6/3/4.8 (side view). Front view (a and b).

Dimensions in mm.

Fig.1 CMS2-5.6/3/4.8 and CMS2-5.6/3/8.9.



a. CMS4-11/3/8.9 (side view).

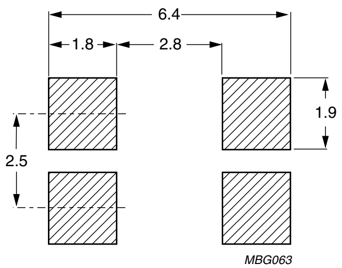
b. CMS4-11/3/4.8 (side view).

Front view (a and b).

Dimensions in mm.

Fig.2 CMS4-11/3/4.8 and CMS4-11/3/8.9.

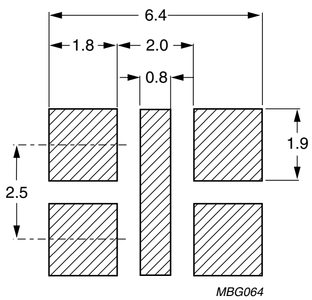
Recommended dimensions of solder lands



Dimensions in mm.

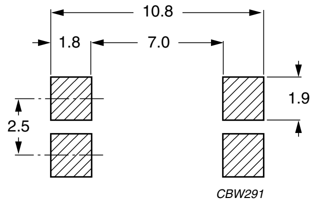
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

Fig.3 Solder lands for reflow soldering of CMS2-5.6/3/4.8.



Dimensions in mm.

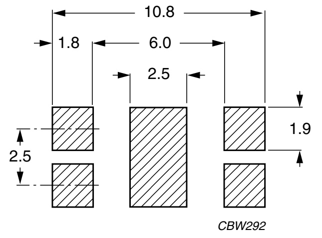
Fig.4 Solder lands for wave soldering of CMS2-5.6/3/4.8.



Dimensions in mm.

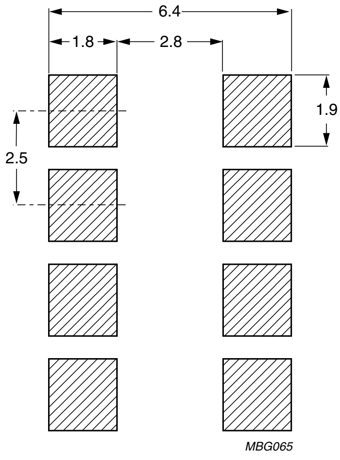
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

Fig.5 Solder lands for reflow soldering of CMS2-5.6/3/8.9.



Dimensions in mm.

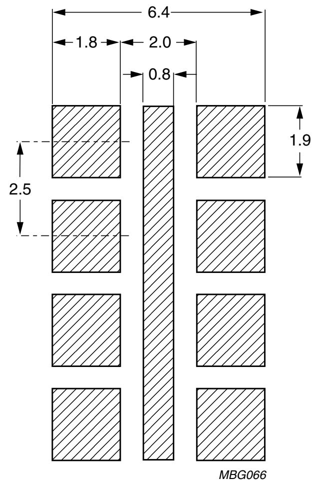
Fig.6 Solder lands for wave soldering of CMS2-5.6/3/8.9.



Dimensions in mm.

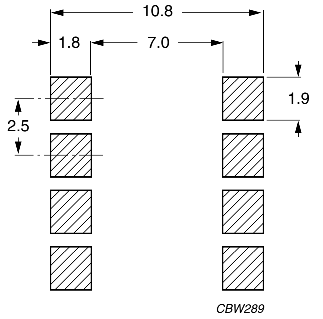
Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

Fig.7 Solder lands for reflow soldering of CMS4-11/3/4.8.



Dimensions in mm.

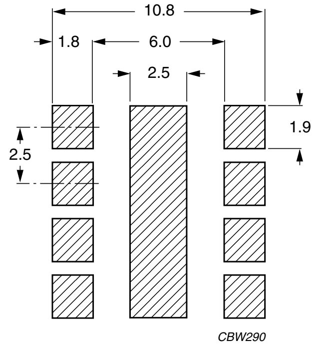
Fig.8 Solder lands for wave soldering of CMS4-11/3/4.8.



Dimensions in mm.

Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

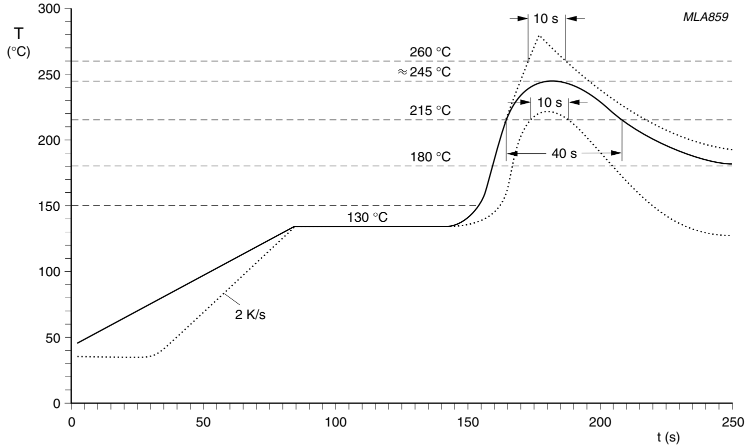
Fig.9 Solder lands for reflow soldering of CMS4-11/3/8.9.



Dimensions in mm.

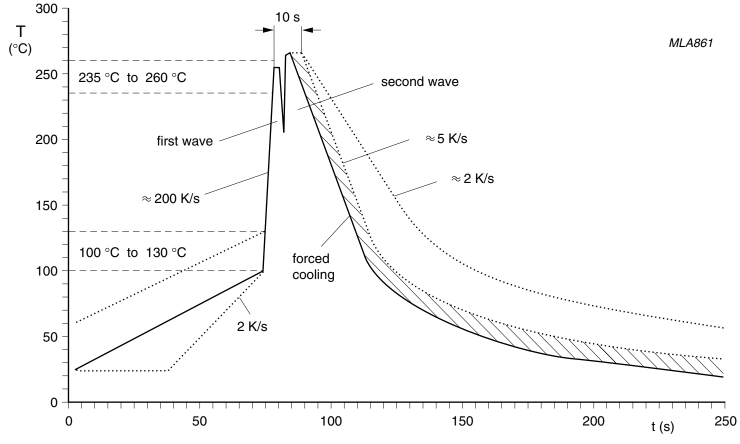
Fig.10 Solder lands for wave soldering of CMS4-11/3/8.9.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

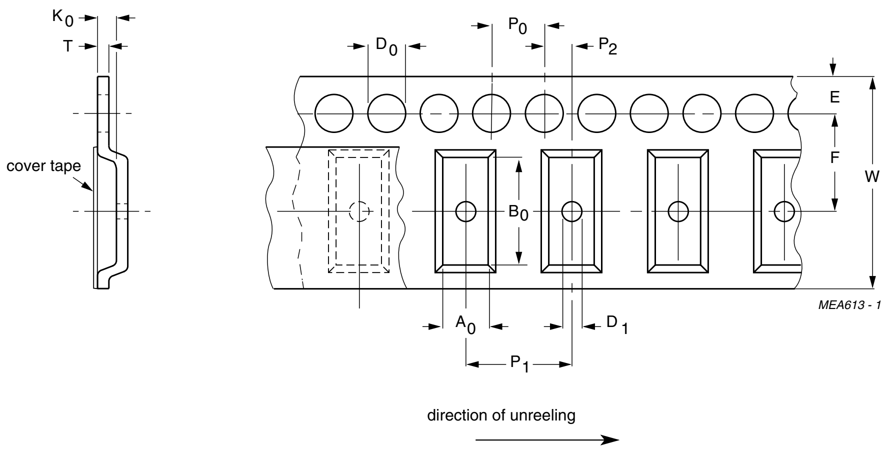
Fig.11 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.12 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

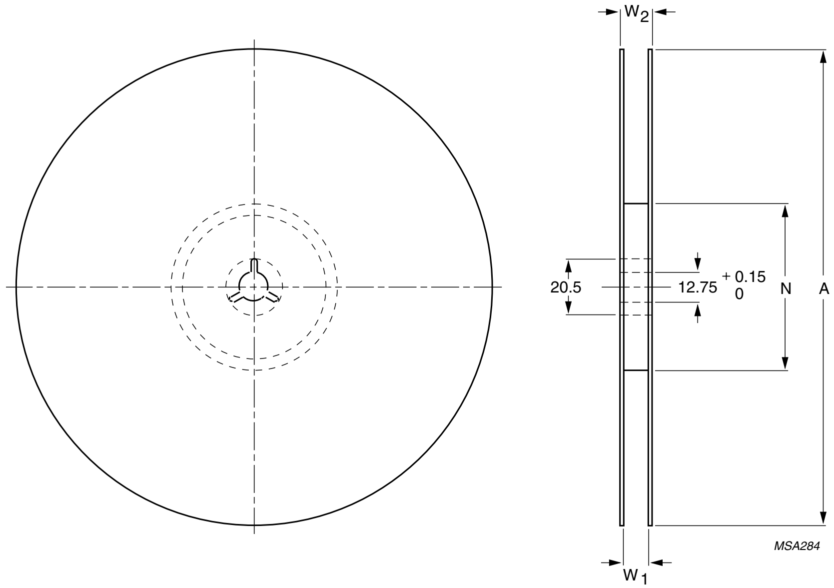


For dimensions see Table 1.

Fig.13 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.13

SIZE	DIMENSIONS (mm)			
	CMS2-5.6/3/4.8	**CMS2-5.6/3/8.9**	**CMS2-5.6/3/8.9**	**CMS4-11/3/8.9**
A_0	5.26	5.99	5.23	10.13
B_0	6.07	9.09	11.18	11.56
K_0	3.18	3.18	4.5	4.5
T	0.3	0.33	0.34	0.36
W	12	16	24	24
E	1.75	1.75	1.75	1.75
F	5.5	7.5	11.75	11.5
D_0	1.5	1.5	1.5	1.5
D_1	≥1.5	≥1.5	≥1.5	≥1.5
P_0	4.0	4.0	4.0	4.0
P_1	8.0	8.0	8.0	16.0
P_2	2.0	2.0	2.0	2.0



Dimensions in mm.
For dimensions see Table 2.

Fig.14 Reel.

Table 2 Reel dimensions; see Fig.14

SIZE	DIMENSIONS (mm)			
	A	N	W_1	W_2
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4
24	330	100 ±5	24.4	≤28.4

SMD WIDEBAND CHOKES

SMD wideband choke WBS1.5-5/4.8/10

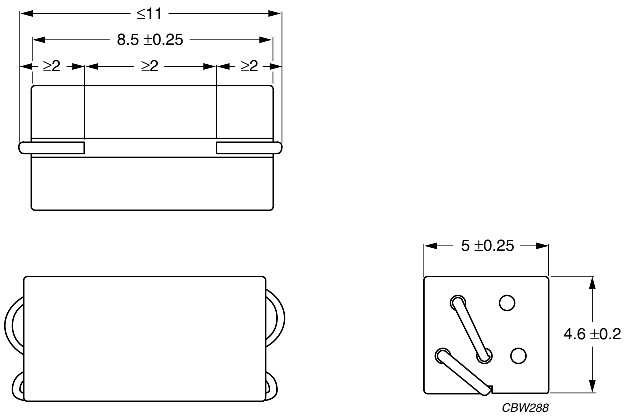
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	*"IEC 60286-3"* and *"EIA 481-2"*

Grades, parameters and type numbers; see Fig.1

GRADE	$\lvert Z_{typ}\rvert$(1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	230	10	WBS1.5-5/4.8/10-3S4
	400	50	
	430	100	
4B1	275	25	WBS1.5-5/4.8/10-4B1
	500	100	
	350	300	

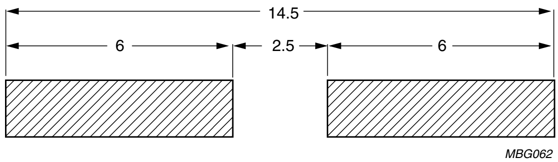
Note

1. Typical values, $\lvert Z\rvert_{min}$ is −20%.



Dimensions in mm.

Fig.1 WBS1.5-5/4.8/10.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

Fig.2 Solder lands for reflow soldering of WBS1.5-5/4.8/10.

SMD wideband choke WBS2.5-5/4.8/10

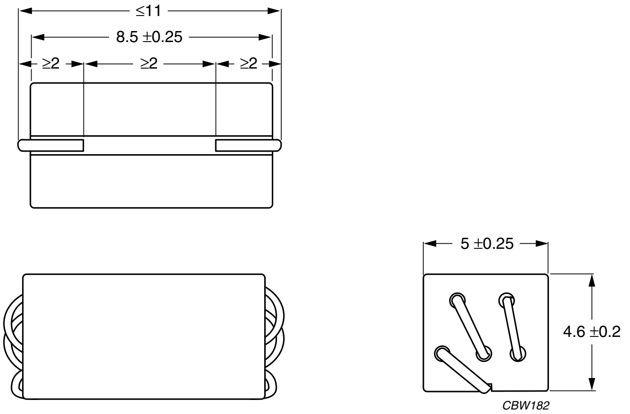
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-58"*, Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	*"IEC 60286-3"* and *"EIA 481-2"*

Grades, parameters and type numbers; see Fig.3

GRADE	$\lvert Z_{typ}\rvert$(1) (Ω)	at f (MHz)	TYPE NUMBER
3S4	300	10	WBS2.5-5/4.8/10-3S4
	625	50	
	600	100	
4B1	485	25	WBS2.5-5/4.8/10-4B1
	850	100	
	350	300	

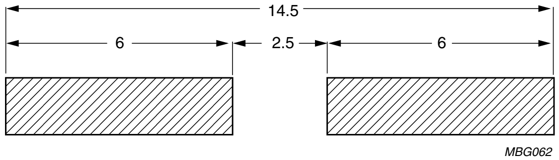
Note

1. Typical values, $\lvert Z\rvert_{min}$ is −20%.



Dimensions in mm.

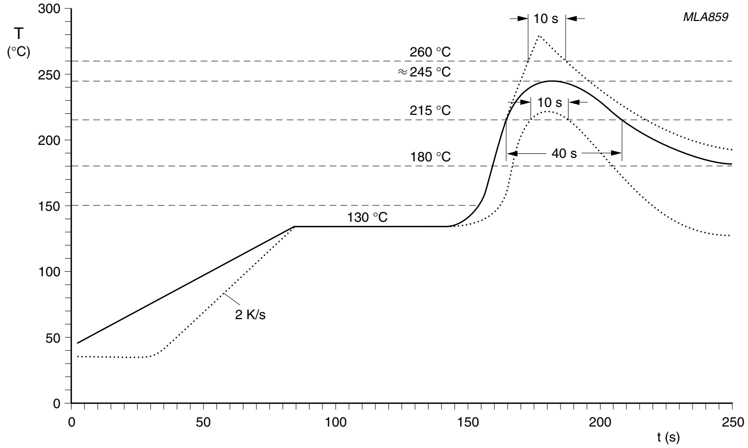
Fig.3 WBS2.5-5/4.8/10.



Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (≈0.7 mg solder paste per mm^2).

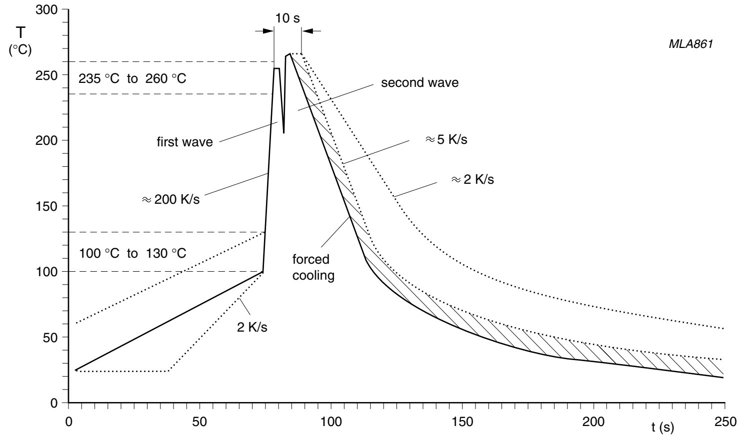
Fig.4 Solder lands for reflow soldering of WBS2.5-5/4.8/10.

Soldering profiles



Typical values (solid line).
Process limits (dotted lines).

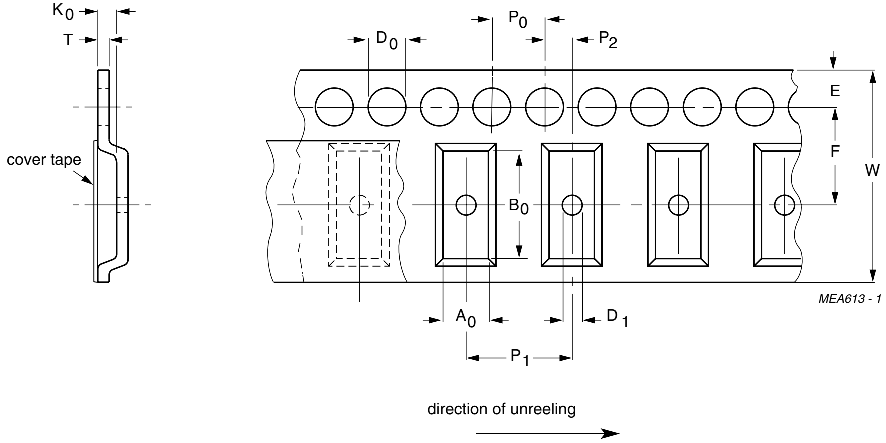
Fig.5 Reflow soldering.



Typical values (solid line).
Process limits (dotted lines).

Fig.6 Double wave soldering.

BLISTER TAPE AND REEL DIMENSIONS

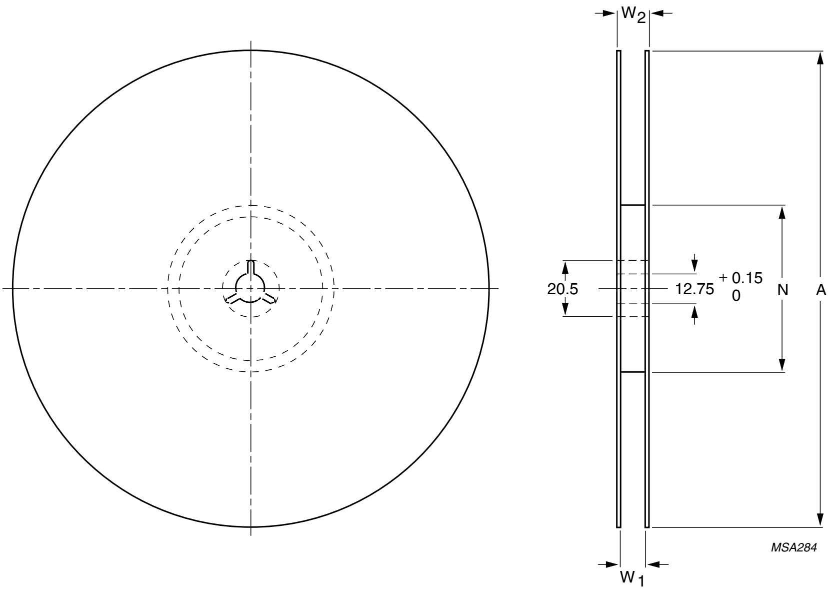


For dimensions see Table 1.

Fig.7 Blister tape.

Table 1 Physical dimensions of blister tape; see Fig.7

SIZE	DIMENSIONS (mm)	
	WBS1.5-5/4.8/10	**WBS2.5-5/4.8/10**
A_0	5.51	5.51
B_0	11	11
K_0	5.03	5.03
T	0.36	0.36
W	24	24
E	1.75	1.75
F	11.5	11.5
D_0	1.5	1.5
D_1	≥1.5	≥1.5
P_0	4.0	4.0
P_1	8.0	8.0
P_2	2.0	2.0



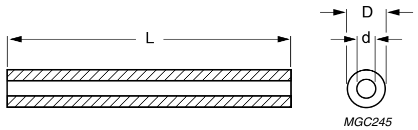
Dimensions in mm.
For dimensions see Table 2.

Fig.8 Reel.

Table 2 Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	**N**	**W_1**	**W_2**
24	330	100 ±5	24.4	≤28.4

TUBES



For dimensions see Table 1.

Fig.1 Tube.

Table 1 Grades, parameters and type numbers; see Fig.1

DIMENSIONS (mm)			TYPE NUMBER		
D	d	L	4B1	3B1	3C90
3.1 – 0.02	1.3 + 0.2	18.8 – 0.5	–	TUB3.1/1.3/19-3B1-DL	–
3.5 – 0.25	1.2 + 0.15	5 – 0.3	TUB3.5/1.2/5-4B1	TUB3.5/1.2/5-3B1	–
3.5 +0.1/–0.2	1.3 + 0.2	3 + 0.5	–	TUB3.5/1.3/3-3B1	–
3.5 ± 0.2	1.3 + 0.2	7.5 +0.5	–	TUB3.5/1.3/7.5-3B1	–
3.7– 0.4	1.2 + 0.2	3.5 – 0.5	TUB3.7/1.2/3.5-4B1	TUB3.7/1.2/3.5-3B1	–
3.8 ± 0.1	2.8 ± 0.1	8 ± 0.25	TUB3.8/2.8/8-4B1	–	–
4 – 0.25	1.6 + 0.15	15 – 0.8	TUB4/1.6/15-4B1	TUB4/1.6/15-3B1	–
4 – 0.25	1.6 + 0.15	40 – 1.6	TUB4/1.6/40-4B1	TUB4/1.6/40-3B1	TUB4/1.6/40-3C90
4 ± 0.2	2 ± 0.2	5 ± 0.5	–	TUB4/2/5-3B1	–
4 ± 0.1	3 + 0.2	9.45 + 0.75	TUB4/3/9.5-4B1	–	–
4.1 + 0.2	2 + 0.2	7 ± 0.2	TUB4.1/2/7-4B1	–	–
4.1 + 0.1	2 + 0.2	7 ± 0.2	–	TUB4.1/2/7-3B1-D	–
4.1 + 0.1	2 + 0.2	11 ± 0.2	–	TUB4.1/2/11-3B1-D	–
4.1 + 0.2	2 + 0.2	25.5 –1	TUB4.1/2/26-4B1	–	–
4.15 – 0.05	2 + 0.2	12.2 – 0.4	TUB4.2/2/12-4B1-DL	TUB4.2/2/12-3B1-DL	–
4.3 – 0.2	2 + 0.2	15.4 – 0.8	TUB4.3/2/15-4B1	TUB4.3/2/15-3B1	–
4.3 – 0.2	2 + 0.2	25.5 – 1	–	TUB4.3/2/26-3B1	–
5 – 0.3	2 + 0.2	50 ± 1	–	–	TUB5/2/50-3C90
5.3 – 0.2	3 + 0.2	22.4 – 0.8	–	TUB5.3/3/22-3B1	–
6 – 0.3	3 + 0.2	20 – 0.9	TUB6/3/20-4B1	TUB6/3/20-3B1	TUB6/3/20-3C90
6 – 0.3	3 + 0.2	30 – 1.2	TUB6/3/30-4B1	–	TUB6/3/30-3C90
8 – 0.4	4 + 0.3	20 – 0.9	TUB8/4/20-4B1	TUB8/4/20-3B1	–
8 – 0.4	4 + 0.3	40 – 1.6	–	TUB8/4/40-3B1	TUB8/4/40-3C90
8 – 0.4	4.2 + 0.6	51.4 – 2.8	TUB8/4.2/51-4B1	TUB8/4.2/51-3B1	–
9.5 ± 0.3	6.5 ± 0.2	17 +0.5/–0.4	–	TUB9.5/6.5/17-3B1	–
10 – 0.5	4.2 + 0.3	20 – 0.9	–	TUB10/4.2/20-3B1	TUB10/4.2/20-3C90
10 – 0.5	6.5 + 0.4	20 – 0.9	TUB10/6.5/20-4B1	–	TUB10/6.5/20-3C90

WIDEBAND CHOKES FOR EMI-SUPPRESSION

General data WBC1.5/A

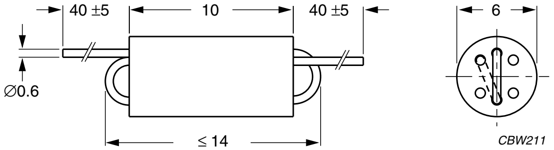
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.1

GRADE	No. OF TURNS	$\lvert Z_{typ}\rvert$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	1.5	≥300	120	WBC1.5/A-3S4
4B1	1.5	≥350	250	WBC1.5/A-4B1
4S2	1.5	213(1)	10	WBC1.5/A-4S2
		400(1)	50	
		470(1)	100	

Note

1. Minimum guaranteed impedance is $\lvert Z\rvert_{typ}$ −20%.
2. Also available with insulated



Dimensions in mm.

Fig.1 WBC1.5/A.

General data WBC1.5/1.5/A

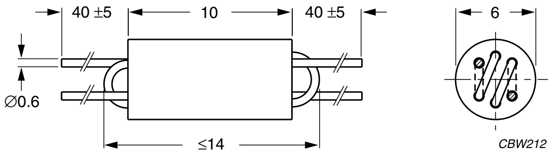
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.2

GRADE	No. OF TURNS	$\lvert Z_{typ}\rvert$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	2 × 1.5	≥700(1)	50	WBC1.5/1.5/A-3S4
4B1	2 × 1.5	≥800(1)	110	WBC1.5/1.5/A-4B1
4S2	2 × 1.5	213(2)	10	WBC1.5/1.5/A-4S2
		400(2)	50	
		470(2)	100	
4A15	2 × 1.5	1000	50	WBC1.5/1.5/A-4A15
		1000	180	

Notes

1. $\lvert Z\rvert$ measured with both windings connected in series.
2. Minimum guaranteed impedance is $\lvert Z\rvert_{typ}$ −20%; measured with one winding.



Dimensions in mm.

Fig.2 WBC1.5/1.5/A.

General data WBC2/R

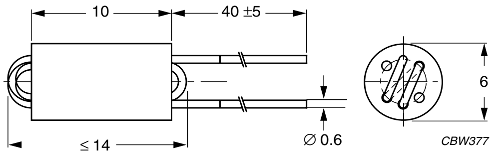
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.3

GRADE	No. OF TURNS	$\|Z_{typ}\|$ (1) (Ω)	at f (MHz)	TYPE NUMBER
4S2	2	300	10	WBC2/R-4S2
		650	50	
		600	100	
4A15	2	≥730	50	WBC2/R-4A15
		≥750	180	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.



Dimensions in mm.

Fig.3 WBC2/R.

General data WBC2.5/A

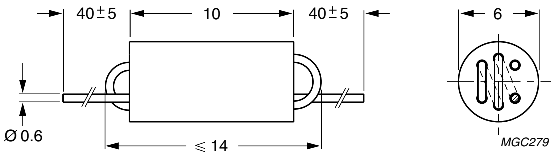
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.4

GRADE	No. OF TURNS	$\|Z_{typ}\|$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	2.5	≥600	50	WBC2.5/A-3S4(2)
4B1	2.5	≥700	180	WBC2.5/A-4B1(2)
4S2	2.5	400(1)	10	WBC2.5/A-4S2
		850(1)	50	
		725(1)	100	
4A15	2.5	800	50	WBC2.5/A-4A15
		820	180	

Note

1. Minimum guaranteed impedance is $|Z|_{typ}$ –20%.
2. Also available with insulated wires, sleeves, encapsulated and taped and reeled.



Dimensions in mm.

Fig.4 WBC2.5/A.

General data WBC2.5/R

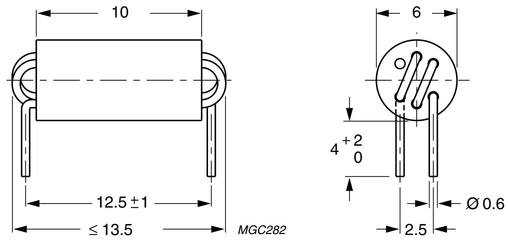
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.5

GRADE	No. OF TURNS	$\lvert Z_{typ}\rvert$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	2.5	≥600	50	WBC2.5/R-3S4(1) sup
4B1	2.5	≥700	75	WBC2.5/R-4B1(2) sup
4S2	2.5	400	10	WBC2.5/R-4S2 sup
		850	50	
		725	100	

Note

1. Also available with insulated wires, sleeves and moulded.
2. Also available with insulated wires, sleeves.



Dimensions in mm.

Fig.5 WBC2.5/R.

General data WBC2.5/SP

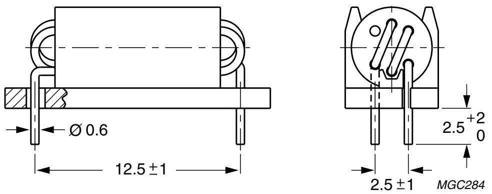
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Support	polyamide (PA6.6) plate to allow mounting across circuit tracks; flame retardant in accordance with UL 94V-0
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.6

GRADE note 1	No. OF TURNS	$\lvert Z_{typ}\rvert$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	2.5	≥600	50	WBC2.5/SP-3S4 sup
4B1	2.5	≥700	75	WBC2.5/SP-4B1 sup

Note

1. Colour code 3S4 = blue, 4B1 = green.



Dimensions in mm.

Fig.6 WBC2.5/SP.

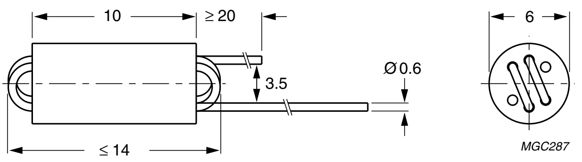
General data WBC3/R

ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated
Solderability	*"IEC 60068-2-20"*, Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.7

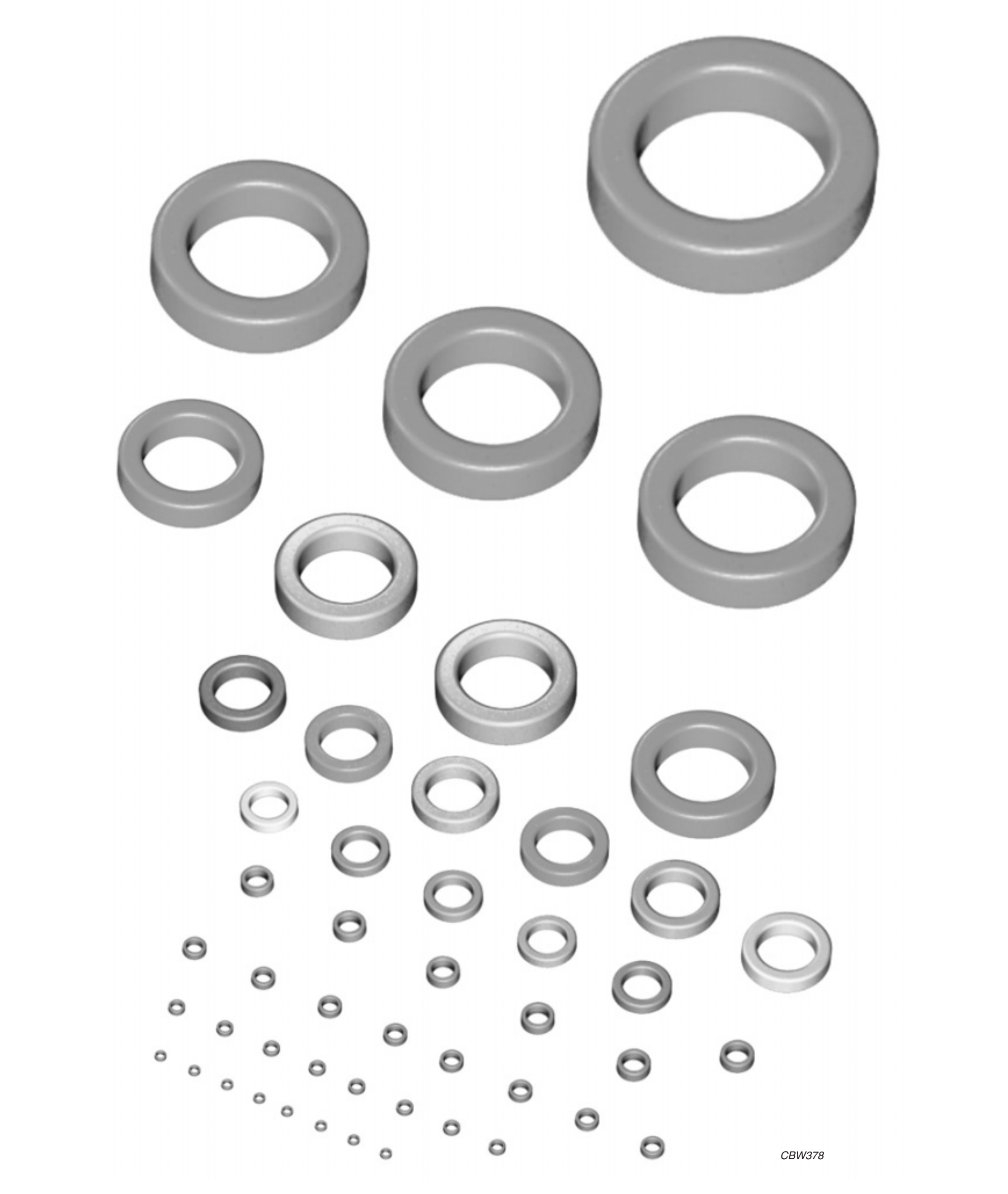
GRADE	No. OF TURNS	$\lvert Z_{typ} \rvert$ (Ω)	at f (MHz)	TYPE NUMBER
3S4	3	≥650	63	WBC3/R-3S4(2)
4B1	3	≥800	110	WBC3/R-4B1(2)
4S2	3	500(1)	10	WBC3/R-4S2
		1000(1)	50	
		688(1)	100	
4A15	3	≥1000	50	WBC3/R-4A15
		≥1000	180	

Note
1. Minimum guaranteed impedance is $\lvert Z \rvert_{typ}$ −20%.
2. Also available with encapsulation and/or taped and reeled.



Dimensions in mm.

Fig.7 WBC3/R.



For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Ferrite ring cores (toroids)

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TC2.5/1.3/0.8	2.7	0.49	0.012
TC2.5/1.3/1.3	4.29	0.76	0.022
TC2.5/1.3/2.5	8.57	1.55	0.044
TC2.5/1.5/0.8	2.21	0.37	0.012
TC2.5/1.5/1-S	2.94	0.49	0.015
TC3.1/1.3/1.3	6.35	1.06	0.033
TC3.1/1.8/2	9.10	1.26	0.05
TC3.4/1.8/1.3	7.3	0.96	0.035
TC3.4/1.8/2	11.6	1.54	0.06
TC3.4/1.8/2.1	11.5	1.52	0.06
TC3.4/1.8/2.3	14.0	1.83	0.068
TC3.5/1.6/1.3	8.3	1.15	0.043
TC3.5/1.8/1.3	7.87	1.03	0.04
TC3.5/1.8/1.5	9.3	1.21	0.05
TC3.5/1.8/1.8	11.0	1.44	0.06
TC3.5/1.8/2	12.4	1.62	0.05
TC3.9/1.8/1.8	14.8	1.83	0.09
TC3.9/1.8/2.5	21.1	2.6	0.12
TC3.9/2.2/1.3	9.2	1.0	0.045
TC4/1.8/0.8	6.43	0.79	0.035
TC4/2/2	16.7	1.92	0.095
TC4/2.2/1.1	8.8	0.96	0.04
TC4/2.2/1.3	9.8	1.07	0.05
TC4/2.2/1.6	12.9	1.40	0.06
TC4/2.2/1.8	14.4	1.56	0.07
TC4/2.2/2	16.1	1.75	0.08
TC4.8/2.3/1.3	15.5	1.52	0.09
TC5.8/3.1/0.8	13.2	1.01	0.07
TC5.8/3.1/1.5	26.1	2.00	0.13
TC5.8/3.1/3.2	55.8	4.28	0.31
TC5.9/3.1/3.1	53.8	4.12	0.14
TC6/4/2	30.2	1.97	0.15
TC6/4/3	45.2	2.96	0.23
TC6.3/3.8/2.5	46.5	3.06	0.23
TC7.6/3.2/4.8	148	9.92	0.70
TC7.6/3.2/5.2	160	10.6	0.75
TC8.2/3.7/4	144	8.50	0.70
TN9/6/3	102	4.44	0.50
TC9.5/4.8/3.2	148	7.16	0.70

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TN10/6/4	188	7.8	0.95
TX10/6/4	188	7.8	0.95
TX13/7.1/4.8	361	12.3	1.8
TN13/7.5/5	368	12.2	1.8
TX13/7.5/5	368	12.2	1.8
TX13/7.9/6.4	442	14.1	2.2
TN14/9/5	430	12.3	2.1
TX14/9/5	430	12.3	2.1
TN14/9/9	774	22.1	3.8
TX14/9/9	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
TX16/9.6/6.3	760	19.7	3.8
TN19/11/10	1795	40.8	9.2
TN19/11/15	2692	61.2	13.8
TN20/10/7	1465	33.6	7.7
TX20/10/7	1465	33.6	7.7
TX22/14/6.4	1340	24.8	6.5
TX22/14/13	2750	50.9	14
TN23/14/7	1722	30.9	8.4
TN25/15/10	2944	48.9	15
TX25/15/10	2944	48.9	15
TN26/15/10	3360	55.9	17
TX26/15/10	3360	55.9	17
TN26/15/20	6720	112	34
TN29/11/6	2680	50.8	14
TN29/19/7.5	2700	36.9	13.5
TX29/19/7.5	2700	36.9	13.5
TX29/19/7.6	2600	35.5	13
TN29/19/15	5410	73.9	28
TX29/19/15	5410	73.9	28
TN32/19/13	5820	76.5	29
TN36/23/10	5730	63.9	28
TX36/23/10	5730	63.9	28
TN36/23/15	8600	95.9	42
TX36/23/15	8410	93.8	40
TX39/20/13	9513	112	45
TX42/26/13	9860	95.8	53
TX42/26/18	13810	134	55

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TX50/30/19	22378	186	100
TX51/32/19	21500	172	100
TL55/32/18	26580	202	100
TL58/41/18	23200	152	110
TL63/38/25	46500	306	220
TX63/38/25	46500	306	220
TX74/39/13	34300	208	170
TL80/40/15	50200	288	240
TL87/54/14	46400	217	220
T87/56/13	42133	194	200
TL102/66/15	68200	267	325
TL107/65/18	96000	370	456
T107/65/25	133000	514	680
T140/106/25	161100	422	800

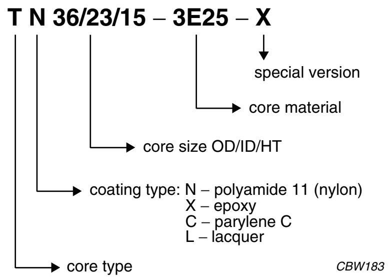


Fig.1 Type number structure for toroids.

Ferrite toroids

TC2.5/1.3/0.8

RING CORES (TOROIDS)

Effective core parameters

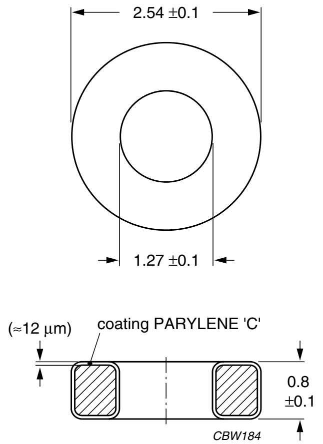
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	11.3	mm^{-1}
V_e	effective volume	2.7	mm^3
l_e	effective length	5.53	mm
A_e	effective area	0.49	mm^2
m	mass of core	≈0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/0.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	94 +25/−20%	≈850	TC2.5/1.3/0.8-4A11

Ferrite toroids TC2.5/1.3/1.3

RING CORES (TOROIDS)

Effective core parameters

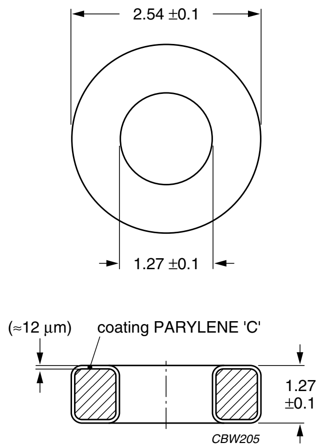
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	7.14	mm^{-1}
V_e	effective volume	4.29	mm^3
l_e	effective length	5.53	mm
A_e	effective area	0.76	mm^2
m	mass of core	≈ 0.022	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	150 ± 25%	≈ 850	TC2.5/1.3/1.3-4A11
3S4 des	300 ± 25%	≈ 1700	TC2.5/1.3/1.3-3S4
3E25 des	970 ± 30%	≈ 5500	TC2.5/1.3/1.3-3E25
3E6 des	1835 ± 30%	≈ 10000	TC2.5/1.3/1.3-3E6(1)

Note

1. Maximum tolerances on mechanical dimensions are ± 0.13 mm.

RING CORES (TOROIDS)

Effective core parameters

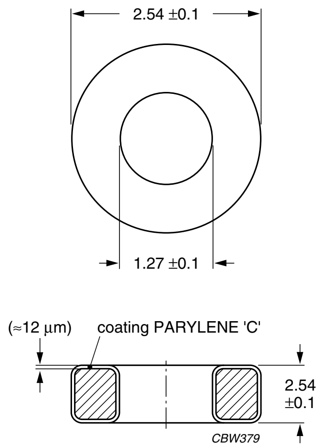
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.57	mm^{-1}
V_e	effective volume	8.57	mm^3
l_e	effective length	5.53	mm
A_e	effective area	1.55	mm^2
m	mass of core	≈0.044	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.3/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1400 ±25%	≈4000	TC2.5/1.3/2.5-3E28

Ferrite toroids TC2.5/1.5/0.8

RING CORES (TOROIDS)

Effective core parameters

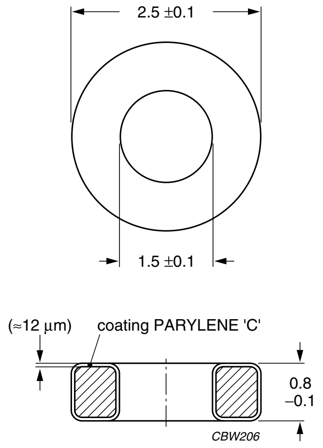
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	16.4	mm^{-1}
V_e	effective volume	2.21	mm^3
l_e	effective length	6.02	mm
A_e	effective area	0.37	mm^2
m	mass of core	≈ 0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.5/0.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	765 ± 30%	≈ 10000	TC2.5/1.5/0.8-3E6

RING CORES (TOROIDS)

Effective core parameters

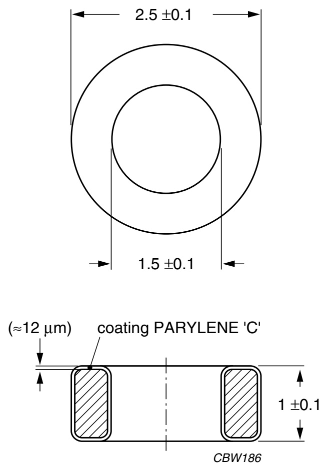
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	12.3	mm^{-1}
V_e	effective volume	2.94	mm^3
l_e	effective length	6.02	mm
A_e	effective area	0.489	mm^2
m	mass of core	≈0.015	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC2.5/1.5/1-S ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	71 ± 25%	≈ 700	TC2.5/1.5/1-4A11-S
3E28 des	410 ± 25%	≈ 4000	TC2.5/1.5/1-3E28-S
3E27 des	513 ± 20%	≈ 5500	TC2.5/1.5/1-3E27-S
3E5 des	920 ± 30%	≈ 9000	TC2.5/1.5/1-3E5-S
3E6 des	1020 ± 30%	≈ 10000	TC2.5/1.5/1-3E6-S

Ferrite toroids TC3.1/1.3/1.3

RING CORES (TOROIDS)

Effective core parameters

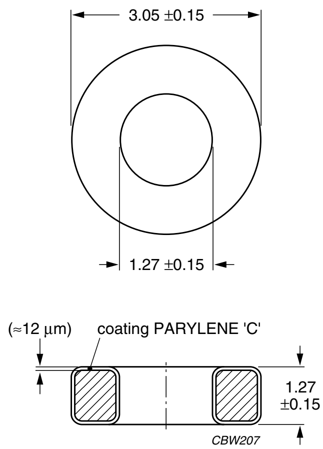
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.65	mm^{-1}
V_e	effective volume	6.35	mm^3
l_e	effective length	5.99	mm
A_e	effective area	1.06	mm^2
m	mass of core	≈ 0.033	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.1/1.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	190 ± 20%	≈ 850	TC3.1/1.3/1.3-4A11
3E25 des	1225 ± 25%	≈ 5500	TC3.1/1.3/1.3-3E25
3E6 des	2225 ± 30%	≈ 10000	TC3.1/1.3/1.3-3E6

RING CORES (TOROIDS)

Effective core parameters

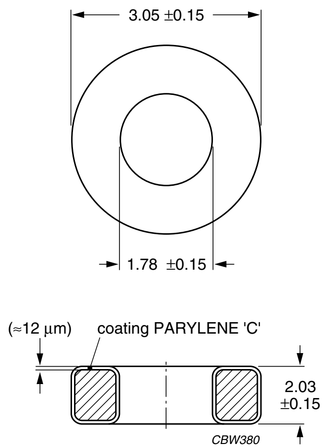
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.75	mm^{-1}
V_e	effective volume	9.10	mm^3
l_e	effective length	7.23	mm
A_e	effective area	1.26	mm^2
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.1/1.8/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1100 ± 25%	≈ 5000	TC3.1/1.8/2-3E28

Ferrite toroids TC3.4/1.8/1.3

RING CORES (TOROIDS)

Effective core parameters

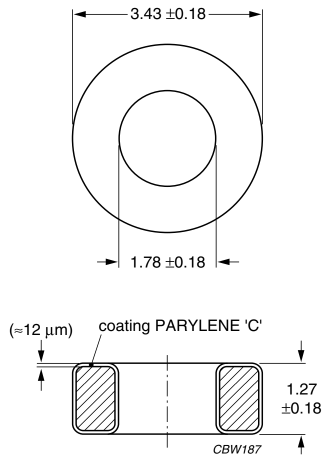
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.93	mm^{-1}
V_e	effective volume	7.3	mm^3
l_e	effective length	7.62	mm
A_e	effective area	0.96	mm^2
m	mass of core	≈ 0.035	g

Coating

The cores are coated with parylene C; flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation



Dimensions in mm.

Fig.1 TC3.4/1.8/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	110 ± 20%	≈ 750	TC3.4/1.8/1.3-3D3
3B7 sup	375 ± 20%	≈ 2300	TC3.4/1.8/1.3-3B7
3E27	660 ± 20%	≈ 4200	TC3.4/1.8/1.3-3E27
3E6 des	1580 ± 30%	≈ 10000	TC3.4/1.8/1.3-3E6

Ferrite toroids TC3.4/1.8/2

RING CORES (TOROIDS)

Effective core parameters

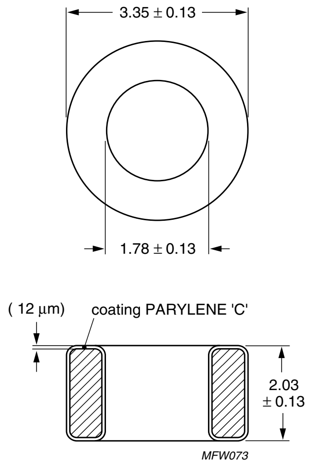
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.9	mm^{-1}
V_e	effective volume	11.6	mm^3
l_e	effective length	7.54	mm
A_e	effective area	1.54	mm^2
m	mass of core	≈ 0.059	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.4/1.8/2 ring core.

Ring core data

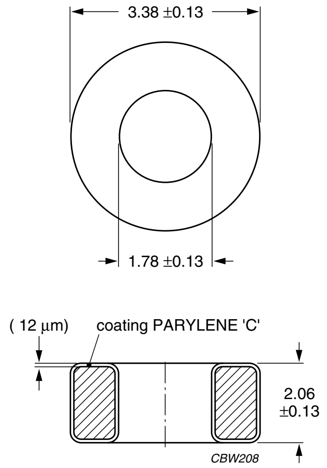
GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25 des	1420 ± 25%	≈ 5500	TC3.4/1.8/2-3E25
3E7 des	3080 ± 30%	≈ 12000	TC3.4/1.8/2-3E7

Ferrite toroids TC3.4/1.8/2.1

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	11.5	mm^3
l_e	effective length	7.54	mm
A_e	effective area	1.52	mm^2
m	mass of core	≈ 0.06	g



Dimensions (uncoated) in mm.

Fig.1 TC3.4/1.8/2.1 ring core.

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25 des	1420 ± 25%	≈ 5600	TC3.4/1.8/2.1-3E25
3E28 des	1045 ± 25%	≈ 4000	TC3.4/1.8/2.1-3E28

RING CORES (TOROIDS)

Effective core parameters

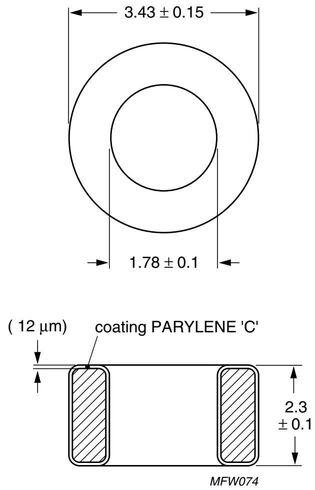
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.16	mm^{-1}
V_e	effective volume	14.0	mm^3
l_e	effective length	7.63	mm
A_e	effective area	1.83	mm^2
m	mass of core	≈ 0.068	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.4/1.8/2.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1207 ± 25%	≈ 4000	TC3.4/1.8/2.3-3E28

Ferrite toroids TC3.5/1.6/1.3

RING CORES (TOROIDS)

Effective core parameters

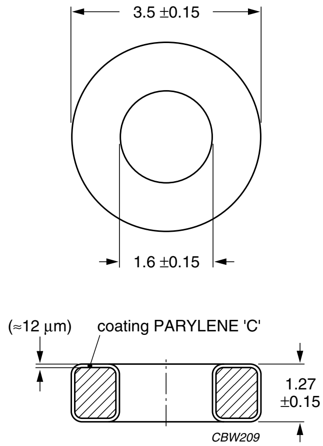
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.32	mm^{-1}
V_e	effective volume	8.3	mm^3
l_e	effective length	7.25	mm
A_e	effective area	1.15	mm^2
m	mass of core	≈ 0.043	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.6/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	862 ± 20%	≈ 4300	TC3.5/1.6/1.3-3C11

Ferrite toroids TC3.5/1.8/1.3

RING CORES (TOROIDS)

Effective core parameters

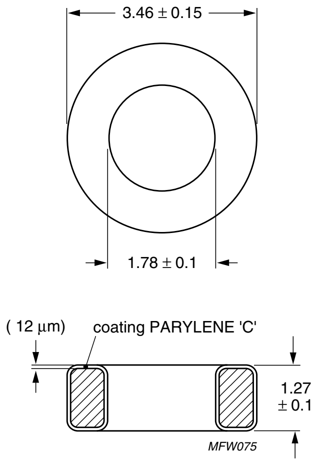
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	7.44	mm^{-1}
V_e	effective volume	7.87	mm^3
l_e	effective length	7.65	mm
A_e	effective area	1.03	mm^2
m	mass of core	≈ 0.04	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.8/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	120 ± 25%	≈ 700	TC3.5/1.8/1.3-4A11
3E27 des	930 ± 25%	≈ 5500	TC3.5/1.8/1.3-3E27

RING CORES (TOROIDS)

Effective core parameters

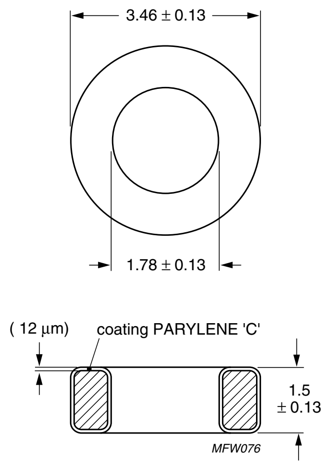
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	6.30	mm^{-1}
V_e	effective volume	9.30	mm^3
l_e	effective length	7.65	mm
A_e	effective area	1.21	mm^2
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.8/1.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A15 des	170 ± 20%	≈ 850	TC3.5/1.8/1.5-4A15

Ferrite toroids TC3.5/1.8/1.8

RING CORES (TOROIDS)

Effective core parameters

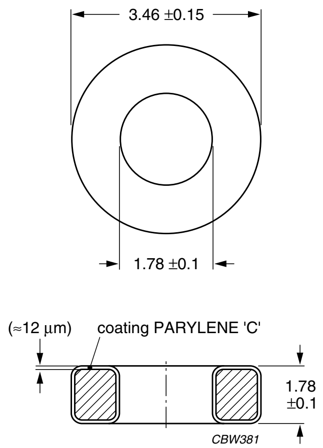
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.31	mm^{-1}
V_e	effective volume	11.0	mm^3
l_e	effective length	7.65	mm
A_e	effective area	1.44	mm^2
m	mass of core	≈ 0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.8/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	950 ± 25%	≈ 4000	TC3.5/1.8/1.8-3E28

Ferrite toroids TC3.5/1.8/2

RING CORES (TOROIDS)

Effective core parameters

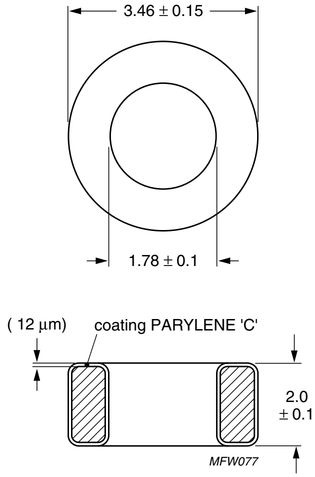
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.73	mm^{-1}
V_e	effective volume	12.4	mm^3
l_e	effective length	7.6	mm
A_e	effective area	1.62	mm^2
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.5/1.8/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1060 ± 25%	≈ 4000	TC3.5/1.8/2-3E28

Ferrite toroids TC3.9/1.8/1.8

RING CORES (TOROIDS)

Effective core parameters

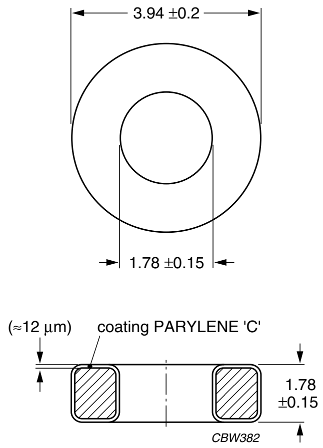
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	4.44	mm^{-1}
V_e	effective volume	14.8	mm^3
l_e	effective length	8.1	mm
A_e	effective area	1.83	mm^2
m	mass of core	≈ 0.086	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/1.8/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	1400 ± 30%	≈ 5000	TC3.9/1.8/1.8-3E28

Ferrite toroids TC3.9/1.8/2.5

RING CORES (TOROIDS)

Effective core parameters

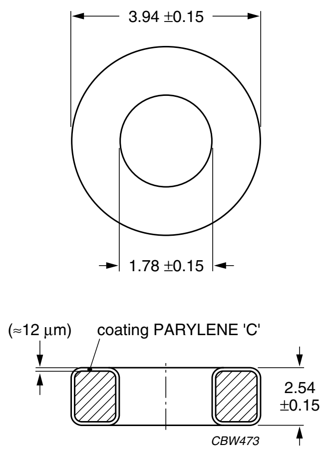
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.11	mm^{-1}
V_e	effective volume	21.1	mm^3
l_e	effective length	8.1	mm
A_e	effective area	2.6	mm^2
m	mass of core	≈ 0.12	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/1.8/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28	2020 ± 30%	≈ 4000	TC3.9/1.8/2.5-3E28

Ferrite toroids TC3.9/2.2/1.3

RING CORES (TOROIDS)

Effective core parameters

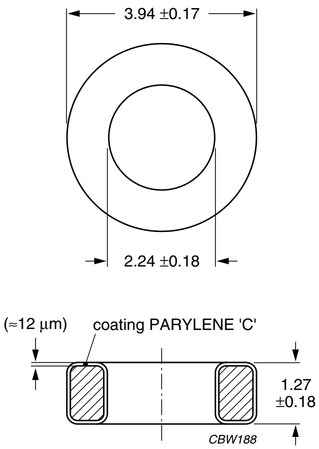
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.20	mm^{-1}
V_e	effective volume	9.20	mm^3
l_e	effective length	9.20	mm
A_e	effective area	1.00	mm^2
m	mass of core	≈ 0.045	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC3.9/2.2/1.3 ring core.

Ring core data

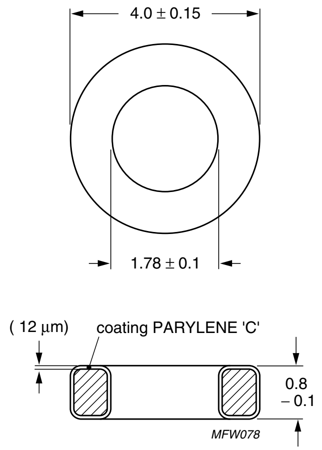
GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	97 ± 20%	≈ 750	TC3.9/2.2/1.3-3D3
3B7 sup	325 ± 20%	≈ 2300	TC3.9/2.2/1.3-3B7
3E27	575 ± 20%	≈ 4100	TC3.9/2.2/1.3-3E27

Ferrite toroids TC4/1.8/0.8

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	10.3	mm^{-1}
V_e	effective volume	6.43	mm^3
l_e	effective length	8.16	mm
A_e	effective area	0.79	mm^2
m	mass of core	≈ 0.035	g



Dimensions (uncoated) in mm.

Fig.1 TC4/1.8/0.8 ring core.

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	486 ± 25%	≈ 4000	TC4/1.8/0.8-3E28

Ferrite toroids TC4/2/2

RING CORES (TOROIDS)

Effective core parameters

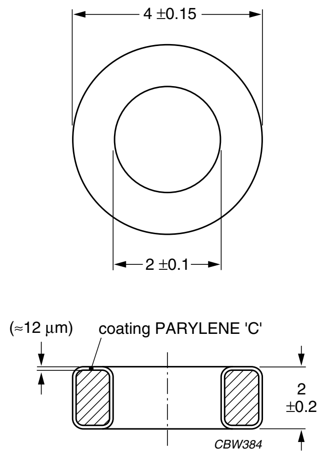
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.54	mm^{-1}
V_e	effective volume	16.7	mm^3
l_e	effective length	8.71	mm
A_e	effective area	1.92	mm^2
m	mass of core	≈ 0.095	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C11	1190 ± 25%	≈ 4300	TC4/2/2-3C11
3E28 des	1110 ± 25%	≈ 4000	TC4/2/2-3E28
3E27 des	1623 ± 20%	≈ 5500	TC4/2/2-3E27

Ferrite toroids TC4/2.2/2

RING CORES (TOROIDS)

Effective core parameters

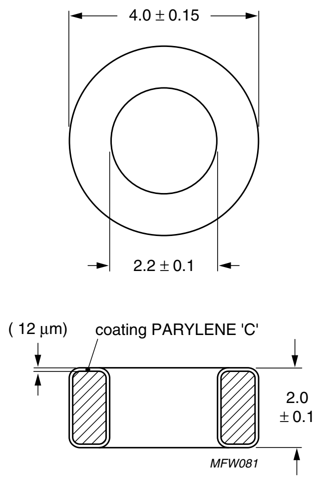
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.26	mm^{-1}
V_e	effective volume	16.1	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.75	mm^2
m	mass of core	≈ 0.08	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E25 des	1315 ± 30%	≈ 5500	TC4/2.2/2-3E25
3E8 prot	3590 ± 30%	≈ 15000	TC4/2.2/2-3E8

Ferrite toroids TC4/2.2/1.1

RING CORES (TOROIDS)

Effective core parameters

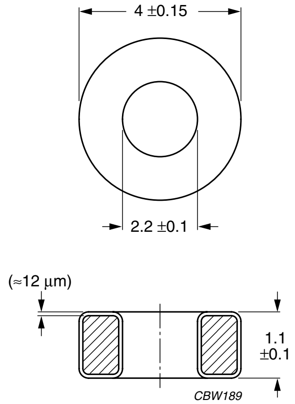
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.55	mm^{-1}
V_e	effective volume	8.82	mm^3
l_e	effective length	9.18	mm
A_e	effective area	0.961	mm^2
m	mass of core	≈ 0.04	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	16 ± 25%	≈ 125	TC4/2.2/1.1-4C65
4A11	92 ± 25%	≈ 700	TC4/2.2/1.1-4A11
3F3	260 ± 25%	≈ 2000	TC4/2.2/1.1-3F3
3E25	725 ± 30%	≈ 5500	TC4/2.2/1.1-3E25
3E5	1120 ± 30%	≈ 8500	TC4/2.2/1.1-3E5
3E6 des	1315 ± 30%	≈ 10000	TC4/2.2/1.1-3E6

Ferrite toroids TC4/2.2/1.3

RING CORES (TOROIDS)

Effective core parameters

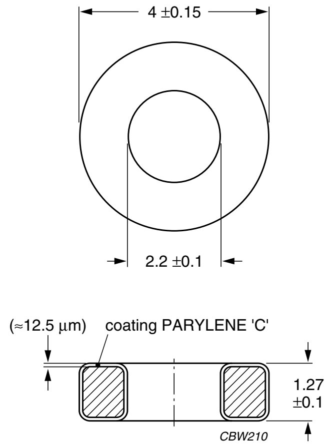
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	8.28	mm^{-1}
V_e	effective volume	10.2	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.11	mm^2
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133.

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	122 ± 20%	≈ 800	TC4/2.2/1.3-4A11
3E25	720 ± 25%	≈ 5500	TC4/2.2/1.3-3E25

Ferrite toroids TC4/2.2/1.6

RING CORES (TOROIDS)

Effective core parameters

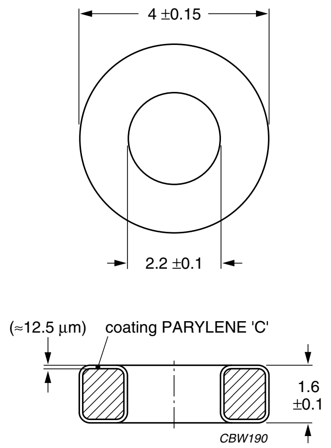
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.56	mm^{-1}
V_e	effective volume	12.9	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.4	mm^2
m	mass of core	≈ 0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	24 ± 25%	≈ 125	TC4/2.2/1.6-4C65
4A11	134 ± 25%	≈ 700	TC4/2.2/1.6-4A11
3S4 des	325 ± 25%	≈ 1700	TC4/2.2/1.6-3S4
3F3	380 ± 25%	≈ 2000	TC4/2.2/1.6-3F3
3E25	1050 ± 30%	≈ 5500	TC4/2.2/1.6-3E25
3E5	1630 ± 30%	≈ 8500	TC4/2.2/1.6-3E5
3E6 des	1915 ± 30%	≈ 10000	TC4/2.2/1.6-3E6

Ferrite toroids TC4/2.2/1.8

RING CORES (TOROIDS)

Effective core parameters

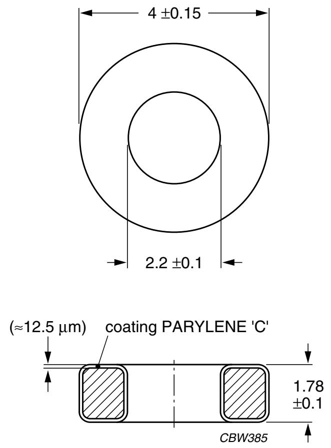
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	5.89	mm^{-1}
V_e	effective volume	14.4	mm^3
l_e	effective length	9.18	mm
A_e	effective area	1.56	mm^2
m	mass of core	≈ 0.07	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4/2.2/1.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	2130 ± 30%	≈ 10000	TC4/2.2/1.8-3E6

Ferrite toroids

TC4.8/2.3/1.3

RING CORES (TOROIDS)

Effective core parameters

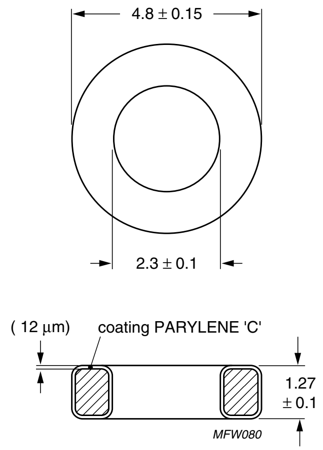
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	6.73	mm^{-1}
V_e	effective volume	15.5	mm^3
l_e	effective length	10.2	mm
A_e	effective area	1.52	mm^2
m	mass of core	≈ 0.09	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *“UL 94V-2”*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC4.8/2.3/1.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E27 des	1030 ± 25%	≈ 5500	TC4.8/2.3/1.3-3E27
3B7 sup	430 ± 20%	≈ 2300	TC4.8/2.3/1.3-3B7

Ferrite toroids TC5.8/3.1/0.8

RING CORES (TOROIDS)

Effective core parameters

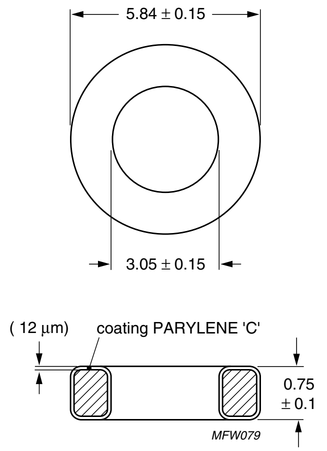
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	12.9	mm^{-1}
V_e	effective volume	13.2	mm^3
l_e	effective length	13.0	mm
A_e	effective area	1.01	mm^2
m	mass of core	≈ 0.07	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *“UL 94V-2”*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.8/3.1/0.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	390 ± 25%	≈ 4000	TC5.8/3.1/0.8-3E28

Ferrite toroids TC5.8/3.1/1.5

RING CORES (TOROIDS)

Effective core parameters

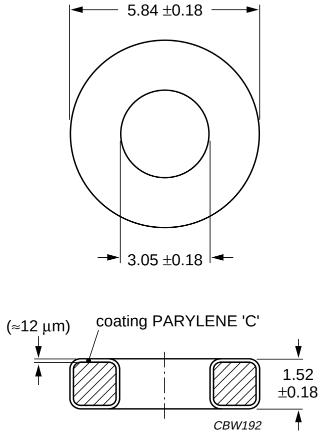
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	6.52	mm^{-1}
V_e	effective volume	26.1	mm^3
l_e	effective length	13.0	mm
A_e	effective area	2.00	mm^2
m	mass of core	≈ 0.13	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.8/3.1/1.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	25 ± 25%	≈ 125	TC5.8/3.1/1.5-4C65(1)
4B1 des	50 ± 25%	≈ 250	TC5.8/3.1/1.5-4B1(1)
3B7 sup	450 ± 20%	≈ 2300	TC5.8/3.1/1.5-3B7(2)
3E27	890 ± 20%	≈ 4600	TC5.8/3.1/1.5-3E27
3E6	1960 ± 30%	≈ 9925	TC5.8/3.1/1.5-3E6(1)
3E8 prot	2940 ± 30%	≈ 15000	TC5.8/3.1/1.5-3E8

Note

1. Dimensions with coating.
2. OD = 6 ± 0.18

Ferrite toroids TC5.8/3.1/3.2

RING CORES (TOROIDS)

Effective core parameters

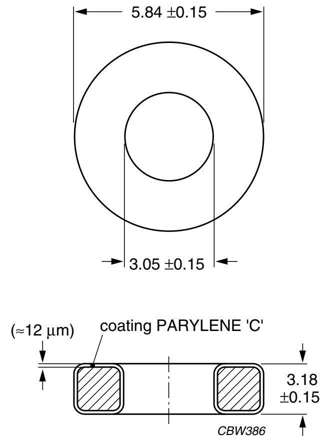
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.04	mm^{-1}
V_e	effective volume	55.8	mm^3
l_e	effective length	13.0	mm
A_e	effective area	4.28	mm^2
m	mass of core	≈ 0.31	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

Dc isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.8/3.1/3.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 des	310 ± 20%	≈ 750	TC5.8/3.1/3.2-3D3
3B7 sup	940 ± 25%	≈ 2300	TC5.8/3.1/3.2-3B7(1)
3E28 des	1650 ± 25%	≈ 4000	TC5.8/3.1/3.2-3E28
3E6 des	4130 ± 30%	≈ 10000	TC5.8/3.1/3.2-3E6

Note

1. Dimensions with coating.

RING CORES (TOROIDS)

Effective core parameters

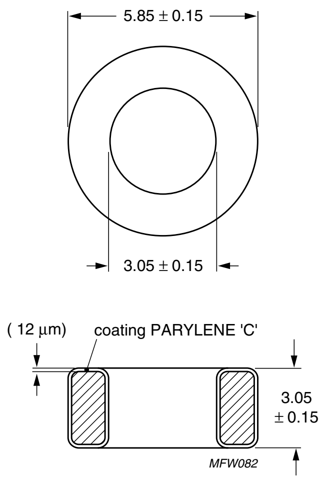
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.16	mm^{-1}
V_e	effective volume	53.8	mm^3
l_e	effective length	13.0	mm
A_e	effective area	4.12	mm^2
m	mass of core	≈ 0.14	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94134 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC5.9/3.1/3.1 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	3960 ± 30%	≈ 10000	TC5.9/3.1/3.1-3E6

Ferrite toroids TC6.3/3.8/2.5

RING CORES (TOROIDS)

Effective core parameters

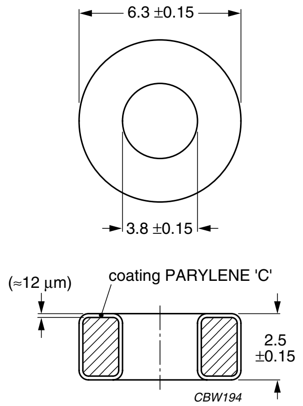
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.97	mm^{-1}
V_e	effective volume	46.5	mm^3
l_e	effective length	15.2	mm
A_e	effective area	3.06	mm^2
m	mass of core	≈ 0.23	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC6.3/3.8/2.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11	177 ± 25%	≈ 700	TC6.3/3.8/2.5-4A11
3F3	500 ± 25%	≈ 2000	TC6.3/3.8/2.5-3F3
3E25	1390 ± 30%	≈ 5500	TC6.3/3.8/2.5-3E25
3E5	2150 ± 30%	≈ 8500	TC6.3/3.8/2.5-3E5
3E6 des	2530 ± 30%	≈ 10000	TC6.3/3.8/2.5-3E6
3E7 des	3600 + 30/– 40%	≈ 12000	TC6.3/3.8/2.5-3E7

RING CORES (TOROIDS)

Effective core parameters

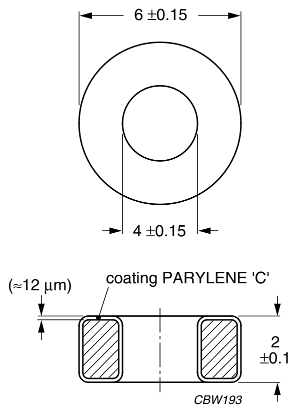
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	7.75	mm^{-1}
V_e	effective volume	30.2	mm^3
l_e	effective length	15.3	mm
A_e	effective area	1.97	mm^2
m	mass of core	≈ 0.15	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC6/4/2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4C65	20 ± 25%	≈ 125	TC6/4/2-4C65
4A11	114 ± 25%	≈ 700	TC6/4/2-4A11
3S4 des	275 ± 25%	≈ 1700	TC6/4/2-3S4
3F3	325 ± 25%	≈ 2000	TC6/4/2-3F3
3E25	890 ± 30%	≈ 5500	TC6/4/2-3E25
3E5	1380 ± 30%	≈ 8500	TC6/4/2-3E5
3E6 des	1620 ± 30%	≈ 10000	TC6/4/2-3E6

Ferrite toroids TC6/4/3

RING CORES (TOROIDS)

Effective core parameters

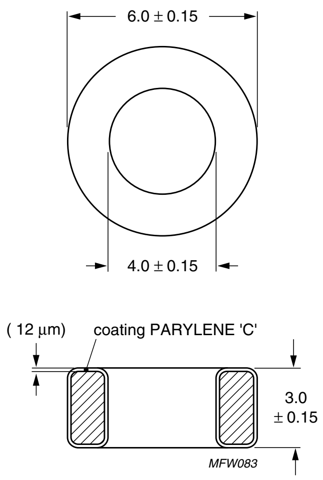
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.17	mm^{-1}
V_e	effective volume	45.2	mm^3
l_e	effective length	15.3	mm
A_e	effective area	2.96	mm^2
m	mass of core	≈ 0.23	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC6/4/3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	2430 ± 30%	≈ 10000	TC6/4/3-3E6

Ferrite toroids TC7.6/3.2/4.8

RING CORES (TOROIDS)

Effective core parameters

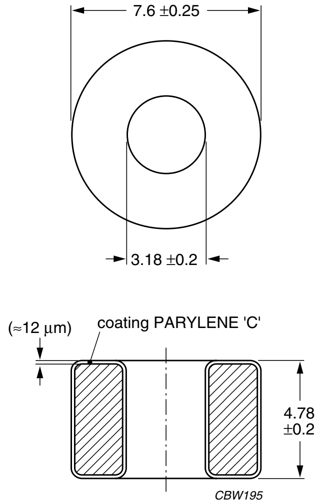
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.51	mm^{-1}
V_e	effective volume	148	mm^3
l_e	effective length	15.0	mm
A_e	effective area	9.92	mm^2
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC7.6/3.2/4.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C90	1915 ±25%	≈ 2300	TC7.6/3.2/4.8-3C90
3E28 des	3800 ±30%	≈ 4000	TC7.6/3.2/4.8-3E28
3E6 des	8360 ±30%	≈ 10000	TC7.6/3.2/4.8-3E6
3E8 prot	12500 ±30%	≈ 15000	TC7.6/3.2/4.8-3E8

RING CORES (TOROIDS)

Effective core parameters

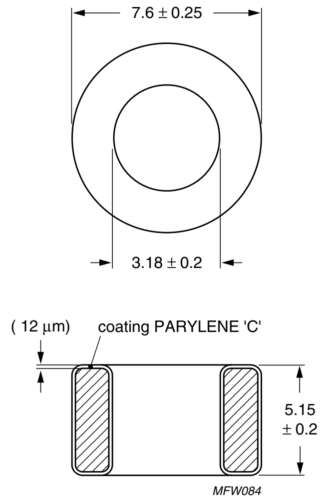
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.41	mm^{-1}
V_e	effective volume	160	mm^3
l_e	effective length	15.0	mm
A_e	effective area	10.6	mm^2
m	mass of core	≈ 0.75	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC7.6/3.2/5.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E28 des	3580 ± 25%	≈ 4000	TC7.6/3.2/5.2-3E28

Ferrite toroids TC8.2/3.7/4

RING CORES (TOROIDS)

Effective core parameters

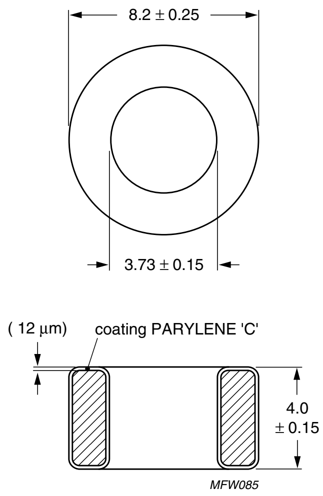
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.99	mm^{-1}
V_e	effective volume	144	mm^3
l_e	effective length	16.9	mm
A_e	effective area	8.5	mm^2
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *“UL 94V-2”*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions (uncoated) in mm.

Fig.1 TC8.2/3.7/4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
4A11 des	440 ± 25%	≈ 700	TC8.2/3.7/4-4A11
3E7 des	7560 ± 30%	≈ 12000	TC8.2/3.7/4-3E7

Ferrite toroids

TC9.5/4.8/3.2

RING CORES (TOROIDS)

Effective core parameters

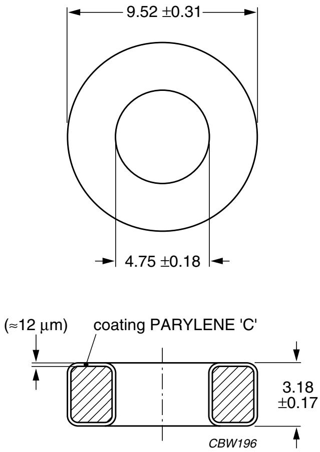
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	2.98	mm^{-1}
V_e	effective volume	144	mm^3
l_e	effective length	20.7	mm
A_e	effective area	6.95	mm^2
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TC9.5/4.8/3.2 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3D3 sup	330 ± 20%	≈ 750	TC9.5/4.8/3.2-3D3
3F3	890 ± 25%	≈ 2000	TC9.5/4.8/3.2-3F3(1)
3B7 sup	1000 ± 20%	≈ 2300	TC9.5/4.8/3.2-3B7
3C81	1200 ± 20%	≈ 2700	TC9.5/4.8/3.2-3C81
3E27	2135 ± 20%	≈ 4900	TC9.5/4.8/3.2-3E27
3E6 des	4390 ± 30%	≈ 10100	TC9.5/4.8/3.2-3E6(1)
3E7 des	5323 ± 30%	≈ 12000	TC9.5/4.8/3.2-3E7(1)
3E8 prot	6590 ± 30%	≈ 15000	TC9.5/4.8/3.2-3E8(1)

Note

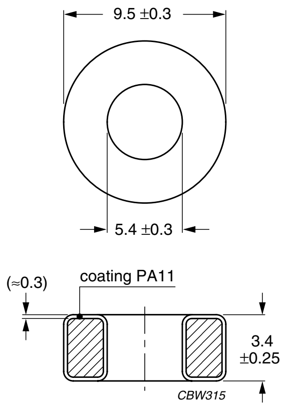
1. Dimensions with coating.

Ferrite toroids TN9/6/3

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	5.17	mm^{-1}
V_e	effective volume	102	mm^3
l_e	effective length	22.9	mm
A_e	effective area	4.44	mm^2
m	mass of core	≈ 0.5	g



Dimensions in mm.

Fig.1 TN9/6/3 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	30 ± 25%	≈ 125	violet	TN9/6/3-4C65
4A11	170 ± 25%	≈ 700	pink	TN9/6/3-4A11
3R1(1)	–	≈ 800	black	TN9/6/3-3R1
3F3	440 ± 25%	≈ 1800	blue	TN9/6/3-3F3
3C90	560 ± 25%	≈ 2300	ultramarine	TN9/6/3-3C90
3E25	1340 ± 30%	≈ 5500	orange	TN9/6/3-3E25
3E5(2)	2070 ± 30%	≈ 8500	yellow/white	TL9/6/3-3E5
3E5(3)	2070 ± 30%	≈ 8500	–	TC9/6/3-3E5
3E6(3) des	2435 ± 30%	≈ 10000	–	TC9/6/3-3E6

Notes

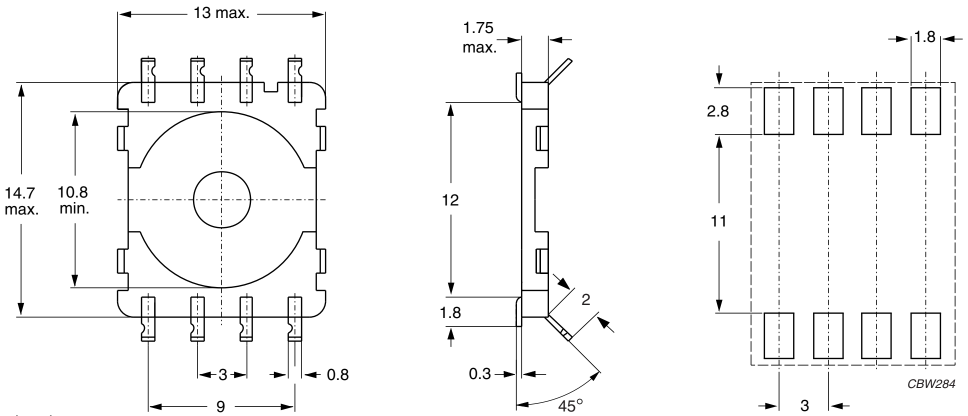
1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.
2. Toroids are lacquered (polyurethane) and have different dimensions: Outside diameter = 9.3 ±0.4 mm; inside diameter = 5.75 ±0.3 mm; height = 3.25 ±0.3 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.
3. Toroids are coated with parylene C and have different dimensions:
Outside diameter = 9.0 ±0.2 mm; inside diameter = 6.0 ±0.2 mm; height = 3.0 ±0.15 mm. flame retardant in accordance with *"UL 94V-2"*; UL file number E 94133 (M).

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Tag plate

General data

PARAMETER	SPECIFICATION
Tag plate material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with *“UL 94V-0”*; UL file number E83005 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated
Maximum operating temperature	155 °C, *“IEC 60085”,* class F
Resistance to soldering heat	*“IEC 60068-2-20”*, Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	*“IEC 60068-2-20”*, Part 2, Test Ta, method 1: 235 °C, 2 s



Dimensions in mm.

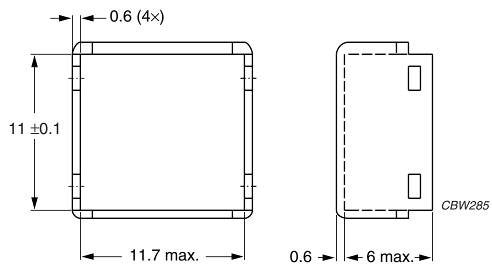
Fig.2 TN9/6/3 tag plate (SMD); 8-solder pads.

Type number information for TN9/6/3 tag plate (SMD) with 8 solder pads

NUMBER OF SOLDER PADS	TYPE NUMBER
8	TGPS9

Cover data

PARAMETER	SPECIFICATION
Cover material	polyamide (PA4.6) glass reinforced, flame retardant in accordance with *“UL 94V-0”*
Maximium operating temperature	130 °C, *“IEC 60085”* class B
Type number	COV9



Dimensions in mm.

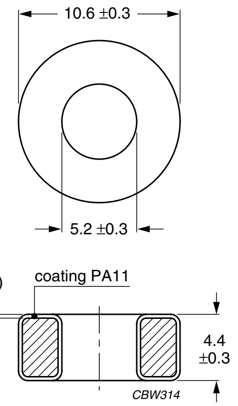
Fig.3 TN9/6/3 tag plate (SMD); 8-solder pads.

Ferrite toroids TN10/6/4

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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



Dimensions in mm.

Fig.1 TN10/6/4 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	52 ± 25%	≈ 125	violet	TN10/6/4-4C65
4A11	286 ± 25%	≈ 700	pink	TN10/6/4-4A11
3D3	306 ± 25%	≈ 750	-	TN10/6/4-3D3
3R1[1]	-	≈ 800	black	TN10/6/4-3R1
3F3	740 ± 25%	≈ 1800	blue	TN10/6/4-3F3
3C90	940 ± 25%	≈ 2300	ultramarine	TN10/6/4-3C90
3C11	1750 ± 25%	≈ 4300	white	TN10/6/4-3C11
3E25	2250 ± 30%	≈ 5500	orange	TN10/6/4-3E25

Notes

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.021	≤ 0.021	–
3F3	≥320	–	≤ 0.03	≤ 0.04

Ferrite toroids TX10/6/4

RING CORES (TOROIDS)

Effective core parameters

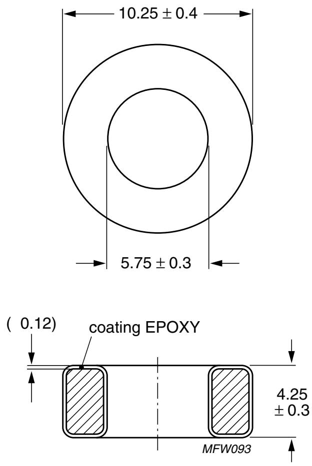
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.07	mm^{-1}
V_e	effective volume	188	mm^3
l_e	effective length	24.1	mm
A_e	effective area	7.8	mm^2
m	mass of core	≈ 0.95	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX10/6/4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	3470 ± 30%	≈ 8500	yellow/white	TX10/6/4-3E5
3E6 des	4085 ± 30%	≈ 10000	purple/white	TX10/6/4-3E6

Ferrite toroids TX13/7.1/4.8

RING CORES (TOROIDS)

Effective core parameters

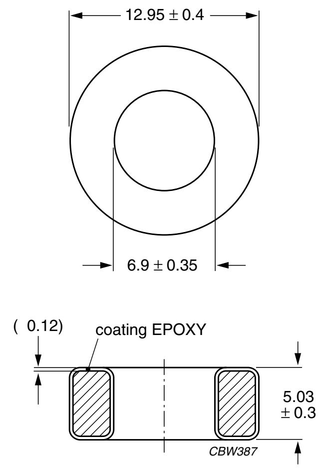
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.40	mm^{-1}
V_e	effective volume	361	mm^3
I_e	effective length	29.5	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈ 1.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX13/7.1/4.8 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3D3 sup	415 ± 20%	≈ 750	–	TX13/7.1/4.8-3D3
3F3	990 ± 20%	≈ 1800	blue/white	TX13/7.1/4.8-3F3
3C90	1260 ± 20%	≈ 2300	ultramarine/white	TX13/7.1/4.8-3C90
3C81	1475 ± 20%	≈ 2700	brown/white	TX13/7.1/4.8-3C81
3E27	2750 ± 20%	≈ 5000	green/white	TX13/7.1/4.8-3E27
3E6 des	5400 ± 30%	≈ 10400	purple/white	TX13/7.1/4.8-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.08	–	–
3C90	≥320	≤ 0.036	≤ 0.036	–
3F3	≥320	–	≤ 0.04	≤ 0.07

RING CORES (TOROIDS)

Effective core parameters

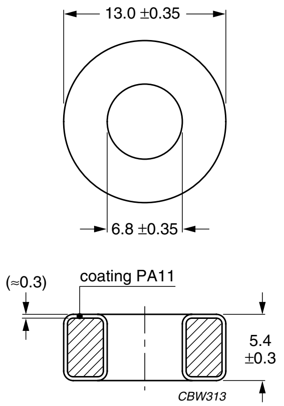
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.46	mm^{-1}
V_e	effective volume	368	mm^3
l_e	effective length	30.1	mm
A_e	effective area	12.2	mm^2
m	mass of core	≈ 1.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN13/7.5/5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	64 ± 25%	≈ 125	violet	TN13/7.5/5-4C65
4A11	360 ± 25%	≈ 700	pink	TN13/7.5/5-4A11
3F4	460 ± 25%	≈ 900	beige	TN13/7.5/5-3F4
4A15	610 ± 25%	≈ 1200	-	TN13/7.5/5-4A15
3F3	900 ± 25%	≈ 1800	blue	TN13/7.5/5-3F3
3C90	1170 ± 25%	≈ 2300	ultramarine	TN13/7.5/5-3C90
3C11	2200 ± 25%	≈ 4300	white	TN13/7.5/5-3C11
3E25	2810 ± 30%	≈ 5500	orange	TN13/7.5/5-3E25
3R1(1)	–	–	black	TN13/7.5/5-3R1

Notes

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.041	≤ 0.041	–
3F3	≥320	–	≤ 0.04	≤ 0.07

Ferrite toroids TX13/7.5/5

RING CORES (TOROIDS)

Effective core parameters

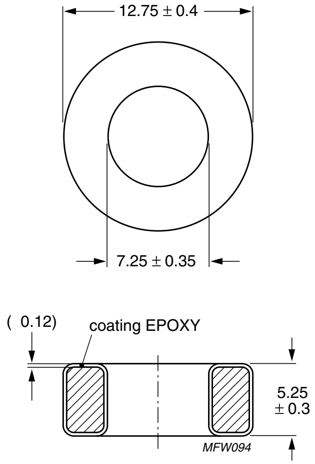
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.46	mm^{-1}
V_e	effective volume	368	mm^3
l_e	effective length	30.1	mm
A_e	effective area	12.2	mm^2
m	mass of core	≈ 1.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX13/7.5/5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	4340 ± 30%	≈ 8500	yellow/white	TX13/7.5/5-3E5
3E6 des	5095 ± 30%	≈ 10000	purple/white	TX13/7.5/5-3E6

Ferrite toroids TX13/7.9/6.4

RING CORES (TOROIDS)

Effective core parameters

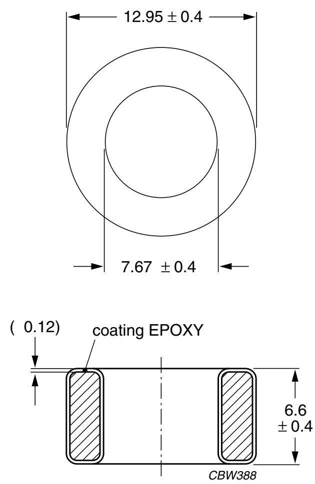
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.21	mm^{-1}
V_e	effective volume	442	mm^3
l_e	effective length	31.2	mm
A_e	effective area	14.1	mm^2
m	mass of core	≈ 2.2	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX13/7.9/6.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1100 ± 20%	≈ 1800	blue/white	TX13/7.9/6.4-3F3
3C90	1380 ± 20%	≈ 2300	ultramarine/white	TX13/7.9/6.4-3C90
3C81	1620 ± 20%	≈ 2700	brown/white	TX13/7.9/6.4-3C81
3E27	3000 ± 20%	≈ 5000	green/white	TX13/7.9/6.4-3E27
3E25	3000 ± 20%	≈ 5000	orange/white	TX13/7.9/6.4-3E25
3E6 des	5900 ± 30%	≈ 10600	purple/white	TX13/7.9/6.4-3E6

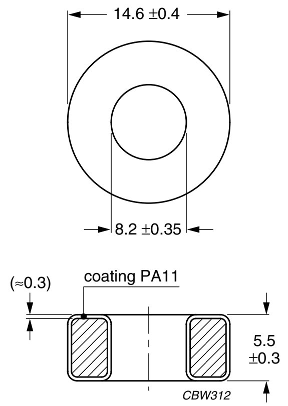
Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 0.10	–	–
3C90	≥320	≤ 0.044	≤ 0.044	–
3F3	≥320	–	≤ 0.05	≤ 0.09

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.84	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	35	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈ 2.1	g



Dimensions in mm.

Fig.1 TN14/9/5 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	55 ± 25%	≈ 125	violet	TN14/9/5-4C65
4A11	310 ± 25%	≈ 700	pink	TN14/9/5-4A11
3R1(1)	–	≈ 800	black	TN14/9/5-3R1
3F3	790 ± 25%	≈ 1800	blue	TN14/9/5-3F3
3C90	1015 ± 25%	≈ 2300	ultramarine	TN14/9/5-3C90
3C11	1900 ± 25%	≈ 4300	white	TN14/9/5-3C11
3E25	2430 ± 30%	≈ 5500	orange	TN14/9/5-3E25

Notes

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.048	≤0.048	
3F3	≥320		≤0.05	≤0.08

Ferrite toroids TX14/9/5

RING CORES (TOROIDS)

Effective core parameters

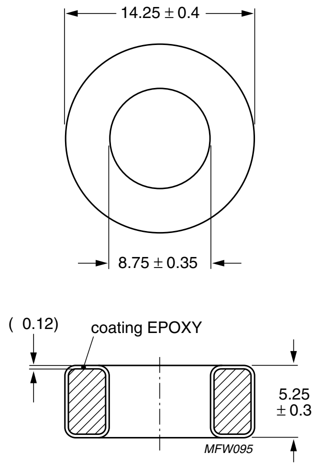
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.84	mm^{-1}
V_e	effective volume	430	mm^3
l_e	effective length	35	mm
A_e	effective area	12.3	mm^2
m	mass of core	≈ 2.1	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *“UL 94V-0”*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX14/9/5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	3760 ± 30%	≈ 8500	yellow/white	TX14/9/5-3E5
3E6 des	4415 ± 30%	≈ 10000	purple/white	TX14/9/5-3E6

Ferrite toroids TN14/9/9

RING CORES (TOROIDS)

Effective core parameters

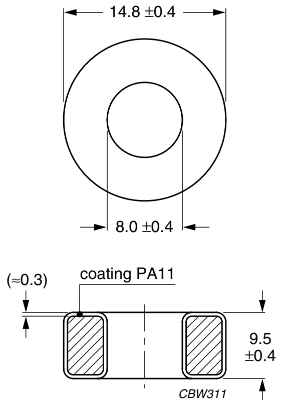
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.58	mm^{-1}
V_e	effective volume	774	mm^3
l_e	effective length	35	mm
A_e	effective area	22.1	mm^2
m	mass of core	≈ 3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN14/9/9 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	560 ± 25%	≈ 700	pink	TN14/9/9-4A11
3F3	1430 ± 25%	≈ 1800	blue	TN14/9/9-3F3
3C90	1825 ± 25%	≈ 2300	ultramarine	TN14/9/9-3C90
3C11	3400 ± 25%	≈ 4300	white	TN14/9/9-3C11
3E25	4370 ± 30%	≈ 5500	orange	TN14/9/9-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °D	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.087	≤ 0.087	–
3F3	≥320	–	≤ 0.09	≤ 0.15

Ferrite toroids TX14/9/9

RING CORES (TOROIDS)

Effective core parameters

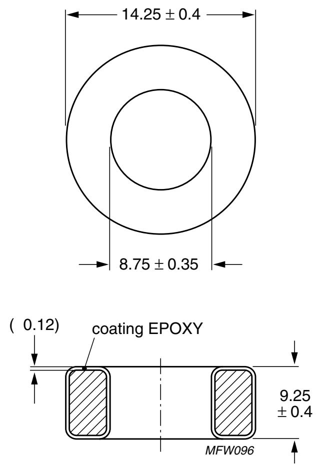
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.58	mm^{-1}
V_e	effective volume	774	mm^3
l_e	effective length	35	mm
A_e	effective area	22.1	mm^2
m	mass of core	≈ 3.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX14/9/9 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	6760 ± 30%	≈ 8500	yellow/white	TX14/9/9-3E5
3E6 des	7955 ± 30%	≈ 10000	purple/white	TX14/9/9-3E6

RING CORES (TOROIDS)

Effective core parameters

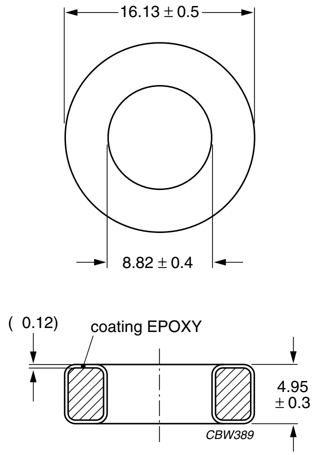
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.53	mm^{-1}
V_e	effective volume	548	mm^3
l_e	effective length	37.2	mm
A_e	effective area	14.7	mm^2
m	mass of core	≈ 2.7	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX16/9.1/4.7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	1215 ± 20%	≈ 2300	ultramarine/white	TX16/9.1/4.7-3C90
3C81	1400 ± 20%	≈ 2700	brown/white	TX16/9.1/4.7-3C81
3E27	2600 ± 20%	≈ 5000	green/white	TX16/9.1/4.7-3E27
3E6 des	5200 ± 30%	≈ 10500	purple/white	TX16/9.1/4.7-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C81	≥320	≤ 0.11	–
3C90	≥320	≤ 0.055	≤ 0.055

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.95	mm^{-1}
V_e	effective volume	760	mm^3
l_e	effective length	38.5	mm
A_e	effective area	19.7	mm^2
m	mass of core	≈ 3.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

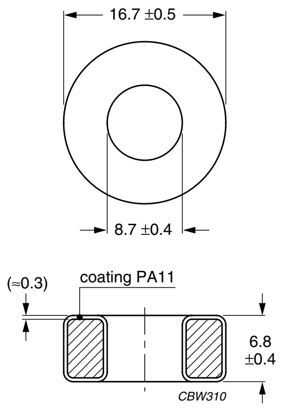


Fig.1 TN16/9.6/6.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	450 ± 25%	≈ 700	pink	TN16/9.6/6.3-4A11
3F3	1160 ± 25%	≈ 1800	blue	TN16/9.6/6.3-3F3
3C90	1480 ± 25%	≈ 2300	ultramarine	TN16/9.6/6.3-3C90
3C11	2700 ± 25%	≈ 4300	white	TN16/9.6/6.3-3C11
3E25	3540 ± 30%	≈ 5500	orange	TN16/9.6/6.3-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.085	≤ 0.085	–
3F3	≥320	–	≤ 0.09	≤ 0.15

Ferrite toroids TX16/9.6/6.3

RING CORES (TOROIDS)

Effective core parameters

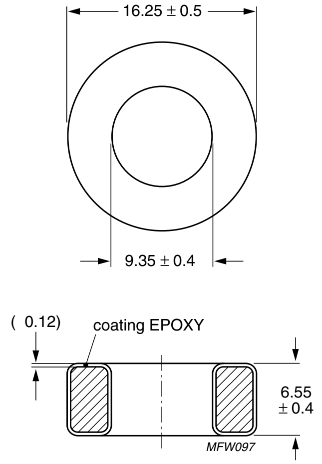
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.95	mm^{-1}
V_e	effective volume	760	mm^3
l_e	effective length	38.5	mm
A_e	effective area	19.7	mm^2
m	mass of core	≈ 3.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX16/9.6/6.3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	5470 ± 30%	≈ 8500	yellow/white	TX16/9.6/6.3-3E5
3E6 des	6430 ± 30%	≈ 10000	purple/white	TX16/9.6/6.3-3E6

Ferrite toroids TN19/11/10

RING CORES (TOROIDS)

Effective core parameters

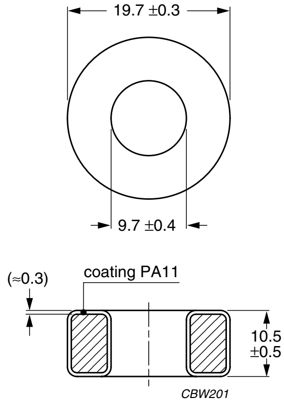
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	1795	mm^3
I_e	effective length	44.0	mm
A_e	effective area	40.8	mm^2
m	mass of core	≈ 9.2	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *“UL 94V-2”*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN19/11/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2680 ± 25%	≈ 2300	ultramarine	TN19/11/10-3C90
3C11	5000 ± 25%	≈ 4300	white	TN19/11/10-3C11
3E25	6420 ± 25%	≈ 5500	orange	TN19/11/10-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.20	≤ 0.20

Ferrite toroids TN19/11/15

RING CORES (TOROIDS)

Effective core parameters

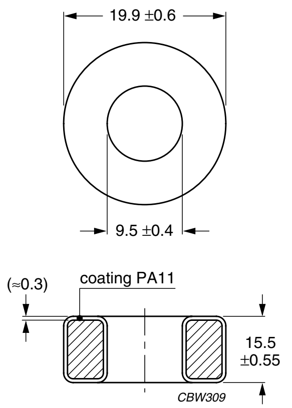
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.718	mm^{-1}
V_e	effective volume	2692	mm^3
l_e	effective length	44.0	mm
A_e	effective area	61.2	mm^2
m	mass of core	≈ 13.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN19/11/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	4020 ± 25%	≈ 2300	ultramarine	TN19/11/15-3C90
3C11	7500 ± 25%	≈ 4300	white	TN19/11/15-3C11
3E25	9630 ± 25%	≈ 5500	orange	TN19/11/15-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.30	≤ 0.30

RING CORES (TOROIDS)

Effective core parameters

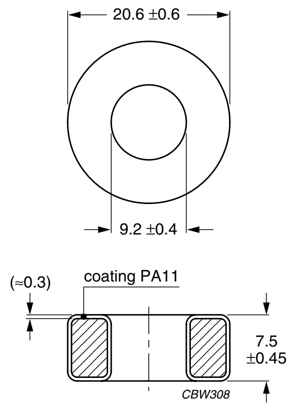
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.30	mm^{-1}
V_e	effective volume	1465	mm^3
l_e	effective length	43.6	mm
A_e	effective area	33.6	mm^2
m	mass of core	≈ 7.7	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 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
3C90	2230 ± 25%	≈ 2300	ultramarine	TN20/10/7-3C90
3C11	4150 ± 25%	≈ 4300	white	TN20/10/7-3C11
3E25	5340 ± 25%	≈ 5500	orange	TN20/10/7-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.15	≤ 0.16

RING CORES (TOROIDS)

Effective core parameters

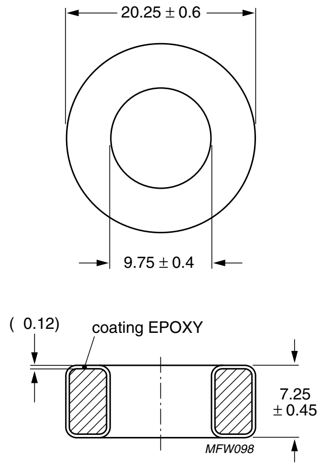
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.30	mm^{-1}
V_e	effective volume	1465	mm^3
I_e	effective length	43.6	mm
A_e	effective area	33.6	mm^2
m	mass of core	≈ 7.7	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX20/10/7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	8250 ± 30%	≈ 8500	yellow/white	TX20/10/7-3E5
3E6 des	9685 ± 30%	≈ 10000	purple/white	TX20/10/7-3E6

RING CORES (TOROIDS)

Effective core parameters

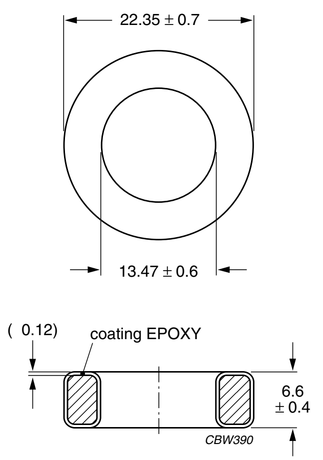
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.20	mm^{-1}
V_e	effective volume	1340	mm^3
l_e	effective length	54.2	mm
A_e	effective area	24.8	mm^2
m	mass of core	≈ 6.5	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *“UL 94V-0”*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX22/14/6.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	75 ± 25%	≈ 125	violet/white	TX22/14/6.4-4C65
3D3	454 ± 20%	≈ 750	-	TX22/14/6.4-3D3
3C90	1400 ± 20%	≈ 2300	ultramarine/white	TX22/14/6.4-3C90
3C81	1650 ± 20%	≈ 2700	brown/white	TX22/14/6.4-3C81
3E27 des	3055 ± 20%	≈ 5300	green/white	TX22/14/6.4-3E27
3E6	6000 ± 30%	≈ 10500	purple/white	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
3C81	≥320	≤ 0.21	–
3C90	≥320	≤ 0.13	≤ 0.13

RING CORES (TOROIDS)

Effective core parameters

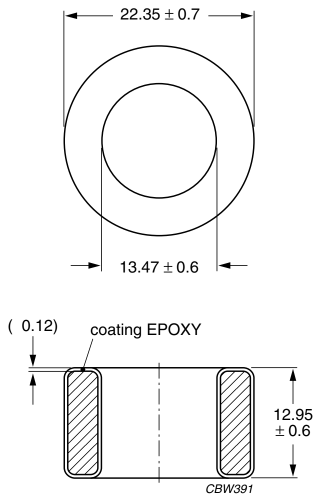
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.07	mm^{-1}
V_e	effective volume	2750	mm^3
l_e	effective length	54.2	mm
A_e	effective area	50.9	mm^2
m	mass of core	≈ 14	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX22/14/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2200 ± 20%	≈ 1800	blue/white	TX22/14/13-3F3
3C90	2795 ± 20%	≈ 2300	ultramarine/white	TX22/14/13-3C90
3E27 des	6110 ± 20%	≈ 5000	green/white	TX22/14/13-3E27
3E6	12080 ± 30%	≈ 10300	purple/white	TX22/14/13-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥320	≤ 0.30	≤ 0.52

RING CORES (TOROIDS)

Effective core parameters

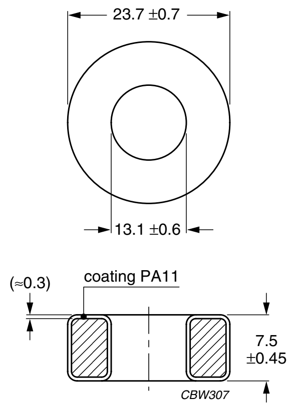
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.81	mm^{-1}
V_e	effective volume	1722	mm^3
l_e	effective length	55.8	mm
A_e	effective area	30.9	mm^2
m	mass of core	≈ 8.4	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN23/14/7 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	87 ± 25%	≈ 125	violet	TN23/14/7-4C65
4A11	485 ± 25%	≈ 700	pink	TN23/14/7-4A11
3R1(1)	–	≈ 800	black	TN23/14/7-3R1
3F3	1250 ± 25%	≈ 1800	blue	TN23/14/7-3F3
3C90 des	1600 ± 25%	≈ 2300	ultramarine	TN23/14/7-3C90
3C11	3000 ± 25%	≈ 4300	white	TN23/14/7-3C11
3E25	3820 ± 25%	≈ 5500	orange	TN23/14/7-3E25

Note

1. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.19	≤ 0.19	
3F3	≥320		≤ 0.19	≤ 0.33

RING CORES (TOROIDS)

Effective core parameters

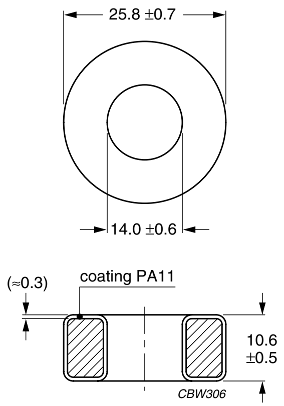
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	2944	mm^3
l_e	effective length	60.2	mm
A_e	effective area	48.9	mm^2
m	mass of core	≈ 15	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN25/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	1840 ± 25%	≈ 1800	blue	TN25/15/10-3F3
3C90	2350 ± 25%	≈ 2300	ultramarine	TN25/15/10-3C90
3C11	4400 ± 25%	≈ 4300	white	TN25/15/10-3C11
3E25	5620 ± 25%	≈ 5500	orange	TN25/15/10-3E25

Properties of cores under power conditions

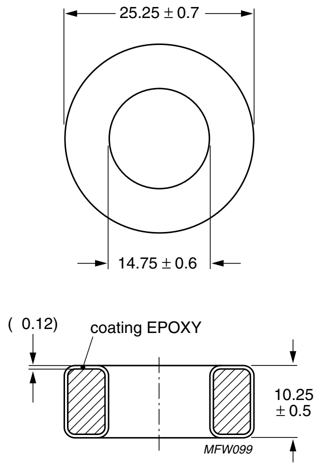
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.33	≤ 0.33	–
3F3	≥320	–	≤ 0.32	≤ 0.56

Ferrite toroids TX25/15/10

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	2944	mm^3
l_e	effective length	60.2	mm
A_e	effective area	48.9	mm^2
m	mass of core	≈ 15	g



Dimensions in mm.

Fig.1 TX25/15/10 ring core.

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	8680 ± 30%	≈ 8500	yellow/white	TX25/15/10-3E5
3E6 des	10200 ± 30%	≈ 10000	purple/white	TX25/15/10-3E6

Ferrite toroids TN26/15/10

RING CORES (TOROIDS)

Effective core parameters

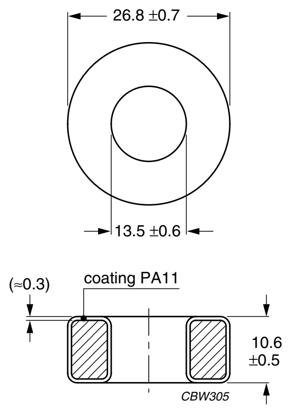
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	60.1	mm
A_e	effective area	55.9	mm^2
m	mass of core	≈ 17	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN26/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	817 ± 25%	≈ 700	pink	TN26/15/10-4A11
3C90	2645 ± 25%	≈ 2300	ultramarine	TN26/15/10-3C90
3C11	5000 ± 25%	≈ 4300	white	TN26/15/10-3C11
3E25	6420 ± 25%	≈ 5500	orange	TN26/15/10-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.38	≤ 0.38

RING CORES (TOROIDS)

Effective core parameters

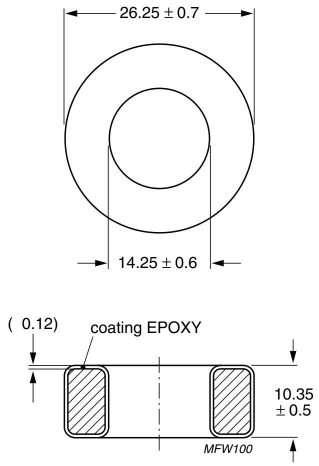
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.08	mm^{-1}
V_e	effective volume	3360	mm^3
l_e	effective length	60.1	mm
A_e	effective area	55.9	mm^2
m	mass of core	≈ 17	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX26/15/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	10000 ± 30%	≈ 8500	yellow/white	TX26/15/10-3E5

Ferrite toroids TN26/15/20

RING CORES (TOROIDS)

Effective core parameters

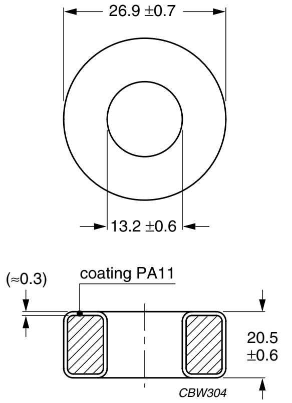
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.538	mm^{-1}
V_e	effective volume	6720	mm^3
l_e	effective length	60.1	mm
A_e	effective area	112	mm^2
m	mass of set	≈ 34	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN26/15/20 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	5400 ± 25%	≈ 2300	red	TN26/15/20-3C90
3C11	10000 ± 25%	≈ 4300	white	TN26/15/20-3C11
3E25	12800 ± 25%	≈ 5500	orange	TN26/15/20-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.75	≤ 0.75

Ferrite toroids TN29/11/6

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.04	mm^{-1}
V_e	effective volume	2680	mm^3
l_e	effective length	52.9	mm
A_e	effective area	50.8	mm^2
m	mass of core	≈ 14	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

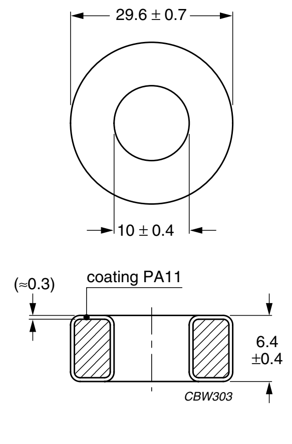


Fig.1 TN29/11/6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	2780 ± 20%	≈ 2300	ultramarine	TN29/11/6-3C90
3C11	5100 ± 25%	≈ 4300	white	TN29/11/6-3C11

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.3	≤ 0.3

RING CORES (TOROIDS)

Effective core parameters

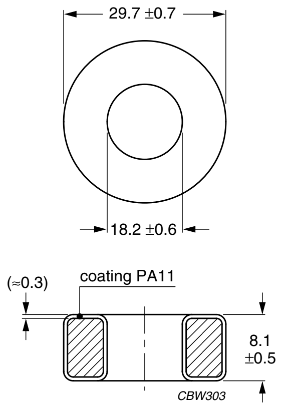
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.98	mm^{-1}
V_e	effective volume	2700	mm^3
l_e	effective length	73.2	mm
A_e	effective area	36.9	mm^2
m	mass of core	≈ 13.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN29/19/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	1460 ± 25%	≈ 2300	ultramarine	TN29/19/7.5-3C90
3C11	2700 ± 25%	≈ 4300	white	TN29/19/7.5-3C11
3E25	3550 ± 25%	≈ 5500	orange	TN29/19/7.5-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤0.30	≤0.30

Ferrite toroids TX29/19/7.5

RING CORES (TOROIDS)

Effective core parameters

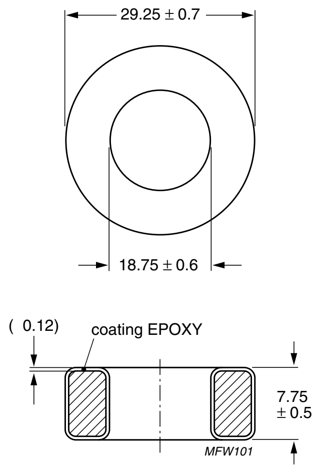
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.98	mm^{-1}
V_e	effective volume	2700	mm^3
I_e	effective length	73.2	mm
A_e	effective area	36.9	mm^2
m	mass of core	≈ 13.5	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX29/19/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E6 des	6340 ± 30%	≈ 10000	purple/white	TX29/19/7.5-3E6

RING CORES (TOROIDS)

Effective core parameters

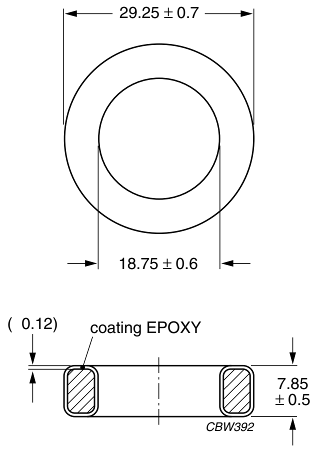
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.06	mm^{-1}
V_e	effective volume	2600	mm^3
l_e	effective length	73.2	mm
A_e	effective area	35.5	mm^2
m	mass of core	≈ 13	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX29/19/7.6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C81	1740 ± 20%	≈ 2800	brown/white	TX29/19/7.6-3C81
3E27	3225 ± 20%	≈ 5300	green/white	TX29/19/7.6-3E27

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C
3C81	≥320	≤ 0.53

Ferrite toroids TN29/19/15

RING CORES (TOROIDS)

Effective core parameters

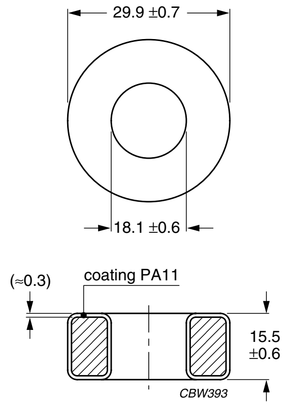
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.98	mm^{-1}
V_e	effective volume	5410	mm^3
l_e	effective length	73.2	mm
A_e	effective area	73.9	mm^2
m	mass of core	≈ 28	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN29/19/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	2960 ± 20%	≈ 2300	ultramarine	TN29/19/15-3C90
3E25	7000 ± 25%	≈ 5500	orange	TN29/19/15-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.61	≤ 0.61

Ferrite toroids TX29/19/15

RING CORES (TOROIDS)

Effective core parameters

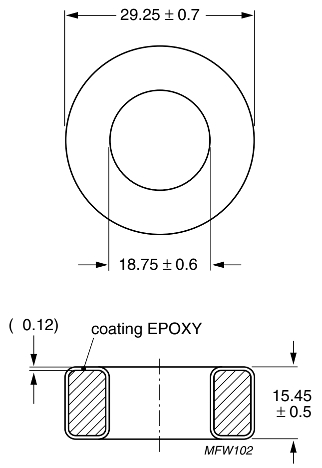
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.98	mm^{-1}
V_e	effective volume	5410	mm^3
l_e	effective length	73.2	mm
A_e	effective area	73.9	mm^2
m	mass of core	≈ 28	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX29/19/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	10780 ± 30%	≈ 8500	yellow/white	TX29/19/15-3E5
3E6 des	12850 ± 30%	≈ 10000	purple/white	TX29/19/15-3E6

Ferrite toroids TN32/19/13

RING CORES (TOROIDS)

Effective core parameters

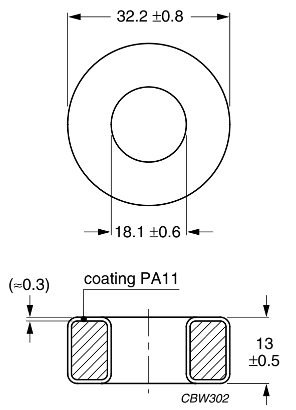
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.99	mm^{-1}
V_e	effective volume	5820	mm^3
I_e	effective length	76	mm
A_e	effective area	76.5	mm^2
m	mass of core	≈29	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *“UL 94V-2”*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN32/19/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	885 ± 25%	≈ 700	pink	TN32/19/13-4A11
3F3	2270 ± 25%	≈ 1800	blue	TN32/19/13-3F3
3C90	2910 ± 25%	≈ 2300	ultramarine	TN32/19/13-3C90
3C11	5450 ± 25%	≈ 4300	white	TN32/19/13-3C11
3E25	6950 ± 25%	≈ 5500	orange	TN32/19/13-3E25
3E5(1)	10700 ± 30%	≈ 8500	yellow/white	TL32/19/13-3E5

Note

1. Ring cores in 3E5 are lacquered (polyurethane) and have different dimensions: outside diameter = 31.75 ±0.8 mm; inside diameter = 18.75 ±0.7 mm; height = 12.75 ±0.5 mm; flame retardant in accordance with *“UL 94V-2”*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤ 0.65	≤ 0.65	–
3F3	≥320	–	≤ 0.64	≤ 1.1

Ferrite toroids TN36/23/10

RING CORES (TOROIDS)

Effective core parameters

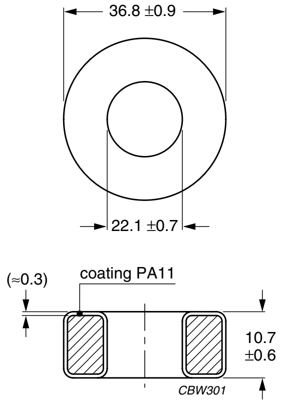
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.40	mm^{-1}
V_e	effective volume	5730	mm^3
l_e	effective length	89.6	mm
A_e	effective area	63.9	mm^2
m	mass of core	≈ 28	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN36/23/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65	112 ± 25%	≈ 125	violet	TN36/23/10-4C65
3C90 des	2060 ± 25%	≈ 2300	ultramarine	TN36/23/10-3C90
3C11	3900 ± 25%	≈ 4300	white	TN36/23/10-3C11

Properties of core under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.64	≤ 0.64

Ferrite toroids TX36/23/10

RING CORES (TOROIDS)

Effective core parameters

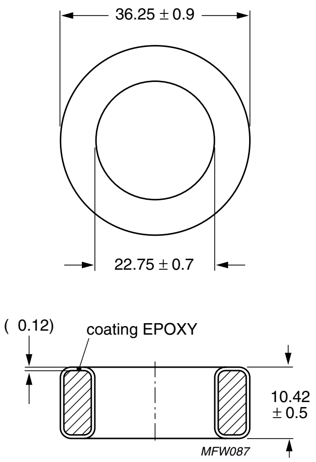
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.45	mm^{-1}
V_e	effective volume	5540	mm^3
l_e	effective length	89.7	mm
A_e	effective area	61.8	mm^2
m	mass of core	≈ 27	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX36/23/10 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C81	2455 ± 20%	≈ 2700	brown/white	TX36/23/10-3C81
3E27	4545 ± 20%	≈ 5000	green/white	TX36/23/10-3E27
3E6 des	9090 ± 30%	≈ 10000	purple/white	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
3C81	≥320	≤ 1.1

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	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

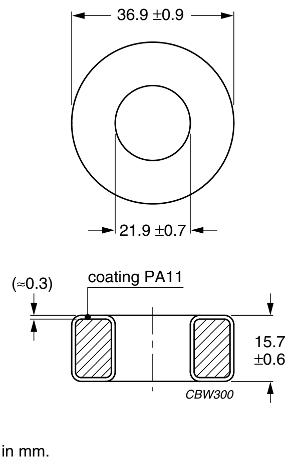


Fig.1 TN36/23/15 ring core.

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65(1)	170 ± 25%	≈ 125	violet	TN36/23/15-4C65
4A11(1)	940 ± 25%	≈ 700	uncoated	T36/23/15-4A11
3R1(2)	−	≈ 800	black	TN36/23/15-3R1
3S4(1)	2285 ± 25%	≈ 1700	uncoated	T36/23/15-3S4
3F3	2420 ± 25%	≈ 1800	blue	TN36/23/15-3F3
3C90	3090 ± 25%	≈ 2300	ultramarine	TN36/23/15-3C90
3C11(1)	5800 ± 25%	≈ 4300	white	TN36/23/15-3C11
3E25(1)	7390 ± 25%	≈ 5500	orange	TN36/23/15-3E25
3E5(3)	11400 ± 30%	≈ 8500	yellow/white	TL36/23/15-3E5
3E6(3) des	13600 ± 30%	≈ 1000	purple/white	TL36/23/15-3E6

Notes

1. Uncoated ring cores have the following dimensions: outside diameter = 36 ±0.7 mm; inside diameter = 23 ±0.5 mm; height = 15 ±0.3 mm.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no A_L value is specified. For the application in magnetic amplifiers A_L is not a critical parameter.
3. Ring cores in 3E5 and 3E6 are lacquered (polyurethane) and have different dimensions: outside diameter = 36.25 ±0.9 mm; inside diameter = 22.75 ±0.7 mm; height = 15.25 ±0.6 mm; flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

WARNING
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to *"3R1"* material specification in this data handbook.

Ferrite toroids TN36/23/15

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C90	≥320	≤0.96	≤0.96	
3F3	≥320		≤0.95	≤1.7

Ferrite toroids TX36/23/15

RING CORES (TOROIDS)

Effective core parameters

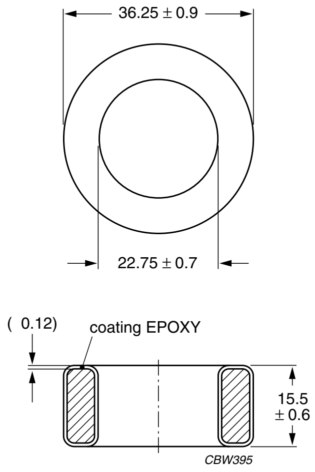
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.96	mm^{-1}
V_e	effective volume	8440	mm^3
l_e	effective length	89.7	mm
A_e	effective area	94.1	mm^2
m	mass of core	≈ 40	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX36/23/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	3090 ± 20%	≈ 2300	ultramarine/white	TX36/23/15-3C90
3C81	3670 ± 20%	≈ 2700	brown/white	TX36/23/15-3C81
3E27 des	6800 ± 20%	≈ 5000	green/white	TX36/23/15-3E27
3E5	11400 ± 20%	≈ 8500	yellow/white	TX36/23/15-3E5
3E6	13600 ± 30%	≈ 10400	purple/white	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
3C81	≥320	≤ 1.7	–
3C90	≥320	≤ 0.96	≤ 0.96

Ferrite toroids TX39/20/13

RING CORES (TOROIDS)

Effective core parameters

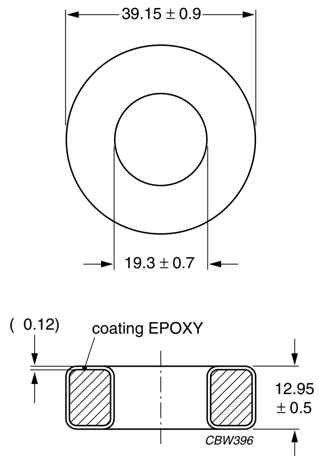
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.76	mm^{-1}
V_e	effective volume	9513	mm^3
l_e	effective length	84.9	mm
A_e	effective area	112	mm^2
m	mass of core	≈ 45	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX39/20/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	3150 ± 20%	≈ 1800	blue/white	TX39/20/13-3F3
3C90	3800 ± 20%	≈ 2300	ultramarine/white	TX39/20/13-3C90
3C81	4700 ± 20%	≈ 2700	brown/white	TX39/20/13-3C81
3E27	8720 ± 20%	≈ 5000	green/white	TX39/20/13-3E27
3E6 des	16700 ± 30%	≈ 9600	purple/white	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	–	–
3C90	≥320	≤1.1	≤1.1	–
3F3	≥320	–	≤1.1	≤1.8

RING CORES (TOROIDS)

Effective core parameters

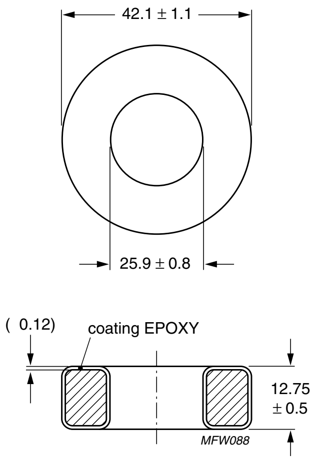
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.076	mm^{-1}
V_e	effective volume	9860	mm^3
l_e	effective length	103	mm
A_e	effective area	95.8	mm^2
m	mass of core	≈ 53	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX42/26/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	2690 ± 25%	≈ 2300	ultramarine/white	TX42/26/13-3C90
3C11	5000 ± 25%	≈ 4300	white	TX42/26/13-3C11
3E25	6425 ± 25%	≈ 5500	orange/white	TX42/26/13-3E25
3E27	6425 ± 25%	≈ 5500	green/white	TX42/26/13-3E27
4A11	820 ± 25%	≈ 700	pink/white	TX42/26/13-4A11

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 1.1	≤ 1.1

Ferrite toroids TX42/26/18

RING CORES (TOROIDS)

Effective core parameters

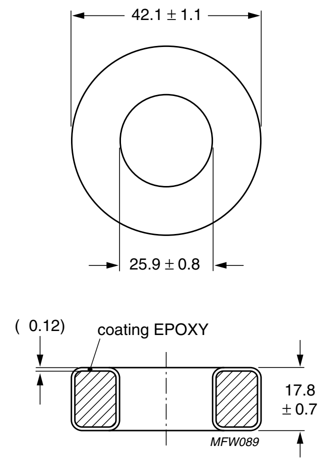
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.769	mm^{-1}
V_e	effective volume	13810	mm^3
l_e	effective length	103	mm
A_e	effective area	134	mm^2
m	mass of core	≈ 55	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *“UL 94V-0”*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX42/26/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E5	12900 ± 30%	≈ 8500	yellow/white	TX42/26/18-3E5

Ferrite toroids TX50/30/19

RING CORES (TOROIDS)

Effective core parameters

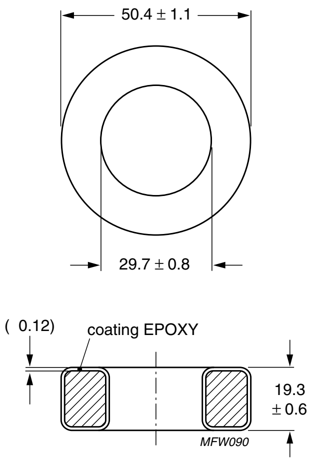
SYMBOL	PARAMETER	VALUE	UNIT
Σ(I/A)	core factor (C1)	0.65	mm^{-1}
V_e	effective volume	22378	mm^3
l_e	effective length	120.4	mm
A_e	effective area	186	mm^2
m	mass of core	≈ 100	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX50/30/19 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	19400 ± 30%	≈ 10000	TX50/30/19-3E6

Ferrite toroids TX51/32/19

RING CORES (TOROIDS)

Effective core parameters

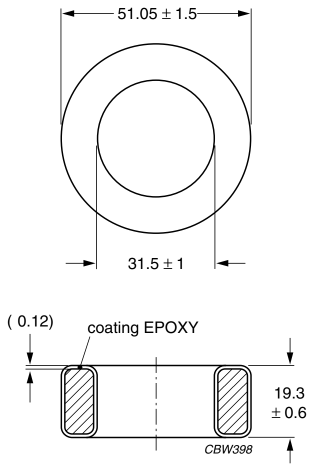
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.73	mm^{-1}
V_e	effective volume	21500	mm^3
l_e	effective length	125	mm
A_e	effective area	172	mm^2
m	mass of core	≈ 100	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *“UL 94V-0”*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX51/32/19 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3 des	3200 ± 20%	≈ 1800	blue/white	TX51/32/19-3F3
3C90	3980 ± 20%	≈ 2300	ultramarine/white	TX51/32/19-3C90
3C81	4800 ± 20%	≈ 2700	brown/white	TX51/32/19-3C81
3E25	8890 ± 20%	≈ 5000	orange/white	TX51/32/19-3E25
3E27 des	8890 ± 20%	≈ 5000	green/white	TX51/32/19-3E27
3E6	17300 ± 20%	≈ 10000	purple/white	TX51/32/19-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 4.4	–	–
3C90	≥320	≤ 2.4	≤ 2.4	–
3F3	≥320	–	≤ 2.4	≤ 4.1

Ferrite toroids TL55/32/18

RING CORES (TOROIDS)

Effective core parameters

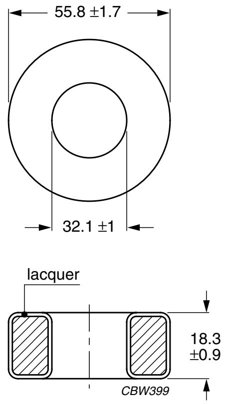
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.651	mm^{-1}
V_e	effective volume	26580	mm^3
l_e	effective length	132	mm
A_e	effective area	202	mm^2
m	mass of core	≈ 134	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL55/32/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4A11	1350 ± 25%	≈ 700	pink/white	TL55/32/18-4A11
3E25	10620 ± 25%	≈ 5500	orange/white	TL55/32/18-3E25
3E27	10620 ± 25%	≈ 5500	green/white	TL55/32/18-3E27

RING CORES (TOROIDS)

Effective core parameters

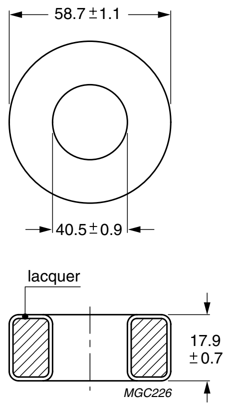
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.0	mm^{-1}
V_e	effective volume	23200	mm^3
l_e	effective length	152	mm
A_e	effective area	152	mm^2
m	mass of core	≈ 110	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *“UL 94V-2”*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL58/41/18 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2890 ± 25%	≈ 2300	ultramarine/white	TL58/41/18-3C90
3C11	5400 ± 25%	≈ 4300	white	TL58/41/18-3C11
3E25	6900 ± 25%	≈ 5500	orange/white	TL58/41/18-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 2.6	≤ 2.6

RING CORES (TOROIDS)

Effective core parameters

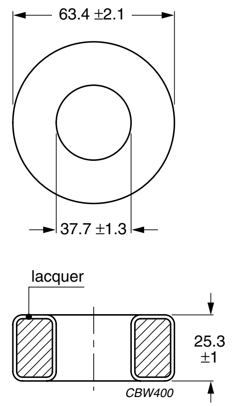
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.497	mm^{-1}
V_e	effective volume	46500	mm^3
l_e	effective length	152	mm
A_e	effective area	306	mm^2
m	mass of core	≈ 220	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL63/38/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	4550 ± 25%	≈ 1800	blue/white	TL63/38/25-3F3
3E25	13900 ± 25%	≈ 5500	orange/white	TL63/38/25-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥320	≤ 5.1	≤ 8.8

Ferrite toroids TX63/38/25

RING CORES (TOROIDS)

Effective core parameters

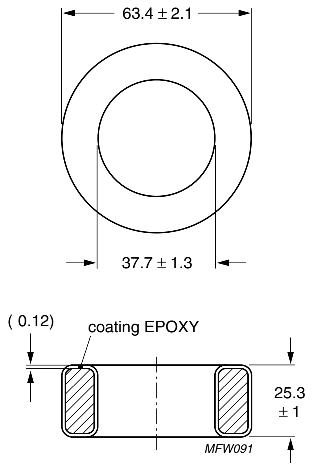
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.497	mm^{-1}
V_e	effective volume	46500	mm^3
l_e	effective length	152	mm
A_e	effective area	306	mm^2
m	mass of core	≈ 220	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX63/38/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3E6 des	25280 ± 30%	≈ 10000	purple/white	TX63/38/25-3E6

Ferrite toroids TX74/39/13

RING CORES (TOROIDS)

Effective core parameters

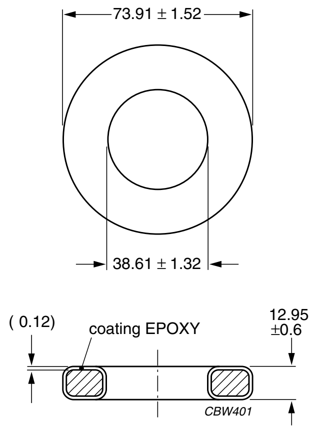
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.80	mm^{-1}
V_e	effective volume	34300	mm^3
l_e	effective length	165	mm
A_e	effective area	208	mm^2
m	mass of core	≈ 170	g

Coating

The cores are coated with epoxy, flame retardant in accordance with *"UL 94V-0"*; UL file number E 214934.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TX74/39/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F3	2900 ± 20%	≈ 1800	blue/white	TX74/39/13-3F3
3C90 des	3620 ± 20%	≈ 2300	ultramarine/white	TX74/39/13-3C90
3C81	4350 ± 20%	≈ 2700	brown/white	TX74/39/13-3C81
3E25	8060 ± 20%	≈ 5000	orange/white	TX74/39/13-3E25
3E6(1) des	15776 ± 30%	≈ 10000	purple/white	TL74/39/13-3E6

Note

1. Ring cores in 3E6 are lacquered (polyurethane); flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3C81	≥320	≤ 7.0	–	–
3C90	≥320	≤ 4.0	≤ 4.0	–
3F3	≥320	–	≤ 3.8	≤ 8.1

Ferrite toroids TL80/40/15

RING CORES (TOROIDS)

Effective core parameters

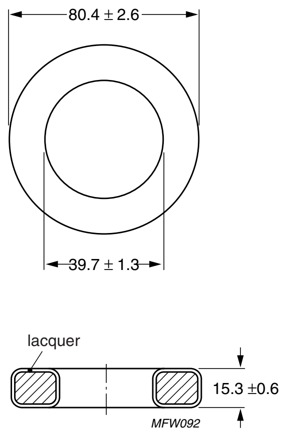
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.604	mm^{-1}
V_e	effective volume	50200	mm^3
l_e	effective length	174	mm
A_e	effective area	288	mm^2
m	mass of core	≈ 240	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL80/40/15 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90	4780 ± 25%	≈ 2300	ultramarine/white	TL80/40/15-3C90

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 6.0	≤ 6.0

RING CORES (TOROIDS)

Effective core parameters

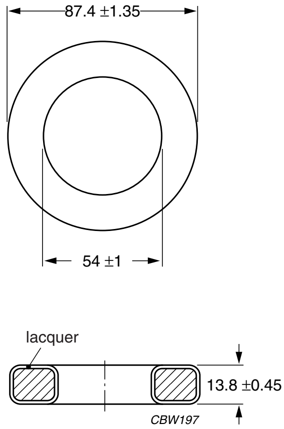
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.987	mm^{-1}
V_e	effective volume	46400	mm^3
l_e	effective length	214	mm
A_e	effective area	217	mm^2
m	mass of core	≈ 220	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL87/54/14 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3C90 des	2930 ± 25%	≈ 2300	ultramarine/white	TL87/54/14-3C90
3C11 des	5470 ± 25%	≈ 4300	white	TL87/54/14-3C11

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 5.5	≤ 5.5

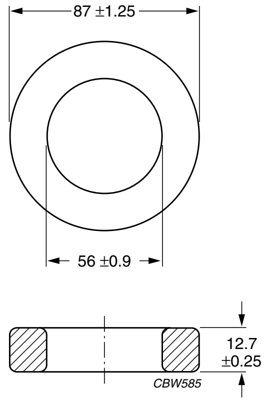
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.123	mm^{-1}
V_e	effective volume	42133	mm^3
l_e	effective length	217.5	mm
A_e	effective area	194	mm^2
m	mass of core	≈ 200	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T87/56/13 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3E6 des	11190 ± 30%	≈ 10000	T87/56/13-3E6

Ferrite toroids TL102/66/15

RING CORES (TOROIDS)

Effective core parameters

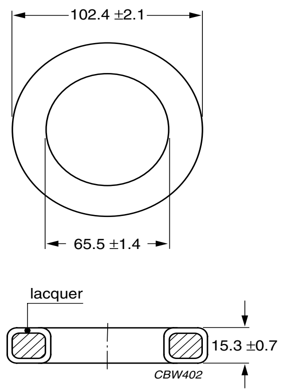
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.956	mm^{-1}
V_e	effective volume	68200	mm^3
l_e	effective length	255	mm
A_e	effective area	267	mm^2
m	mass of core	≈ 325	g

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TL102/66/15 ring core.

Ring core data

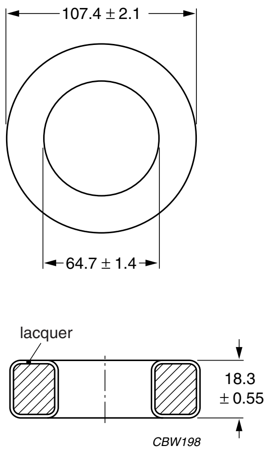
GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
4C65 des	165 ± 25%	≈ 125	violet/white	TL102/66/15-4C65
3C11 des	5300 ± 25%	≈ 4300	white	TL102/66/15-3C11
3E25 des	7900 ± 25%	≈ 5500	orange/white	TL102/66/15-3E25

Ferrite toroids TL107/65/18

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.700	mm^{-1}
V_e	effective volume	96000	mm^3
l_e	effective length	259	mm
A_e	effective area	370	mm^2
m	mass of core	≈ 456	g



Dimensions in mm.

Fig.1 TL107/65/18 ring core.

Coating

The cores are coated with polyurethane lacquer, flame retardant in accordance with *"UL 94V-2"*; UL file number E 192048.

Isolation voltage

DC isolation voltage: 2000 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
3F4 des	1354 ± 25%	≈ 750	–	T107/65/18-3F4(1)
3F3	3230 ± 25%	≈ 1800	blue/white	TL107/65/18-3F3
3E25	9900 ± 25%	≈ 5500	orange/white	TL107/65/18-3E25

Note

1. Non-coated. Dimensions for this core are: outside diameter = 107 ± 2 mm; inside diameter = 65 ± 1.3 mm; height = 18 ± 0.35 mm.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C	f = 400 kHz; $\hat{B}$ = 50 mT; T = 100 °C
3F3	≥320	≤ 10.6	≤ 18.2

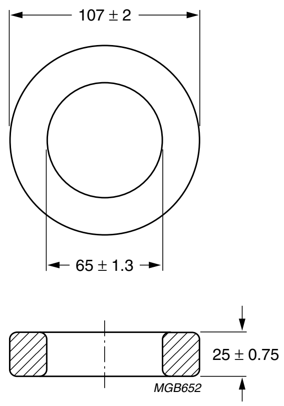
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.504	mm^{-1}
V_e	effective volume	133000	mm^3
l_e	effective length	259	mm
A_e	effective area	514	mm^2
m	mass of core	≈ 680	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T107/65/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3F4 des	1870 ± 25%	≈ 750	T107/65/25-3F4
3F3 des	4485 ± 25%	≈ 1800	T107/65/25-3F3

Ferrite toroids T140/106/25

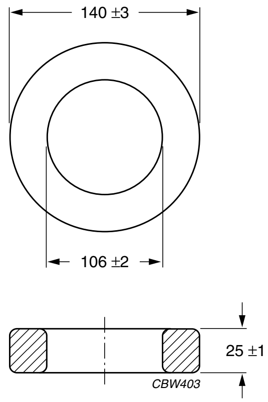
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.903	mm^{-1}
V_e	effective volume	161100	mm^3
l_e	effective length	382	mm
A_e	effective area	422	mm^2
m	mass of core	≈ 800	g

Coating

Coated cores are available on request.



Dimensions in mm.

Fig.1 T107/65/25 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	TYPE NUMBER
3C90	3200 ± 20%	≈ 2300	T140/106/25-3C90
3E25	7700 ± 30%	≈ 5500	T140/106/25-3E25

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B}$ = 200 mT; T = 100 °C	f = 100 kHz; $\hat{B}$ = 100 mT; T = 100 °C
3C90	≥320	≤ 22.7	≤ 22.7

CBW624

For more information on Product Status Definitions, see page 3.

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview iron powder ring cores (toroids)

CORE TYPE	V_e (mm^3)	A_e (mm^2)	MASS (g)
TN7.5/4.1/3	83	4.81	0.6
TN12/8/4.4	290	9.37	2
TN17/9.8/4.4	635	15.8	5
TN20/13/6	1020	20.4	7.5
TN24/15/7.5	1895	32.8	13
TN27/15/11	3720	60.4	25
TN33/20/11	5200	65.0	35

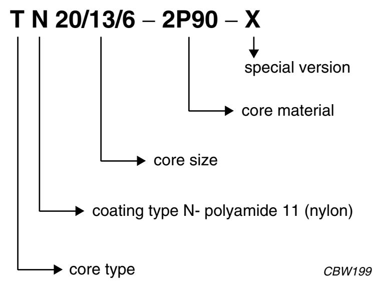


Fig.1 Type number structure for ring cores.

Iron powder toroids TN7.5/4.1/3

RING CORES (TOROIDS)

Effective core parameters

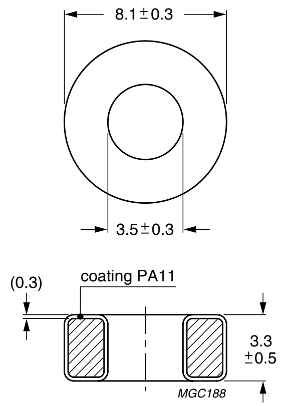
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.58	mm^{-1}
V_e	effective volume	83	mm^3
l_e	effective length	17.3	mm
A_e	effective area	4.81	mm^2
m	mass of core	≈0.6	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN7.5/4.1/3 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	14 ±10%	≈40	dark yellow	TN7.5/4.1/3-2P40
2P50 sup	18 ±10%	≈50	dark blue	TN7.5/4.1/3-2P50
2P65 sup	23 ±10%	≈65	dark red	TN7.5/4.1/3-2P65
2P80 sup	28 ±10%	≈80	dark green	TN7.5/4.1/3-2P80
2P90 sup	30 +10/−15%	≈90	dark brown	TN7.5/4.1/3-2P90

RING CORES (TOROIDS)

Effective core parameters

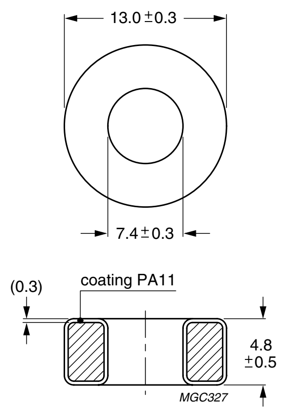
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.30	mm^{-1}
V_e	effective volume	290	mm^3
l_e	effective length	30.9	mm
A_e	effective area	9.37	mm^2
m	mass of core	≈2	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN12/8/4.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	15 ±10%	≈40	dark yellow	TN12/8/4.4-2P40
2P50 sup	19 ±10%	≈50	dark blue	TN12/8/4.4-2P50
2P65 sup	25 ±10%	≈65	dark red	TN12/8/4.4-2P65
2P80 sup	31 ±10%	≈80	dark green	TN12/8/4.4-2P80
2P90 sup	33 +10/−15%	≈90	dark brown	TN12/8/4.4-2P90

Iron powder toroids TN17/9.8/4.4

RING CORES (TOROIDS)

Effective core parameters

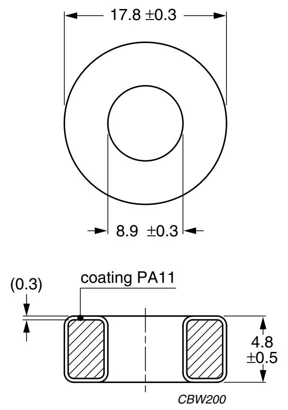
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.55	mm^{-1}
V_e	effective volume	635	mm^3
l_e	effective length	40.2	mm
A_e	effective area	15.8	mm^2
m	mass of core	≈5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN17/9.8/4.4 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	20 ±10%	≈40	dark yellow	TN17/9.8/4.4-2P40
2P50 sup	25 ±10%	≈50	dark blue	TN17/9.8/4.4-2P50
2P65 sup	32 ±10%	≈65	dark red	TN17/9.8/4.4-2P65
2P80 sup	40 ±10%	≈80	dark green	TN17/9.8/4.4-2P80
2P90 sup	42 +10/−15%	≈90	dark brown	TN17/9.8/4.4-2P90

Iron powder toroids TN20/13/6

RING CORES (TOROIDS)

Effective core parameters

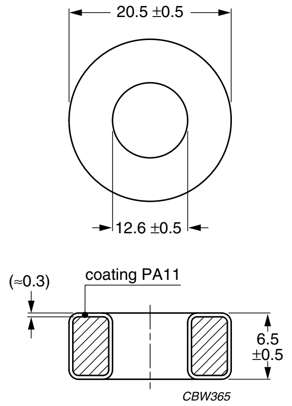
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.44	mm^{-1}
V_e	effective volume	1020	mm^3
l_e	effective length	49.9	mm
A_e	effective area	20.4	mm^2
m	mass of core	≈7.5	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN20/13/6 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	21 ±10%	≈40	dark yellow	TN20/13/6-2P40
2P50 sup	26 ±10%	≈50	dark blue	TN20/13/6-2P50
2P65 sup	34 ±10%	≈65	dark red	TN20/13/6-2P65
2P80 sup	41 ±10%	≈80	dark green	TN20/13/6-2P80
2P90 sup	44 +10/−15%	≈90	dark brown	TN20/13/6-2P90

Iron powder toroids

TN24/15/7.5

RING CORES (TOROIDS)

Effective core parameters

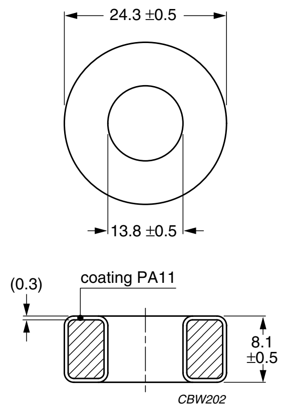
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.76	mm^{-1}
V_e	effective volume	1895	mm^3
l_e	effective length	57.8	mm
A_e	effective area	32.8	mm^2
m	mass of core	≈13	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN24/15/7.5 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	29 ±10%	≈40	dark yellow	TN24/15/7.5-2P40
2P50 sup	36 ±10%	≈50	dark blue	TN24/15/7.5-2P50
2P65 sup	47 ±10%	≈65	dark red	TN24/15/7.5-2P65
2P80 sup	57 ±10%	≈80	dark green	TN24/15/7.5-2P80
2P90 sup	61 +10/−15%	≈90	dark brown	TN24/15/7.5-2P90

Iron powder toroids TN27/15/11

RING CORES (TOROIDS)

Effective core parameters

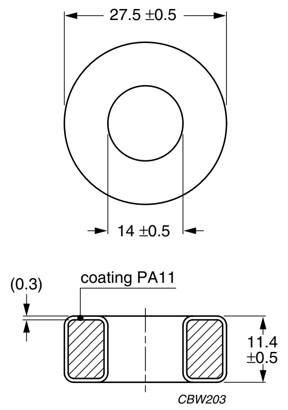
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.02	mm^{-1}
V_e	effective volume	3720	mm^3
l_e	effective length	61.6	mm
A_e	effective area	60.4	mm^2
m	mass of core	≈25	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.



Dimensions in mm.

Fig.1 TN27/15/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	49 ±10%	≈40	dark yellow	TN27/15/11-2P40
2P50 sup	62 ±10%	≈50	dark blue	TN27/15/11-2P50
2P65 sup	80 ±10%	≈65	dark red	TN27/15/11-2P65
2P80 sup	94 ±10%	≈80	dark green	TN27/15/11-2P80
2P90 sup	105 +10/−15%	≈90	dark brown	TN27/15/11-2P90

Iron powder toroids TN33/20/11

RING CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	1.23	mm^{-1}
V_e	effective volume	5200	mm^3
l_e	effective length	80.0	mm
A_e	effective area	65.0	mm^2
m	mass of core	≈35	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with *"UL 94V-2"*; UL file number E 45228 (M).

Isolation voltage

DC isolation voltage: 1500 V.
Contacts are applied on the edge of the ring core, which is also the critical point for the winding operation.

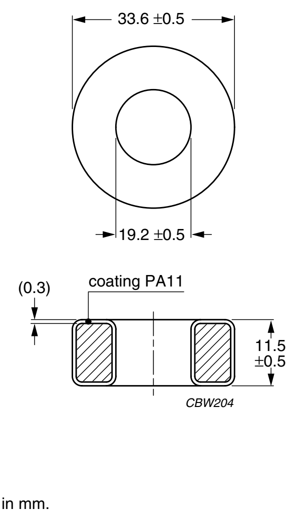


Fig.1 TN33/20/11 ring core.

Ring core data

GRADE	A_L (nH)	μ_i	COLOUR CODE	TYPE NUMBER
2P40 sup	41 ±10%	≈40	dark yellow	TN33/20/11-2P40
2P50 sup	51 ±10%	≈50	dark blue	TN33/20/11-2P50
2P65 sup	67 ±10%	≈65	dark red	TN33/20/11-2P65
2P80 sup	82 ±10%	≈80	dark green	TN33/20/11-2P80
2P90 sup	87 +10/−15%	≈90	dark brown	TN33/20/11-2P90