

# Soft Ferrites and Accessories

<b>Contents</b>	<b>Page</b>
Introduction	4
Quality	14
Environmental aspects of soft ferrites	15
Ordering information	16
Applications	17
Literature and reference publications	53
Ferrite materials survey and specifications	56
- Ferrite materials survey	57
- Material specifications and graphs	60
Specialty ferrites	153
- Machined ferrites	155
- Ferrites for anechoic chambers ( PLT )	157
- Ferrites for particle accelerators ( T )	158
E cores and Accessories	165
EI cores	297
Planar E cores and Accessories ( E, E/R, PLT, PLT/S, PLT/R)	309
EC cores and Accessories	367
EFD cores and Accessories	385
EP, EP/LP cores and Accessories	417
EPX cores and Accessories	455
EQ, EQ/LP cores and Accessories (EQ, EQ/R, EQ/LP, PLT, PLT/S)	471
ER cores and Accessories	485
Planar ER cores and Accessories	497
ETD cores and Accessories	517
Frame and Bar cores and Accessories (FRM, BAR)	545
Integrated Inductive Components (IIC)	561
P, P/I cores and Accessories	571
PT, PTS, PTS/I cores and Accessories	649
PH cores	673
PM cores	681
PQ cores and Accessories	685
RM, RM/I, RM/ILP cores and Accessories	715

U, I cores and Accessories	807
UR cores	833
EMI-suppression products	839
- Bobbin cores (BC)	841
- Cable shields (CSA, CSC, CSF, CSU, CST)	843
- EMI-suppression beads (BD)	850
- EMI-suppression beads on wire (BDW)	851
- Miniature balun cores (MHB)	852
- Miniature drum cores (D)	854
- Multihole cores (MHC, MHB, MHR)	855
- Multilayer inductors (MLI, MLH)	858
- Multilayer suppressors (MLS, MLP, MLN)	871
- Rods (ROD)	882
- SMD beads (BDS)	883
- SMD common mode chokes (CMS)	888
- SMD wideband chokes (WBS, WBSM)	895
- Tubes (TUB)	904
- Wideband chokes (WBC)	905
Gapped ferrite toroids (TN)	909
Ferrite toroids (T, TC, TN, TX)	917
Iron powder toroids (TN)	1021




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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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Design-in		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		These products are <b>not</b> 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  $\text{MeFe}_2\text{O}_4$  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 ( $\mu_i$ ) 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  $\mu\text{m}$  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.

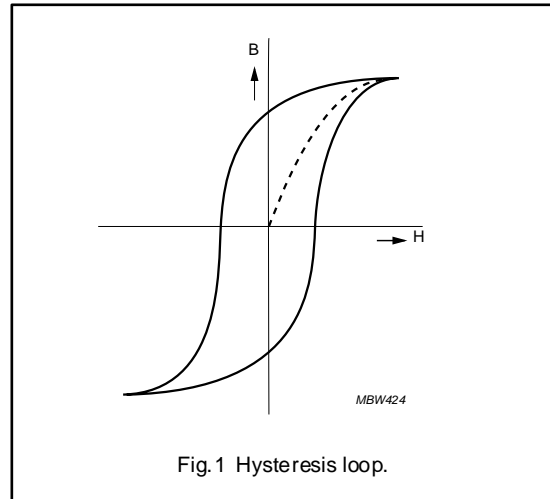


Fig.1 Hysteresis loop.

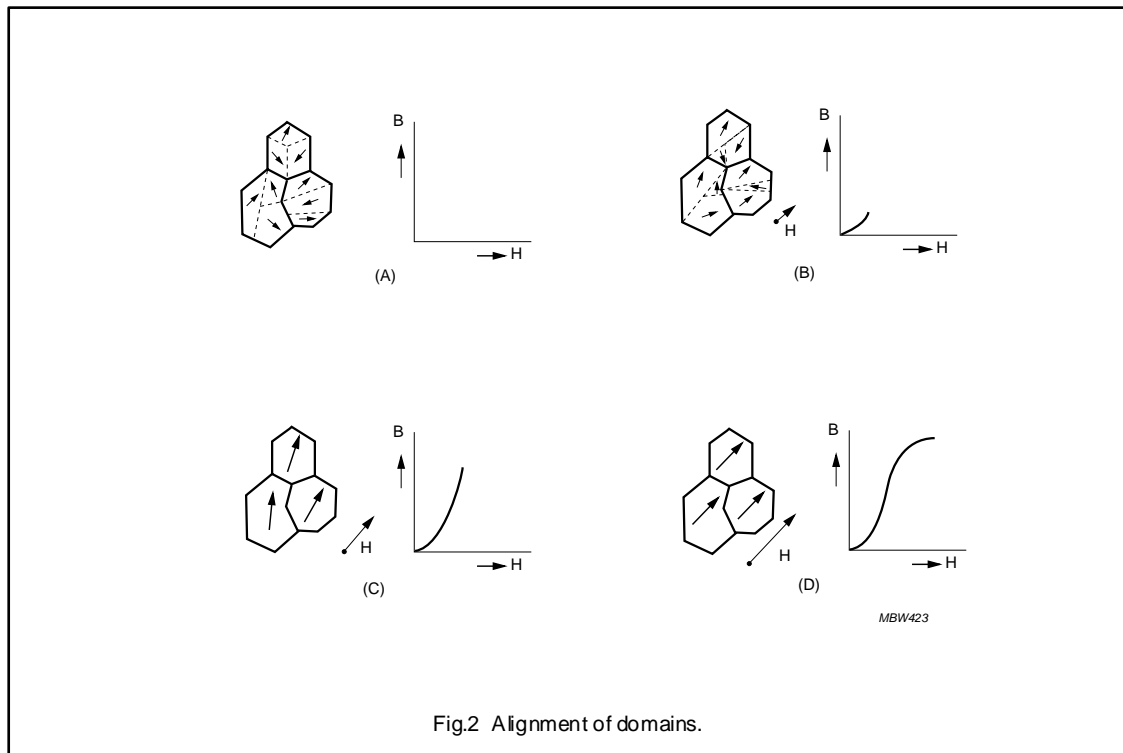


Fig.2 Alignment of domains.

## EXPLANATION OF TERMS AND FORMULAE

## Symbols and units

SYMBOL	DESCRIPTION	UNIT
$A_e$	effective cross-sectional area of a core	$\text{mm}^2$
$A_{\min}$	minimum cross-sectional area of a core	$\text{mm}^2$
$A_L$	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
$D_F$	disaccommodation factor	–
f	frequency	Hz
G	gap length	$\mu\text{m}$
H	magnetic field strength	A/m
$H_c$	coercivity	A/m
$\hat{H}$	peak magnetic field strength	A/m
I	current	A
U	voltage	V
$l_e$	effective magnetic path length	mm
L	inductance	H
N	number of turns	–
$P_v$	specific power loss of core material	$\text{kW/m}^3$
Q	quality factor	–
$T_c$	Curie temperature	$^{\circ}\text{C}$
$\text{THD}/\mu_a$	Total Harmonic Distortion factor	dB
$V_e$	effective volume of core	$\text{mm}^3$
$\alpha_F$	temperature factor of permeability	$\text{K}^{-1}$
$\tan \delta/\mu_i$	loss factor	–
$\eta_B$	hysteresis material constant	$\text{T}^{-1}$
$\mu$	absolute permeability	–
$\mu_0$	magnetic constant ( $4\pi \times 10^{-7}$ )	$\text{Hm}^{-1}$
$\mu_s'$	real component of complex series permeability	–
$\mu_s''$	imaginary component of complex series permeability	–
$\mu_a$	amplitude permeability	–
$\mu_e$	effective permeability	–
$\mu_i$	initial permeability	–
$\mu_r$	relative permeability	–
$\mu_{\text{rev}}$	reversible permeability	–
$\mu_{\Delta}$	incremental permeability	–
$\rho$	resistivity	$\Omega\text{m}$
$\Sigma(I/A)$	core factor (C1)	$\text{mm}^{-1}$

**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.

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

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

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

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

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

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

Since there are several versions of  $\mu_r$  depending on conditions the index 'r' is generally removed and replaced by the applicable symbol e.g.  $\mu_i$ ,  $\mu_a$ ,  $\mu_\Delta$  etc.

INITIAL PERMEABILITY

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

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

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.

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

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.

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

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

INCREMENTAL PERMEABILITY

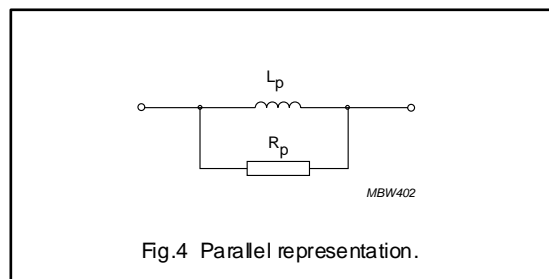
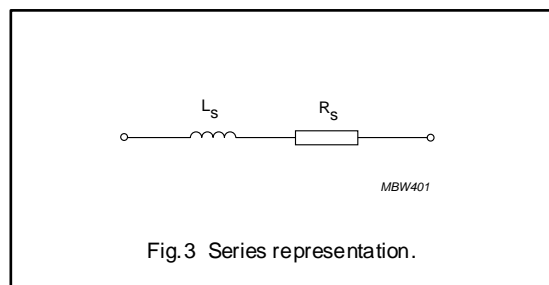
The permeability observed when an alternating magnetic field is superimposed on a static bias field, is called the incremental permeability.

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

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

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.



For series representation

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

and for parallel representation,

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

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

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

The phase shift caused by magnetic losses is given by:

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

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

The relationship between the representations is given by:

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

LOSS FACTOR

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

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

This gives the formula:

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

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

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

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

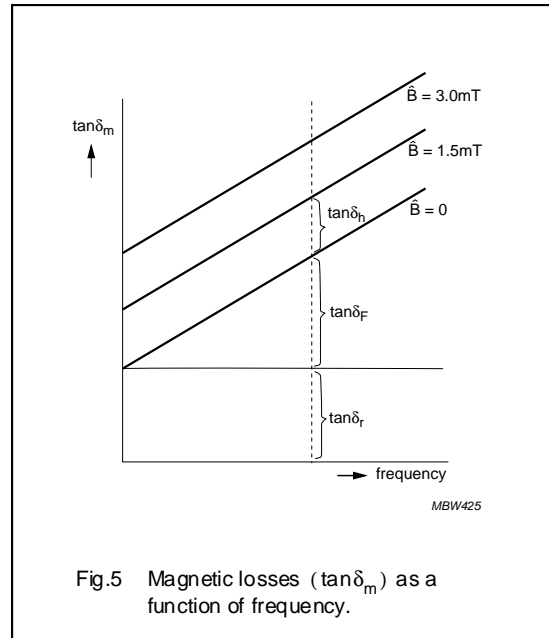


Fig.5 Magnetic losses ( $\tan \delta_m$ ) as a function of frequency.

Since  $\mu_i$  and  $\mu_e$  are usually much greater than 1, a good approximation is:

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

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

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

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

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

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

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

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

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



## HYSTERESIS MATERIAL CONSTANT

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

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

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:

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

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

$$L = \frac{\mu_0 \times N^2}{\frac{1}{\mu_e} \times \sum \frac{l}{A}} \quad (23)$$

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

for sine wave:

$$\hat{B} = \frac{U \sqrt{2}}{\omega A_e N} = \frac{U}{\pi \sqrt{2} \times f N A_e} \quad (24)$$

for square wave:

$$\hat{B} = \frac{\hat{U}}{4 \times f N A_e} \quad (25)$$

The magnetic field strength (H) is calculated using the effective length ( $l_e$ ):

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

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:

$$L = N^2 \times A_L \quad (27)$$

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

$$A_L = \frac{\mu_0 \mu_e}{\sum (l/A)} \quad (28)$$

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.

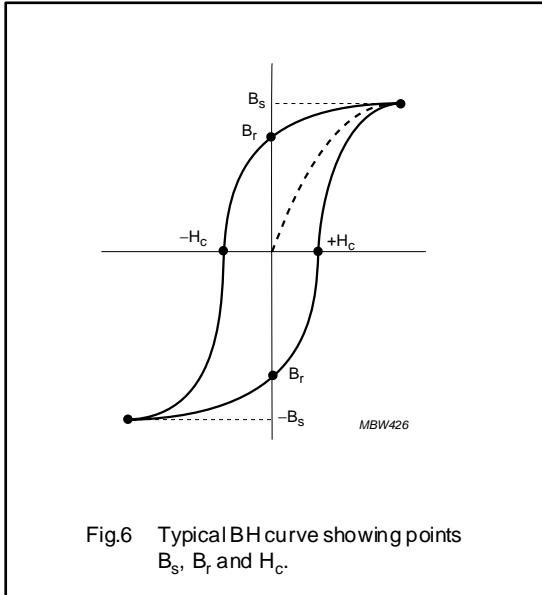


Fig.6 Typical BH curve showing points  $B_s$ ,  $B_r$  and  $H_c$ .

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:

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

For a gapped magnetic circuit, the influence of the permeability temperature dependence is reduced by the factor  $\mu_e/\mu_i$ . Hence:

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

$$= \mu_e \times \alpha_F$$

So  $\alpha_F$  is defined as:

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

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

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

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

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.

For signals without bias, the THD is defined as the ratio of: the square root of the sum of the quadratic amplitudes of the (uneven) higher harmonic voltages and, the amplitude of the fundamental frequency ( $V_1$ ). 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:

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

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  $THD/\mu_{ae}$  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.  $THD/\mu_{ae}$  is defined as the THD-factor, denoted as  $THD_F$ .

The term  $\mu_{ae}$  stands for effective amplitude permeability of the ferrite material. It is a more general term than the effective permeability  $\mu_e$  which is only defined for very low flux densities ( $< 0.25$  mT).

Published data of this THD-factor ( $THD_F$ ) as a function of frequency ( $f$ ), flux density ( $B$ ) and temperature ( $T$ ) can

directly be used to predict the THD in gapped core sets (THD<sub>C</sub>) at the applicable operating conditions of f, B and T.

$$THD_C = THD_F + 20 \times 10 \log(\mu_{ae}) \text{ [dB]} \quad (33)$$

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<sub>F3</sub>) and measured third harmonic voltage (V<sub>M3</sub>).

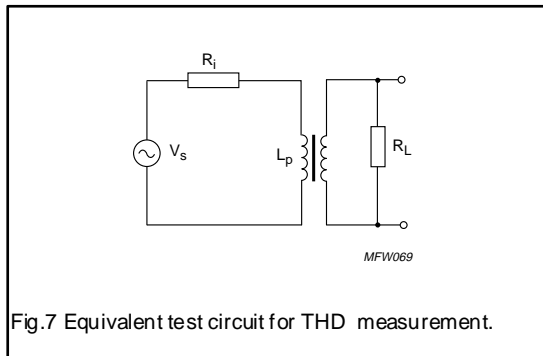


Fig.7 Equivalent test circuit for THD measurement.

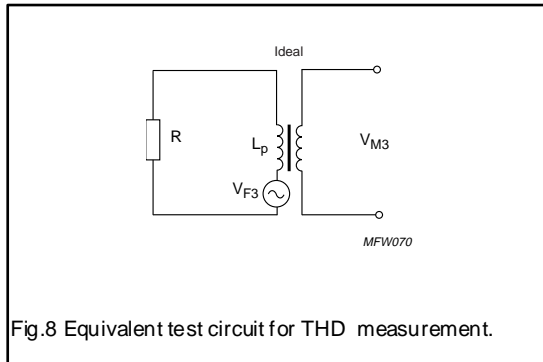


Fig.8 Equivalent test circuit for THD measurement.

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<sub>s</sub> in Fig.7.

R<sub>i</sub> 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<sub>p</sub> is the inductance of

the transformer under test connected to the load resistance R<sub>L</sub>.

The generated third harmonic voltage V<sub>F3</sub> will cause a current flow through the impedances R<sub>i</sub> and R<sub>L</sub>, 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:

$$R = \frac{R_i \times R_L}{R_i + R_L} \quad (34)$$

in which R<sub>Lp</sub> is R<sub>L</sub> referred to the primary side:

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

Hardly any voltage drop will occur when R is very high compared to the impedance 3ωL<sub>p</sub>. In that case the measured third harmonic voltage V<sub>M3</sub> would be equal to the real generated third harmonic V<sub>F3</sub> multiplied by the transformation ratio N<sub>s</sub>/N<sub>p</sub>.

The measuring situation would be fully current driven. However in practical situations the resistance R will play a role and V<sub>F3</sub> can be calculated with equation:

$$V_{F3} = V_{M3} \times \frac{N_p}{N_s} \times \sqrt{1 + (3\omega L_p / R)^2} \quad (36)$$

MEASUREMENT PRECAUTIONS

In general it is advised to check measuring conditions and the test circuit with impedances R and ωL<sub>p</sub> 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. The real generated THD by the ferrite core (THD<sub>C</sub> ≈ V<sub>F3</sub>/V<sub>F1</sub>) can be related to the THD which is measured in the circuitry (THD<sub>M</sub> ≈ V<sub>M3</sub>/V<sub>M1</sub>) by knowing that V<sub>F1</sub> = V<sub>M1</sub> × (N<sub>p</sub>/N<sub>s</sub>). By using equation [36] this relation is as follows :

$$THD_M = \frac{1}{\sqrt{1 + (3\omega L_p / R)^2}} \times THD_C = CCF \times THD_C \quad (37)$$

The inverse square root term in equation [37] is the circuit correction factor (CCF). To get the measured THD in terms of the factor THD<sub>F</sub>, equation [37] must be combined with [33] which gives in units of dB :

$$THD_M = THD_F + 20 \times 10 \log(\mu_{ae} \times CCF) \quad (38)$$

To make use of equation [38] in practice, the following route can be followed :

The first step is to determine the voltage which will appear across the transformer. This is the voltage  $V_{Lp}$  across the inductance  $L_p$  in figure 8. If this value is not known from the (test) specification, it can be derived from the source voltage  $V_s$ . The relation between the source voltage  $V_s$ , the primary voltage  $V_{Lp}$  and the secondary voltage  $V_{RL}$  is given in equations [39] and [40] :

$$V_{Lp} = V_s \times \left| \frac{j\omega L_p \parallel R_{Lp}}{R_i + (j\omega L_p \parallel R_{Lp})} \right| \quad (39)$$

or

$$V_{Lp} = V_s \times \frac{1}{\sqrt{(1 + R_i/R_{Lp})^2 + (R_i/\omega L_p)^2}} \quad (40)$$

and  $V_{RL} = (N_s/N_p) \times V_{Lp}$ .

The second step is to use Faraday's law of induction to find the flux density  $B$  in the transformer. In case the voltage  $V_{Lp}$  is a sinusoidal rms voltage, the relation to the peak flux density  $B_{peak}$  can be written as :

$$V_{Lp} = \frac{1}{2} \sqrt{2} \cdot \omega \cdot N_1 \cdot A_e \cdot B_{peak} \quad (41)$$

The third step is to use the published curves on THD<sub>F</sub> (as e.g. in fig. 4, 5 and 6 for 3E55) to determine the THD<sub>F</sub> under the application conditions of  $f$ ,  $B$  and  $T$ .

The last step is to use equation [38] to calculate the THD which will be measured and, to check whether this value is in line with the requirement (specification).

**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:

$$D = \frac{\mu_1 - \mu_2}{\mu_1} \quad (42)$$

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

$$d = \frac{\mu_1 - \mu_2}{\mu_1 \times \log(t_2/t_1)} \quad (43)$$

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  $\mu_e/\mu_i$ .

Therefore, a disaccommodation factor  $D_F$  is defined:

$$D_F = \frac{d}{\mu_i} = \frac{\mu_1 - \mu_2}{\mu_i^2 \times \log(t_2/t_1)} \quad (44)$$

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 with time of a coil can now easily be predicted by:

$$\frac{L_1 - L_2}{L_1} = \mu_e \times D_F \quad (45)$$

$L_1$  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  $10^{-3} \Omega m$  for a MnZn type ferrite, and about  $30 \Omega m$  for a NiZn ferrite.

Since there is an isolating layer between the crystals, the bulk resistivity is much higher: 0.1 to  $10 \Omega m$  for MnZn ferrites and  $10^4$  to  $10^6 \Omega m$  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 ( $\Omega\text{m}$ )
0	$\approx 5 \cdot 10^7$
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 their 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 ( $\Omega\text{m}$ )
0.1	$\approx 2$
1	$\approx 0.5$
10	$\approx 0.1$
100	$\approx 0.01$

**Table 4** Resistivity as function of frequency for NiZn ferrites

FREQUENCY (MHz)	RESISTIVITY ( $\Omega\text{m}$ )
0.1	$\approx 10^5$
1	$\approx 5 \cdot 10^4$
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 ( $\epsilon_r$ )
0.1	$\approx 2 \cdot 10^5$
1	$\approx 10^5$
10	$\approx 5 \cdot 10^4$
100	$\approx 10^4$

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

FREQUENCY (MHz)	PERMITTIVITY ( $\epsilon_r$ )
0.001	$\approx 100$
0.01	$\approx 50$
1	$\approx 25$
10	$\approx 15$
100	$\approx 12$

**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 ISO 9001 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 62044. 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.

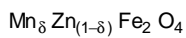
Reliability is mainly governed by the quality of the total assembly of the wound component. Extreme thermal shocks should be avoided.

**ENVIRONMENTAL ASPECTS OF SOFT FERRITES**

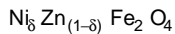
Our range of soft ferrites has the general composition  $MeFe_2O_4$  where Me represents one or several of the divalent transition metals such as manganese (Mn), zinc (Zn), nickel (Ni), or magnesium (Mg).

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

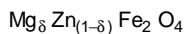
Their general chemical formula is:



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



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

**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 throughout their lifecycle. A short definition of product status is given in the table "Product status definitions".

**Product status definitions**

STATUS	INDICATION	DEFINITION
Prototype		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		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		These products are <b>not</b> 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.

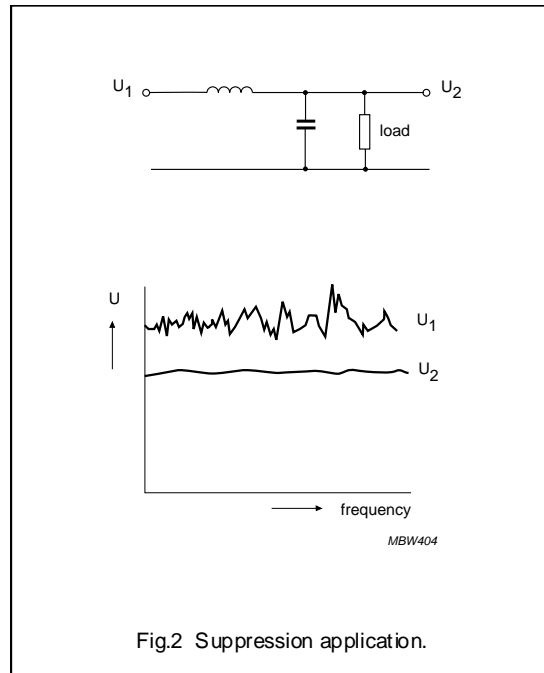
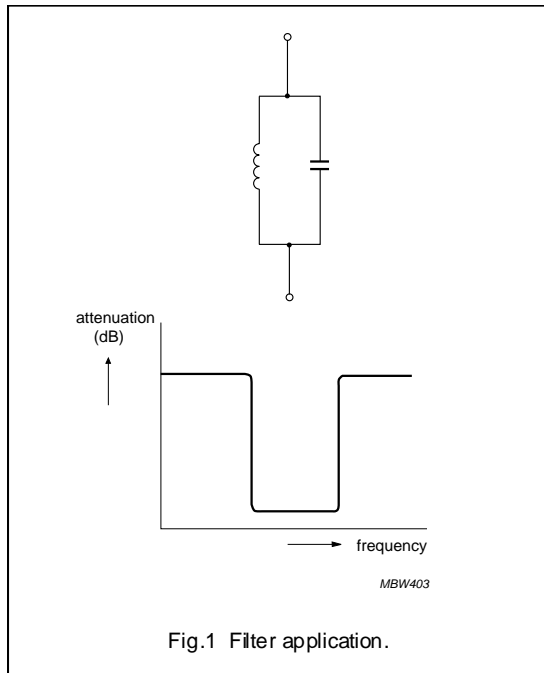
**INTERFERENCE SUPPRESSION**

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.



## Soft Ferrites

## Applications

### DELAYING PULSES

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

Material requirements:

- High permeability ( $\mu_i$ ).

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

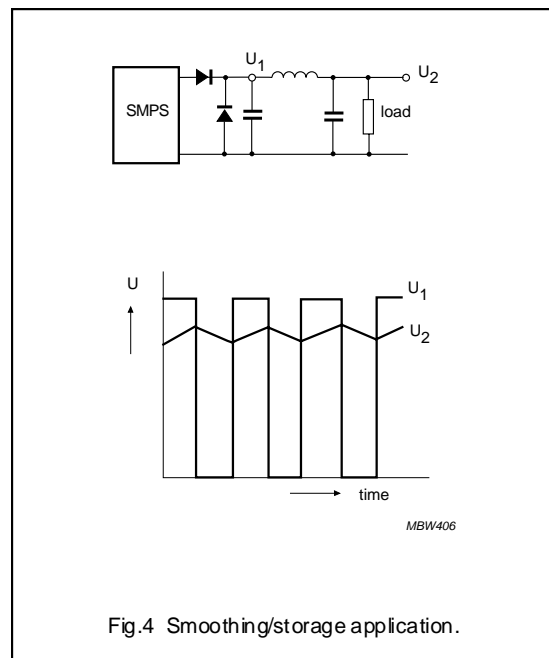
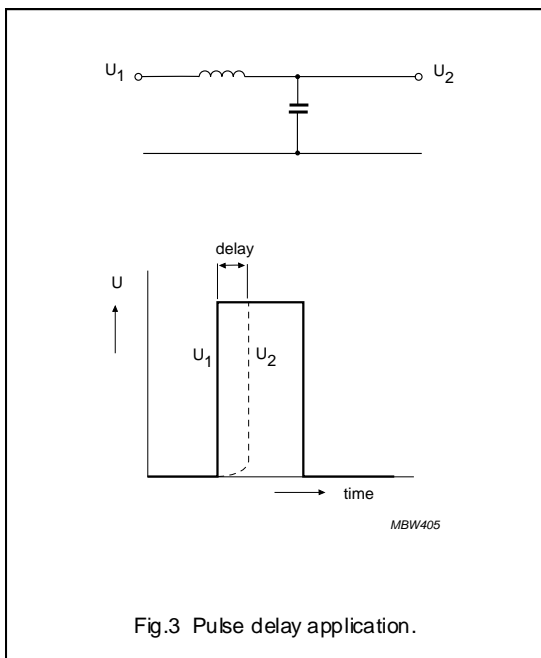
### STORAGE OF ENERGY

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.



Soft Ferrites

Applications

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.

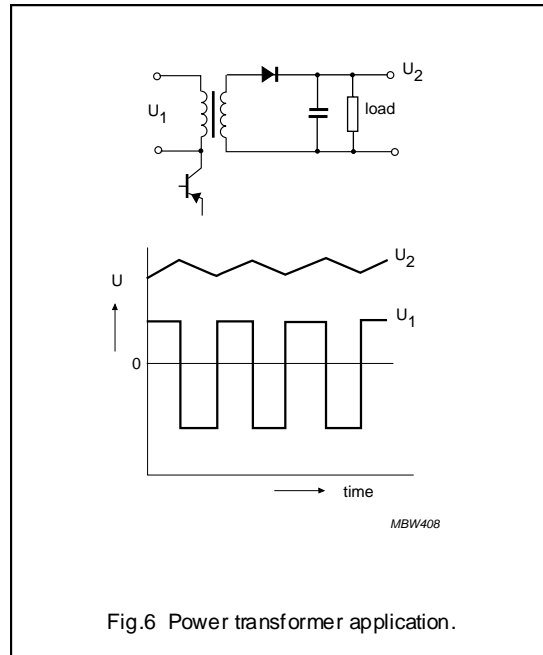
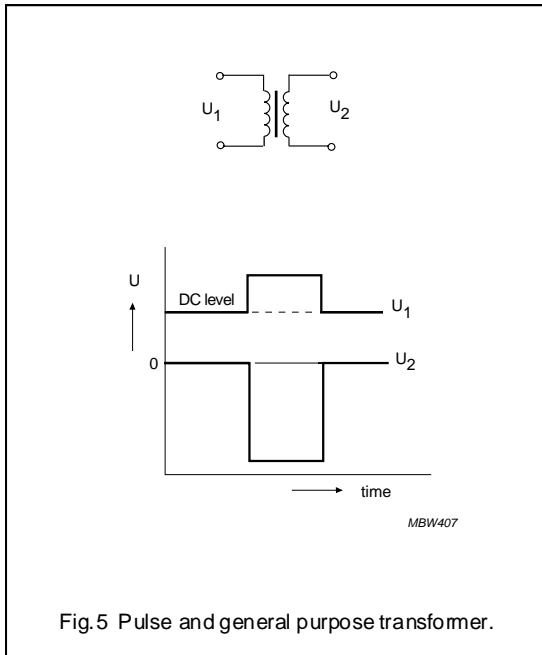
POWER TRANSFORMERS

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.



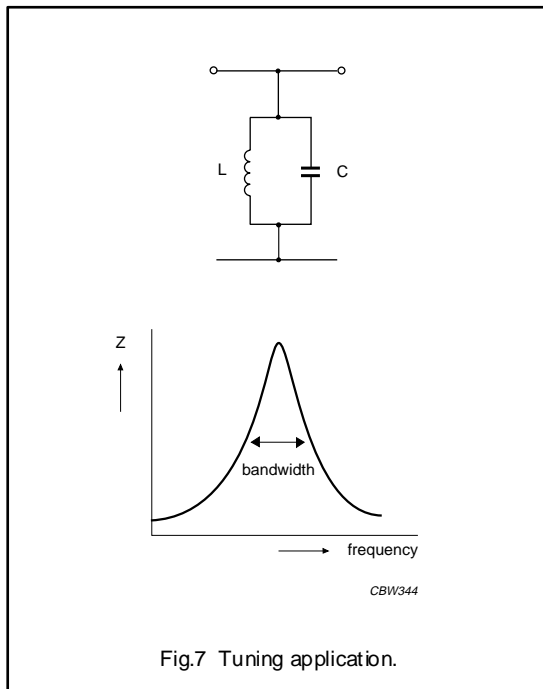
## TUNING

LC filters 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.



**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:

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

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:

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

The space (copper) factor  $f_{\text{Cu}}$  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:

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

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

**Dielectric losses**

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

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

**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:

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

**Eddy-current and residual losses**

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

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

## Soft Ferrites

## Applications

### 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.

## Soft Ferrites

## Applications

### FERROXCUBE PULSE AND SIGNAL TRANSFORMERS

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

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

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

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

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

$E_s$  = source voltage

$R_s$  = source resistance

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

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

$L_p$  = open circuit inductance

$R_p$  = the shunt loss resistance representing the core loss

$N_1, N_2$  = the primary and referred secondary self or stray capacitance respectively

$R_b$  = load resistance referred to the primary turns ratio.

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

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

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

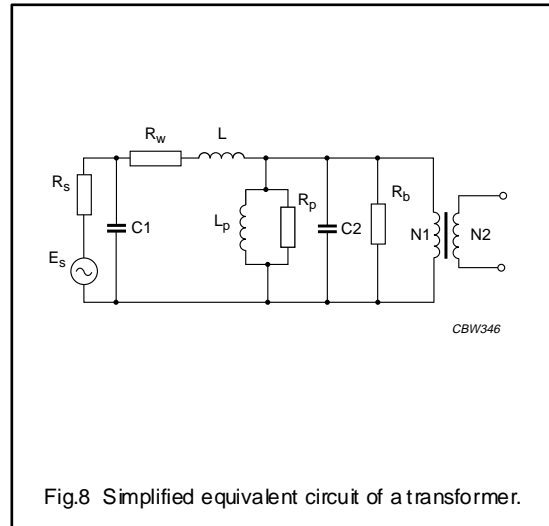


Fig.8 Simplified equivalent circuit of a transformer.

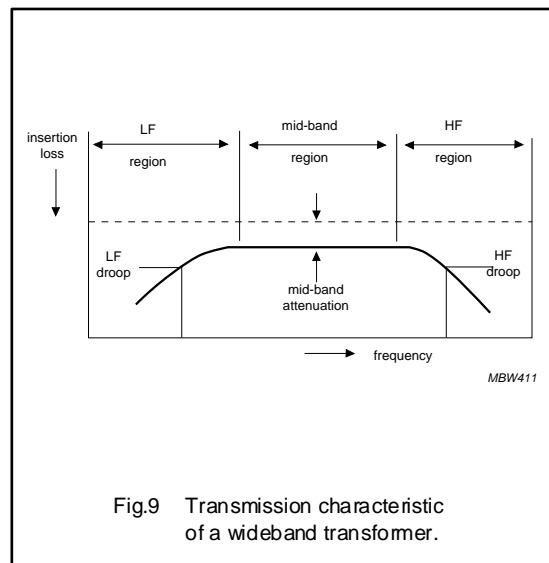
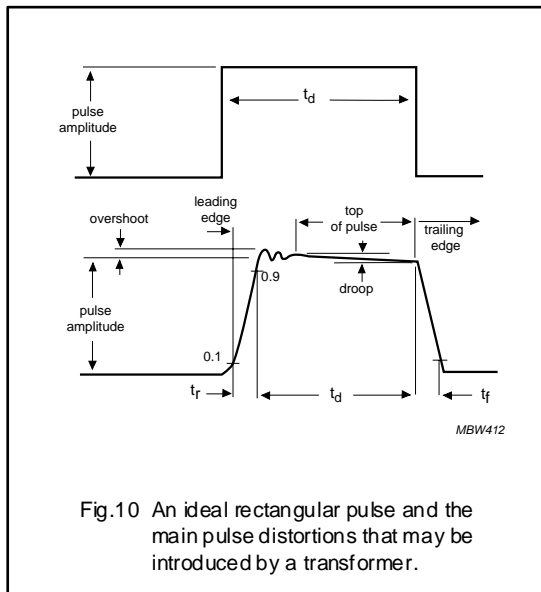


Fig.9 Transmission characteristic of a wideband transformer.

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



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

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

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

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

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

If the signal is superimposed on a DC current, core saturation 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.



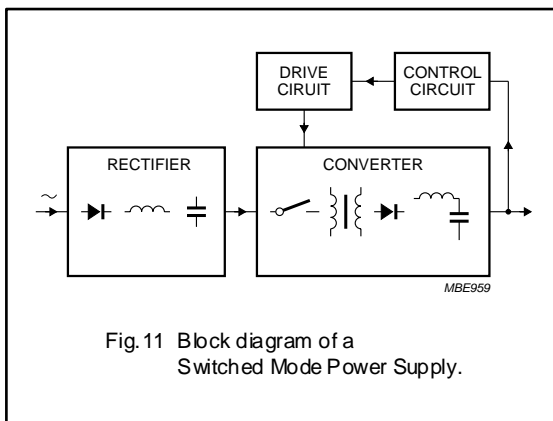
**Ferrites for Power conversion**

Power conversion is one of the major application areas for ferrites and is generally realized by using a switched mode power supply (SMPS). The basic arrangement of a SMPS is shown in Fig.11. In a SMPS, power is efficiently converted into the voltage and current levels, required by the end-application. The wide area in which SMPSs are applied can be divided into four parts: DC-DC, DC-AC, AC-DC and AC-AC. Although every converter type can be found for power conversion, most SMPS applications are based upon the DC-DC (e.g. battery operated equipment) and DC-AC types (e.g. inverters of lamp drivers). Note that many of these converters still have an AC-DC front-end, most of the times nothing more than a rectifier, a smoothing capacitor and a filter for EMC reasons. This front-end does not belong to the SMPS itself and ferrites used in the EMC filter will be treated in the part about interference suppression.

Numerous converter types exist, but most SMPS applications make use of one of the following types :

- Buck or down converter (DC-DC)
- Boost or up converter (DC-DC)
- Flyback converter (DC-DC)
- Forward converter (DC-DC)
- Half and full bridge converter (DC-AC)

Their basic operation principle will first be discussed and after this the focus is put on how to choose the appropriate core material.

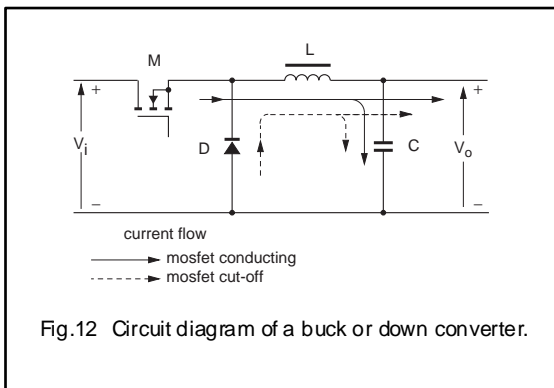


**BUCK OR DOWN CONVERTER**

With a buck or down converter, as shown in Fig.12 , it is possible to adapt the input voltage to a lower level. It also means that the average output current is larger than the input current. The basic operation is as follows. During the on-time of the mosfet, a linearly rising current is flowing from the input to the output and energy is stored in the inductor (note that always the largest part of the energy is stored in the air gap and a minor part in the ferrite itself). By the end of the on-time, defined by the ratio of the output voltage and the input voltage, the mosfet is switched off. According to Lenz' law, the inductor voltage reverses and the stored energy results in a decreasing output current via the diode.

Dependent on the operating condition defined by the load, the current through the inductor will be mainly DC (continuous mode) with a triangular ripple on top of it. This means that the ferrite is operating around a DC bias point of B and H. Around this point a minor BH loop can be found.

In all those applications where a lower voltage is needed than the available supply voltage (e.g. automotive), buck converters can be found. Another application can be a so-called voltage regulated module (VRM) behind the standard computer power supply or Silver Box to deliver a stable processor voltage even under high load variations.



BOOST OR UP CONVERTER

Re-arranging the circuit components of the buck converter results in the boost or up converter of Fig.13. It adapts the DC input voltage to a higher output level. When the mosfet is on, the inductor voltage is equal to the input voltage and the linearly rising current stores energy in the inductor. Switching off the mosfet stops the storage of energy and the inductor voltage reverses. The output voltage becomes the sum of the input and inductor voltage and a decreasing inductor current will be forced to flow to the output via the diode.

Typical boost converter applications can be found in battery operated equipment, e.g. a laptop where higher internal voltages are needed than supplied by the battery. In order to meet the stringent requirements on EMC, boost converters can also be used as power factor correction (PFC) circuits in between the mains and a SMPS. A PFC circuit ensures that a sinusoidal voltage and current are drawn from the mains, which is not possible with a SMPS only.

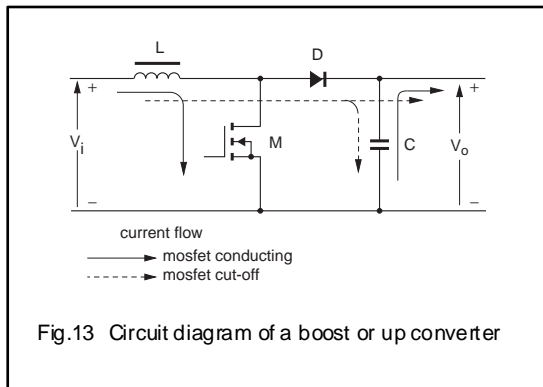


Fig.13 Circuit diagram of a boost or up converter

FLYBACK CONVERTER

One of the major drawbacks of both buck and boost converter is the absence of galvanic isolation between in- and output, which can be required by some applications. Introducing a magnetically coupled coil, like in the flyback converter of Fig. 14, solves this point. But the big advantage of the flyback converter is that the output voltage can be higher or lower than the input voltage, depending on the turns ratio  $N$ . More secondary windings result in more output voltages. During the on-time of the mosfet, a linearly rising current is flowing through the primary winding and energy will be stored in the coupled coil. By the end of the on-time the primary voltage reverses and the stored energy introduces, via the magnetic coupling, a linearly decreasing current in the secondary

winding. The dots close to the primary and secondary windings indicate the winding direction, necessary for good operation.

The galvanic isolation between in- and output and the possibility of multiple outputs make the flyback converter one of the most popular SMPS types. Flyback converters can be found in many applications from small low power stand-by supplies of less than 1 W to big power supplies delivering over a few kW.

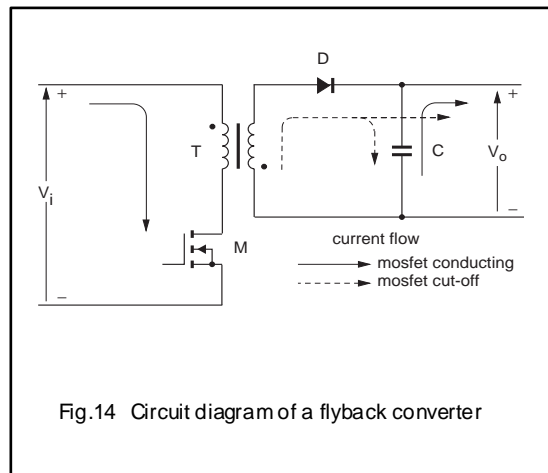


Fig.14 Circuit diagram of a flyback converter

FORWARD CONVERTER

The forward converter of Fig.15 is basically a buck converter with galvanic isolation realized by the transformer. With the turns ratio, the output voltage can be made higher or lower than the input voltage. When the mosfet is on, current is flowing through both the primary and secondary winding of the transformer and it will be magnetized. The secondary current stores energy in the coil. Switching off the mosfet releases the energy and a decreasing current is flowing to the output. De-magnetizing of the transformer is achieved by a third winding having an equal number of turns but opposite winding direction. With its higher component count, the forward converter is less attractive than the flyback converter.

A push-pull converter is an arrangement of two forward converters operating in antiphase (push-pull action). 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

Soft Ferrites

Applications

flyback converters. Therefore, for the same operating conditions and power throughput, a push-pull converter design can use a smaller transformer core.

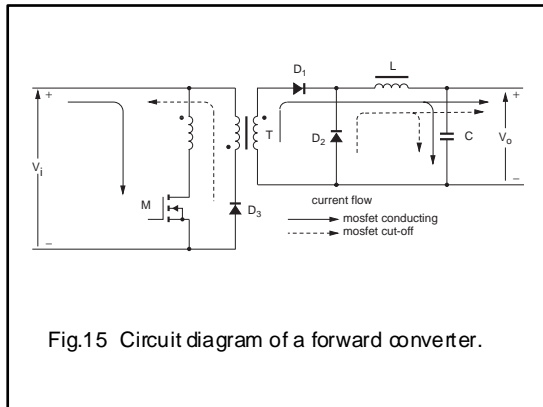


Fig.15 Circuit diagram of a forward converter.

HALF AND FULL BRIDGE CONVERTER

With the half bridge converter of Fig. 16, one side of the primary winding is at a voltage potential equal to half the supply voltage. Switching the mosfets puts the other side alternately to the supply voltage and ground and therefore the primary voltage is half the supply voltage. However, with the full bridge converter, see Fig. 17, and using the same transformer, the primary voltage is equal to the supply voltage. This makes the full bridge converter more efficient, but the control of two pairs of mosfets is more complicated. Transformer de-magnetizing is in both converters realized by the body diodes of the mosfets. For example, magnetizing of the transformer core is done with M1, while the de-magnetizing is done by the body diode of M2. An advantage of this principle is that M2 can be switched on during the de-magnetizing process and no switch-on losses (the so-called zero voltage switching ZVS principle) occur and less EMI is generated.

The advantage of the bridge converters compared to the previous ones (except the push-pull converter) is that the transformer is excited in two directions and therefore the full BH loop from -Bsat to +Bsat can be used. For equal throughput power, the transformer of a bridge converter can be smaller than e.g. the transformer of a forward converter operating on the same frequency.

With a secondary circuit identical to that of a forward converter, the DC-AC converter is transformed into a DC-DC converter. Still, the operating frequency of the energy storage inductor is twice the control frequency and the ripple current has been halved. Therefore, the core volume of the inductor can also be smaller.

Half and full bridge converters are normally the basis for resonant converters. In these converters, the primary inductance is a part of a resonant tank made with one or more capacitors and/or inductors. Although the resonant tank has a squarewave input voltage, sinusoidal voltages and currents appear in the tank. This means that no harmonics are introduced and in combination with the ZVS of the mosfets, it makes resonant converters very attractive for high frequency designs. Note that resonant converters directly deliver their energy to the load and no energy storage inductor is necessary.

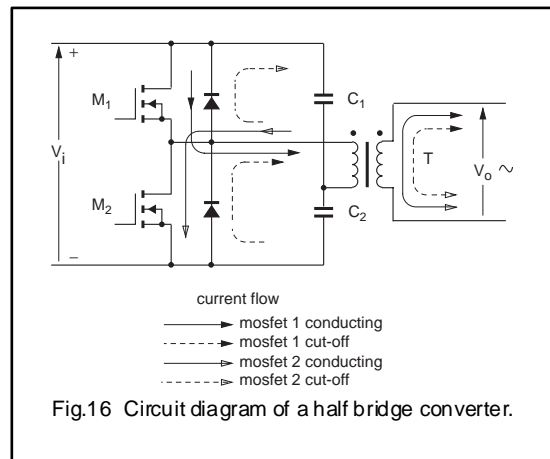


Fig.16 Circuit diagram of a half bridge converter.

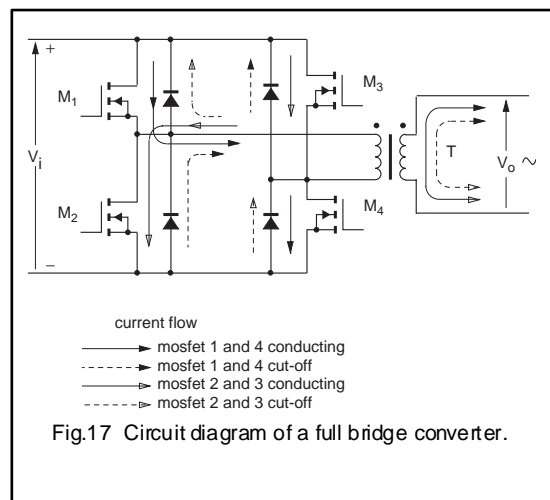


Fig.17 Circuit diagram of a full bridge converter.

## Soft Ferrites

## Applications

### FERRITE SELECTION

Dependent on the converter type, the ferrites used in these converters operate under saturation or loss limited conditions, which require special power ferrites with high saturation and low loss levels even at elevated operation temperatures.

The operating frequency is one of the parameters defining which core material can be used in an application. For

those SMPSs which are connected directly to a high input voltage (e.g. the rectified mains can be up to 400 V in some parts of the world), semiconductors with a high breakdown voltage are needed. A high breakdown voltage limits the switching frequency otherwise severe switching losses inside the semiconductor occur (on the other hand, a low voltage device can be used at much higher operating frequencies). For flyback converters things are even worse. When the mosfet is switched off, its drain-source voltage is the sum of input and rectified secondary voltage. Therefore the operating frequency of a high voltage input SMPS is limited by the capabilities of the used semiconductors and switching frequencies up to 300 kHz can be found nowadays even when the semiconductors are connected to a heatsink. This means that most power ferrites of the 3Cxx series will mainly be used under saturation limited conditions, see also the performance factor graph in Fig.19. On top, for many applications the operating frequency is only a few tens of kHz due to EMC regulations. The reason is that these requirements can relatively easily be met in the frequency area below 150 kHz.

Converters which are not directly connected to a high input voltage and/or soft-switching power supplies, like half and full bridge (resonant) converters can overcome this problem and operating frequencies into the MHz range can be found. Power ferrites for this range are gathered in the 3Fxx series and 4F1.

The energy storage inductor of all converters (except flyback and resonant) normally operates at a bias level, therefore ferrites with a high saturation value at the application temperature, like 3C92, result in the smallest core volumes.

In case of post regulators, the operating frequency can be chosen much higher as the input voltage is much lower and the generated EMI will be sufficiently attenuated by the SMPS in front of the post regulator. Now ferrites from the 3Fxx series and 4F1 are the best choice.

All the inductors, including the coupled inductor of the flyback converter, need an air gap necessary for the energy storage, while the transformers can be made without gap.

### CORE SELECTION

#### 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.

## Soft Ferrites

## 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 1 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 1** Power throughput for different core types at 100 kHz switching frequency

POWER RANGE (W)	CORE TYPE
< 5	RM4; P1 1/7; T14; EF13; U10
5 to 10	RM5; P1 4/8
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; T58; U25; U30; E42; EFD30
200 to 500	ETD44; ETD49; E55; EC52; E42; P42/29; U67
> 500	E65; EC70; U93; U100; P66/56; PM87; PM1 14; T140

### 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  $T_c$ , 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.

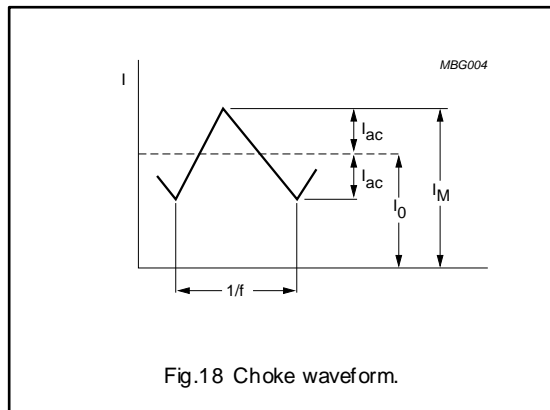


Fig.18 Choke waveform.

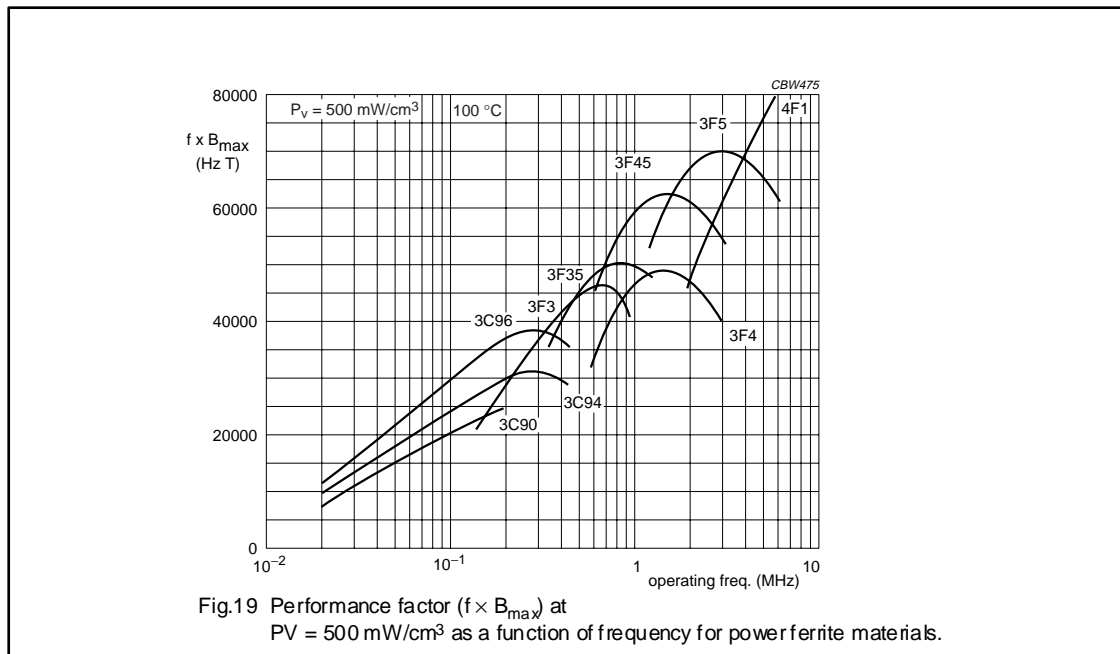


Fig.19 Performance factor ( $f \times B_{max}$ ) at  $P_V = 500 \text{ mW/cm}^3$  as a function of frequency for power ferrite materials.

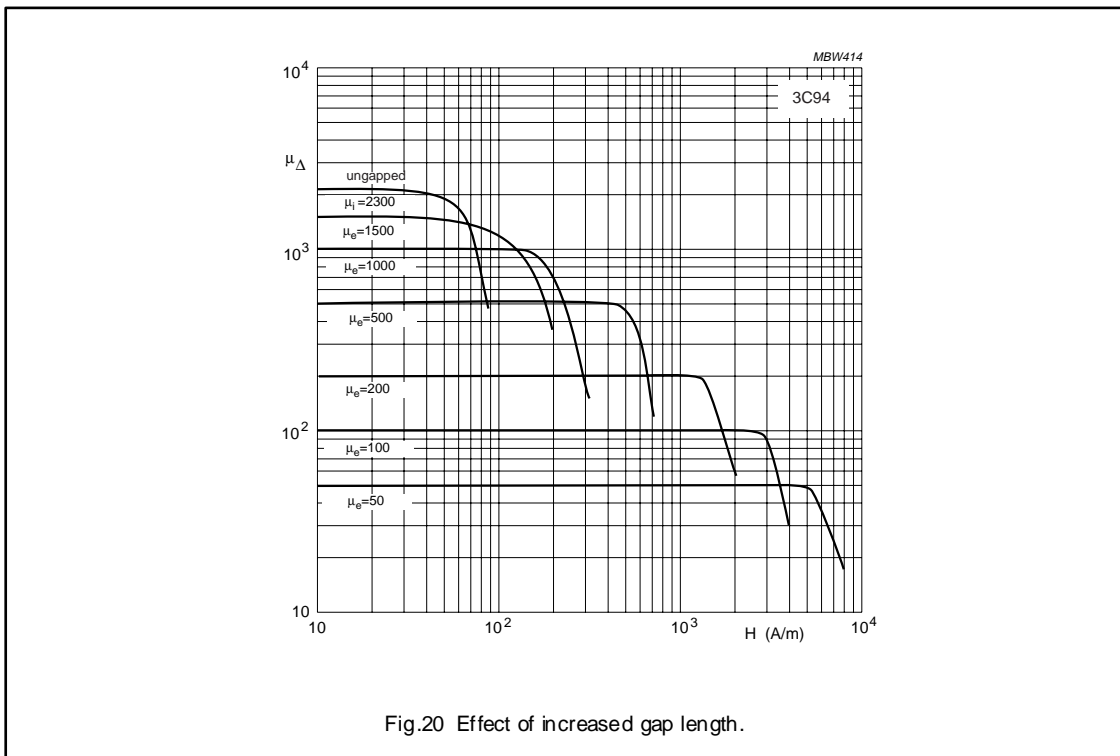
GAPPED CORE SETS

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.

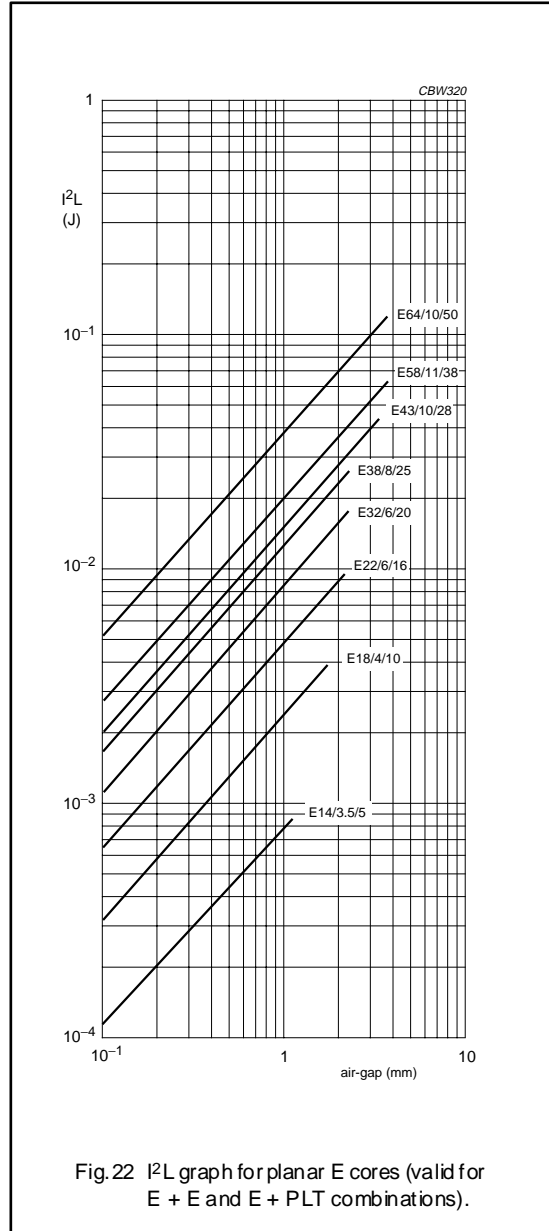
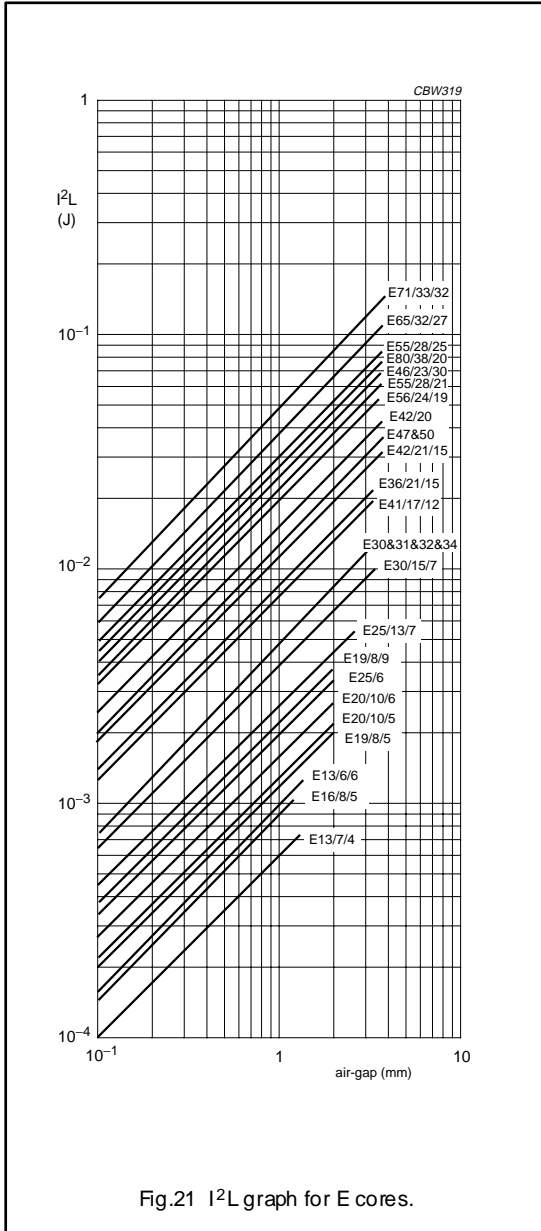
The product  $I^2L$  is a measure of the energy which is stored in the core during one half cycle.

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.

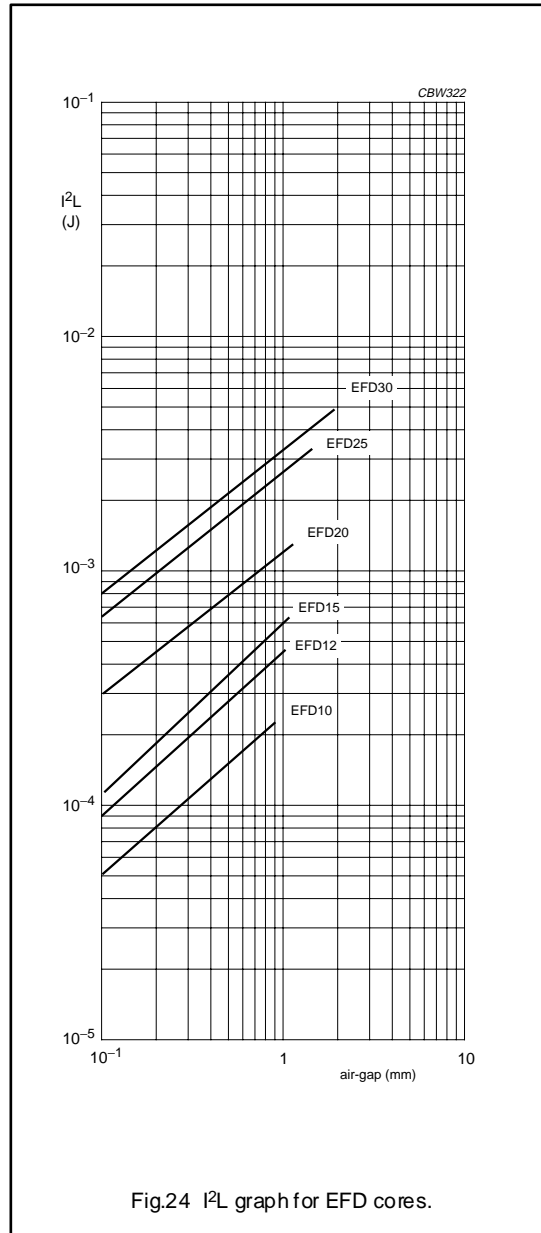
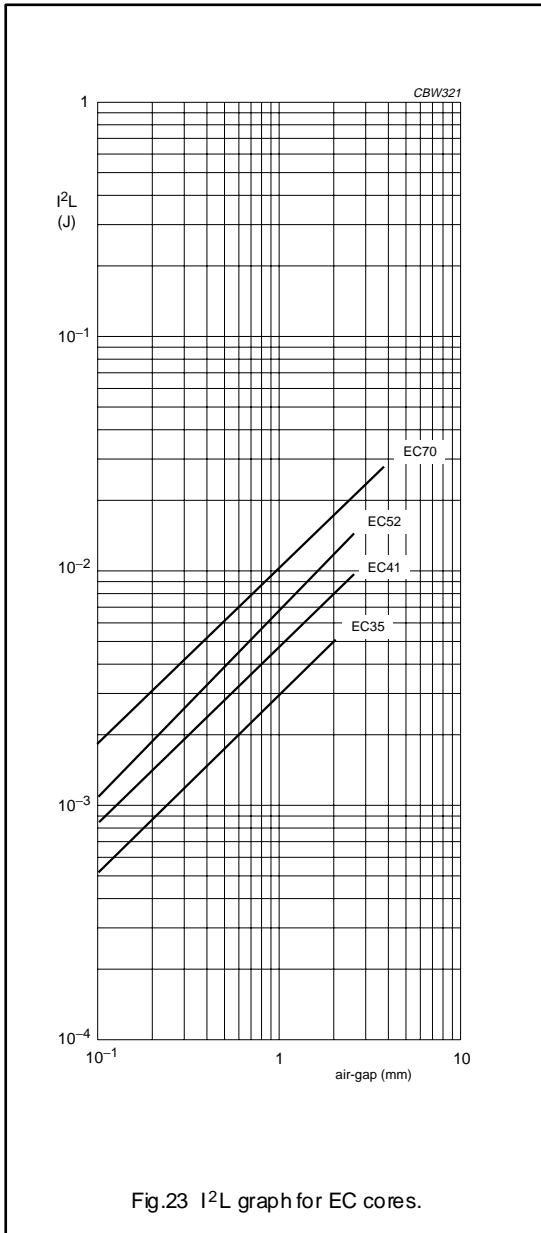


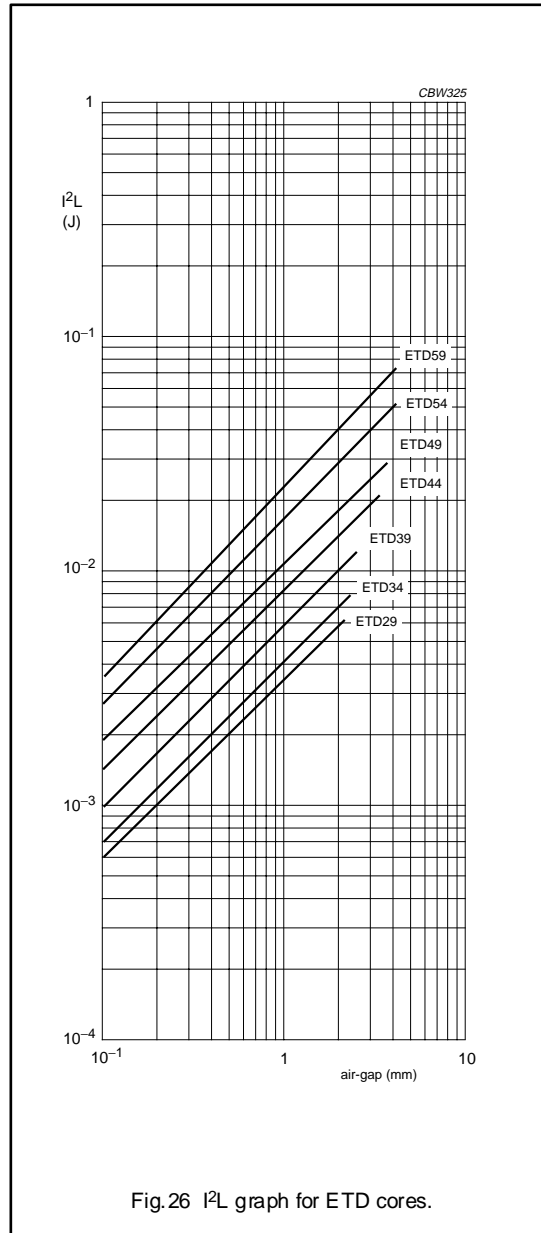
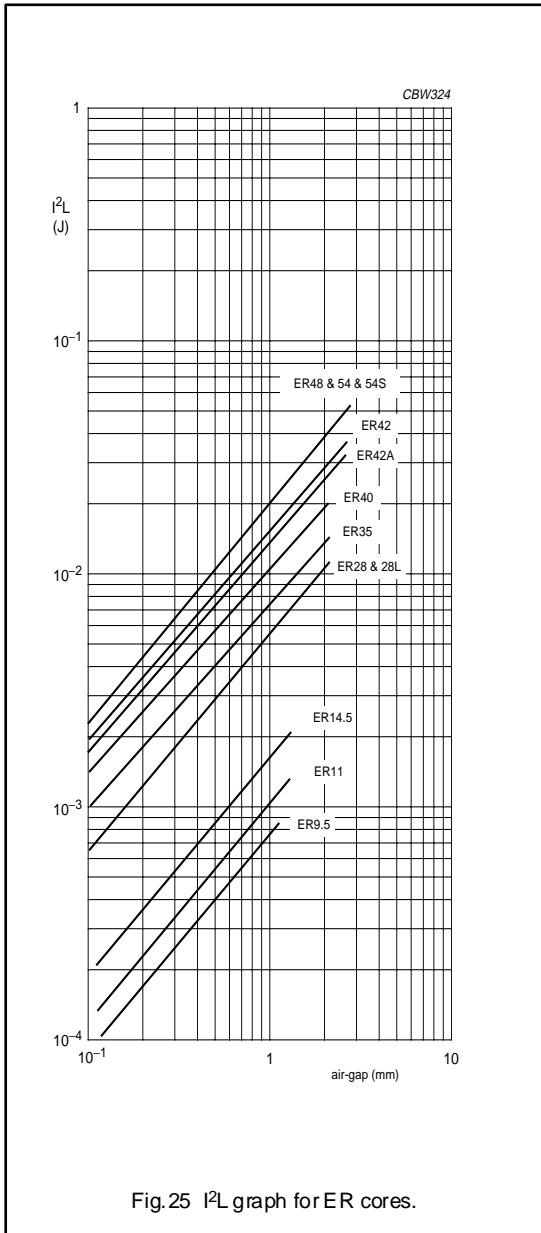
Soft Ferrites

Applications









Soft Ferrites

Applications

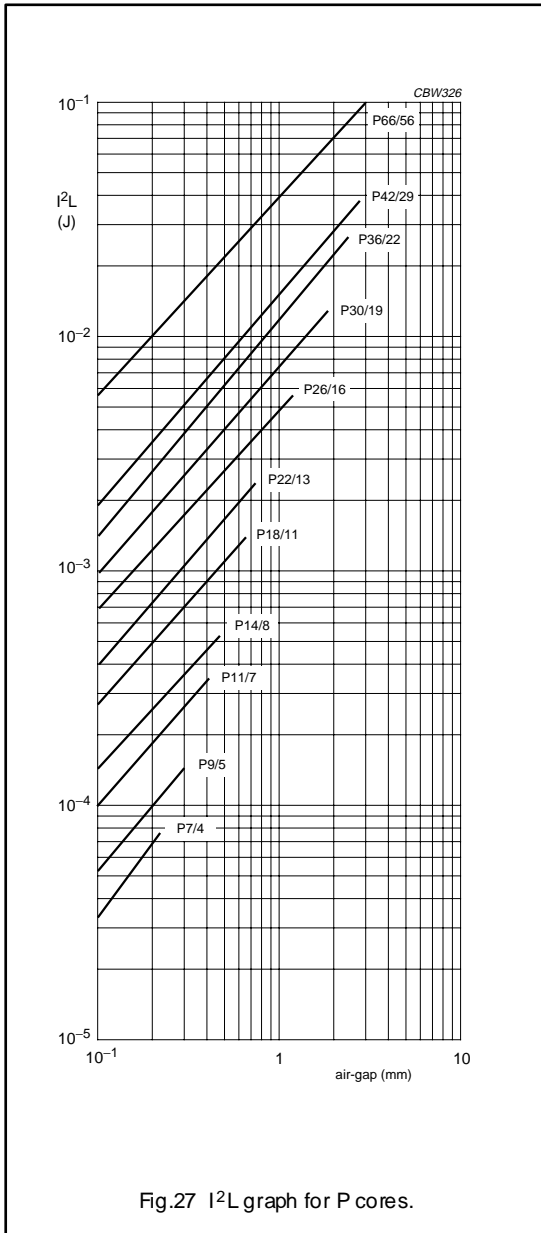


Fig.27  $I^2L$  graph for P cores.

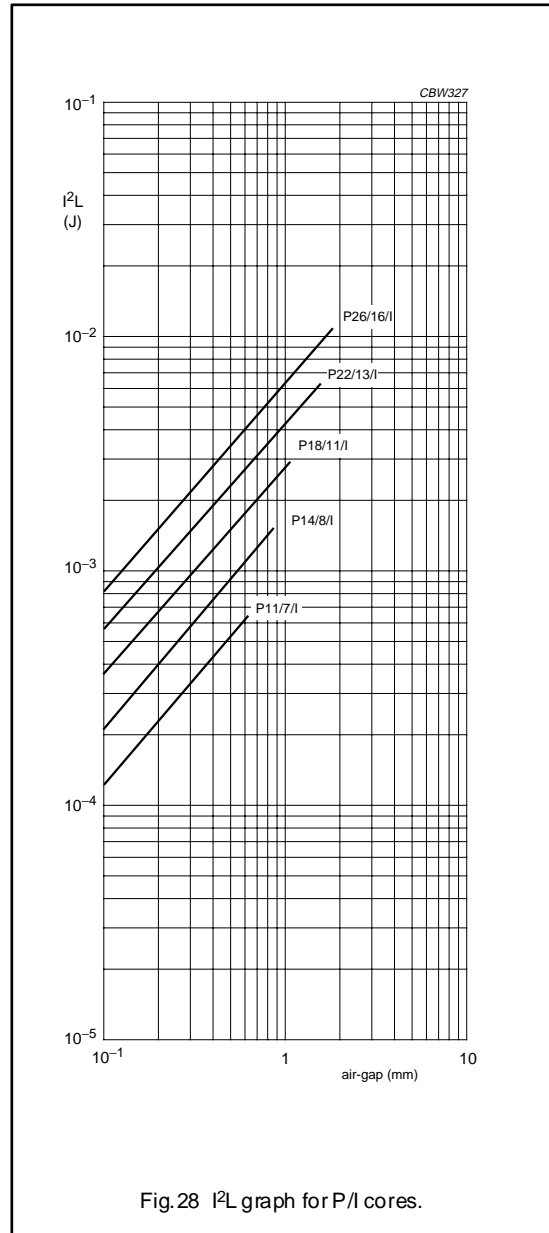
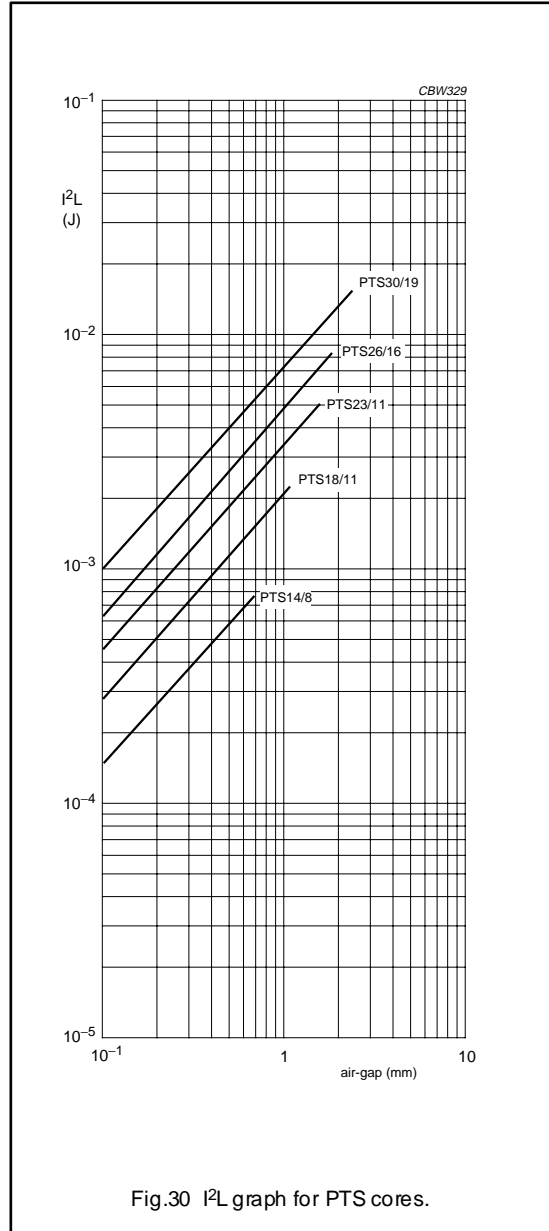
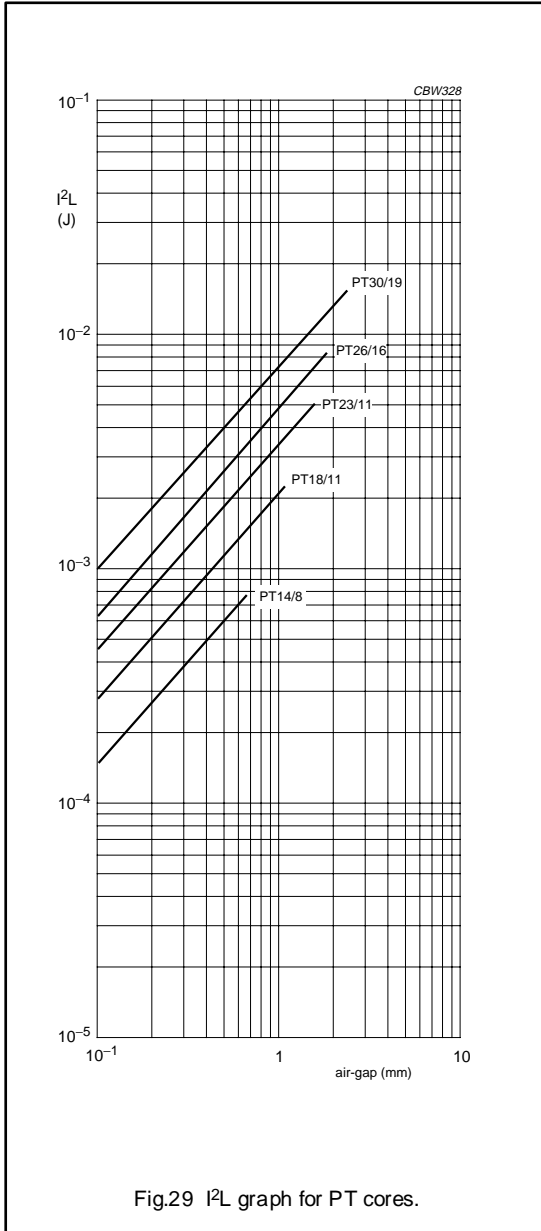
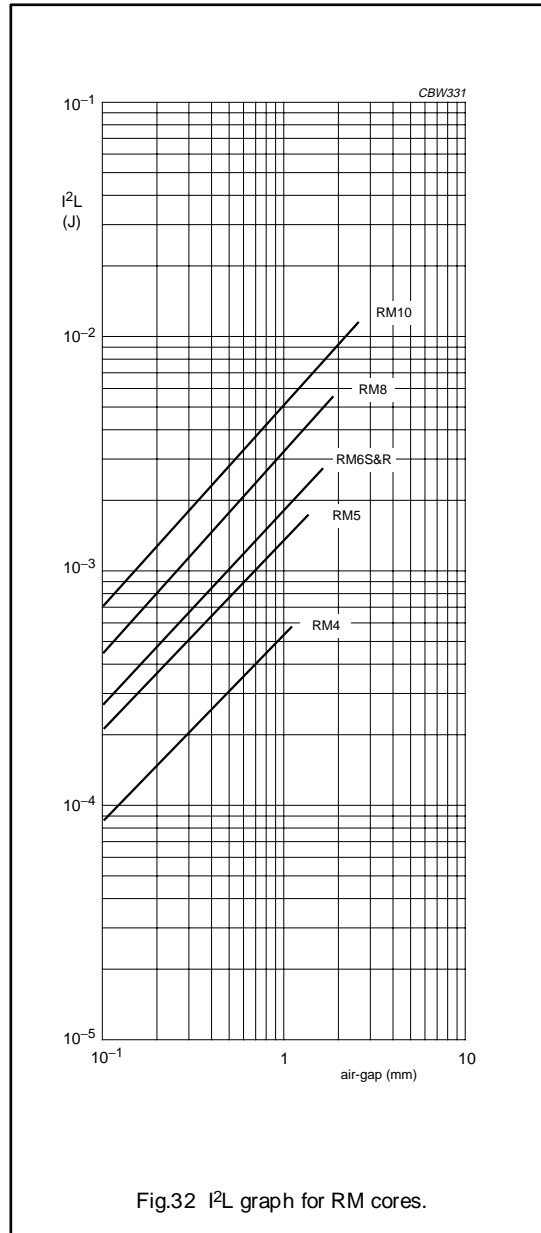
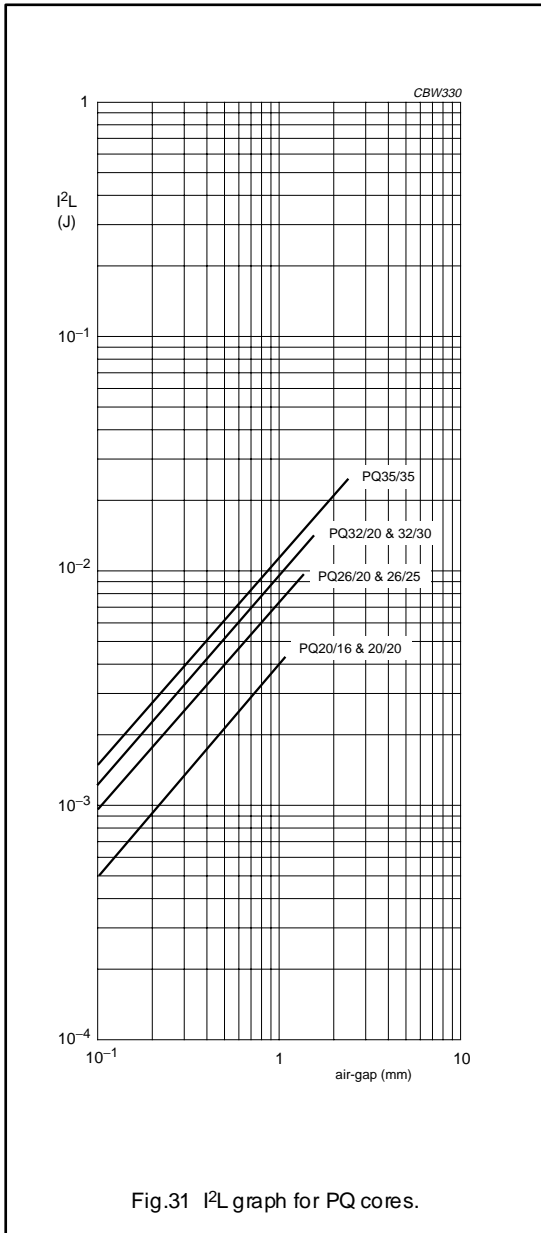


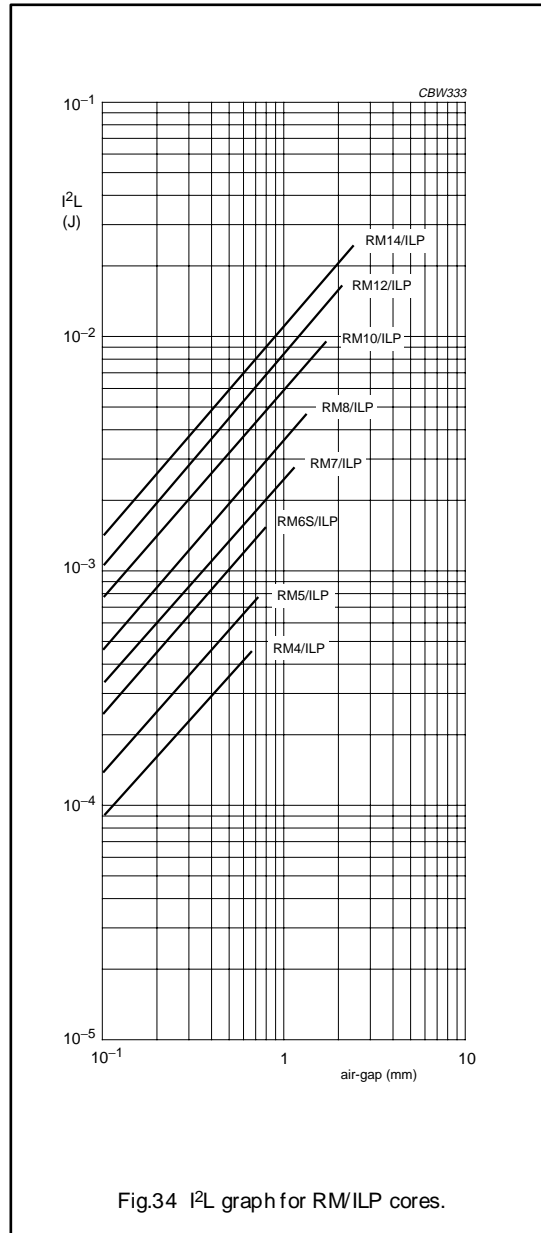
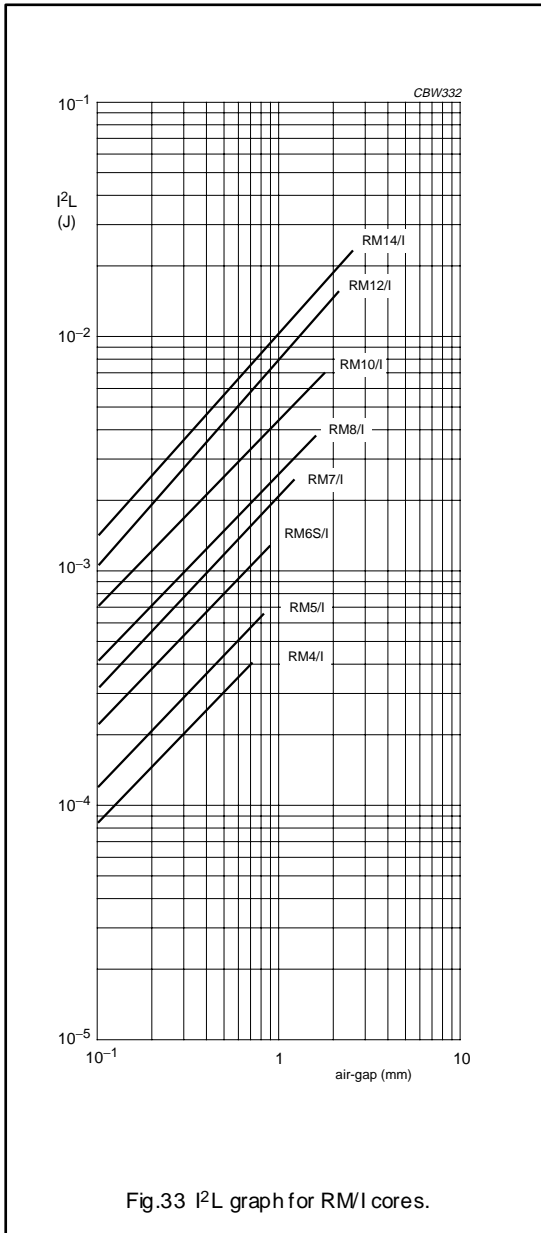
Fig.28  $I^2L$  graph for P/I cores.

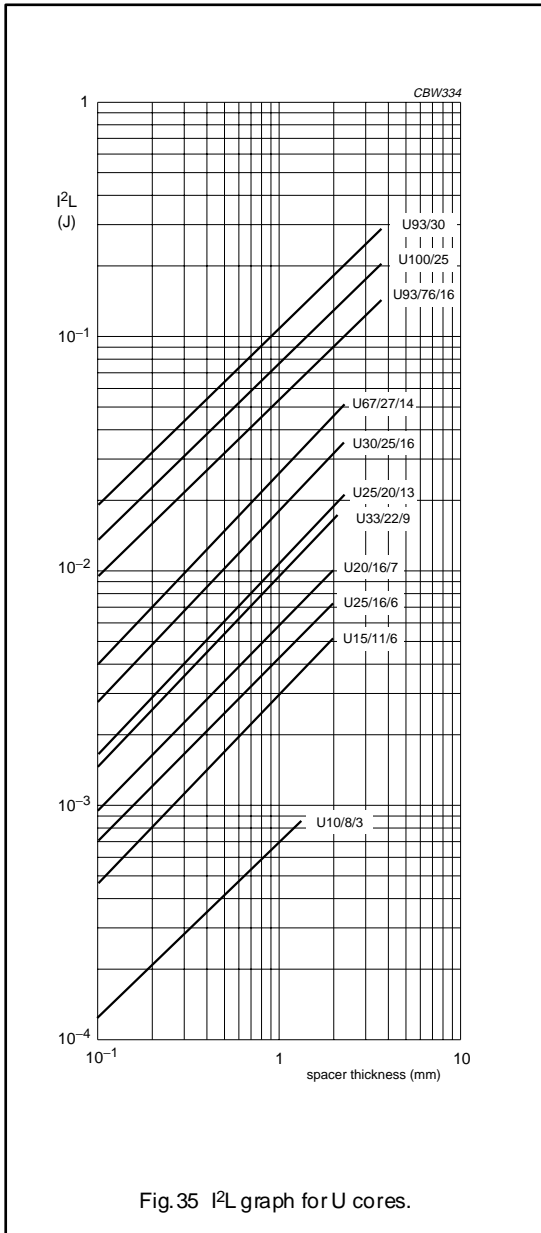


Soft Ferrites

Applications



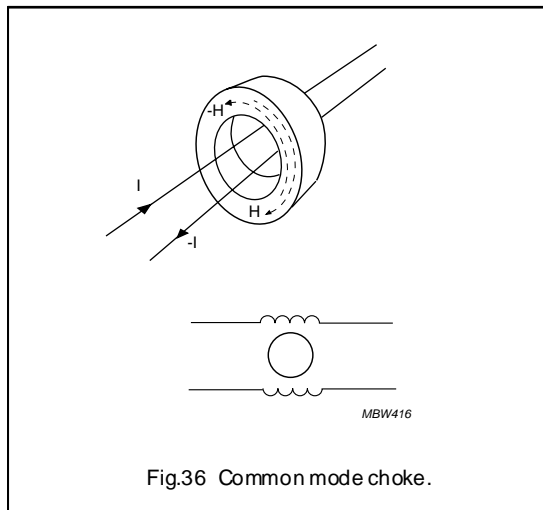




## IRON POWDER RING CORES

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)



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.37.

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 and thus, also the impedance. A better result could have been obtained with a grade having a lower permeability. Fig.38 provides a quick method of choosing the right ferrite for the job.



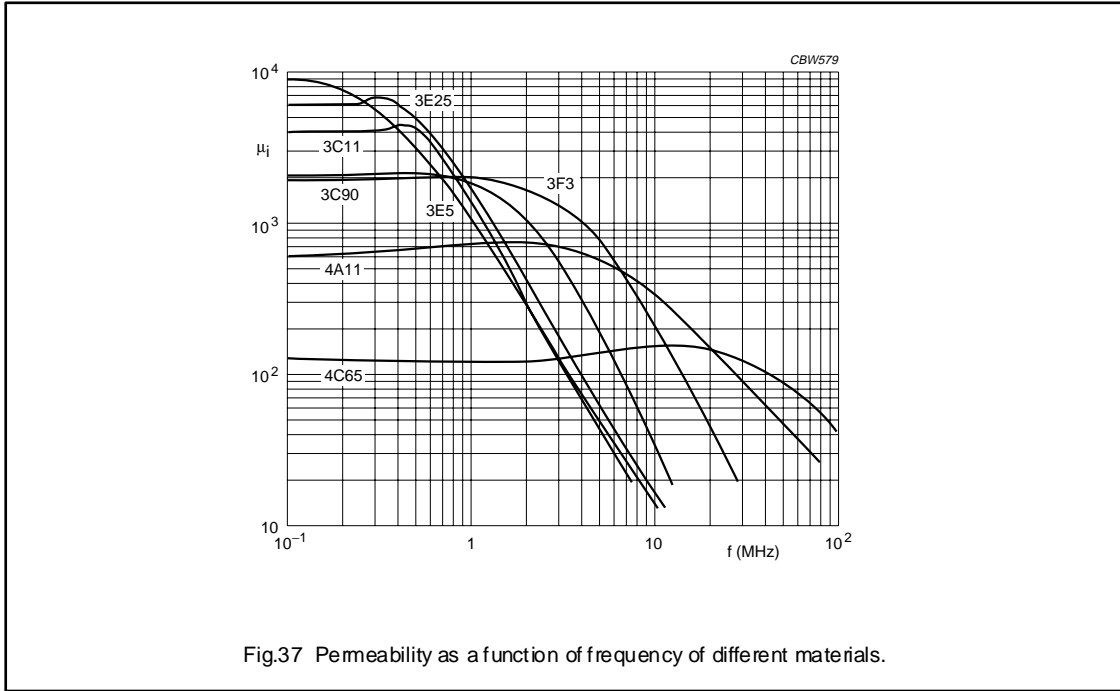


Fig.37 Permeability as a function of frequency of different materials.

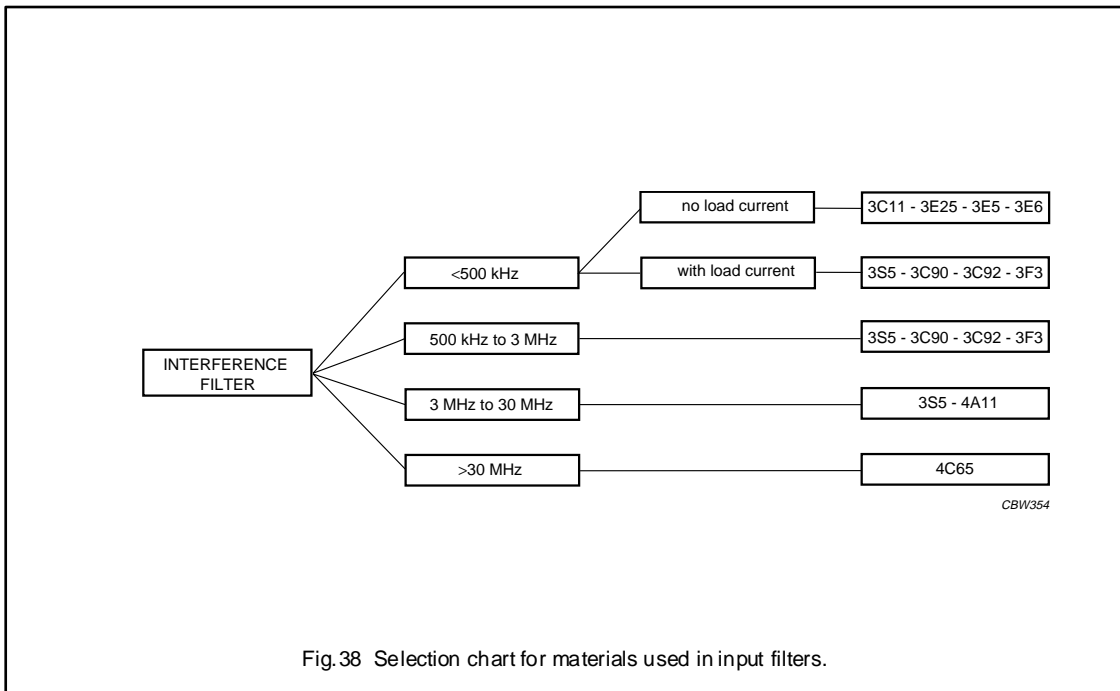


Fig.38 Selection chart for materials used in input filters.

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.39.

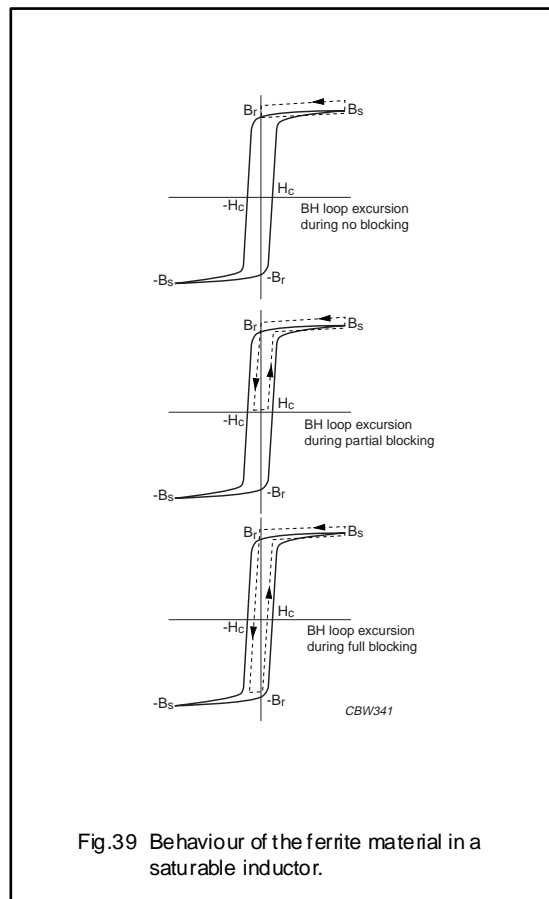


Fig.39 Behaviour of the ferrite material in a saturable inductor.



**Ferrites for Interference Suppression and Electromagnetic Compatibility (EMC)**

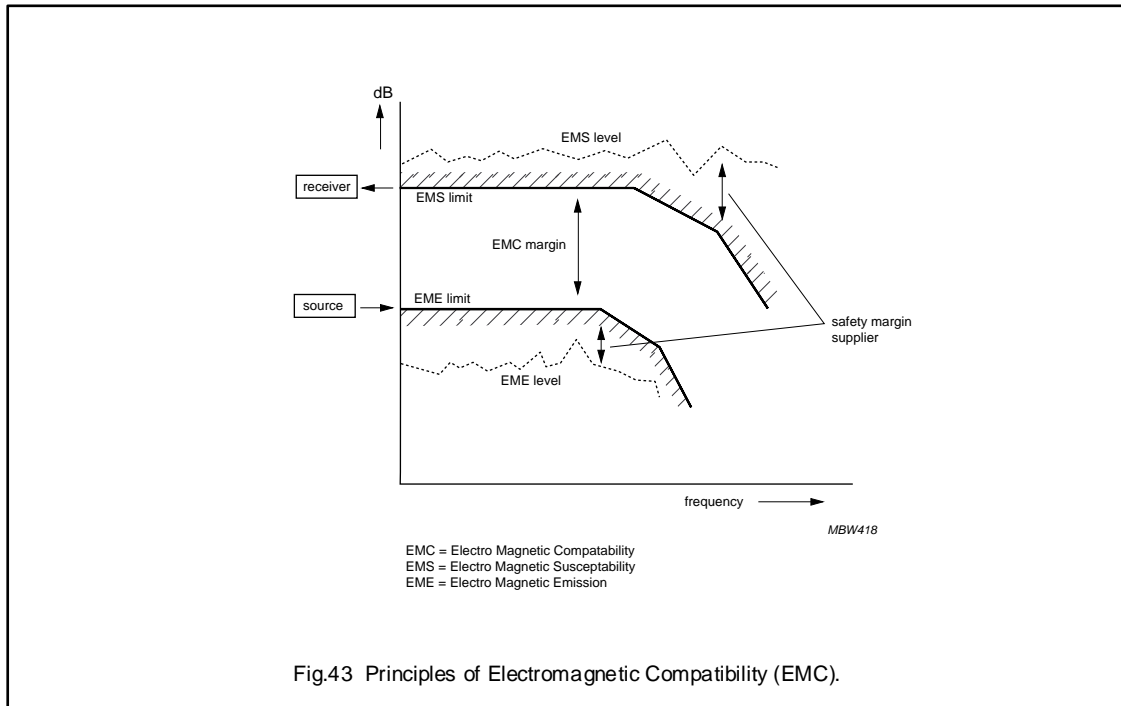


Fig.43 Principles of Electromagnetic Compatibility (EMC).

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.44 .

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.

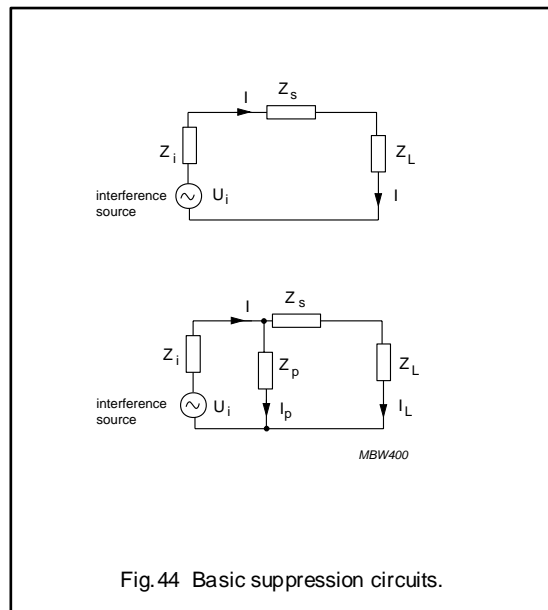


Fig.44 Basic suppression circuits.

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 3S5 is a better choice, especially at elevated temperatures.

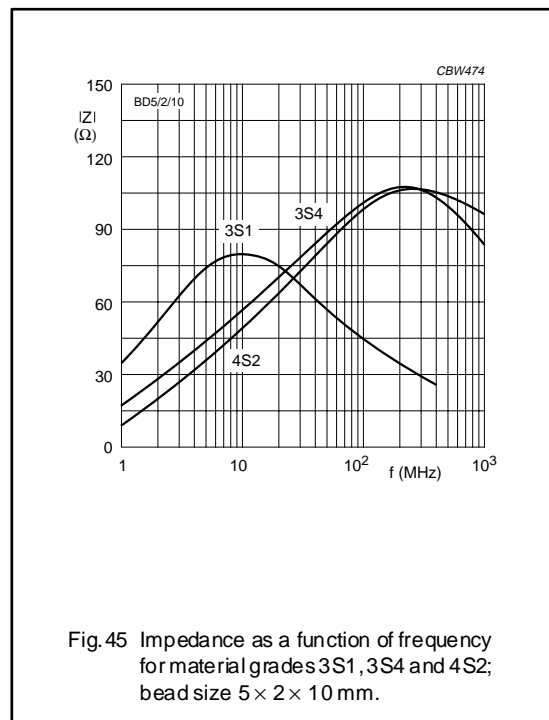


Fig. 45 Impedance as a function of frequency for material grades 3S1, 3S4 and 4S2; bead size  $5 \times 2 \times 10$  mm.

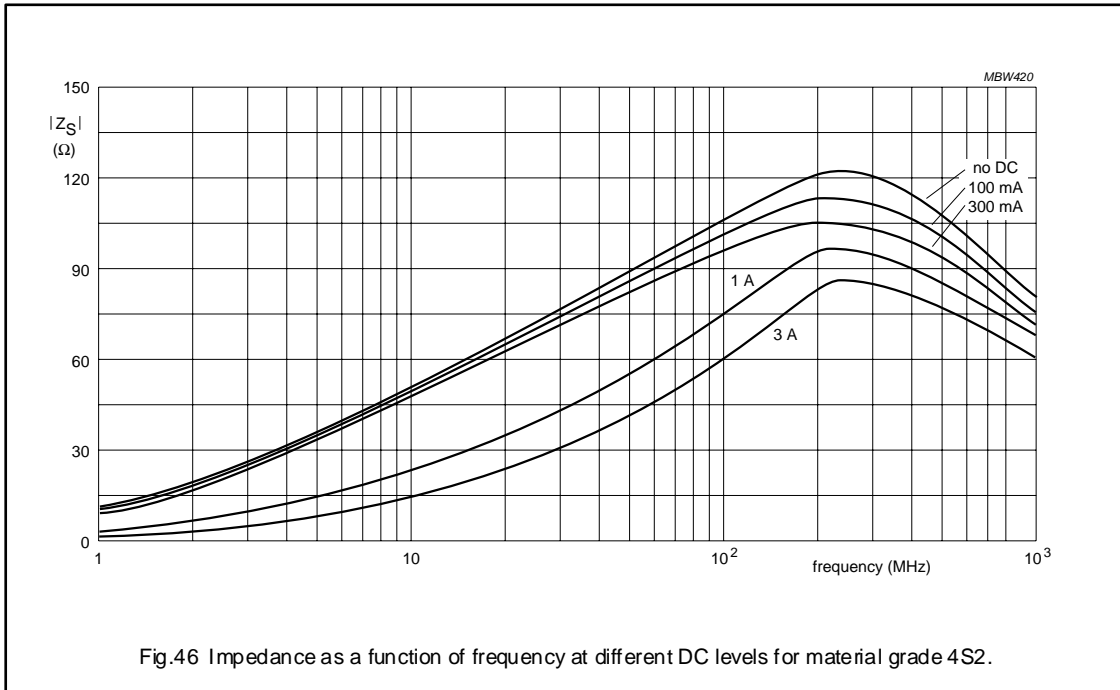


Fig.46 Impedance as a function of frequency at different DC levels for material grade 4S2.

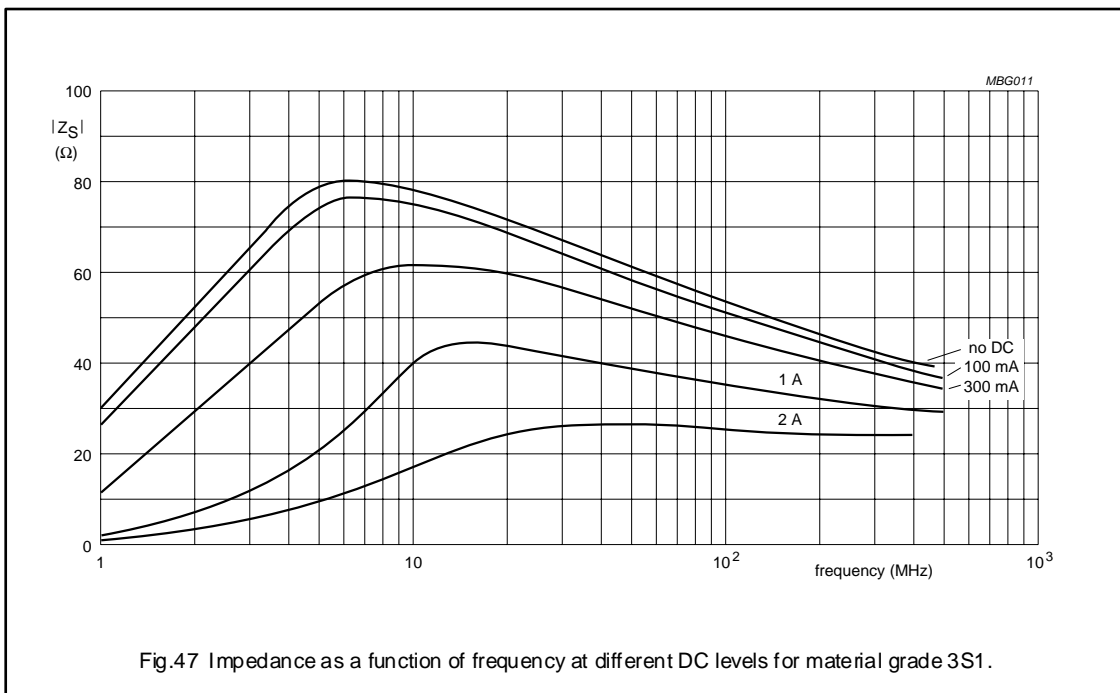


Fig.47 Impedance as a function of frequency at different DC levels for material grade 3S1.

## Soft Ferrites

## Applications

### 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.

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

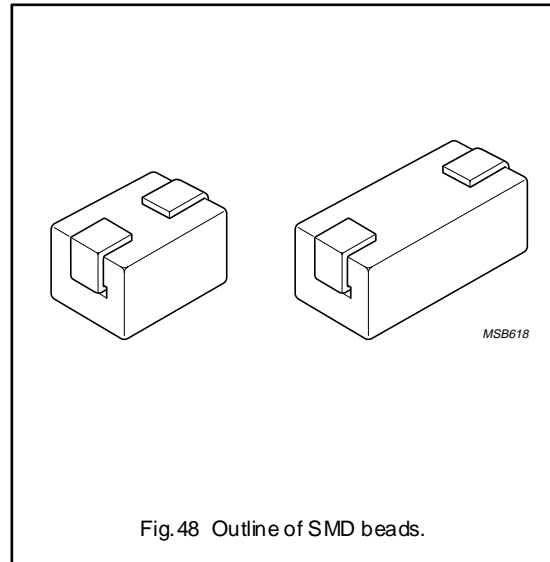


Fig. 48 Outline of SMD beads.

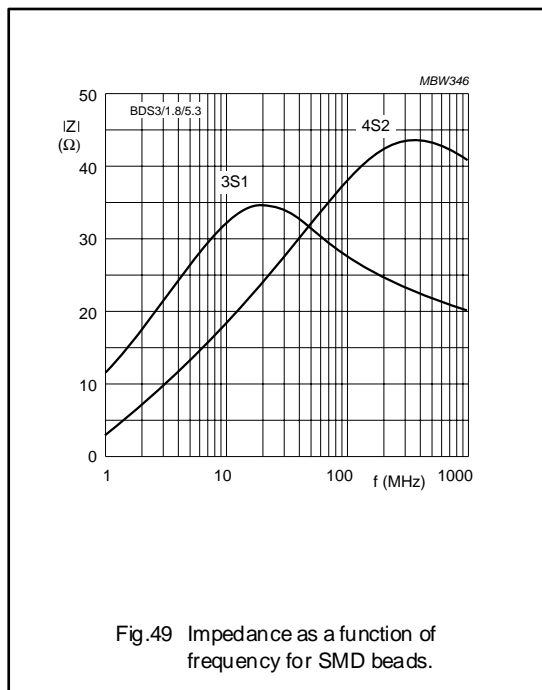


Fig. 49 Impedance as a function of frequency for SMD beads.

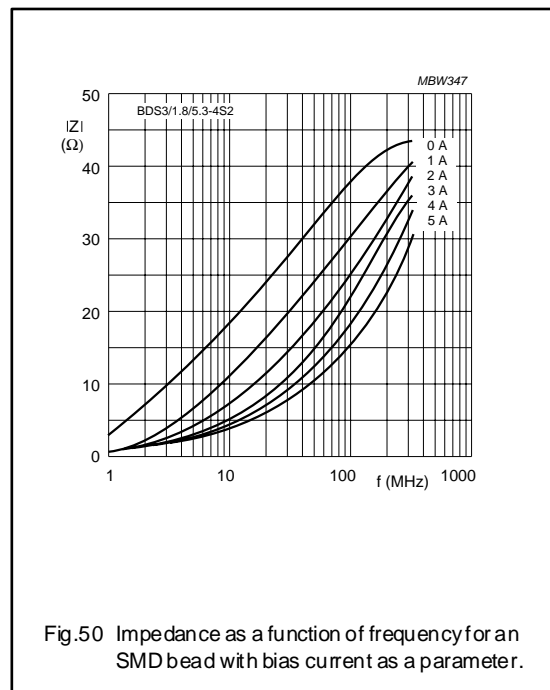


Fig. 50 Impedance as a function of frequency for a SMD bead with bias current as a parameter.

Soft Ferrites

Applications

SMD FERRITE BEADS FOR COMMON-MODE INTERFERENCE SUPPRESSION

Ferroxcube has a 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.

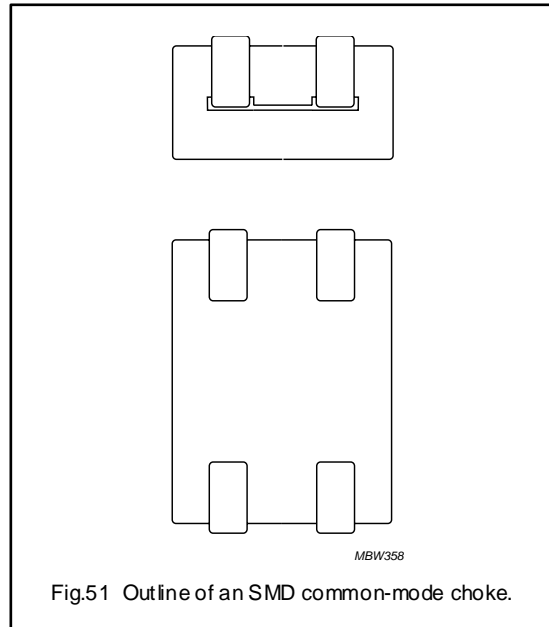


Fig.51 Outline of an SMD common-mode choke.

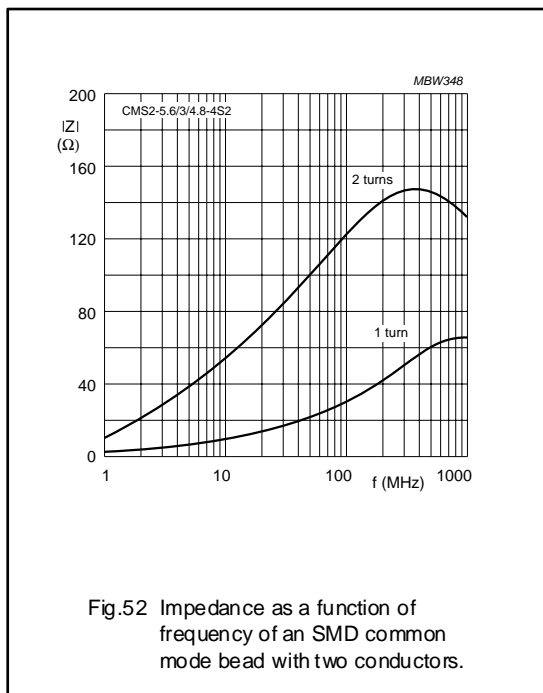


Fig.52 Impedance as a function of frequency of an SMD common mode bead with two conductors.

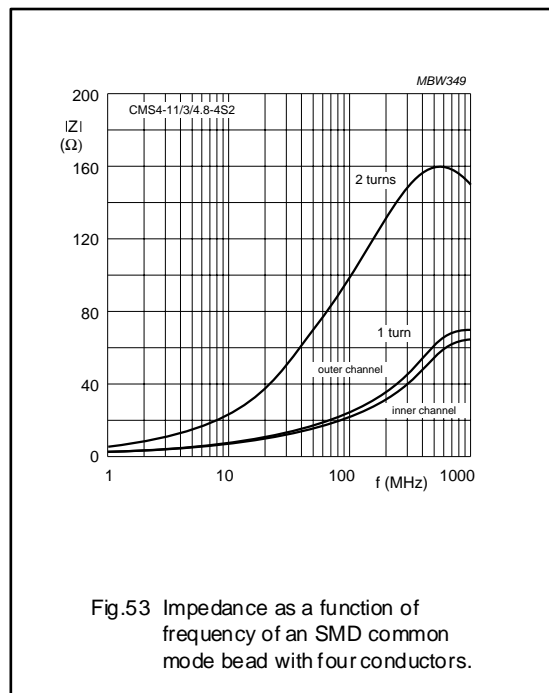


Fig.53 Impedance as a function of frequency of an SMD common mode bead with four conductors.



Soft Ferrites

Applications

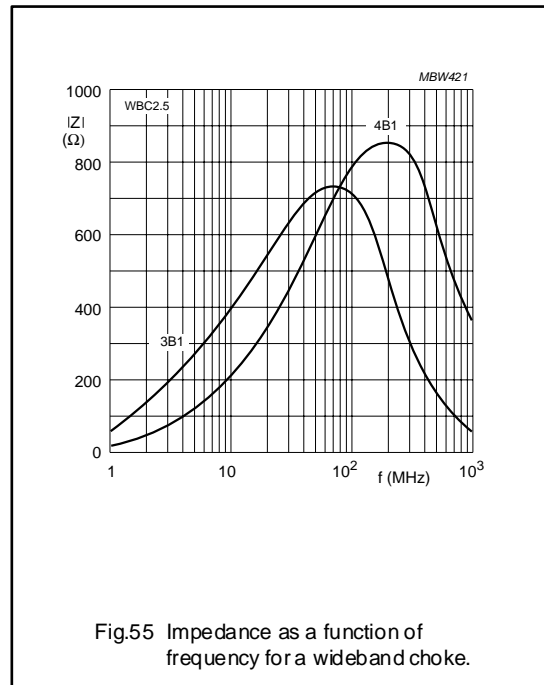
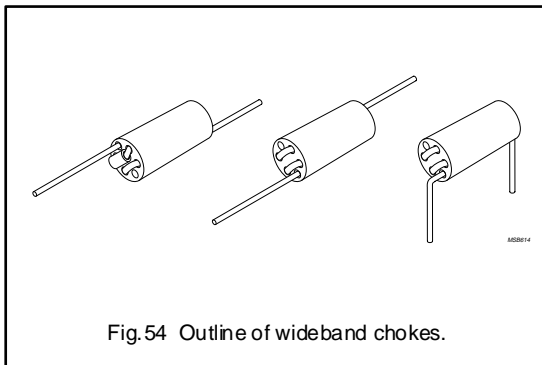
WIDE BAND CHOKES

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.

The basic range has been extended with several types, e.g. with isolation and taped on reel.



## Soft Ferrites

## Applications

### 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.

A plated version is available to increase the soldering surface. The metallization does not extend to the edge of the core to allow for side-to-side mounting.

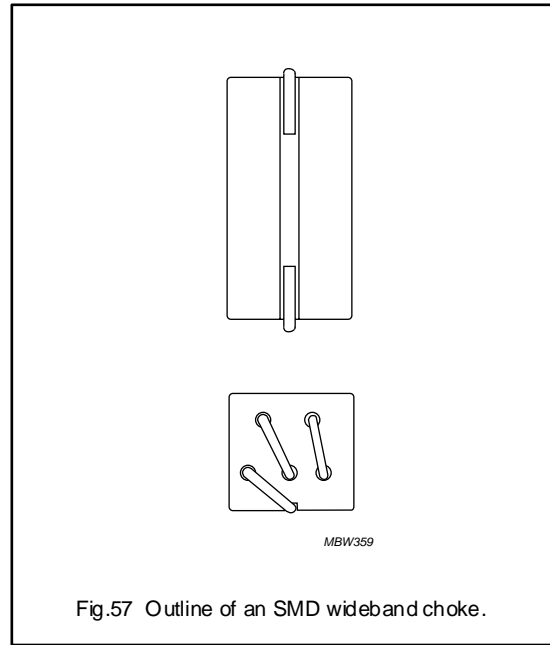


Fig.57 Outline of an SMD wideband choke.

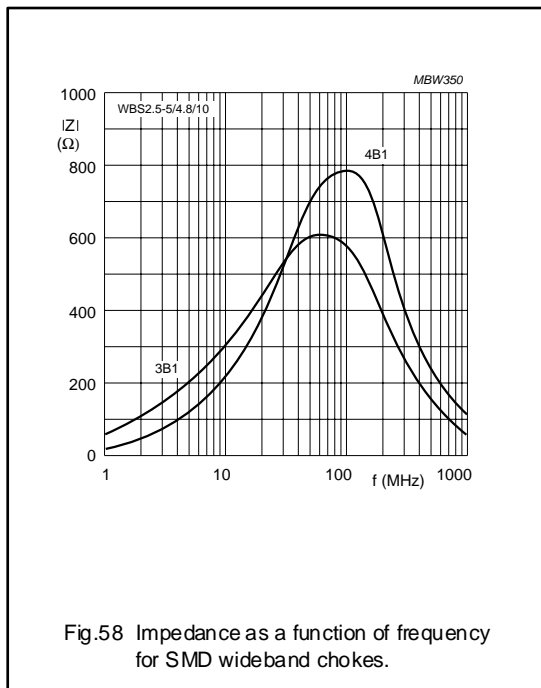


Fig.58 Impedance as a function of frequency for SMD wideband chokes.

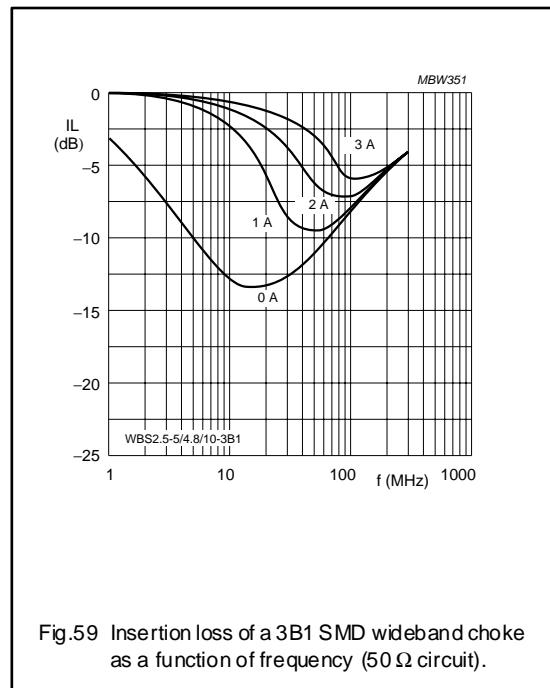


Fig.59 Insertion loss of a 3B1 SMD wideband choke as a function of frequency (50 Ω circuit).

CABLE SHIELDS

Also 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.

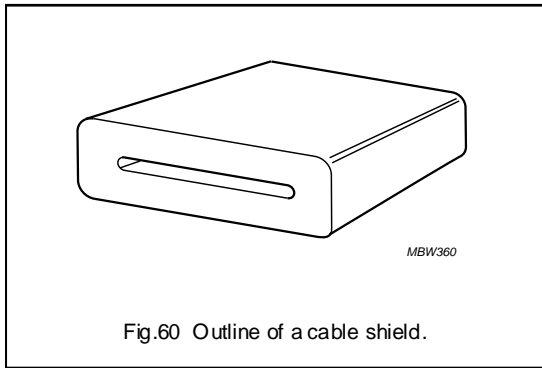


Fig.60 Outline of a cable shield.

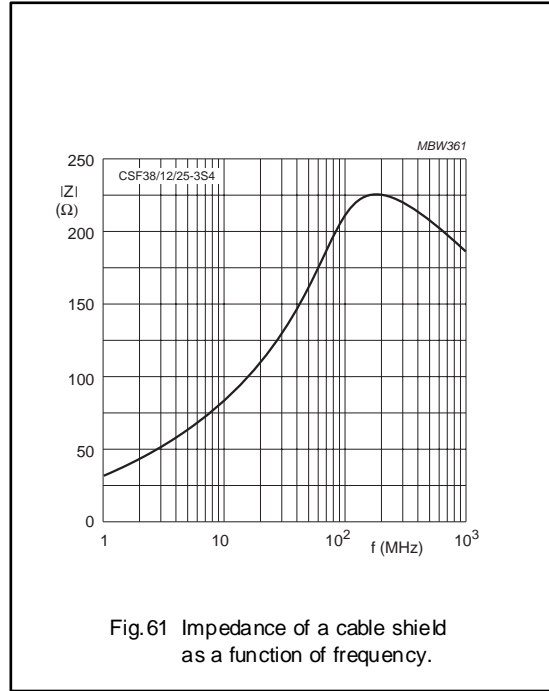


Fig.61 Impedance of a cable shield as a function of frequency.

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.62) 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:

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

where:

N = number of turns

A = cross sectional area of rod

l = length of coil.

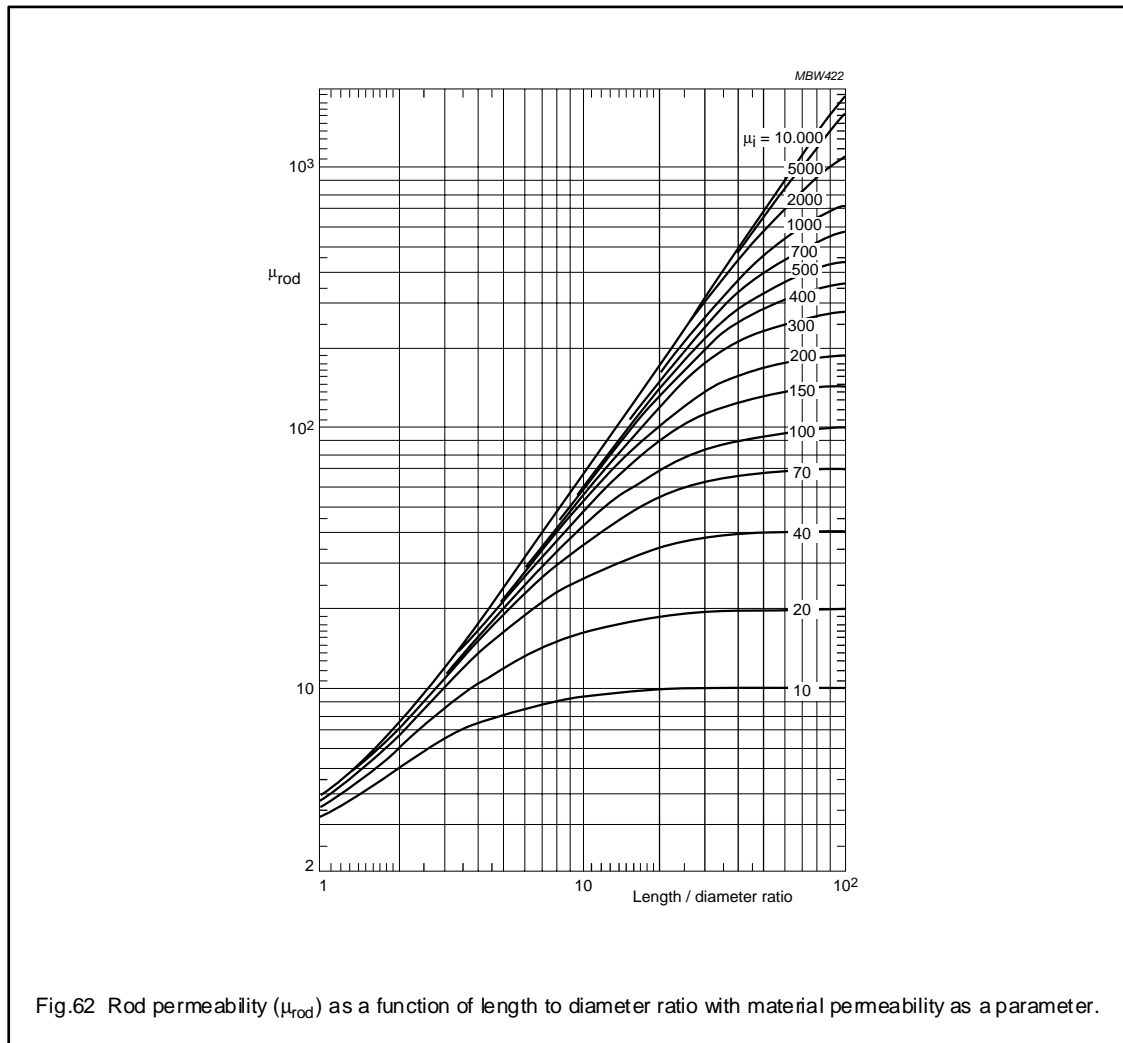


Fig.62 Rod permeability ( $\mu_{rod}$ ) as a function of length to diameter ratio with material permeability as a parameter.

## Literature and reference materials

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### FERROXCUBE APPLICATION LITERATURE

For the latest application literature, refer to the website at: [www.ferroxcube.com](http://www.ferroxcube.com)

### IEC STANDARDS ON SOFT FERRITES

- 60050-221 International Electrotechnical Vocabulary (IEV) - Chapter 221 : Magnetic materials and components - General terms
- 60133 Dimensions for pot cores made of magnetic oxides and associated parts
- 60205 Calculation of the effective parameters of magnetic piece parts
- 60401 Terms and nomenclature for cores made of magnetically soft ferrites
- 60367 Cores for inductors and transformers for telecommunications (replaced by 62044)
- 60401-1 Part 1 : Terms used for physical irregularities
- 60401-2 Part 2 : Reference of dimensions
- 60401-3 Part 3 : Guidelines on the format of data appearing in manufacturers' catalogues of transformer and inductor cores
- 60424-1 Ferrite cores - Guide on the limits of surface irregularities - Part 1 : General specification
- 60431 Dimensions of square cores (RM cores) made of magnetic oxides and associated parts (low-profile cores (RMILP) will move to 62313)
- 60647 Dimensions for magnetic oxide cores intended for use in power supplies (EC cores)
- 61185 Magnetic oxide cores (ETD cores) intended for use in power supply applications - Dimensions
- 61246 Magnetic oxide cores (E cores) of rectangular cross-section and associated parts - Dimensions
- 61247 PM cores made of magnetic oxides and associated parts - Dimensions
- 61332 Soft ferrite material classification
- 61596 Magnetic oxide EP cores and associated parts for use in inductors and transformers - Dimensions
- 61604 Dimensions of uncoated ring cores of magnetic oxides
- 61631 Test method for the mechanical strength of cores made of magnetic oxides
- 61860 Dimensions of low-profile cores made of magnetic oxides (will be replaced by 62313)
- 62024-1 High frequency inductive components - Electrical characteristics and measuring methods - Part 1 : Nanohenry range chip inductor
- 62025-1 High frequency inductive components - Non-electrical characteristics and measuring methods - Part 1 : Fixed surface mount inductors for use in electronic and telecommunication equipment
- 62044 Cores made of soft magnetic materials - Measuring methods
- 62044-1 Part 1 : Generic specification
- 62044-2 Part 2 : Magnetic properties at low excitation level
- 62044-3 Part 3 : Magnetic properties at high excitation level
- 62211 Inductive components - Reliability management
- 62313 Ferrite cores - Shapes and dimensions for planar magnetics applications
- 62358 Ferrite cores - Standard inductance factor (AL) and its tolerance
- 62398 Technology approval schedule for ferrite cores (IECQ / CECC QC210018)

## Literature and reference materials

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### RELATED IEC STANDARDS

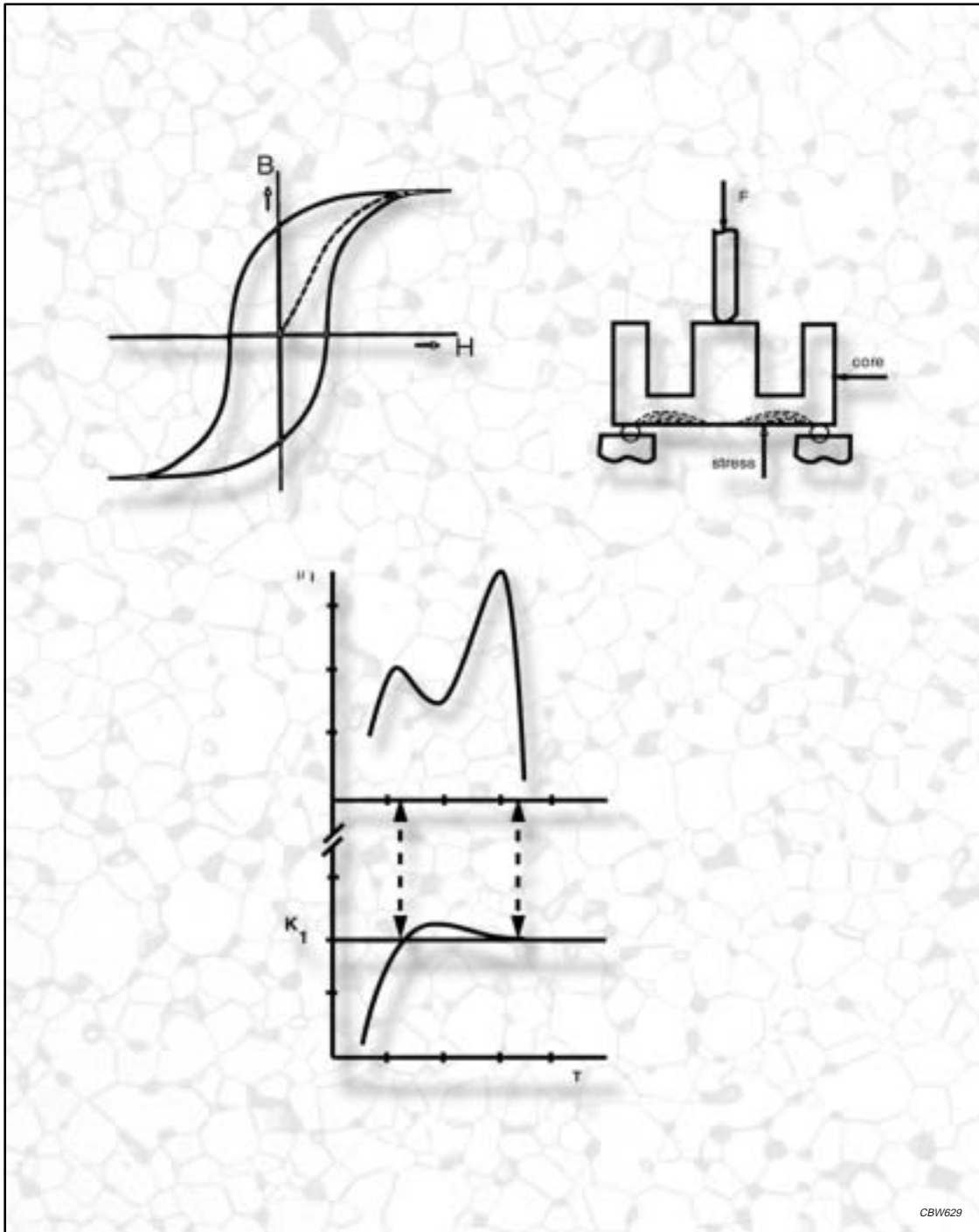
- 60068 Environmental testing
- 60068-2-20 Test T : Soldering
- 60068-2-58 Test Td : Test methods for solderability, resistance to dissolution of metallization and to soldering heat of surface mounting devices (SMD)
- 60085 Method for determining the thermal classification of electrical insulation
- 60286 Packaging of components for automatic handling
- 60286-1 Part 1 : Tape packaging of components with axial leads on continuous tapes
- 60286-2 Part 2 : Tape packaging of components with unidirectional leads on continuous tapes
- 60286-3 Part 3 : Packaging of leadless components on continuous tapes

## Literature and reference materials

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### 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 Dekker, 207 Madison Ave., New York, NY10016
4. Magnetic Core Selection for Transformers and Inductors C. McLyman, Marcel Dekker, 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. Chrysis, 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, NY 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





Soft Ferrites

Ferrite materials survey

Properties specified in this section are related to room temperature (25 °C) unless otherwise stated. They have been measured on sintered, non ground ring cores of dimensions  $\varnothing 25 \times \varnothing 15 \times 10$  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	$\mu_i$ at 25 °C	$B_{sat}$ (mT) at 25 °C (1200 A/m)	$T_C$ (°C)	$\rho$ ( $\Omega m$ )	FERRITE TYPE	AVAILABLE CORE SHAPES
Telecom filters Proximity sensors		3B46	3800	$\approx 545$	$\geq 255$	$\approx 10$	MnZn	RM, P, PT, PTS, EP, E, PlanarER, RM/I, RM/LP, PH
	< 0.1	3B7	2300	$\approx 440$	$\geq 170$	$\approx 1$	MnZn	
	0.2 – 2	3D3	750	$\approx 380$	$\geq 200$	$\approx 2$	MnZn	
	< 0.2	3H3	2000	$\approx 360$	$\geq 160$	$\approx 2$	MnZn	
Wideband signal transformers Pulse transformers Delay lines		3E27	6000	$\approx 430$	$\geq 150$	$\approx 0.5$	MnZn	RM, P, PT, PTS, EP, EP/LP, EPX, E, PlanarER, RM/I, RM/LP, Toroids
		3E28	4000	$\approx 440$	$\geq 145$	$\approx 1$	MnZn	
		3E5	10000	$\approx 380$	$\geq 125$	$\approx 0.5$	MnZn	
		3E55	10000	$\approx 370$	$\geq 100$	$\approx 0.1$	MnZn	
		3E6	12000	$\approx 390$	$\geq 130$	$\approx 0.1$	MnZn	
		3E7	15000	$\approx 390$	$\geq 130$	$\approx 0.1$	MnZn	
		3E8	18000	$\approx 380$	$\geq 100$	$\approx 0.1$	MnZn	Toroids
		3E9	20000	$\approx 380$	$\geq 100$	$\approx 0.1$	MnZn	
Line output transformers (LOT)	< 0.2	3C30	2100	$\approx 500$	$\geq 240$	$\approx 2$	MnZn	UR
	< 0.3	3C34	2100	$\approx 500$	$\geq 240$	$\approx 5$	MnZn	
Power transformers Power inductors General purpose transformers and inductors	< 0.2	3C81	2700	$\approx 450$	$\geq 210$	$\approx 1$	MnZn	E, EI, Planar E, EC, EP/D, EP, ETD, ER, PlanarER, U, RM/I, RM/LP, P, P/I, PT, PTS, PM, PQ, Toroids (gapped), Bobbin cores, Mini drumcores
	< 0.2	3C90	2300	$\approx 470$	$\geq 220$	$\approx 5$	MnZn	
	< 0.3	3C91	3000	$\approx 470$	$\geq 220$	$\approx 5$	MnZn	
	< 0.2	3C92	1500	$\approx 520$	$\geq 280$	$\approx 5$	MnZn	
	< 0.3	3C93	1800	$\approx 500$	$\geq 240$	$\approx 5$	MnZn	
	< 0.3	3C94	2300	$\approx 470$	$\geq 220$	$\approx 5$	MnZn	
	< 0.4	3C96	2000	$\approx 500$	$\geq 240$	$\approx 5$	MnZn	
	0.2 – 0.5	3F3	2000	$\approx 440$	$\geq 200$	$\approx 2$	MnZn	
	0.5 – 1	3F35	1400	$\approx 500$	$\geq 240$	$\approx 10$	MnZn	
	1 – 2	3F4	900	$\approx 410$	$\geq 220$	$\approx 10$	MnZn	
	1 – 2	3F45	900	$\approx 420$	$\geq 300$	$\approx 10$	MnZn	
2 – 4	3F5	650	$\approx 380$	$\geq 300$	$\approx 10$	MnZn		
4 – 10	4F1	80	$\approx 320^{(1)}$	$\geq 260$	$\approx 10^5$	NiZn		
Wideband EMI-suppression Wideband transformers Balun transformers	10 – 100	3B1	900	$\approx 380$	$\geq 150$	$\approx 0.2$	MnZn	BD, BDW, BDS, MLS, CMS, Cable shields, Rods, Toroids, WBS, WBC
	1 – 30	3S1	4000	$\approx 400$	$\geq 125$	$\approx 1$	MnZn	
	30 – 1000	3S3	350	$\approx 320$	$\geq 225$	$\approx 10^4$	MnZn	
	10 – 300	3S4	1700	$\approx 320$	$\geq 110$	$\approx 10^3$	MnZn	
	1 – 30	3S5	3800	$\approx 545$	$\geq 255$	$\approx 10$	MnZn	
	30 – 1000	4A11	850	$\approx 340$	$\geq 125$	$\approx 10^5$	NiZn	
	10 – 300	4A15	1200	$\approx 350$	$\geq 125$	$\approx 10^5$	NiZn	
	30 – 1000	4B1	250	$\approx 360^{(1)}$	$\geq 250$	$\approx 10^5$	NiZn	
	50 – 1000	4C65	125	$\approx 380^{(1)}$	$\geq 350$	$\approx 10^5$	NiZn	
	30 – 1000	4S2	850	$\approx 340$	$\geq 125$	$\approx 10^5$	NiZn	

Soft Ferrites

Ferrite materials survey

MAIN APPLICATION AREA	FREQUENCY RANGE (MHZ)	MATERIAL	$\mu_i$ at 25 °C	$B_{sat}$ (mT) at 25 °C (1200 A/m)	$T_C$ (°C)	$\rho$ ( $\Omega m$ )	FERRITE TYPE	AVAILABLE CORE SHAPES
EMI-filters Current compensated chokes		3C11	4300	$\approx 390$	$\geq 125$	$\approx 1$	MnZn	Toroids E, EI, U
		3E25	6000	$\approx 390$	$\geq 125$	$\approx 0.5$	MnZn	
		3E26	7000	$\approx 430$	$\geq 155$	$\approx 0.5$	MnZn	
		3E5	10000	$\approx 380$	$\geq 125$	$\approx 0.5$	MnZn	
		3E6	12000	$\approx 390$	$\geq 130$	$\approx 0.1$	MnZn	
		4A11	850	$\approx 340$	$\geq 125$	$\approx 10^5$	NiZn	
HF Tuning	< 1	3B1	900	$\approx 380$	$\geq 150$	$\approx 0.2$	MnZn	Rods, Tubes, Widband chokes
	< 2	3D3	750	$\approx 380$	$\geq 200$	$\approx 2$	MnZn	
	< 5	4B1	250	$\approx 360^{(1)}$	$\geq 250$	$\approx 10^5$	NiZn	
	< 5	4B2	250	$\approx 360^{(1)}$	$\geq 335$	$\approx 10^5$	NiZn	
	< 20	4C65	125	$\approx 380^{(1)}$	$\geq 350$	$\approx 10^5$	NiZn	
	< 50	4D2	60	$\approx 250^{(2)}$	$\geq 400$	$\approx 10^5$	NiZn	
	< 200	4E1	15	$\approx 220^{(3)}$	$\geq 500$	$\approx 10^5$	NiZn	
magnetic regulators	< 0.2	3R1	800	$\approx 410$	$\geq 230$	$\approx 10^3$	MnZn	Toroids
absorber tiles	< 1000	4S60	2000	$\approx 260$	$\geq 100$	$\approx 10^5$	NiZn	Tiles
scientific particle accelerators	< 10	4B3	300	$\approx 420^{(1)}$	$\geq 250$	$\approx 10^5$	NiZn	Large toroids Machined ferrite products
	< 100	4E2	25	$\approx 350^{(2)}$	$\geq 400$	$\approx 10^5$	NiZn	
	< 10	4M2	140	$\approx 310^{(1)}$	$\geq 200$	$\approx 10^5$	NiZn	
	< 1	8C11	1200	$\approx 310$	$\geq 125$	$\approx 10^5$	NiZn	
	< 10	8C12	900	$\approx 260$	$\geq 125$	$\approx 10^5$	NiZn	

1. At 3000 A/m
2. At 10 kA/m
3. At 20 kA/m

Iron powder material grade survey

IRON POWDER MATERIAL	$\mu_i$ 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 modulus	$(90 \text{ to } 150) \times 10^3$	$(80 \text{ to } 150) \times 10^3$	N/mm <sup>2</sup>
Ultimate compressive strength	200 to 600	200 to 700	N/mm <sup>2</sup>
Ultimate tensile strength	20 to 65	30 to 60	N/mm <sup>2</sup>
Vickers hardness	600 to 700	800 to 900	N/mm <sup>2</sup>
Linear expansion coefficient	$(10 \text{ to } 12) \times 10^{-6}$	$(7 \text{ to } 8) \times 10^{-6}$	K <sup>-1</sup>
Specific heat	700 to 800	750	Jkg <sup>-1</sup> × K <sup>-1</sup>
Heat conductivity	$(3.5 \text{ to } 5.0) \times 10^{-3}$	$(3.5 \text{ to } 5.0) \times 10^{-3}$	Jmm <sup>-1</sup> s <sup>-1</sup> × K <sup>-1</sup>

## Soft Ferrites

## Ferrite materials survey

## RESISTIVITY

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

Since there is an isolating layer between the crystals, the bulk resistivity is much higher: 0.1 to  $10 \Omega\text{m}$  for MnZn ferrites and  $10^4$  to  $10^6 \Omega\text{m}$  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 ( $\Omega\text{m}$ )
-20	$\approx 10$
0	$\approx 7$
20	$\approx 4$
50	$\approx 2$
100	$\approx 1$

**Table 2** Resistivity as a function of temperature of a NiZn-ferrite (4C65)

TEMPERATURE (°C)	RESISTIVITY ( $\Omega\text{m}$ )
0	$\approx 5 \cdot 10^7$
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 their 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 ( $\Omega\text{m}$ )
0.1	$\approx 2$
1	$\approx 0.5$
10	$\approx 0.1$
100	$\approx 0.01$

**Table 4** Resistivity as function of frequency for NiZn ferrites

FREQUENCY (MHz)	RESISTIVITY ( $\Omega\text{m}$ )
0.1	$\approx 10^5$
1	$\approx 5 \cdot 10^4$
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 ( $\epsilon_r$ )
0.1	$\approx 2 \cdot 10^5$
1	$\approx 10^5$
10	$\approx 5 \cdot 10^4$
100	$\approx 10^4$

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

FREQUENCY (MHz)	PERMITTIVITY ( $\epsilon_r$ )
0.001	$\approx 100$
0.01	$\approx 50$
1	$\approx 25$
10	$\approx 15$
100	$\approx 12$

Material specification

2P..

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	40 $\pm 10\%$	
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\leq 1500 \times 10^{-6}$	
$B_r$	from $25 \times 10^3$ A/m	$\approx 250$	mT
$H_c$	from $25 \times 10^3$ A/m	$\approx 2000$	A/m
B	H = $25 \times 10^3$ A/m	$\approx 950$	mT
$\alpha_F$	25 to 55 °C	$\approx 10 \times 10^{-6}$	K <sup>-1</sup>
$T_{max}$		160	°C

Material grade specification - 2P50

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	50 $\pm 10\%$	
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\approx 1500 \times 10^{-6}$	
$B_r$	from $25 \times 10^3$ A/m	$\approx 300$	mT
$H_c$	from $25 \times 10^3$ A/m	$\approx 1800$	A/m
B	H = $25 \times 10^3$ A/m	$\approx 1000$	mT
$\alpha_F$	25 to 55 °C	$\approx 20 \times 10^{-6}$	K <sup>-1</sup>
$T_{max}$		140	°C

Material grade specification - 2P65

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	65 $\pm 10\%$	
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\approx 1000 \times 10^{-6}$	
$B_r$	from $25 \times 10^3$ A/m	$\approx 350$	mT
$H_c$	from $25 \times 10^3$ A/m	$\approx 1500$	A/m
B	H = $25 \times 10^3$ A/m	$\approx 1150$	mT
$\alpha_F$	25 to 55 °C	$\approx 15 \times 10^{-6}$	K <sup>-1</sup>
$T_{max}$		140	°C

Material grade specification - 2P80

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	80 $\pm 10\%$	
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\approx 1000 \times 10^{-6}$	
$B_r$	from $25 \times 10^3$ A/m	$\approx 400$	mT
$H_c$	from $25 \times 10^3$ A/m	$\approx 1200$	A/m
B	H = $25 \times 10^3$ A/m	$\approx 1400$	mT
$\alpha_F$	25 to 55 °C	$\approx 15 \times 10^{-6}$	K <sup>-1</sup>
$T_{max}$		140	°C

Material grade specification - 2P90

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	90 $\pm 10\%$	
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\approx 1000 \times 10^{-6}$	
$B_r$	from $25 \times 10^3$ A/m	$\approx 450$	mT
$H_c$	from $25 \times 10^3$ A/m	$\approx 900$	A/m
B	H = $25 \times 10^3$ A/m	$\approx 1600$	mT
$\alpha_F$	25 to 55 °C	$\approx 15 \times 10^{-6}$	K <sup>-1</sup>
$T_{max}$		140	°C

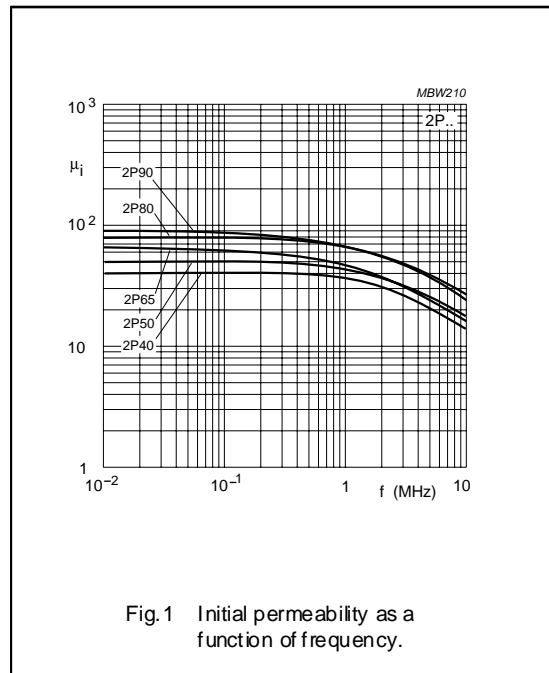


Fig.1 Initial permeability as a function of frequency.

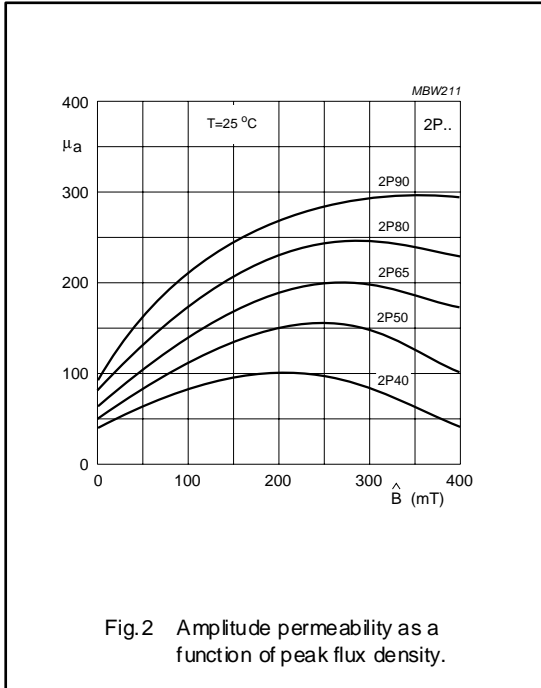


Fig.2 Amplitude permeability as a function of peak flux density.

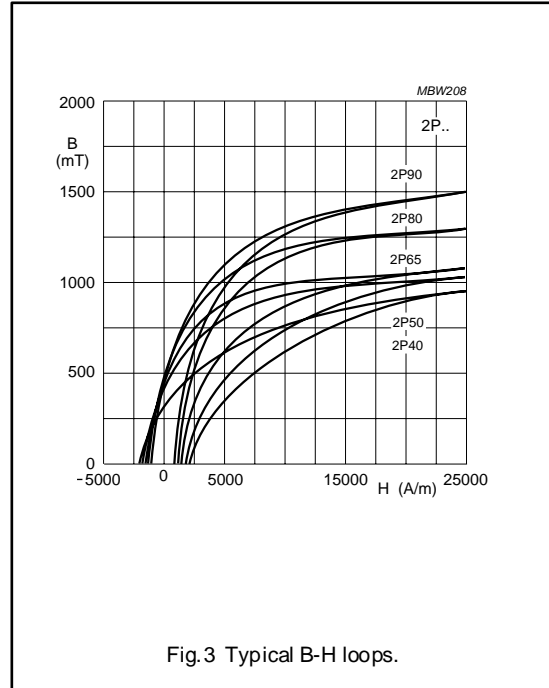


Fig.3 Typical B-H loops.

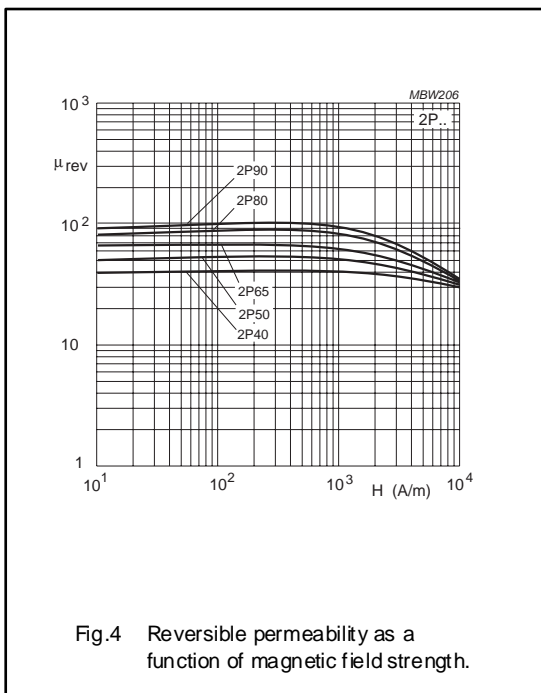


Fig.4 Reversible permeability as a function of magnetic field strength.

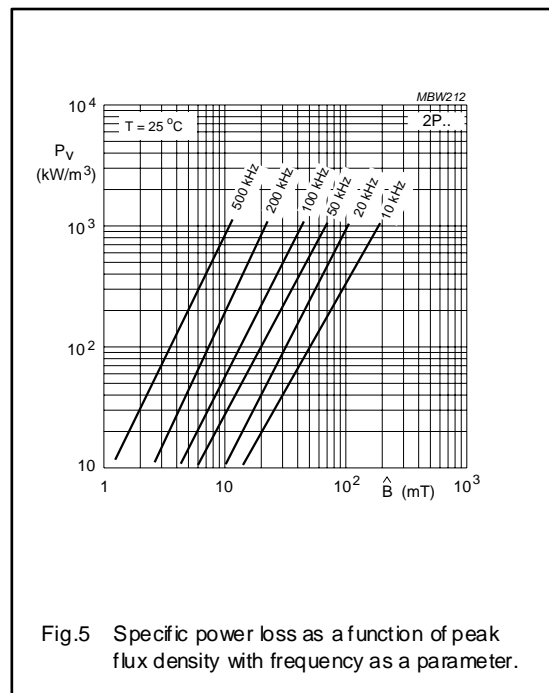


Fig.5 Specific power loss as a function of peak flux density with frequency as a parameter.

Material specification

3B1

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	900 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 380$ $\approx 230$	mT
$\tan \delta/\mu_i$	25 °C; 450 kHz; 0.25 mT	$\leq 50 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 0.2$	$\Omega\text{m}$
$T_C$		$\geq 150$	°C
density		$\approx 4800$	$\text{kg/m}^3$

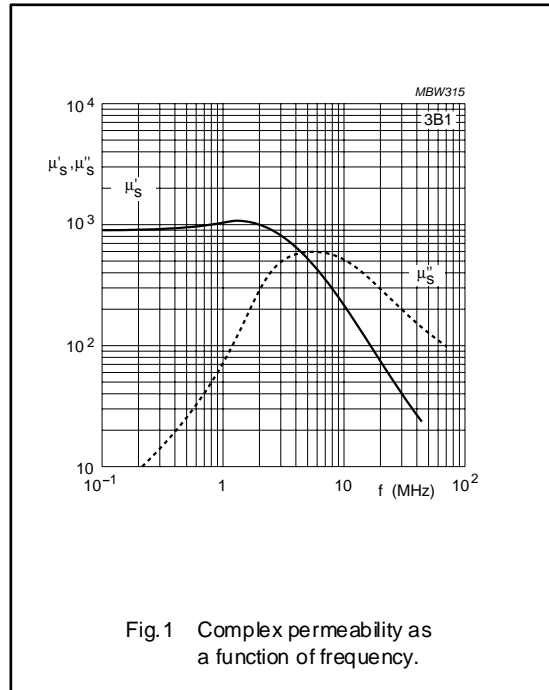


Fig. 1 Complex permeability as a function of frequency.

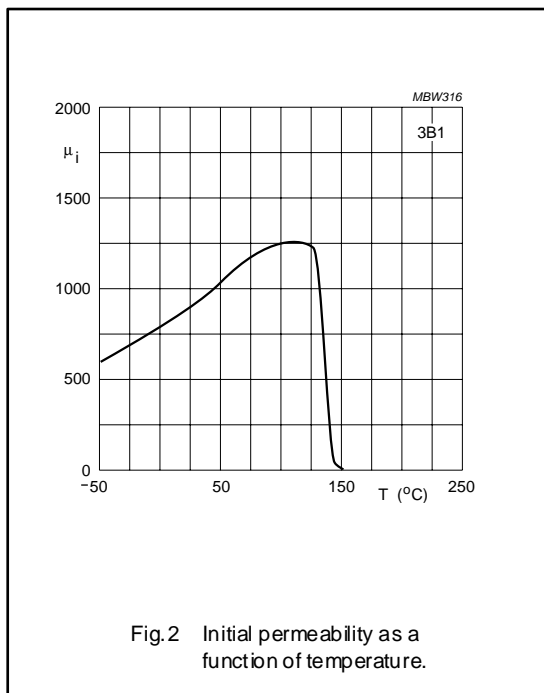


Fig. 2 Initial permeability as a function of temperature.

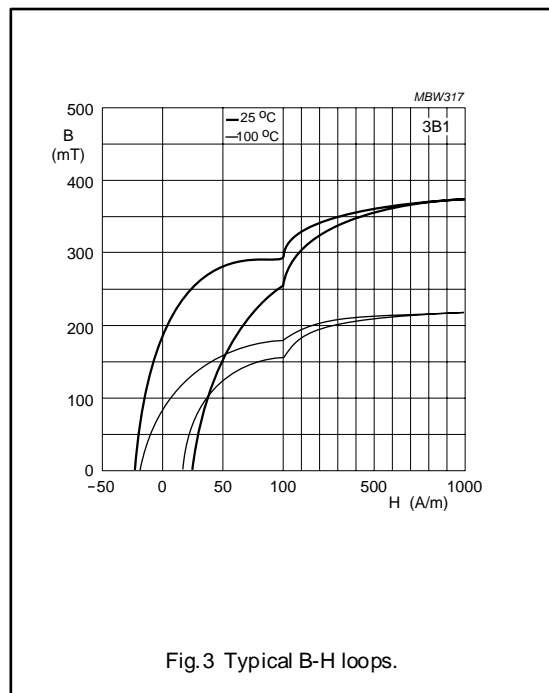


Fig. 3 Typical B-H loops.



**3B46 SPECIFICATIONS**

A medium permeability material with high saturation flux density. This material is suitable as linear filter choke with dc bias current, over a broad temperature range. It has been specifically designed for use in POTS-splitters for DSL applications.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$3800 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 545$ $\approx 435$	mT
$\tan\delta/\mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 100 kHz; 0.25 mT	$\approx 0.6 \times 10^{-6}$ $\approx 1.6 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5–3 mT	$\approx 0.12 \times 10^{-6}$	mT <sup>-1</sup>
$\alpha_F$	$\leq 10$ kHz; 0.25 mT; 5 to 25 °C $\leq 10$ kHz; 0.25 mT; 25 to 55 °C	$\approx 4.4 \times 10^{-6}$ $\approx -2.2 \times 10^{-6}$	K <sup>-1</sup> K <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
$T_C$		$\geq 255$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

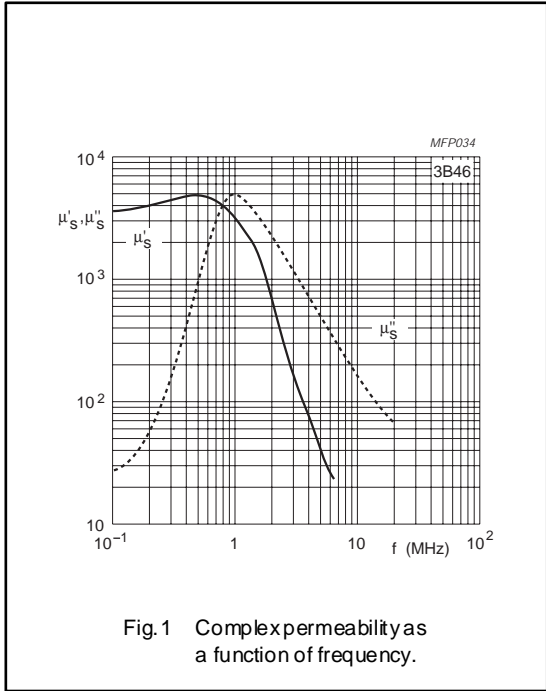


Fig. 1 Complex permeability as a function of frequency.

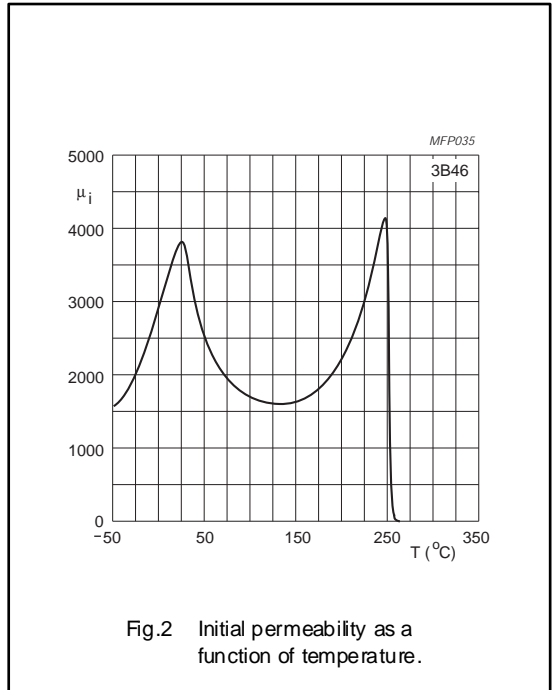


Fig. 2 Initial permeability as a function of temperature.

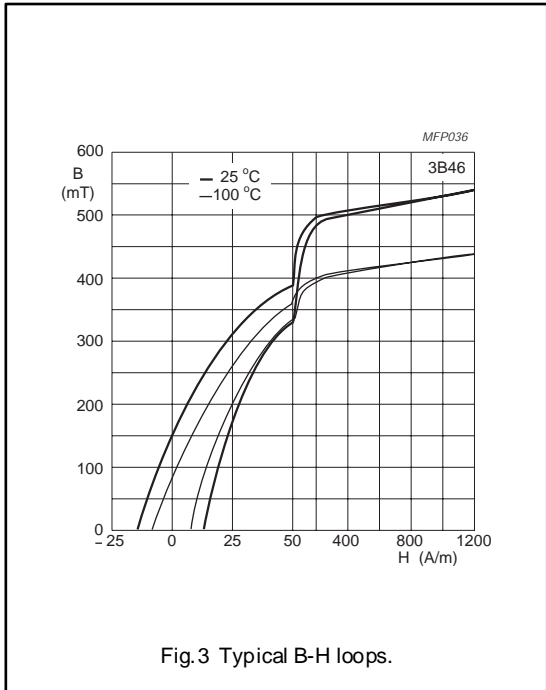
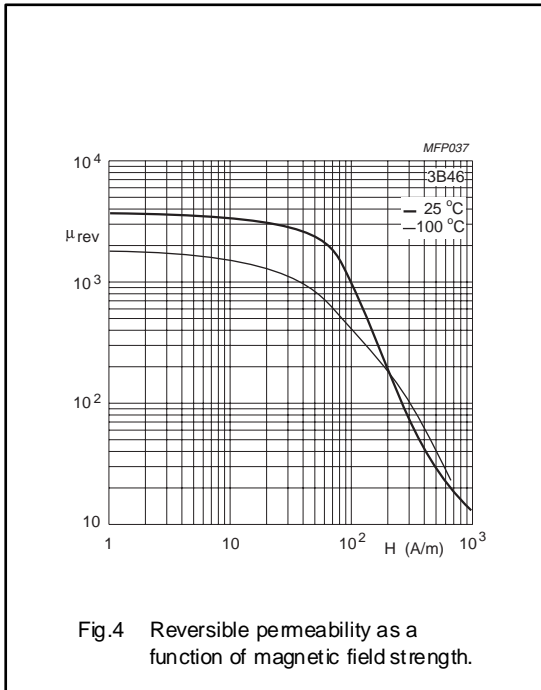


Fig. 3 Typical B-H loops.





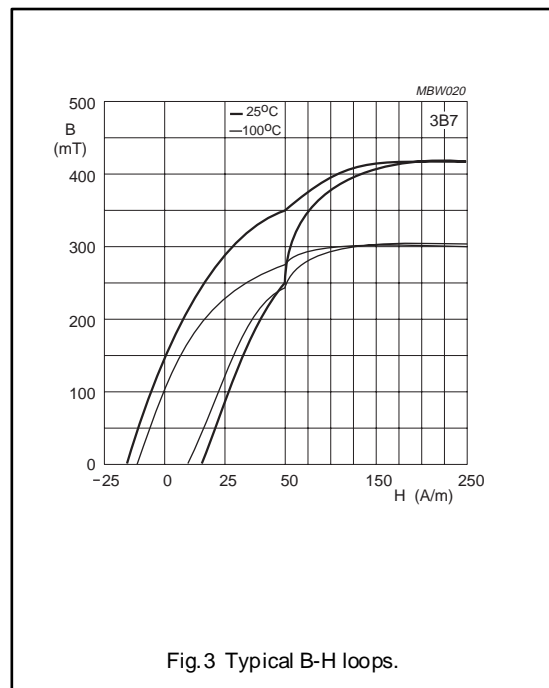
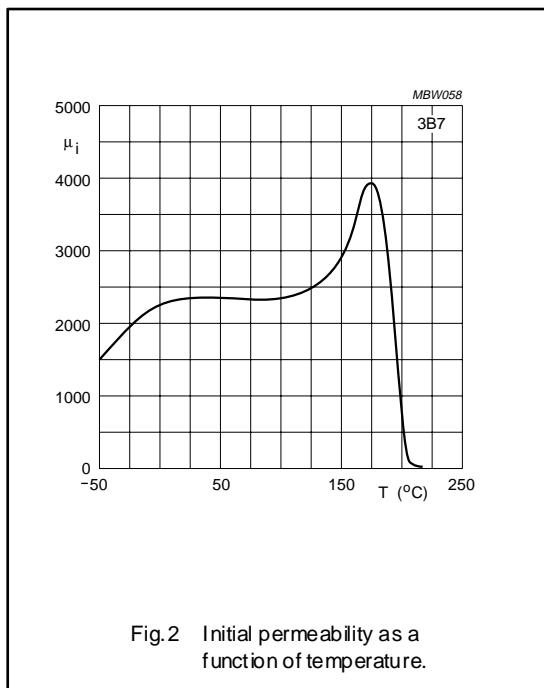
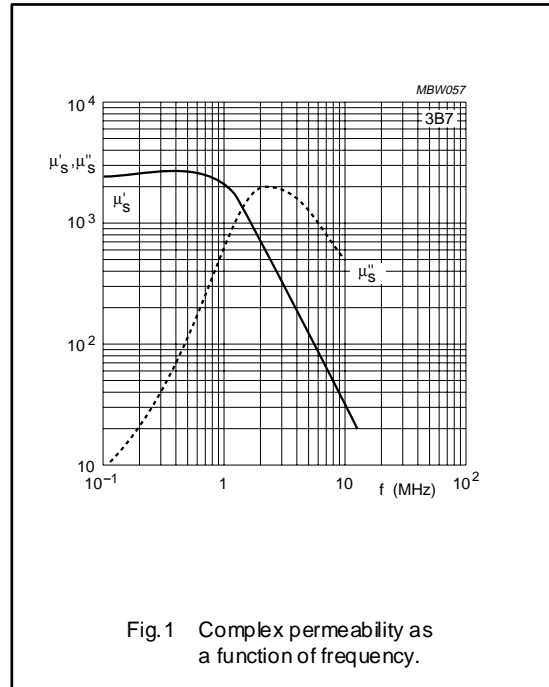
Material specification

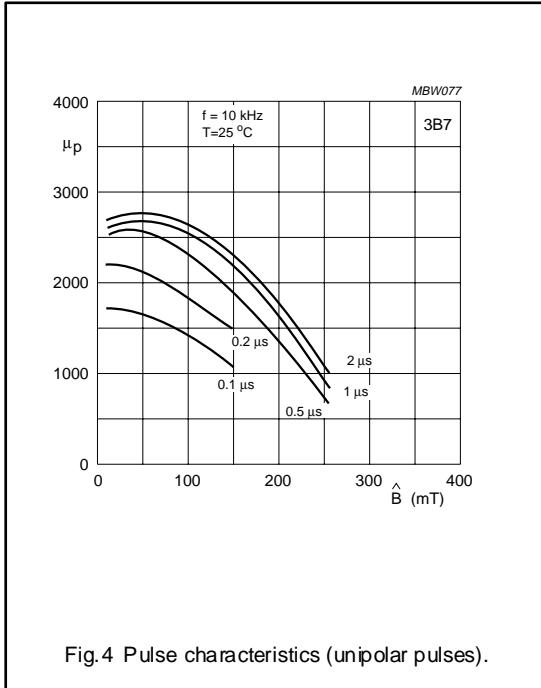
3B7

3B7 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2300 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 440$ $\approx 320$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT 25 °C; 500 kHz; 0.25 mT 25 °C; 1 MHz; 0.25 mT	$\leq 5 \times 10^{-6}$ $\approx 25 \times 10^{-6}$ $\approx 120 \times 10^{-6}$	
$D_F$	25 °C; 10 kHz; 0.25 mT	$\leq 4.5 \times 10^{-6}$	
$\alpha_F$	+20 to 70 °C; $\leq 10$ kHz; 0.25 mT	$(0 \pm 0.6) \times 10^{-6}$	$K^{-1}$
$\rho$	DC, 25 °C	$\approx 1$	$\Omega m$
$T_C$		$\geq 170$	°C
density		$\approx 4800$	$kg/m^3$





Material specification

3C11

3C11 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$4300 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 390$ $\approx 230$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT 25 °C; 300 kHz; 0.25 mT	$\leq 20 \times 10^{-6}$ $\leq 200 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 1$	$\Omega\text{m}$
$T_c$		$\geq 125$	°C
density		$\approx 4900$	$\text{kg/m}^3$

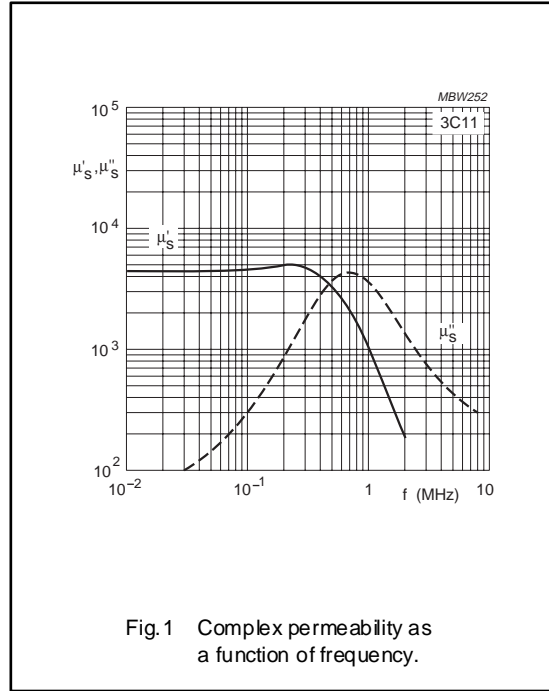


Fig. 1 Complex permeability as a function of frequency.

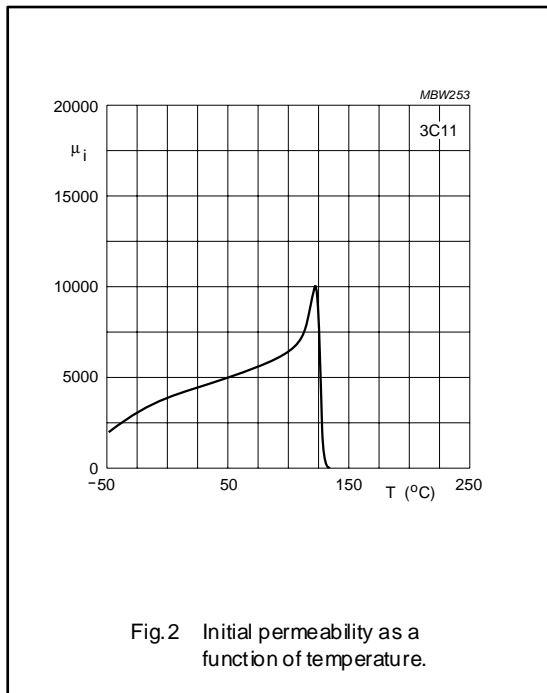


Fig. 2 Initial permeability as a function of temperature.

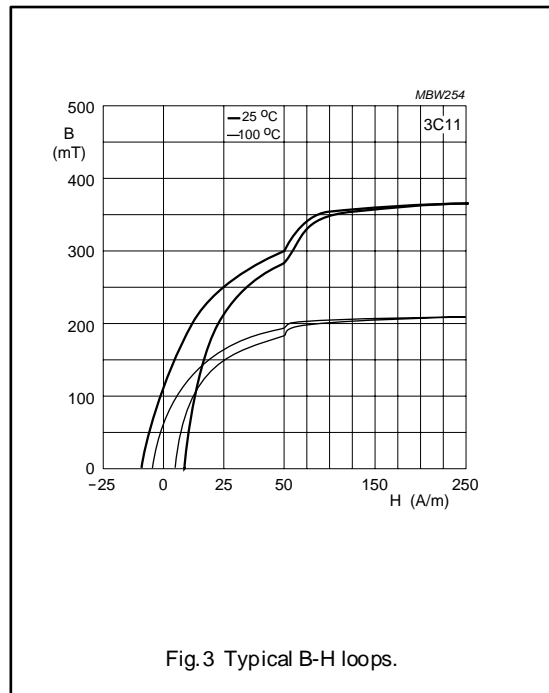
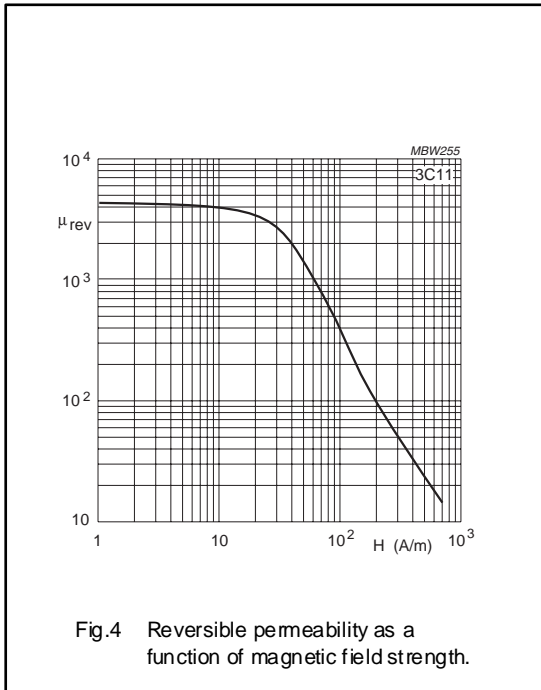


Fig. 3 Typical B-H loops.



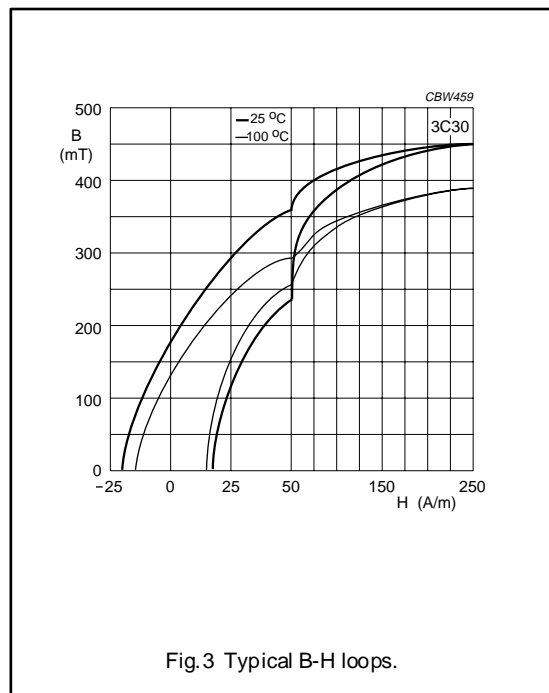
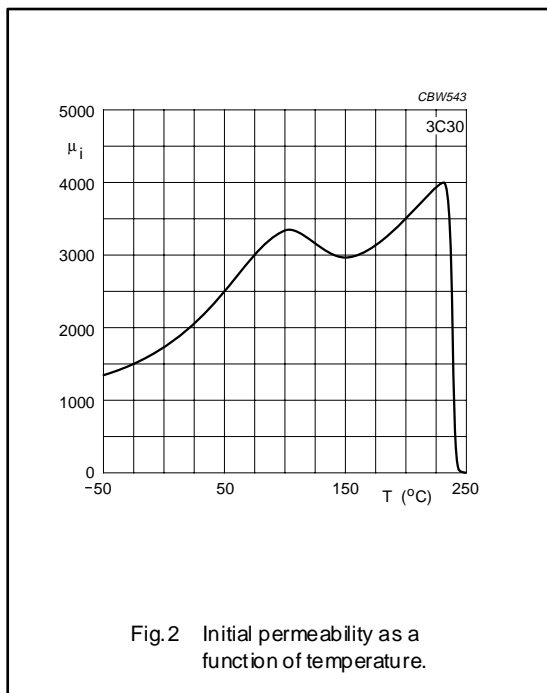
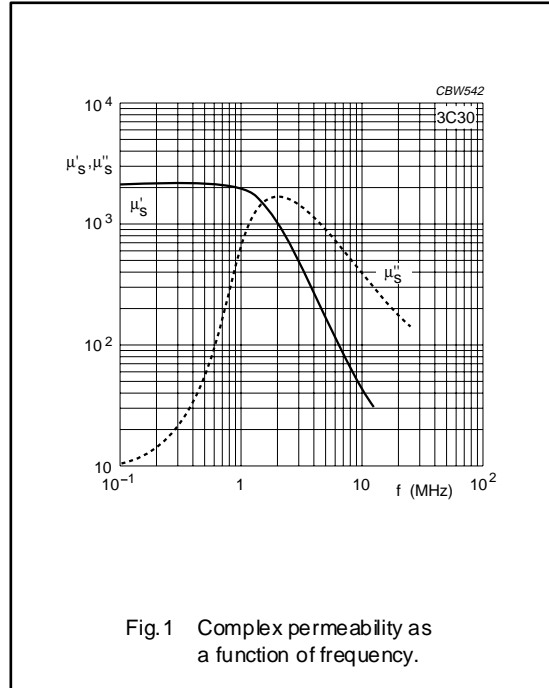
Material specification

3C30

3C30 SPECIFICATIONS

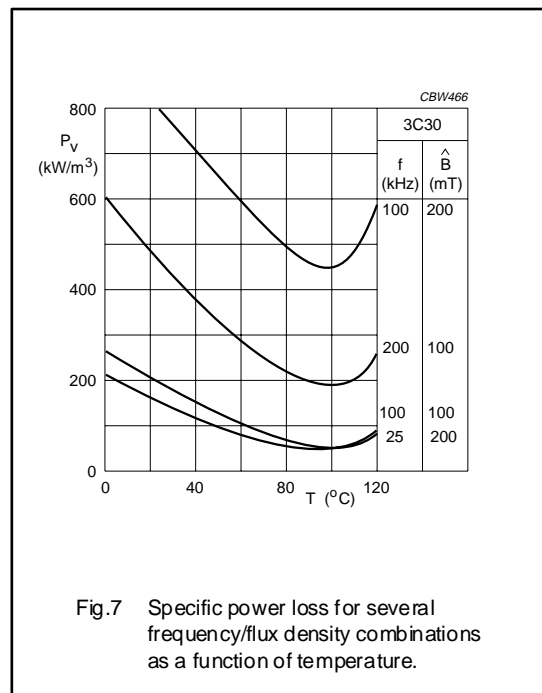
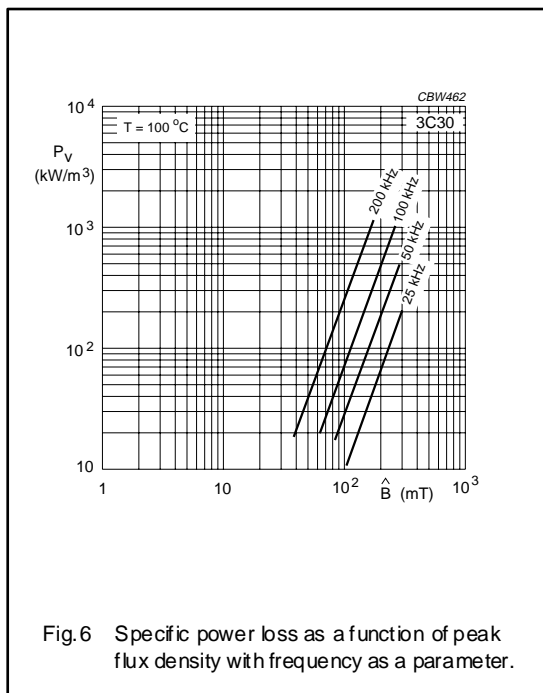
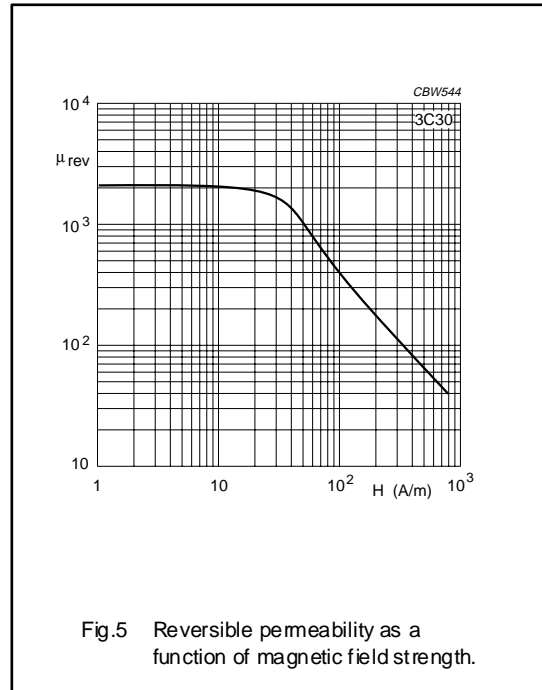
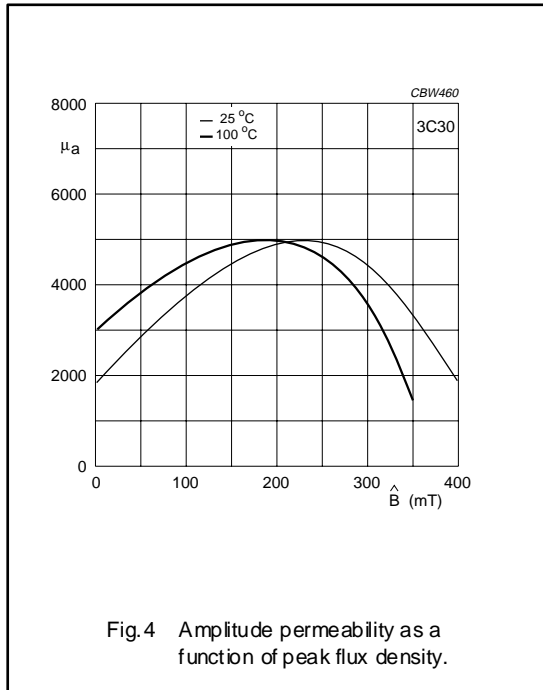
A low frequency, high Bsat power material optimized for use in line output transformers at frequencies up to 0.2 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2100 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	5000 $\pm 25\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 500$ $\approx 440$	mT
$P_V$	100 °C; 25 kHz; 200 mT 100 °C; 100 kHz; 100 mT 100 °C; 100 kHz; 200 mT	$\leq 80$ $\leq 80$ $\approx 450$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 2$	$\Omega\text{m}$
$T_C$		$\geq 240$	°C
density		$\approx 4800$	kg/m <sup>3</sup>



Material specification

3C30



Material specification

3C34

3C34 SPECIFICATIONS

A medium frequency, high Bs<sub>at</sub> power material optimized for use in line output transformers at frequencies up to 0.3 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2100 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	6500 $\pm 25\%$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 500$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 440$	mT
P <sub>V</sub>	100 °C; 100 kHz; 100 mT	$\leq 60$	kW/m <sup>3</sup>
	100 °C; 100 kHz; 200 mT	$\leq 400$	
$\rho$	DC; 25 °C	$\approx 5$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 240$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

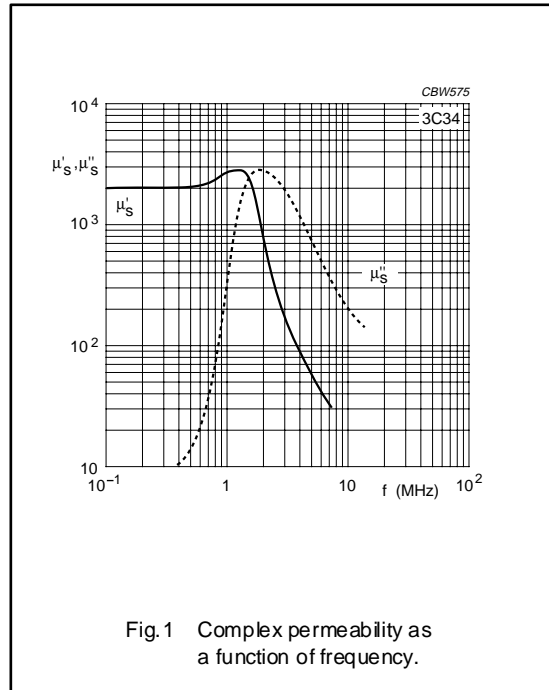


Fig.1 Complex permeability as a function of frequency.

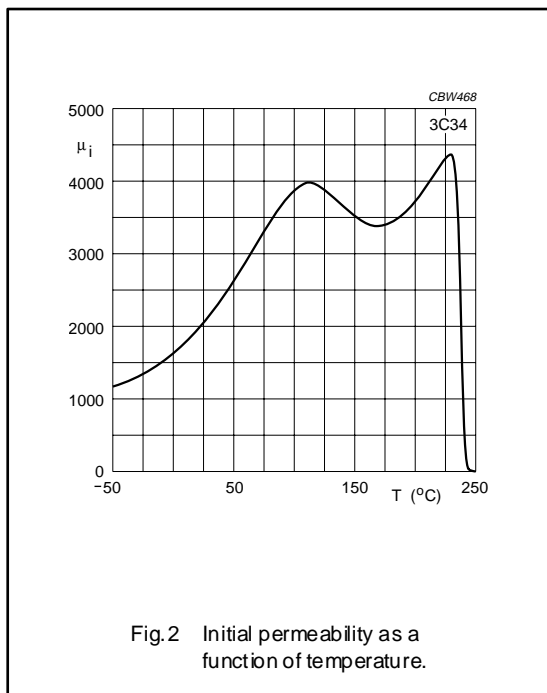


Fig.2 Initial permeability as a function of temperature.

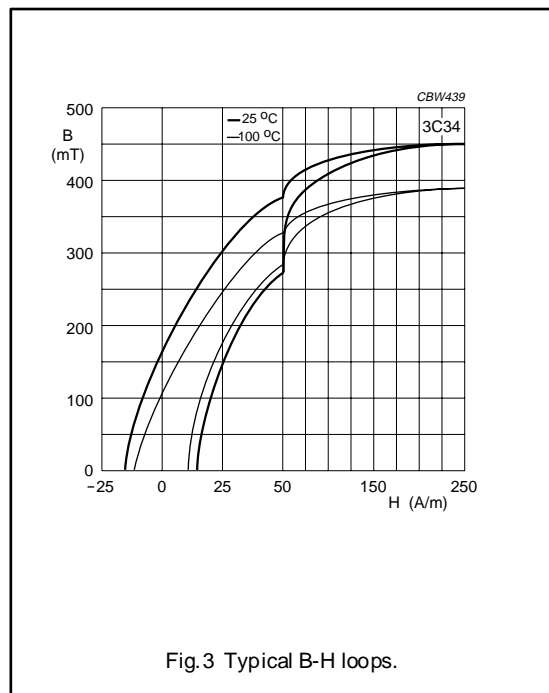
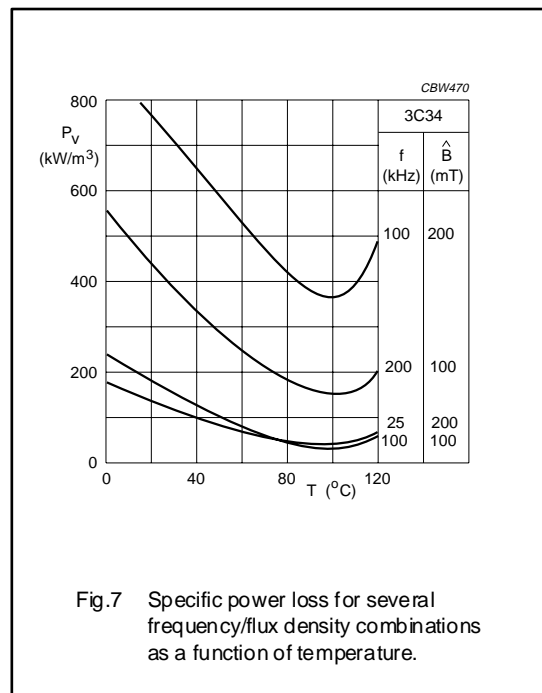
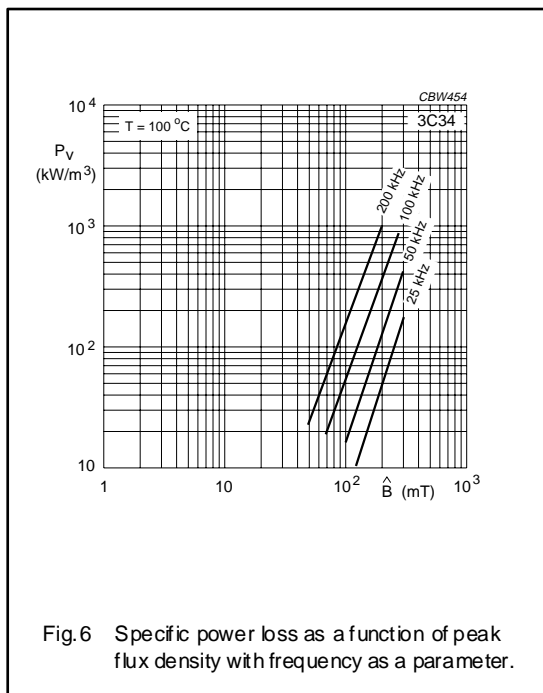
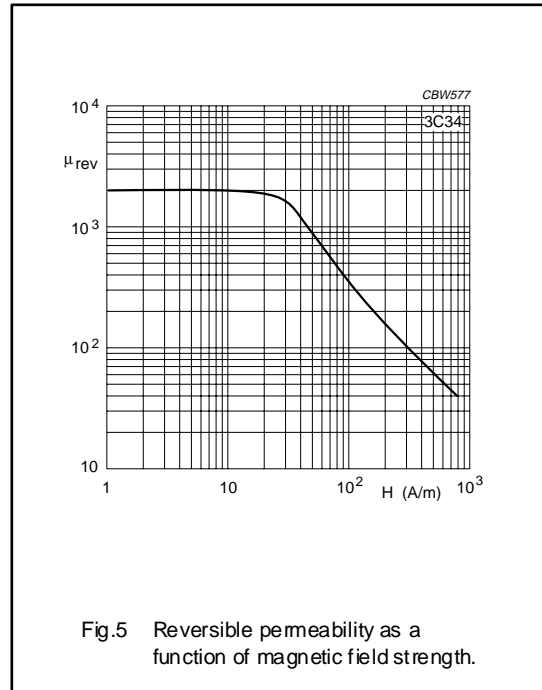
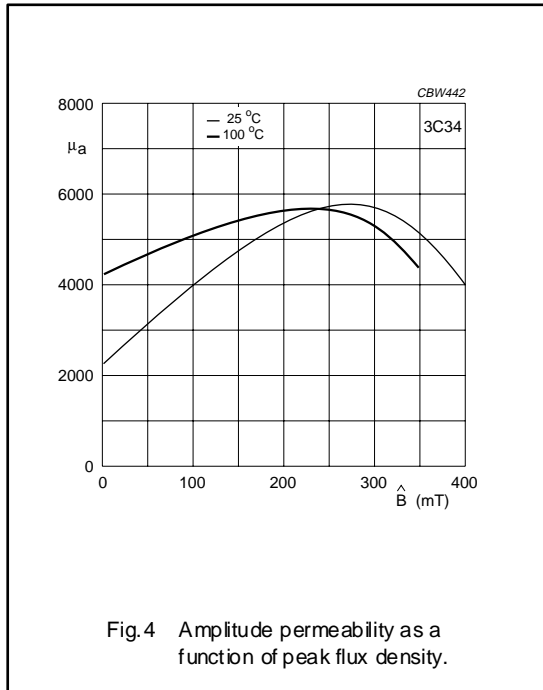


Fig.3 Typical B-H loops.



Material specification

3C34



Material specification

3C81

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2700 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	5500 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 450$ $\approx 360$	mT
$P_V$	100 °C; 25 kHz; 200 mT	$\leq 185$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 1$	$\Omega\text{m}$
$T_C$		$\geq 210$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

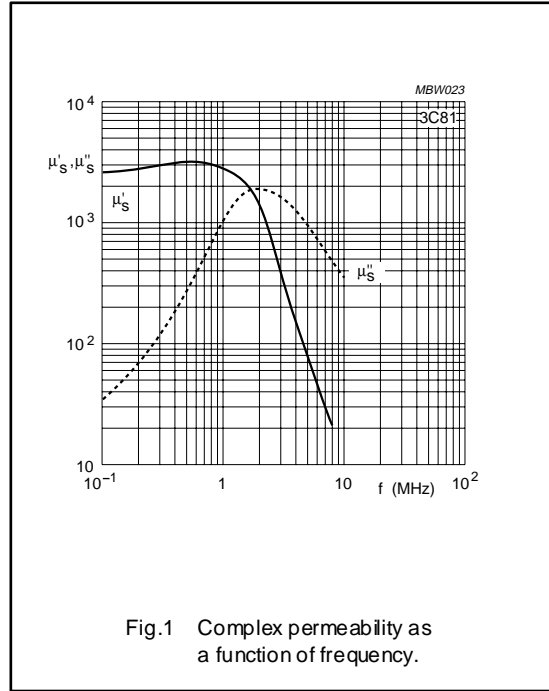


Fig.1 Complex permeability as a function of frequency.

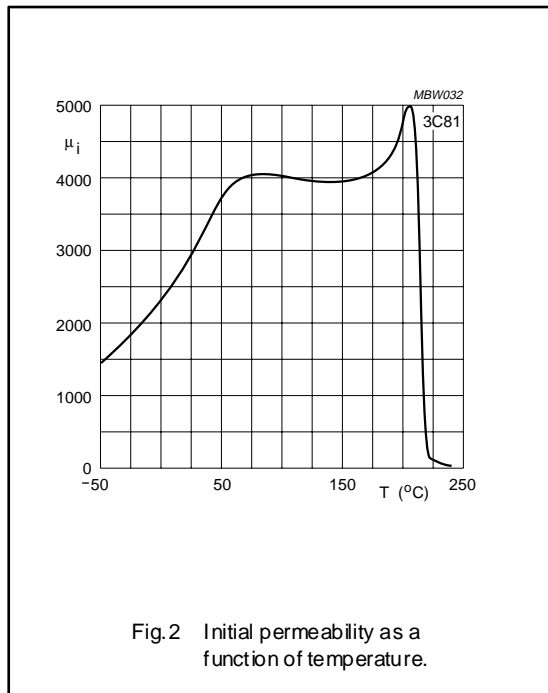


Fig.2 Initial permeability as a function of temperature.

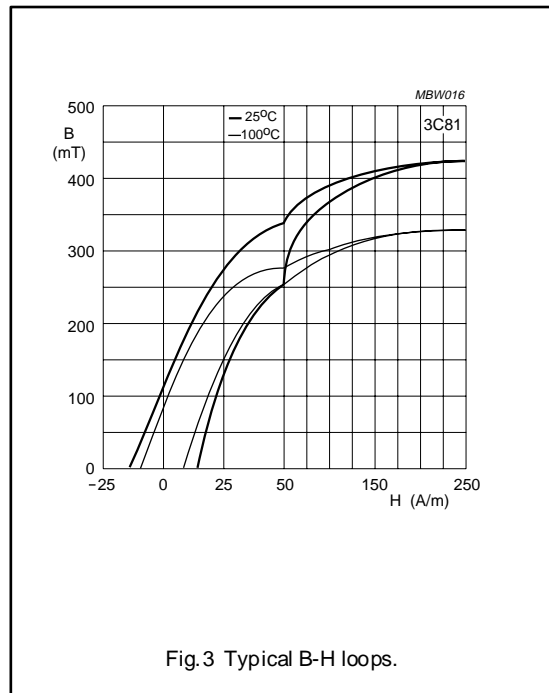
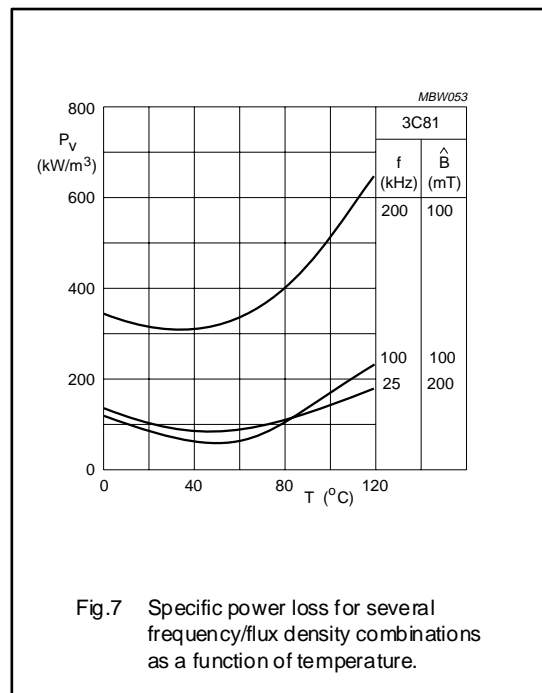
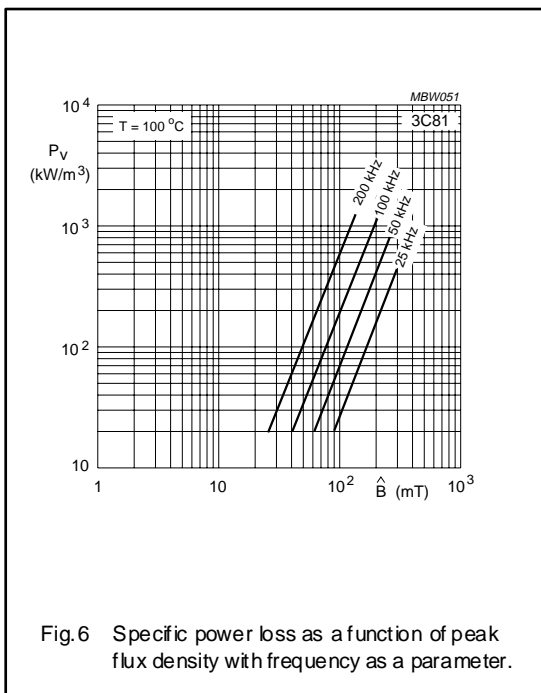
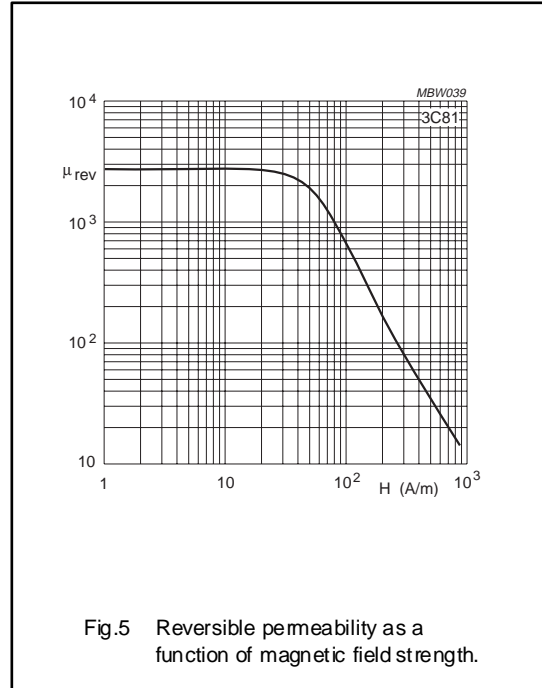
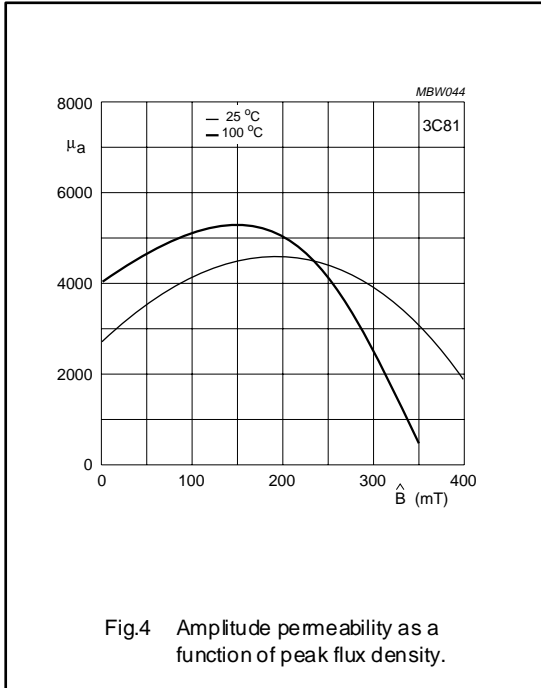


Fig.3 Typical B-H loops.

Material specification

3C81



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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$2300 \pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$5500 \pm 25\%$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 470$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 380$	mT
P <sub>V</sub>	100 °C; 25 kHz; 200 mT	$\leq 80$	kW/m <sup>3</sup>
	100 °C; 100 kHz; 100 mT	$\leq 80$	
	100 °C; 100 kHz; 200 mT	$\approx 450$	
$\rho$	DC, 25 °C	$\approx 5$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 220$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

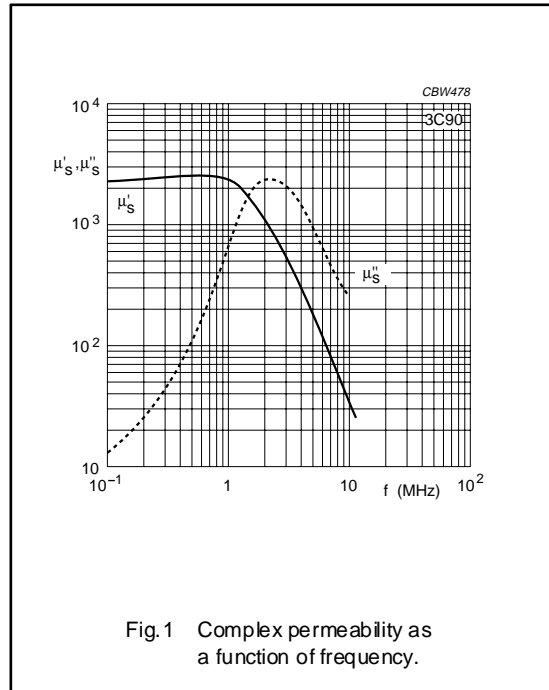


Fig. 1 Complex permeability as a function of frequency.

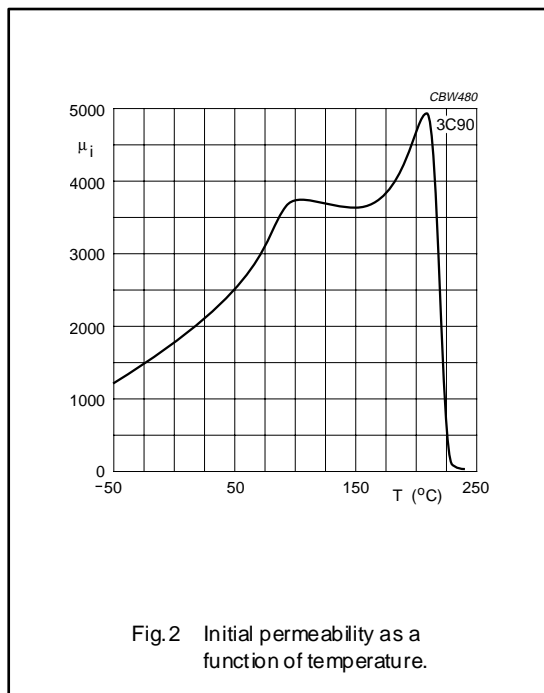


Fig. 2 Initial permeability as a function of temperature.

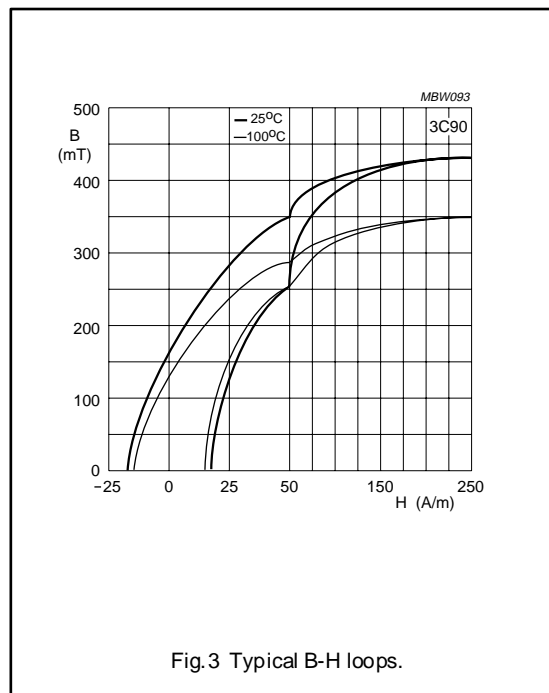
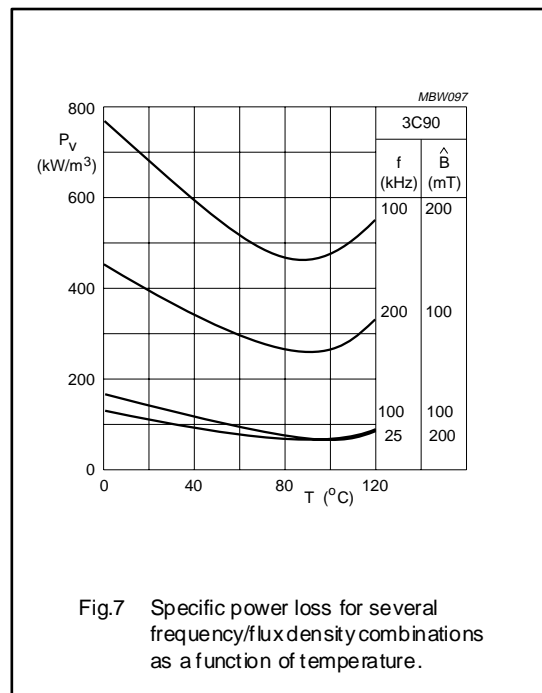
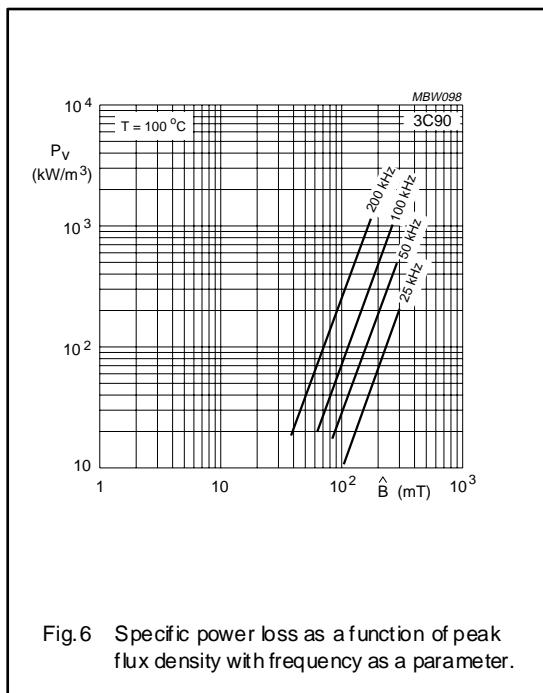
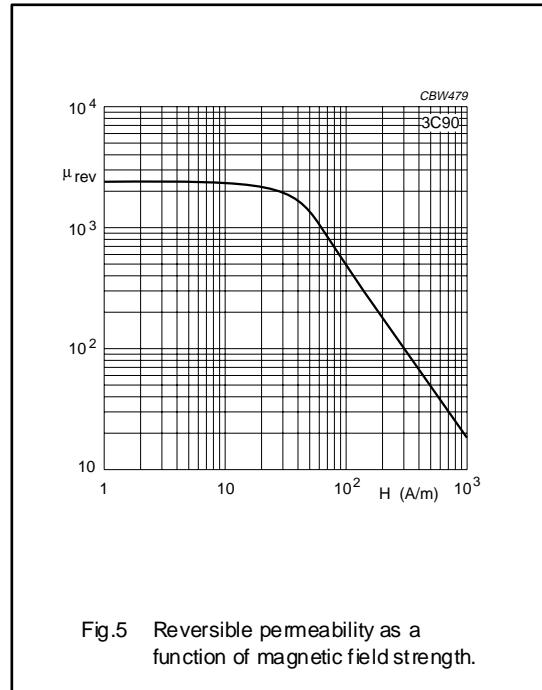
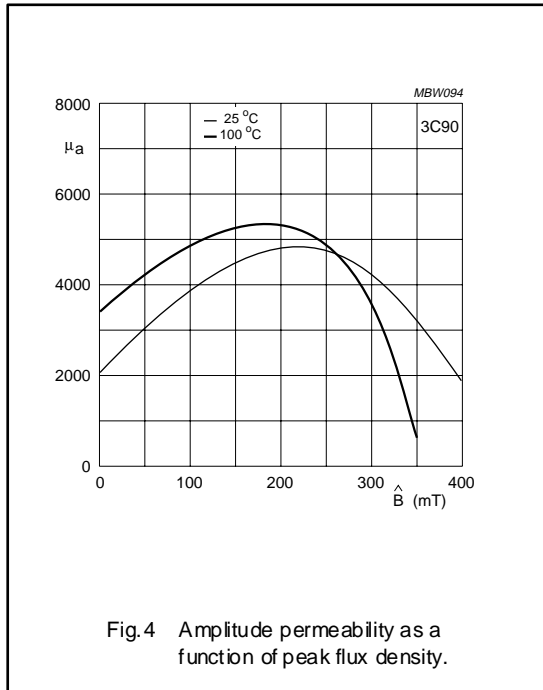


Fig. 3 Typical B-H loops.

Material specification

3C90



Material specification

3C91

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	3000 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	5500 $\pm 25\%$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 470$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 370$	mT
P <sub>V</sub>	60 °C; 100 kHz; 100 mT	$\leq 40$	kW/m <sup>3</sup>
	60 °C; 100 kHz; 200 mT	$\approx 300$	
$\rho$	DC, 25 °C	$\approx 5$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 220$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

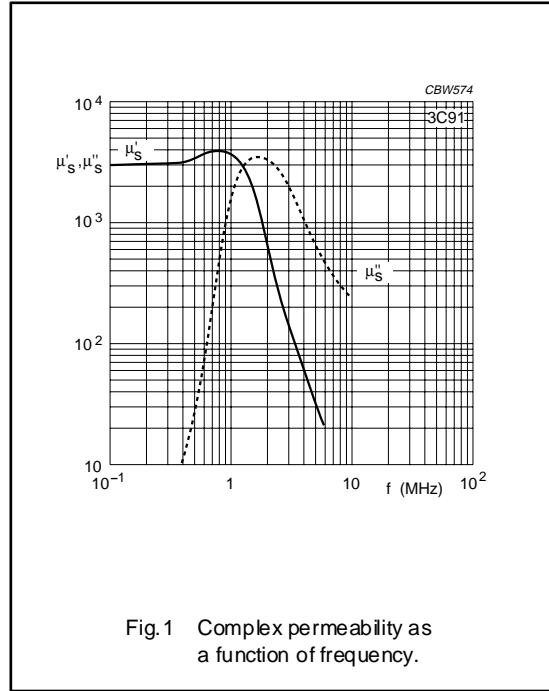


Fig. 1 Complex permeability as a function of frequency.

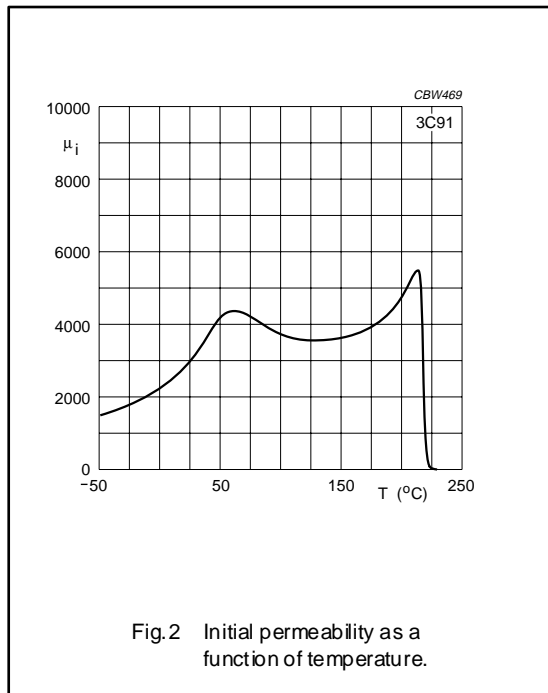


Fig. 2 Initial permeability as a function of temperature.

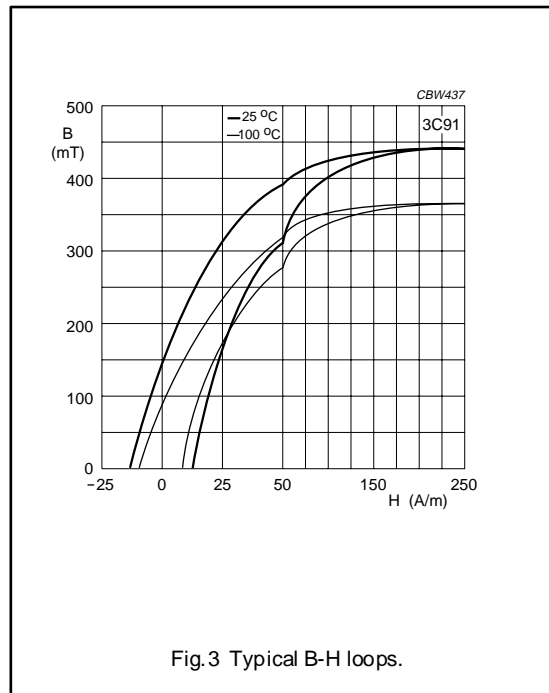


Fig. 3 Typical B-H loops.

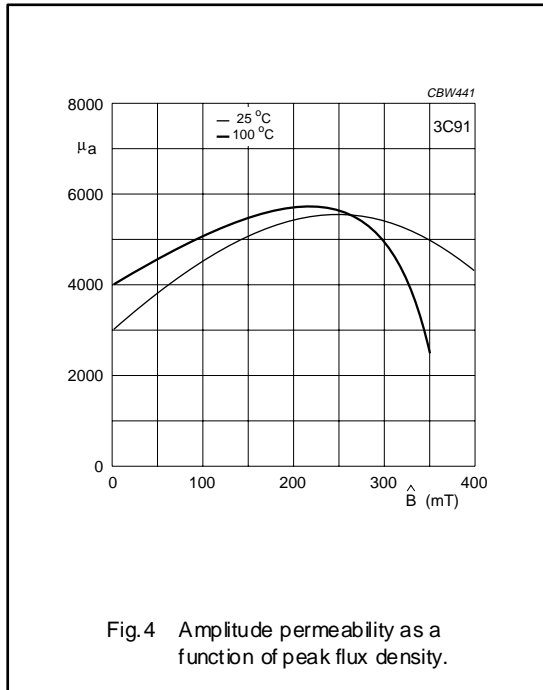


Fig. 4 Amplitude permeability as a function of peak flux density.

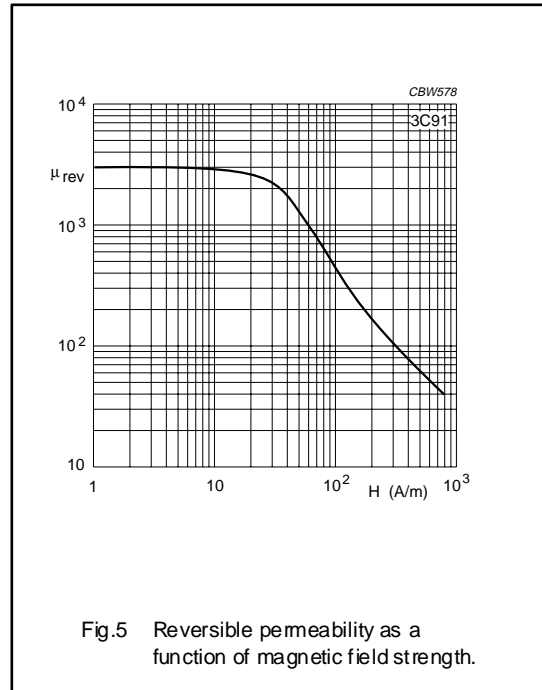


Fig. 5 Reversible permeability as a function of magnetic field strength.

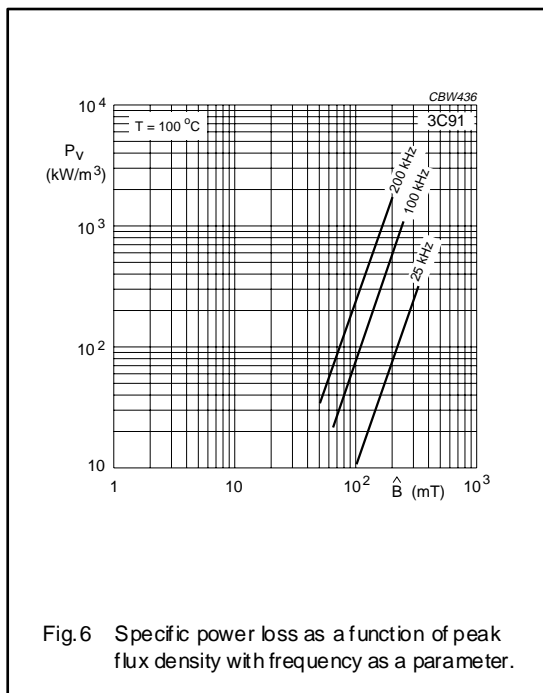


Fig. 6 Specific power loss as a function of peak flux density with frequency as a parameter.

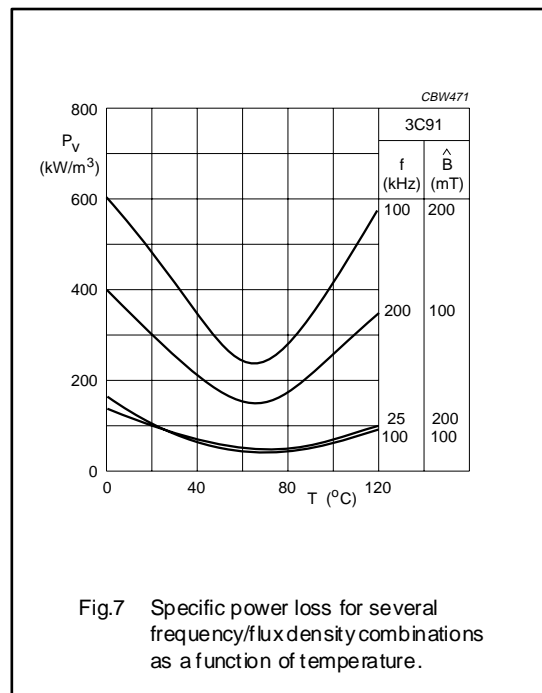


Fig. 7 Specific power loss for several frequency/flux density combinations as a function of temperature.

Material specification

3C92

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$1500 \pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 5000$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m 140 °C; 10 kHz; 1200 A/m	$\approx 540$ $\approx 460$ $\approx 400$	mT
$P_V$	100 °C; 100 kHz; 100 mT 100 °C; 100 kHz; 200 mT	$\approx 50$ $\approx 350$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 5$	$\Omega\text{m}$
$T_C$		$\geq 280$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

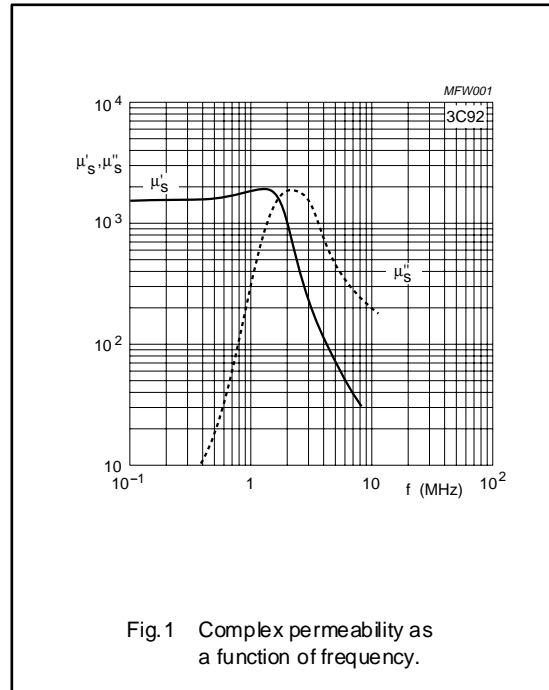


Fig. 1 Complex permeability as a function of frequency.

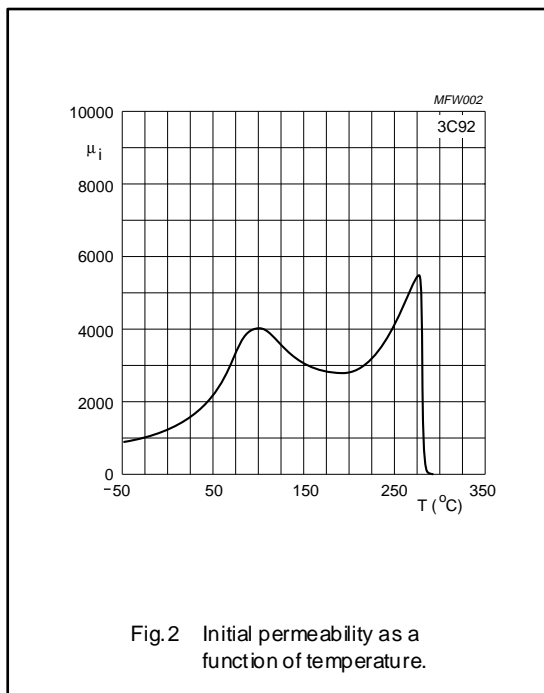


Fig. 2 Initial permeability as a function of temperature.

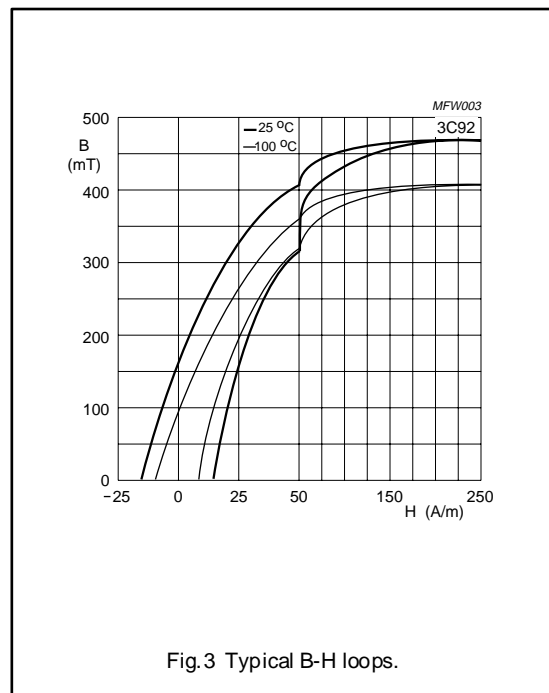
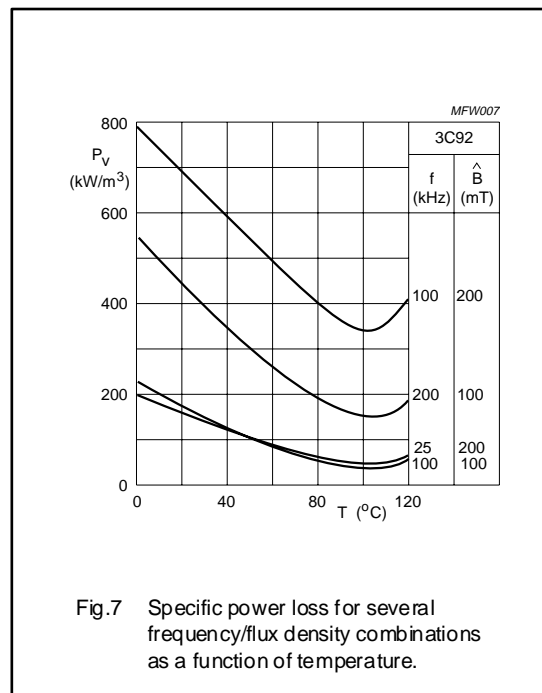
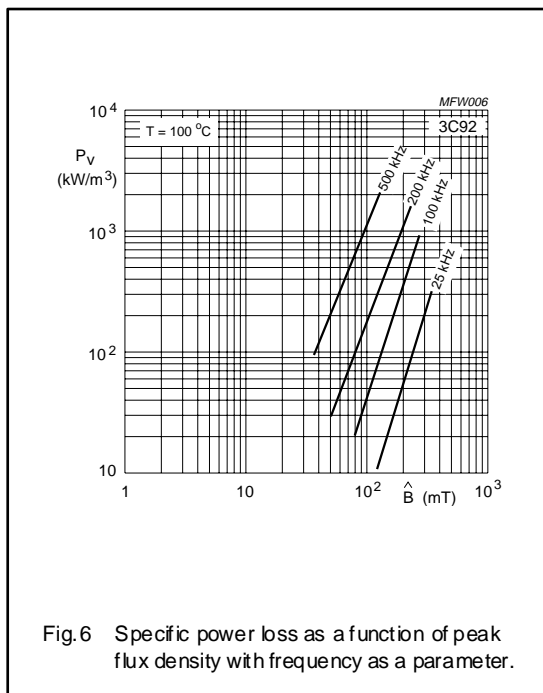
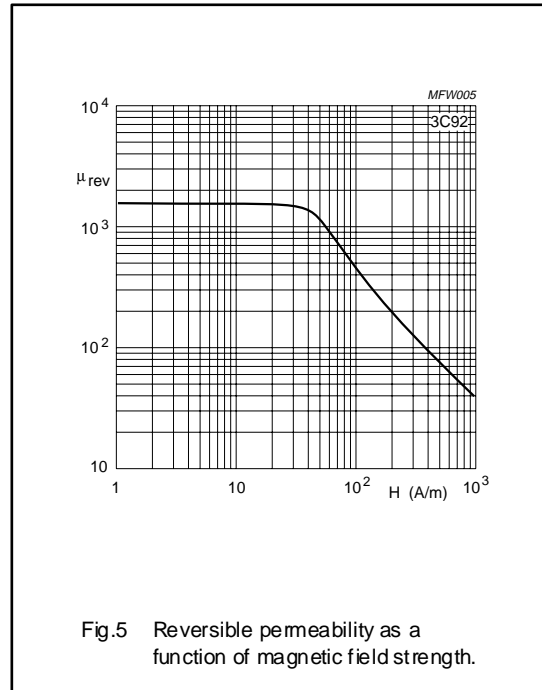
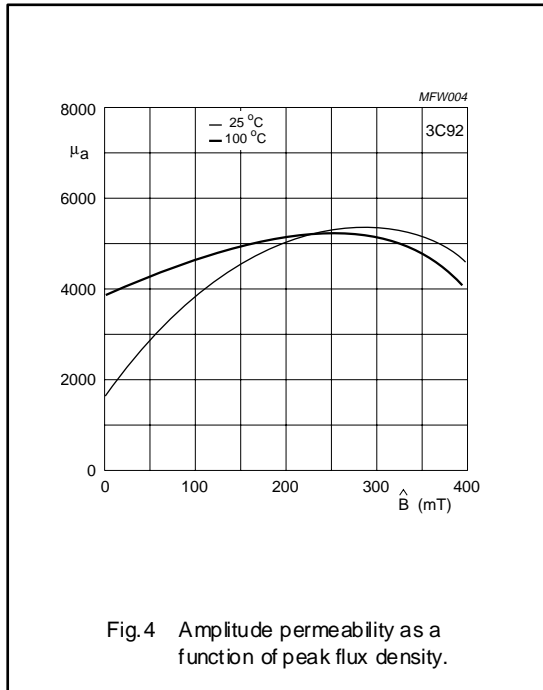


Fig. 3 Typical B-H loops.



Material specification

3C92



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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	1800 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 5000$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m 140 °C; 10 kHz; 1200 A/m	$\approx 520$ $\approx 430$ $\approx 360$	mT
$P_v$	140 °C; 100 kHz; 100 mT 140 °C; 100 kHz; 200 mT 140 °C; 500 kHz; 50 mT	$\approx 50$ $\approx 350$ $\approx 300$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 5$	$\Omega\text{m}$
$T_C$		$\geq 240$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

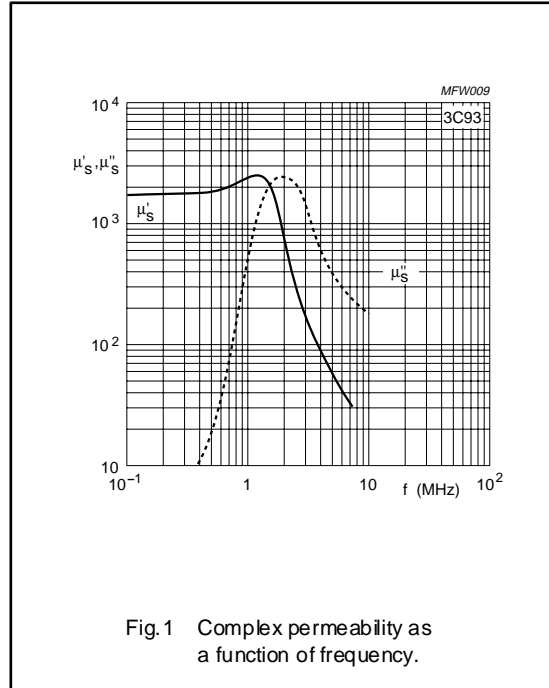


Fig.1 Complex permeability as a function of frequency.

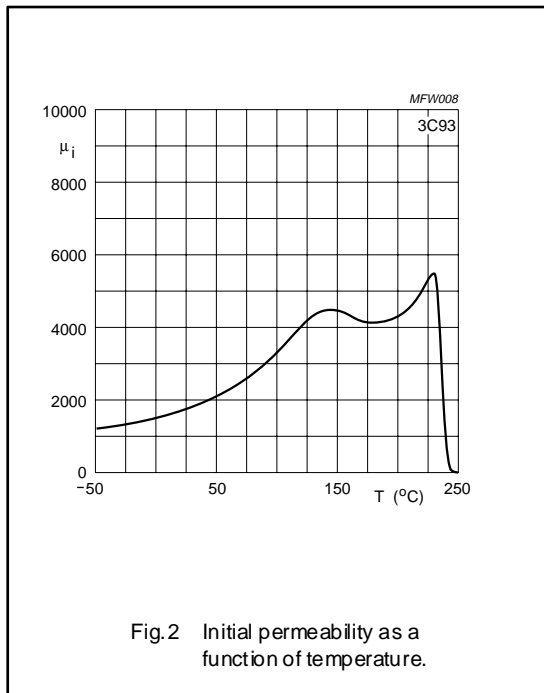


Fig.2 Initial permeability as a function of temperature.

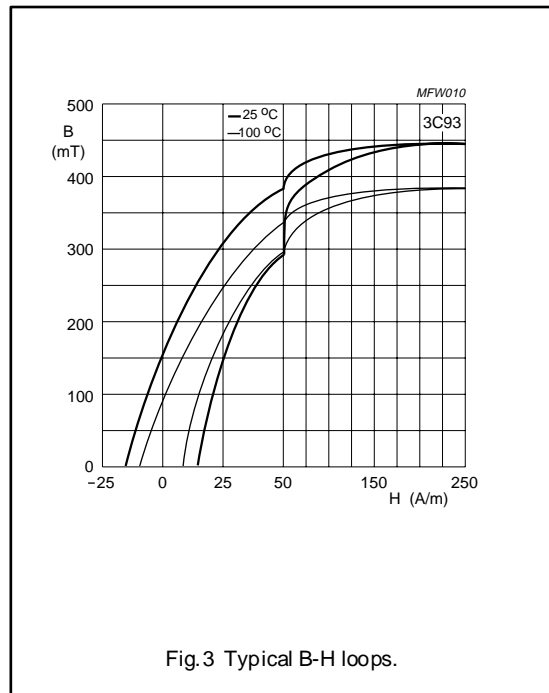
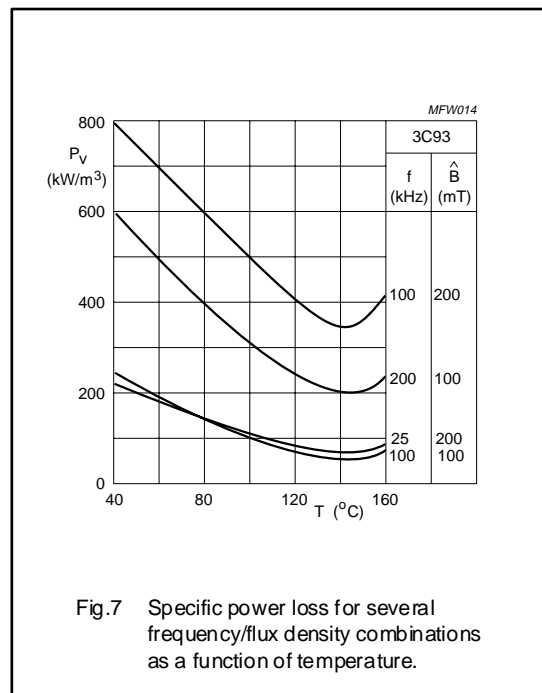
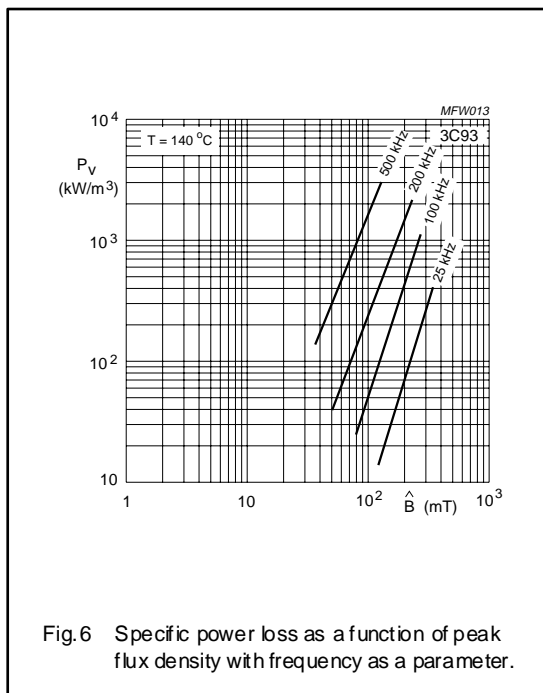
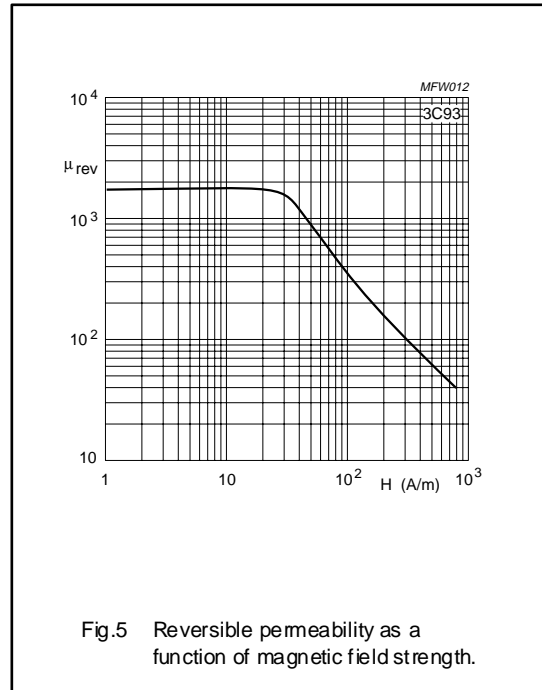
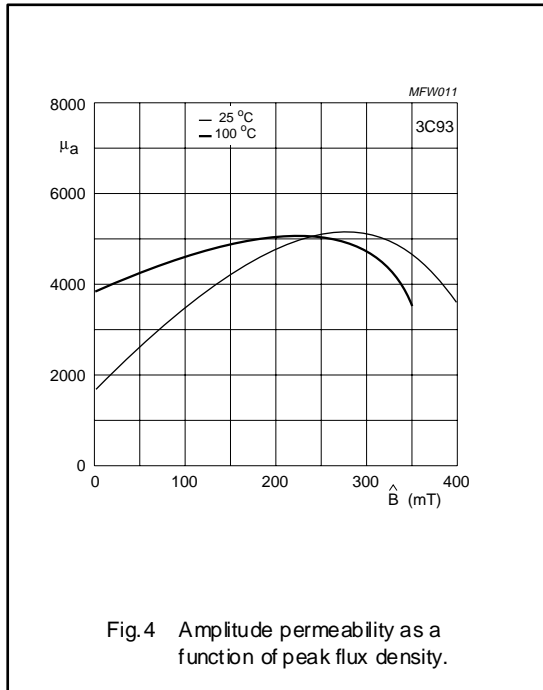


Fig.3 Typical B-H loops.

Material specification

3C93



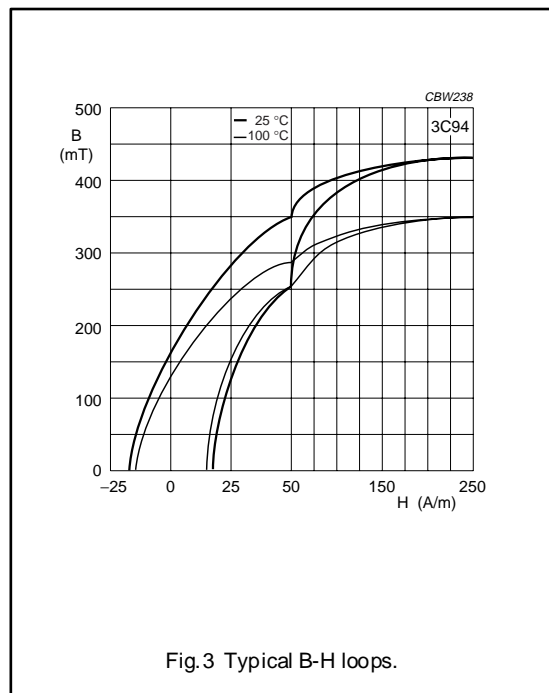
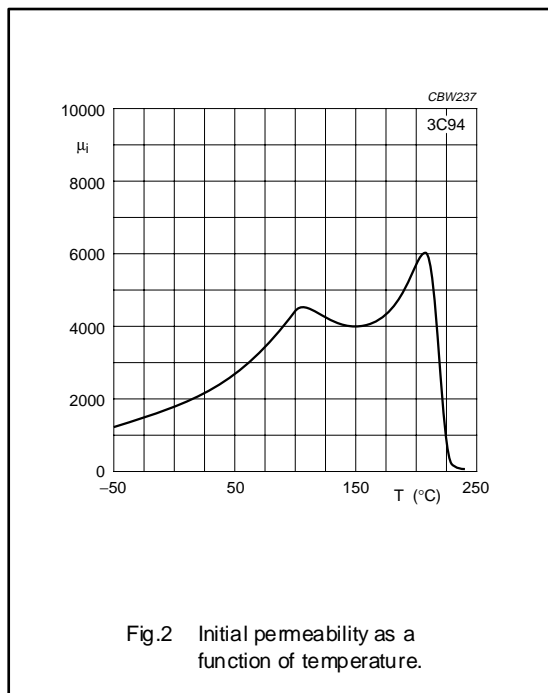
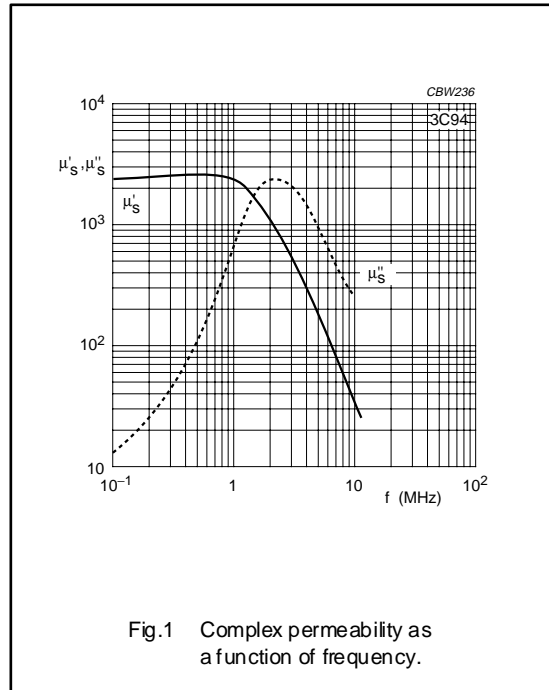
Material specification

3C94

3C94 SPECIFICATIONS

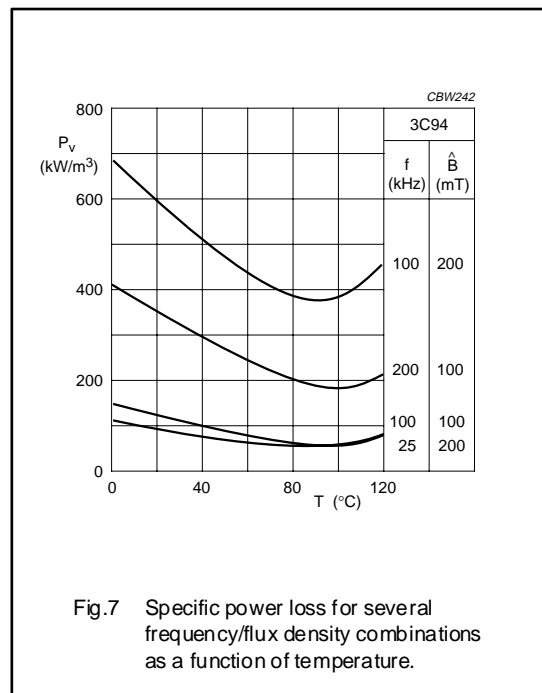
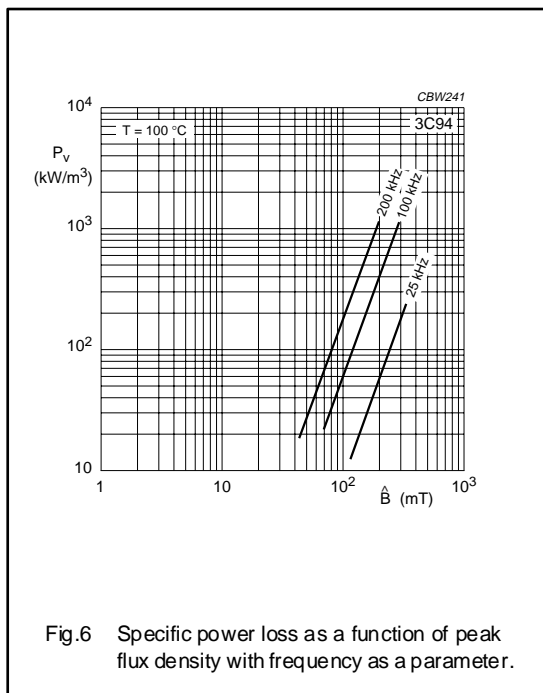
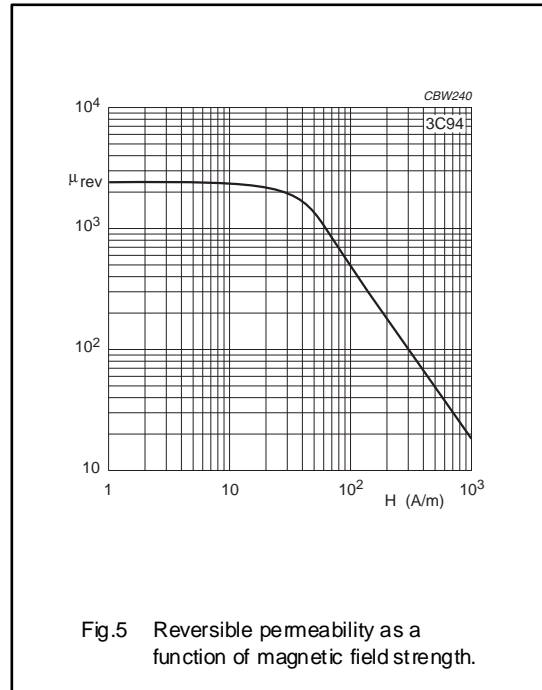
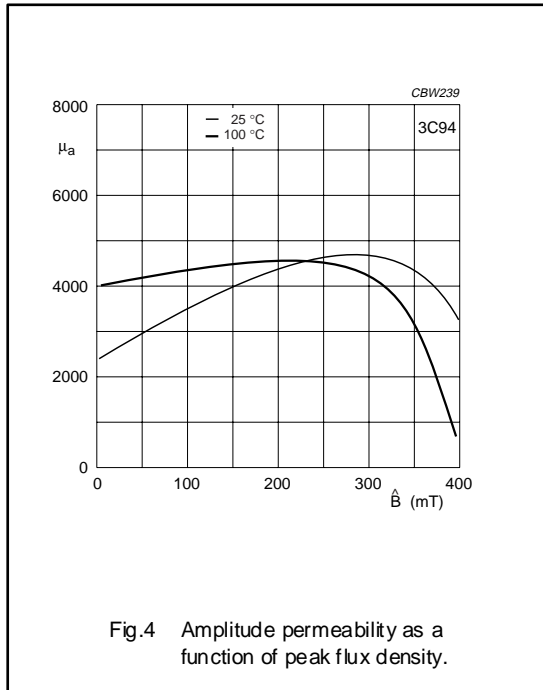
A low frequency power material for use in power and general purpose transformers at frequencies up to 0.3 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2300 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	5500 $\pm 25\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 470$ $\approx 380$	mT
$P_V$	100 °C; 100 kHz; 100 mT 100 °C; 100 kHz; 200 mT	$\approx 50$ $\approx 350$	kW/m <sup>3</sup>
$\rho$	DC, 25 °C	$\approx 5$	$\Omega\text{m}$
$T_C$		$\geq 220$	°C
density		$\approx 4800$	kg/m <sup>3</sup>



Material specification

3C94



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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	2 000 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 5500$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 500$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 440$	
$P_V$	100 °C; 100 kHz; 100 mT	$\approx 40$	kW/m <sup>3</sup>
	100 °C; 100 kHz; 200 mT	$\approx 300$	
	100 °C; 500 kHz; 50 mT	$\approx 250$	
$\rho$	DC; 25 °C	$\approx 5$	$\Omega\text{m}$
$T_C$		$\geq 240$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

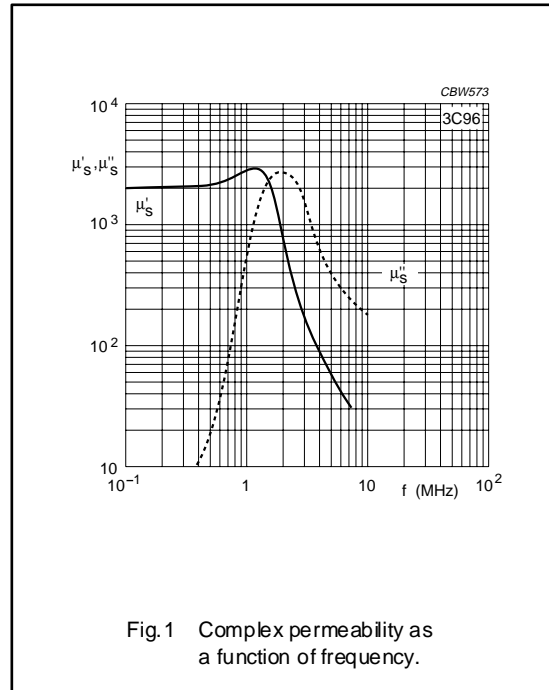


Fig.1 Complex permeability as a function of frequency.

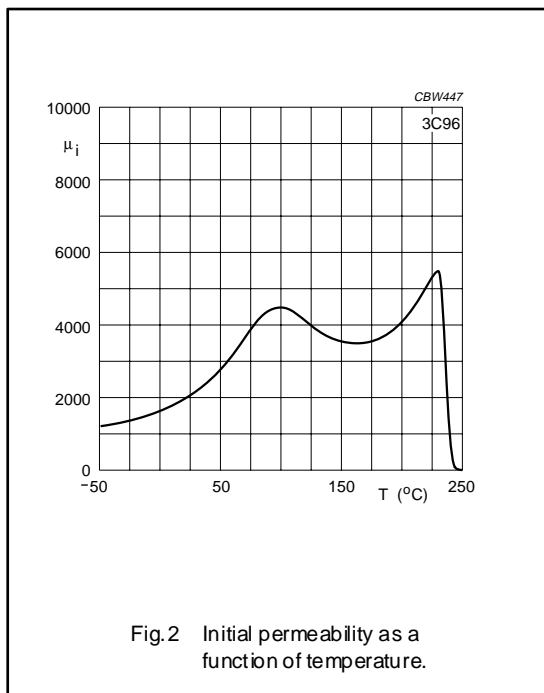


Fig.2 Initial permeability as a function of temperature.

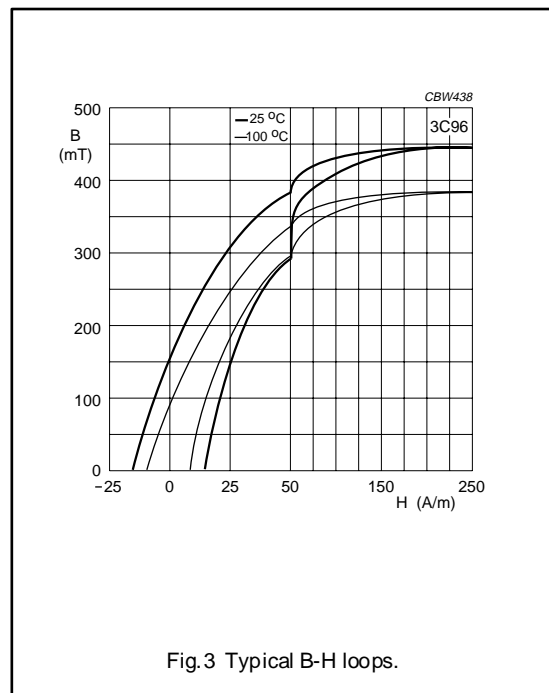
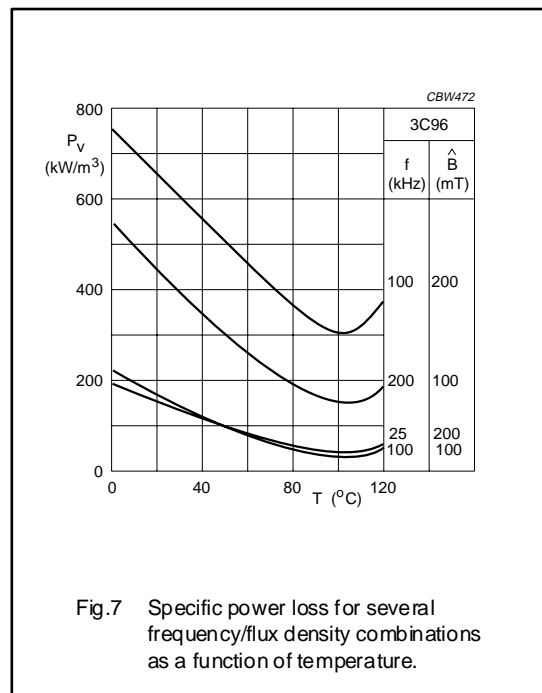
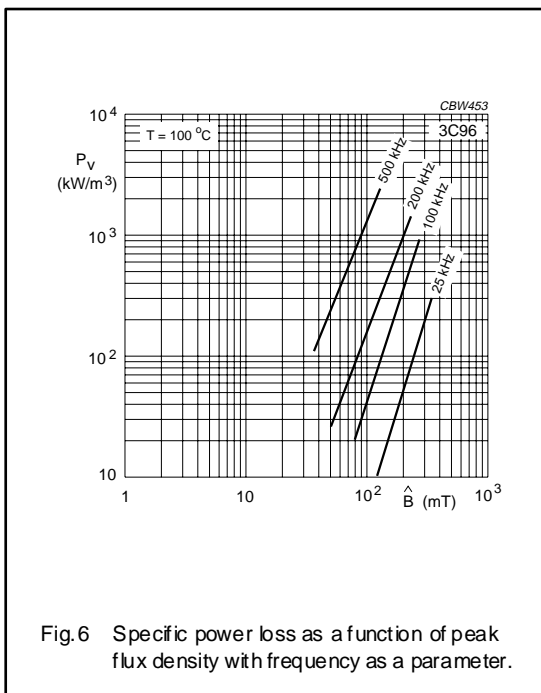
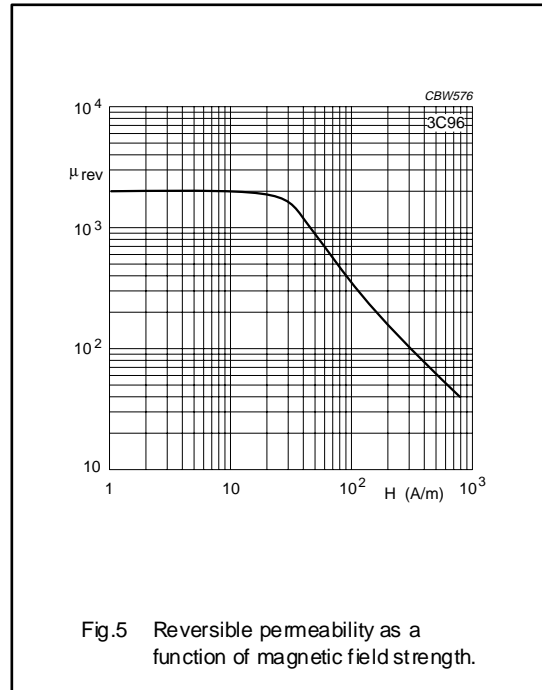
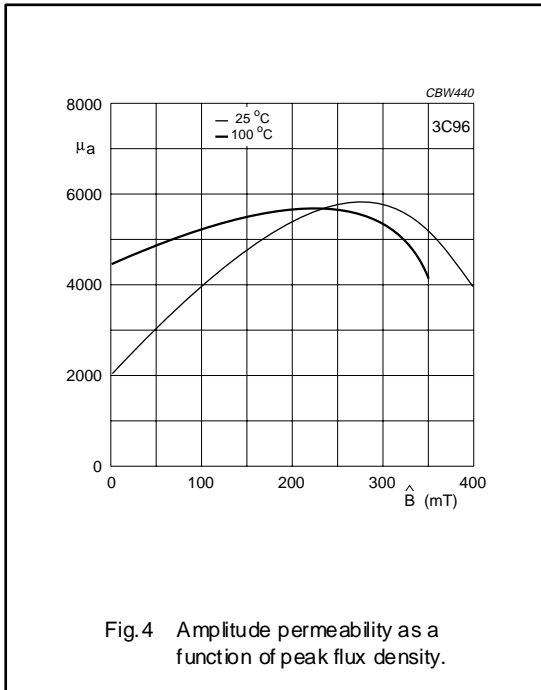


Fig.3 Typical B-H loops.

Material specification

3C96



Material specification

3D3

3D3 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	750 $\pm 20$ %	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 380$ $\approx 310$	mT
$\tan\delta/\mu_i$	25 °C; 300 kHz; 0.25 mT 25 °C; 1 MHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
$\eta_B$	25 °C; 100 kHz; 1.5 to 3 mT	$\leq 1.8 \times 10^{-3}$	T <sup>-1</sup>
$D_F$	25 °C; 10 kHz; 0.25 mT	$\leq 12 \times 10^{-6}$	
$\alpha_F$	25 to 70 °C; $\leq 10$ kHz; 0.25 mT	$(1.5 \pm 1) \times 10^{-6}$	K <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 2$	$\Omega\text{m}$
$T_C$		$\geq 200$	°C
density		$\approx 4700$	kg/m <sup>3</sup>

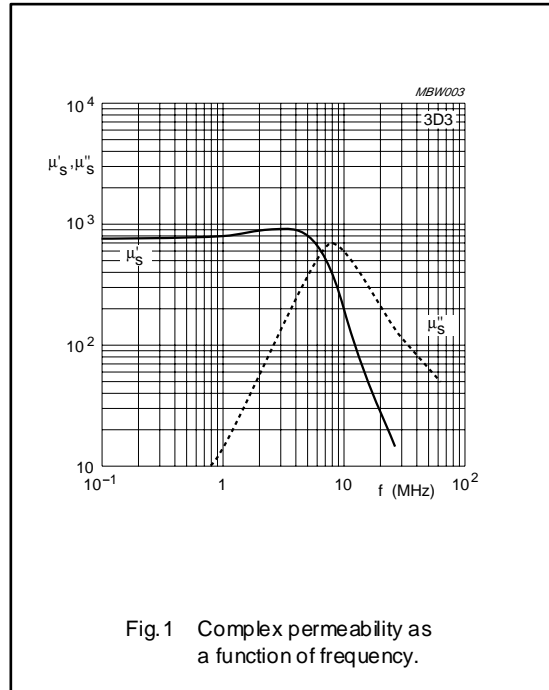


Fig. 1 Complex permeability as a function of frequency.

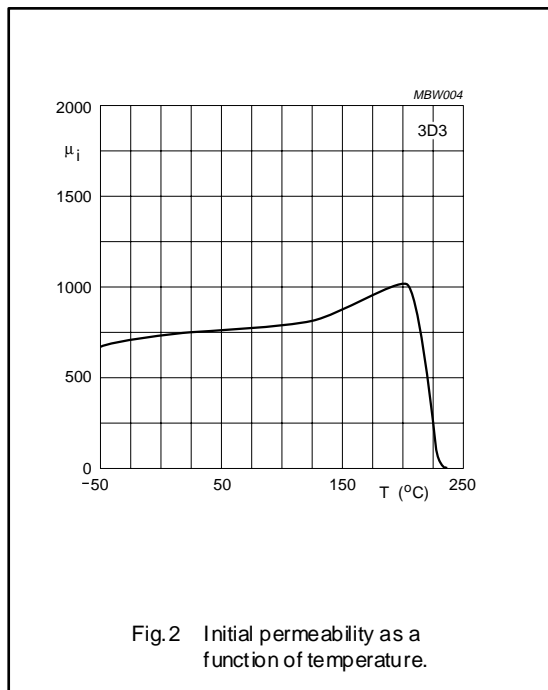


Fig. 2 Initial permeability as a function of temperature.

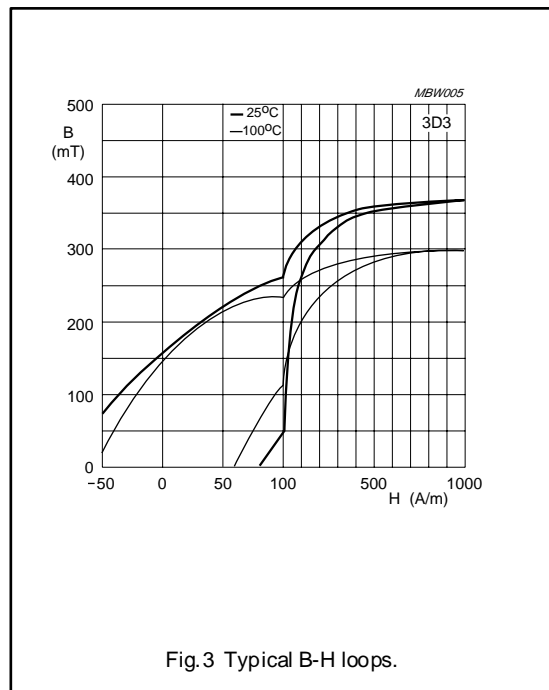
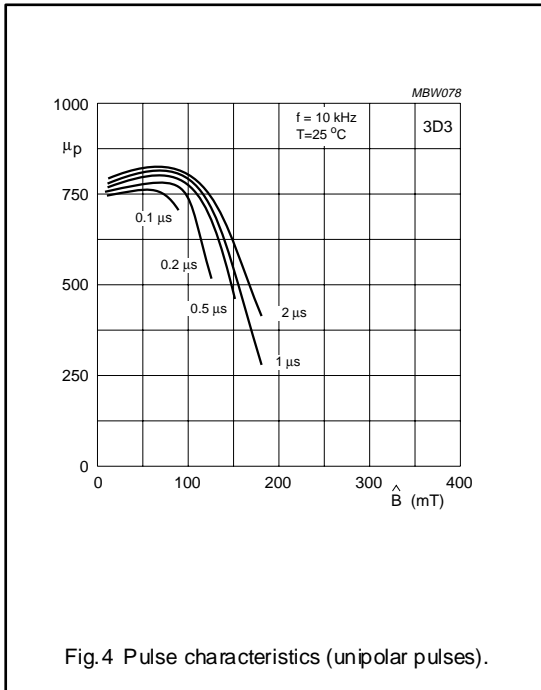


Fig. 3 Typical B-H loops.





Material specification

3E25

3E25 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$6000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 390$ $\approx 220$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT 25 °C; 300 kHz; 0.25 mT	$\leq 25 \times 10^{-6}$ $\leq 200 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 0.5$	$\Omega\text{m}$
$T_C$		$\geq 125$	°C
density		$\approx 4900$	$\text{kg/m}^3$

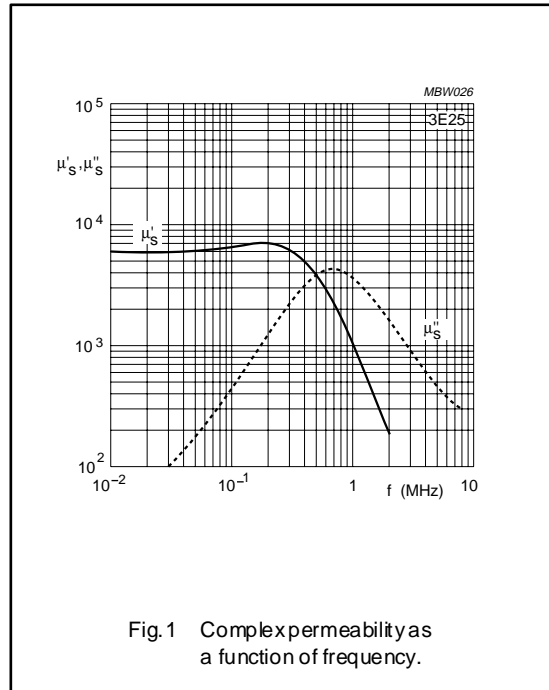


Fig. 1 Complex permeability as a function of frequency.

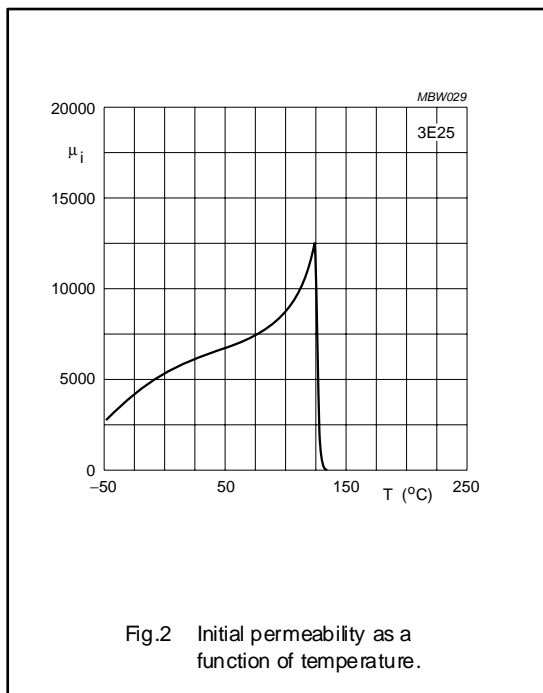


Fig. 2 Initial permeability as a function of temperature.

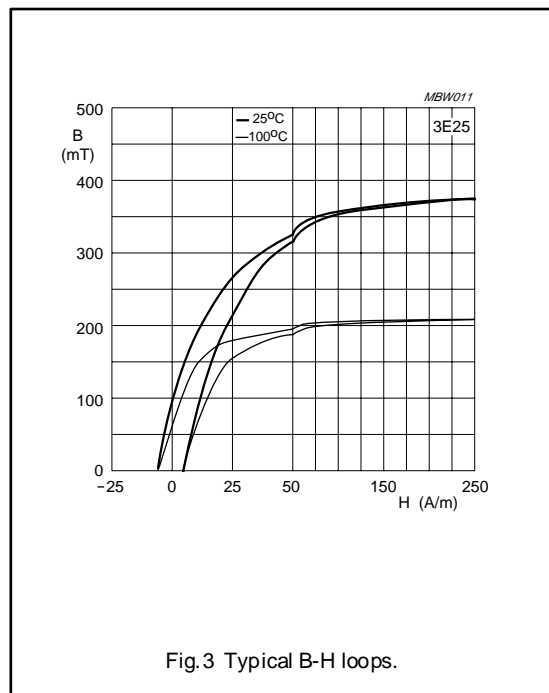


Fig. 3 Typical B-H loops.

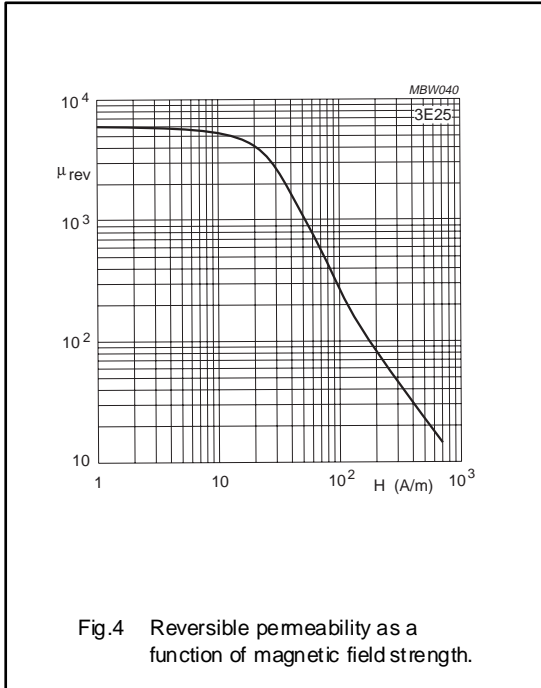


Fig.4 Reversible permeability as a function of magnetic field strength.

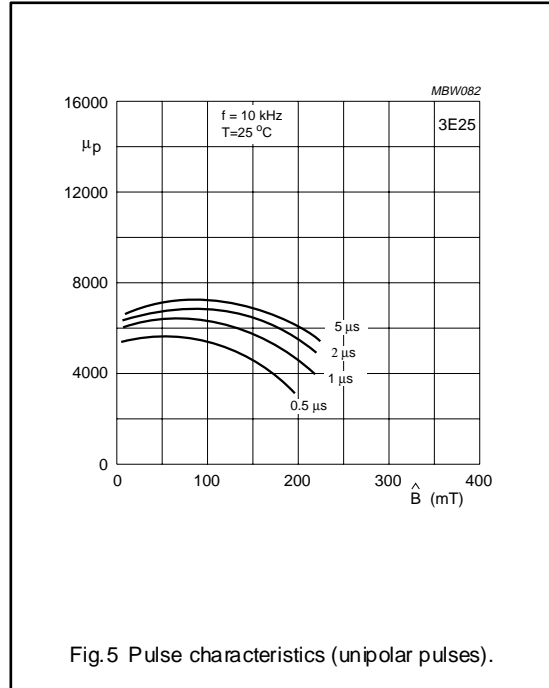


Fig.5 Pulse characteristics (unipolar pulses).

Material specification

3E26

3E26 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$7000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 430$ $\approx 290$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\leq 20 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 0.5$	$\Omega m$
$T_C$		$\geq 155$	°C
density		$\approx 4900$	$kg/m^3$

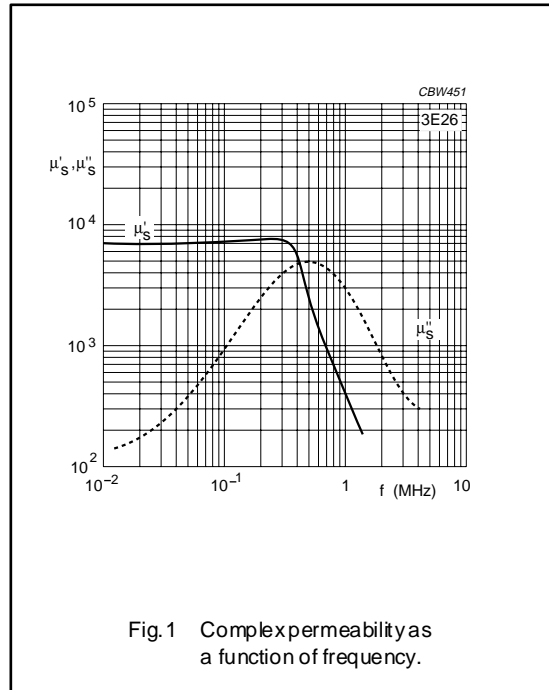


Fig. 1 Complex permeability as a function of frequency.

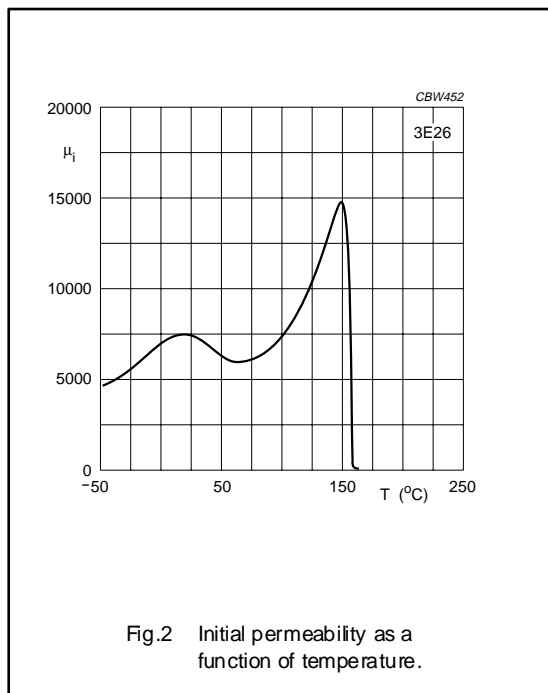


Fig. 2 Initial permeability as a function of temperature.

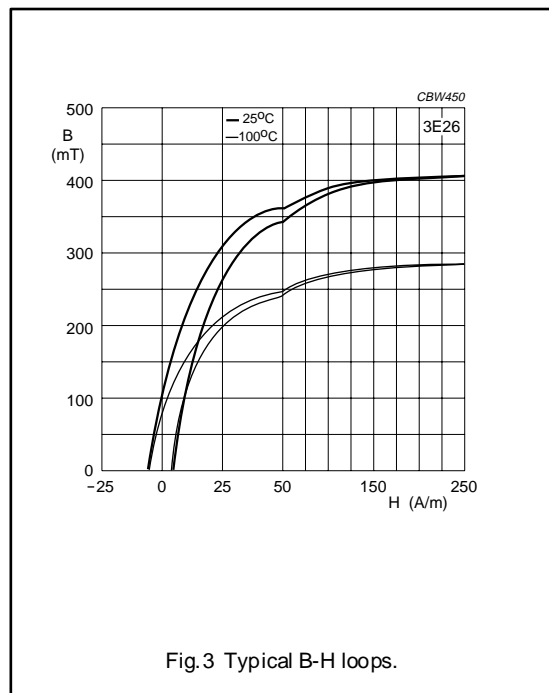
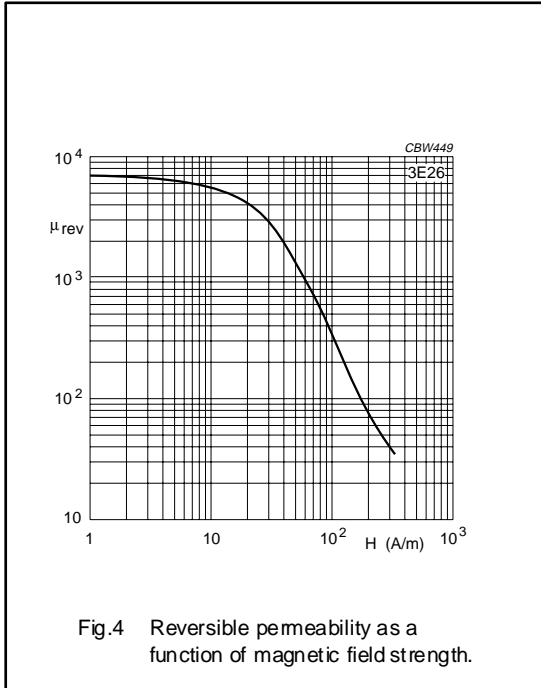


Fig. 3 Typical B-H loops.



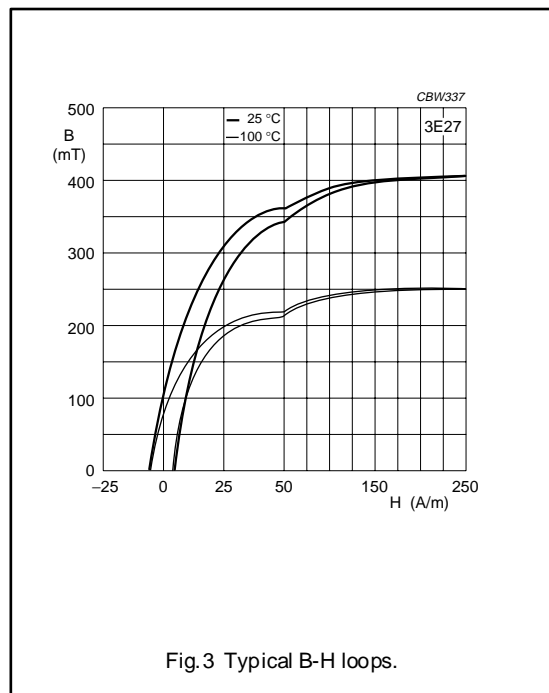
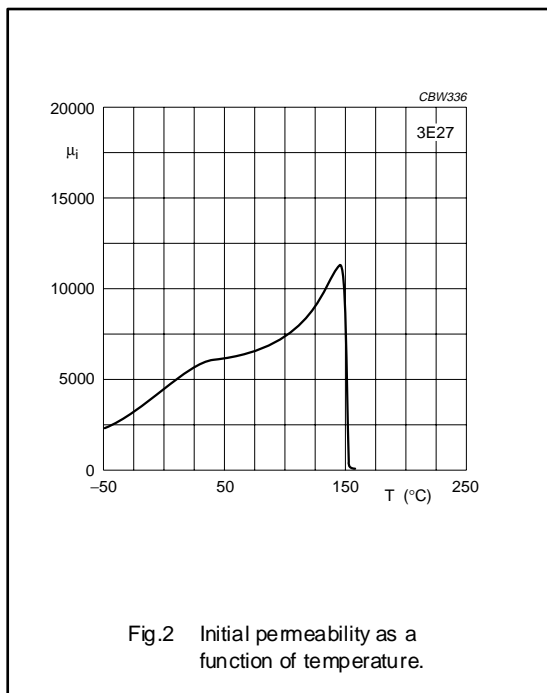
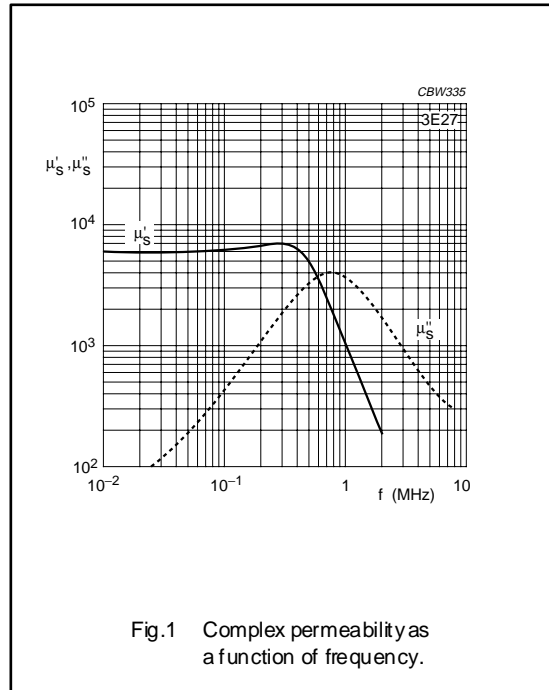
Material specification

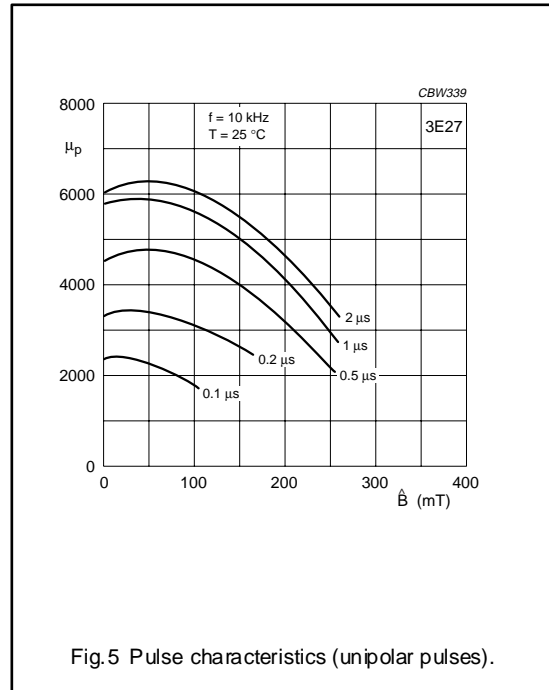
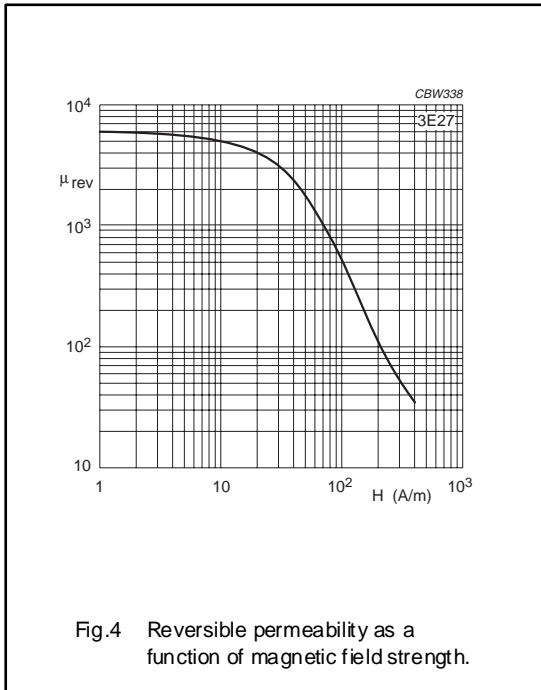
3E27

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$6000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 430$ $\approx 270$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\leq 15 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 0.5$	$\Omega\text{m}$
$T_c$		$\geq 150$	°C
density		$\approx 4800$	$\text{kg/m}^3$





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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$4000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 440$ $\approx 280$	mT
$\tan \delta / \mu_i$	25 °C; 100 kHz; 0.25 mT	$\leq 5 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 1$	$\Omega\text{m}$
$T_C$		$\geq 145$	°C
density		$\approx 4800$	$\text{kg/m}^3$

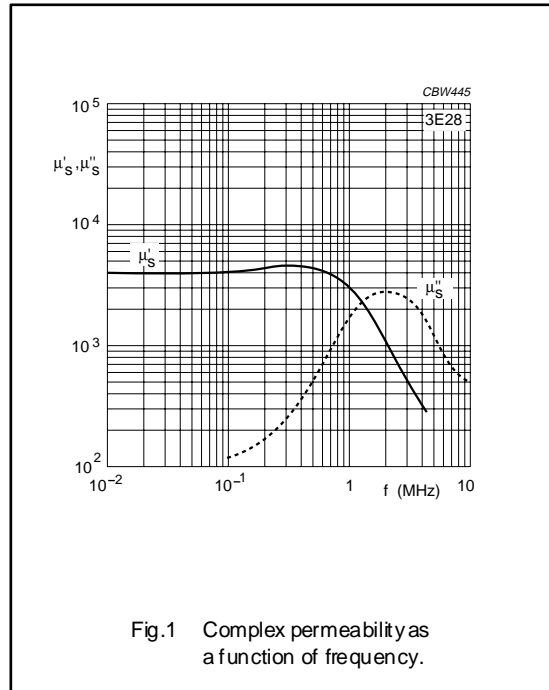


Fig.1 Complex permeability as a function of frequency.

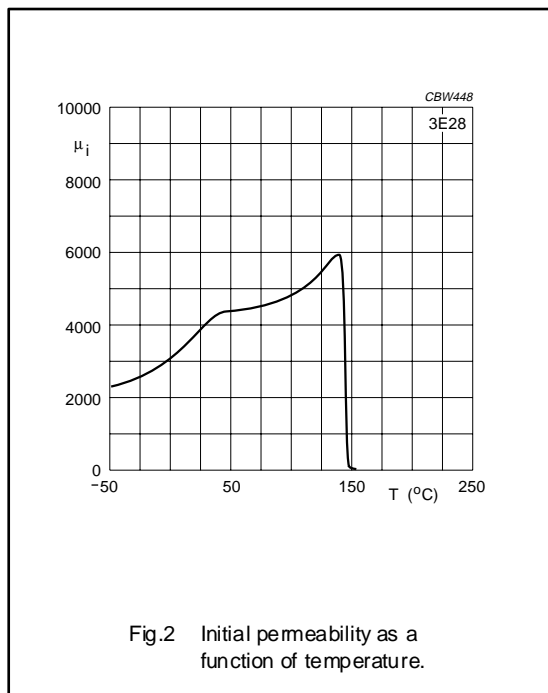


Fig.2 Initial permeability as a function of temperature.

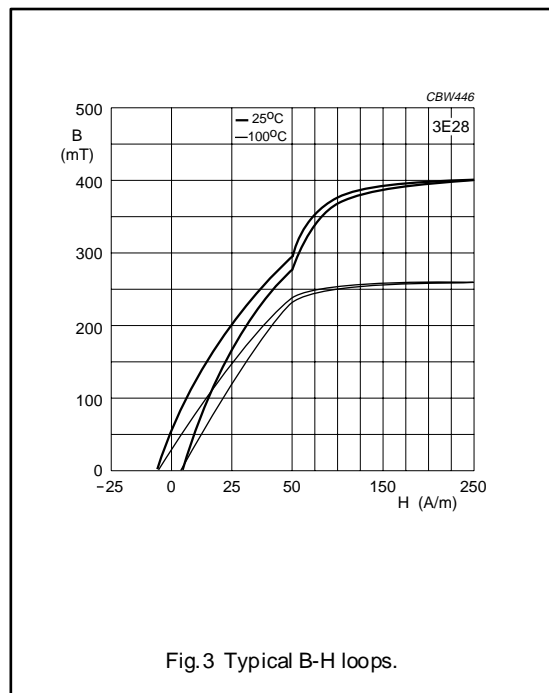
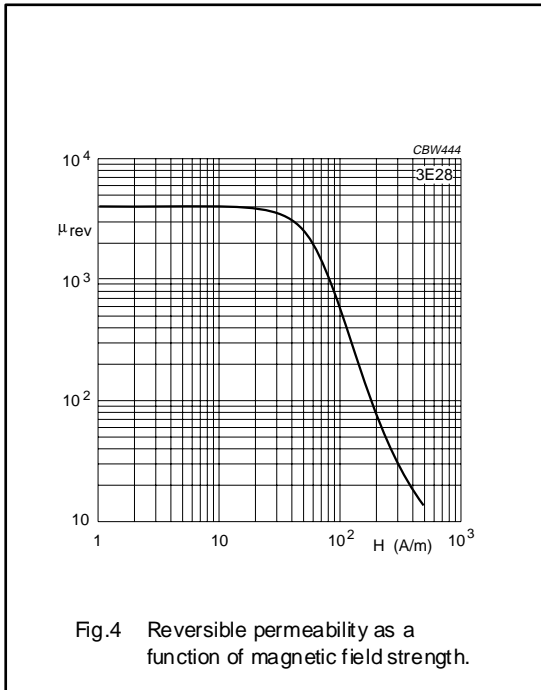


Fig.3 Typical B-H loops.





Material specification

3E5

3E5 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$10000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 380$ $\approx 210$	mT
$\tan \delta / \mu_i$	25 °C; 30 kHz; 0.25 mT 25 °C; 100 kHz; 0.25 mT	$\leq 25 \times 10^{-6}$ $\leq 75 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.5$	$\Omega\text{m}$
$T_C$		$\geq 125$	°C
density		$\approx 4900$	kg/m <sup>3</sup>

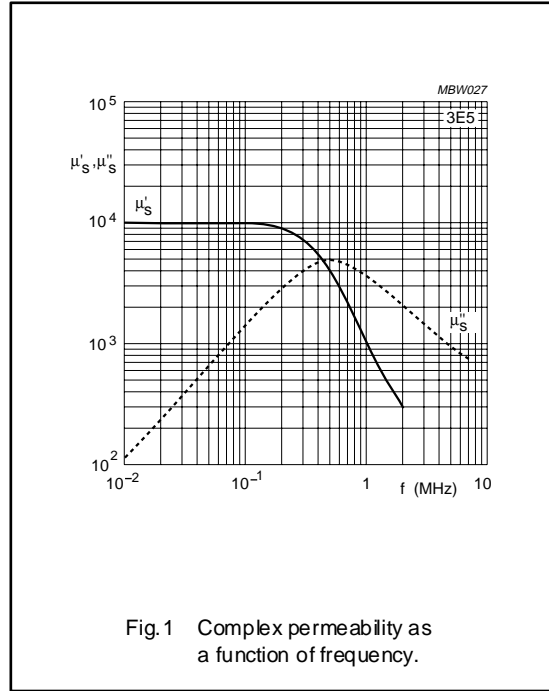


Fig. 1 Complex permeability as a function of frequency.

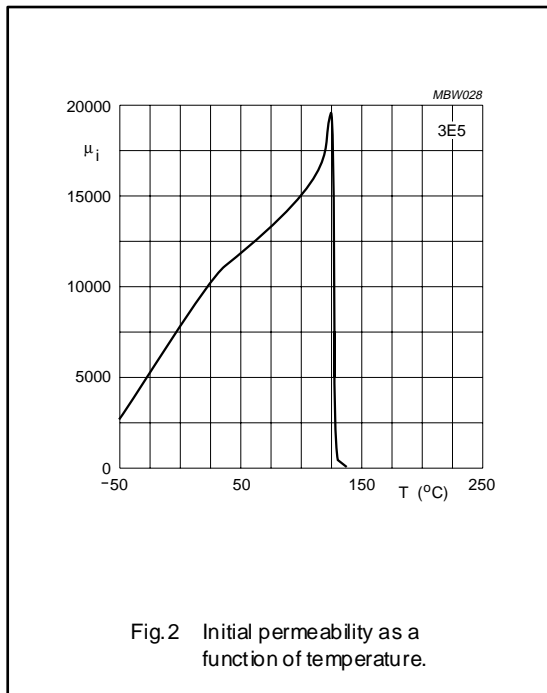


Fig. 2 Initial permeability as a function of temperature.

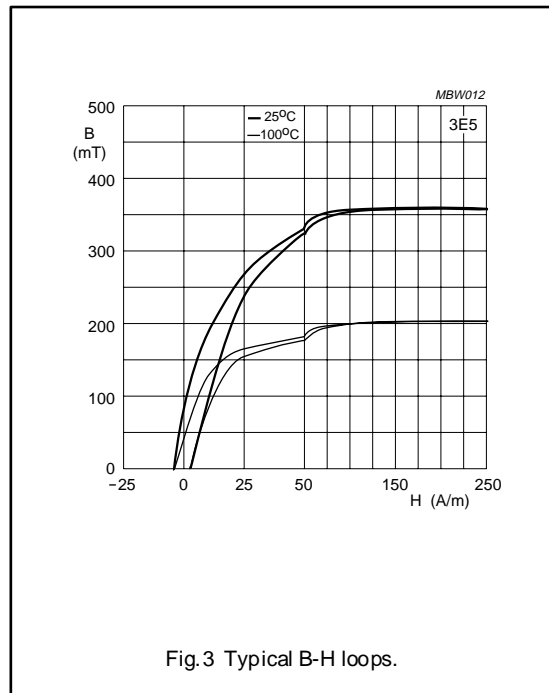


Fig. 3 Typical B-H loops.

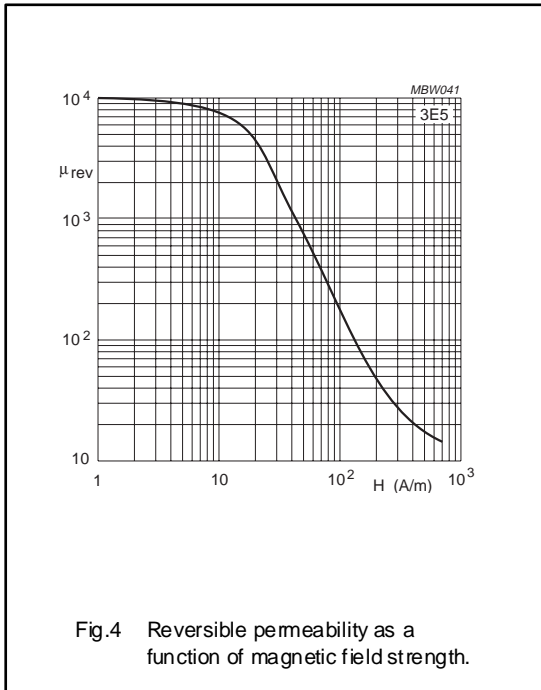


Fig.4 Reversible permeability as a function of magnetic field strength.

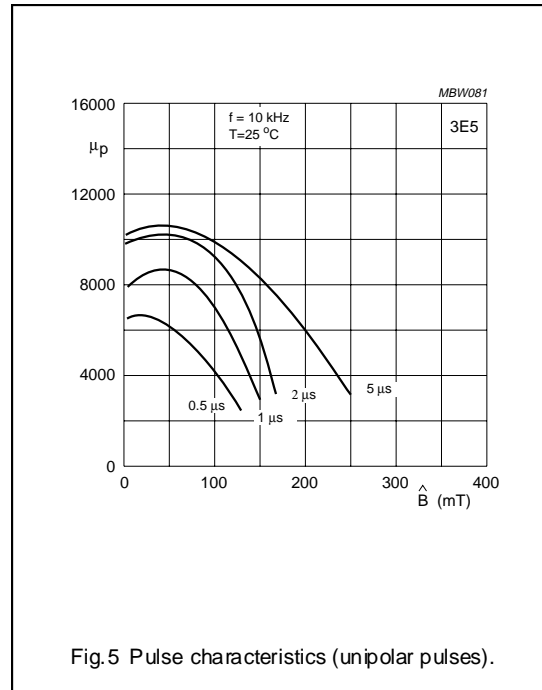


Fig.5 Pulse characteristics (unipolar pulses).

Material specification

3E55

3E55 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	10000 $\pm$ 20%	
B	25 °C; 10 kHz; 1200 A/m 80 °C; 10 kHz; 1200 A/m	$\approx 370$ $\approx 200$	mT
$\tan \delta / \mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 30 kHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 0.2 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.1$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 100$	°C
density		$\approx 5000$	kg/m <sup>3</sup>

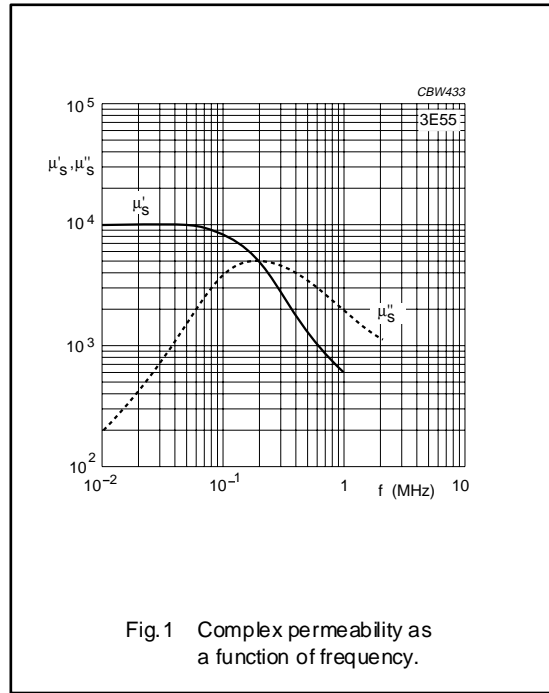


Fig. 1 Complex permeability as a function of frequency.

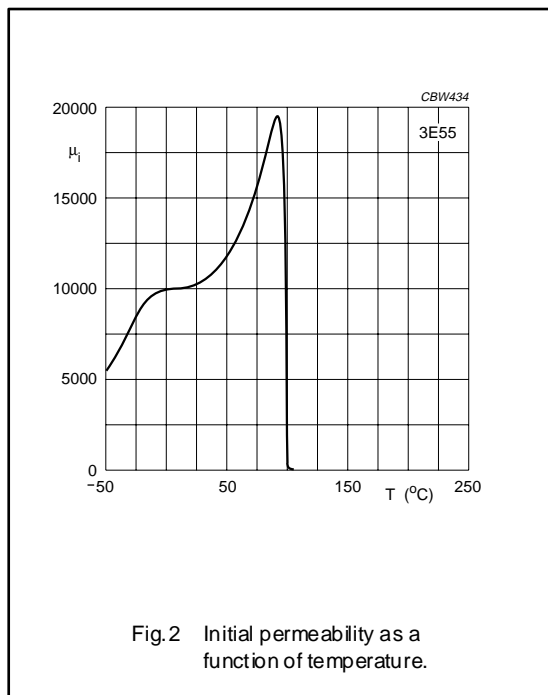


Fig. 2 Initial permeability as a function of temperature.

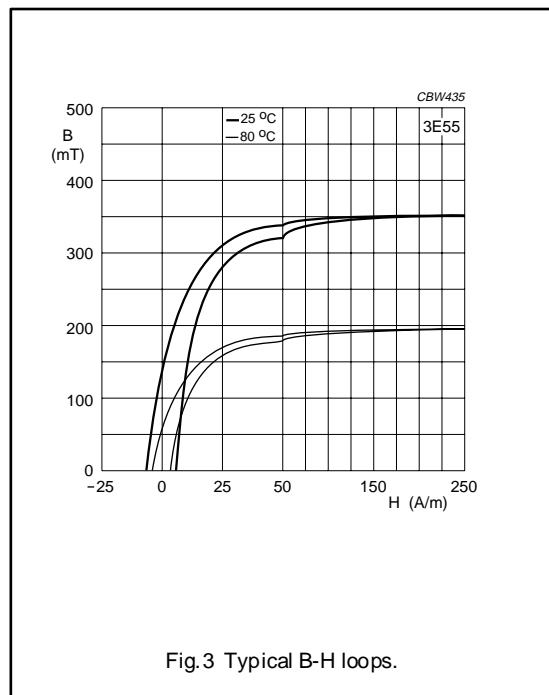
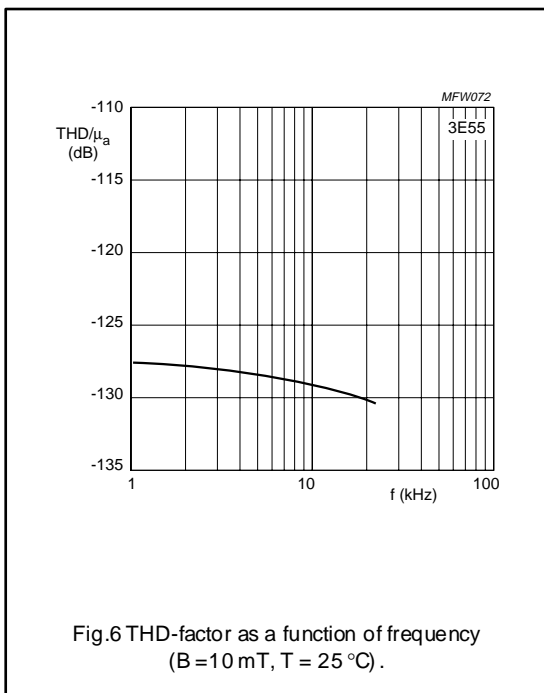
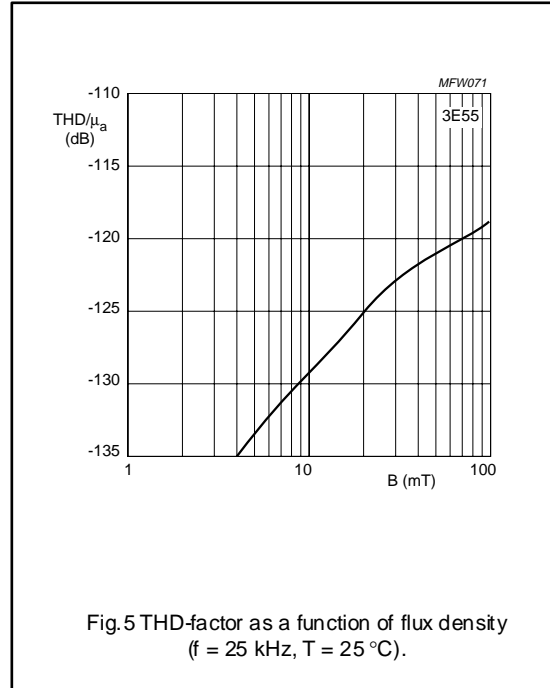
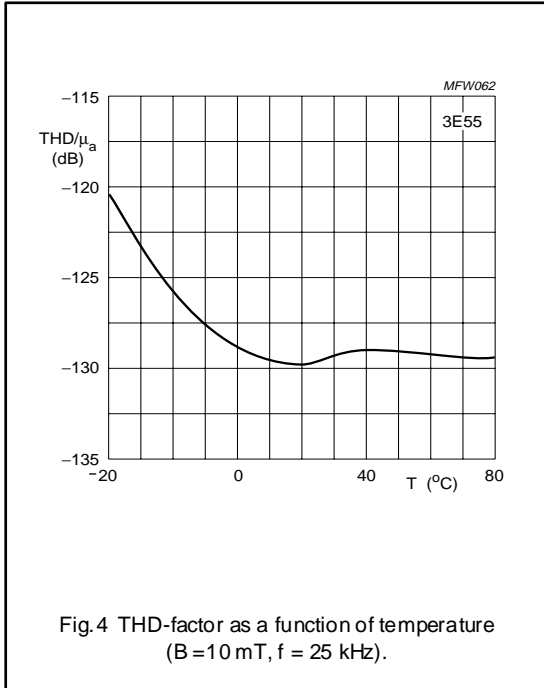


Fig. 3 Typical B-H loops.



Material specification

3E6

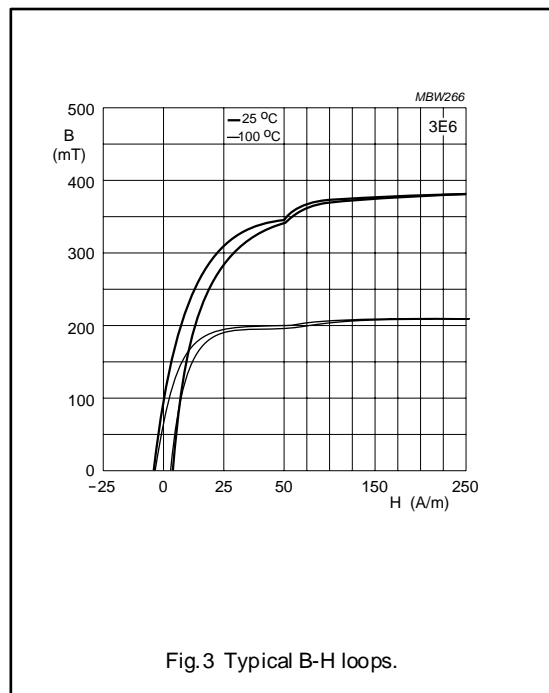
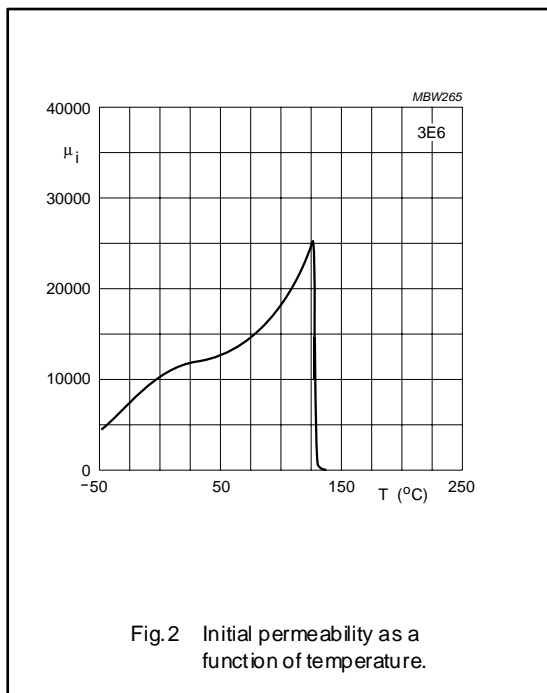
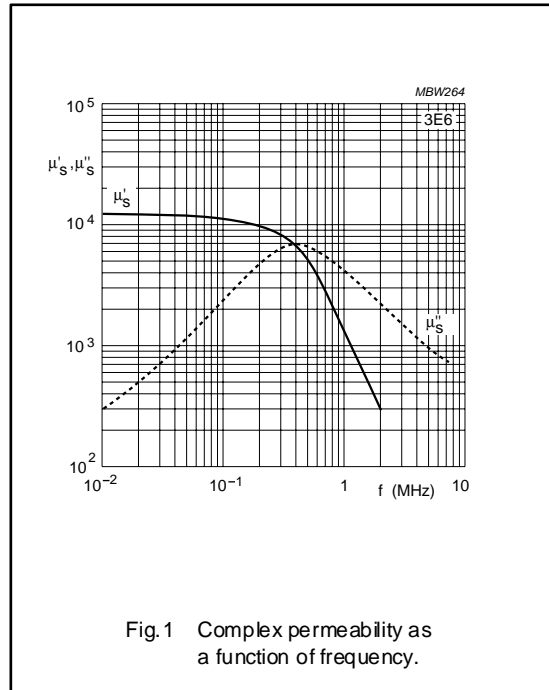
3E6 SPECIFICATIONS

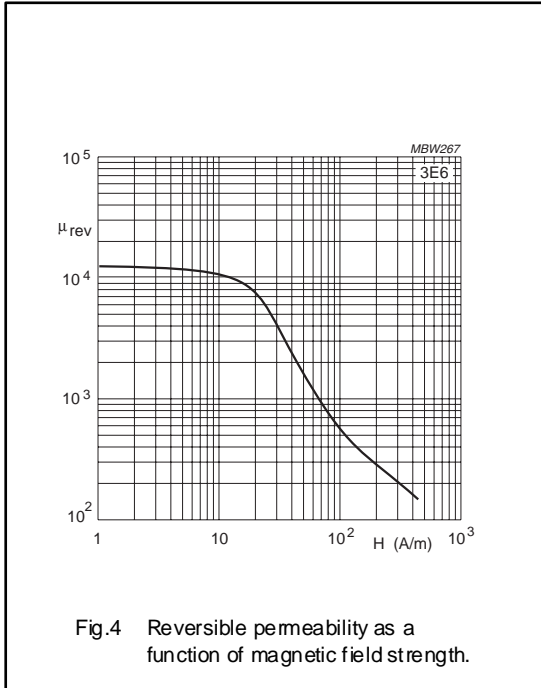
A high permeability material optimized for use in wideband transformers as well as EMI-suppression filters.

	CONDITIONS	VALUE <sup>(1)</sup>	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$12000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 390$ $\approx 220$	mT
$\tan \delta / \mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 30 kHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.1$	$\Omega m$
T <sub>C</sub>		$\geq 130$	°C
density		$\approx 4900$	kg/m <sup>3</sup>

Note

1. Measured on sintered, non-ground ring cores of dimensions  $\varnothing 14 \times \varnothing 9 \times 5$  which are not subjected to external stresses.





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 <sup>(1)</sup>	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	15000 $\pm$ 20%	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 390$ $\approx 220$	mT
$\tan \delta / \mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 30 kHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.1$	$\Omega m$
T <sub>C</sub>		$\geq 130$	°C
density		$\approx 4900$	kg/m <sup>3</sup>

Note

1. Measured on sintered, non-ground ring cores of dimensions  $\varnothing 14 \times \varnothing 9 \times 5$  which are not subjected to external stresses.

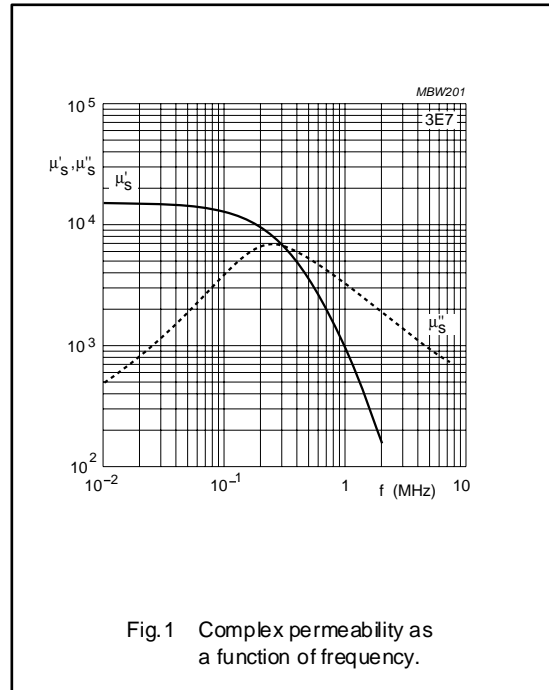


Fig. 1 Complex permeability as a function of frequency.

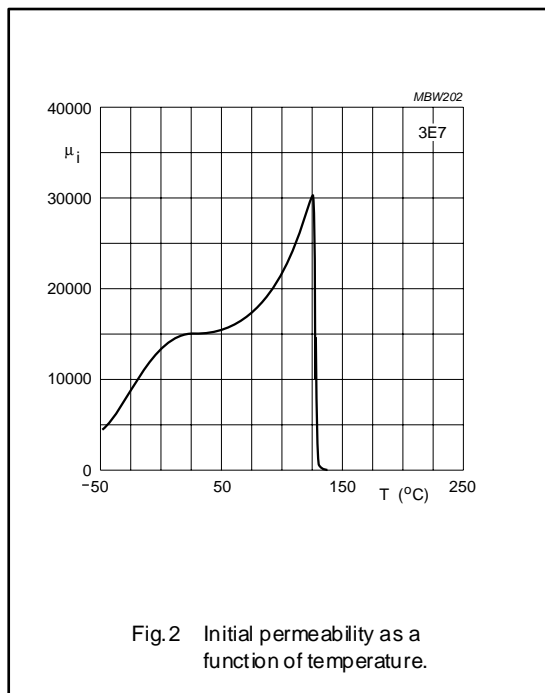


Fig. 2 Initial permeability as a function of temperature.

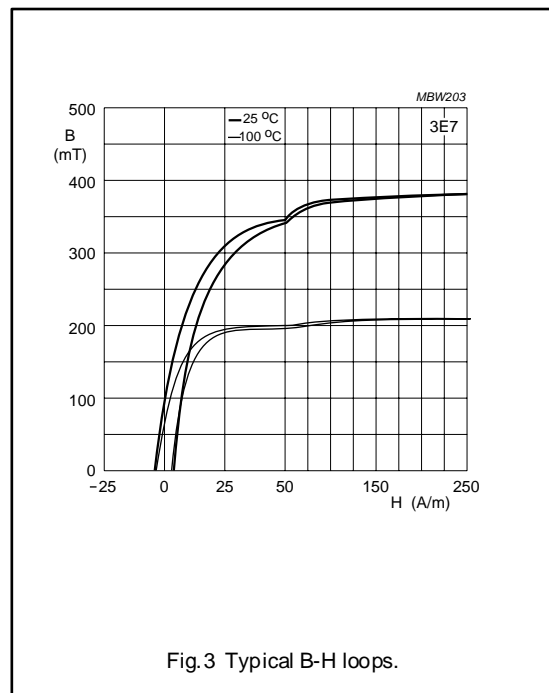
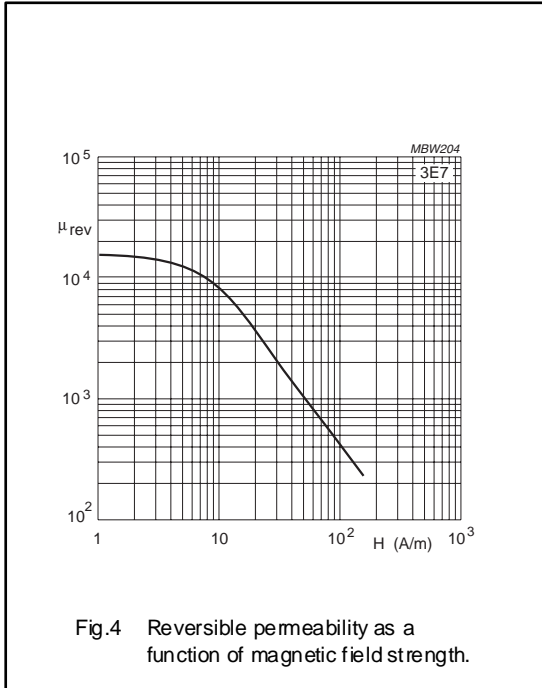


Fig. 3 Typical B-H loops.





Material specification

3E8

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 <sup>(1)</sup>	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	18000 $\pm$ 20%	
B	25 °C; 10 kHz; 1200 A/m 80 °C; 10 kHz; 1200 A/m	$\approx 380$ $\approx 210$	mT
$\tan \delta / \mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 30 kHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 30 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.1$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 100$	°C
density		$\approx 5000$	kg/m <sup>3</sup>

Note

1. Measured on sintered, non-ground ring cores of dimensions  $\varnothing 14 \times \varnothing 9 \times 5$  which are not subjected to external stresses.

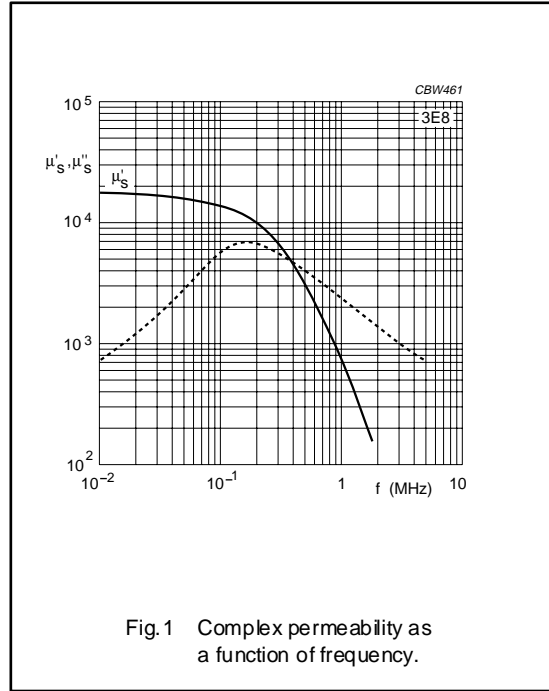


Fig. 1 Complex permeability as a function of frequency.

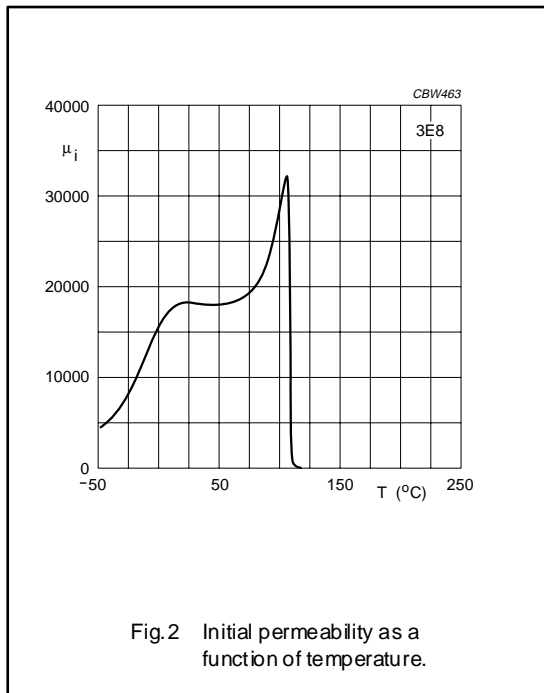


Fig. 2 Initial permeability as a function of temperature.

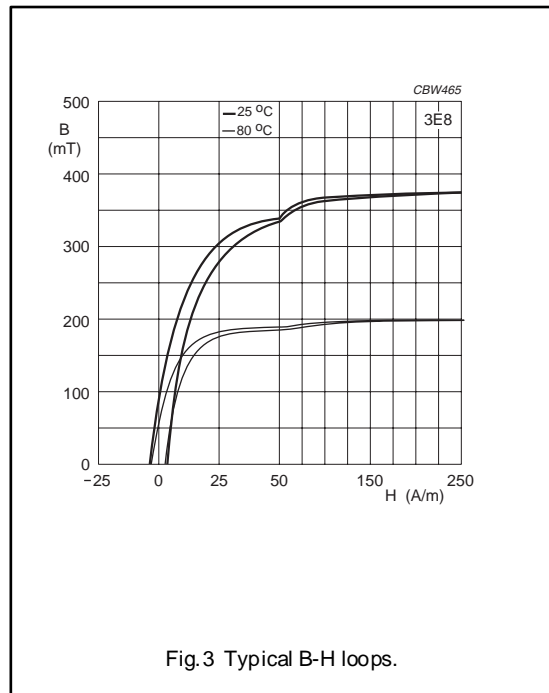
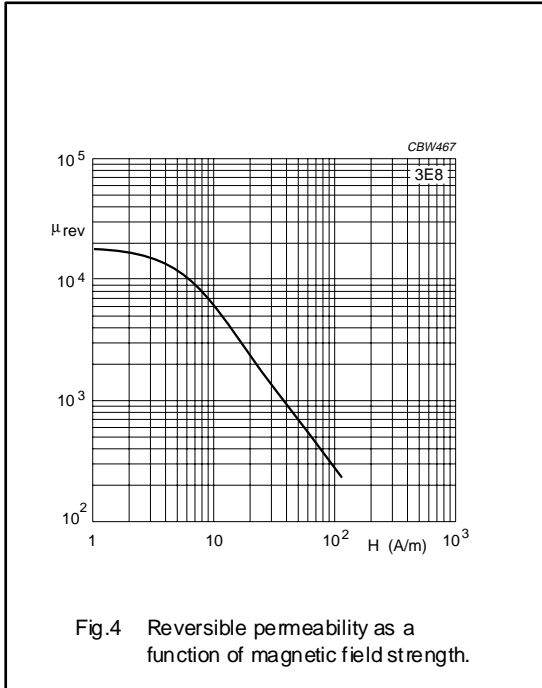


Fig. 3 Typical B-H loops.



Preliminary material specification

3E9

3E9 SPECIFICATIONS

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

	CONDITIONS	VALUE <sup>(1)</sup>	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	20000 $\pm$ 20%	
B	25 °C; 10 kHz; 1200 A/m 80 °C; 10 kHz; 1200 A/m	$\approx$ 380 $\approx$ 210	mT
$\tan \delta / \mu_i$	25 °C; 10 kHz; 0.25 mT 25 °C; 30 kHz; 0.25 mT	$\leq 10 \times 10^{-6}$ $\leq 50 \times 10^{-6}$	
$\eta_B$	25 °C; 10 kHz; 1.5 to 3 mT	$\leq 1 \times 10^{-3}$	T <sup>-1</sup>
$\rho$	DC; 25 °C	$\approx 0.1$	$\Omega\text{m}$
$T_C$		$\geq 100$	°C
density		$\approx 5000$	kg/m <sup>3</sup>

Note

1. Measured on sintered, non-ground ring cores of dimensions  $\varnothing 14 \times \varnothing 9 \times 5$  which are not subjected to external stresses.

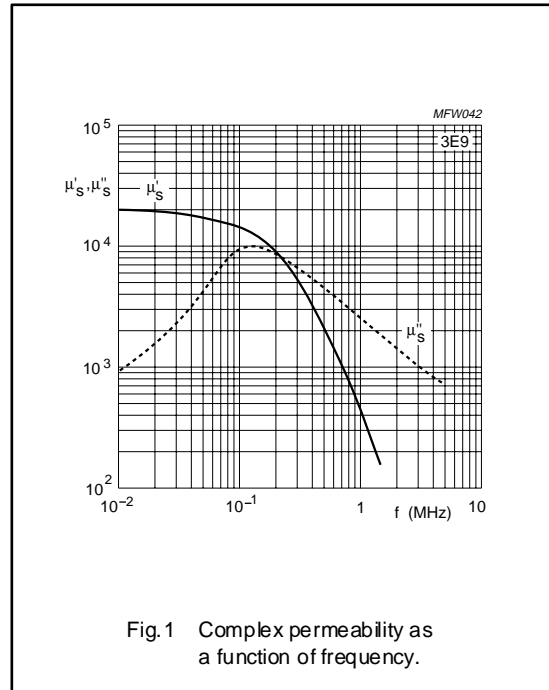


Fig. 1 Complex permeability as a function of frequency.

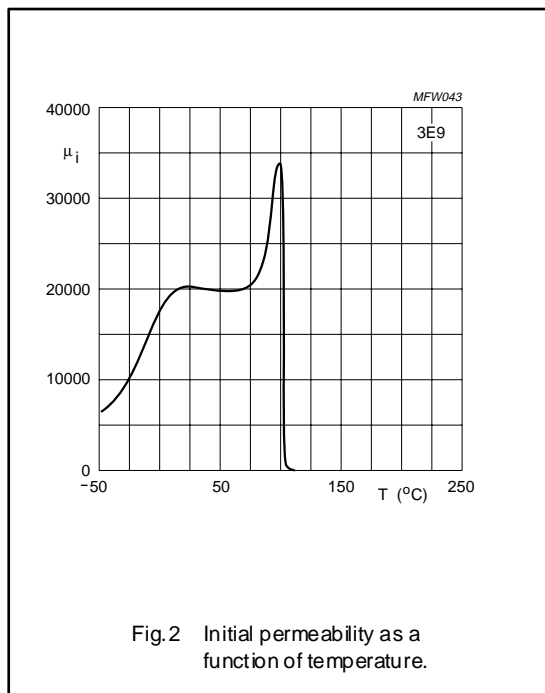


Fig. 2 Initial permeability as a function of temperature.

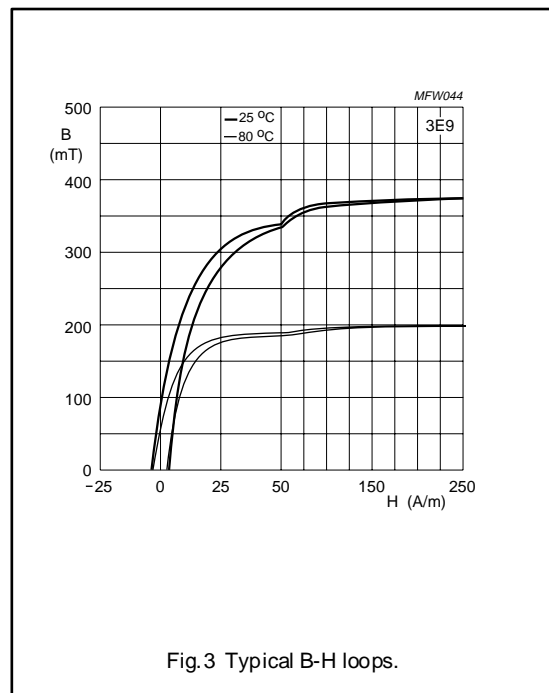
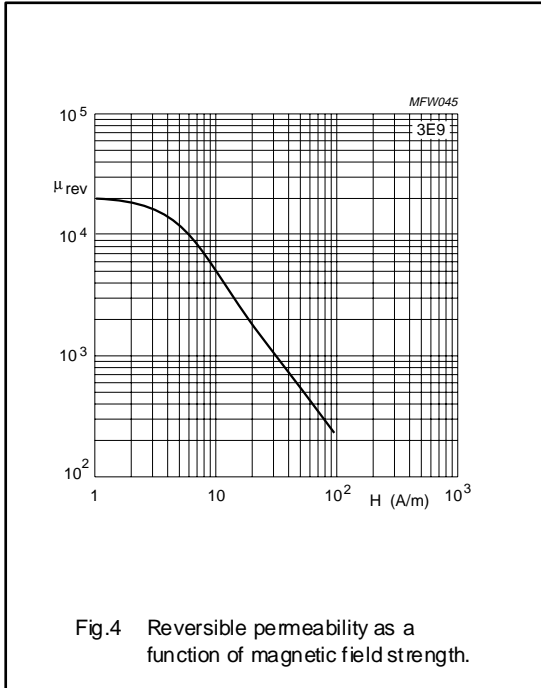


Fig. 3 Typical B-H loops.



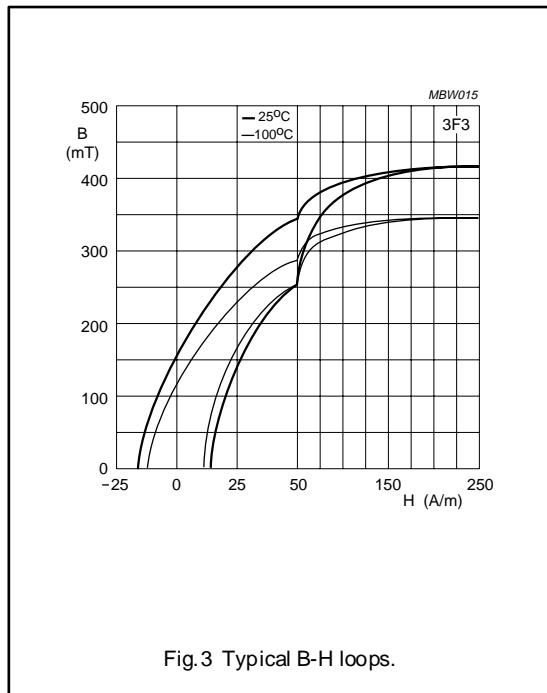
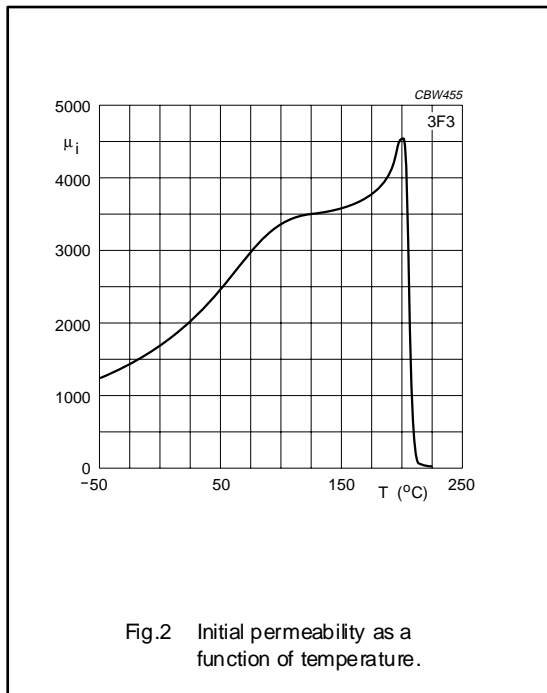
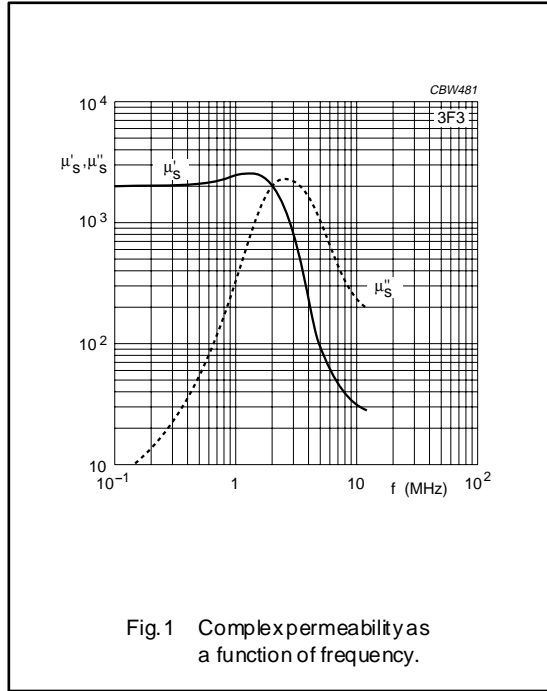
Material specification

3F3

3F3 SPECIFICATIONS

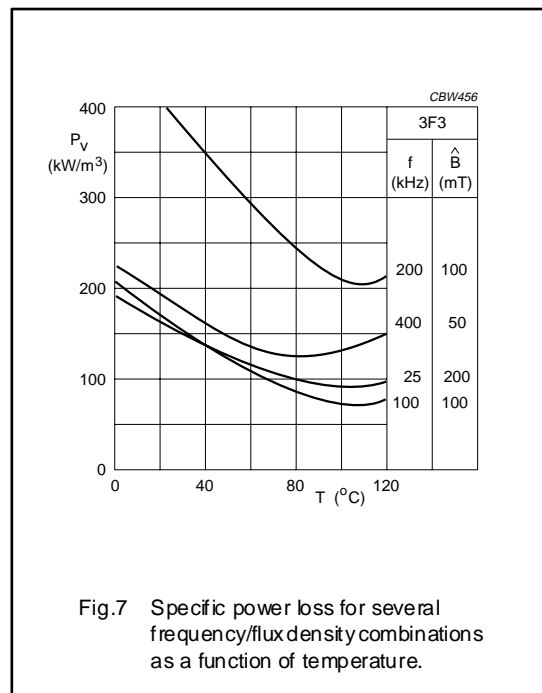
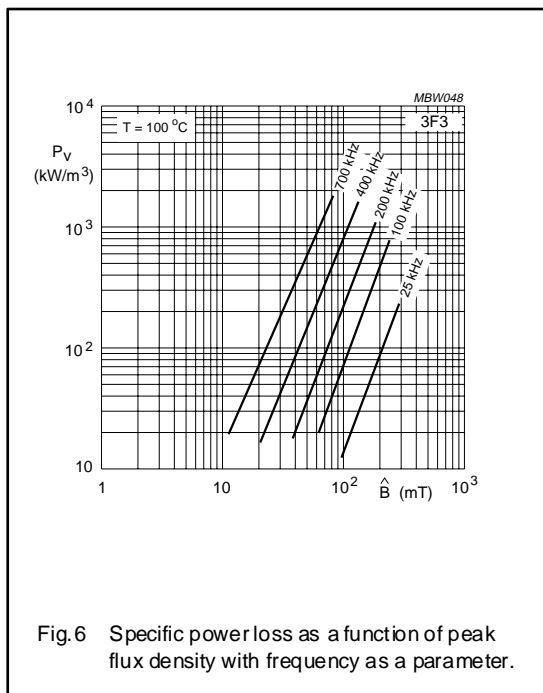
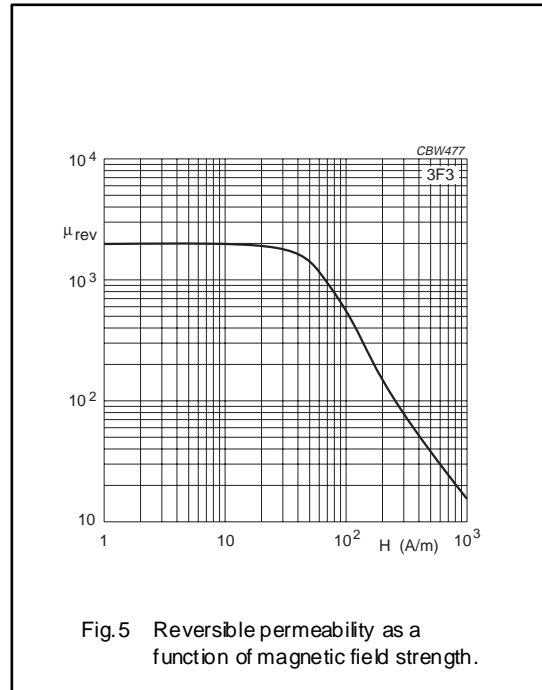
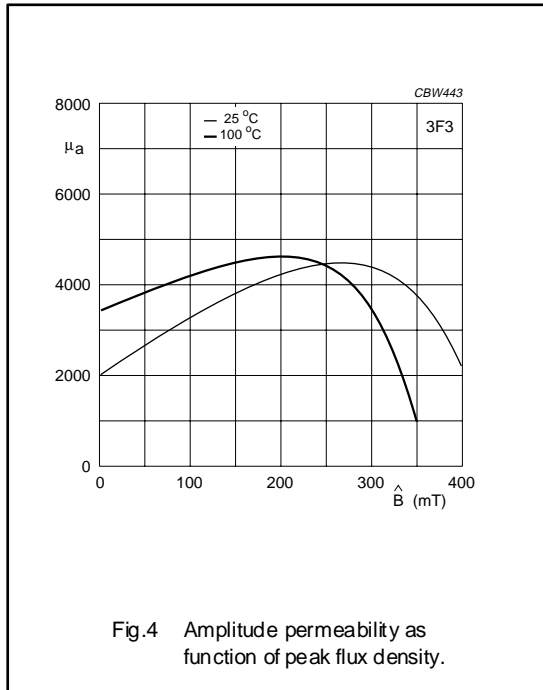
A medium frequency power material for use in power and general purpose transformers at frequencies of 0.2 - 0.5 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$2000 \pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 4000$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 440$ $\approx 370$	mT
$P_V$	100 °C; 100 kHz; 100 mT 100 °C; 400 kHz; 50 mT	$\leq 80$ $\leq 150$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 2$	$\Omega\text{m}$
$T_C$		$\geq 200$	°C
density		$\approx 4750$	kg/m <sup>3</sup>



Material specification

3F3



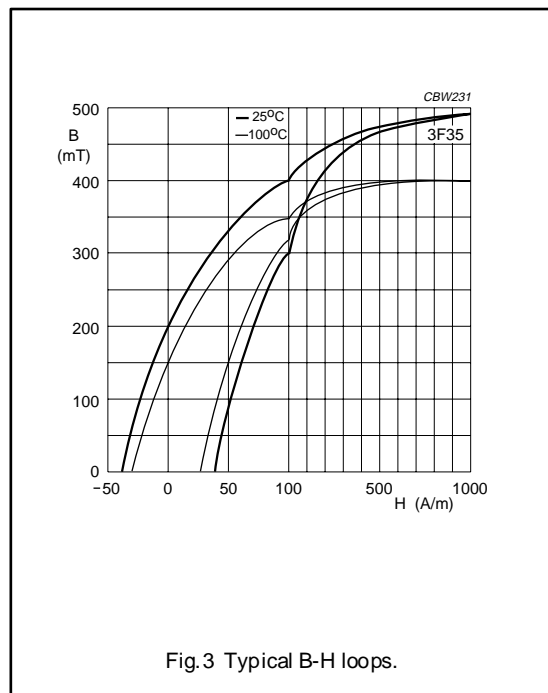
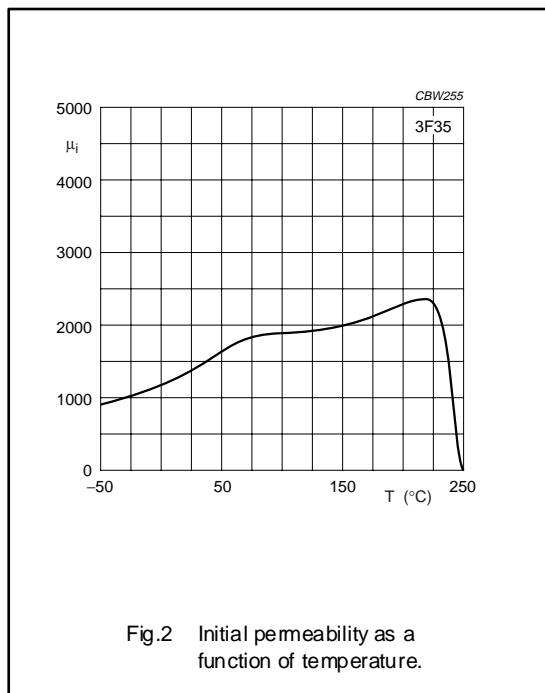
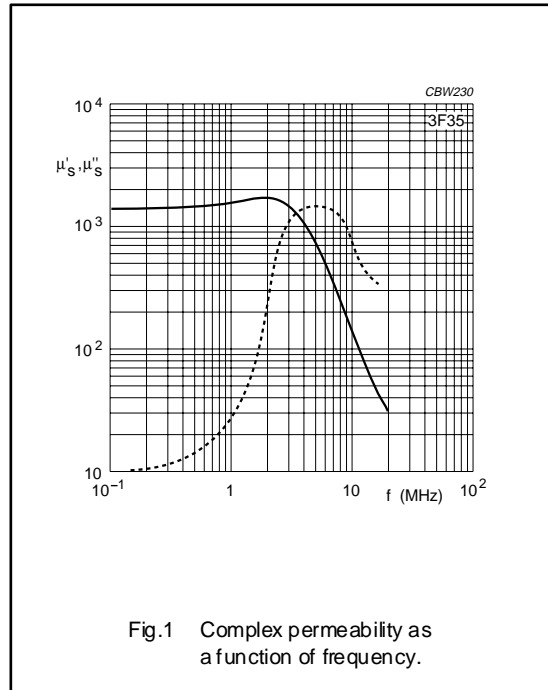
Material specification

3F35

3F35 SPECIFICATIONS

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

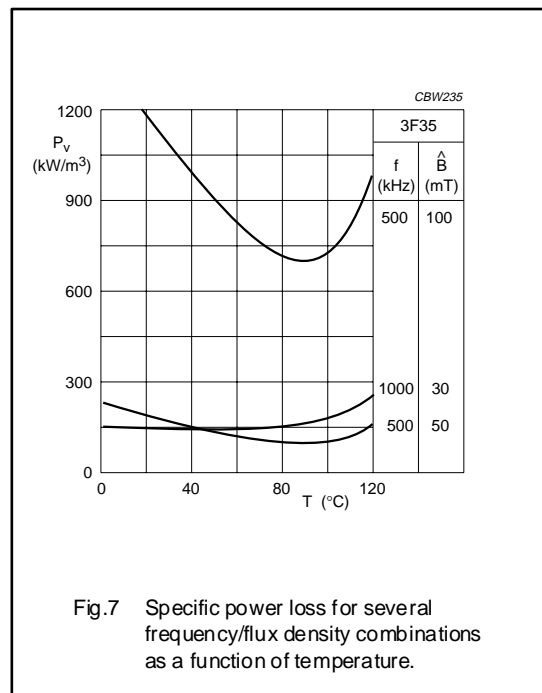
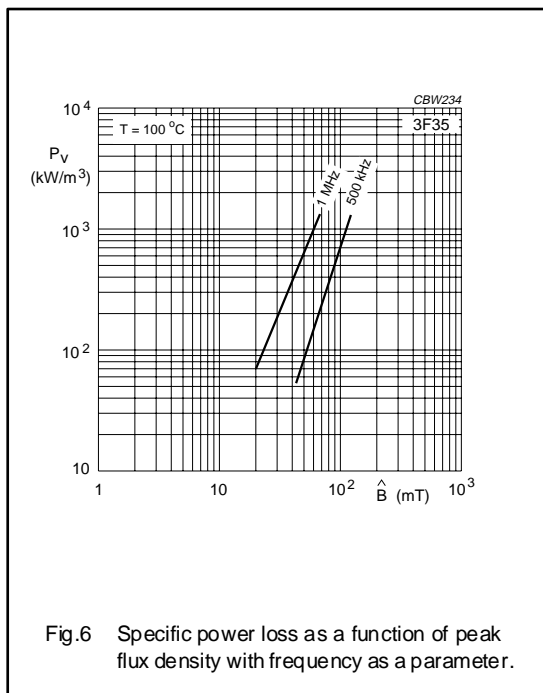
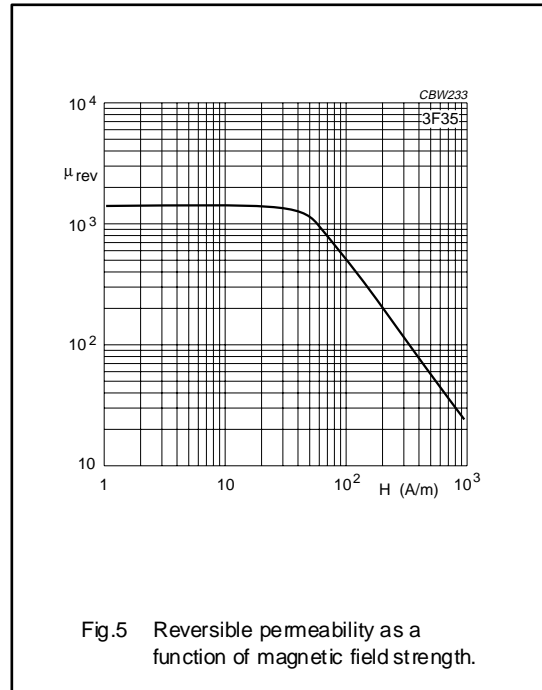
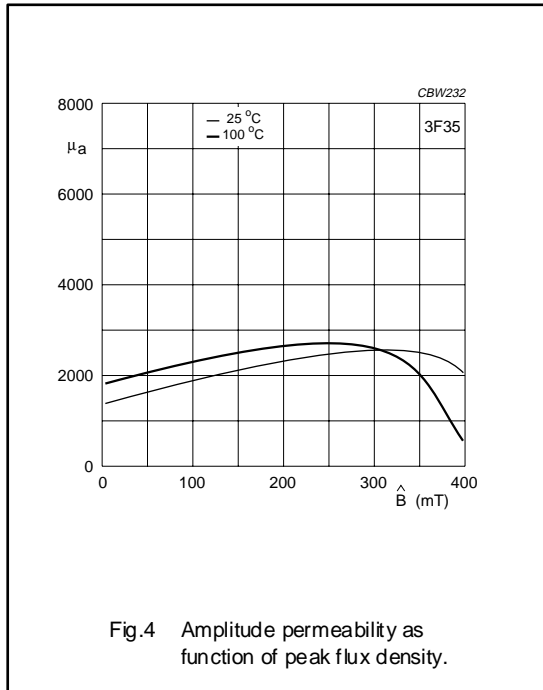
	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	1400 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 2400$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 500$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 420$	
P <sub>v</sub>	100 °C; 400 kHz; 50 mT	$\approx 60$	kW/m <sup>3</sup>
	100 °C; 500 kHz; 50 mT	$\approx 90$	
	100 °C; 500 kHz; 100 mT	$\approx 700$	
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 240$	°C
density		$\approx 4750$	kg/m <sup>3</sup>





Material specification

3F35



Material specification

3F4

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	900 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 1700$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 410$ $\approx 350$	mT
$P_V$	100 °C; 1 MHz; 30 mT 100 °C; 3 MHz; 10 mT	$\approx 130$ $\approx 220$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
$T_C$		$\geq 220$	°C
density		$\approx 4700$	kg/m <sup>3</sup>

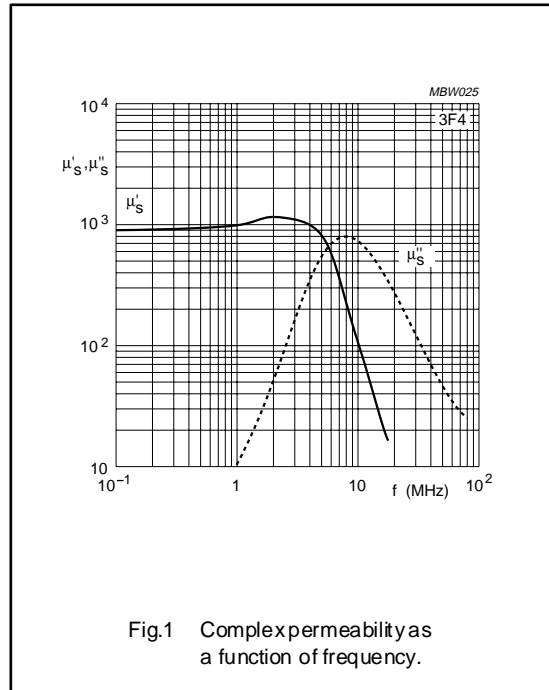


Fig.1 Complex permeability as a function of frequency.

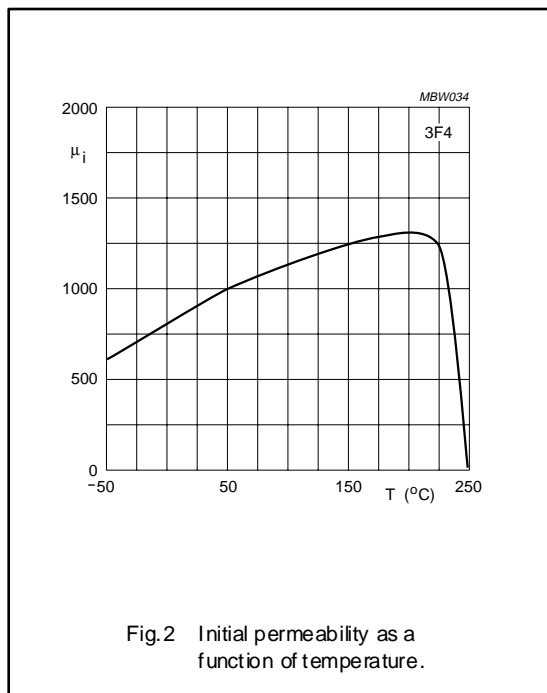


Fig.2 Initial permeability as a function of temperature.

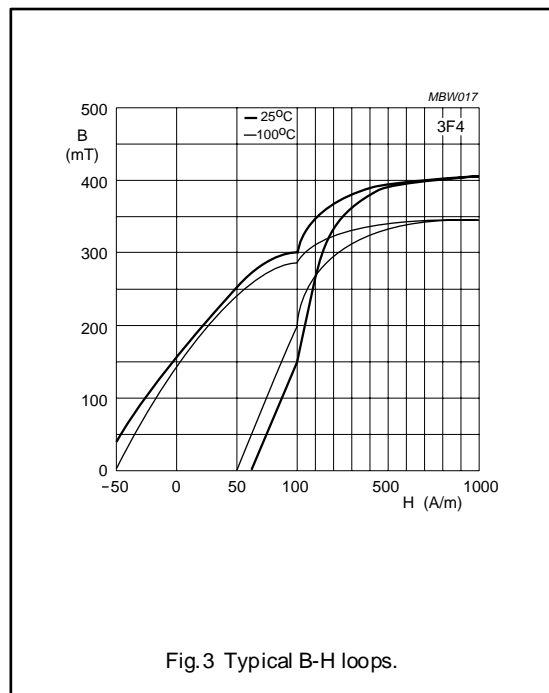
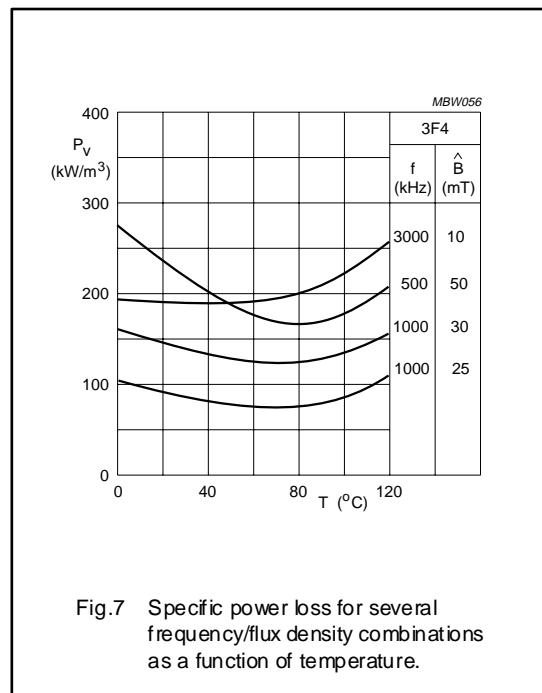
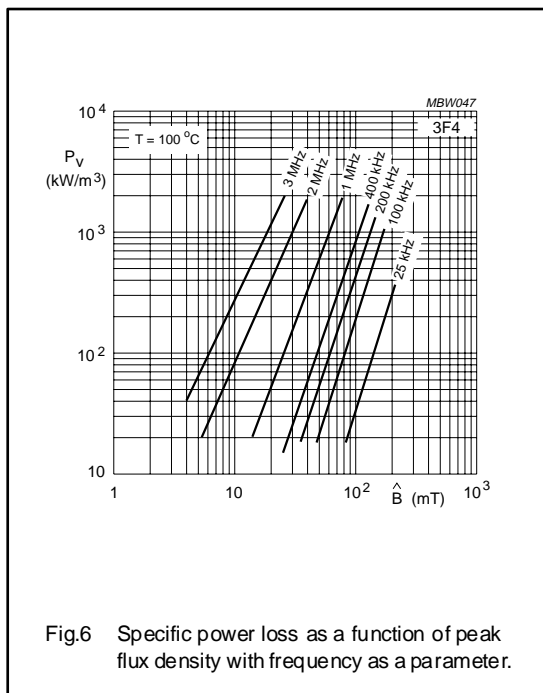
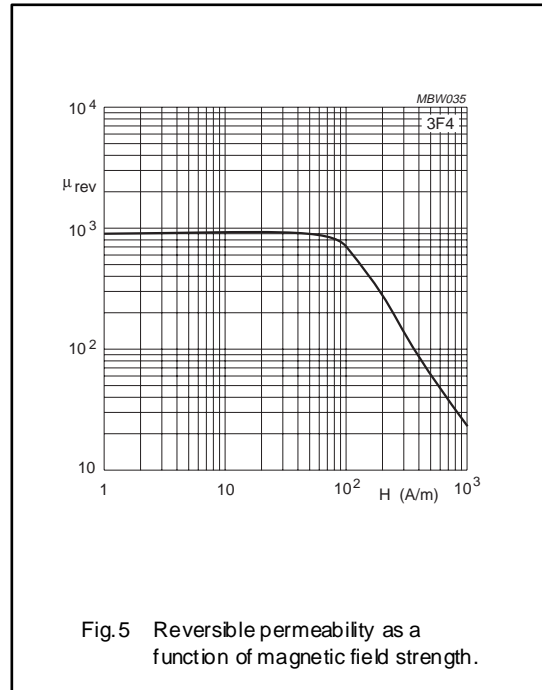
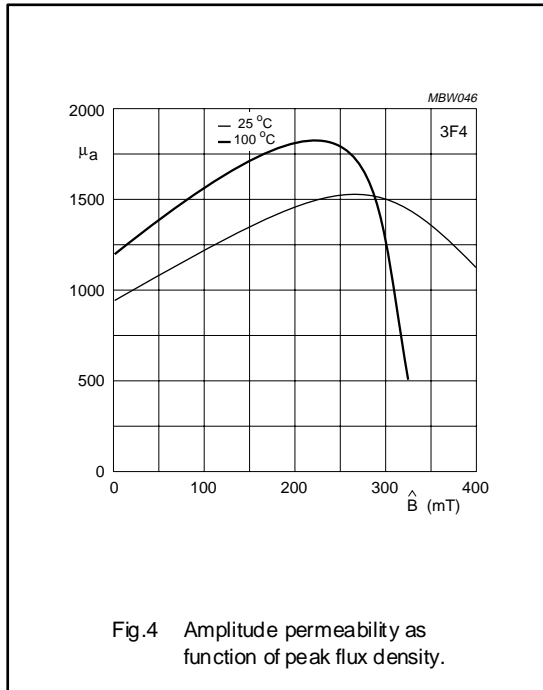


Fig.3 Typical B-H loops.

Material specification

3F4



Preliminary material specification

3F45

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	900 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 1700$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 420$ $\approx 370$	mT
$P_V$	100 °C; 1 MHz; 30 mT 100 °C; 1 MHz; 50 mT 100 °C; 3 MHz; 10 mT	$\approx 80$ $\approx 300$ $\approx 150$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
$T_C$		$\geq 300$	°C
density		$\approx 4800$	kg/m <sup>3</sup>

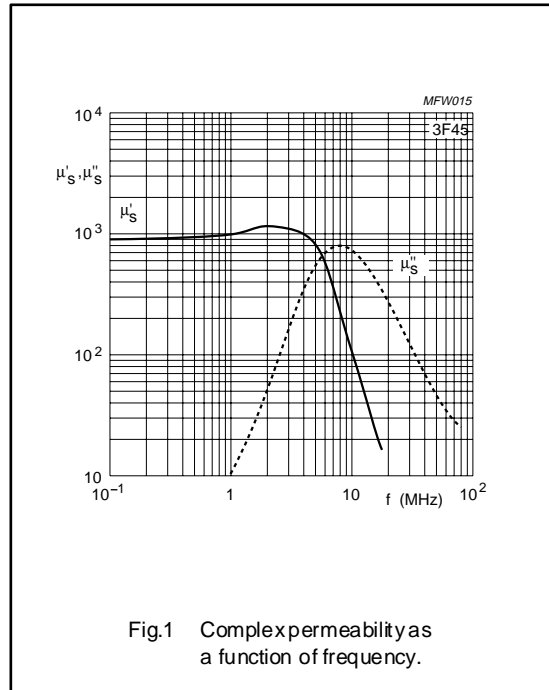


Fig.1 Complex permeability as a function of frequency.

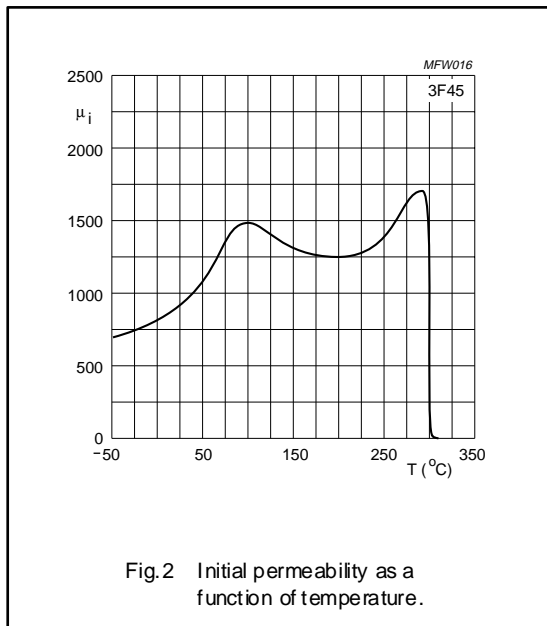


Fig.2 Initial permeability as a function of temperature.

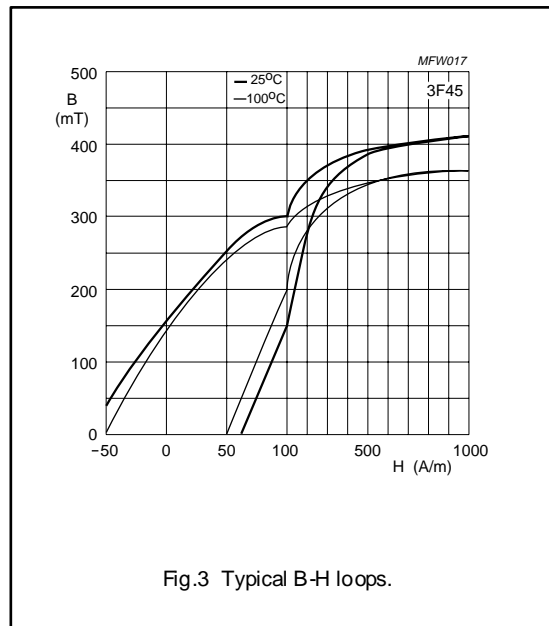


Fig.3 Typical B-H loops.

Preliminary material specification

3F45

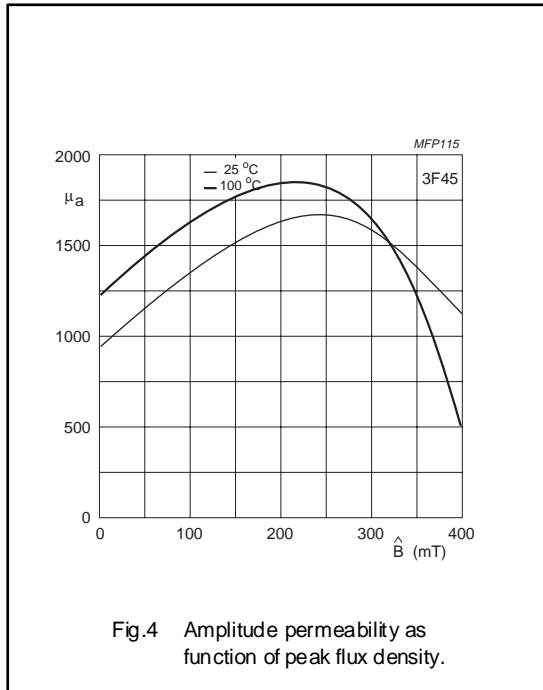


Fig.4 Amplitude permeability as function of peak flux density.

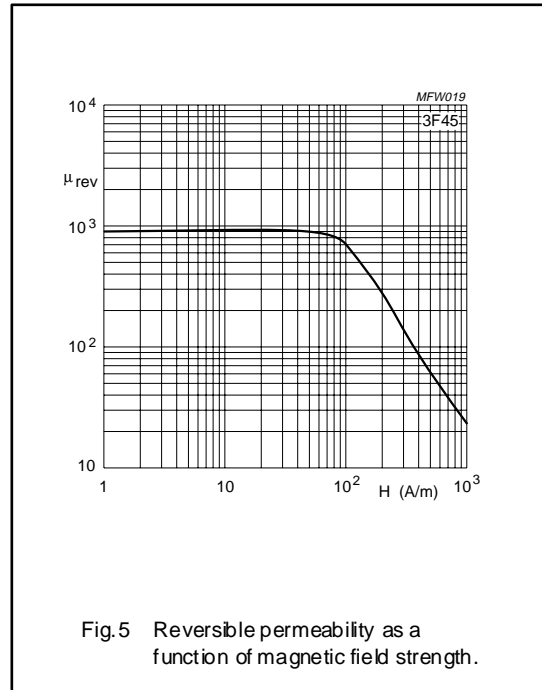


Fig.5 Reversible permeability as a function of magnetic field strength.

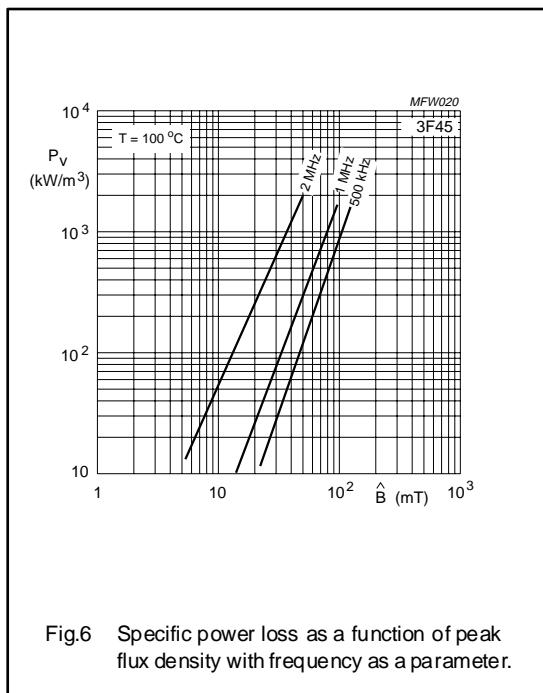


Fig.6 Specific power loss as a function of peak flux density with frequency as a parameter.

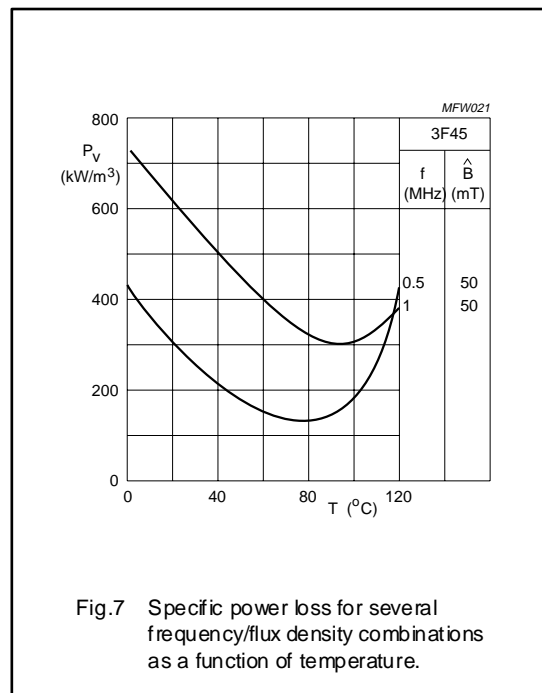


Fig.7 Specific power loss for several frequency/flux density combinations as a function of temperature.

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	650 $\pm 20\%$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 1000$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 380$ $\approx 340$	mT
$P_V$	100 °C; 3 MHz; 10 mT 100 °C; 3 MHz; 30 mT	$\approx 100$ $\approx 900$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
$T_C$		$\geq 300$	°C
density		$\approx 4750$	kg/m <sup>3</sup>

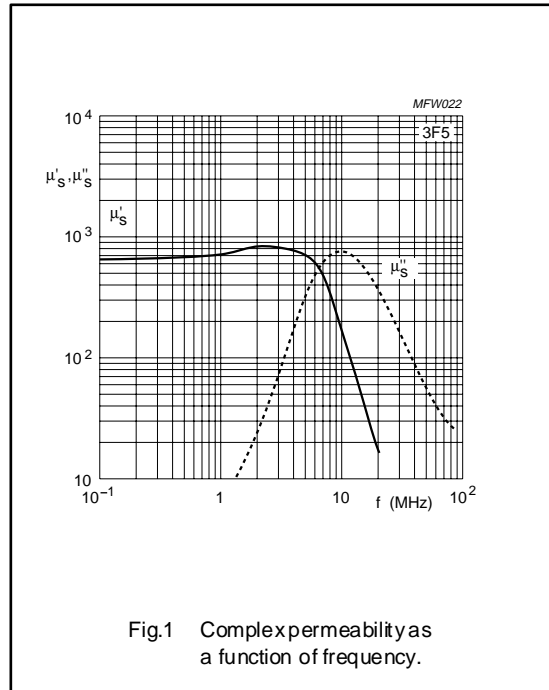


Fig.1 Complex permeability as a function of frequency.

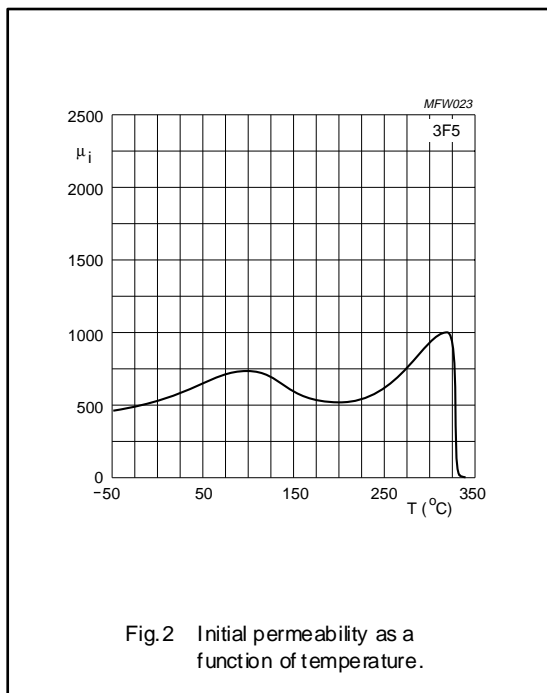


Fig.2 Initial permeability as a function of temperature.

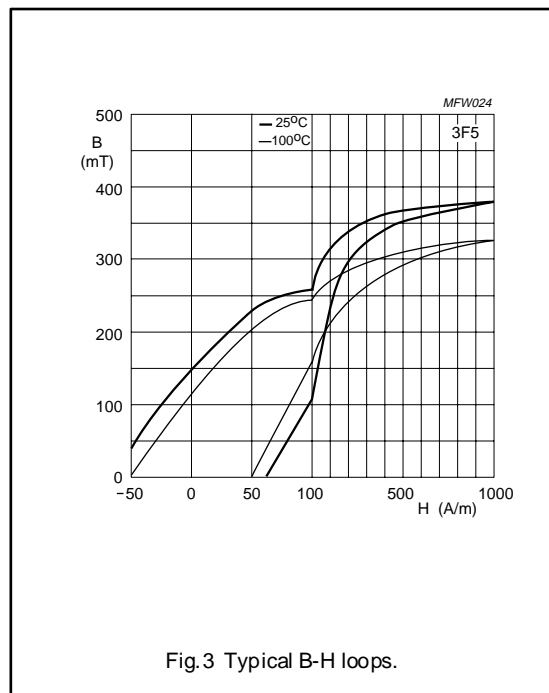
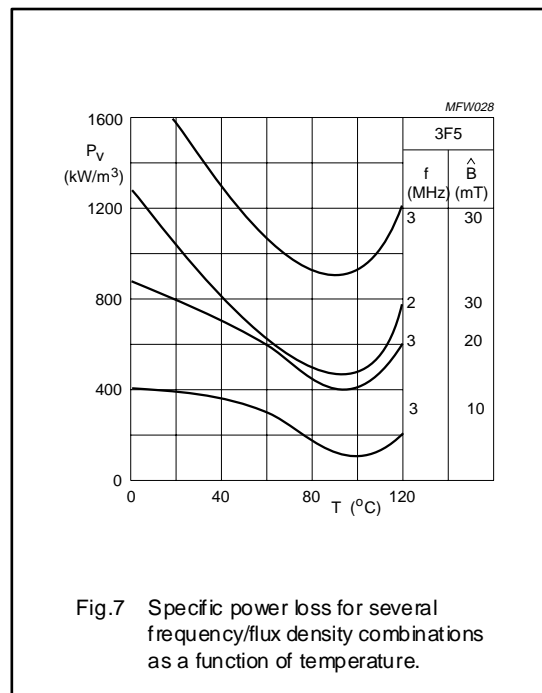
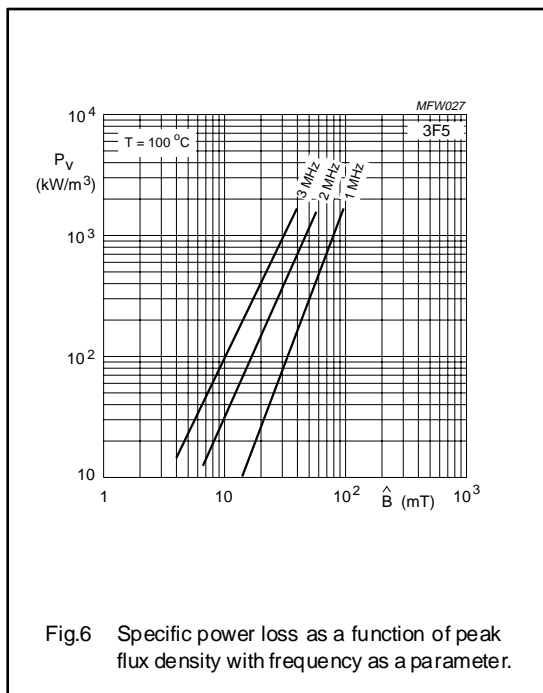
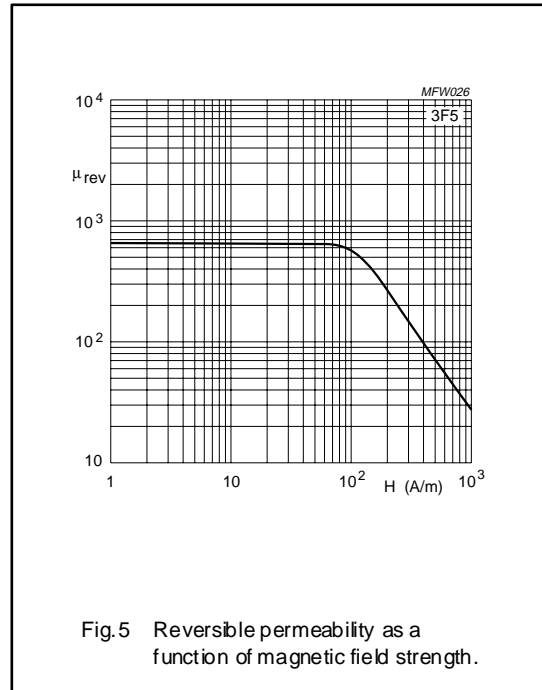
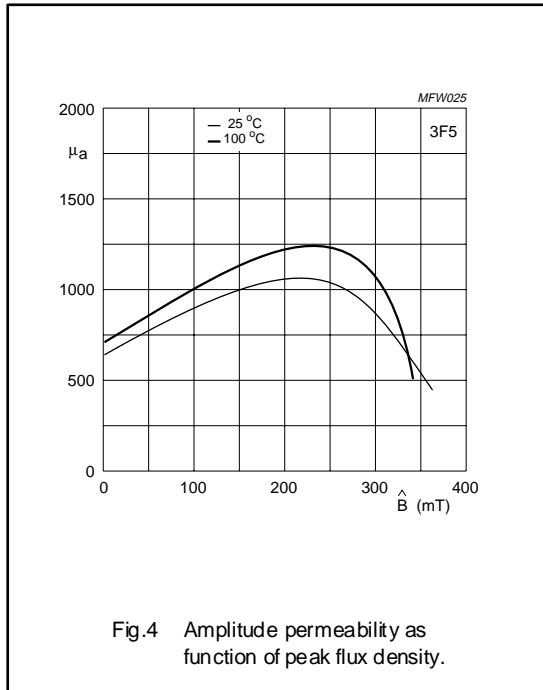


Fig.3 Typical B-H loops.



Material specification

3H3

3H3 SPECIFICATIONS

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

	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$2000 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 360$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 270$	
$\tan\delta/\mu_i$	25 °C; 0.25 mT; 30 kHz	$\leq 1.6 \times 10^{-6}$	
	25 °C; 0.25 mT; 100 kHz	$\leq 2.5 \times 10^{-6}$	
$\eta_B$	25 °C; 100 kHz; 1.5 to 3 mT	$\leq 0.6 \times 10^{-3}$	T <sup>-1</sup>
D <sub>F</sub>	0.25 mT; 10 kHz: 25 °C	$\leq 3 \times 10^{-6}$	
	40 °C	$\leq 3 \times 10^{-6}$	
$\alpha_F$	$\leq 10$ kHz; 0.25 mT; 5 to 25 °C	$(0.7 \pm 0.3) \times 10^{-6}$	K <sup>-1</sup>
	25 to 55 °C	$(0.7 \pm 0.3) \times 10^{-6}$	
	25 to 70 °C	$(0.7 \pm 0.3) \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 2$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 160$	°C
density		$\approx 4700$	kg/m <sup>3</sup>

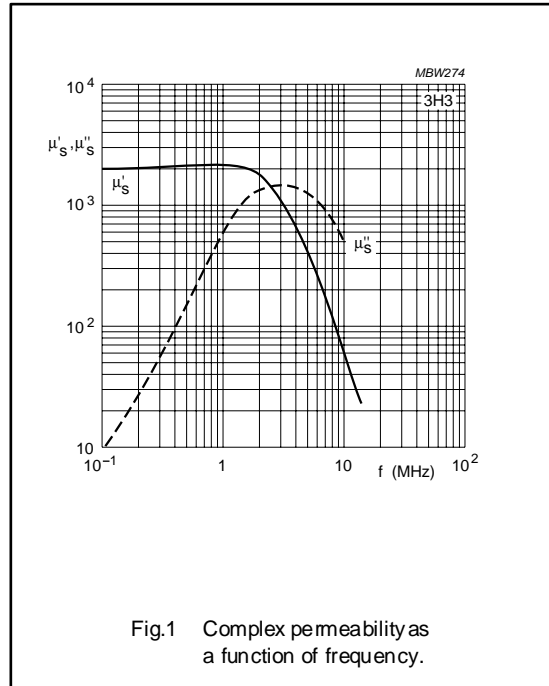


Fig.1 Complex permeability as a function of frequency.

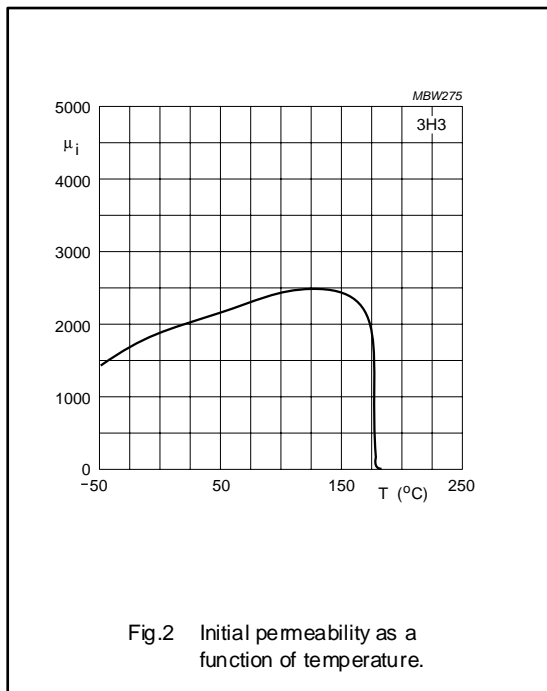


Fig.2 Initial permeability as a function of temperature.

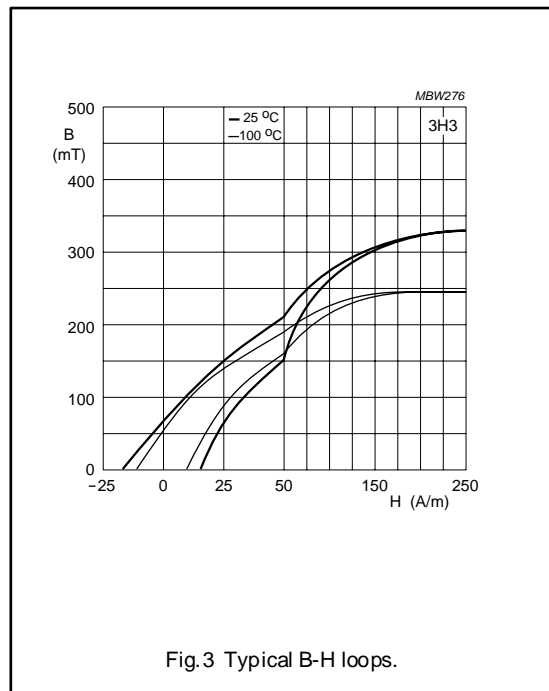


Fig.3 Typical B-H loops.





Material specification

3R1

3R1 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$800 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 410$ $\approx 340$	mT
$B_r$	from 1 kA/m; 25 °C from 1 kA/m; 100 °C	$\geq 310$ $\geq 220$	mT
$H_c$	from 1 kA/m; 25 °C from 1 kA/m; 100 °C	$\leq 52$ $\leq 23$	A/m
$\rho$	DC; 25 °C	$\approx 10^3$	$\Omega\text{m}$
$T_C$		$\geq 230$	°C
density		$\approx 4700$	$\text{kg/m}^3$

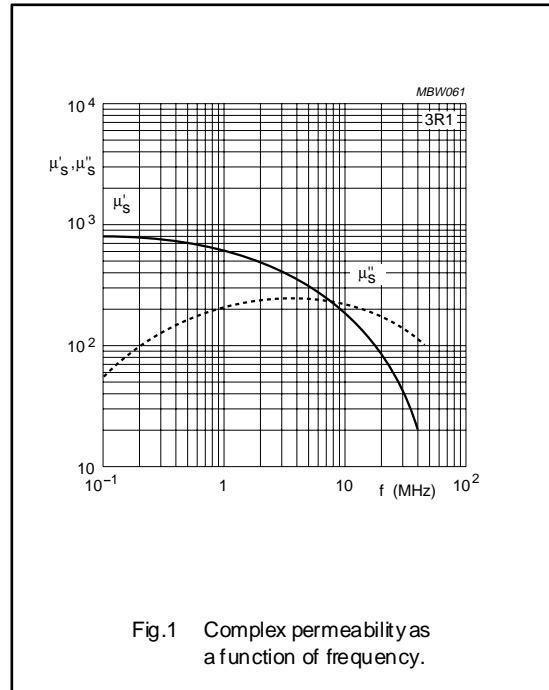


Fig.1 Complex permeability as a function of frequency.

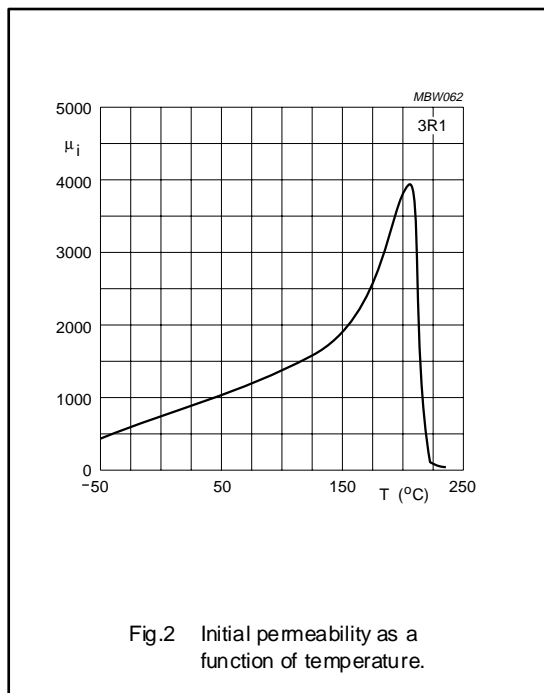


Fig.2 Initial permeability as a function of temperature.

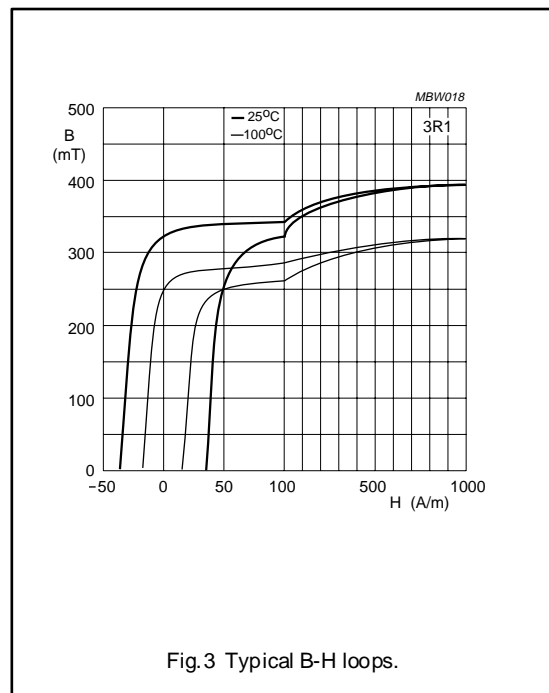
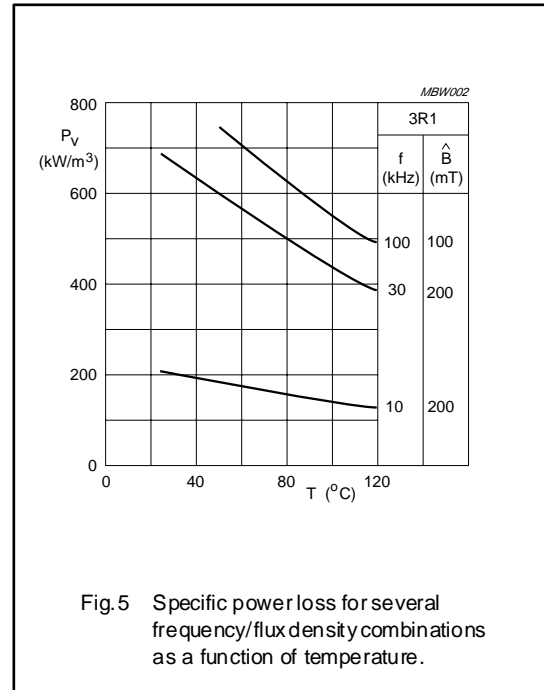
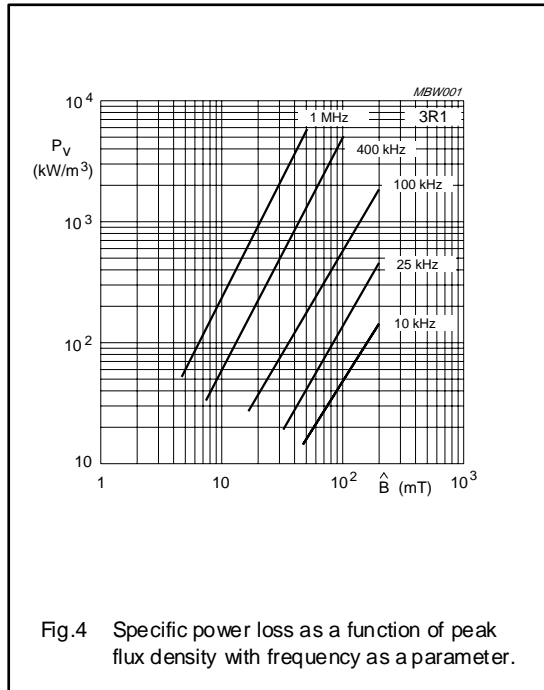


Fig.3 Typical B-H loops.



**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<sub>o</sub> = outside diameter (mm)
- D<sub>i</sub> = inside diameter (mm).

Material specification

3S1

3S1 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$\approx 4000$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 400$ $\approx 230$	mT
$ Z ^{(1)}$	25 °C; 1 MHz 25 °C; 10 MHz	$\geq 30$ $\geq 60$	$\Omega$
$\rho$	DC; 25 °C	$\approx 1$	$\Omega\text{m}$
$T_c$		$\geq 125$	°C
density		$\approx 4900$	$\text{kg/m}^3$

Note

1. Measured on a bead  $\varnothing 5 \times \varnothing 2 \times 10$  mm.

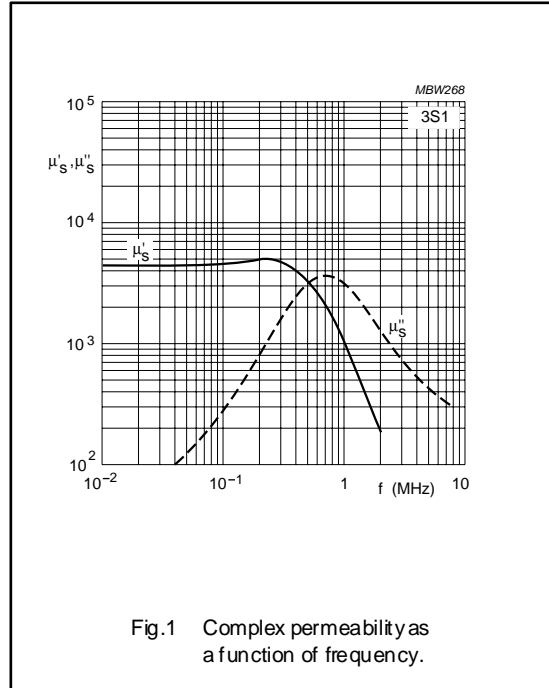


Fig.1 Complex permeability as a function of frequency.

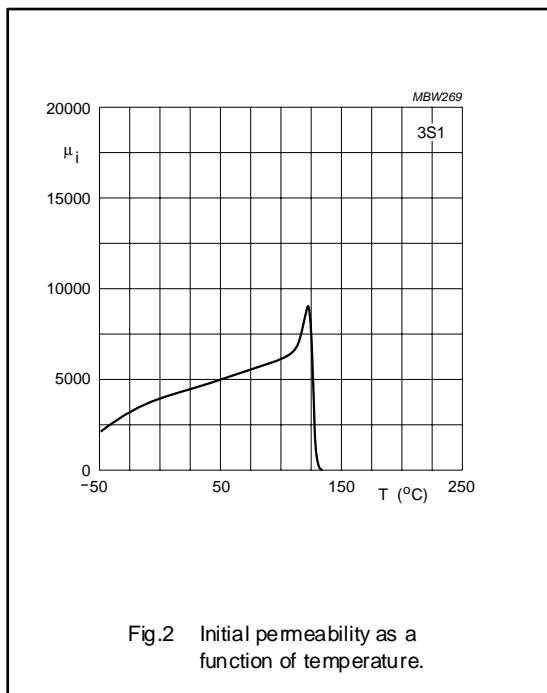


Fig.2 Initial permeability as a function of temperature.

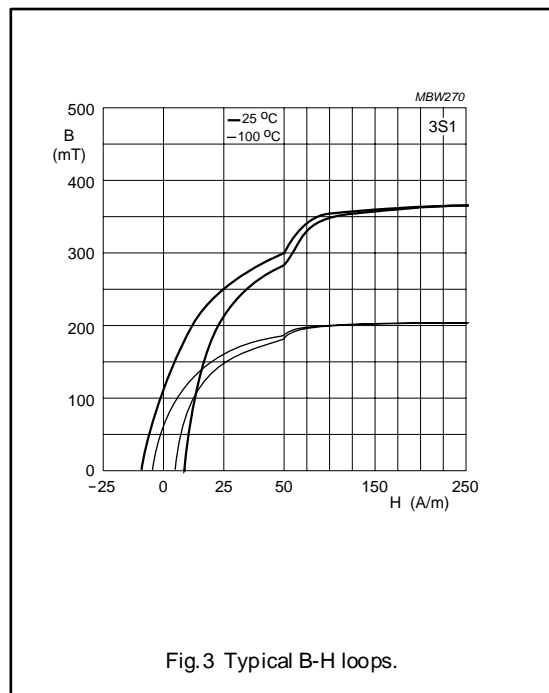
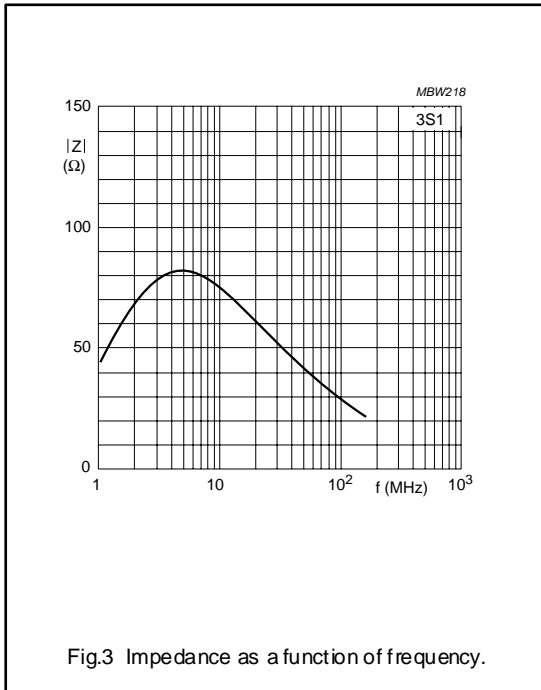


Fig.3 Typical B-H loops.



Material 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
$\mu_i$	25 °C; $\leq 10$ kHz; 0,25 mT	$\approx 350$	
B	25 °C; 10 kHz; 1200 A/m	$\approx 320$	mT
	100 °C; 10 kHz; 1200 A/m	$\approx 270$	
$ Z ^{(1)}$	25 °C; 30 MHz	$\geq 25$	$\Omega$
	25 °C; 100 MHz	$\geq 60$	
	25 °C; 300 MHz	$\geq 100$	
$\rho$	DC; 25 °C	$\approx 10^4$	$\Omega\text{m}$
$T_C$		$\geq 225$	$^{\circ}\text{C}$
density		$\approx 4800$	$\text{kg/m}^3$

Note

1. Measured on a bead  $\varnothing 5 \times \varnothing 2 \times 10$  mm.

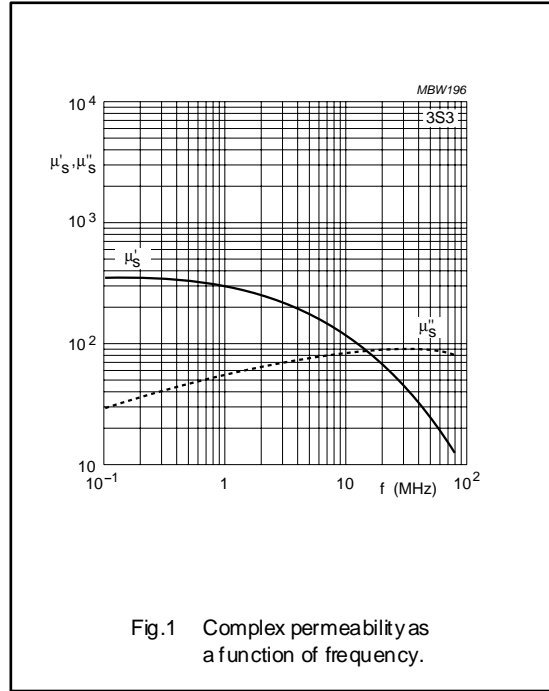


Fig.1 Complex permeability as a function of frequency.

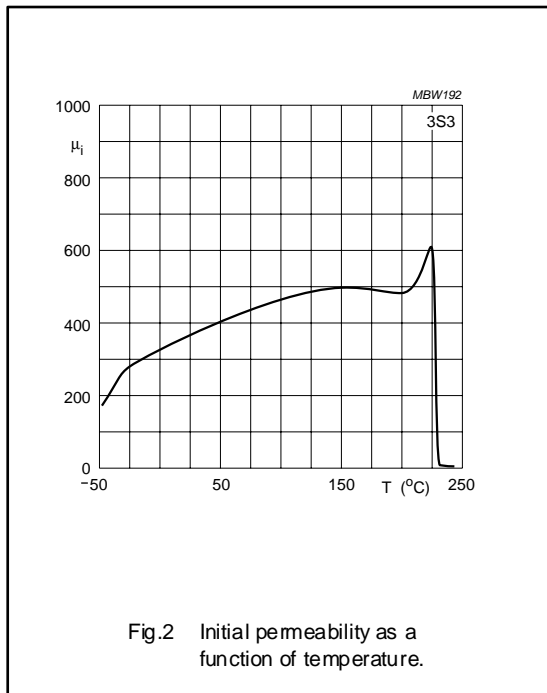


Fig.2 Initial permeability as a function of temperature.

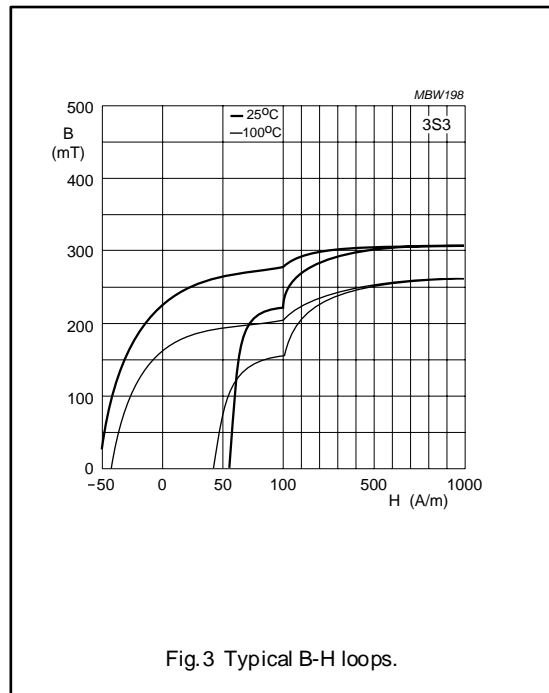


Fig.3 Typical B-H loops.

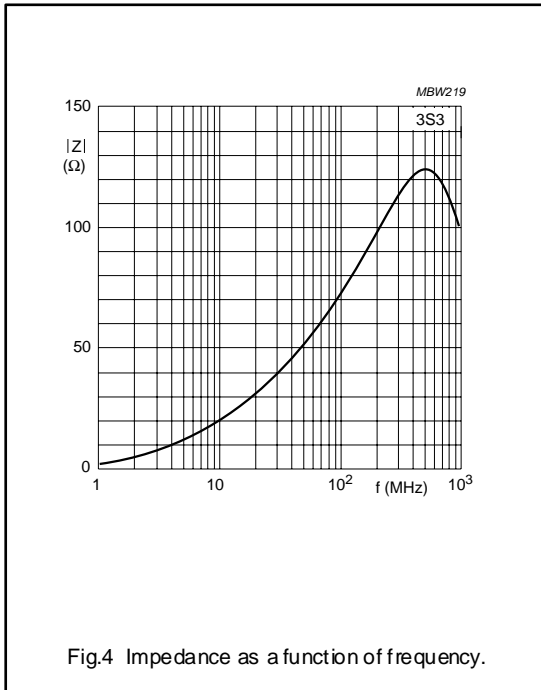


Fig.4 Impedance as a function of frequency.

Material specification

3S4

3S4 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$\approx 1700$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 320$ $\approx 170$	mT
$ Z ^{(1)}$	25 °C; 3 MHz 25 °C; 30 MHz 25 °C; 100 MHz 25 °C; 300 MHz	$\geq 25$ $\geq 60$ $\geq 80$ $\geq 90$	$\Omega$
$\rho$	DC; 25 °C	$\approx 10^3$	$\Omega\text{m}$
$T_C$		$\geq 110$	$^{\circ}\text{C}$
density		$\approx 4800$	$\text{kg/m}^3$

Note

1. Measured on a bead  $\varnothing 5 \times \varnothing 2 \times 10$  mm.

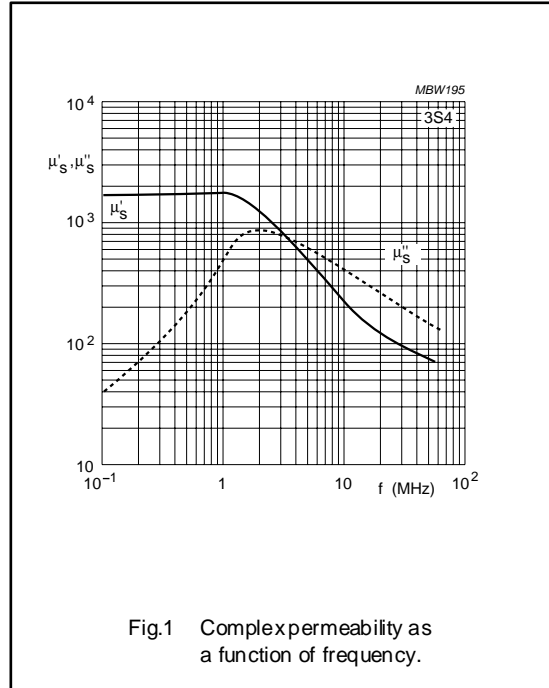


Fig.1 Complex permeability as a function of frequency.

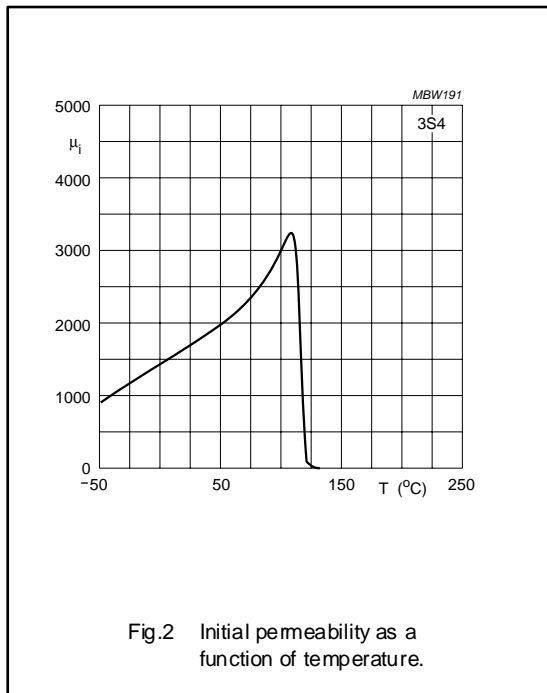


Fig.2 Initial permeability as a function of temperature.

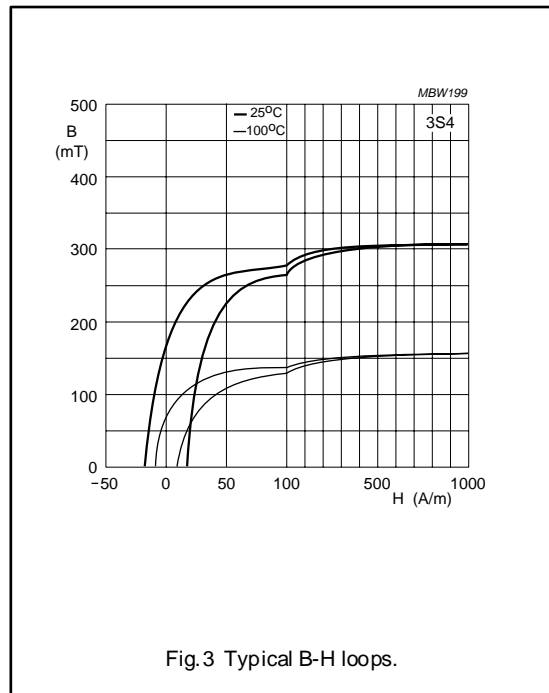
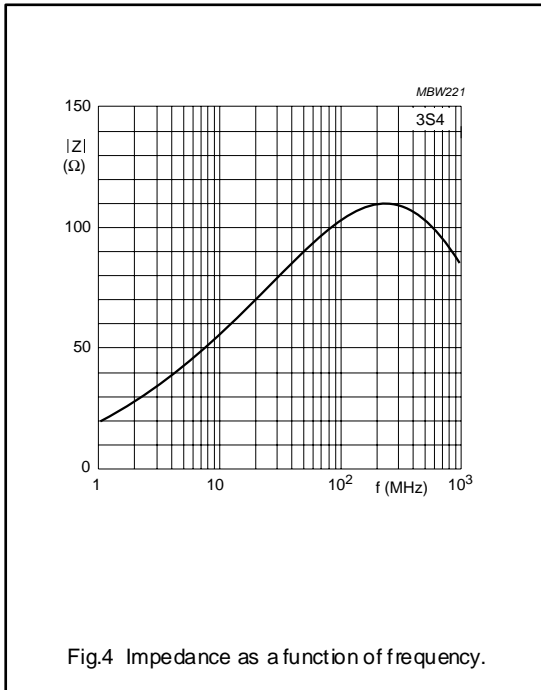


Fig.3 Typical B-H loops.





Material specification

3S5

3S5 SPECIFICATIONS

A low frequency EMI-suppression material specified on impedance and optimized for frequencies up to 30 MHz in applications with high bias currents at elevated temperatures (e.g. automotive and industrial).

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$3800 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 545$ $\approx 435$	mT
$ Z ^{(1)}$	25 °C; 1 MHz 25 °C; 10 MHz	$\geq 20$ $\geq 40$	$\Omega$
$\rho$	DC; 25 °C	$\approx 10$	$\Omega\text{m}$
$T_c$		$\geq 255$	°C
density		$\approx 4800$	$\text{kg/m}^3$

1. Measured on a bead  $\varnothing 5 \times \varnothing 2 \times 10$  mm.

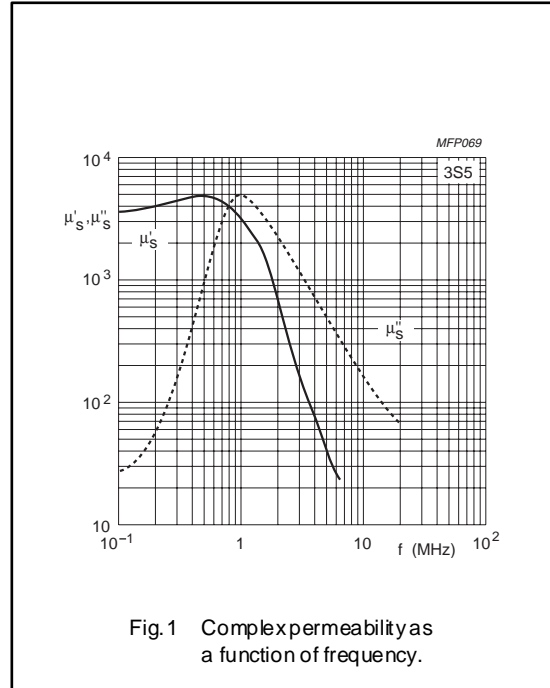


Fig. 1 Complex permeability as a function of frequency.

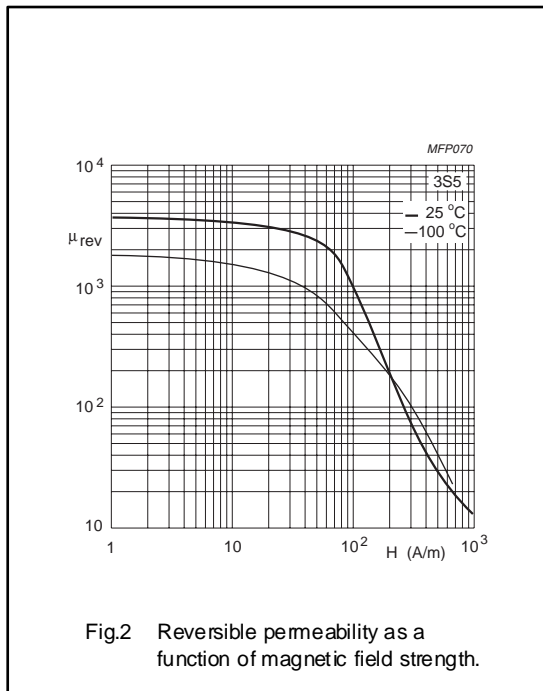


Fig. 2 Reversible permeability as a function of magnetic field strength.

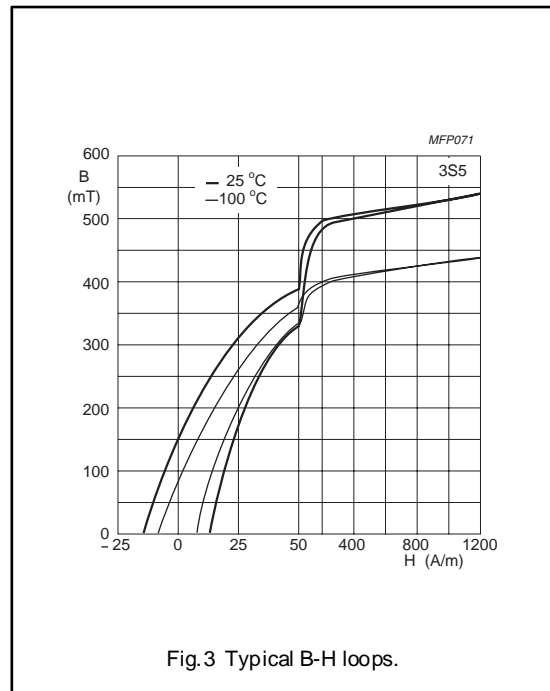
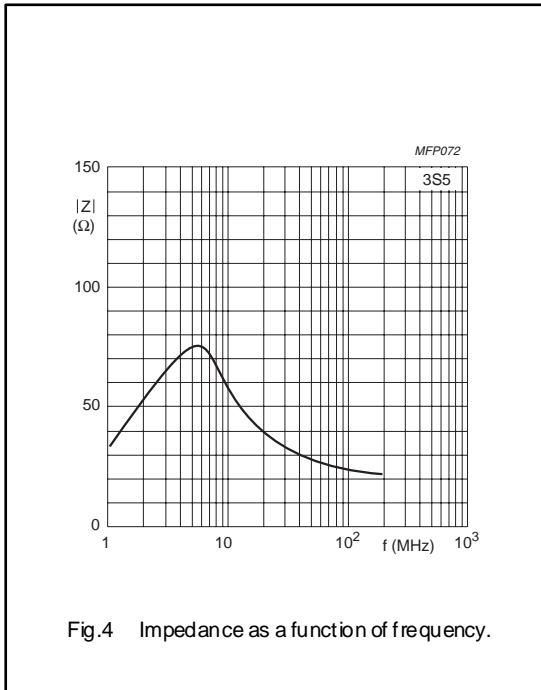


Fig. 3 Typical B-H loops.



Material specification

4A11

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	850 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 340$ $\approx 230$	mT
$\tan \delta / \mu_i$	25 °C; 1 MHz; 0.25 mT 25 °C; 3 MHz; 0.25 mT	$\leq 100 \times 10^{-6}$ $\leq 1000 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega m$
$T_c$		$\geq 125$	°C
density		$\approx 5100$	kg/m <sup>3</sup>

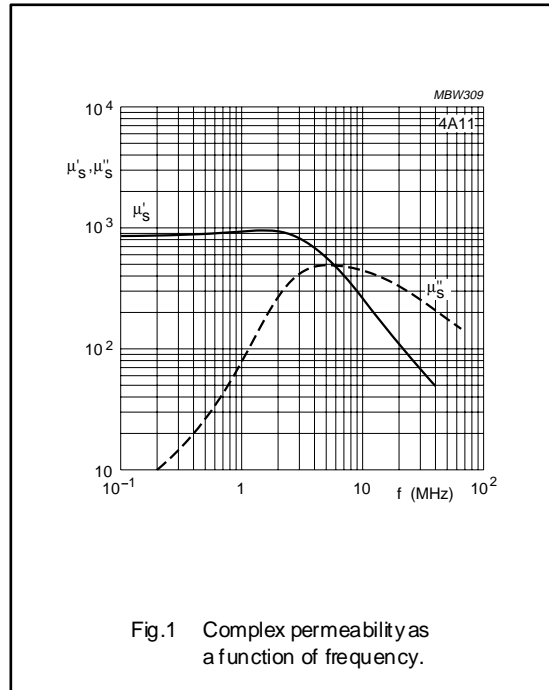


Fig.1 Complex permeability as a function of frequency.

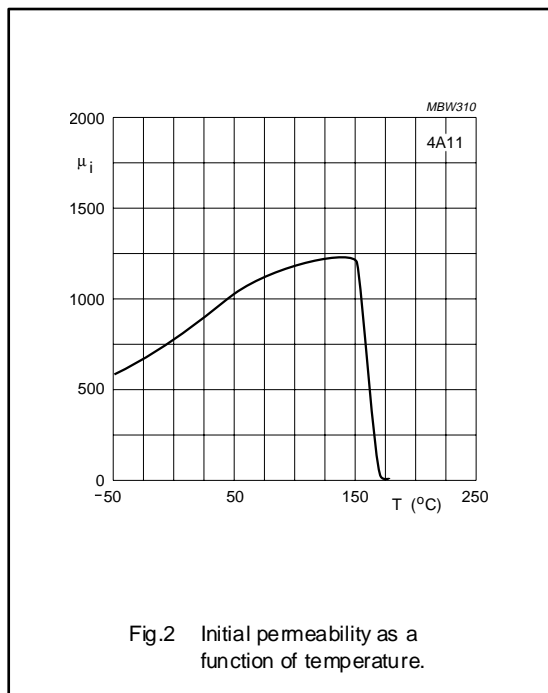


Fig.2 Initial permeability as a function of temperature.

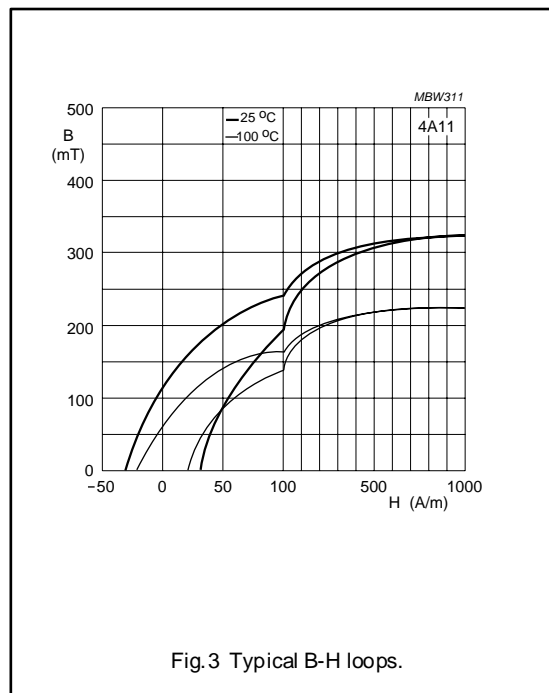


Fig.3 Typical B-H loops.

Material specification

4A15

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	1200 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 350$ $\approx 230$	mT
$\tan \delta / \mu_i$	25 °C; 1 MHz; 0.25 mT 25 °C; 3 MHz; 0.25 mT	$\leq 300 \times 10^{-6}$ $\leq 1500 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega m$
$T_c$		$\geq 125$	°C
density		$\approx 5100$	kg/m <sup>3</sup>

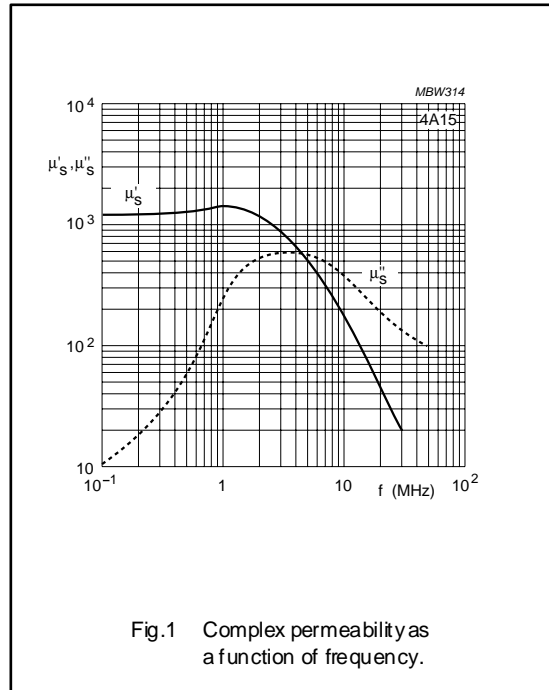


Fig.1 Complex permeability as a function of frequency.

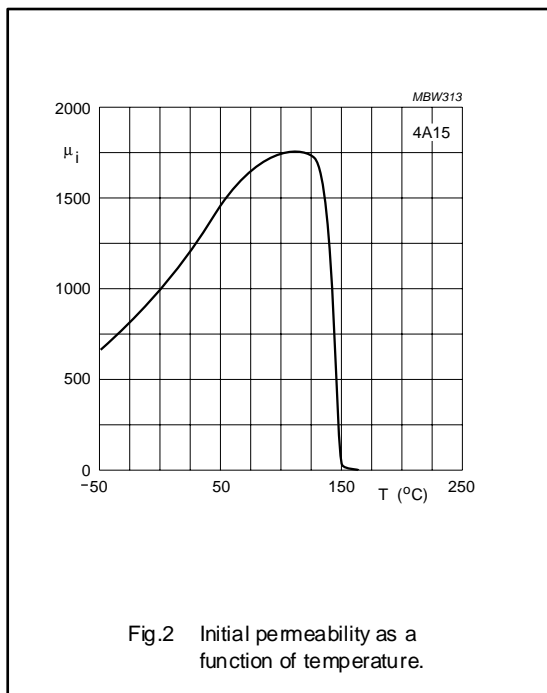


Fig.2 Initial permeability as a function of temperature.

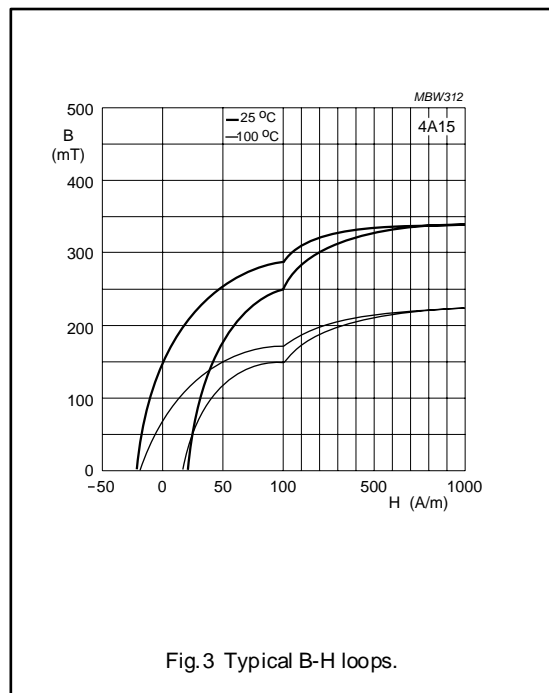


Fig.3 Typical B-H loops.

Material specification

4B1

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	250 $\pm 20\%$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 360$ $\approx 310$	mT
$\tan \delta / \mu_i$	25 °C; 1 MHz; 0.25 mT 25 °C; 3 MHz; 0.25 mT	$\leq 90 \times 10^{-6}$ $\leq 300 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega m$
$T_C$		$\geq 250$	°C
density		$\approx 4600$	$kg/m^3$

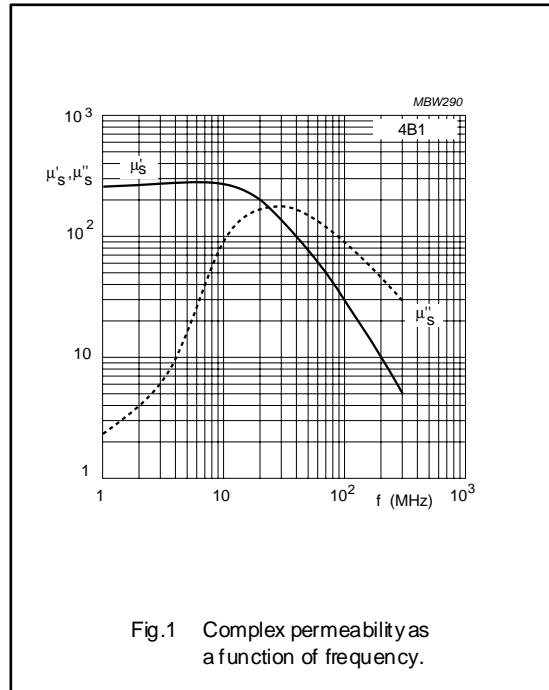


Fig.1 Complex permeability as a function of frequency.

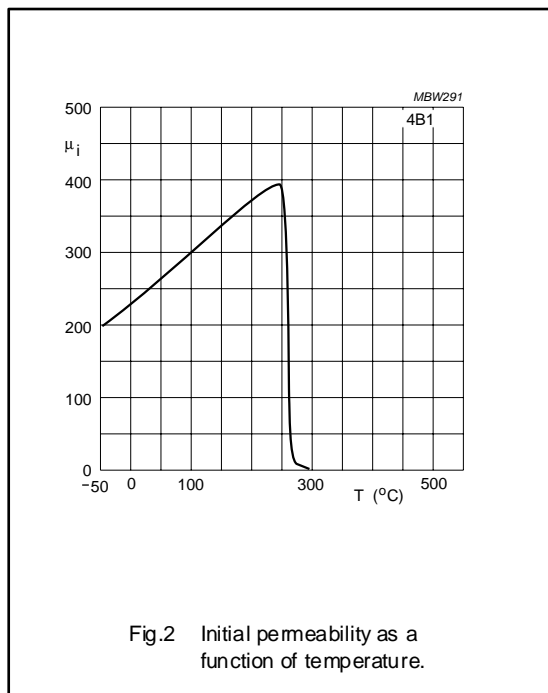


Fig.2 Initial permeability as a function of temperature.

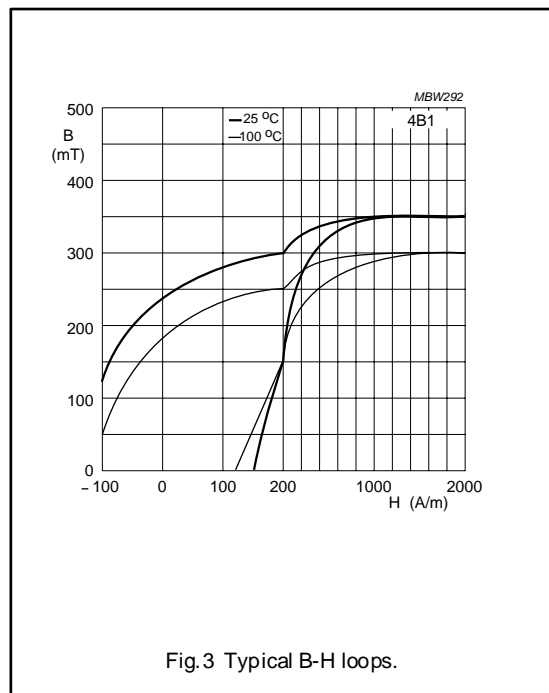


Fig.3 Typical B-H loops.

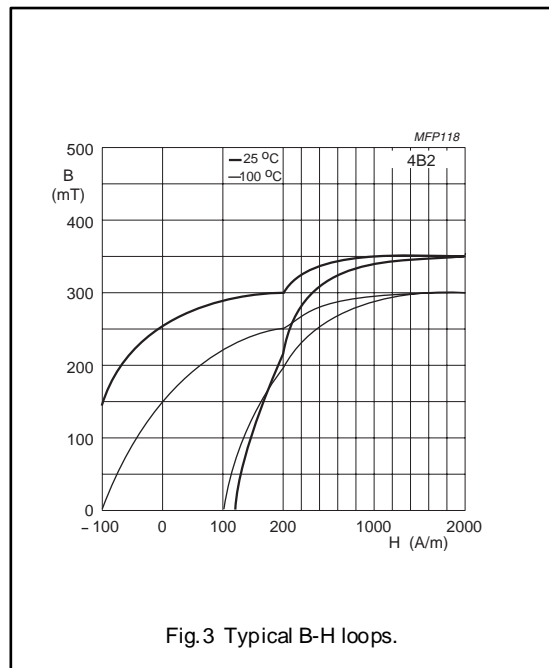
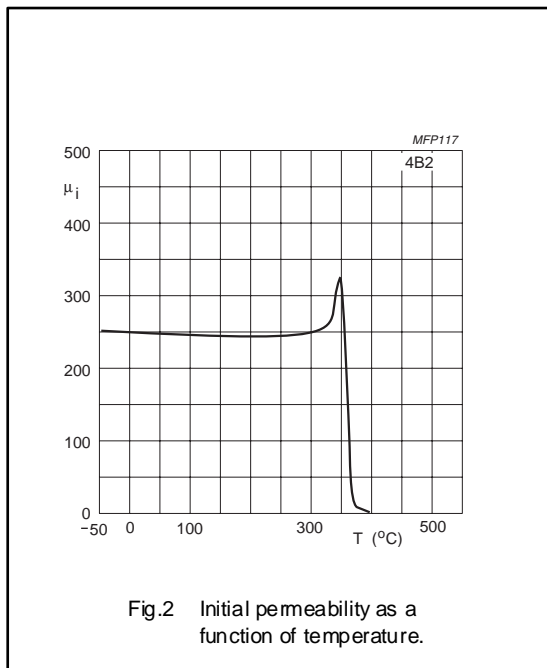
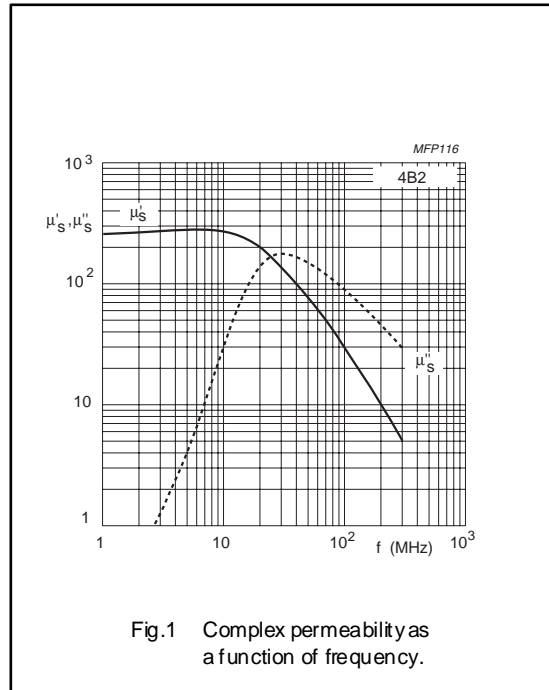
Preliminary material specification

4B2

4B2 SPECIFICATIONS

Medium permeability NiZn ferrite for use in RF tuning, especially antenna rods in RFID transponders in automotive applications, and wideband and balun transformers.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$250 \pm 20 \%$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 360$ $\approx 310$	mT
$\tan \delta / \mu_i$	25 °C; 3 MHz; 0.25 mT	$\leq 300 \times 10^{-6}$	
$\alpha_F$	$\leq 10$ kHz; 0.25 mT; -40 to 25 °C -10 to 55 °C 0 to 25 °C 25 to 55 °C 25 to 85 °C	$(-1 \pm 4) \times 10^{-6}$ $(-1 \pm 4) \times 10^{-6}$ $(-2.5 \pm 4) \times 10^{-6}$ $(2 \pm 4) \times 10^{-6}$ $(0.5 \pm 4) \times 10^{-6}$	$K^{-1}$
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega m$
$T_C$		$\geq 335$	°C
density		$\approx 4600$	$kg/m^3$



Material specification

4B3

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	300 $\pm 20\%$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 420$ $\approx 350$	mT
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\cdot m$
$T_C$		$\geq 250$	°C
density		$\approx 5000$	$kg/m^3$

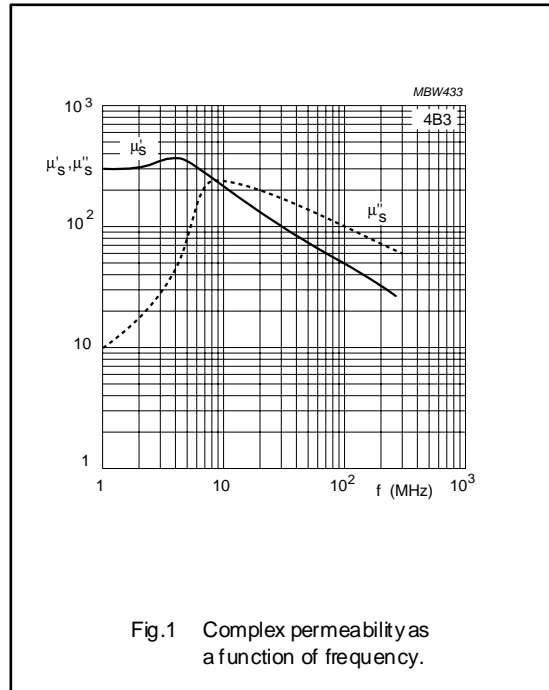


Fig.1 Complex permeability as a function of frequency.

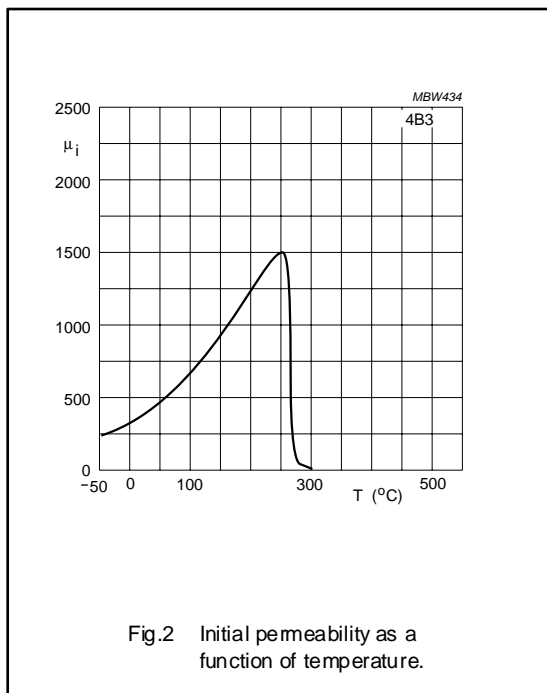


Fig.2 Initial permeability as a function of temperature.

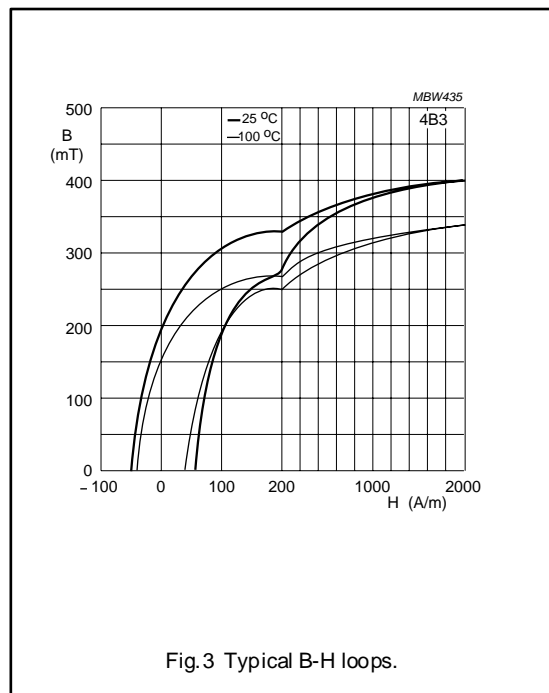


Fig.3 Typical B-H loops.





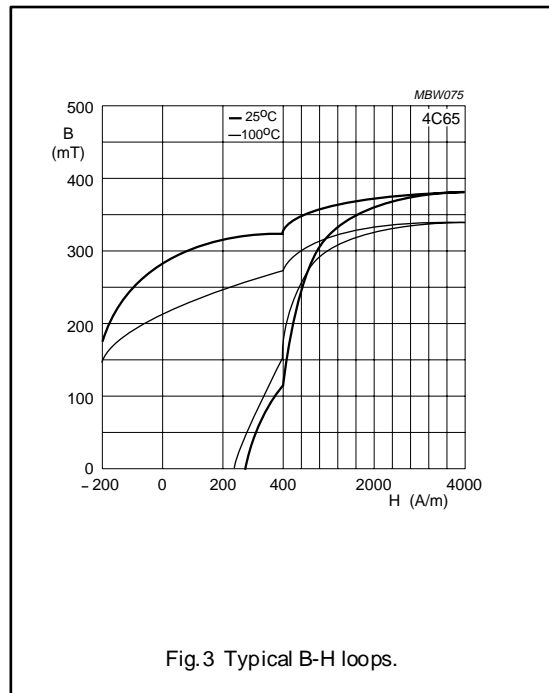
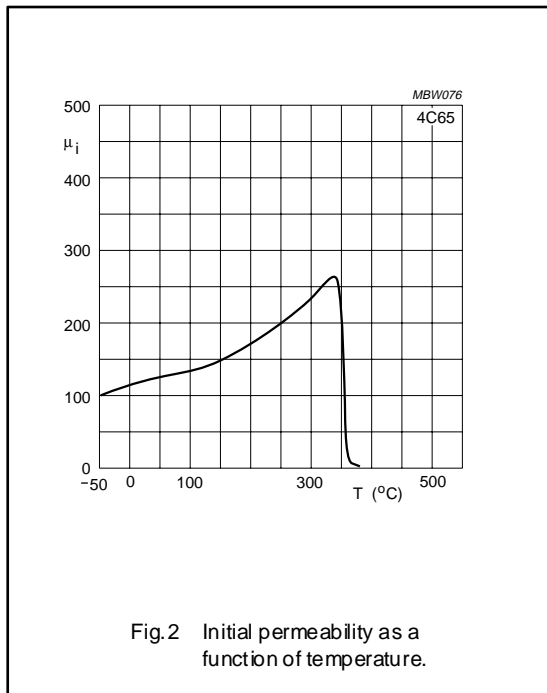
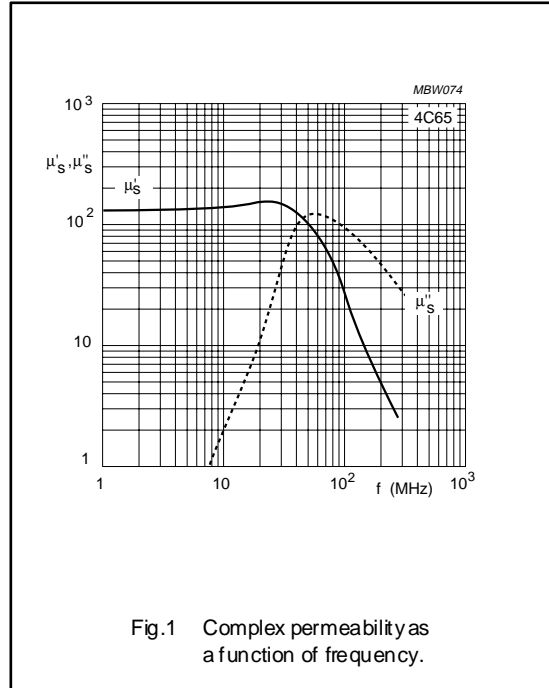
Material specification

4C65

4C65 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	125 $\pm 20\%$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 380$ $\approx 340$	mT
$\tan \delta / \mu_i$	25 °C; 3 MHz; 0.25 mT 25 °C; 10 MHz; 0.25 mT	$\leq 80 \times 10^{-6}$ $\leq 130 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 350$	°C
density		$\approx 4500$	$\text{kg/m}^3$



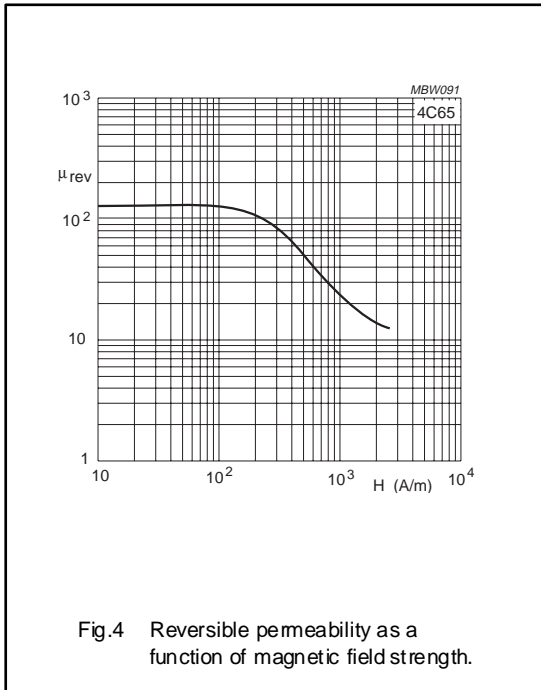


Fig.4 Reversible permeability as a function of magnetic field strength.

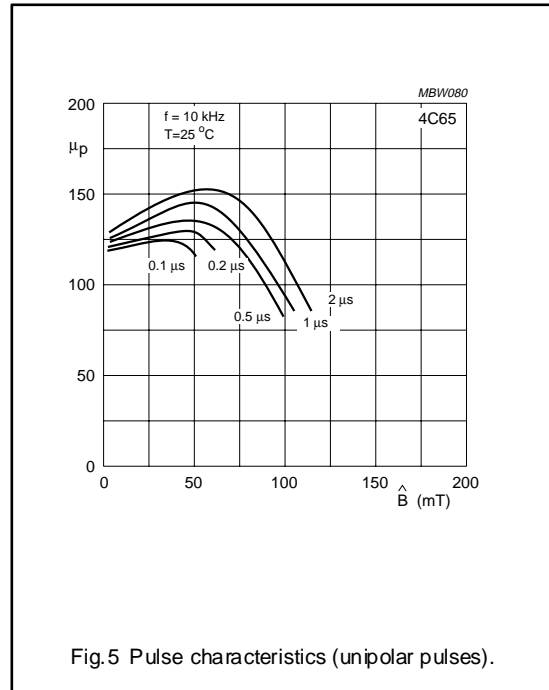


Fig.5 Pulse characteristics (unipolar pulses).

Material specification

4D2

4D2 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$60 \pm 20\%$	
B	25 °C; 10 kHz; 10 kA/m 100 °C; 10 kHz; 10 kA/m	$\approx 250$ $\approx 230$	mT
$\tan \delta / \mu_i$	25 °C; 10 MHz; 0.25 mT 25 °C; 30 MHz; 0.25 mT	$\leq 100 \times 10^{-6}$ $\leq 600 \times 10^{-6}$	
$\rho$	DC, 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 400$	°C
density		$\approx 4200$	$\text{kg/m}^3$

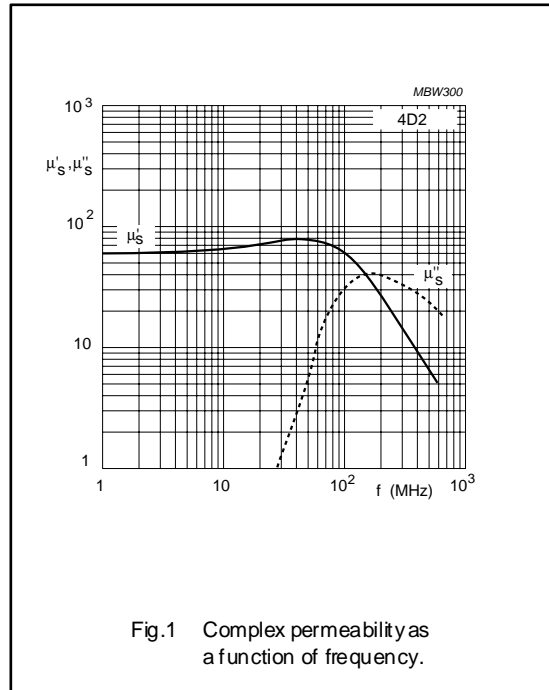


Fig.1 Complex permeability as a function of frequency.

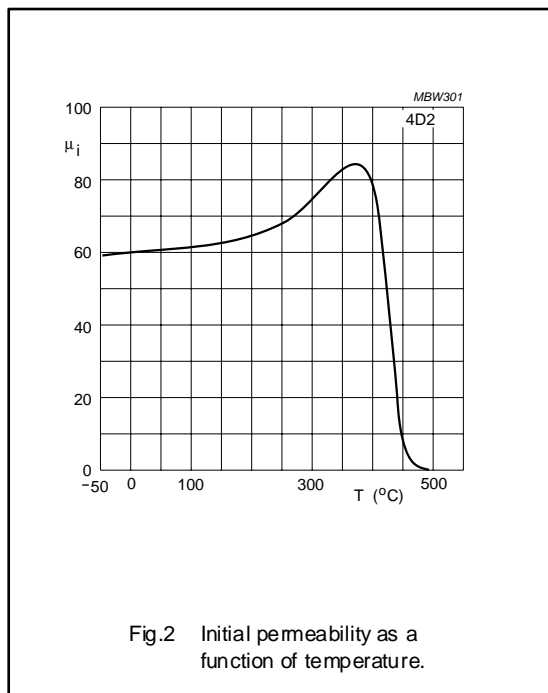


Fig.2 Initial permeability as a function of temperature.

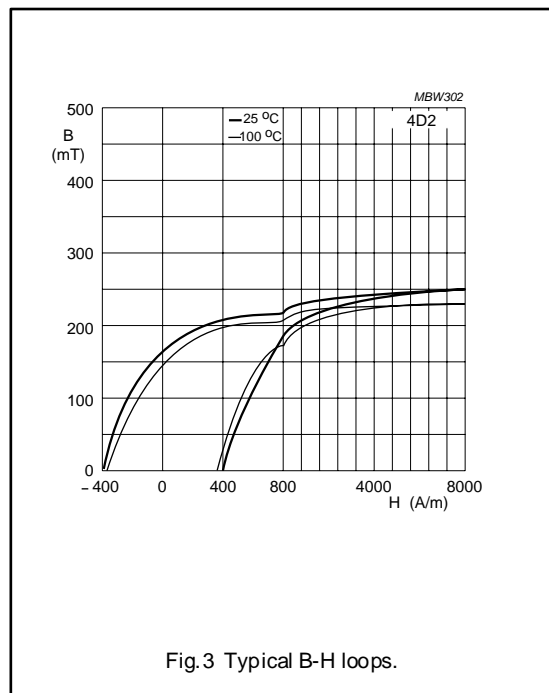


Fig.3 Typical B-H loops.

Material specification

4E1

4E1 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	15 $\pm 20\%$	
B	25 °C; 10 kHz; 20 kA/m 100 °C; 10 kHz; 20 kA/m	$\approx 220$ $\approx 210$	mT
$\tan \delta / \mu_i$	25 °C; 10 MHz; 0.25 mT 25 °C; 30 MHz; 0.25 mT	$\leq 300 \times 10^{-6}$ $\leq 350 \times 10^{-6}$	
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega m$
$T_C$		$\geq 500$	°C
density		$\approx 3700$	$kg/m^3$

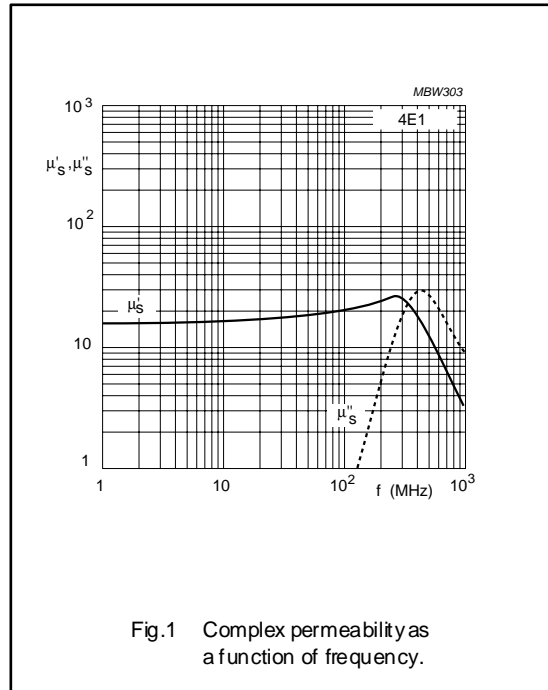


Fig.1 Complex permeability as a function of frequency.

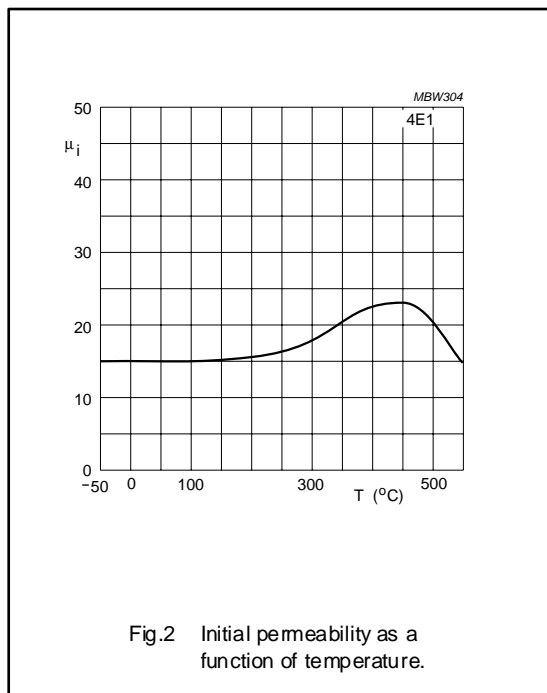


Fig.2 Initial permeability as a function of temperature.

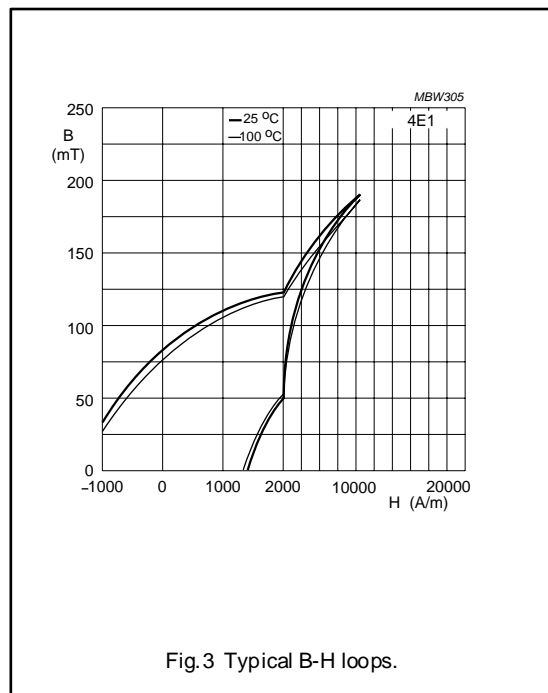


Fig.3 Typical B-H loops.

Material specification

4E2

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	25 $\pm 20\%$	
B	25 °C; 10 kHz; 10 kA/m 100 °C; 10 kHz; 10 kA/m	$\approx 350$ $\approx 310$	mT
$\rho$	DC, 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 400$	°C
density		$\approx 4000$	$\text{kg/m}^3$

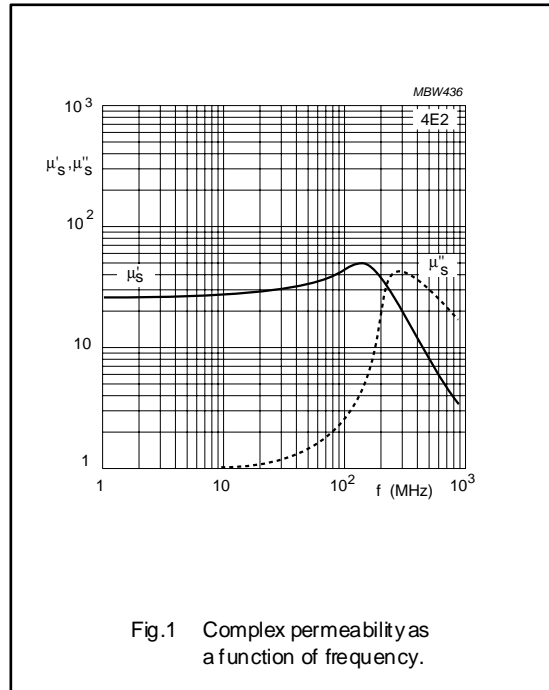


Fig.1 Complex permeability as a function of frequency.

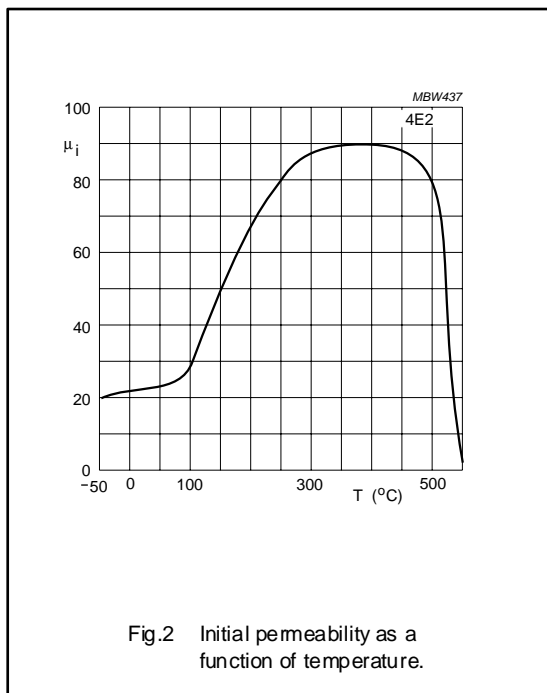


Fig.2 Initial permeability as a function of temperature.

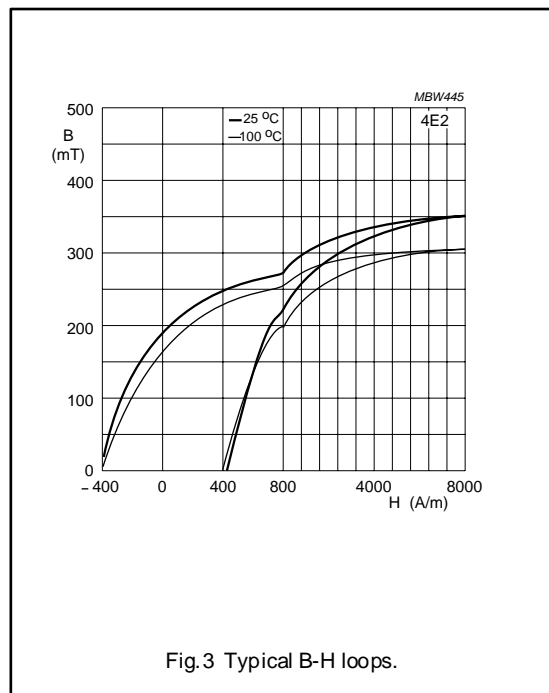


Fig.3 Typical B-H loops.

Material specification

4F1

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$\approx 80$	
$\mu_a$	100 °C; 25 kHz; 200 mT	$\approx 300$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 320$ $\approx 260$	mT
$P_V$	100 °C; 3 MHz; 10 mT 100 °C; 10 MHz; 5 mT	$\leq 200$ $\leq 200$	kW/m <sup>3</sup>
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 260$	°C
density		$\approx 4600$	kg/m <sup>3</sup>

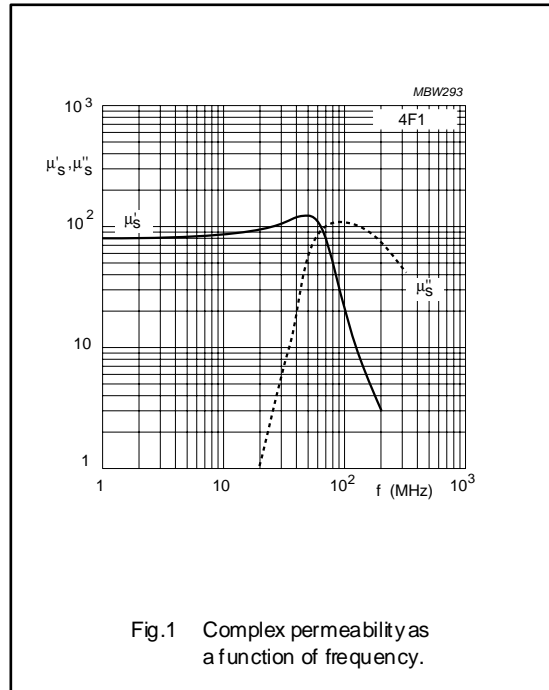


Fig.1 Complex permeability as a function of frequency.

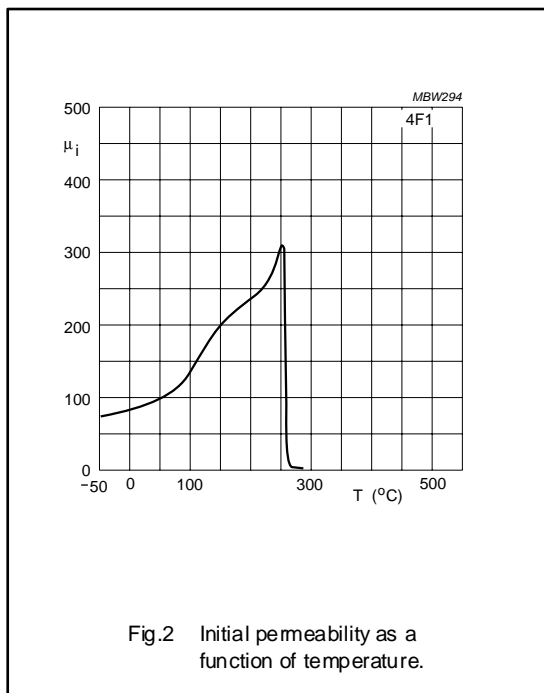


Fig.2 Initial permeability as a function of temperature.

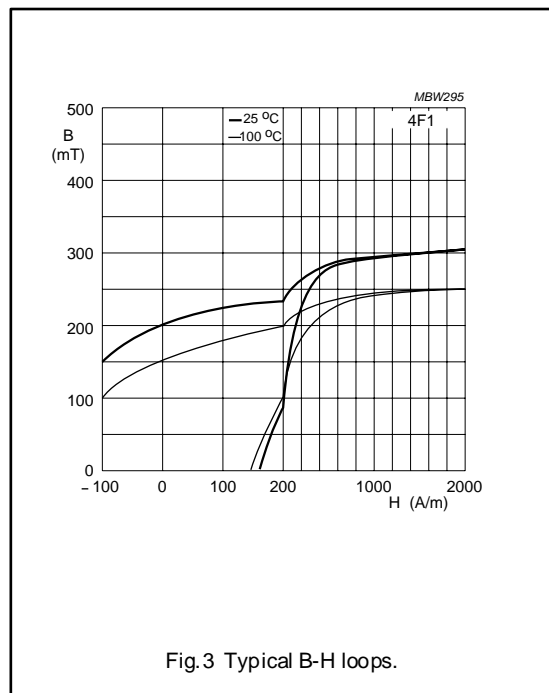
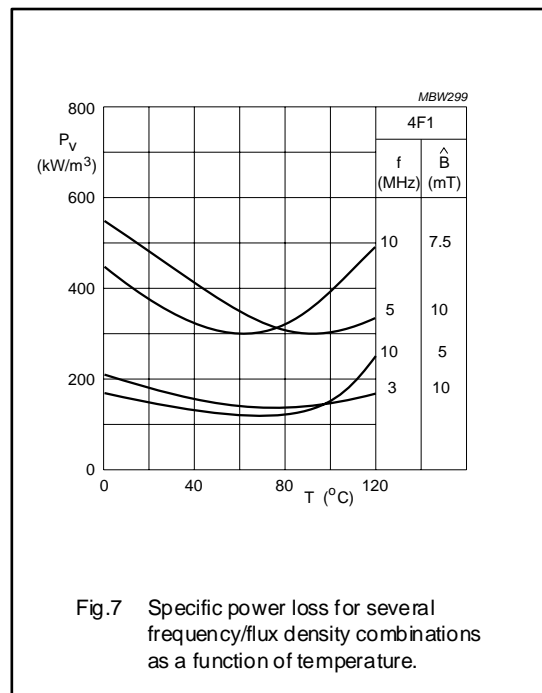
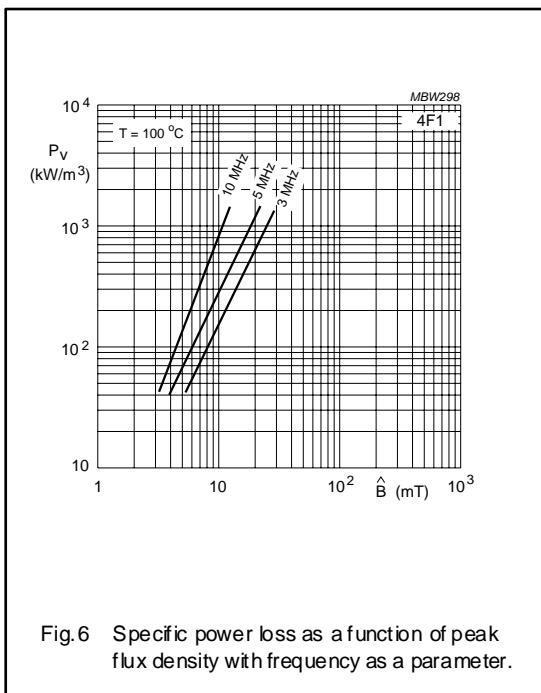
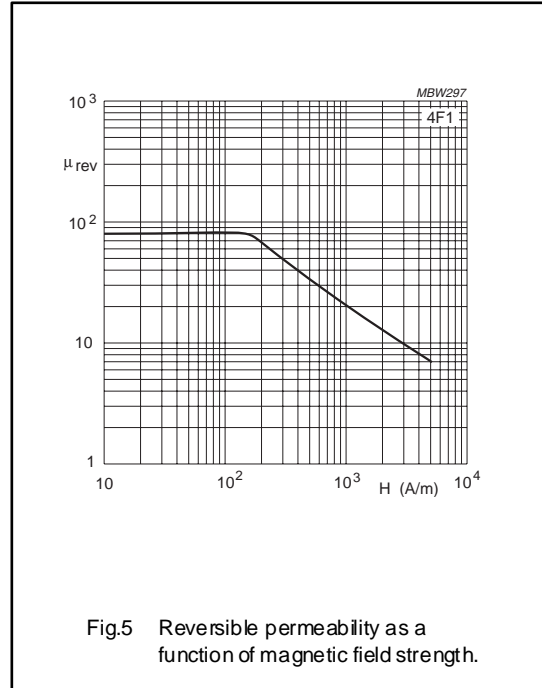
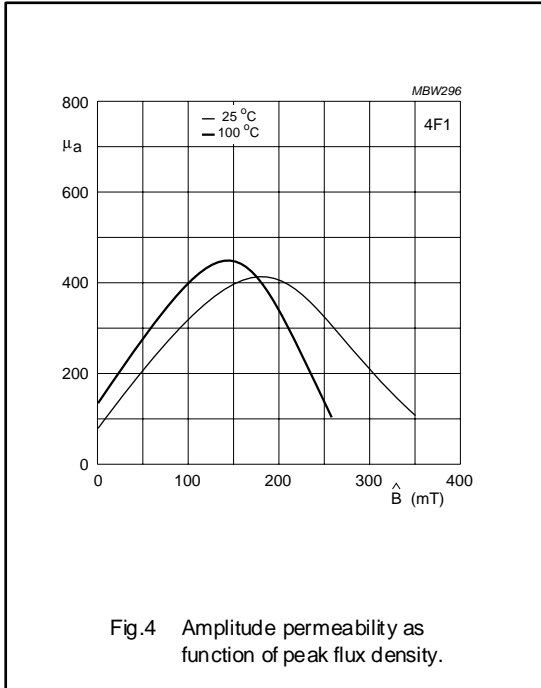


Fig.3 Typical B-H loops.

Material specification

4F1





Material specification

4M2

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	140 $\pm 20\%$	
B	25 °C; 10 kHz; 3000 A/m 100 °C; 10 kHz; 3000 A/m	$\approx 310$ $\approx 270$	mT
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 200$	°C
density		$\approx 5000$	$\text{kg/m}^3$

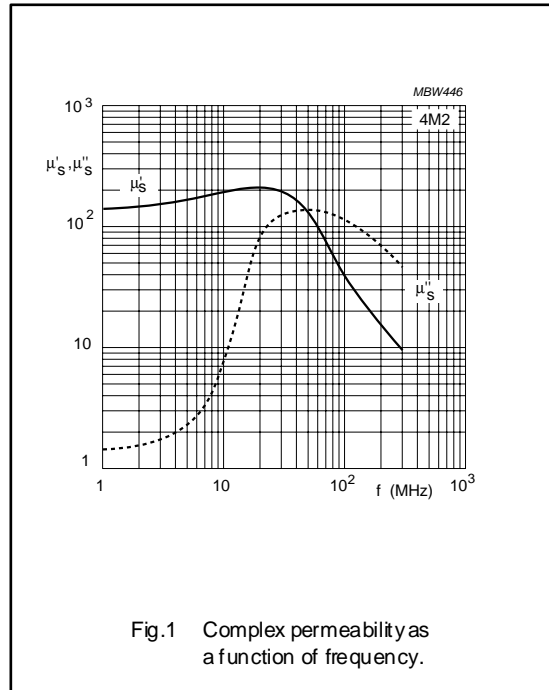


Fig.1 Complex permeability as a function of frequency.

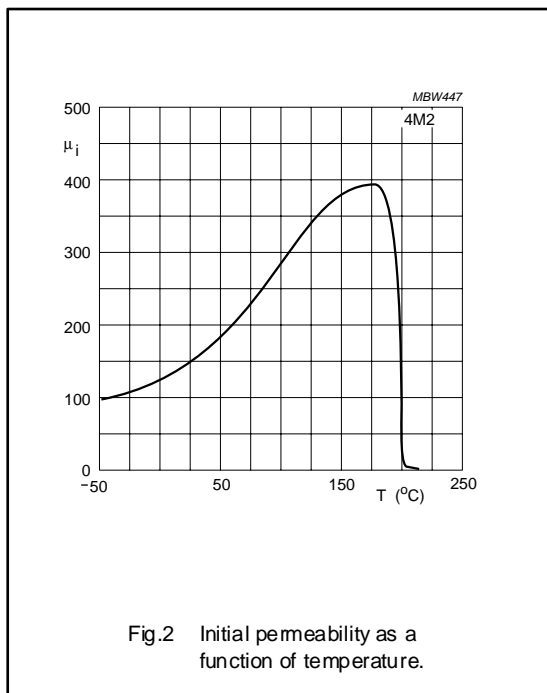


Fig.2 Initial permeability as a function of temperature.

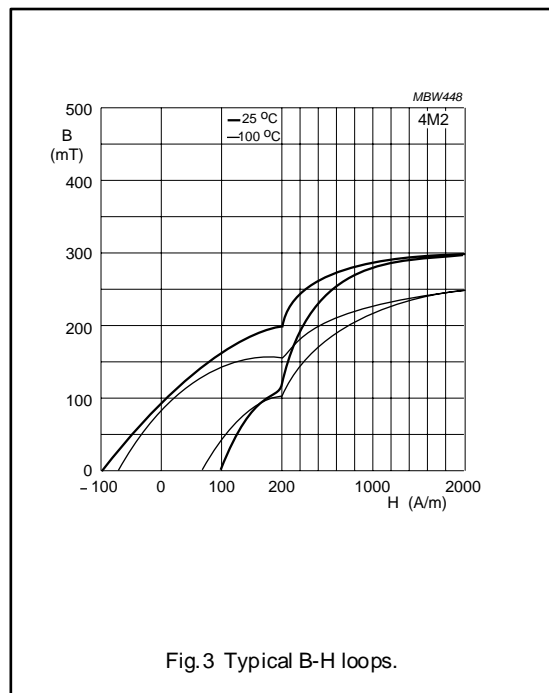


Fig.3 Typical B-H loops.

Material specification

4S2

4S2 SPECIFICATIONS

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

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$\approx 850$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 340$ $\approx 230$	mT
$ Z ^{(1)}$	25 °C; 30 MHz 25 °C; 300 MHz	$\geq 50$ $\geq 90$	$\Omega$
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
T <sub>C</sub>		$\geq 125$	°C
density		$\approx 5000$	$\text{kg/m}^3$

Note

1. Measured on a bead  $\varnothing 5 \times \varnothing 2 \times 10$  mm.

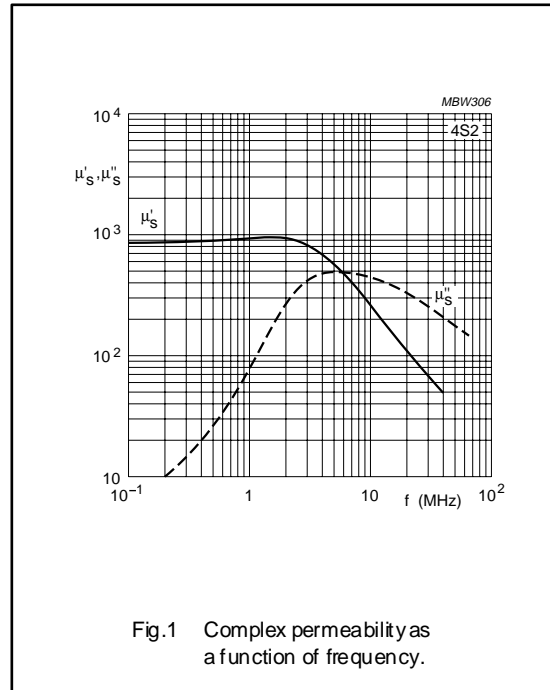


Fig.1 Complex permeability as a function of frequency.

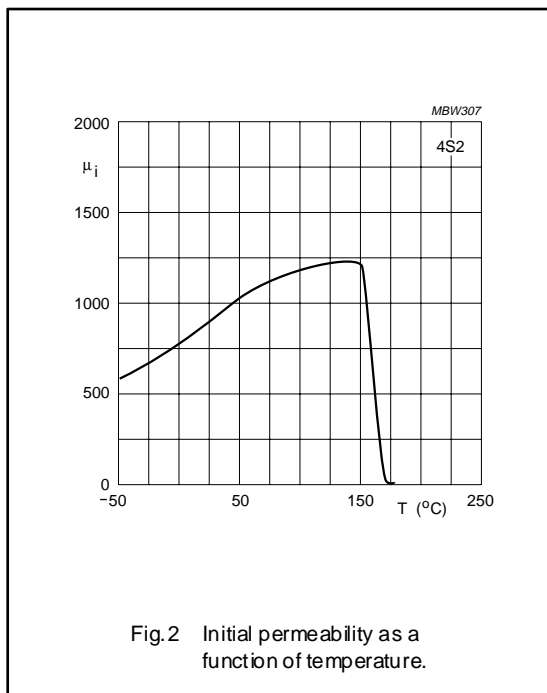


Fig.2 Initial permeability as a function of temperature.

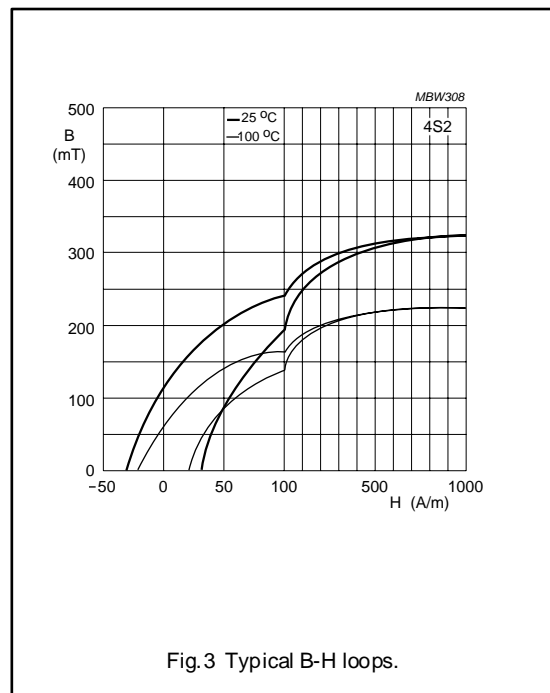
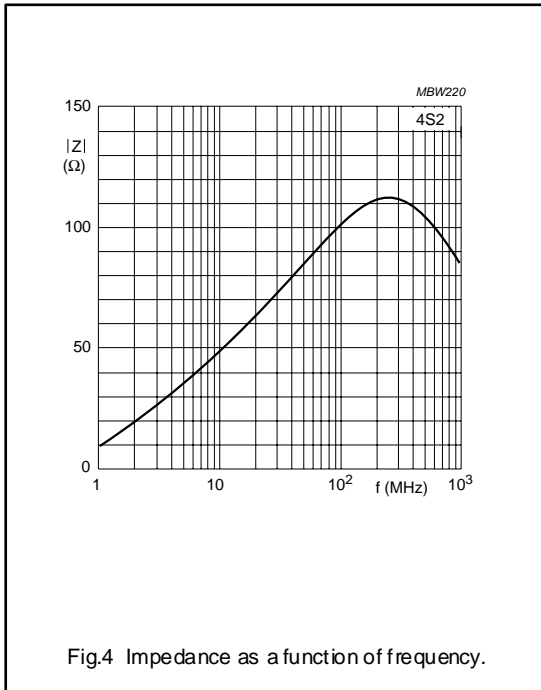


Fig.3 Typical B-H loops.



Material specification

4S60

4S60 SPECIFICATIONS

High permeability specialty NiZn ferrite only used in absorber tiles for anechoic chambers operating at frequencies up to 1000 MHz.

SYMBOL	CONDITIONS	VALUE	UNIT
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$2000 \pm 20 \%$	
B	25 °C; 10 kHz; 1200 A/m 80 °C; 10 kHz; 1200 A/m	$\approx 260$ $\approx 150$	mT
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_c$		$\geq 100$	°C
density		$\approx 5000$	$\text{kg/m}^3$

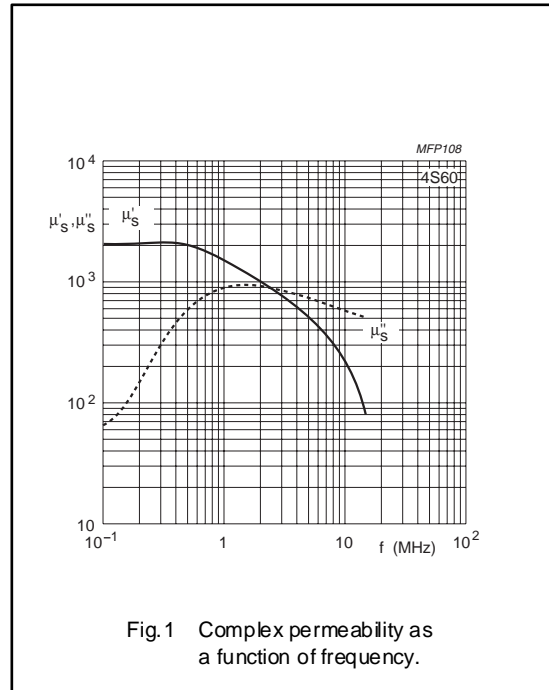


Fig.1 Complex permeability as a function of frequency.

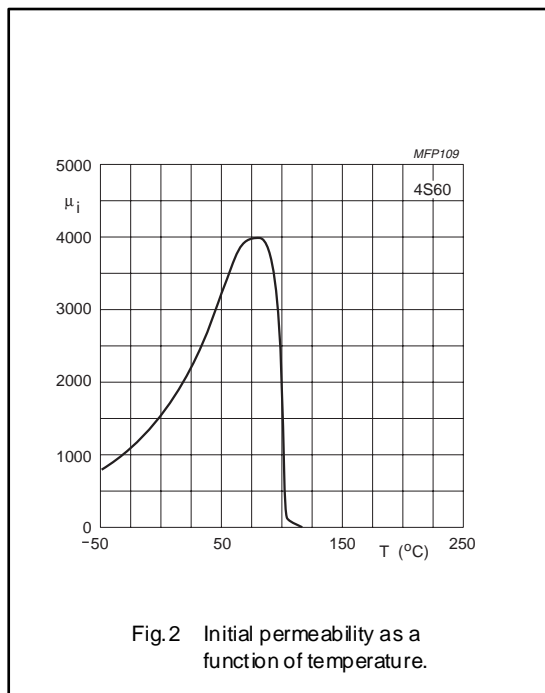


Fig.2 Initial permeability as a function of temperature.

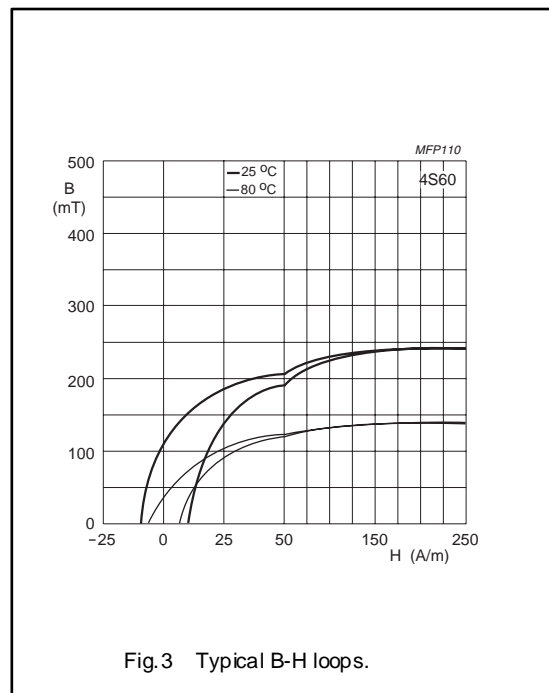
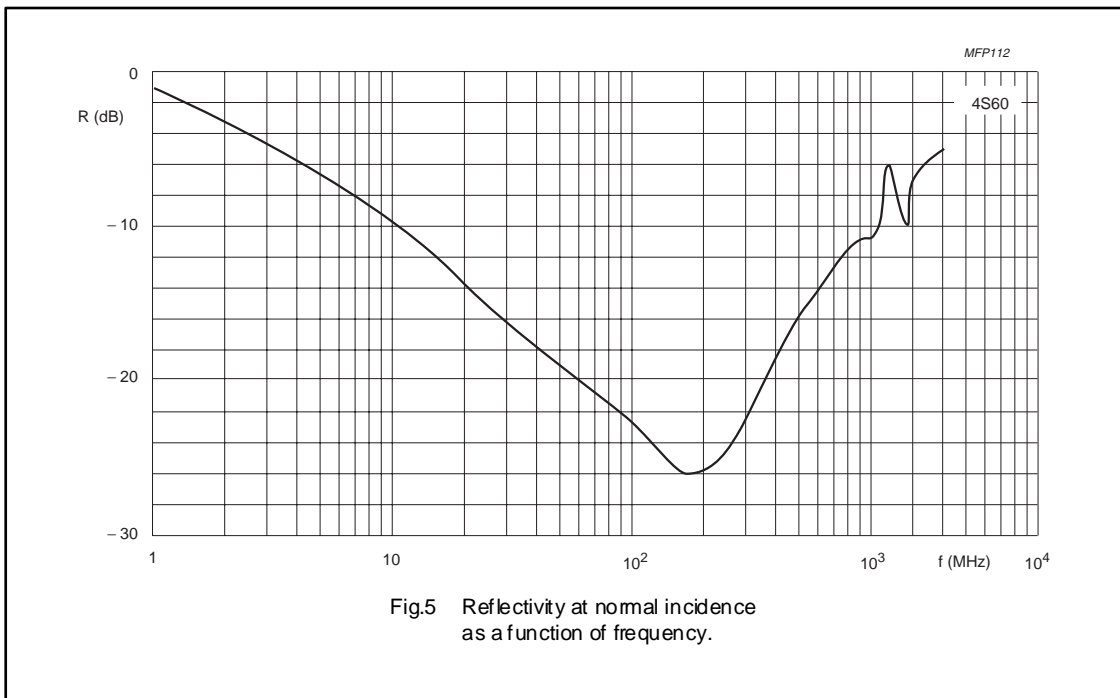
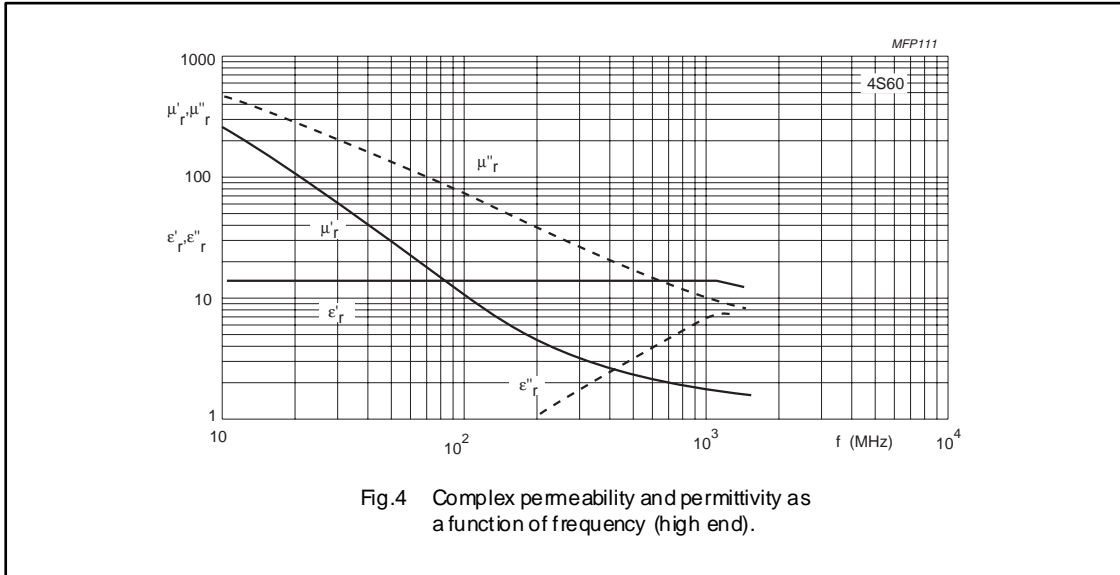


Fig.3 Typical B-H loops.



Material specification

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	$1200 \pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 310$ $\approx 210$	mT
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 125$	°C
density		$\approx 5100$	$\text{kg/m}^3$

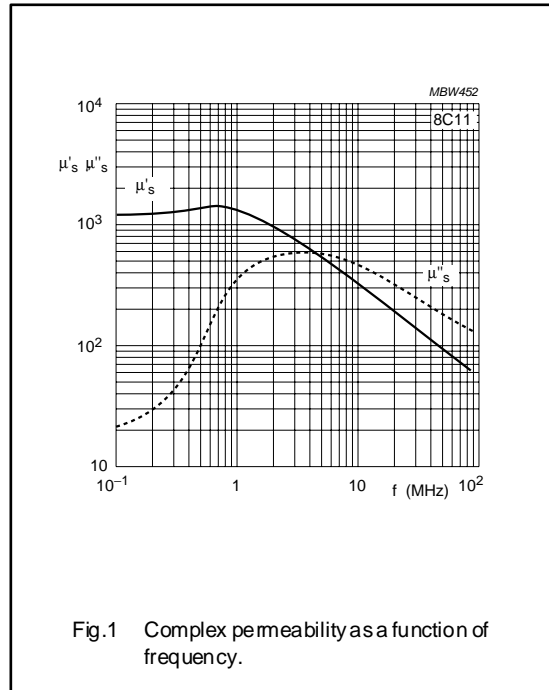


Fig.1 Complex permeability as a function of frequency.

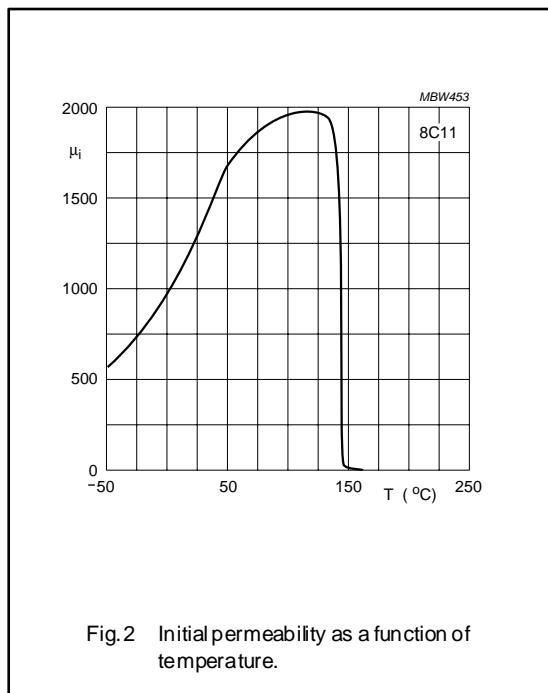


Fig.2 Initial permeability as a function of temperature.

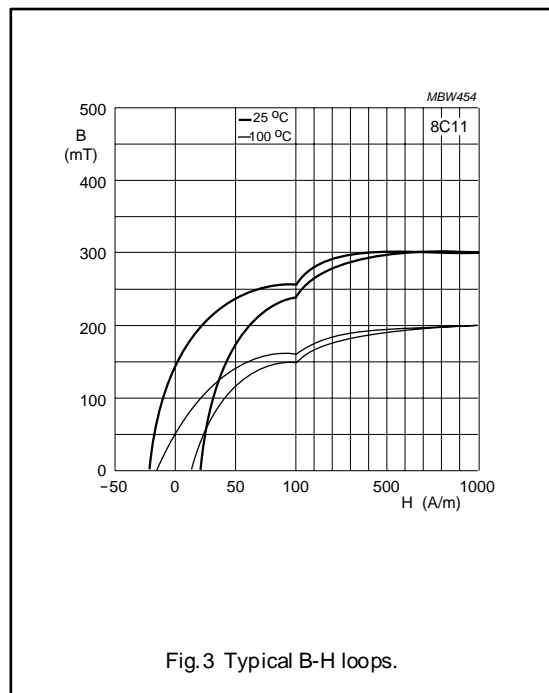


Fig.3 Typical B-H loops.

Material specification

8C12

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
$\mu_i$	25 °C; $\leq 10$ kHz; 0.25 mT	900 $\pm 20\%$	
B	25 °C; 10 kHz; 1200 A/m 100 °C; 10 kHz; 1200 A/m	$\approx 260$ $\approx 180$	mT
$\rho$	DC; 25 °C	$\approx 10^5$	$\Omega\text{m}$
$T_C$		$\geq 125$	°C
density		$\approx 5100$	kg/m <sup>3</sup>

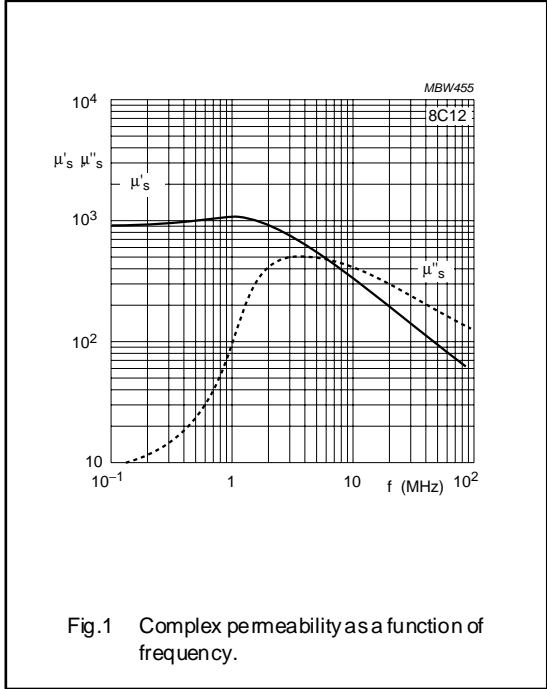


Fig.1 Complex permeability as a function of frequency.

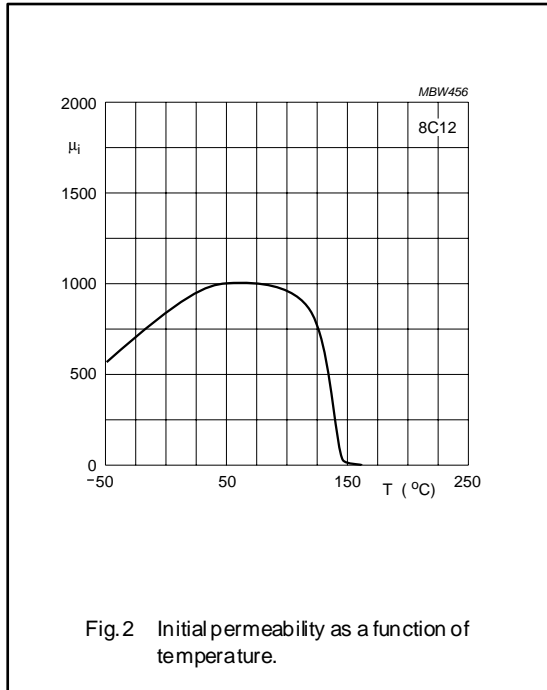


Fig.2 Initial permeability as a function of temperature.

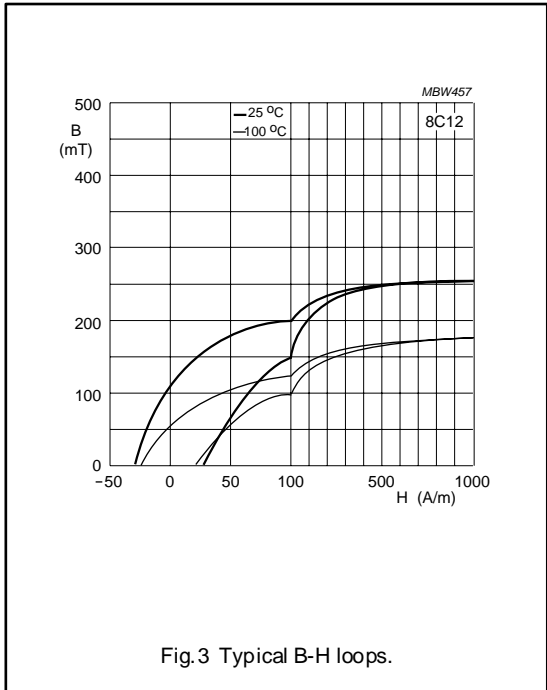


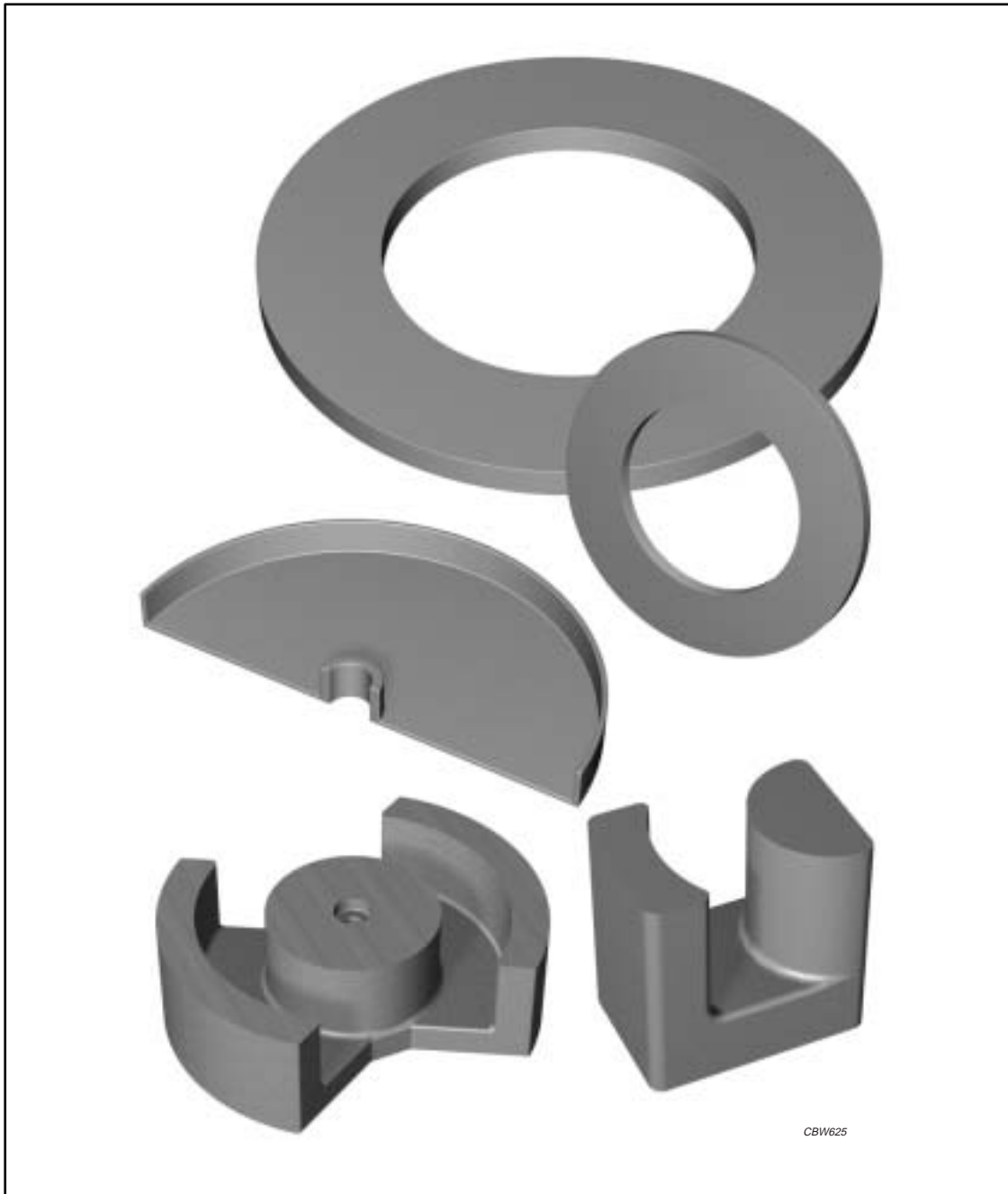
Fig.3 Typical B-H loops.





**Soft Ferrites**

**Specialty Ferrites**



CBW625

**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.

Soft Ferrites

Specialty Ferrites

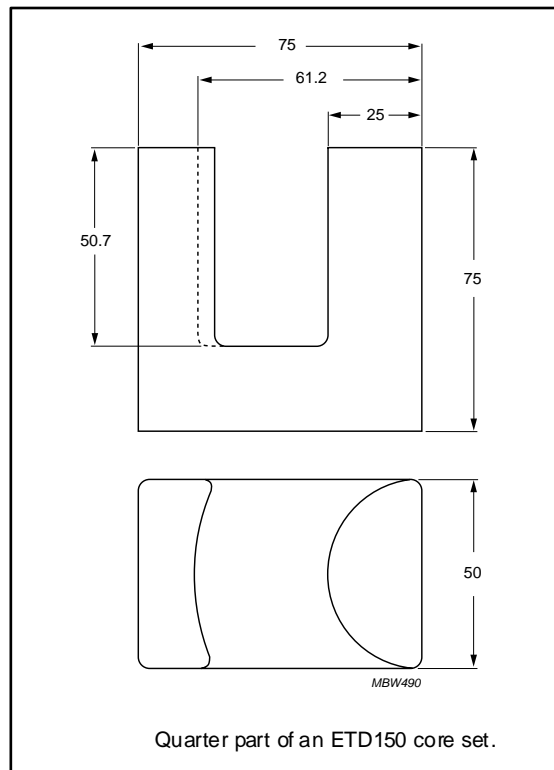
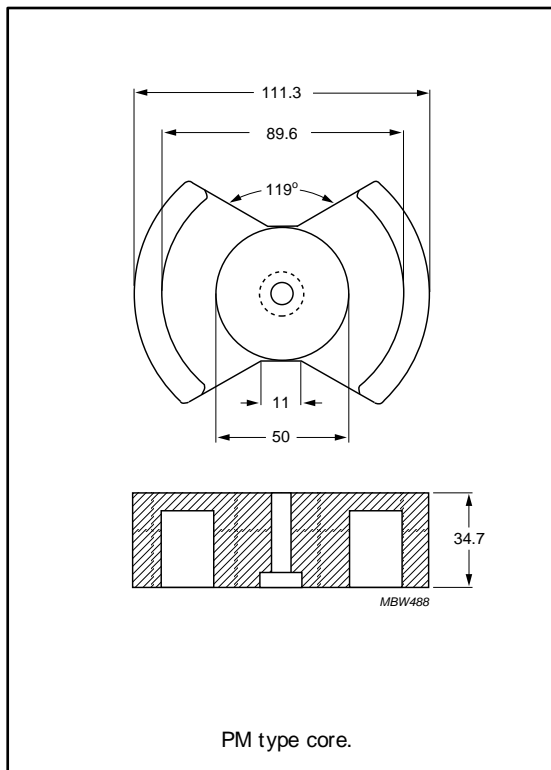
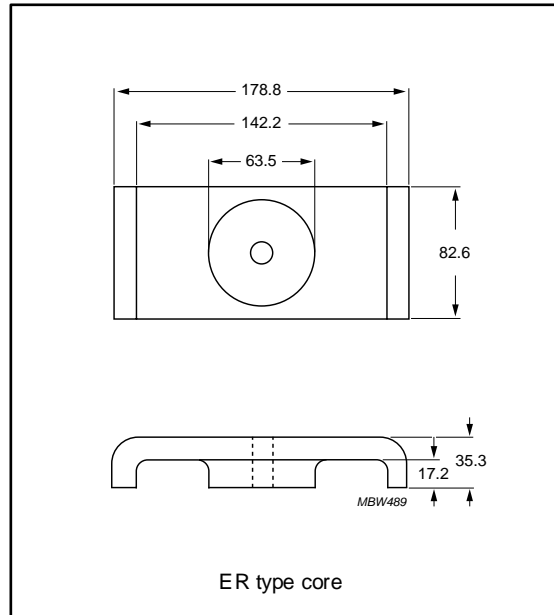
**MACHINED FERRITES AND SPECIALTY SHAPES**

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.

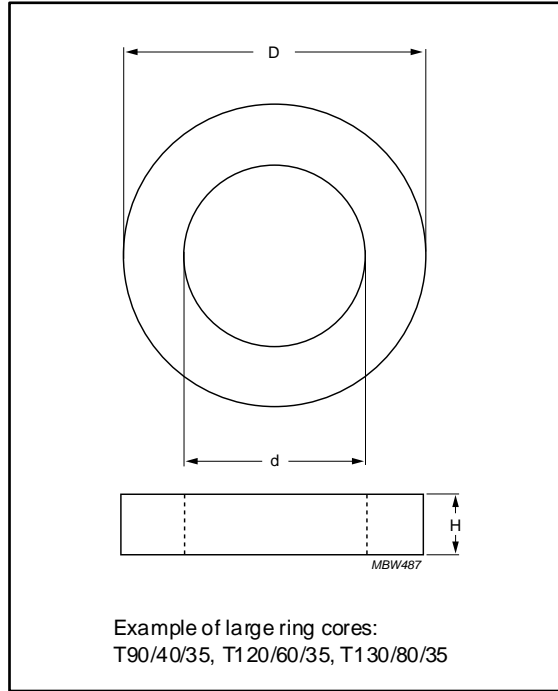
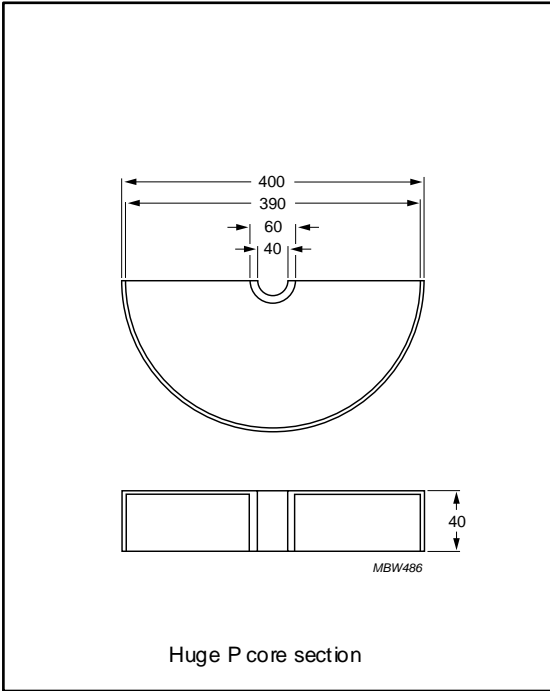
There are several reasons to choose machined ferrite cores. Samples are sometimes required on very short notice, while pressing tools are not yet available. On other occasions, only a limited number of cores will be needed and it is not worthwhile to make a tool at all. Cores can be so complicated or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



Soft Ferrites

Specialty Ferrites



**FERRITE IN ANECHOIC CHAMBERS FOR EMI MEASUREMENT**

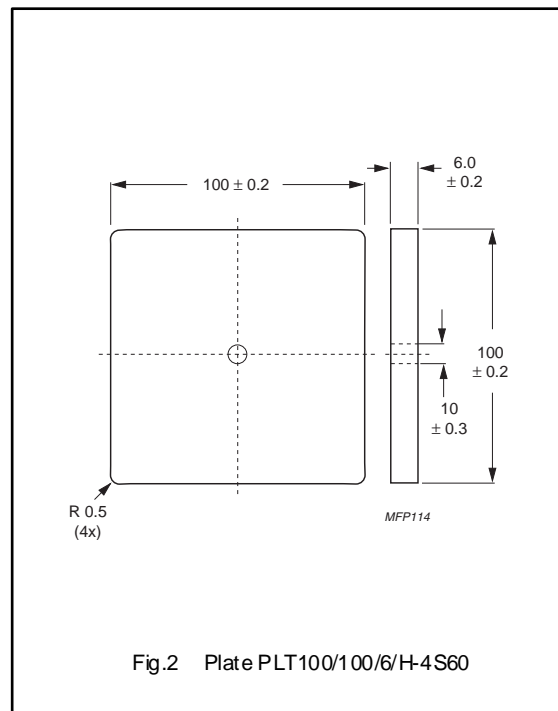
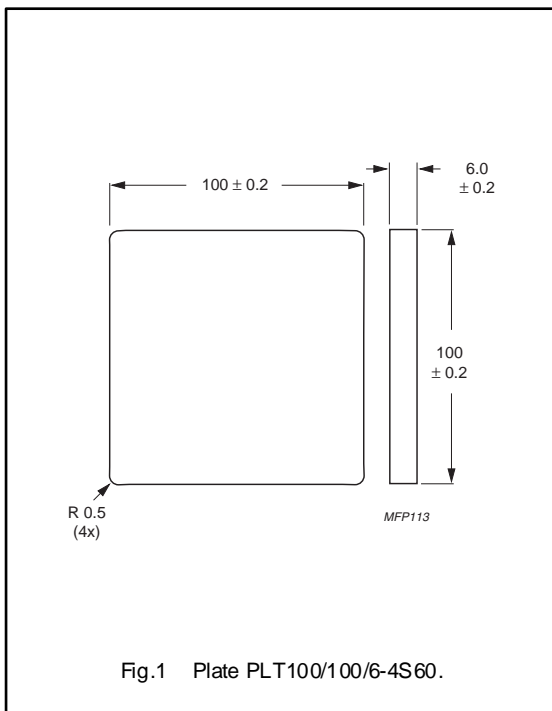
**The application**

Regulations are in place for every kind of electromagnetic interference from equipment. Especially free field radiation limits would require outdoor testing and would need a lot of space. This can be overcome with the help of anechoic chambers. They have walls with a very low reflection and thus approach outdoor testing. Ferrite tiles are a compact alternative to large carbon pyramid absorbers, to reduce the size of EMI test chambers.

**Our product range**

The absorber material 4S60 has been designed for broadband operation (up to 1000 MHz). Its parameters were matched to achieve low reflection of incident waves. The high-frequency losses of the ferrite do the rest of the job as the wave travels up and down the tile. See the material specification section for all characteristics of 4S60.

Common tile size is 100 x 100 mm, available with and without hole for screw mounting and gluing respectively. All sides are ground to tight tolerances to achieve flatness and squareness for optimum performance of the tiled chamber walls.



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## Soft Ferrites

## Specialty Ferrites

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### 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  $\varnothing 25 \times \varnothing 15 \times 10$  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.

Soft Ferrites

Specialty Ferrites

**MATERIALS FOR PARTICLE ACCELERATORS**

**Materials and relevant values**

PARAMETER	8C11	8C12	4M2	4E2	4B3
$\mu_i$ ( $\pm 20\%$ )	1200	900	140	25	300
$\mu_{rem}$ approx.	850	600	130	20	–
$B_s$ 25 °C (mT, 800 A/m)	$\geq 300$	280	250	250	$\geq 300$
$B_s$ 40 °C (mT, 800 A/m)	$\geq 280$	250	220	220	–
$H_c$ (A/m, after 800 A/m)	$\leq 20$	30	100	500	$< 80$
$\rho$ DC ( $\Omega m$ )	$> 10^5$	$> 10^5$	$> 10^5$	$> 10^5$	$> 10^5$
$T_c$ (°C)	$\geq 125$	$\geq 125$	$\geq 150$	$\geq 400$	$\geq 250$
$\mu Q$ in remanence 200 kHz:					
10 mT		$15 \times 10^3$			
20 mT		$9 \times 10^3$			
50 mT		$4 \times 10^3$			
$\mu Q$ in remanence 500 kHz:					
10 mT		$10 \times 10^3$			
20 mT		$6 \times 10^3$			
50 mT		$25 \times 10^3$			
$\mu Q$ in remanence 1 MHz:					
5 mT		$10 \times 10^3$	$20 \times 10^3$		
10 mT		$75 \times 10^3$	$20 \times 10^3$		
20 mT		$5 \times 10^3$	$15 \times 10^3$		
30 mT		–	$8 \times 10^3$		
$\mu Q$ in remanence 2.5 MHz:					
5 mT			$20 \times 10^3$		
10 mT			$20 \times 10^3$		
20 mT			$15 \times 10^3$		
30 mT			$7 \times 10^3$		
$\mu Q$ in remanence 5 MHz:					
5 mT			$15 \times 10^3$		
10 mT			$15 \times 10^3$		
20 mT			$10 \times 10^3$		
30 mT			$7 \times 10^3$		
$\mu Q$ in remanence 10 MHz:					
5 mT			$12 \times 10^3$		
10 mT			$10 \times 10^3$		
$\mu Q$ in remanence 80 MHz:					
1 mT				$2.5 \times 10^3$	
$\mu Q$ in remanence 100 MHz					
				$2 \times 10^3$	
Decrease in $\mu Q$ (%), measured 10 ms after application of DC bias (approx.)		10	15	30	
$\mu_\Delta$ with DC bias field (approx.):					
0 A/m		600	130		
250 A/m		120	80		
500 A/m		50	40		
1 000 A/m		22	22		
2 000 A/m		8	12		
3 000 A/m		5.5	8		
Frequency range (with or without DC bias) in MHz		up to 2	2 to 10	20 to 100	
Application areas and special features	kicker magnets; high resistance	high frequency ratio possible with DC bias	fast recovery after magnetic bias	high frequency material	high ( $B_s + B_r$ )

Soft Ferrites

Specialty Ferrites

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
T76/38/13	38500	232	≈ 220
T170/110/20	251 500	589	≈ 1300
T240/160/20	482 000	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

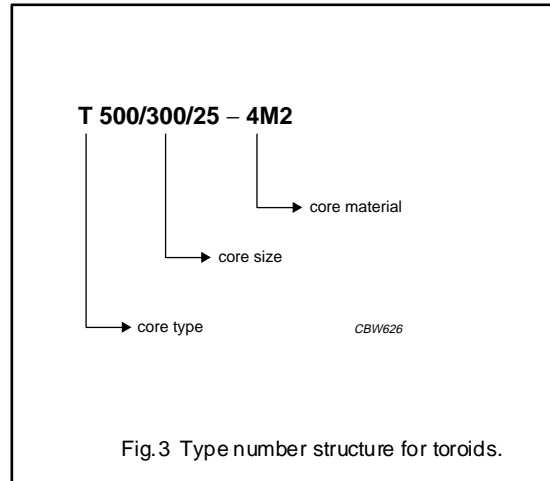


Fig.3 Type number structure for toroids.

RING CORES T76/38/13

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.716	mm <sup>-1</sup>
$V_e$	effective volume	38500	mm <sup>3</sup>
$l_e$	effective length	166	mm
$A_e$	effective area	232	mm <sup>2</sup>
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

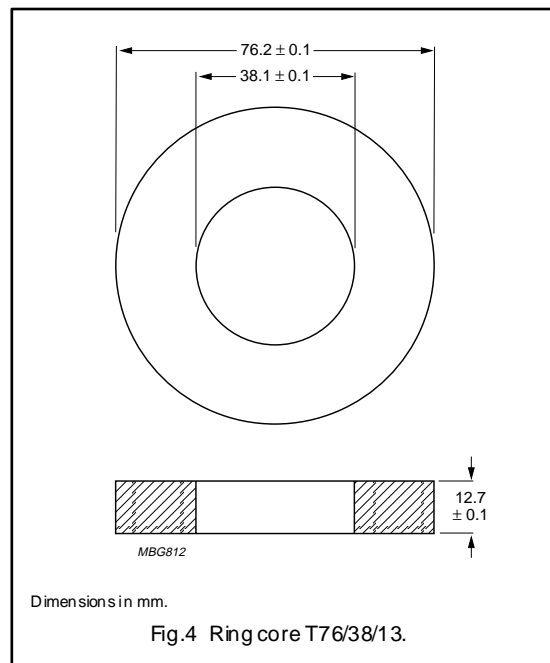


Fig.4 Ring core T76/38/13.



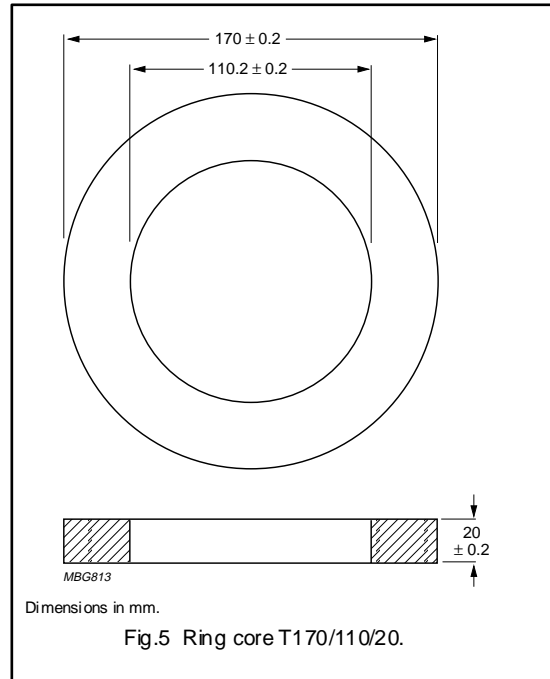
**RING CORES T170/110/20**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.725	mm <sup>-1</sup>
$V_e$	effective volume	251500	mm <sup>3</sup>
$l_e$	effective length	427	mm
$A_e$	effective area	589	mm <sup>2</sup>
m	mass	≈ 1300	g

**Ring core data**

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



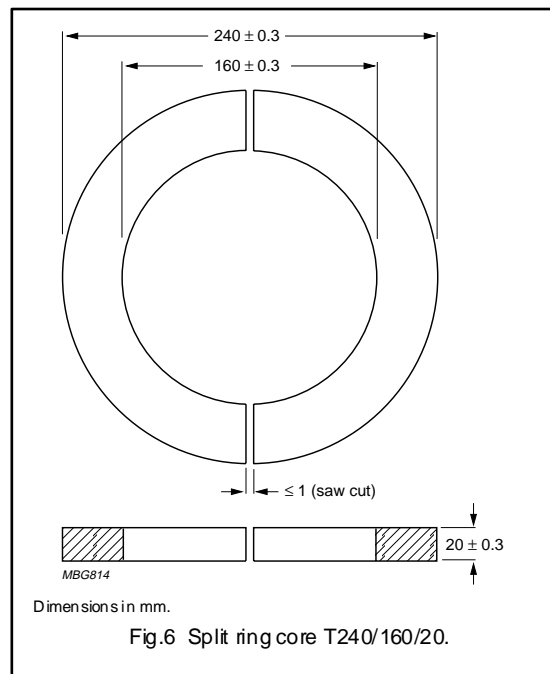
**SPLIT RING CORE T240/160/20**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.774	mm <sup>-1</sup>
$V_e$	effective volume	482000	mm <sup>3</sup>
$l_e$	effective length	611	mm
$A_e$	effective area	789	mm <sup>2</sup>
m	mass	≈ 2500	g

**Ring core data**

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



Soft Ferrites

Specialty Ferrites

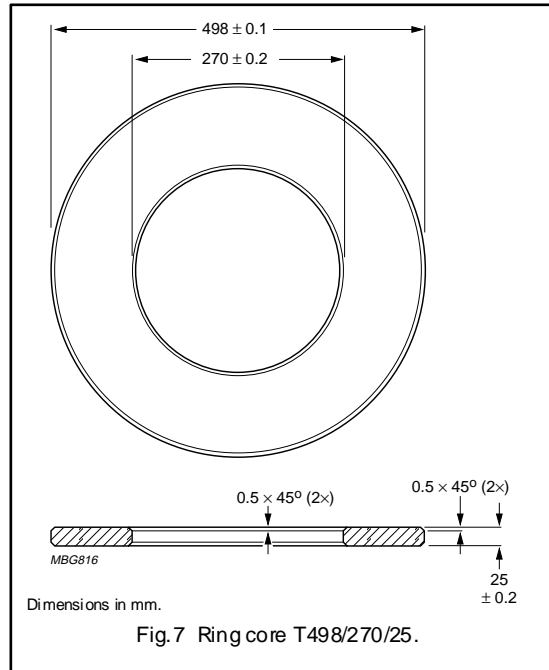
**RING CORE T498/270/25**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.409	mm <sup>-1</sup>
$V_e$	effective volume	3120000	mm <sup>3</sup>
$l_e$	effective length	1130	mm
$A_e$	effective area	2760	mm <sup>2</sup>
m	mass	≈ 17000	g

**Ring core data**

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



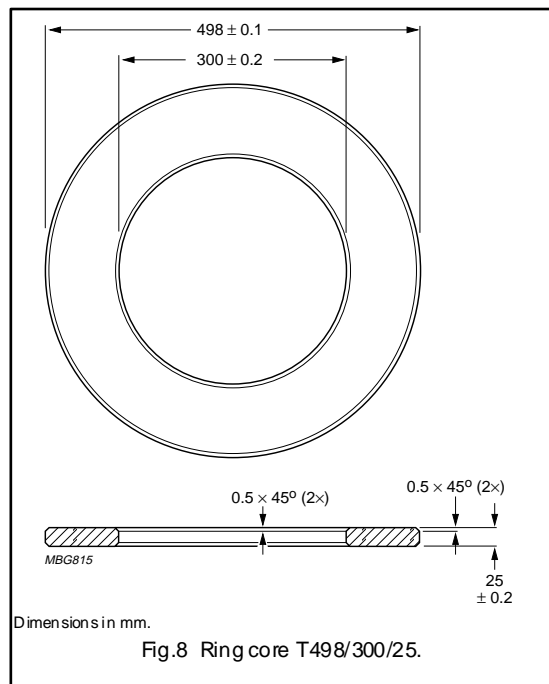
**RING CORE T498/300/25**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.496	mm <sup>-1</sup>
$V_e$	effective volume	2900000	mm <sup>3</sup>
$l_e$	effective length	1200	mm
$A_e$	effective area	2420	mm <sup>2</sup>
m	mass	≈ 15000	g

**Ring core data**

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



Soft Ferrites

Specialty Ferrites

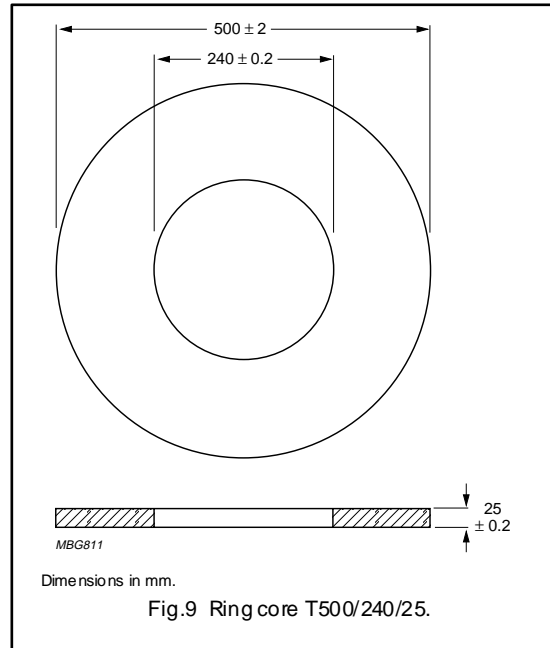
**RING CORE T500/240/25**

**Effective core parameters**

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

**Ring core data**

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



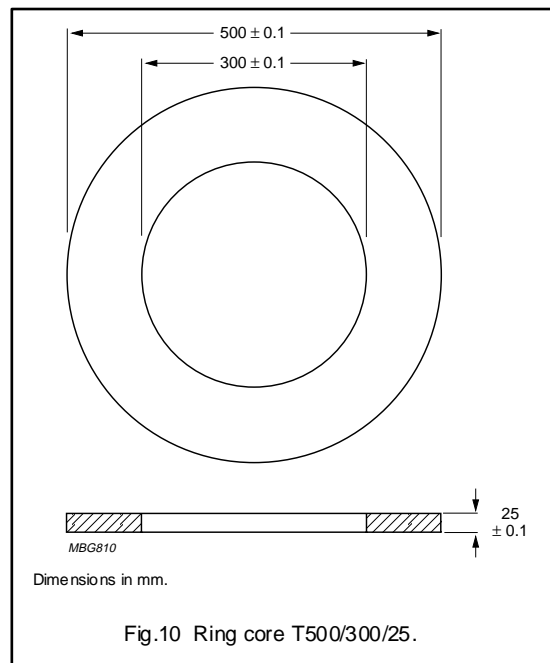
**RING CORE T500/300/25**

**Effective core parameters**

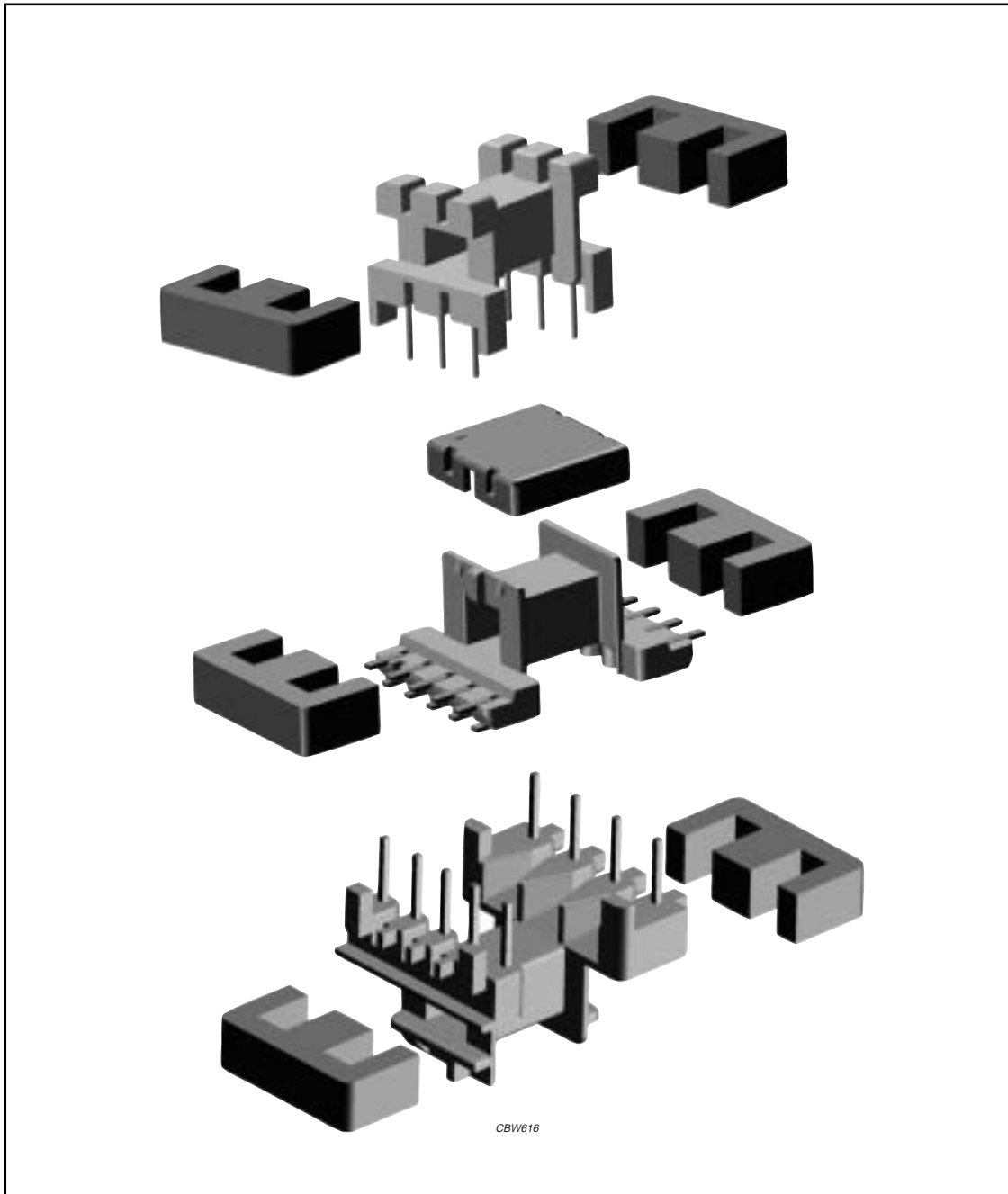
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.49	mm <sup>-1</sup>
$V_e$	effective volume	2950000	mm <sup>3</sup>
$l_e$	effective length	1200	mm
$A_e$	effective area	2450	mm <sup>2</sup>
m	mass	≈ 16000	g

**Ring core data**

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







Soft Ferrites

E cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview E cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	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

• In accordance with IEC 61246.

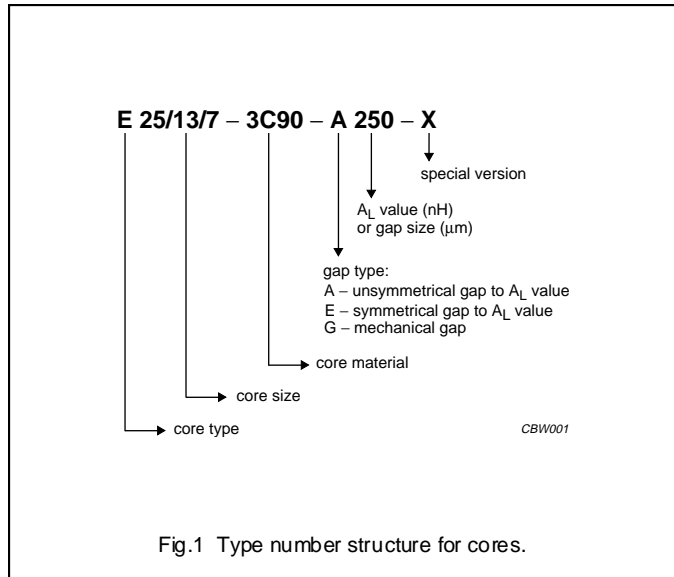


Fig.1 Type number structure for cores.

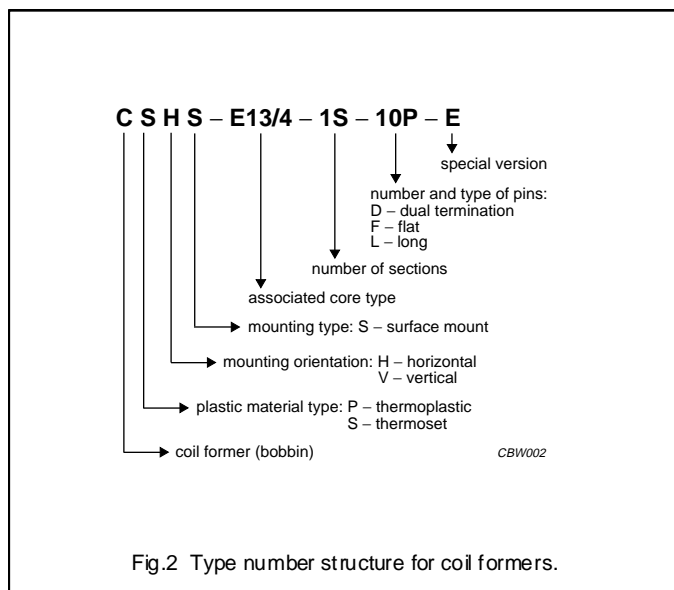
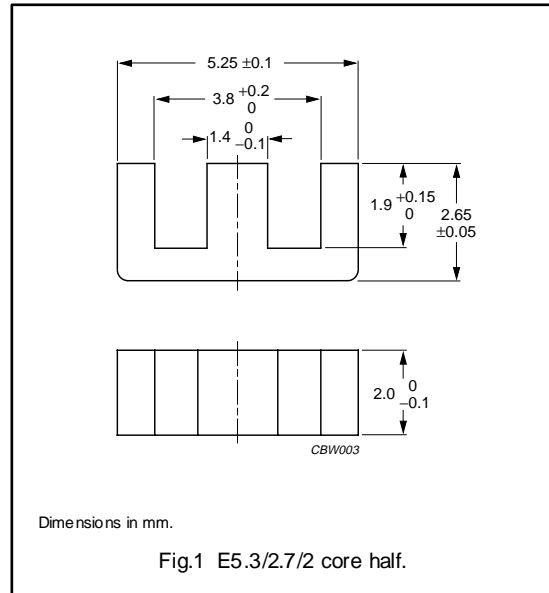


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

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



**Core halves for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 5 ± 2 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C92 <small>des</small>	240 ± 25%	≈ 900	≈ 0	E5.3/2.7/2-3C92
3C94	300 ± 25%	≈ 1120	≈ 0	E5.3/2.7/2-3C94
3C96 <small>des</small>	275 ± 25%	≈ 1030	≈ 0	E5.3/2.7/2-3C96
3F3	265 ± 25%	≈ 990	≈ 0	E5.3/2.7/2-3F3
3F35 <small>prot</small>	225 ± 25%	≈ 840	≈ 0	E5.3/2.7/2-3F35
3F4 <small>des</small>	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.

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

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C92	≥370	≤0.003	≤0.02	–
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)

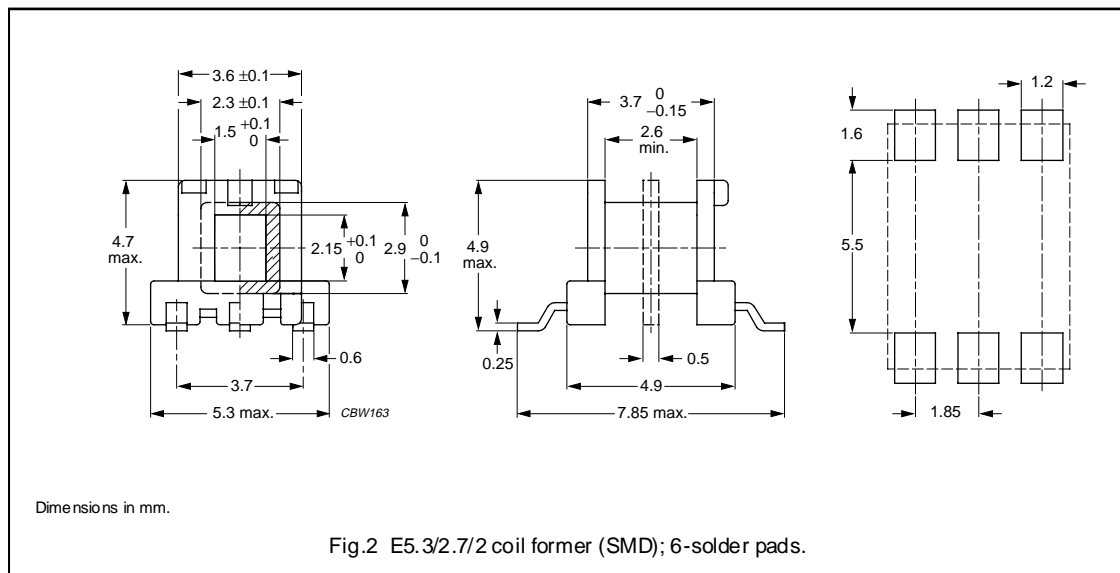
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤0.012	–	–	–
3F3	≥300	–	–	–	–
3F35	≥300	≤0.004	≤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 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin (Sn) 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



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

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

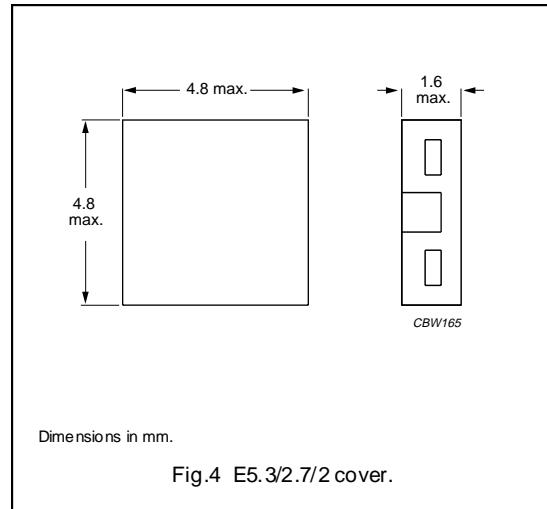
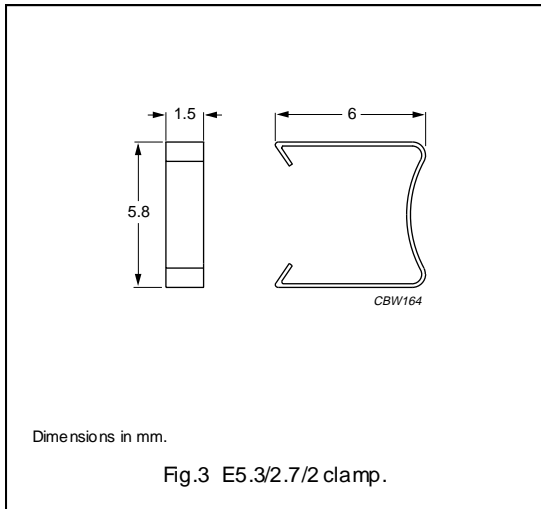
E cores and accessories

E5.3/2.7/2

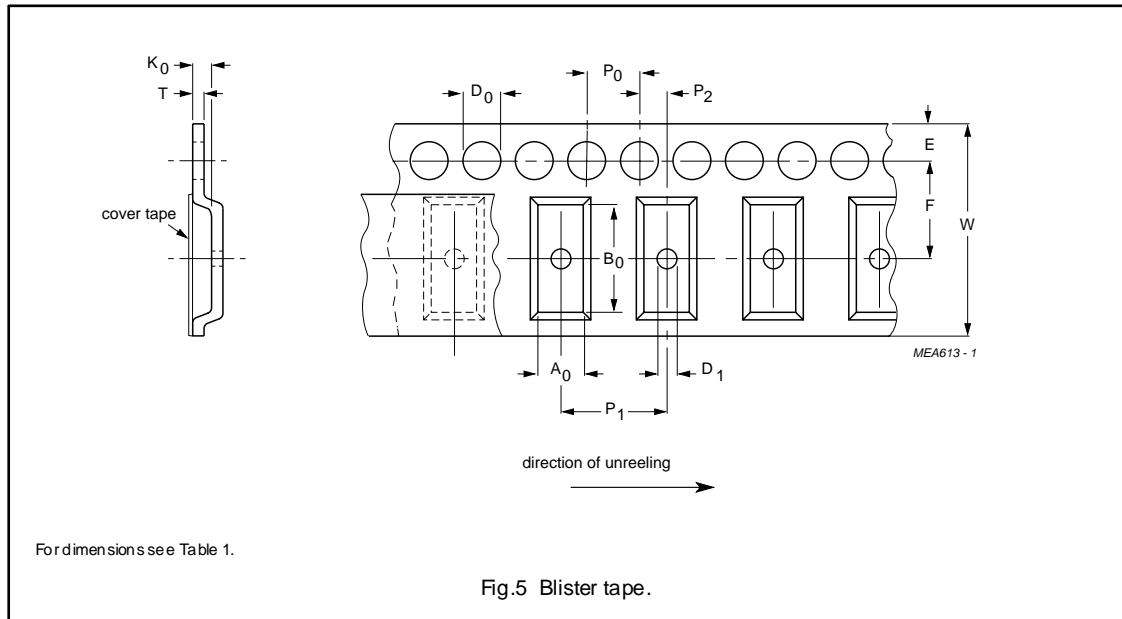
**MOUNTING PARTS**

**General data for mounting parts**

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



**BLISTER TAPE AND REEL DIMENSIONS**



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

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

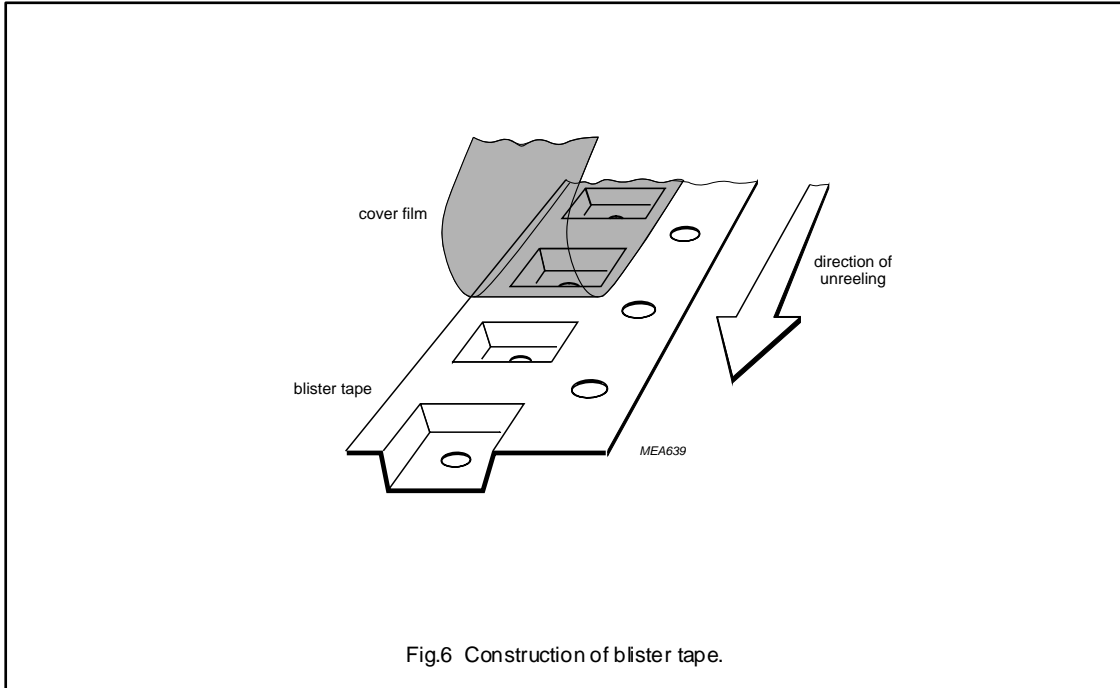


Fig.6 Construction of blister tape.

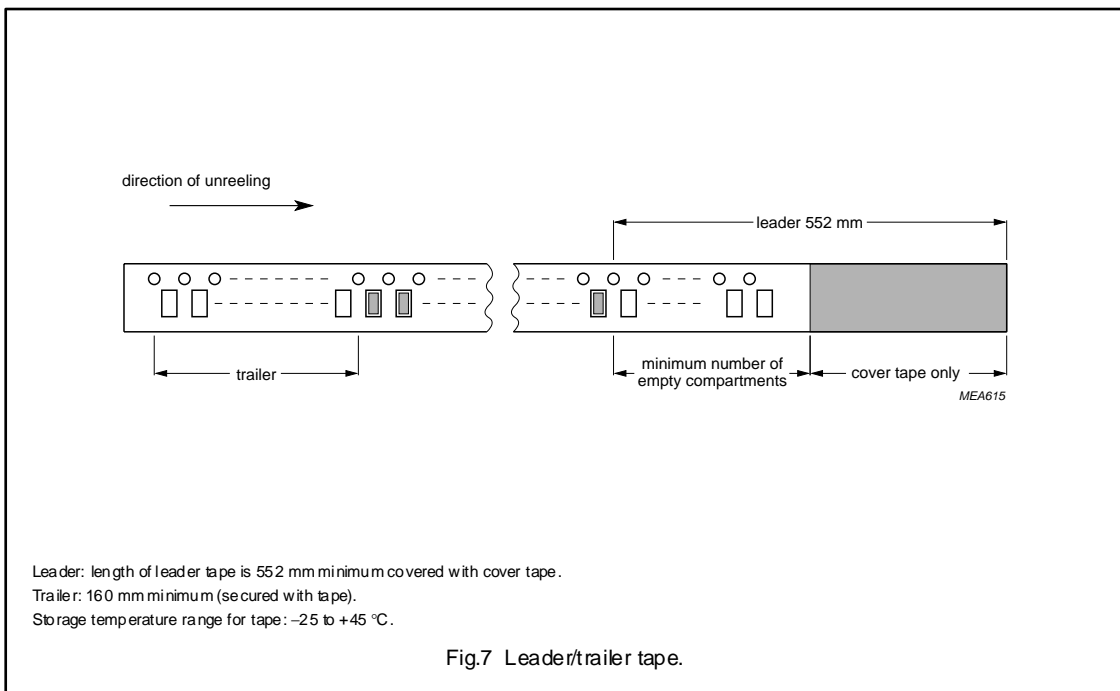
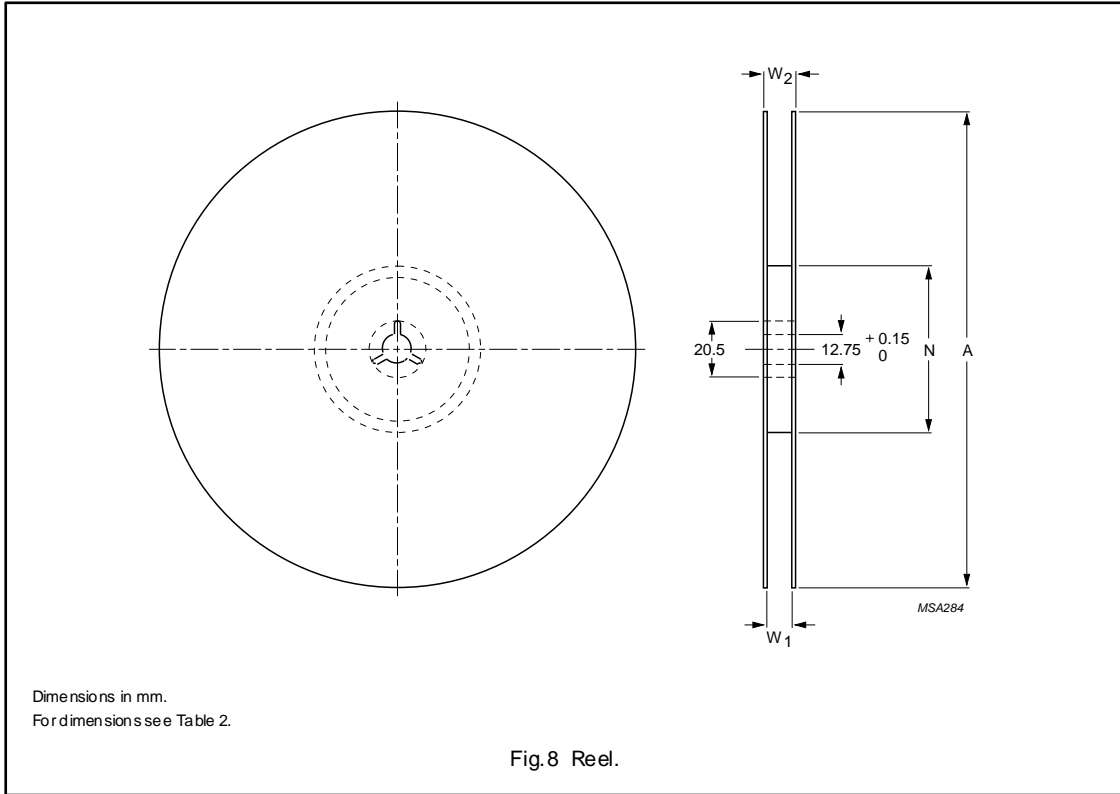


Fig.7 Leader/trailer tape.



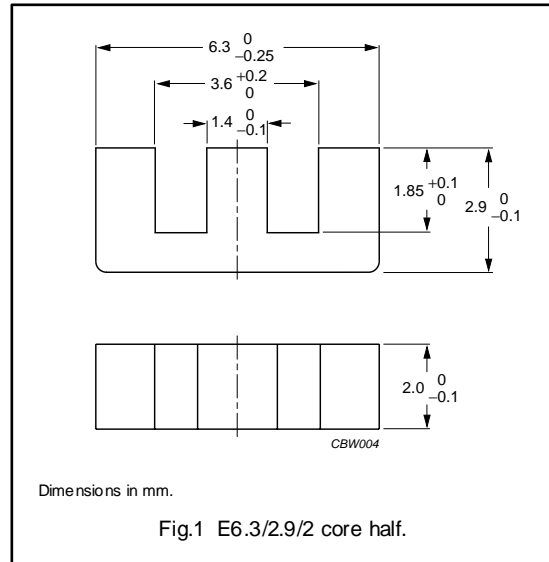
**Table 2** Reel dimensions; see Fig.8

SIZE	DIMENSIONS (mm)			
	A	N	W <sub>1</sub>	W <sub>2</sub>
12	330	100 ±5	12.4	≤16.4

**CORE SETS**

**Effective core parameters**

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



**Core halves for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 5 ±2 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C92	310 ±25%	≈ 900	≈ 0	E6.3/2.9/2-3C92
3C94	400 ±25%	≈ 1170	≈ 0	E6.3/2.9/2-3C94
3C96 <small>des</small>	380 ±25%	≈ 1110	≈ 0	E6.3/2.9/2-3C96
3F3	360 ±25%	≈ 1050	≈ 0	E6.3/2.9/2-3F3
3F35 <small>prot</small>	300 ±25%	≈ 875	≈ 0	E6.3/2.9/2-3F35
3F4 <small>des</small>	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.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3E5	1 700 +40/-30%	≈ 5000	≈ 0	E6.3/2.9/2-3E5
3E6	2 100 +40/-30%	≈ 6180	≈ 0	E6.3/2.9/2-3E6

## E cores and accessories

E6.3/2.9/2

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C92	≥370	≤ 0.004	≤ 0.025	–
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	–	–	–

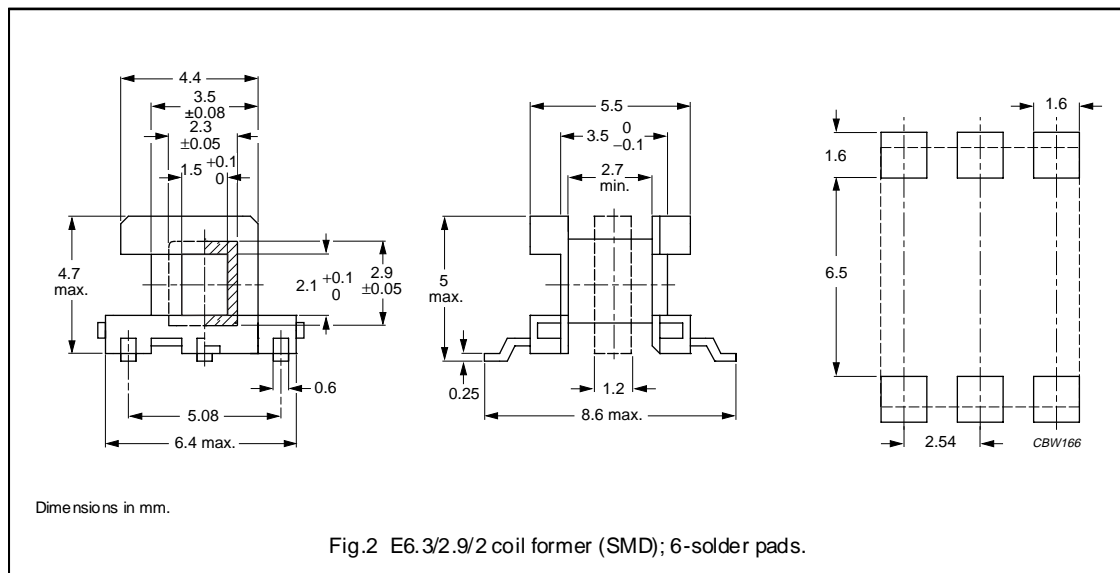
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	≥370	–	–	–	–
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 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin (Sn) plated
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



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

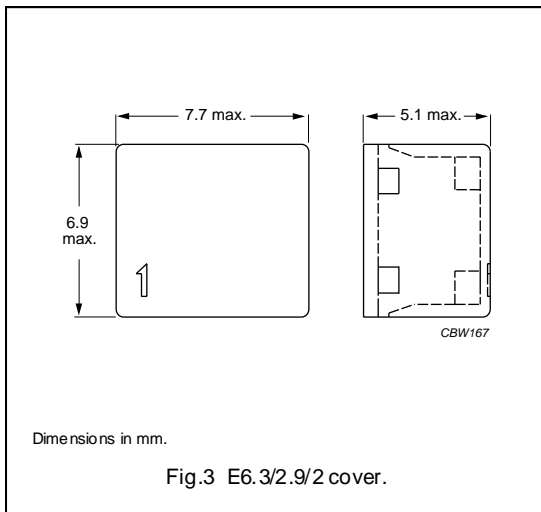
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	1.62	2.7	12.8	CPHS-E6.3/2-1S-4P-Z
1	1.62	2.7	12.8	CPHS-E6.3/2-1S-6P-Z
2	2 × 0.45	2 × 0.75	12.8	CPHS-E6.3/2-2S-4P-Z
2	2 × 0.45	2 × 0.75	12.8	CPHS-E6.3/2-2S-6P-Z



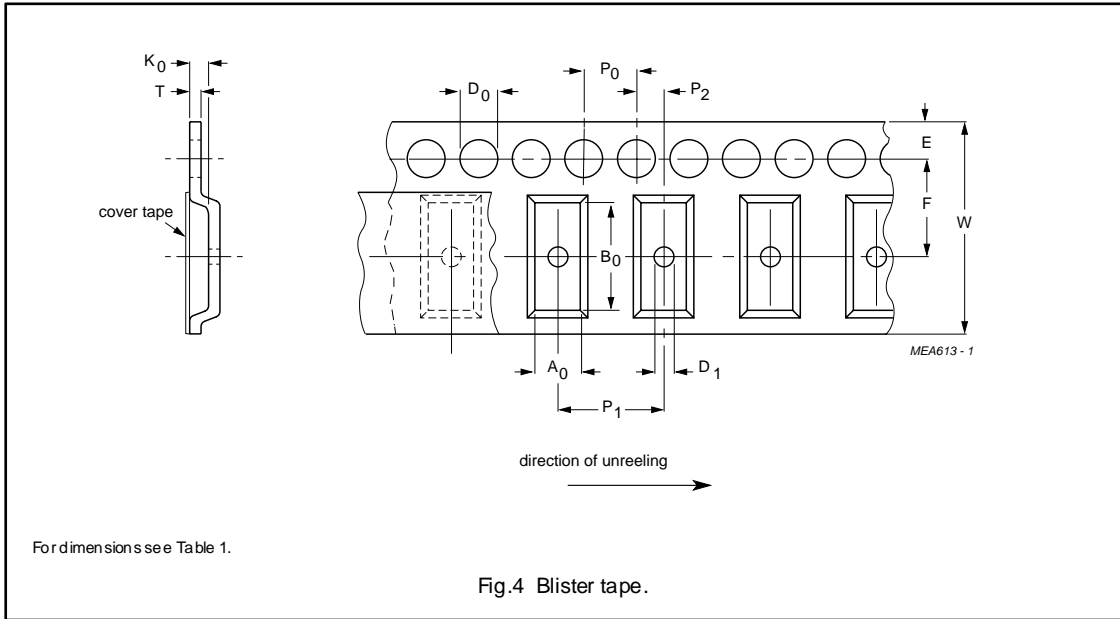
**MOUNTING PARTS**

**General data for mounting parts**

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

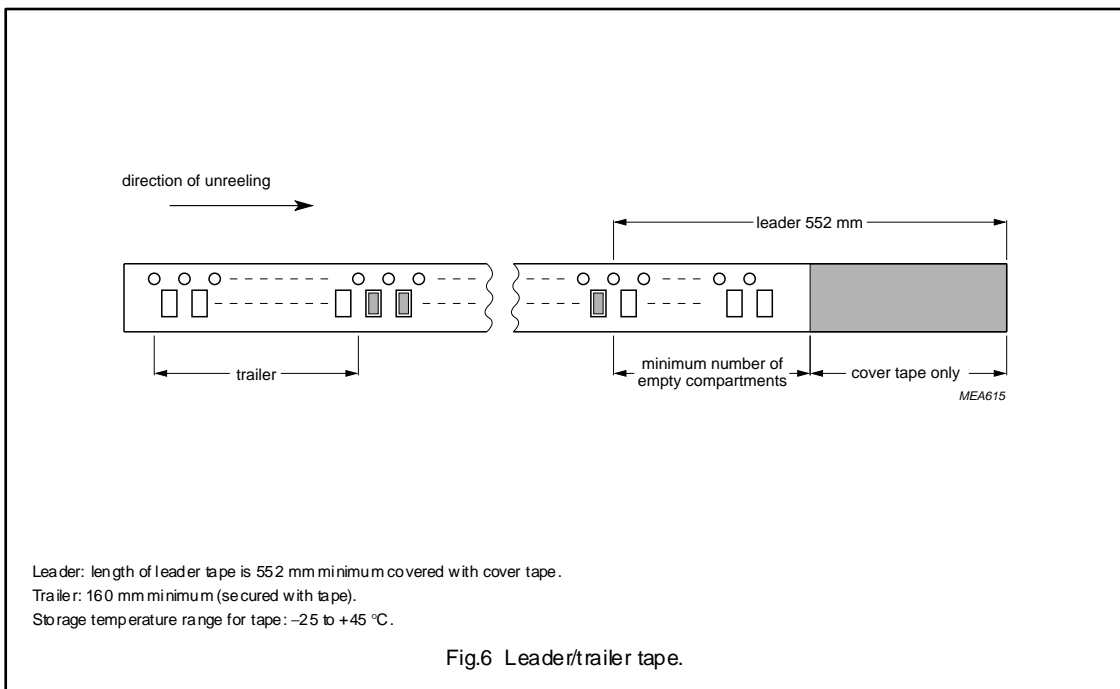
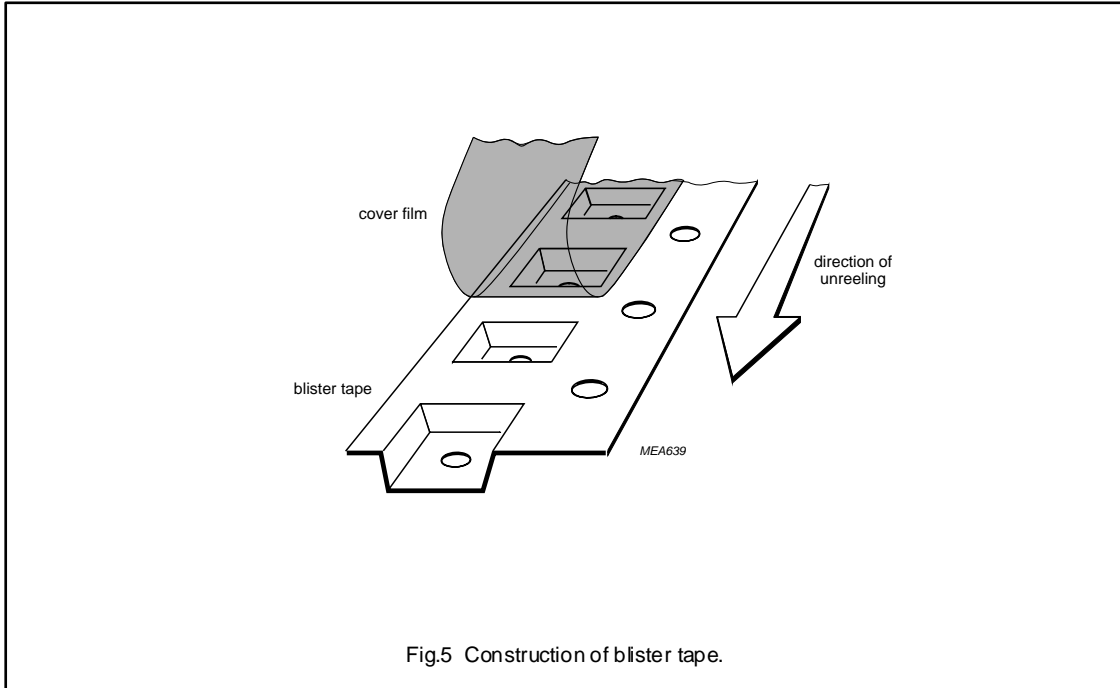


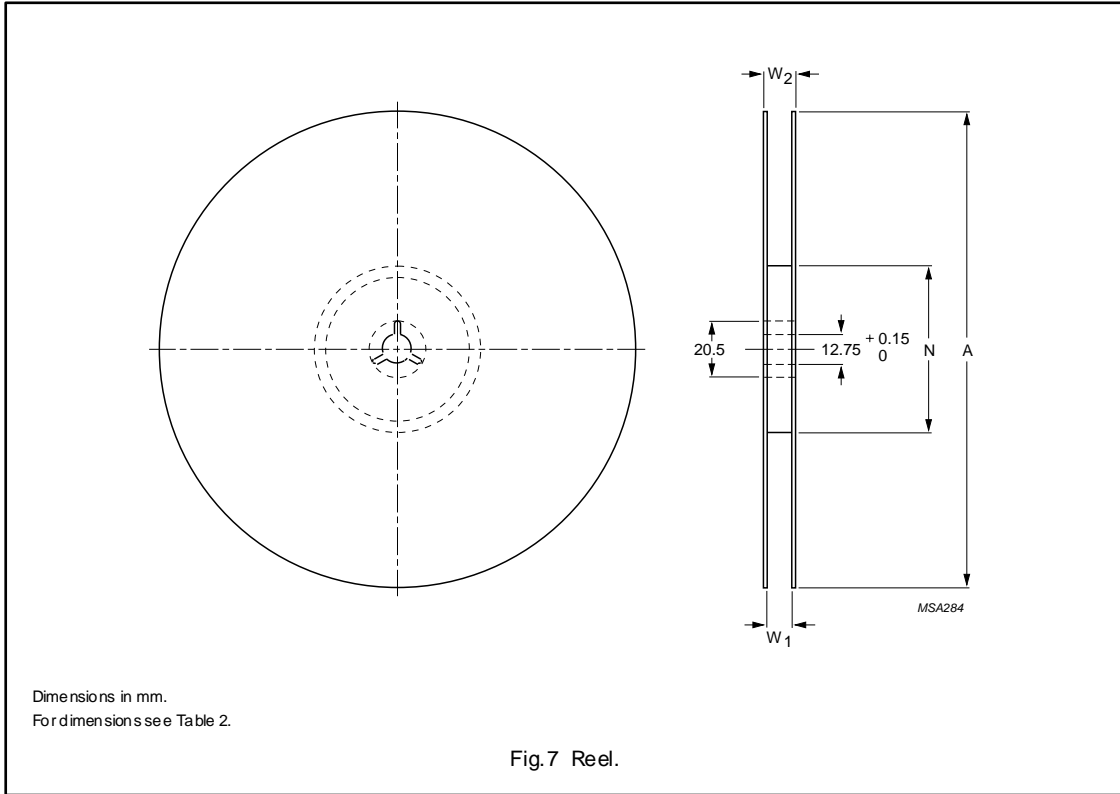
**BLISTER TAPE AND REEL DIMENSIONS**



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

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





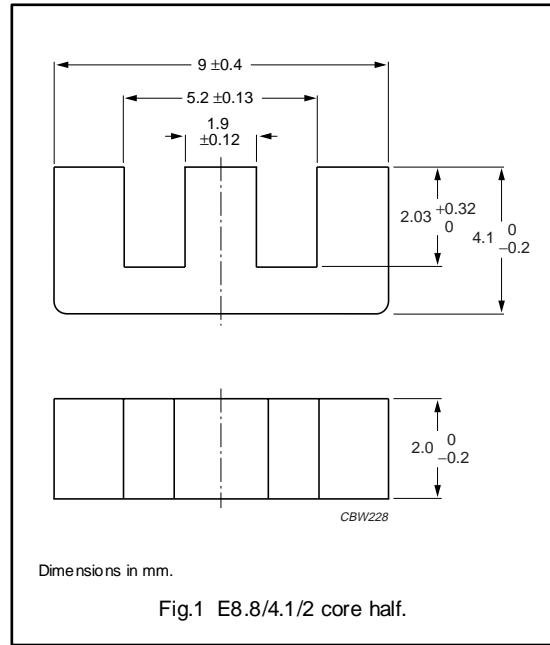
**Table 2** Reel dimensions; see Fig.7

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
12	330	100 ±5	12.4	≤16.4

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C92 <small>des</small>	400 ±25%	≈ 1000	≈ 0	E8.8/4.1/2-3C92
3C94	530 ±25%	≈ 1310	≈ 0	E8.8/4.1/2-3C94
3C96 <small>des</small>	480 ±25%	≈ 1190	≈ 0	E8.8/4.1/2-3C96
3F3	460 ±25%	≈ 1140	≈ 0	E8.8/4.1/2-3F3
3F35 <small>prot</small>	380 ±25%	≈ 940	≈ 0	E8.8/4.1/2-3F35
3F4 <small>des</small>	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.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C92	≥370	≤0.007	≤0.04	–
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	–	–	–

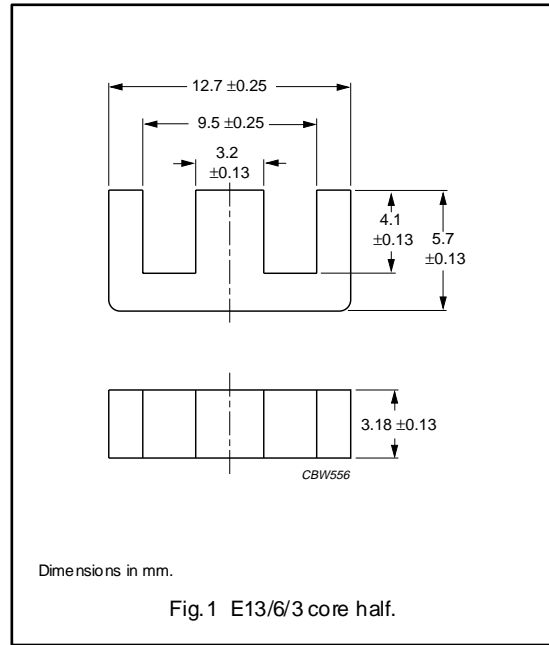
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 500 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	≥370	–	–	–	–
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
$\Sigma(l/A)$	core factor (C1)	2.74	mm <sup>-1</sup>
$V_e$	effective volume	281	mm <sup>3</sup>
$l_e$	effective length	27.8	mm
$A_e$	effective area	10.1	mm <sup>2</sup>
$A_{min}$	minimum area	10.1	mm <sup>2</sup>
$m$	mass of core half	≈ 0.7	g



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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
3C92 <span style="border: 1px solid black; padding: 0 2px;">des</span>	540 ± 25%	≈ 1180	≈ 0	E13/6/3-3C92

**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 0.03	≤ 0.03	–
3C92	≥ 370	–	≤ 0.022	≤ 0.16



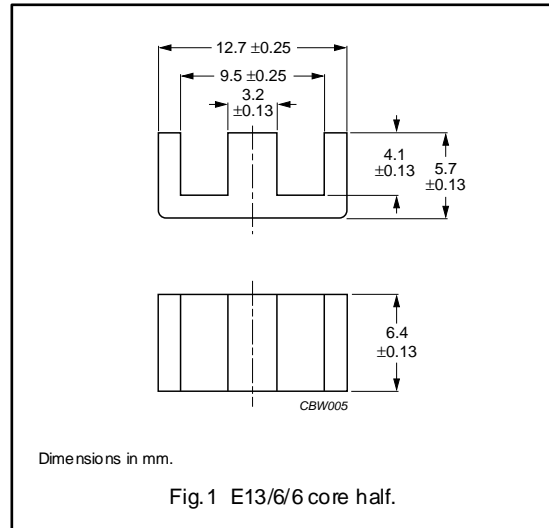
E cores and accessories

E13/6/6  
(814E250)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.37	mm <sup>-1</sup>
$V_e$	effective volume	559	mm <sup>3</sup>
$l_e$	effective length	27.7	mm
$A_e$	effective area	20.2	mm <sup>2</sup>
$A_{min}$	minimum area	20.2	mm <sup>2</sup>
m	mass of core half	≈ 1.4	g




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)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	1950 ± 25%	≈ 2130	≈ 0	E13/6/6-3C91
3C92 <small>des</small>	1080 ± 25%	≈ 1180	≈ 0	E13/6/6-3C92
3C94	1470 ± 25%	≈ 1605	≈ 0	E13/6/6-3C94
3C96 <small>des</small>	1250 ± 25%	≈ 1360	≈ 0	E13/6/6-3C96

## E cores and accessories

E13/6/6  
(814E250)

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	63 $\pm$ 5%	$\approx$ 70	$\approx$ 560	E13/6/6-3F3-A63
	100 $\pm$ 8%	$\approx$ 110	$\approx$ 310	E13/6/6-3F3-A100
	160 $\pm$ 8%	$\approx$ 175	$\approx$ 175	E13/6/6-3F3-A160
	250 $\pm$ 20%	$\approx$ 275	$\approx$ 100	E13/6/6-3F3-A250
	315 $\pm$ 20%	$\approx$ 340	$\approx$ 75	E13/6/6-3F3-A315
	1 250 $\pm$ 25%	$\approx$ 1 370	$\approx$ 0	E13/6/6-3F3
3F35 	1 000 $\pm$ 25%	$\approx$ 1 090	$\approx$ 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  $\pm$  5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	2600 $\pm$ 25%	$\approx$ 2840	$\approx$ 0	E13/6/6-3E27

## E cores and accessories

E13/6/6  
(814E250)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.12	–	–	–
3C90	≥320	≤ 0.06	≤ 0.06	–	–
3C91	≥320	–	≤ 0.037 <sup>(1)</sup>	≤ 0.25 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.048	≤ 0.33	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.21	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.075	≤ 0.6	–	–

## Note

1. Measured at 60 °C.

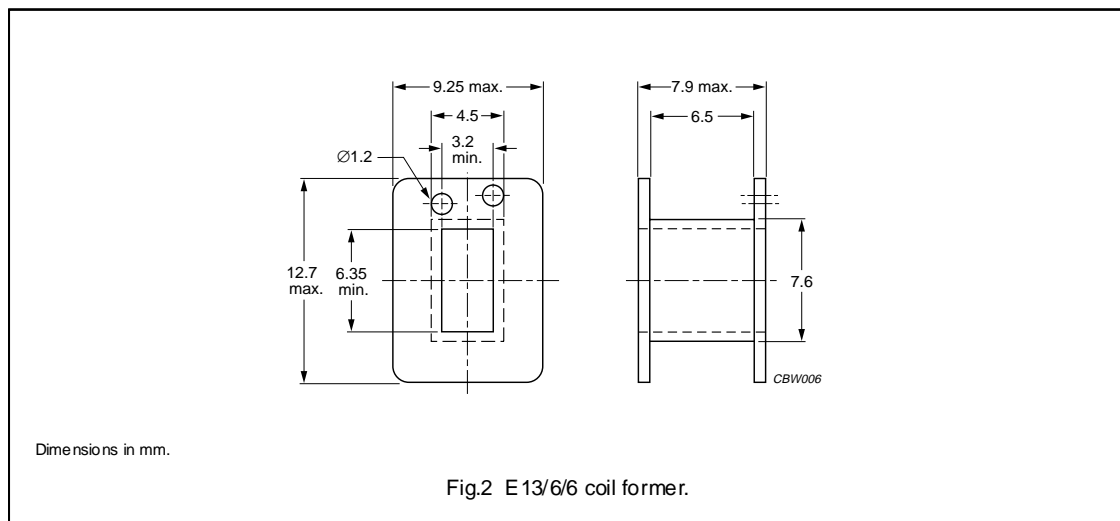
E cores and accessories

E13/6/6  
(814E250)

**COIL FORMERS**

**General data for E13/6/6 coil former**

ITEM	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with "UL 94V-2", UL file number E41938(M)
Maximum operating temperature	130 °C, "IEC 60 085", class B



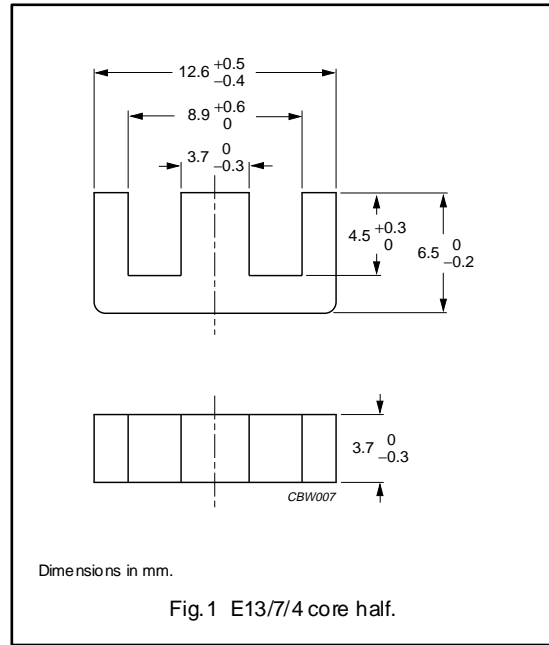
**Winding data for E13/6/6 coil former**

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

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	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
3C92 <small>des</small>	630 ± 25%	≈ 1200	≈ 0	E13/7/4-3C92
3C94	800 ± 25%	≈ 1525	≈ 0	E13/7/4-3C94
3C96 <small>des</small>	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 <small>prot</small>	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,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	1 500 $\pm 25\%$	$\approx 2800$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.05$	$\leq 0.05$	–	–
3C92	$\geq 370$	–	$\leq 0.04$	$\leq 0.2$	–
3C94	$\geq 320$	–	$\leq 0.04$	$\leq 0.2$	–
3C96	$\geq 340$	–	$\leq 0.03$	$\leq 0.16$	–
3F3	$\geq 320$	–	$\leq 0.05$	–	$\leq 0.07$
3F35	$\geq 300$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C92	$\geq 370$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 0.14$	–	–	–
3F3	$\geq 315$	–	–	–	–
3F35	$\geq 300$	$\leq 0.05$	$\leq 0.39$	–	–

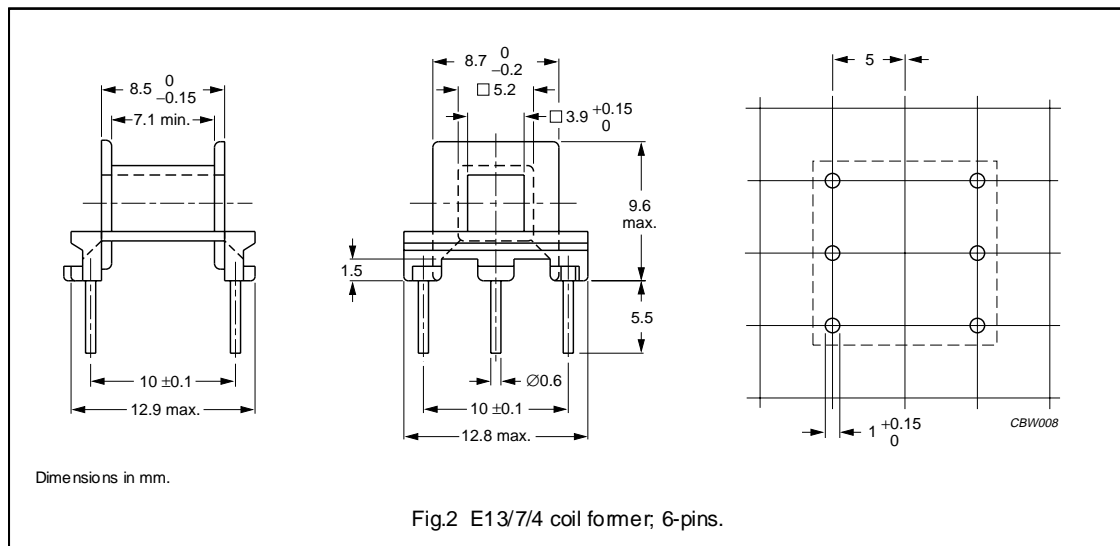
E cores and accessories

E13/7/4  
(EF12.6)

**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 94 V-0"; UL file number E41 871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
Maximum operating temperature	130 °C, "IEC 60085", class B
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



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

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

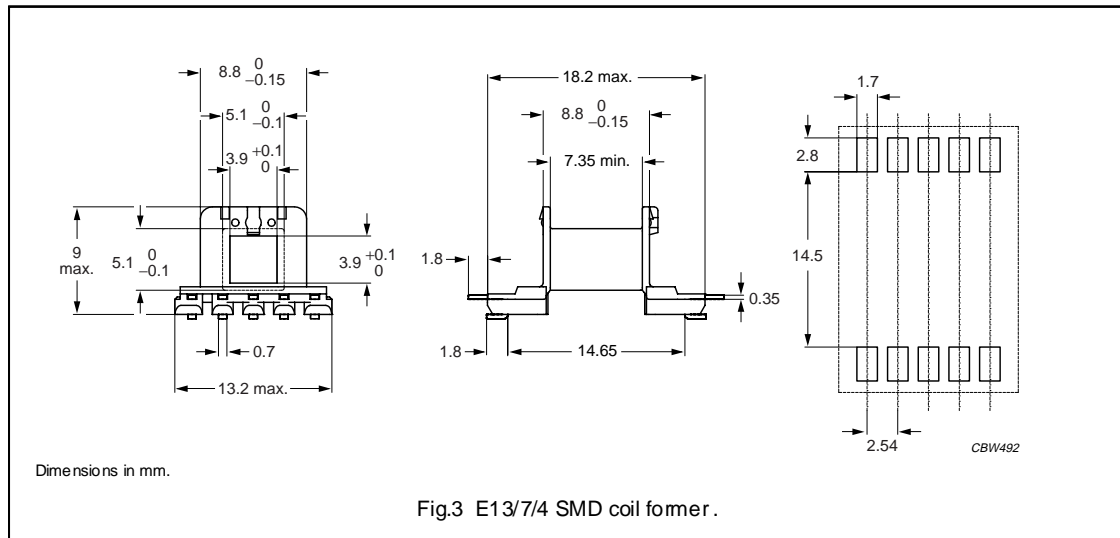
E cores and accessories

E13/7/4  
(EF12.6)

**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 94 V-0"; UL file number E41429(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



Winding data for E13/7/4 SMD coil former

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



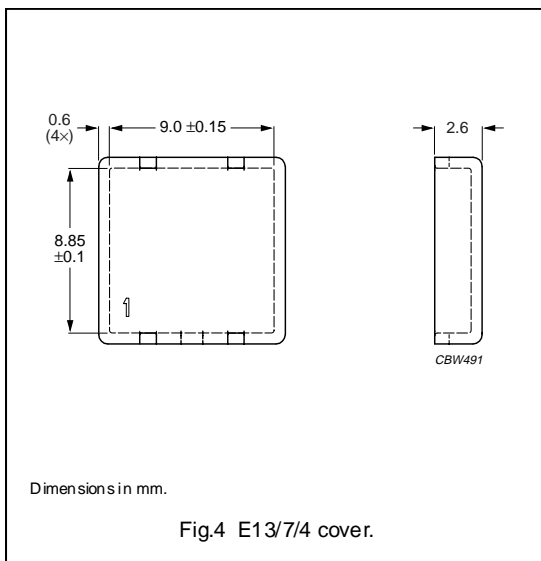
E cores and accessories

E13/7/4  
(EF12.6)

**MOUNTING PARTS**

**General data for mounting parts**

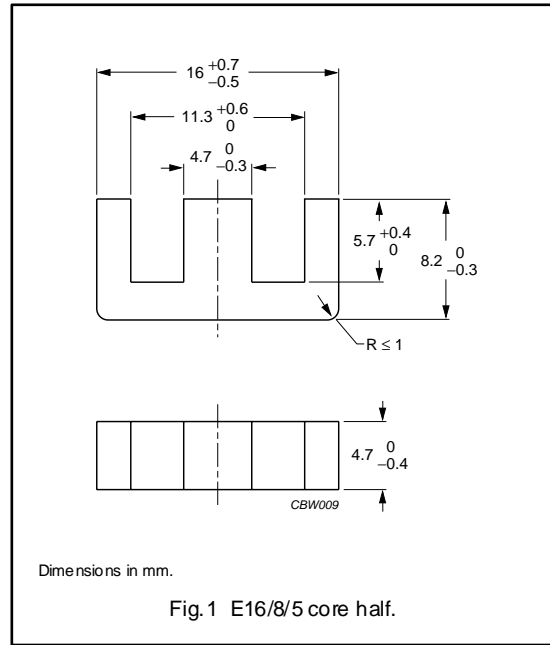
ITEM	REMARKS	FIGURE	TYPE NUMBER
Cover	polyamide (PA), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E119177(M); maximum operating temperature 130 °C, "IEC 60 085", class B	4	COV-E13/7/4



**CORE SETS**

**Effective core parameters**

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



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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
3C92 <small>des</small>	840 ±25%	≈ 1250	≈ 0	E16/8/5-3C92
3C94	1100 ±25%	≈ 1640	≈ 0	E16/8/5-3C94
3C96 <small>des</small>	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 <small>prot</small>	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,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$2\,200 \pm 25\%$	$\approx 3300$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.1$	$\leq 0.1$	–	–
3C92	$\geq 370$	–	$\leq 0.075$	$\leq 0.38$	–
3C94	$\geq 320$	–	$\leq 0.075$	$\leq 0.38$	–
3C96	$\geq 340$	–	$\leq 0.055$	$\leq 0.3$	–
3F3	$\geq 320$	–	$\leq 0.1$	–	$\leq 0.15$
3F35	$\geq 300$	–	–	–	–

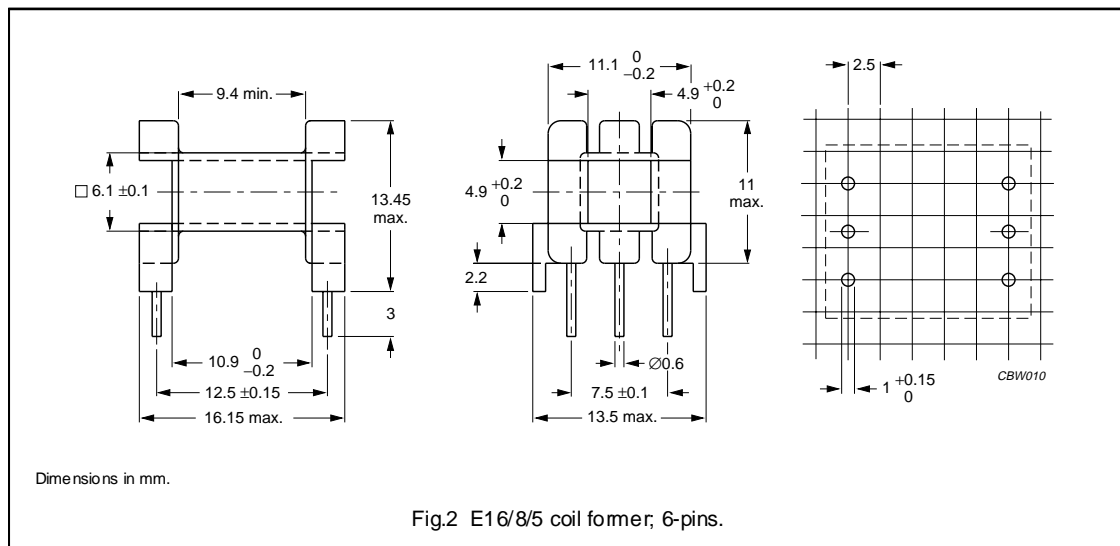
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C92	$\geq 370$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 0.28$	–	–	–
3F3	$\geq 315$	–	–	–	–
3F35	$\geq 300$	$\leq 0.1$	$\leq 0.8$	–	–

**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 94 V-0"; UL file number E41 871(M)
Pin material	copper-tin alloy (CuSn), tin (Sn) 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



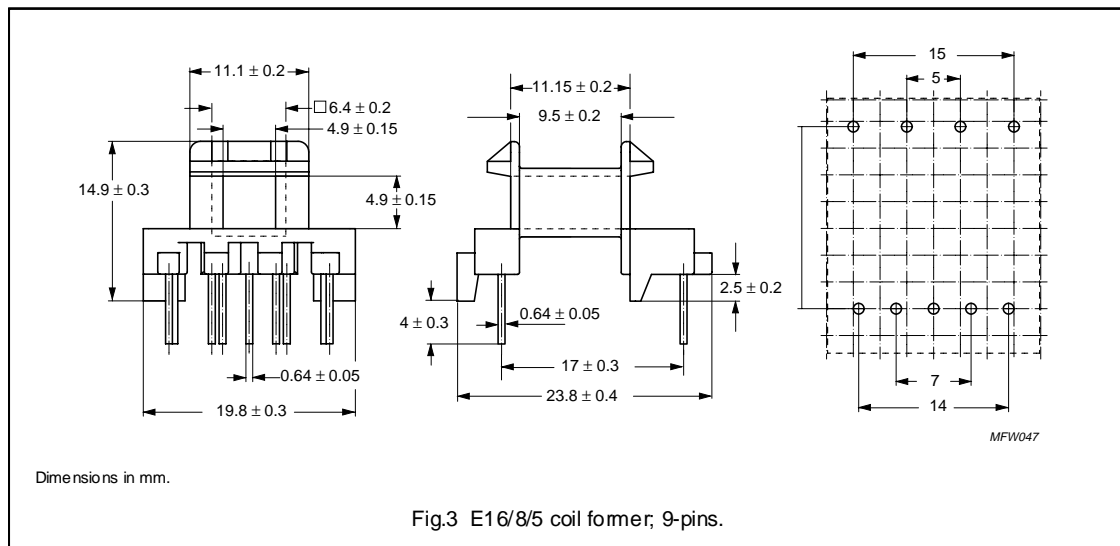
**Winding data for 6-pins E16/8/5 coil former**

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

**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 94 V-0"; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



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

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	20.2	9.6	35	CSH-E 16/8/5-1S-9P

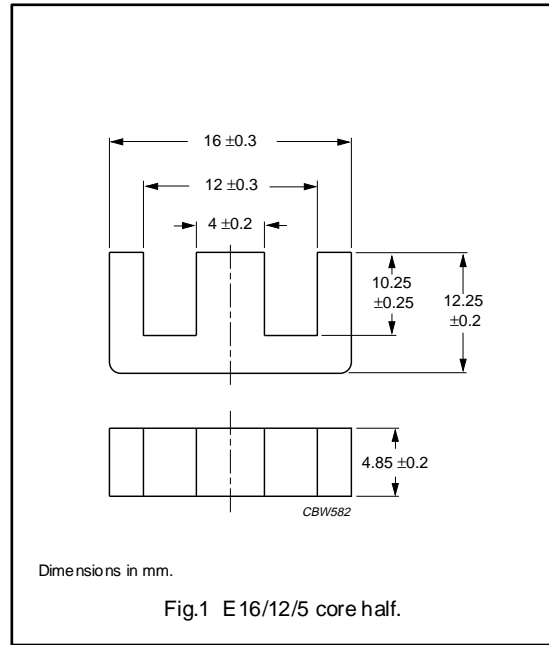
**Note**

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.

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	800 ± 25%	≈ 1810	≈ 0	E 16/ 12/5-3C90
3C92 <small>des</small>	580 ± 25%	≈ 1320	≈ 0	E 16/ 12/5-3C92

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E26	2 000 ± 25%	≈ 4530	≈ 0	E16/ 12/5-3E 26

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 315	≤ 0.13	≤ 0.14	–
3C92	≥ 370	–	≤ 0.1	≤ 0.65

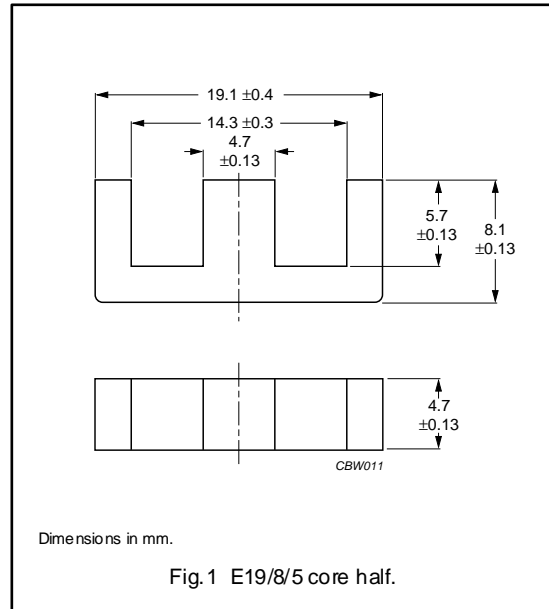
E cores and accessories

E19/8/5  
(813E187)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.77	mm <sup>-1</sup>
$V_e$	effective volume	900	mm <sup>3</sup>
$l_e$	effective length	39.9	mm
$A_e$	effective area	22.6	mm <sup>2</sup>
$A_{min}$	minimum area	22.1	mm <sup>2</sup>
$m$	mass of core half	≈ 2.3	g




Core halves

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	1500 ± 25%	≈ 2110	≈ 0	E19/8/5-3C91
3C92 <small>des</small>	900 ± 25%	≈ 1260	≈ 0	E19/8/5-3C92
3C94	1170 ± 25%	≈ 1650	≈ 0	E19/8/5-3C94
3C96 <small>des</small>	1000 ± 25%	≈ 1400	≈ 0	E19/8/5-3C96

## E cores and accessories

E19/8/5  
(813E187)

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	63 $\pm$ 5%	$\approx$ 88	$\approx$ 640	E19/8/5-3F3-A63
	100 $\pm$ 8%	$\approx$ 140	$\approx$ 330	E19/8/5-3F3-A100
	160 $\pm$ 8%	$\approx$ 225	$\approx$ 190	E19/8/5-3F3-A160
	250 $\pm$ 15%	$\approx$ 350	$\approx$ 110	E19/8/5-3F3-A250
	315 $\pm$ 15%	$\approx$ 440	$\approx$ 80	E19/8/5-3F3-A315
	1000 $\pm$ 25%	$\approx$ 1400	$\approx$ 0	E19/8/5-3F3
3F35 	810 $\pm$ 25%	$\approx$ 1140	$\approx$ 0	E19/8/5-3F35

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements, 20  $\pm$ 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	2 300 $\pm$ 25%	$\approx$ 3230	$\approx$ 0	E19/8/5-3E27



## E cores and accessories

E19/8/5  
(813E187)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.2	–	–	–
3C90	≥320	≤ 0.09	≤ 0.1	–	–
3C91	≥320	–	≤ 0.064 <sup>(1)</sup>	≤ 0.37 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.08	≤ 0.45	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 0.32	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤ 0.12	≤ 0.95	–	–

## Note

1. Measured at 60 °C.

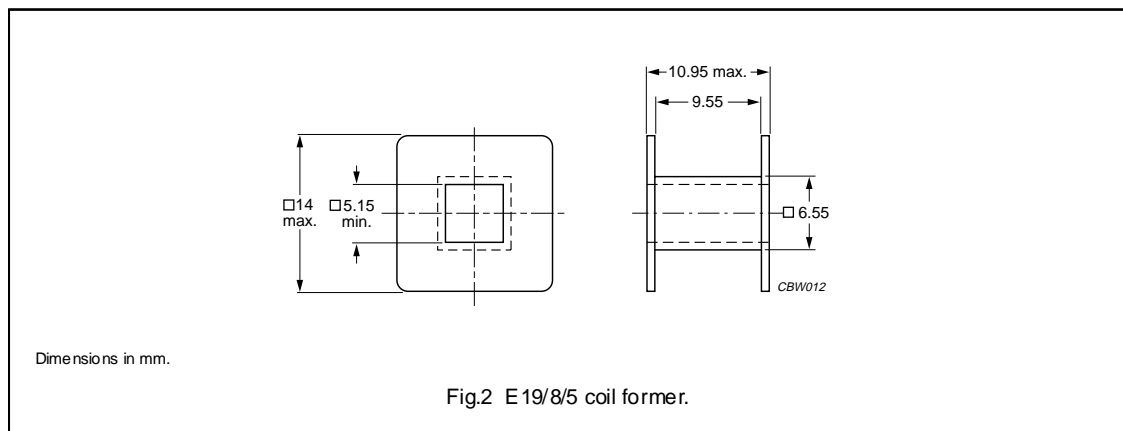
E cores and accessories

E19/8/5  
(813E187)

**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



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

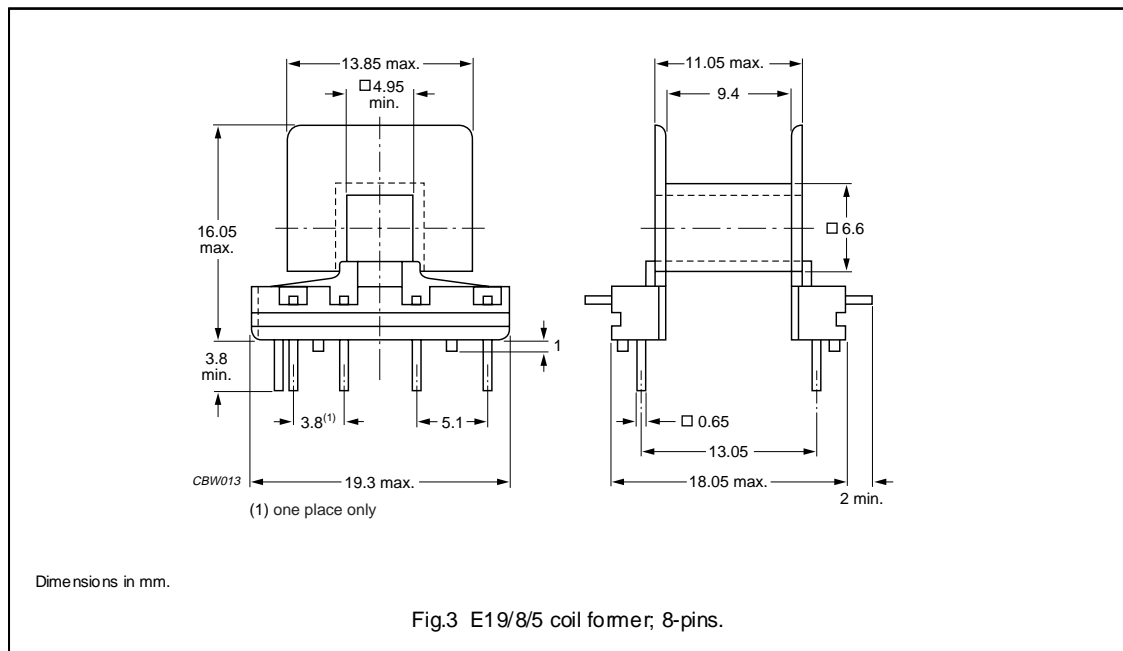
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	33.0	9.5	37.9	CP-E19/8/5-1S

E cores and accessories

E19/8/5  
(813E187)

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, transition to lead-free (Sn) ongoing.
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



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

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	32.3	9.4	40.9	CPH-E 19/8/5-1S-8PD

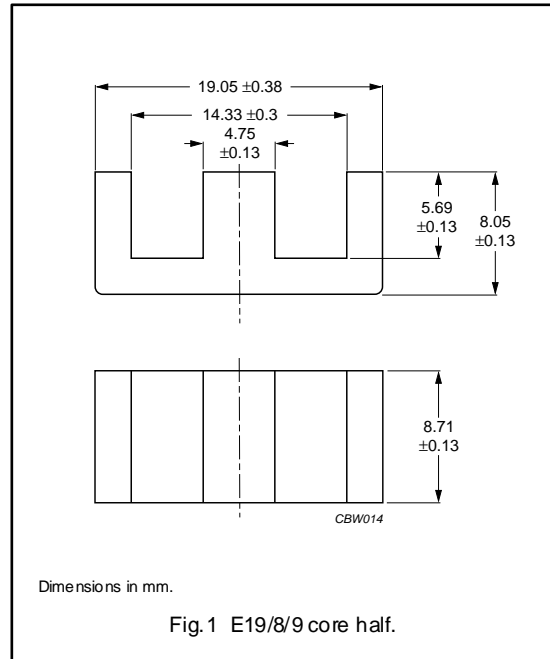
E cores and accessories

E19/8/9  
(813E343)

CORE SETS

Effective core parameters

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




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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C81	63 ± 5% <sup>(1)</sup>	≈ 48	≈ 1280	E19/8/9-3C81-E63
	100 ± 8% <sup>(1)</sup>	≈ 77	≈ 700	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% <sup>(1)</sup>	≈ 48	≈ 1300	E19/8/9-3C90-E63
	100 ± 8% <sup>(1)</sup>	≈ 77	≈ 700	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 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	2740 ± 25%	≈ 2680	≈ 0	E19/8/9-3C91
3C92 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	1640 ± 25%	≈ 1250	≈ 0	E19/8/9-3C92
3C94	2150 ± 25%	≈ 2100	≈ 0	E19/8/9-3C94
3C96 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	1830 ± 25%	≈ 1410	≈ 0	E19/8/9-3C96

## E cores and accessories

E19/8/9  
(813E343)

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$63 \pm 5\%^{(1)}$	$\approx 48$	$\approx 1300$	E19/8/9-3F3-E63
	$100 \pm 8\%^{(1)}$	$\approx 77$	$\approx 700$	E19/8/9-3F3-E100
	$160 \pm 8\%$	$\approx 123$	$\approx 380$	E19/8/9-3F3-A250
	$250 \pm 15\%$	$\approx 192$	$\approx 220$	E19/8/9-3F3-A315
	$315 \pm 15\%$	$\approx 240$	$\approx 170$	E19/8/9-3F3-A400
	$1830 \pm 25\%$	$\approx 1410$	$\approx 0$	E19/8/9-3F3
3F35 	$1490 \pm 25\%$	$\approx 1150$	$\approx 0$	E19/8/9-3F35

**Note**

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

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$4\,250 \pm 25\%$	$\approx 3270$	$\approx 0$	E19/8/9-3E27

## E cores and accessories

E19/8/9  
(813E343)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.4	–	–	–
3C90	≥320	≤0.17	≤0.18	–	–
3C91	≥320	–	≤0.11 <sup>(1)</sup>	≤0.68 <sup>(1)</sup>	–
3C92	≥370	–	≤0.14	≤0.85	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤0.6	–	–	–
3F3	≥315	–	–	–	–
3F35	≥300	≤0.22	≤1.7	–	–

## Note

1. Measured at 60 °C.

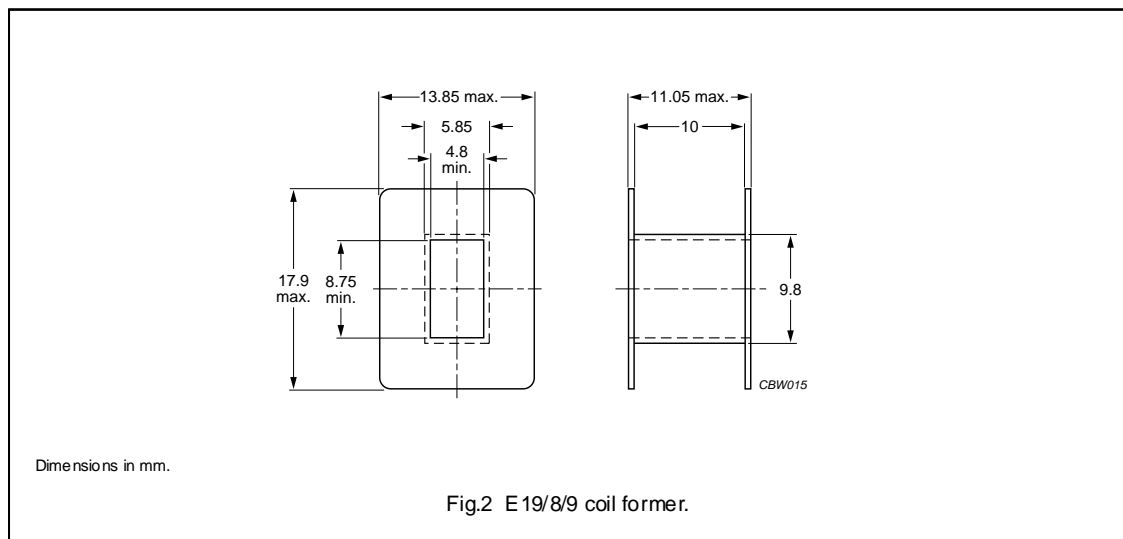
E cores and accessories

E19/8/9  
(813E343)

**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



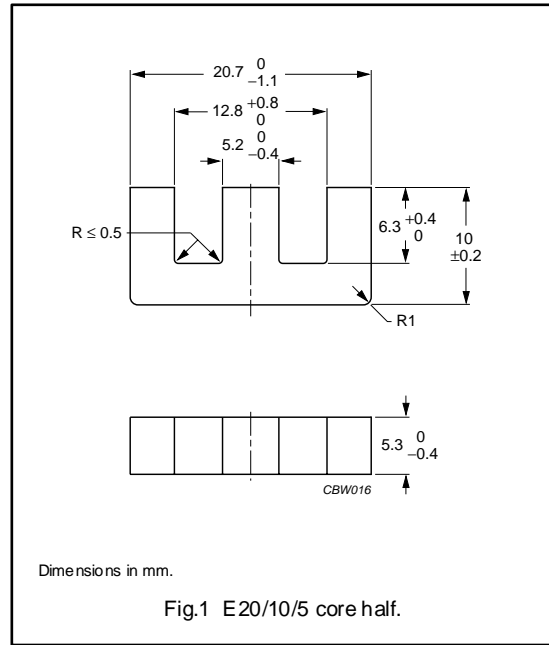
**Winding data for E19/8/9 coil former**

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

**CORE SETS**

**Effective core parameters**

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



**Core halves**

Clamping force for  $A_L$  measurements, 20 ±10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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
3C92 <small>des</small>	1170 ±25%	≈ 1280	≈ 0	E20/10/5-3C92
3C94	1500 ±25%	≈ 1640	≈ 0	E20/10/5-3C94
3C96 <small>des</small>	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 <small>prot</small>	1060 ±25%	≈ 1160	≈ 0	E20/10/5-3F35



## E cores and accessories

E20/10/5

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	2 600 $\pm 25\%$	$\approx 2840$	$\approx 0$	E20/10/5-3C11
3E27	2 800 $\pm 25\%$	$\approx 2870$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 330$	$\leq 0.15$	$\leq 0.17$	–	–
3C92	$\geq 370$	–	$\leq 0.13$	$\leq 0.7$	–
3C94	$\geq 320$	–	$\leq 0.13$	$\leq 0.7$	–
3C96	$\geq 340$	–	$\leq 0.1$	$\leq 0.56$	–
3F3	$\geq 320$	–	$\leq 0.16$	–	$\leq 0.28$
3F35	$\geq 300$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 330$	–	–	–	–
3C92	$\geq 370$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 0.5$	–	–	–
3F3	$\geq 320$	–	–	–	–
3F35	$\geq 300$	$\leq 0.18$	$\leq 1.4$	–	–

E cores and accessories

E20/10/5

**COIL FORMER**

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

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with "UL 94HB"; UL file number E41871 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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

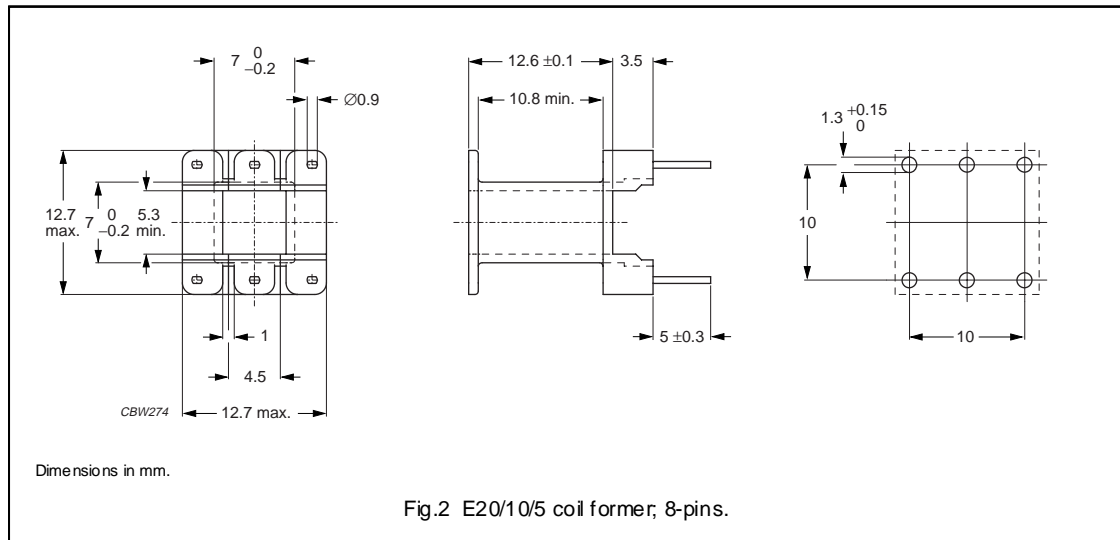


Fig.2 E20/10/5 coil former, 8-pins.

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

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

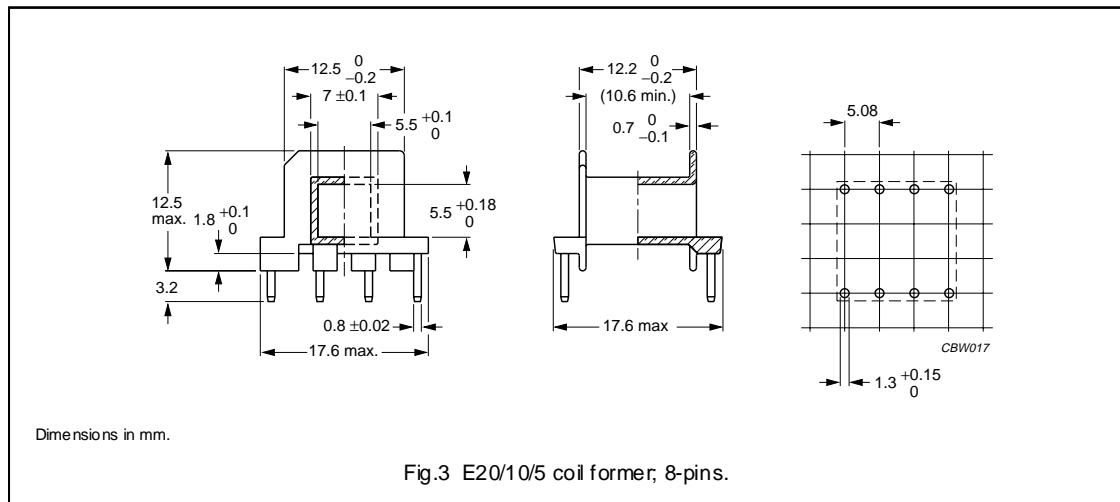
E cores and accessories

E20/10/5

**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 94 V-0"; UL file number E167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



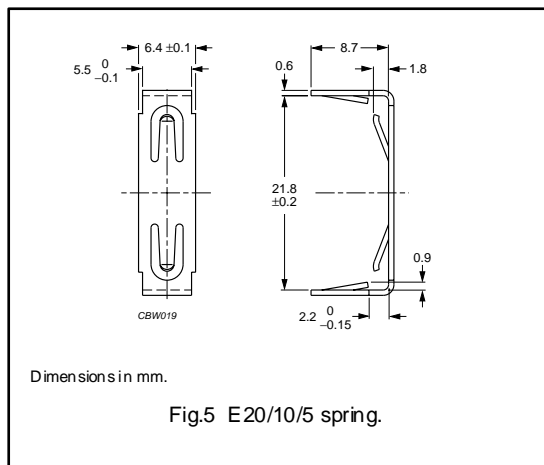
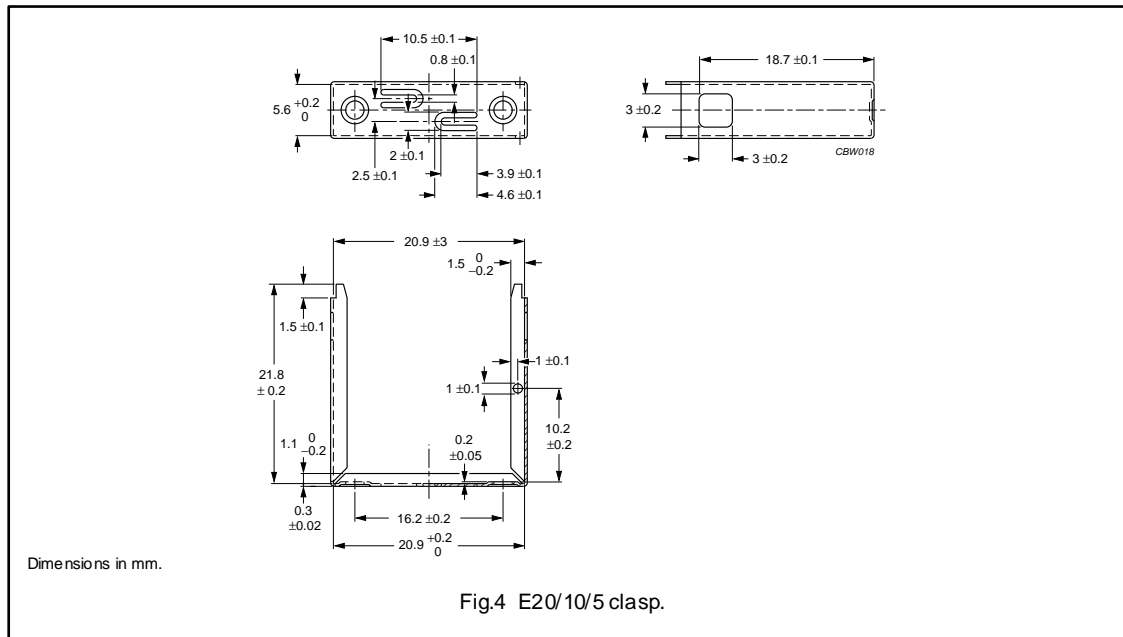
Winding data for 8-pins E20/10/5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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**

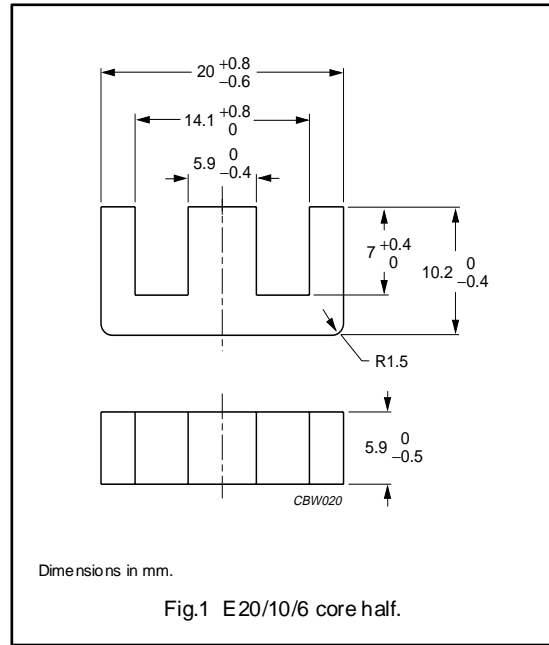
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-zinc alloy (CuZn), nickel (Ni) plated	4	CLA-E20/10/5
Spring	copper-tin alloy (CuSn), nickel (Ni) plated	5	SPR-E20/10/5



**CORE SETS**

**Effective core parameters**

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



**Core halves**

Clamping force for  $A_L$  measurements, 20 ±10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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
3C92 <small>des</small>	1130 ±25%	≈ 1300	≈ 0	E20/10/6-3C92
3C94	1450 ±25%	≈ 1660	≈ 0	E20/10/6-3C94
3C96 <small>des</small>	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 <small>prot</small>	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,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$2600 \pm 25\%$	$\approx 2970$	$\approx 0$	E20/10/6-3C11
3E27	$2700 \pm 25\%$	$\approx 3090$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.16$	$\leq 0.18$	–	–
3C92	$\geq 370$	–	$\leq 0.14$	$\leq 0.75$	–
3C94	$\geq 320$	–	$\leq 0.14$	$\leq 0.75$	–
3C96	$\geq 340$	–	$\leq 0.11$	$\leq 0.6$	–
3F3	$\geq 320$	–	$\leq 0.2$	–	$\leq 0.3$
3F35	$\geq 300$	–	–	–	–

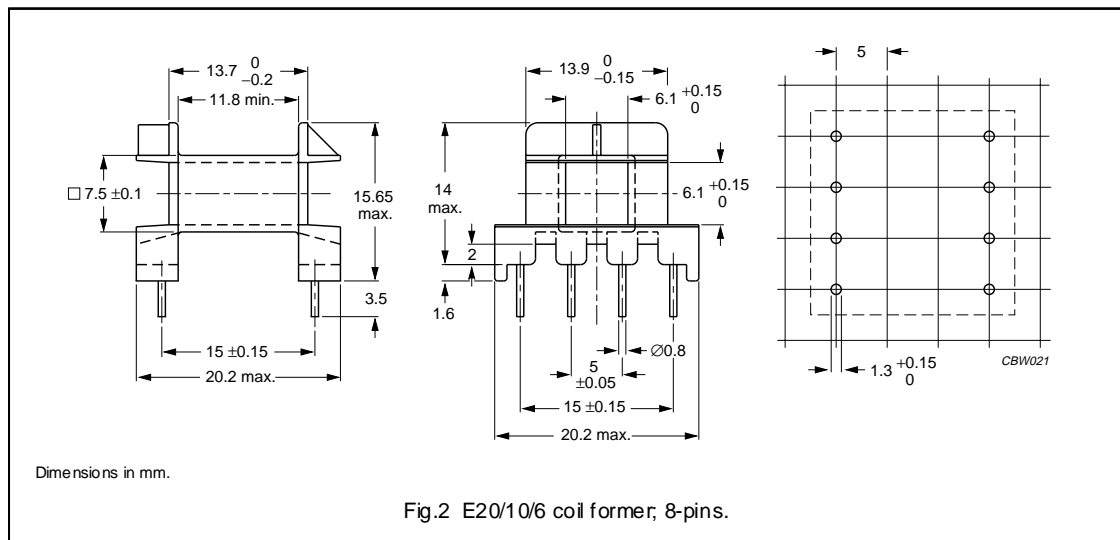
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C92	$\geq 370$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 0.55$	–	–	–
3F3	$\geq 320$	–	–	–	–
3F35	$\geq 300$	$\leq 0.2$	$\leq 1.5$	–	–

**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, transition to lead-free (Sn) ongoing.
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

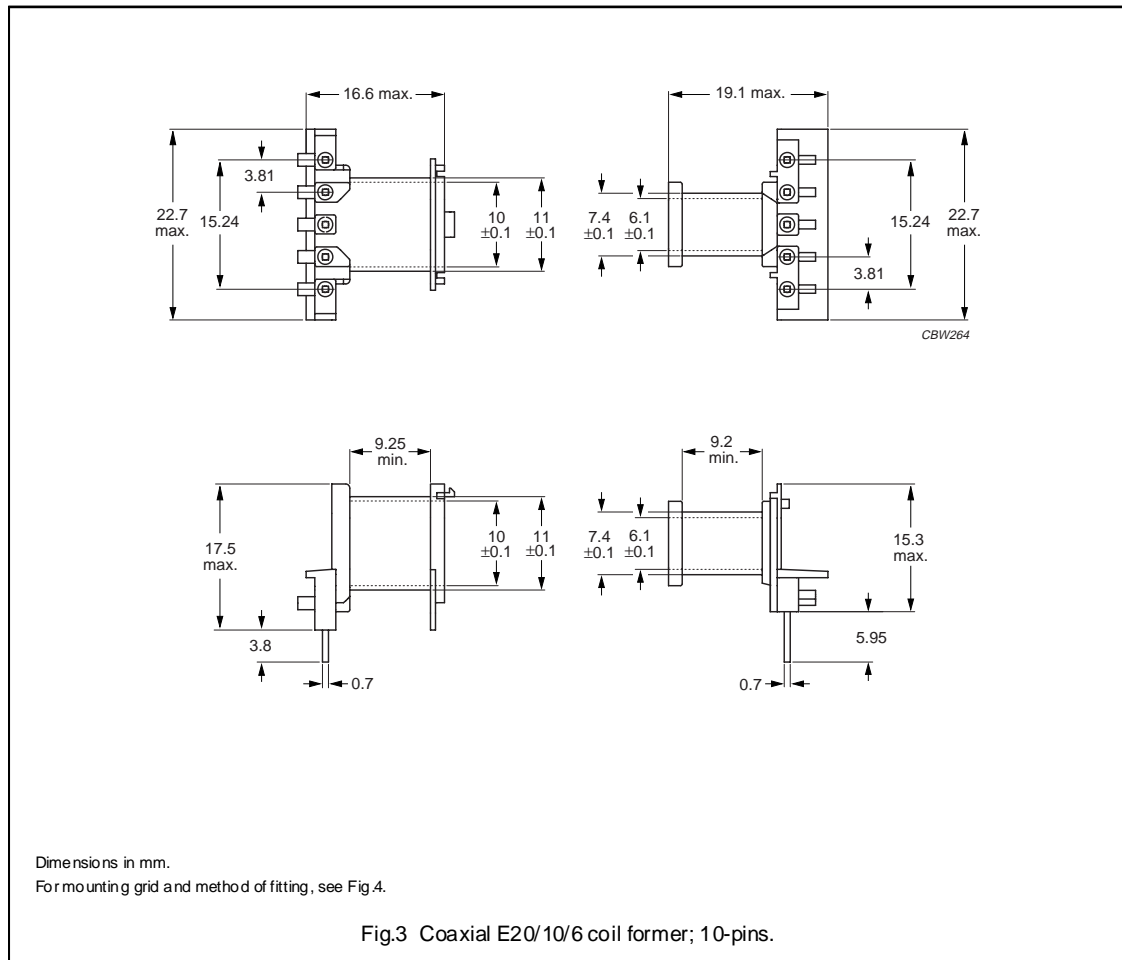


**Winding data for 8-pins E20/10/6 coil former**

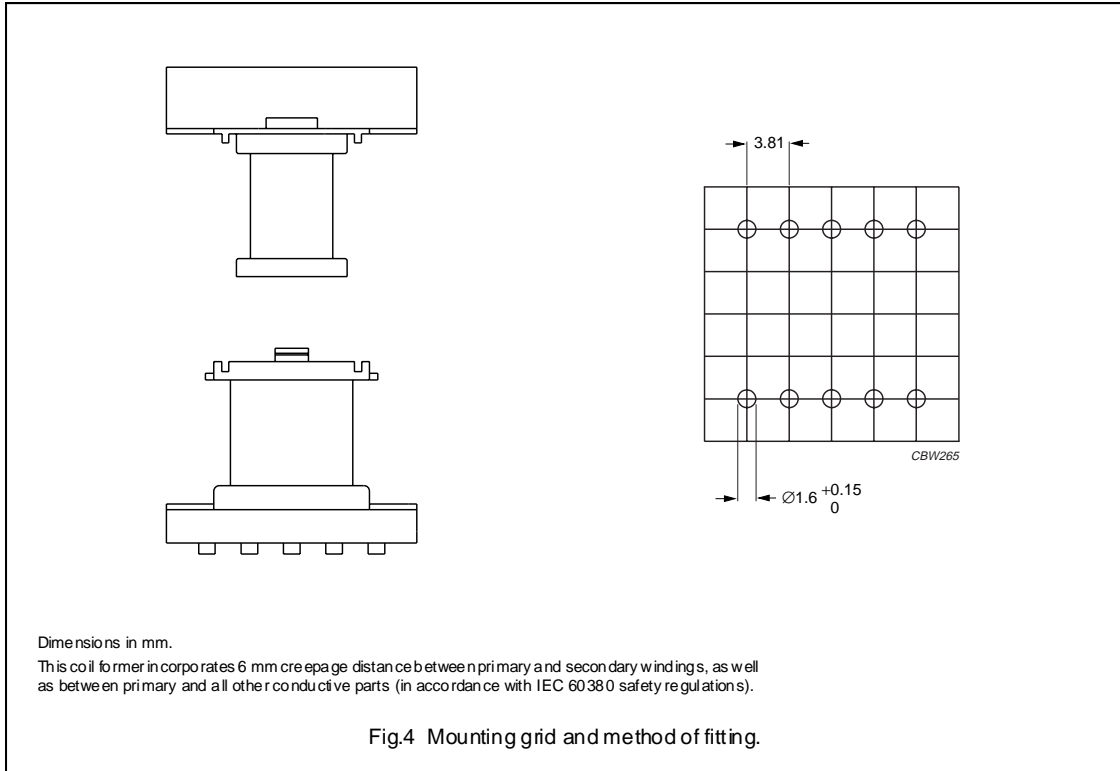
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	35	11.8	39	CPH-E20/10/6-1S-8P

**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 (Sn) 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







**Winding data for coaxial E20/10/6 coil former**

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

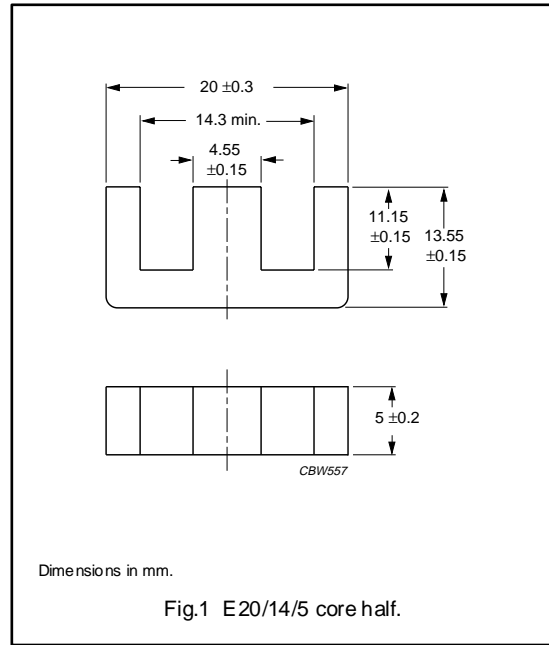
**Note**

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

**CORE SETS**

**Effective core parameters**

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



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	900 ± 25%	≈ 1820	≈ 0	E20/14/5-3C90
3C92 <small>des</small>	660 ± 25%	≈ 1330	≈ 0	E20/14/5-3C92

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E26	2300 ± 25%	≈ 4650	≈ 0	E20/14/5-3E26

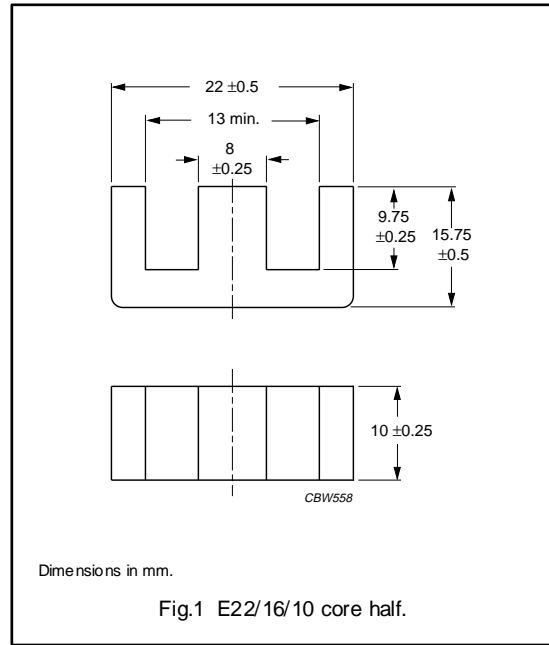
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 330	≤ 0.16	≤ 0.18	–
3C92	≥ 370	–	≤ 0.13	≤ 0.9

**CORE SETS**

**Effective core parameters**

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



**Core halves**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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
3C92 <small>des</small>	2300 ± 25%	≈ 1270	≈ 0	E22/16/10-3C92

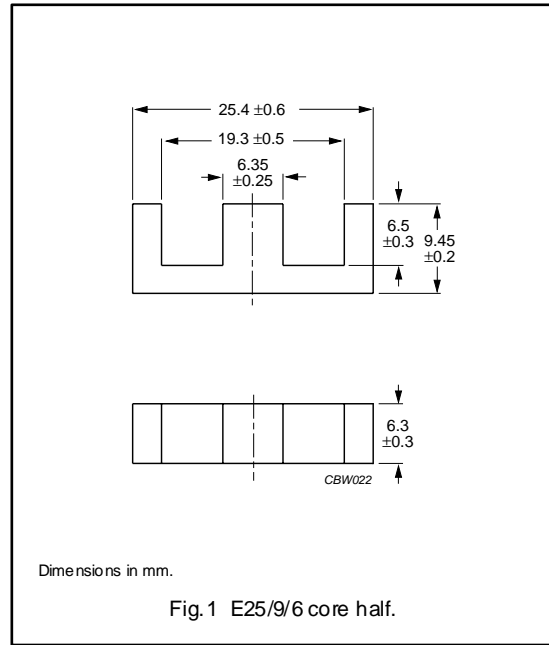
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 330	≤ 0.55	≤ 0.6	—
3C92	≥ 370	—	≤ 0.4	≤ 3.0

**CORE SETS**

**Effective core parameters**

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



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	2 000 ± 25%	≈ 1950	≈ 0	E25/9/6-3C90
3C92 <small>des</small>	1320 ± 25%	≈ 1290	≈ 0	E25/9/6-3C92
3C94	1 600 ± 25%	≈ 1540	≈ 0	E25/9/6-3C94

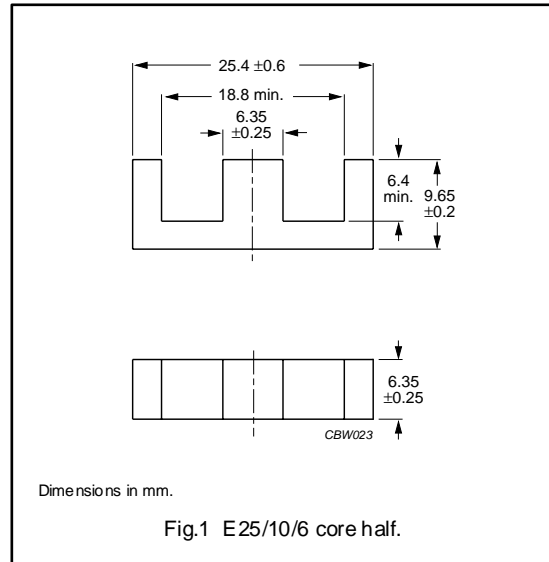
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥ 330	≤ 0.20	≤ 0.22	–	–
3C92	≥ 370	–	≤ 0.17	≤ 1.1	–
3C94	≥ 330	–	≤ 0.17	≤ 1.1	–

**CORE SETS**

**Effective core parameters**

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




**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	63 ± 5% <sup>(1)</sup>	≈ 62	≈ 1240	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% <sup>(1)</sup>	≈ 62	≈ 1240	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 <small>des</small>	2340 ± 25%	≈ 2310	≈ 0	E25/10/6-3C91
3C92 <small>des</small>	1320 ± 25%	≈ 1300	≈ 0	E25/10/6-3C92
3C94	1600 ± 25%	≈ 1580	≈ 0	E25/10/6-3C94
3C96 <small>des</small>	1470 ± 25%	≈ 1450	≈ 0	E25/10/6-3C96

## E cores and accessories

E25/10/6

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$63 \pm 5\%$ <sup>(1)</sup>	$\approx 62$	$\approx 1240$	E25/10/6-3F3-E63
	$100 \pm 8\%$	$\approx 99$	$\approx 660$	E25/10/6-3F3-A100
	$160 \pm 8\%$	$\approx 158$	$\approx 360$	E25/10/6-3F3-A160
	$250 \pm 15\%$	$\approx 247$	$\approx 210$	E25/10/6-3F3-A250
	$315 \pm 15\%$	$\approx 311$	$\approx 150$	E25/10/6-3F3-A315
	$1470 \pm 25\%$	$\approx 1450$	$\approx 0$	E25/10/6-3F3
3F35 	$1150 \pm 25\%$	$\approx 1140$	$\approx 0$	E25/10/6-3F35

**Note**

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

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$2600 \pm 25\%$	$\approx 2570$	$\approx 0$	E25/10/6-3C11
3E27	$3200 \pm 25\%$	$\approx 3160$	$\approx 0$	E25/10/6-3E27

## E cores and accessories

E25/10/6

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.4	–	–	–
3C90	≥330	≤0.2	≤0.22	–	–
3C91	≥320	–	≤0.13 <sup>(1)</sup>	≤0.8 <sup>(1)</sup>	–
3C92	≥370	–	≤0.17	≤1.0	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤0.7	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤0.26	≤2.0	–	–

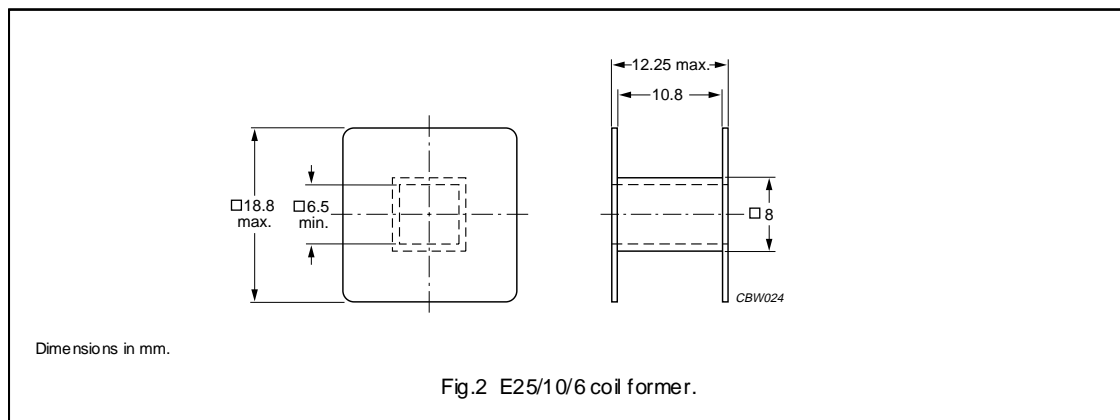
## Note

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



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

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

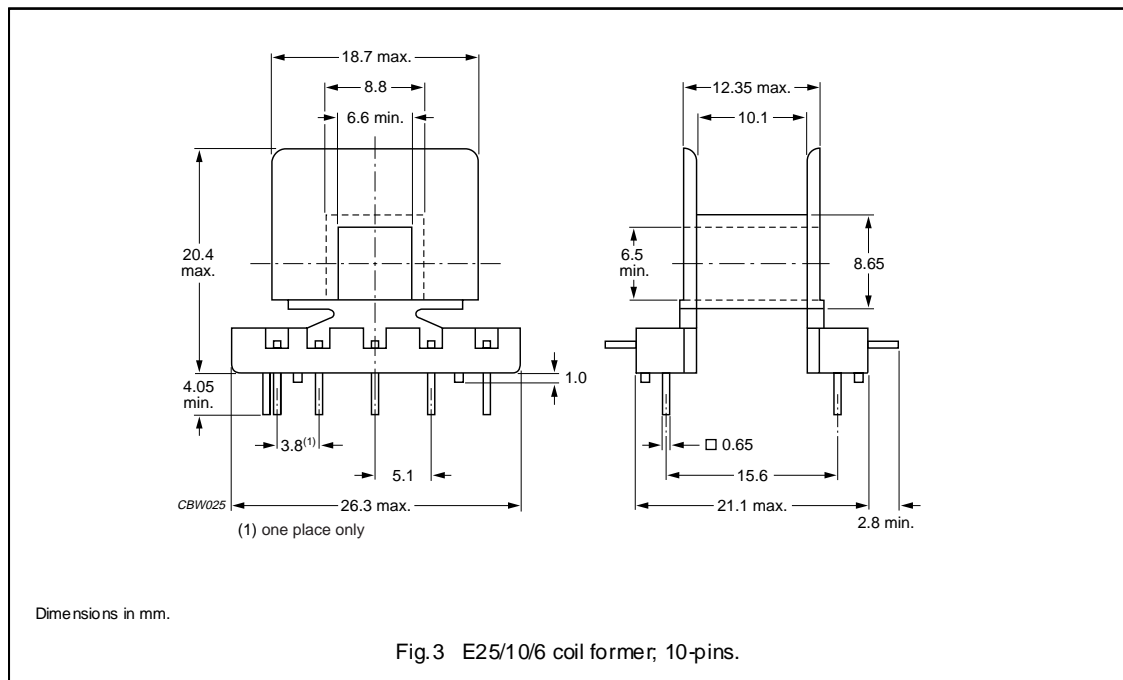


E cores and accessories

E25/10/6

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, transition to lead-free (Sn) ongoing.



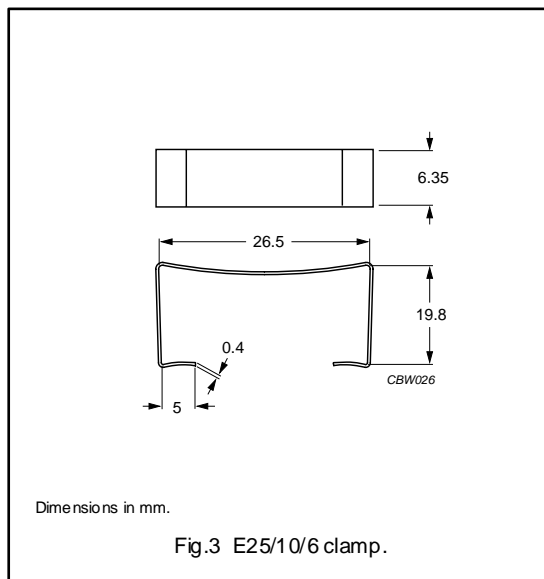
Winding data for 10-pins E25/10/6 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

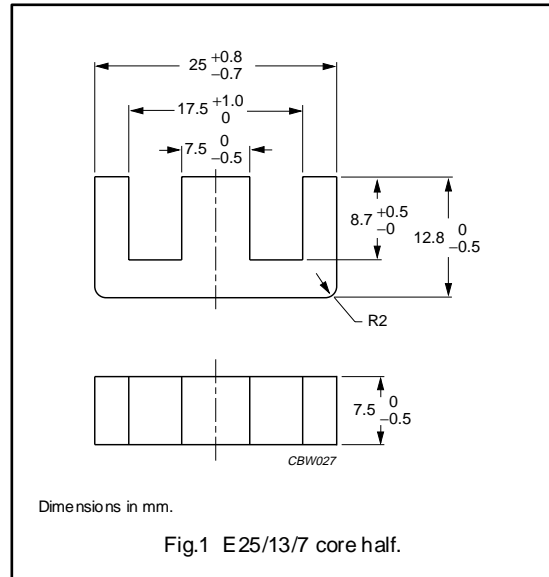
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force $\approx 30$ N	3	CLM-E25/10/6



**CORE SETS**

**Effective core parameters**

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




**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	63 $\pm 5\%$ <sup>(1)</sup>	≈ 56	≈ 1740	E25/1 3/7-3C81-E 63
	100 $\pm 8\%$	≈ 99	≈ 920	E25/1 3/7-3C81-A 100
	160 $\pm 8\%$	≈ 143	≈ 500	E25/1 3/7-3C81-A 160
	250 $\pm 15\%$	≈ 224	≈ 280	E25/1 3/7-3C81-A 250
	315 $\pm 15\%$	≈ 282	≈ 210	E25/1 3/7-3C81-A 315
	2 460 $\pm 25\%$	≈ 2200	≈ 0	E25/1 3/7-3C81
3C90	63 $\pm 5\%$ <sup>(1)</sup>	≈ 56	≈ 1740	E25/1 3/7-3C90-E 63
	100 $\pm 8\%$	≈ 99	≈ 920	E25/1 3/7-3C90-A 100
	160 $\pm 8\%$	≈ 143	≈ 500	E25/1 3/7-3C90-A 160
	250 $\pm 15\%$	≈ 224	≈ 280	E25/1 3/7-3C90-A 250
	315 $\pm 15\%$	≈ 282	≈ 210	E25/1 3/7-3C90-A 315
	1 900 $\pm 25\%$	≈ 1700	≈ 0	E25/1 3/7-3C90
3C91 <b>des</b>	2 460 $\pm 25\%$	≈ 2200	≈ 0	E25/1 3/7-3C91
3C92 <b>des</b>	1 450 $\pm 25\%$	≈ 1280	≈ 0	E25/1 3/7-3C92
3C94	1 900 $\pm 25\%$	≈ 1700	≈ 0	E25/1 3/7-3C94
3C96 <b>des</b>	1 650 $\pm 25\%$	≈ 1480	≈ 0	E25/1 3/7-3C96

## E cores and accessories

E25/13/7  
(EF25)

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$63 \pm 5\%^{(1)}$	$\approx 56$	$\approx 1740$	E25/13/7-3F3-E63
	$100 \pm 8\%$	$\approx 99$	$\approx 920$	E25/13/7-3F3-A100
	$160 \pm 8\%$	$\approx 143$	$\approx 500$	E25/13/7-3F3-A160
	$250 \pm 15\%$	$\approx 224$	$\approx 280$	E25/13/7-3F3-A250
	$315 \pm 15\%$	$\approx 282$	$\approx 210$	E25/13/7-3F3-A315
	$1650 \pm 25\%$	$\approx 1480$	$\approx 0$	E25/13/7-3F3
3F35 	$1250 \pm 25\%$	$\approx 1120$	$\approx 0$	E25/13/7-3F3

**Note**

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

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$3\ 100 \pm 25\%$	$\approx 2780$	$\approx 0$	E25/13/7-3C11
3E27	$4\ 000 \pm 25\%$	$\approx 3580$	$\approx 0$	E25/13/7-3E27

## E cores and accessories

E25/13/7  
(EF25)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.61	–	–	–
3C90	≥330	≤ 0.35	≤ 0.38	–	–
3C91	≥320	–	≤ 0.22 <sup>(1)</sup>	≤ 1.2 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.3	≤ 1.5	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.1	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.4	≤ 3.1	–	–

## Note

1. Measured at 60 °C.

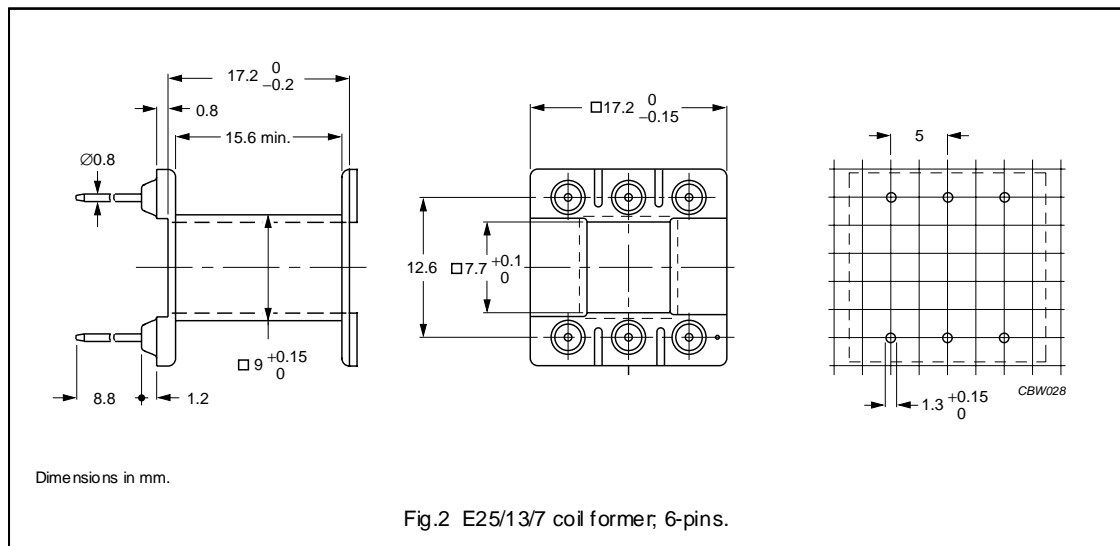
E cores and accessories

E25/13/7  
(EF25)

**COIL FORMERS**

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

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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, transition to lead-free (Sn) ongoing.
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



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

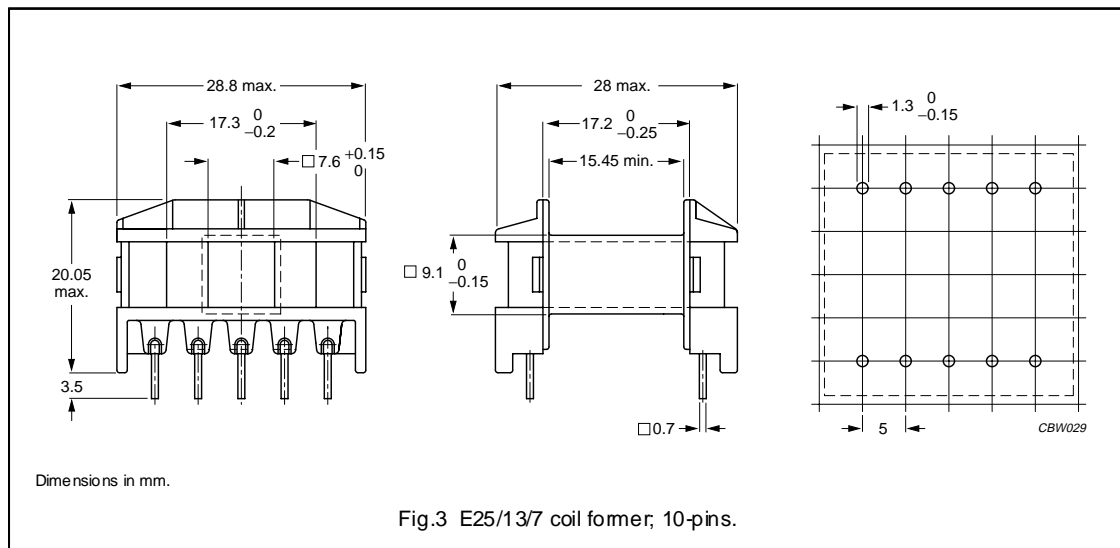
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	56	15.6	49	CPV-E25/13/7-1S-6P

E cores and accessories

E25/13/7  
(EF25)

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

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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, transition to lead-free (Sn) ongoing.
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



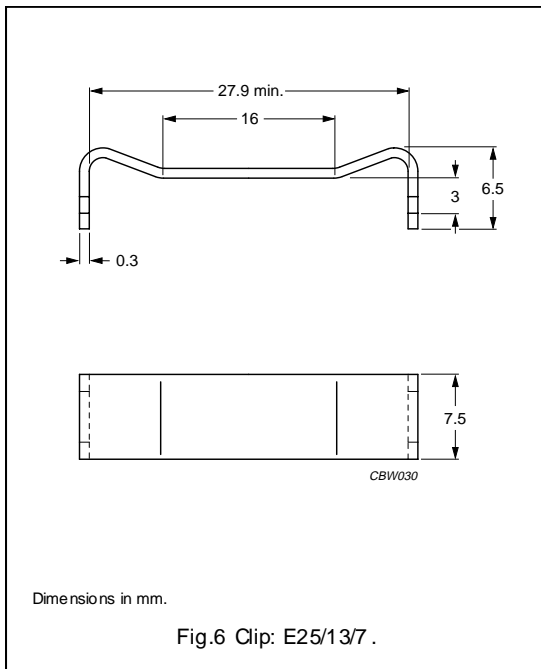
Winding data for 10-pins E25/13/7 coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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)	6	CLI-E25/13/7

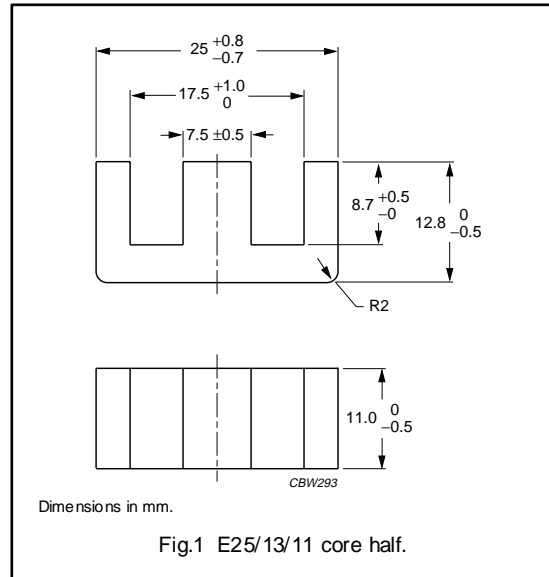




**CORE SETS**

**Effective core parameters**

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



**Core halves**

Clamping force for  $A_L$  measurements  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	$63 \pm 5\%$ <sup>(1)</sup>	≈ 37	≈ 2800	E25/13/11-3C90-E63
	$100 \pm 8\%$ <sup>(1)</sup>	≈ 58	≈ 1480	E25/13/11-3C90-E100
	$160 \pm 8\%$	≈ 93	≈ 790	E25/13/11-3C90-A160
	$250 \pm 15\%$	≈ 146	≈ 450	E25/13/11-3C90-A250
	$315 \pm 15\%$	≈ 184	≈ 340	E25/13/11-3C90-A315
	$2800 \pm 25\%$	≈ 1630	≈ 0	E25/13/11-3C90
3C92 <span style="border: 1px solid black; padding: 0 2px;">des</span>	$2200 \pm 25\%$	≈ 1280	≈ 0	E25/13/11-3C92
3C94	$2800 \pm 25\%$	≈ 1630	≈ 0	E25/13/11-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	$2700 \pm 25\%$	≈ 1580	≈ 0	E25/13/11-3C96
3F3	$63 \pm 5\%$ <sup>(1)</sup>	≈ 37	≈ 2800	E25/13/11-3F3-E63
	$100 \pm 8\%$ <sup>(1)</sup>	≈ 58	≈ 1480	E25/13/11-3F3-E100
	$160 \pm 8\%$	≈ 93	≈ 790	E25/13/11-3F3-A160
	$250 \pm 15\%$	≈ 146	≈ 450	E25/13/11-3F3-A250
	$315 \pm 15\%$	≈ 184	≈ 340	E25/13/11-3F3-A315
	$2700 \pm 25\%$	≈ 1580	≈ 0	E25/13/11-3F3
3F35 <span style="border: 1px solid black; padding: 0 2px;">pro</span>	$2000 \pm 25\%$	≈ 1170	≈ 0	E25/13/11-3F35

**Note**

1. Measured in combination with an equal gapped core half, clamping force for  $A_L$  measurements,  $20 \pm 10$  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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤ 0.55	≤ 0.55	–	–
3C92	≥370	–	≤ 0.42	≤ 2.4	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.7	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.6	≤ 4.7	–	–

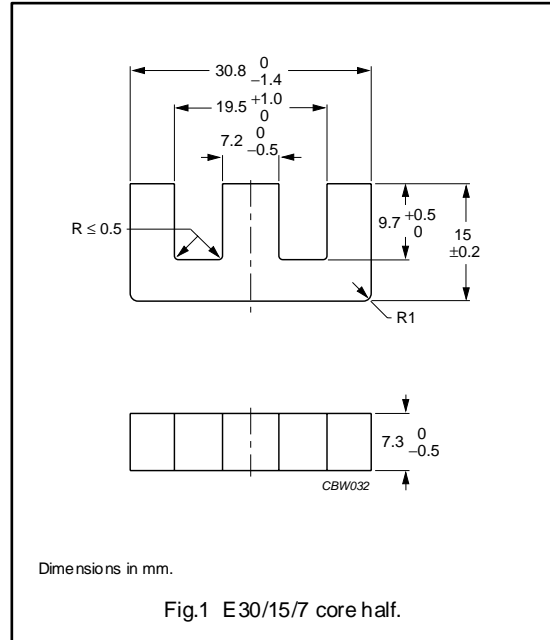
E cores and accessories

E30/15/7

CORE SETS

Effective core parameters

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




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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 89	≈ 1100	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% <sup>(1)</sup>	≈ 89	≈ 1100	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 des	2500 ± 25%	≈ 2220	≈ 0	E30/15/7-3C91
3C92 des	1400 ± 25%	≈ 1250	≈ 0	E30/15/7-3C92
3C94	1900 ± 25%	≈ 1690	≈ 0	E30/15/7-3C94
3C96 des	1600 ± 25%	≈ 1420	≈ 0	E30/15/7-3C96

## E cores and accessories

E30/15/7

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 89$	$\approx 1100$	E30/15/7-3F3-E100
	$160 \pm 5\%$	$\approx 142$	$\approx 580$	E30/15/7-3F3-A160
	$250 \pm 5\%$	$\approx 222$	$\approx 330$	E30/15/7-3F3-A250
	$315 \pm 5\%$	$\approx 280$	$\approx 240$	E30/15/7-3F3-A315
	$400 \pm 8\%$	$\approx 355$	$\approx 180$	E30/15/7-3F3-A400
	$630 \pm 15\%$	$\approx 560$	$\approx 100$	E30/15/7-3F3-A630
	$1600 \pm 25\%$	$\approx 1420$	$\approx 0$	E30/15/7-3F3
3F35 	$1250 \pm 25\%$	$\approx 1110$	$\approx 0$	E30/15/7-3F35

**Note**

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

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$3300 \pm 25\%$	$\approx 2930$	$\approx 0$	E30/15/7-3C11
3E27	$4100 \pm 25\%$	$\approx 3640$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.82	–	–	–
3C90	≥330	≤ 0.45	≤ 0.48	–	–
3C91	≥320	–	≤ 0.27 <sup>(1)</sup>	≤ 1.6 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.36	≤ 2.0	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥330	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 1.5	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.54	≤ 4.2	–	–

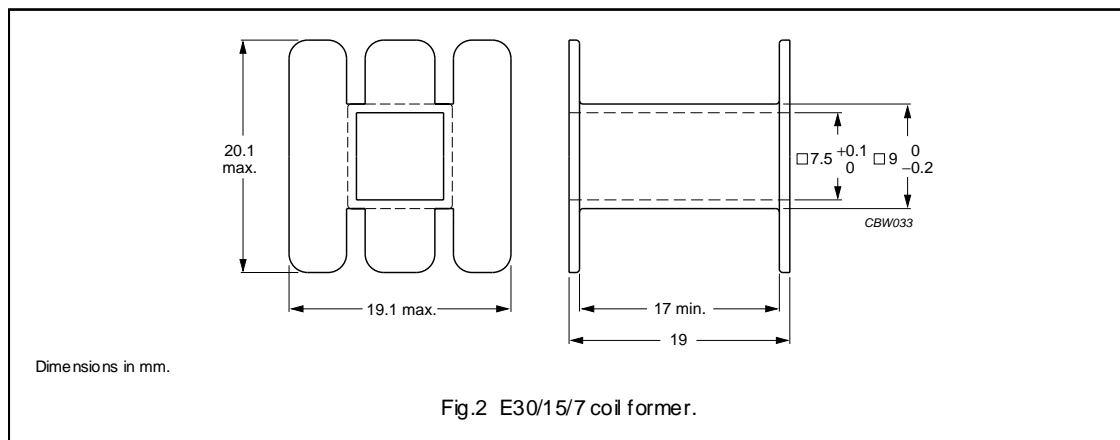
## Note

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



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

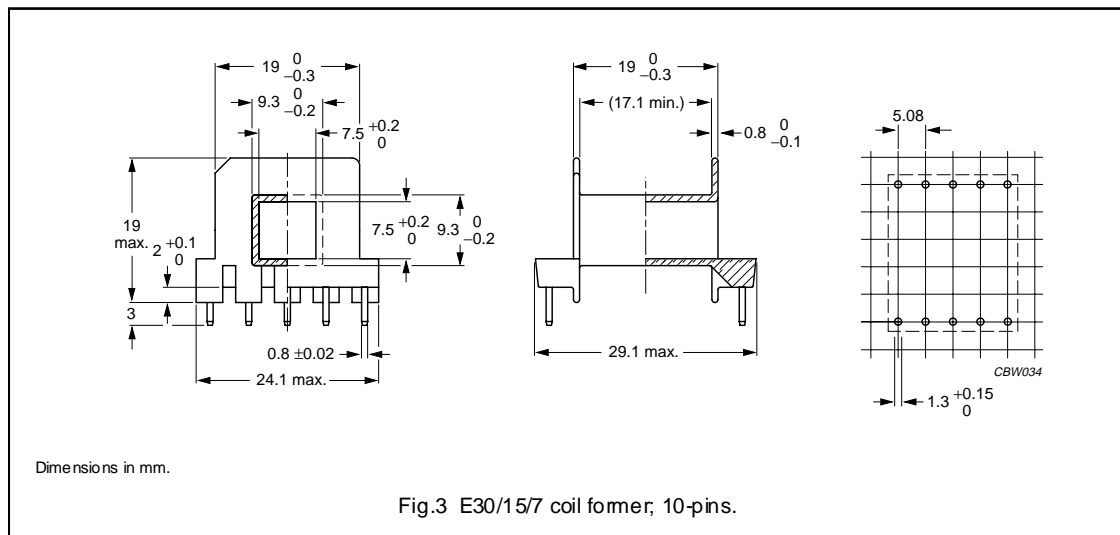
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	80	17.0	56	CP-E30/15/7-1S

E cores and accessories

E30/15/7

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 E 167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



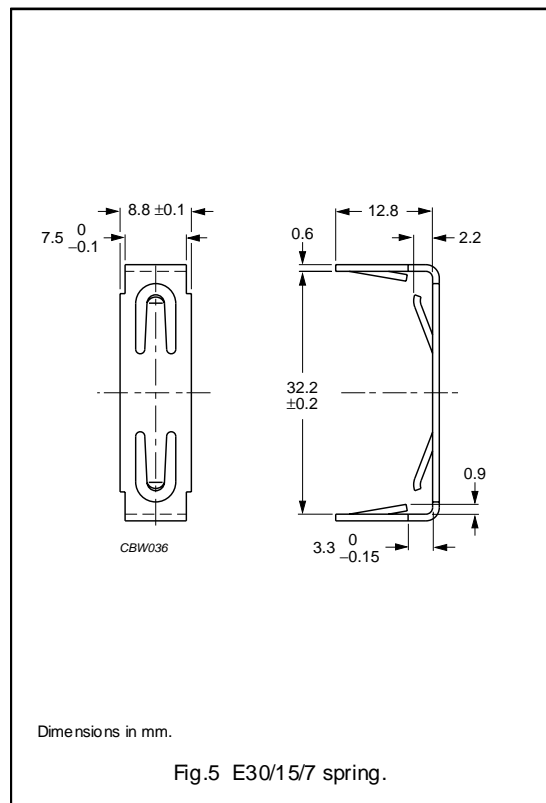
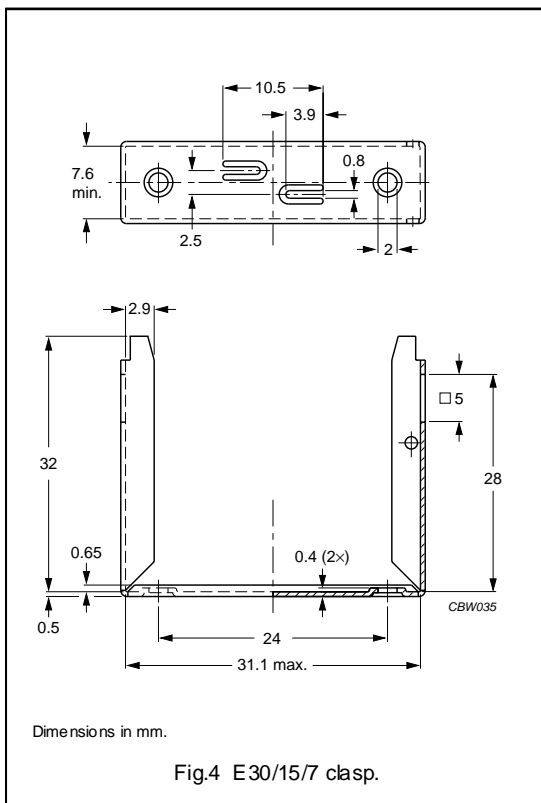
WINDING DATA FOR 10-PINS E30/15/7 COIL FORMER (E)

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

**MOUNTING PARTS**

**General data and ordering information**

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

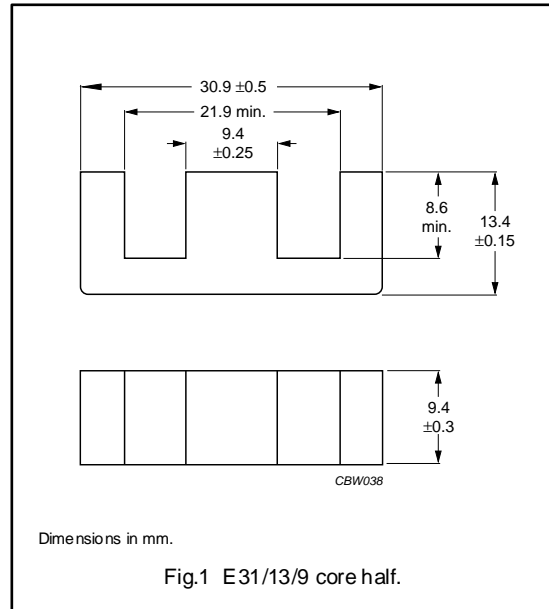




**CORE SETS**

**Effective core parameters**

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




**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 59	≈ 1560	E31/13/9-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 95	≈ 840	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% <sup>(1)</sup>	≈ 59	≈ 1560	E31/13/9-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 95	≈ 840	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 <small>des</small>	3735 ± 25%	≈ 2210	≈ 0	E31/13/9-3C91
3C92 <small>des</small>	2200 ± 25%	≈ 1300	≈ 0	E31/13/9-3C92
3C94	2970 ± 25%	≈ 1760	≈ 0	E31/13/9-3C94
3C96 <small>des</small>	2650 ± 25%	≈ 1570	≈ 0	E31/13/9-3C96

## E cores and accessories

E31/13/9

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%$ <sup>(1)</sup>	$\approx 59$	$\approx 1560$	E31/13/9-3F3-E 100
	$160 \pm 5\%$ <sup>(1)</sup>	$\approx 95$	$\approx 840$	E31/13/9-3F3-E 160
	$250 \pm 5\%$	$\approx 148$	$\approx 480$	E31/13/9-3F3-A250
	$315 \pm 5\%$	$\approx 186$	$\approx 360$	E31/13/9-3F3-A315
	$400 \pm 8\%$	$\approx 237$	$\approx 270$	E31/13/9-3F3-A400
	$630 \pm 15\%$	$\approx 373$	$\approx 150$	E31/13/9-3F3-A630
	$2650 \pm 25\%$	$\approx 1570$	$\approx 0$	E31/13/9-3F3
3F35 	$1950 \pm 25\%$	$\approx 1150$	$\approx 0$	E31/13/9-3F35

**Note**

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

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$6\,790 \pm 25\%$	$\approx 4020$	$\approx 0$	E31/13/9-3E27

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 1.1	–	–	–
3C90	≥320	≤ 0.52	≤ 0.58	–	–
3C91	≥320	–	≤ 0.35 <sup>(1)</sup>	≤ 2.1 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.46	≤ 2.6	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 1.9	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.7	≤ 5.4	–	–

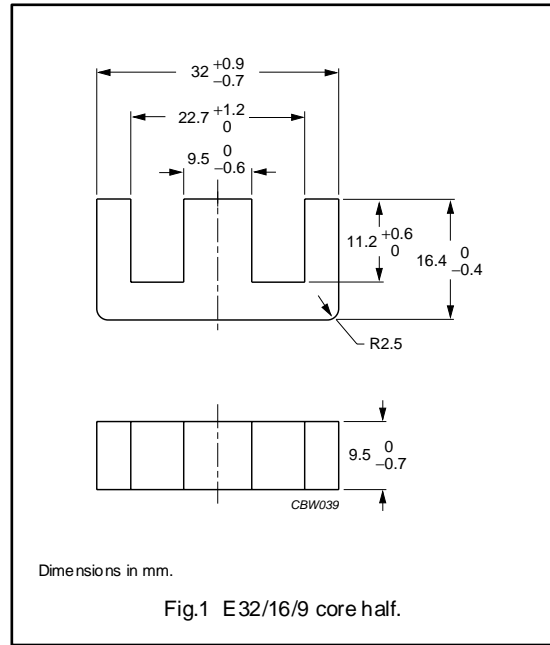
## Note

1. Measured at 60 °C.

**CORE SETS**

**Effective core parameters**

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




**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$100 \pm 5\%$ <sup>(1)</sup>	≈ 71	≈ 1600	E32/16/9-3C90-E100
	$160 \pm 5\%$ <sup>(1)</sup>	≈ 114	≈ 860	E32/16/9-3C90-E160
	$250 \pm 5\%$	≈ 177	≈ 480	E32/16/9-3C90-A250
	$315 \pm 5\%$	≈ 223	≈ 360	E32/16/9-3C90-A315
	$400 \pm 8\%$	≈ 284	≈ 260	E32/16/9-3C90-A400
	$630 \pm 15\%$	≈ 447	≈ 150	E32/16/9-3C90-A630
	$2500 \pm 25\%$	≈ 1770	≈ 0	E32/16/9-3C90
3C92 <b>des</b>	$1850 \pm 25\%$	≈ 1320	≈ 0	E32/16/9-3C92
3C94	$2500 \pm 25\%$	≈ 1770	≈ 0	E32/16/9-3C94
3C96 <b>des</b>	$2300 \pm 25\%$	≈ 1630	≈ 0	E32/16/9-3C96

## E cores and accessories

E32/16/9

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%$ <sup>(1)</sup>	$\approx 71$	$\approx 1600$	E32/16/9-3F3-E 100
	$160 \pm 5\%$ <sup>(1)</sup>	$\approx 114$	$\approx 860$	E32/16/9-3F3-E 160
	$250 \pm 5\%$	$\approx 177$	$\approx 480$	E32/16/9-3F3-A250
	$315 \pm 5\%$	$\approx 223$	$\approx 360$	E32/16/9-3F3-A315
	$400 \pm 8\%$	$\approx 284$	$\approx 260$	E32/16/9-3F3-A400
	$630 \pm 15\%$	$\approx 447$	$\approx 150$	E32/16/9-3F3-A630
	$2300 \pm 25\%$	$\approx 1630$	$\approx 0$	E32/16/9-3F3
3F35 	$1700 \pm 25\%$	$\approx 1210$	$\approx 0$	E32/16/9-3F35

1.  $A_L$  measured in combination with a equal gapped core half.

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$4\ 000 \pm 25\%$	$\approx 2840$	$\approx 0$	E32/16/9-3C11
3E27	$5\ 000 \pm 25\%$	$\approx 3550$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤ 0.65	≤ 0.7	–	–
3C92	≥370	–	≤ 0.55	≤ 3.2	–
3C94	≥330	–	≤ 0.55	≤ 3.2	–
3C96	≥340	–	≤ 0.43	≤ 2.5	–
3F3	≥320	–	≤ 0.75	–	≤ 1.3
3F35	≥300	–	–	–	–

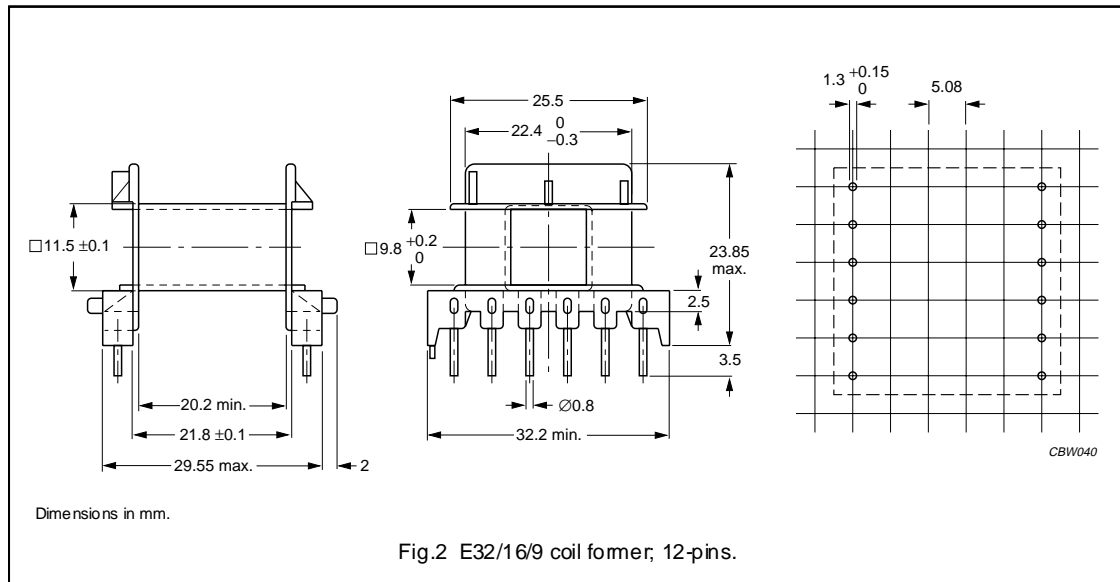
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C92	≥370	–	–	–	–
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 94 V-0"; UL file number E41 871(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



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

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97	20.2	60	CPH-E32/16/9-1S-12P

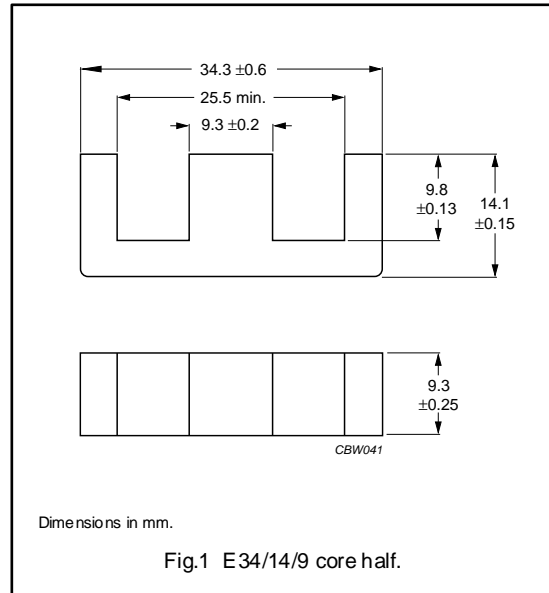
E cores and accessories

E34/14/9  
(E375)

CORE SETS

Effective core parameters

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



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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 68	≈ 1520	E34/14/9-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 109	≈ 820	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% <sup>(1)</sup>	≈ 68	≈ 1520	E34/14/9-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 109	≈ 820	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 <small>des</small>	3200 ± 25%	≈ 2190	≈ 0	E34/14/9-3C91
3C92 <small>des</small>	1850 ± 25%	≈ 1250	≈ 0	E34/14/9-3C92
3C94	2440 ± 25%	≈ 1760	≈ 0	E34/14/9-3C94
3C96 <small>des</small>	2125 ± 25%	≈ 1450	≈ 0	E34/14/9-3C96



## E cores and accessories

E34/14/9  
(E375)

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5% <sup>(1)</sup>	≈ 68	≈ 1520	E34/14/9-3F3-E 100
	160 ±5% <sup>(1)</sup>	≈ 109	≈ 820	E34/14/9-3F3-E 160
	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 	1680 ±25%	≈ 1150	≈ 0	E34/14/9-3F35

**Note**

1. Measured in combination with an equal gapped core half, clamping force for A<sub>L</sub> measurements, 40 ±20 N.

**Core halves of high permeability grades**Clamping force for A<sub>L</sub> measurements 40 ±20 N.

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	AIR GAP (μm)	TYPE NUMBER
3E27	4700 ±25%	≈ 3200	≈ 0	E34/14/9-3E27

## E cores and accessories

E34/14/9  
(E375)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 1.2	–	–	–
3C90	≥320	≤ 0.56	≤ 0.63	–	–
3C91	≥320	–	≤ 0.38 <sup>(1)</sup>	≤ 2.3 <sup>(1)</sup>	–
3C92	≥370	–	≤ 0.5	≤ 2.9	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥320	–	–	–	–
3C90	≥320	–	–	–	–
3C91	≥320	–	–	–	–
3C92	≥370	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤ 2.1	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.75	≤ 5.9	–	–

## Note

1. Measured at 60 °C.

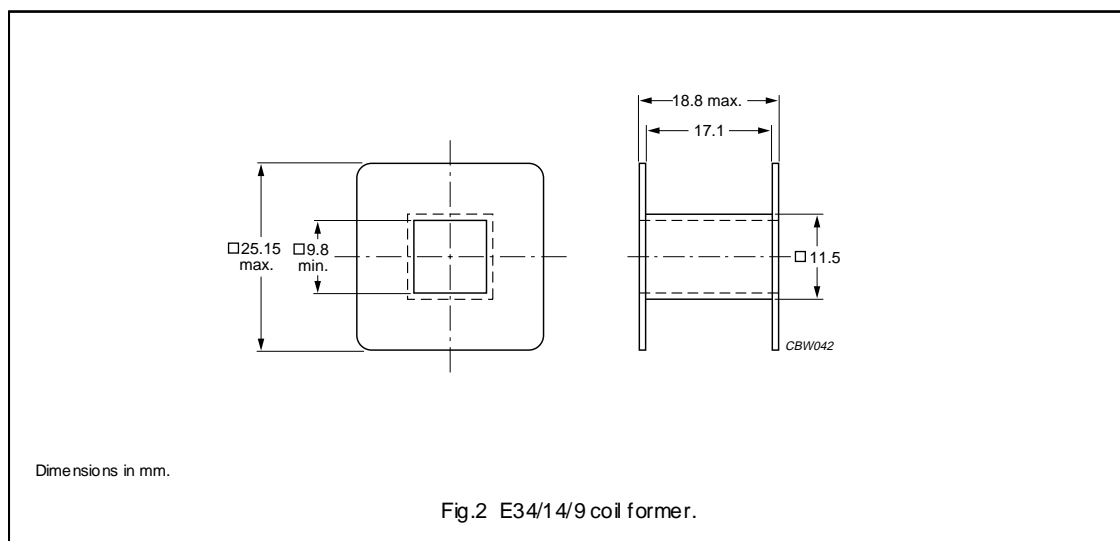
E cores and accessories

E34/14/9  
(E375)

**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



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

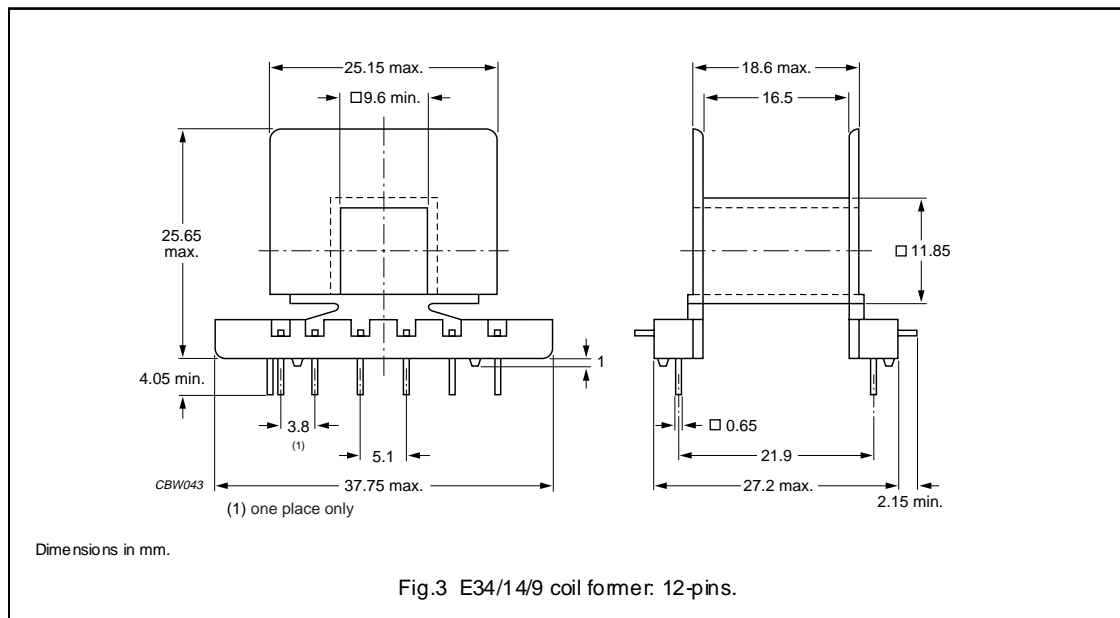
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	111	17.1	67.0	CP-E34/14/9-1S

E cores and accessories

E34/14/9  
(E375)

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, transition to lead-free (Sn) ongoing.
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



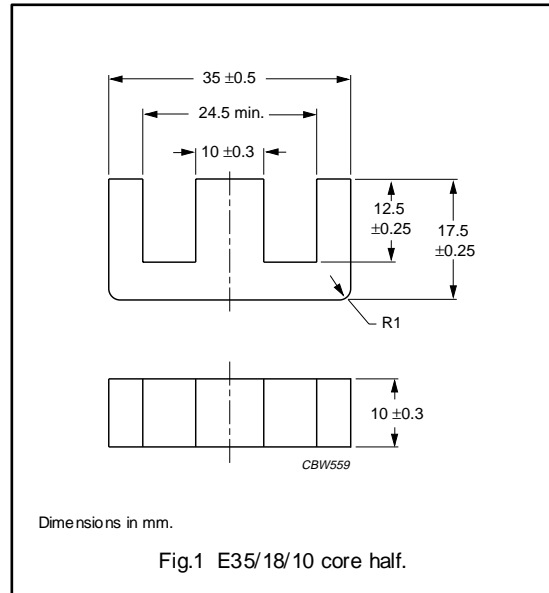
Winding data for 12-pins E34/14/9 coil former

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

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.807	mm <sup>-1</sup>
$V_e$	effective volume	8070	mm <sup>3</sup>
$l_e$	effective length	80.7	mm
$A_e$	effective area	100	mm <sup>2</sup>
$A_{min}$	minimum area	100	mm <sup>2</sup>
$m$	mass of core half	≈ 20	g



**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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	100 ± 5% <sup>(1)</sup>	≈ 64	≈ 2000	E35/18/10-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 103	≈ 1060	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
3C92 <small>des</small>	2000 ± 25%	≈ 1280	≈ 0	E35/18/10-3C92

**Note**

1. Measured in combination with an equal gapped core half, clamping force for  $A_L$  measurements, 30 ± 15 N.

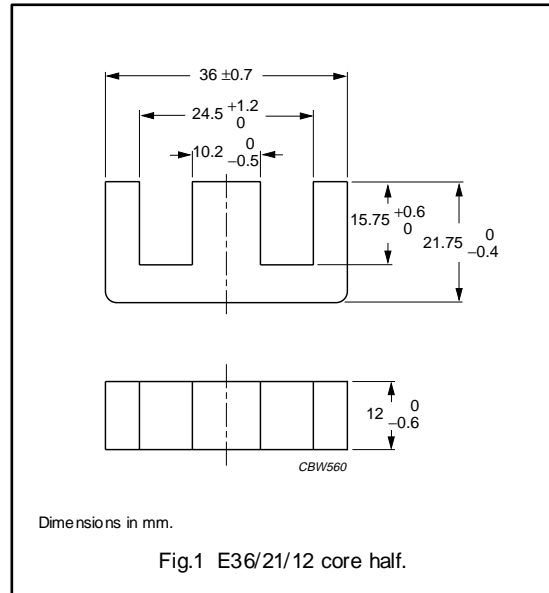
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 330	≤ 0.95	≤ 1.1	–
3C92	≥ 370	–	≤ 0.7	≤ 4.8

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	100 ± 5% <sup>(1)</sup>	≈ 61	≈ 2720	E36/21/12-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 97	≈ 1400	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
3C92 <small>des</small>	2100 ± 25%	≈ 1270	≈ 0	E36/21/12-3C92

**Note**

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

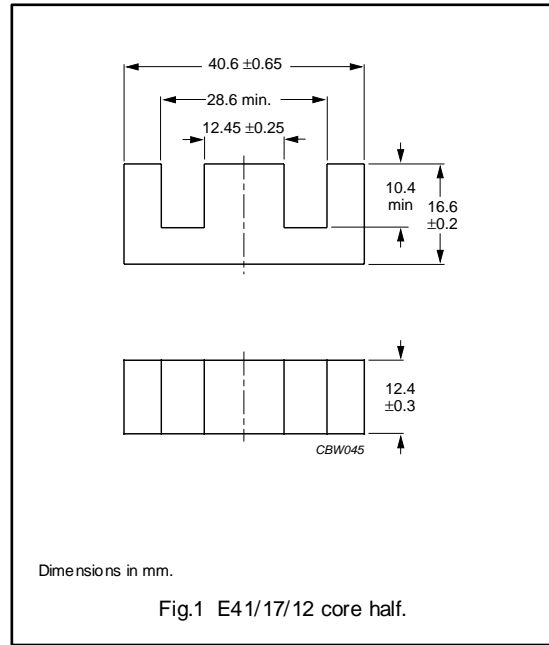
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 330	≤ 1.4	≤ 1.5	–
3C92	≥ 370	–	≤ 1.1	≤ 7.3

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 41	≈ 3000	E41/17/12-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 66	≈ 1620	E41/17/12-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 103	≈ 920	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% <sup>(1)</sup>	≈ 41	≈ 3000	E41/17/12-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 66	≈ 1620	E41/17/12-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 103	≈ 920	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 <small>des</small>	5370 ± 25%	≈ 2210	≈ 0	E41/17/12-3C91
3C92 <small>des</small>	3300 ± 25%	≈ 1360	≈ 0	E41/17/12-3C92
3C94	4100 ± 25%	≈ 1670	≈ 0	E41/17/12-3C94

## E cores and accessories

E41/17/12

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	AIR GAP (μm)	TYPE NUMBER
3F3	100 ±5% <sup>(1)</sup>	≈ 41	≈ 3000	E41/17/12-3F3-E100
	160 ±5% <sup>(1)</sup>	≈ 66	≈ 1620	E41/17/12-3F3-E160
	250 ±5% <sup>(1)</sup>	≈ 103	≈ 920	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<sub>L</sub> measurements, 40 ±20 N.

**Core halves of high permeability grades**Clamping force for A<sub>L</sub> measurements 40 ±20 N.

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 2.4	–	–	–
3C90	≥320	≤ 1.3	≤ 1.45	–	–
3C91	≥320	–	≤ 0.85 <sup>(1)</sup>	≤ 5.1 <sup>(1)</sup>	–
3C92	≥370	–	≤ 1.1	≤ 6.4	–
3C94	≥320	–	≤ 1.1	≤ 6.4	–
3F3	≥320	–	≤ 1.4	–	≤ 2.2

**Note**

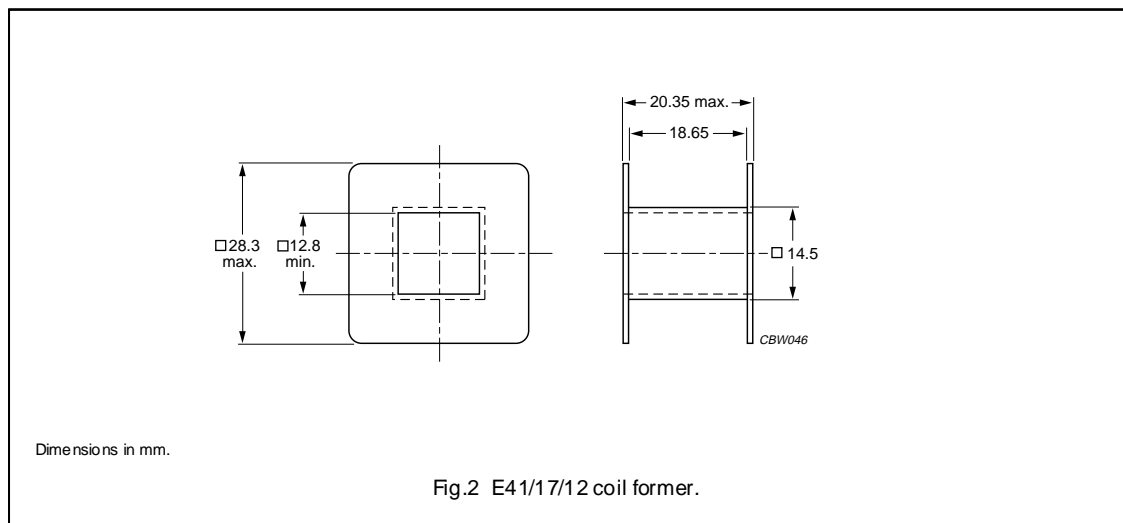
1. Measured at 60 °C.



**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 94 V-2"; UL file number E41938(M)
Maximum operating temperature	130 °C, "IEC 60085", class B



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

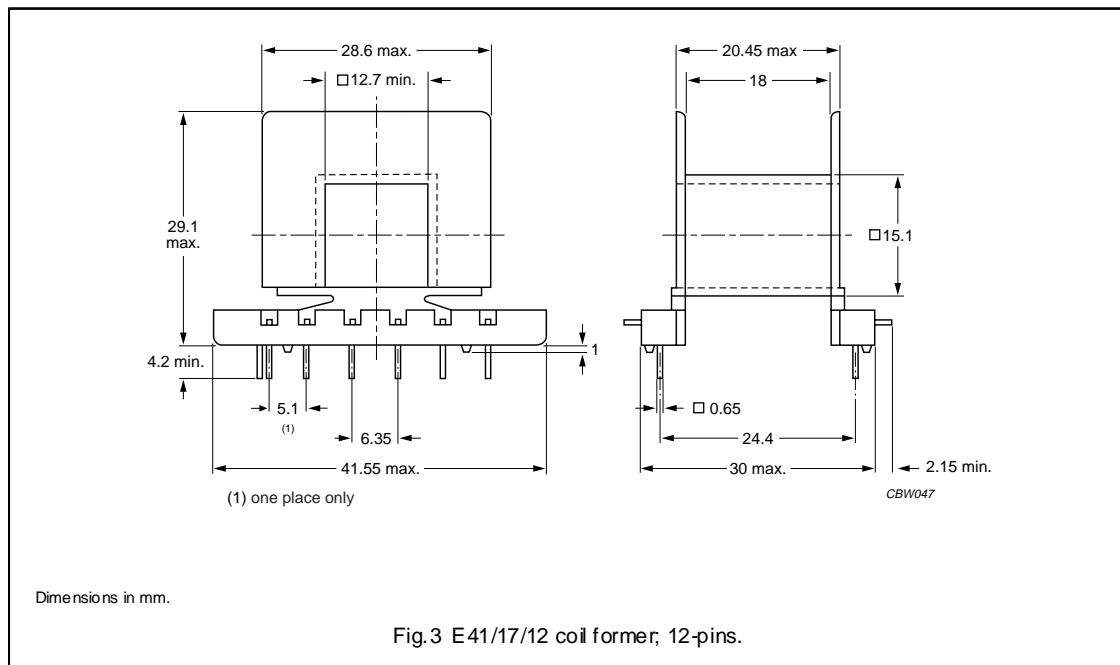
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	120	18.6	79.6	CP-E41/17/12-1S

E cores and accessories

E41/17/12

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

PARAMETER	SPECIFICATION
Coil former material	polyethyleneterephthalate (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, transition to lead-free (Sn) ongoing.
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



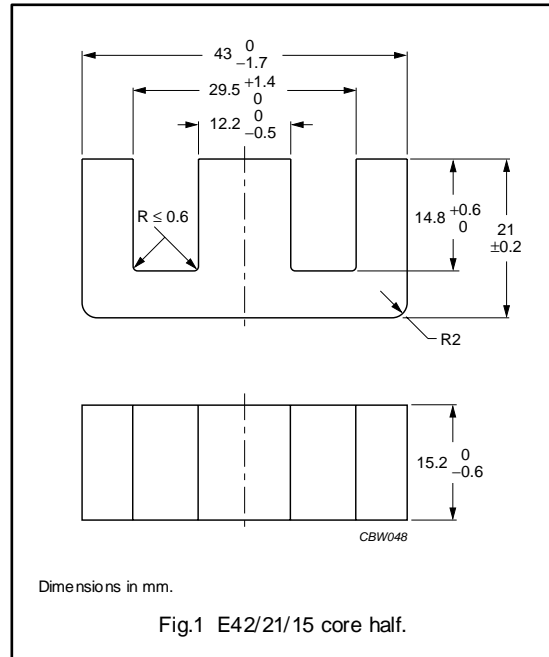
Winding data for 12-pins E41/17/12 coil former

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

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 43	≈ 3960	E42/21/15-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 69	≈ 2060	E42/21/15-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 108	≈ 1140	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% <sup>(1)</sup>	≈ 43	≈ 3960	E42/21/15-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 69	≈ 2060	E42/21/15-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 108	≈ 1140	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 <small>des</small>	5300 ± 25%	≈ 2300	≈ 0	E42/21/15-3C91
3C92 <small>des</small>	3100 ± 25%	≈ 1350	≈ 0	E42/21/15-3C92
3C94	4100 ± 25%	≈ 1780	≈ 0	E42/21/15-3C94

## E cores and accessories

E42/21/15

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 43$	$\approx 3960$	E42/21/15-3F3-E100
	$160 \pm 5\%^{(1)}$	$\approx 69$	$\approx 2060$	E42/21/15-3F3-E160
	$250 \pm 5\%^{(1)}$	$\approx 108$	$\approx 1140$	E42/21/15-3F3-E250
	$315 \pm 5\%$	$\approx 137$	$\approx 850$	E42/21/15-3F3-A315
	$400 \pm 8\%$	$\approx 173$	$\approx 630$	E42/21/15-3F3-A400
	$630 \pm 15\%$	$\approx 273$	$\approx 360$	E42/21/15-3F3-A630
	$3600 \pm 25\%$	$\approx 1560$	$\approx 0$	E42/21/15-3F3

**Note**

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

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$8000 \pm 25\%$	$\approx 3470$	$\approx 0$	E42/21/15-3C11
3E27	$8000 \pm 25\%$	$\approx 3470$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 3.6$	–	–	–
3C90	$\geq 320$	$\leq 1.9$	$\leq 2.2$	–	–
3C91	$\geq 320$	–	$\leq 1.3^{(1)}$	$\leq 7.0^{(1)}$	–
3C92	$\geq 370$	–	$\leq 1.7$	$\leq 8.8$	–
3C94	$\geq 320$	–	$\leq 1.7$	$\leq 8.8$	–
3F3	$\geq 320$	–	$\leq 2.2$	–	$\leq 3.8$

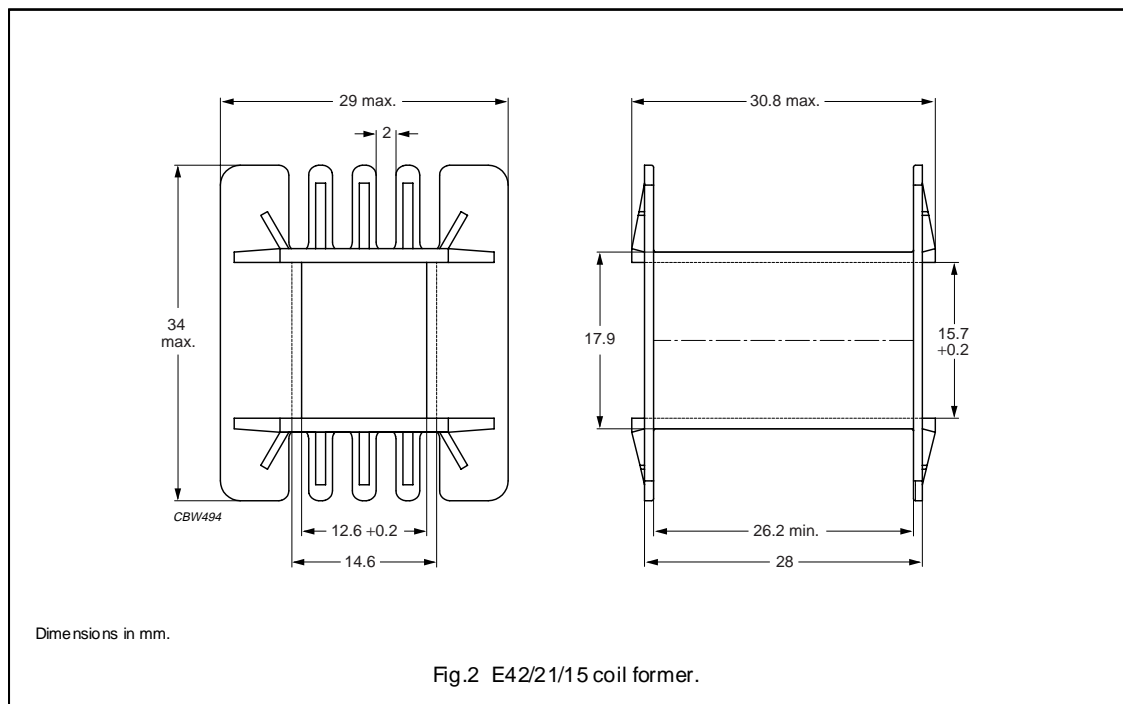
**Note**

1. Measured at 60 °C.

**COIL FORMERS**

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

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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



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

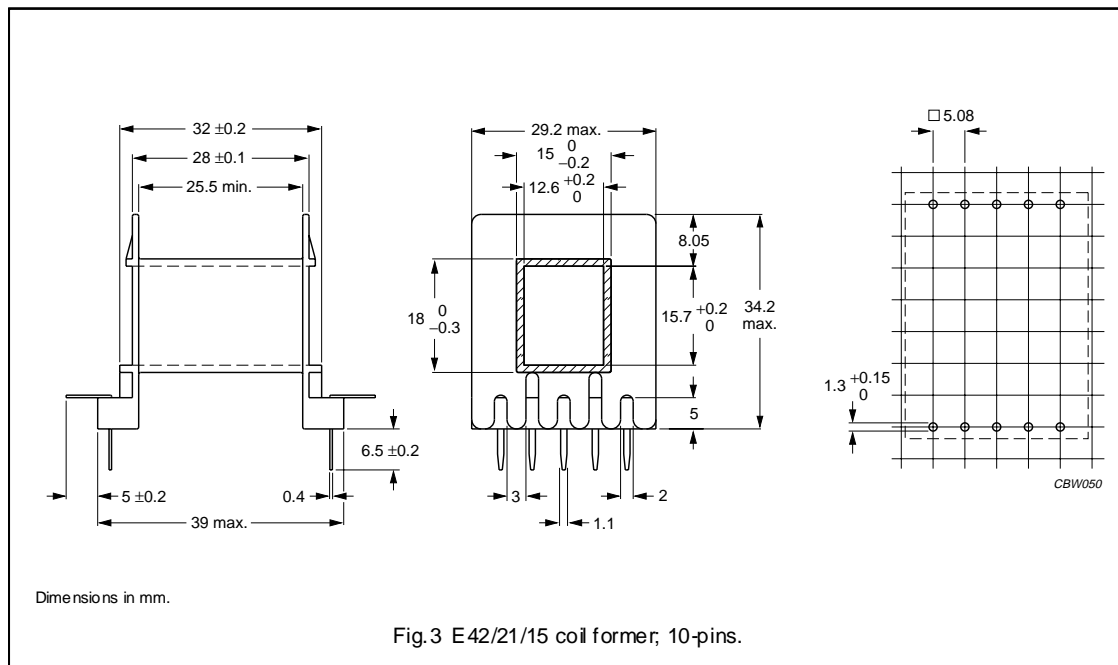
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	178	26.2	93	CP-E42/21/15-1S

E cores and accessories

E42/21/15

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, transition to lead-free (Sn) ongoing.
Maximum operating temperature	120 °C, "IEC 60085", class E
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



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

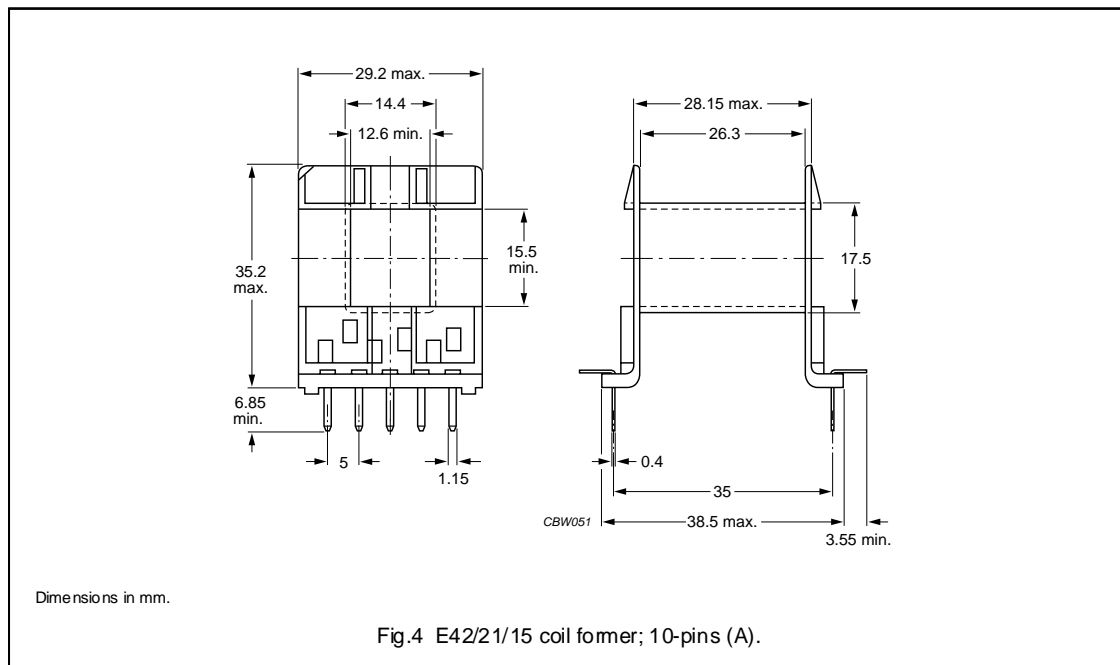
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	178	25.5	93	CPH-E42/21/15-1S-10P

E cores and accessories

E42/21/15

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, transition to lead-free (Sn) ongoing.
Maximum operating temperature	105 °C, "IEC 60085", class A
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B: 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



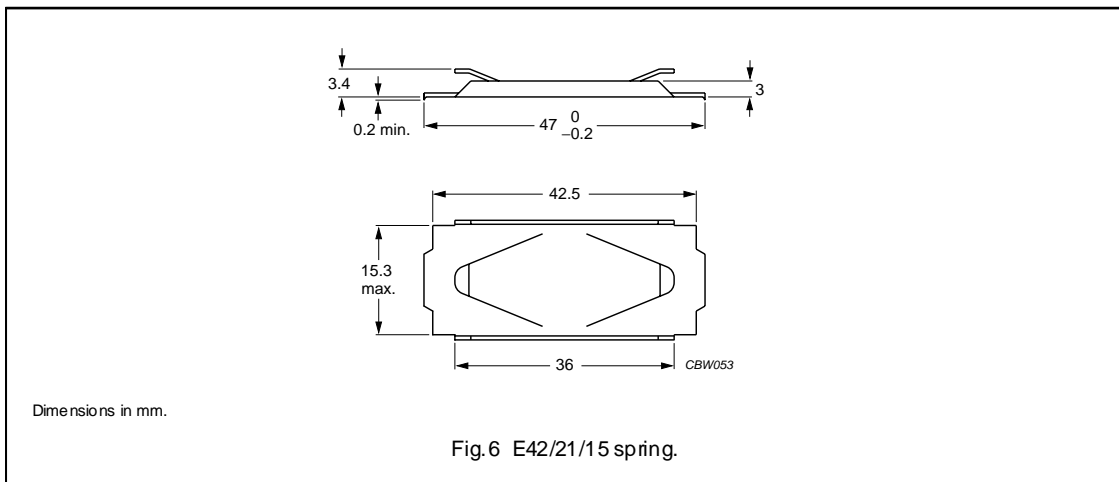
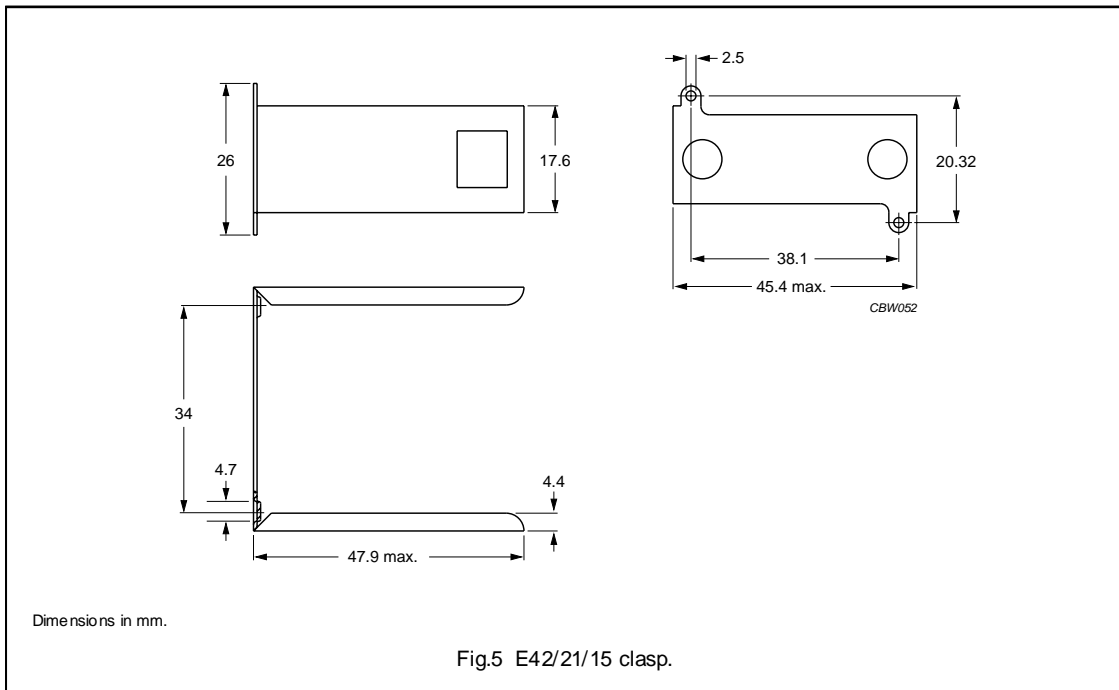
Winding data for 10-pins E42/21/15 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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





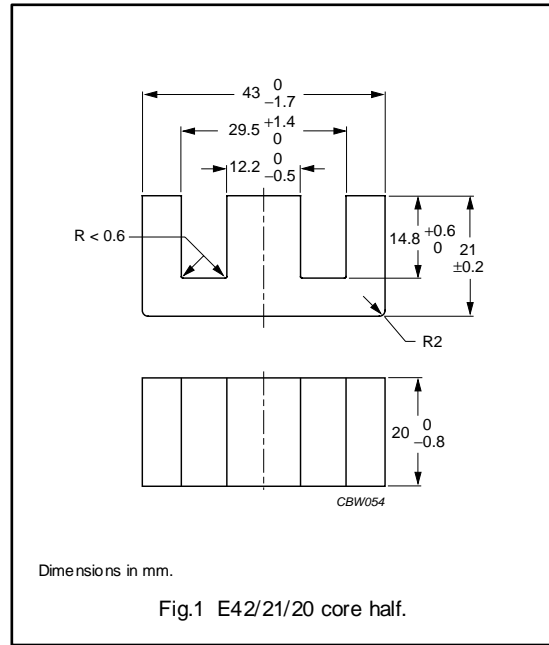
E cores and accessories

E42/21/20

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.417	mm <sup>-1</sup>
$V_e$	effective volume	22700	mm <sup>3</sup>
$l_e$	effective length	97.0	mm
$A_e$	effective area	233	mm <sup>2</sup>
$A_{min}$	minimum area	233	mm <sup>2</sup>
$m$	mass of core half	≈ 56	g



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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 33	≈ 5320	E42/21/20-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 53	≈ 2800	E42/21/20-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 83	≈ 1540	E42/21/20-3C81-E250
	315 ± 5% <sup>(1)</sup>	≈ 104	≈ 1160	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% <sup>(1)</sup>	≈ 33	≈ 5320	E42/21/20-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 53	≈ 2800	E42/21/20-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 83	≈ 1540	E42/21/20-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 104	≈ 1160	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 <small>des</small>	6950 ± 25%	≈ 2300	≈ 0	E42/21/20-3C91
3C92 <small>des</small>	4100 ± 25%	≈ 1360	≈ 0	E42/21/20-3C92
3C94	5200 ± 25%	≈ 1720	≈ 0	E42/21/20-3C94

## E cores and accessories

E42/21/20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 33$	$\approx 5320$	E42/21/20-3F3-E100
	$160 \pm 5\%^{(1)}$	$\approx 53$	$\approx 2800$	E42/21/20-3F3-E160
	$250 \pm 5\%^{(1)}$	$\approx 83$	$\approx 1540$	E42/21/20-3F3-E250
	$315 \pm 5\%^{(1)}$	$\approx 104$	$\approx 1160$	E42/21/20-3F3-E315
	$400 \pm 8\%$	$\approx 133$	$\approx 850$	E42/21/20-3F3-A400
	$630 \pm 15\%$	$\approx 209$	$\approx 490$	E42/21/20-3F3-A630
	$4600 \pm 25\%$	$\approx 1520$	$\approx 0$	E42/21/20-3F3

**Note**

1. Measured in combination with an equal gapped core half.

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$10500 \pm 25\%$	$\approx 3480$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 4.7$	–	–	–
3C90	$\geq 320$	$\leq 2.4$	$\leq 2.9$	–	–
3C91	$\geq 320$	–	$\leq 1.8^{(1)}$	$\leq 9.4^{(1)}$	–
3C92	$\geq 370$	–	$\leq 2.3$	$\leq 12$	–
3C94	$\geq 320$	–	$\leq 2.3$	$\leq 12$	–
3F3	$\geq 320$	–	$\leq 2.7$	–	$\leq 5.0$

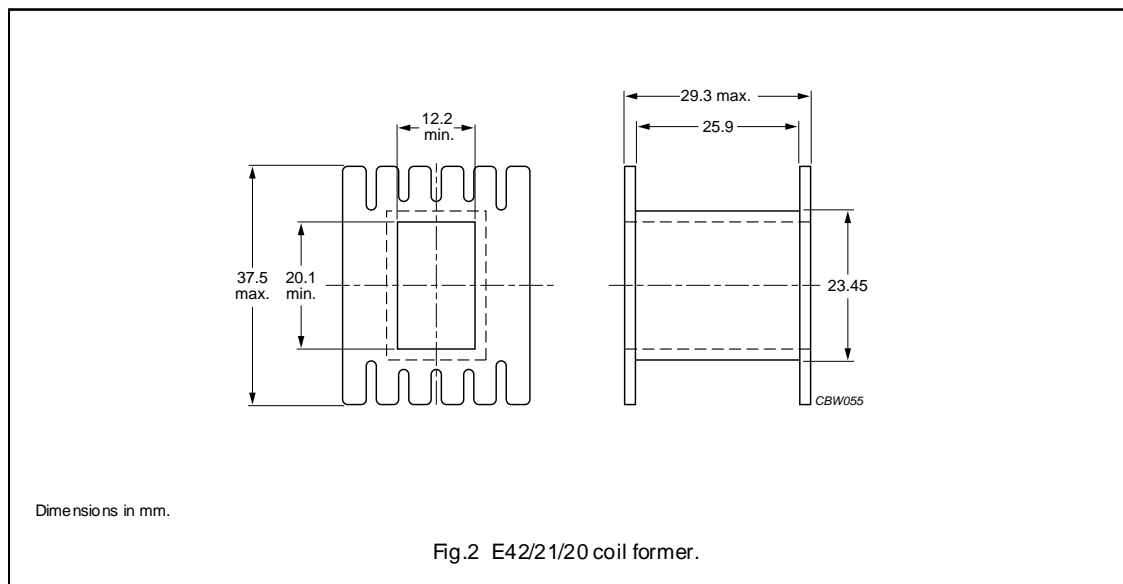
**Note**

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



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

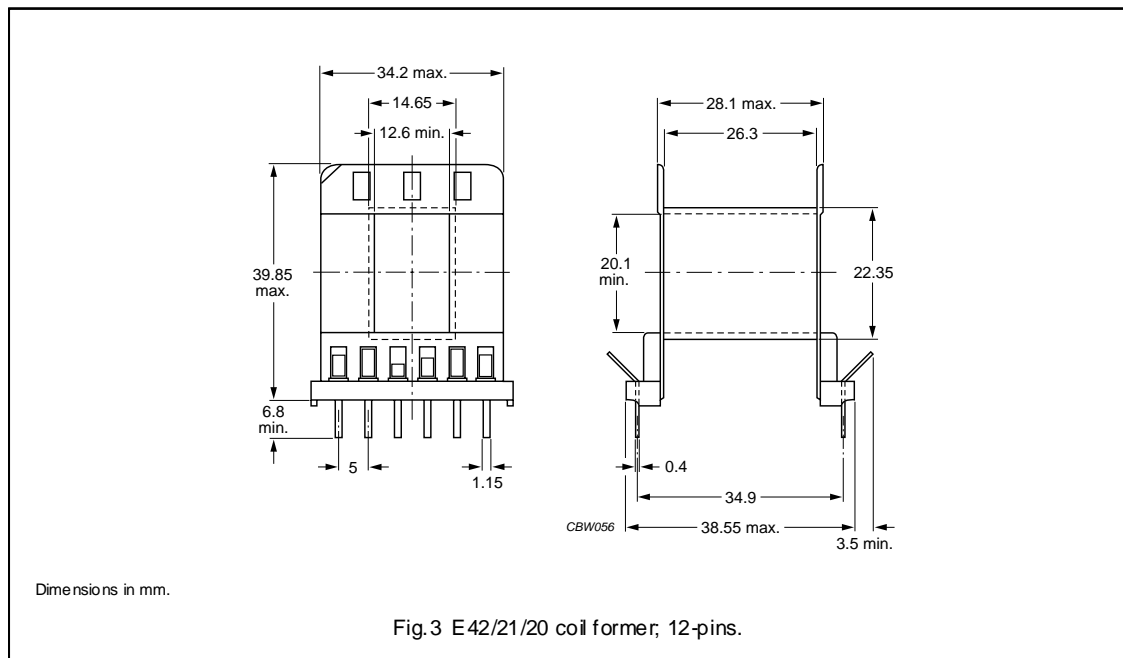
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	173	25.9	100	CP-E42/21/20-1S

E cores and accessories

E42/21/20

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, transition to lead-free (Sn) ongoing.
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



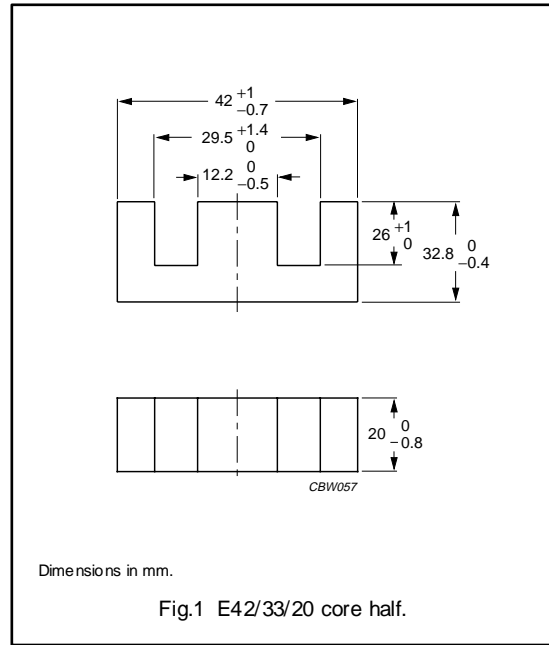
Winding data for 12-pins E42/21/20 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	255	26.3	78.5	CPH-E42/20-1S-12PD

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	100 ± 5% <sup>(1)</sup>	≈ 49	≈ 5480	E42/33/20-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 78	≈ 2840	E42/33/20-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 122	≈ 1540	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
3C92 <small>des</small>	2900 ± 25%	≈ 1420	≈ 0	E42/33/20-3C92
3C94	4000 ± 25%	≈ 1960	≈ 0	E42/33/20-3C94
3F3	100 ± 5% <sup>(1)</sup>	≈ 49	≈ 5480	E42/33/20-3F3-E100
	160 ± 5% <sup>(1)</sup>	≈ 78	≈ 2840	E42/33/20-3F3-E160
	250 ± 5% <sup>(1)</sup>	≈ 122	≈ 1540	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

1. Measured in combination with an equal gapped core half.

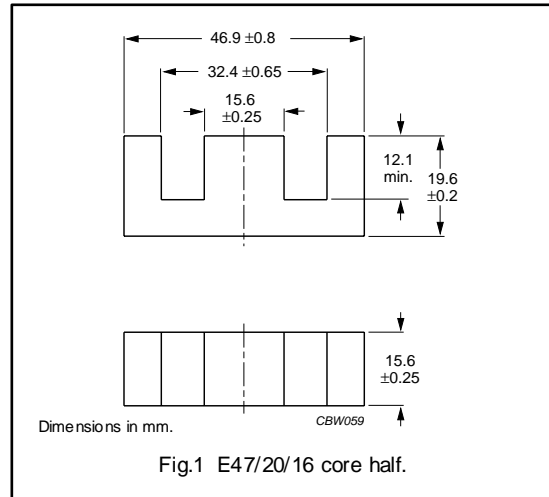
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤3.6	≤4.2	–	–
3C92	≥370	–	≤3.4	≤20	–
3C94	≥330	–	≤3.4	≤20	–
3F3	≥320	–	≤4.0	–	≤7.3

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 30	≈ 5080	E47/20/16-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 48	≈ 2720	E47/20/16-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 76	≈ 1540	E47/20/16-3C81-E250
	315 ± 5% <sup>(1)</sup>	≈ 95	≈ 1140	E47/20/16-3C81-E315
	400 ± 8% <sup>(1)</sup>	≈ 121	≈ 860	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% <sup>(1)</sup>	≈ 30	≈ 5080	E47/20/16-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 48	≈ 2720	E47/20/16-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 76	≈ 1540	E47/20/16-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 95	≈ 1140	E47/20/16-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 121	≈ 860	E47/20/16-3C90-E400
	630 ± 10%	≈ 190	≈ 490	E47/20/16-3C90-A630
	5500 ± 25%	≈ 1660	≈ 0	E47/20/16-3C90
3C91 <small>des</small>	7540 ± 25%	≈ 2280	≈ 0	E47/20/16-3C91
3C92 <small>des</small>	4400 ± 25%	≈ 1330	≈ 0	E47/20/16-3C92
3C94	5600 ± 25%	≈ 1690	≈ 0	E47/20/16-3C94

## E cores and accessories

E47/20/16

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 30$	$\approx 5080$	E47/20/16-3F3-E100
	$160 \pm 5\%^{(1)}$	$\approx 48$	$\approx 2720$	E47/20/16-3F3-E160
	$250 \pm 5\%^{(1)}$	$\approx 76$	$\approx 1540$	E47/20/16-3F3-E250
	$315 \pm 5\%^{(1)}$	$\approx 95$	$\approx 1140$	E47/20/16-3F3-E315
	$400 \pm 8\%^{(1)}$	$\approx 121$	$\approx 860$	E47/20/16-3F3-E400
	$630 \pm 10\%$	$\approx 190$	$\approx 490$	E47/20/16-3F3-A630
	$5100 \pm 25\%$	$\approx 1540$	$\approx 0$	E47/20/16-3F3

**Note**

1. Measured in combination with an equal gapped core half.

**Core halves of high permeability grades**Clamping force  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$11475 \pm 25\%$	$\approx 3470$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 4.3$	–	–	–
3C90	$\geq 320$	$\leq 2.3$	$\leq 2.7$	–	–
3C91	$\geq 320$	–	$\leq 1.7^{(1)}$	$\leq 8.8^{(1)}$	–
3C92	$\geq 370$	–	$\leq 2.1$	$\leq 11$	–
3C94	$\geq 320$	–	$\leq 2.1$	$\leq 11$	–
3F3	$\geq 320$	–	$\leq 2.5$	–	$\leq 4.0$

**Note**

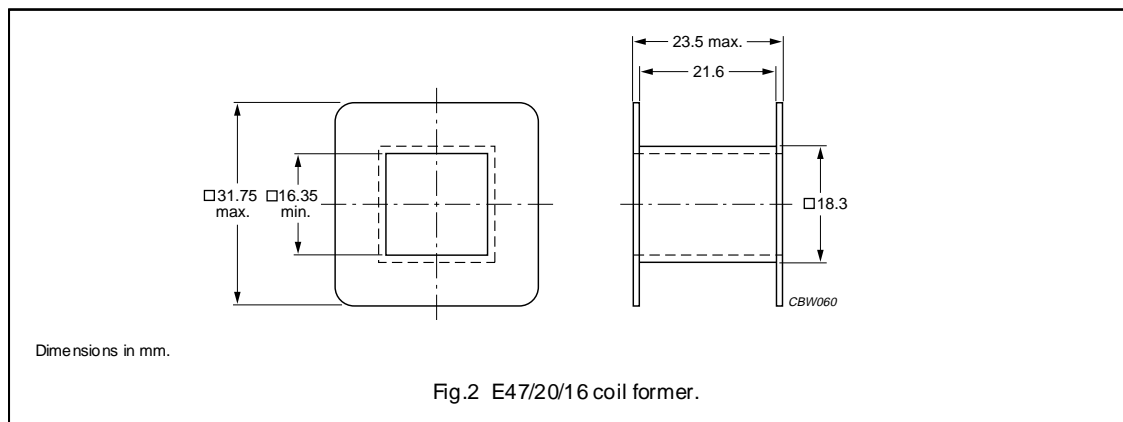
1. Measured at 60 °C.



**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



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

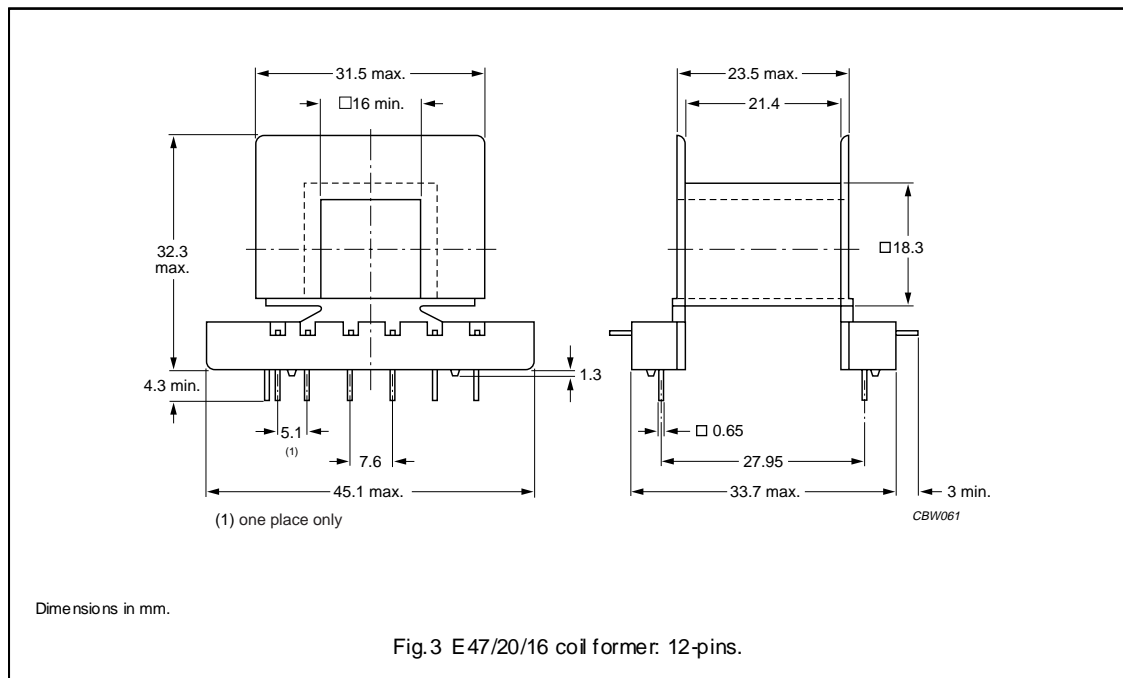
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	130	21.6	93.3	CP-E47/20/16-1S

E cores and accessories

E47/20/16

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

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with "UL 94-HB"; UL file number E41938(M)
Maximum operating temperature	130 °C, "IEC 60085", class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



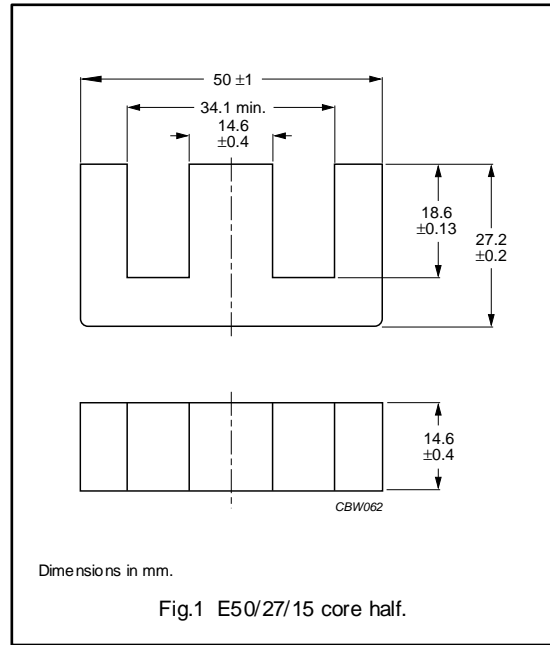
Winding data for 12-pins E47/20/16 coil former

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

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.530	mm <sup>-1</sup>
$V_e$	effective volume	26900	mm <sup>3</sup>
$l_e$	effective length	120	mm
$A_e$	effective area	225	mm <sup>2</sup>
$A_{min}$	minimum area	213	mm <sup>2</sup>
$m$	mass of core half	≈ 68	g



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 42	≈ 5400	E50/27/15-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 68	≈ 2760	E50/27/15-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 106	≈ 1500	E50/27/15-3C81-E250
	315 ± 5% <sup>(1)</sup>	≈ 134	≈ 1100	E50/27/15-3C81-E315
	400 ± 8% <sup>(1)</sup>	≈ 170	≈ 820	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% <sup>(1)</sup>	≈ 42	≈ 5400	E50/27/15-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 68	≈ 2760	E50/27/15-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 106	≈ 1500	E50/27/15-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 134	≈ 1100	E50/27/15-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 170	≈ 820	E50/27/15-3C90-E400
	630 ± 10%	≈ 267	≈ 460	E50/27/15-3C90-A630
	4350 ± 25%	≈ 1850	≈ 0	E50/27/15-3C90
3C91 <small>des</small>	5500 ± 25%	≈ 2330	≈ 0	E50/27/15-3C91
3C92 <small>des</small>	3200 ± 25%	≈ 1350	≈ 0	E50/27/15-3C92
3C94	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  $\pm$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 5.5$	–	–	–
3C90	$\geq 320$	$\leq 2.7$	$\leq 3.4$	–	–
3C91	$\geq 320$	–	$\leq 2.1^{(1)}$	$\leq 12^{(1)}$	–
3C92	$\geq 370$	–	$\leq 2.7$	$\leq 16$	–
3C94	$\geq 320$	–	$\leq 2.7$	$\leq 16$	–

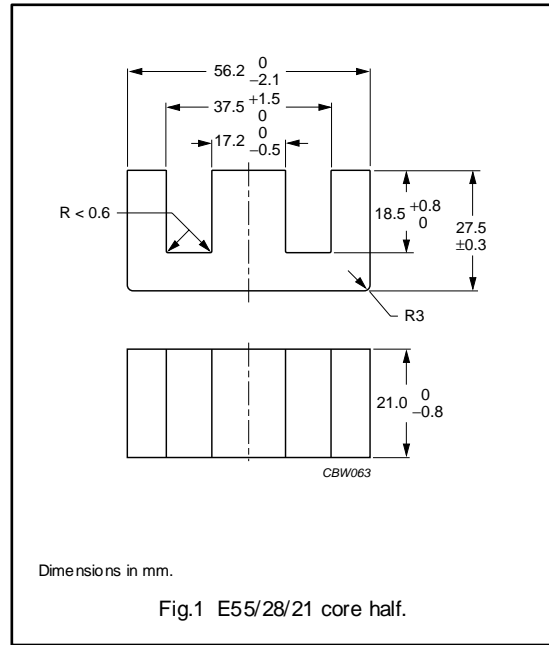
**Note**

1. Measured at 60 °C.

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	100 ±5% <sup>(1)</sup>	≈ 28	≈ 8740	E55/28/21-3C81-E100
	160 ±5% <sup>(1)</sup>	≈ 45	≈ 4560	E55/28/21-3C81-E160
	250 ±5% <sup>(1)</sup>	≈ 70	≈ 2500	E55/28/21-3C81-E250
	315 ±5% <sup>(1)</sup>	≈ 88	≈ 1840	E55/28/21-3C81-E315
	400 ±8% <sup>(1)</sup>	≈ 112	≈ 1360	E55/28/21-3C81-E400
	630 ±10% <sup>(1)</sup>	≈ 176	≈ 780	E55/28/21-3C81-E630
	8625 ±25%	≈ 2410	≈ 0	E55/28/21-3C81
3C90	100 ±5% <sup>(1)</sup>	≈ 28	≈ 8740	E55/28/21-3C90-E100
	160 ±5% <sup>(1)</sup>	≈ 45	≈ 4560	E55/28/21-3C90-E160
	250 ±5% <sup>(1)</sup>	≈ 70	≈ 2500	E55/28/21-3C90-E250
	315 ±5% <sup>(1)</sup>	≈ 88	≈ 1840	E55/28/21-3C90-E315
	400 ±8% <sup>(1)</sup>	≈ 112	≈ 1360	E55/28/21-3C90-E400
	630 ±10% <sup>(1)</sup>	≈ 176	≈ 780	E55/28/21-3C90-E630
	6300 ±25%	≈ 1760	≈ 0	E55/28/21-3C90
3C91 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	8625 ±25%	≈ 2410	≈ 0	E55/28/21-3C91
3C92 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	4700 ±25%	≈ 1310	≈ 0	E55/28/21-3C92
3C94	6400 ±25%	≈ 1790	≈ 0	E55/28/21-3C94

## E cores and accessories

E55/28/21

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 28$	$\approx 8740$	E55/28/21-3F3-E100
	$160 \pm 5\%^{(1)}$	$\approx 45$	$\approx 4560$	E55/28/21-3F3-E160
	$250 \pm 5\%^{(1)}$	$\approx 70$	$\approx 2500$	E55/28/21-3F3-E250
	$315 \pm 5\%^{(1)}$	$\approx 88$	$\approx 1840$	E55/28/21-3F3-E315
	$400 \pm 8\%^{(1)}$	$\approx 112$	$\approx 1360$	E55/28/21-3F3-E400
	$630 \pm 10\%^{(1)}$	$\approx 176$	$\approx 780$	E55/28/21-3F3-E630
	$5700 \pm 25\%$	$\approx 1590$	$\approx 0$	E55/28/21-3F3

**Note**

1. Measured in combination with an equal gapped core half.

**Core halves of high permeability grades**

Clamping force for  $A_L$  measurements  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$12800 \pm 25\%$	$\approx 3580$	$\approx 0$	E55/28/21-3C11
3E27	$15400 \pm 25\%$	$\approx 4300$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 9.0$	–	–	–
3C90	$\geq 320$	$\leq 4.8$	$\leq 5.9$	–	–
3C91	$\geq 320$	–	$\leq 3.5^{(1)}$	$\leq 20^{(1)}$	–
3C92	$\geq 370$	–	$\leq 3.8$	$\leq 27$	–
3C94	$\geq 320$	–	$\leq 3.8$	$\leq 27$	–
3F3	$\geq 320$	–	$\leq 5.6$	–	$\leq 10$

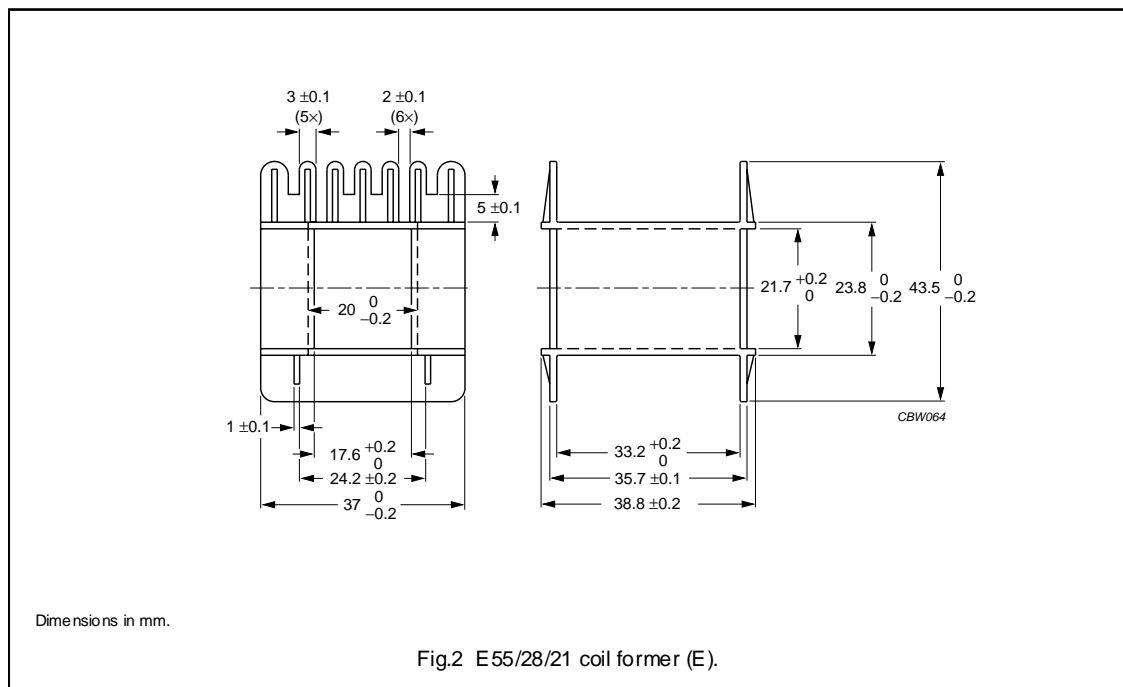
**Note**

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



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

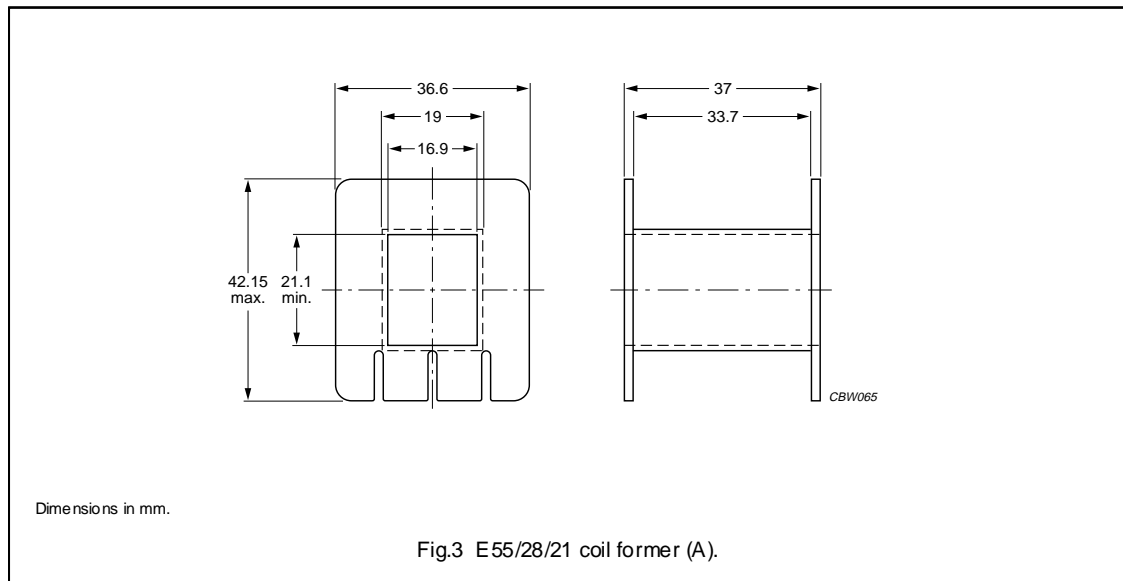
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	250	33.2	116	CP-E55/28/21-1S

E cores and accessories

E55/28/21

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

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



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

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

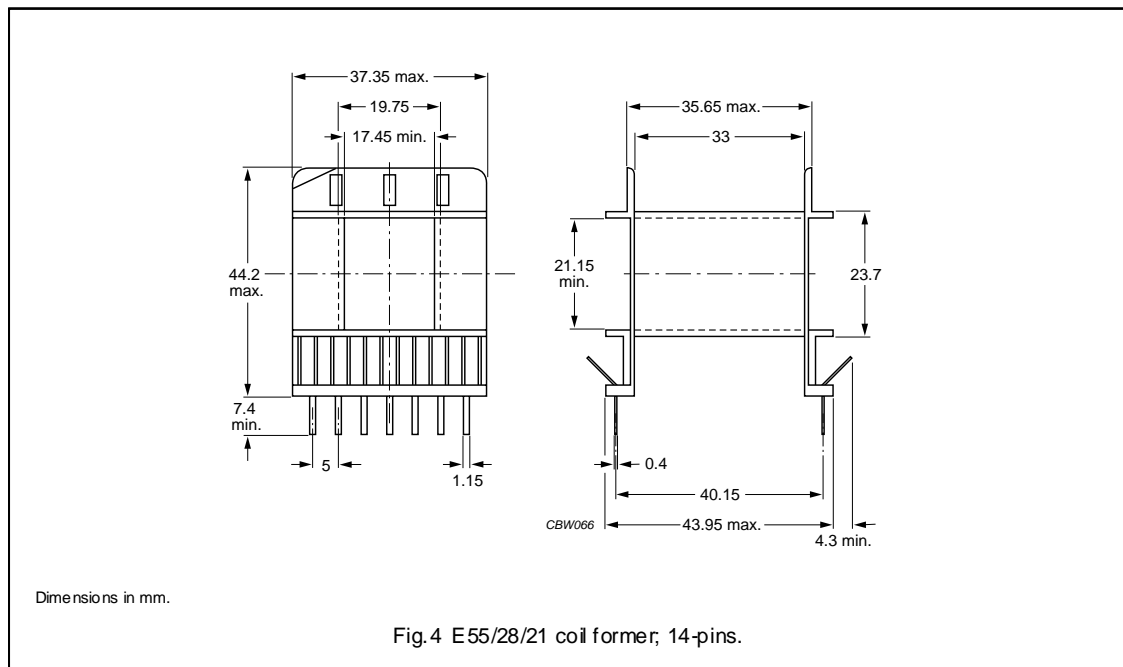


E cores and accessories

E55/28/21

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, transition to lead-free (Sn) ongoing.
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



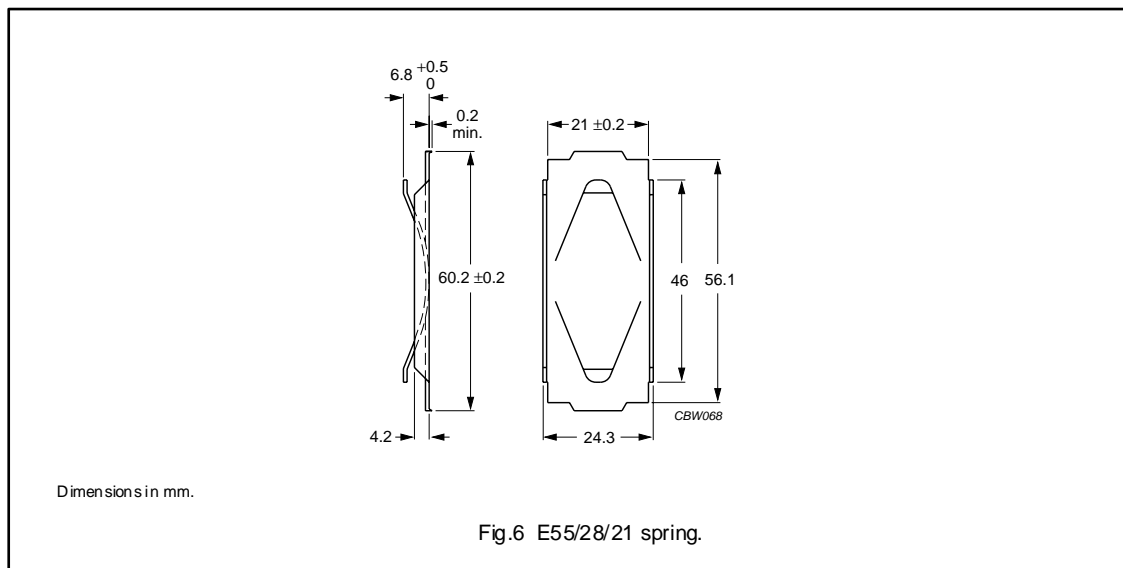
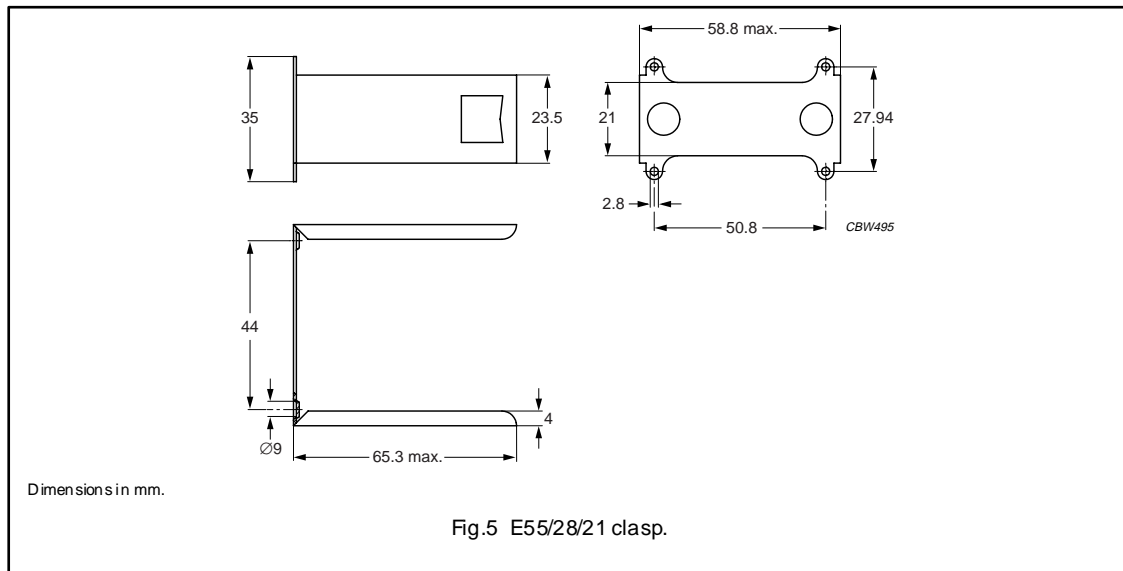
Winding data for 14-pins E55/28/21 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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



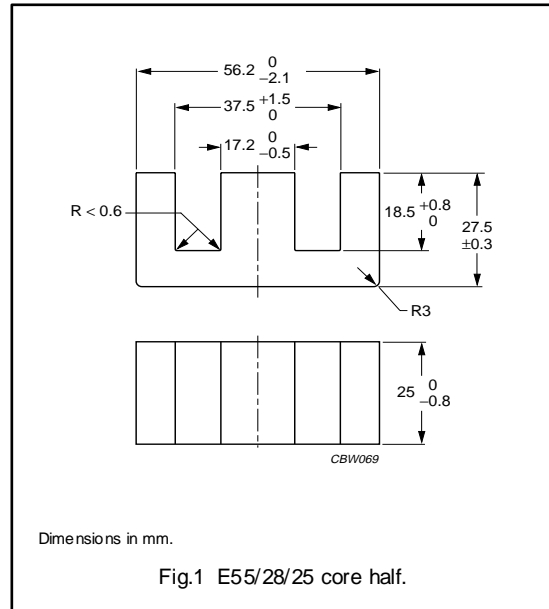
E cores and accessories

E55/28/25

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.239	mm <sup>-1</sup>
$V_e$	effective volume	52000	mm <sup>3</sup>
$l_e$	effective length	123	mm
$A_e$	effective area	420	mm <sup>2</sup>
$A_{min}$	minimum area	411	mm <sup>2</sup>
$m$	mass of core half	≈ 130	g



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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	100 ± 5% <sup>(1)</sup>	≈ 23	≈ 5220	E55/28/25-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 37	≈ 2760	E55/28/25-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 58	≈ 1520	E55/28/25-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 73	≈ 1120	E55/28/25-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 93	≈ 830	E55/28/25-3C90-E400
	630 ± 10% <sup>(1)</sup>	≈ 147	≈ 470	E55/28/25-3C90-E630
	8000 ± 25%	≈ 1860	≈ 0	E55/28/25-3C90
3C92 <b>des</b>	5800 ± 25%	≈ 1100	≈ 0	E55/28/25-3C92
3C94	8000 ± 25%	≈ 1860	≈ 0	E55/28/25-3C94
3F3	100 ± 5% <sup>(1)</sup>	≈ 23	≈ 5220	E55/28/25-3F3-E100
	160 ± 5% <sup>(1)</sup>	≈ 37	≈ 2760	E55/28/25-3F3-E160
	250 ± 5% <sup>(1)</sup>	≈ 58	≈ 1520	E55/28/25-3F3-E250
	315 ± 5% <sup>(1)</sup>	≈ 73	≈ 1120	E55/28/25-3F3-E315
	400 ± 8% <sup>(1)</sup>	≈ 93	≈ 830	E55/28/25-3F3-E400
	630 ± 10% <sup>(1)</sup>	≈ 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.

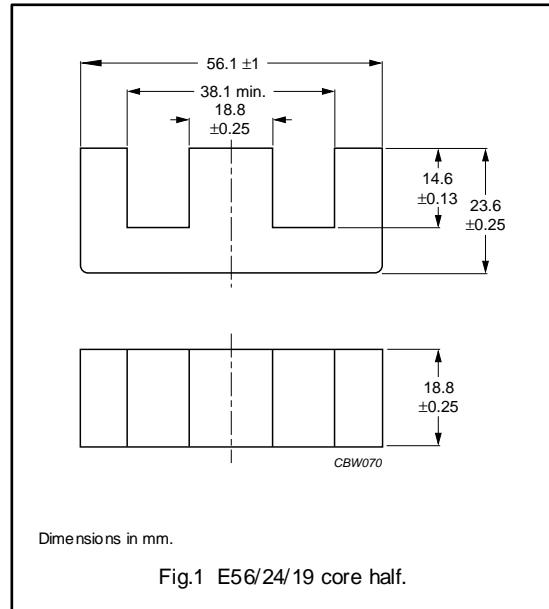
## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤5.7	≤7.3	–	–
3C92	≥370	–	≤4.8	≤31	–
3C94	≥330	–	≤4.8	≤31	–
3F3	≥310	–	≤6.6	–	≤12.7

**CORE SETS**

**Effective core parameters**

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



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 25	≈ 3890	E56/24/19-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 40	≈ 2080	E56/24/19-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 63	≈ 1160	E56/24/19-3C81-E250
	315 ± 5% <sup>(1)</sup>	≈ 80	≈ 860	E56/24/19-3C81-E315
	400 ± 8% <sup>(1)</sup>	≈ 101	≈ 640	E56/24/19-3C81-E400
	630 ± 10% <sup>(1)</sup>	≈ 159	≈ 370	E56/24/19-3C81-E630
	9500 ± 25%	≈ 2400	≈ 0	E56/24/19-3C81
3C90	100 ± 5% <sup>(1)</sup>	≈ 25	≈ 3890	E56/24/19-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 40	≈ 2080	E56/24/19-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 63	≈ 1160	E56/24/19-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 80	≈ 860	E56/24/19-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 101	≈ 640	E56/24/19-3C90-E400
	630 ± 10% <sup>(1)</sup>	≈ 159	≈ 370	E56/24/19-3C90-E630
	6900 ± 25%	≈ 1740	≈ 0	E56/24/19-3C90
3C91 <small>des</small>	9500 ± 25%	≈ 2400	≈ 0	E56/24/19-3C91
3C92 <small>des</small>	5200 ± 25%	≈ 1320	≈ 0	E56/24/19-3C92
3C94	6900 ± 25%	≈ 1740	≈ 0	E56/24/19-3C94

## E cores and accessories

E56/24/19  
(E75)**Note**

1. Measured in combination with an equal gapped core half.

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$14580 \pm 25\%$	$\approx 3680$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 7.4$	–	–	–
3C90	$\geq 320$	$\leq 3.6$	$\leq 4.8$	–	–
3C91	$\geq 320$	–	$\leq 2.7^{(1)}$	$\leq 16^{(1)}$	–
3C92	$\geq 370$	–	$\leq 3.6$	$\leq 22$	–
3C94	$\geq 320$	–	$\leq 3.6$	$\leq 22$	–

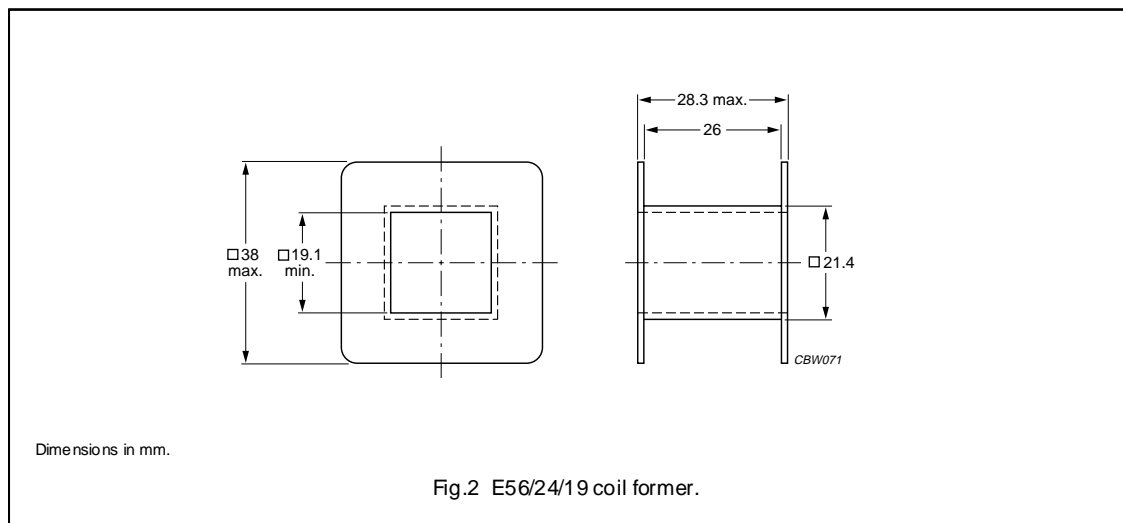
**Note**

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



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

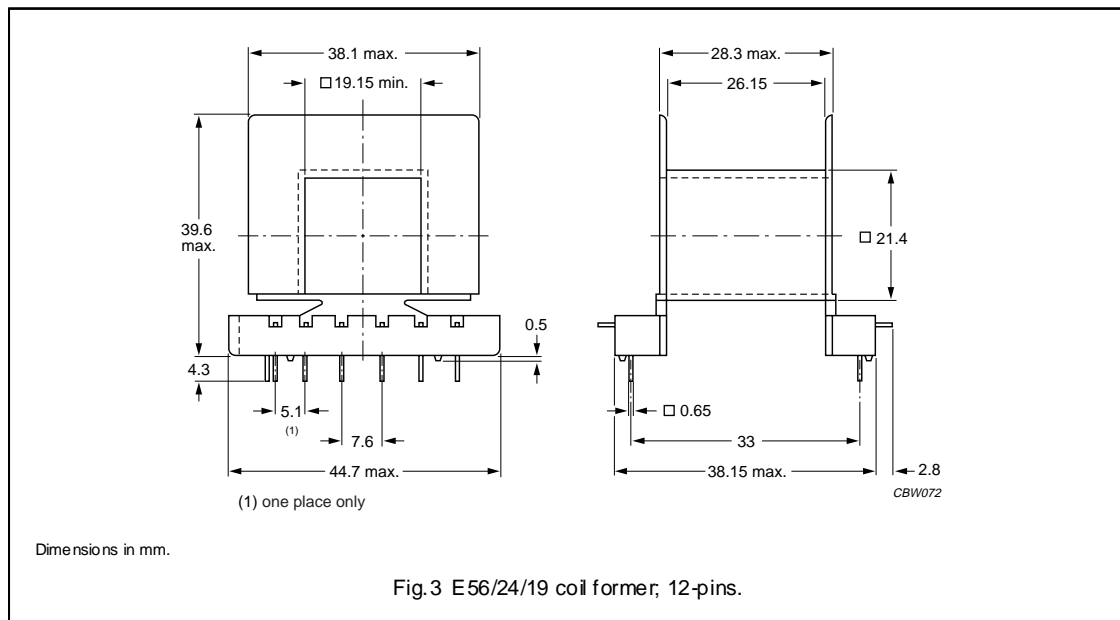
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	222	26.1	112	CP-E56/24/19-1S

E cores and accessories

E56/24/19  
(E75)

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, transition to lead-free (Sn) ongoing.
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



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

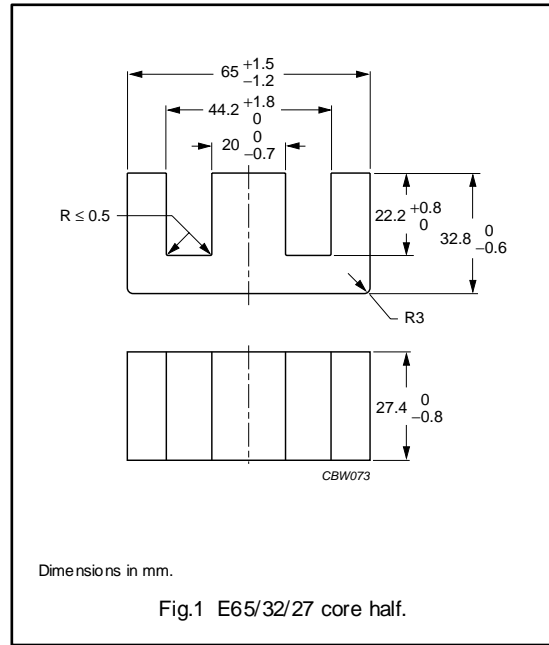
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	205	26.2	114	CPH-E56/24/19-1S-12PD



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.274	mm <sup>-1</sup>
$V_e$	effective volume	79 000	mm <sup>3</sup>
$l_e$	effective length	147	mm
$A_e$	effective area	540	mm <sup>2</sup>
$A_{min}$	minimum area	530	mm <sup>2</sup>
$m$	mass of core half	≈205	g



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	100 ±5% <sup>(1)</sup>	≈ 22	≈ 7190	E65/32/27-3C90-E100
	160 ±5% <sup>(1)</sup>	≈ 35	≈ 3780	E65/32/27-3C90-E160
	250 ±5% <sup>(1)</sup>	≈ 54	≈ 2050	E65/32/27-3C90-E250
	315 ±5% <sup>(1)</sup>	≈ 68	≈ 1510	E65/32/27-3C90-E315
	400 ±8% <sup>(1)</sup>	≈ 87	≈ 1100	E65/32/27-3C90-E400
	630 ±10% <sup>(1)</sup>	≈ 136	≈ 620	E65/32/27-3C90-E630
	8600 ±25%	≈ 1860	≈ 0	E65/32/27-3C90
3C92 <b>des</b>	6000 ±25%	≈ 1310	≈ 0	E65/32/27-3C92
3C94	8600 ±25%	≈ 1860	≈ 0	E65/32/27-3C94
3F3	100 ±5% <sup>(1)</sup>	≈ 22	≈ 7190	E65/32/27-3F3-E100
	160 ±5% <sup>(1)</sup>	≈ 35	≈ 3780	E65/32/27-3F3-E160
	250 ±5% <sup>(1)</sup>	≈ 54	≈ 2050	E65/32/27-3F3-E250
	315 ±5% <sup>(1)</sup>	≈ 68	≈ 1510	E65/32/27-3F3-E315
	400 ±8% <sup>(1)</sup>	≈ 87	≈ 1100	E65/32/27-3F3-E400
	630 ±10% <sup>(1)</sup>	≈ 136	≈ 620	E65/32/27-3F3-E630
	7300 ±25%	≈ 1580	≈ 0	E65/32/27-3F3

## E cores and accessories

E65/32/27

**Note**

1. Measured in combination with an equal gapped core half.

**Core halves of high permeability grades**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C11	$16700 \pm 25\%$	$\approx 3620$	$\approx 0$	E65/32/27-3C11

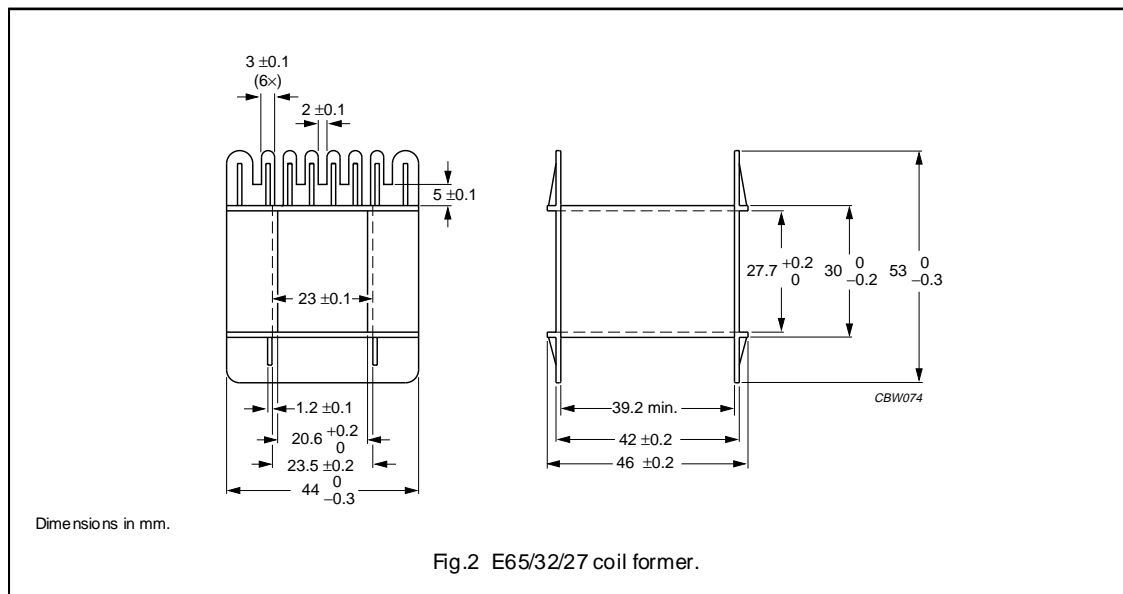
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 9.1$	$\leq 12$	–	–
3C92	$\geq 370$	–	$\leq 8.5$	$\leq 47$	–
3C94	$\geq 320$	–	$\leq 8.5$	$\leq 47$	–
3F3	$\geq 320$	–	$\leq 10.5$	–	$\leq 21$

**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 60 085", class B



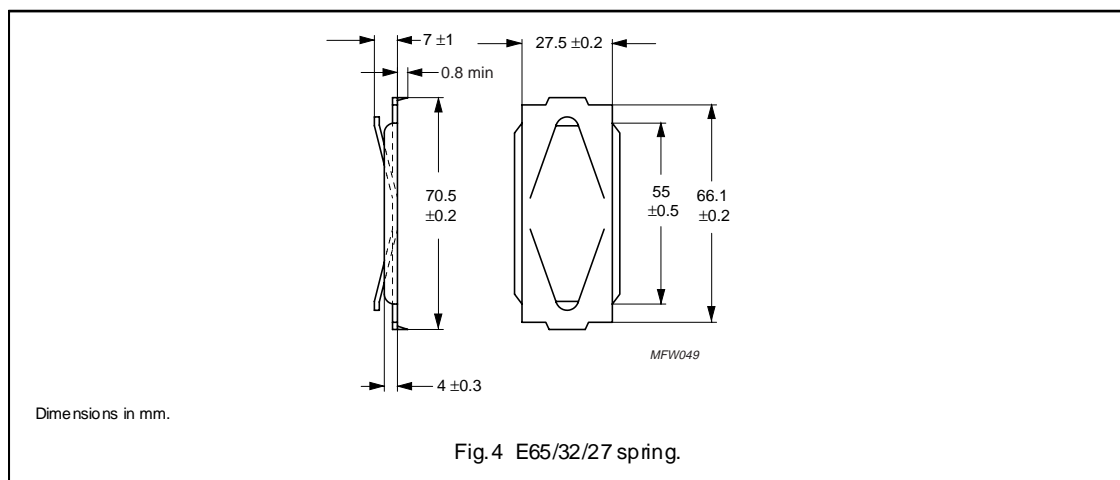
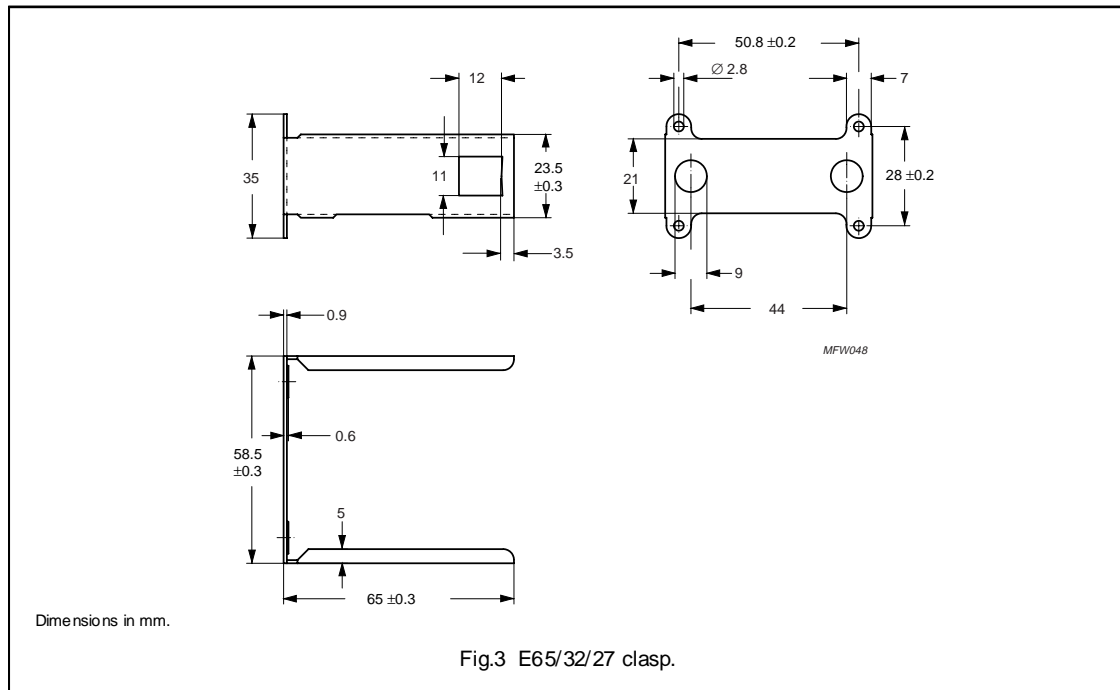
**Winding data for E65/32/27 coil former without pins (E)**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

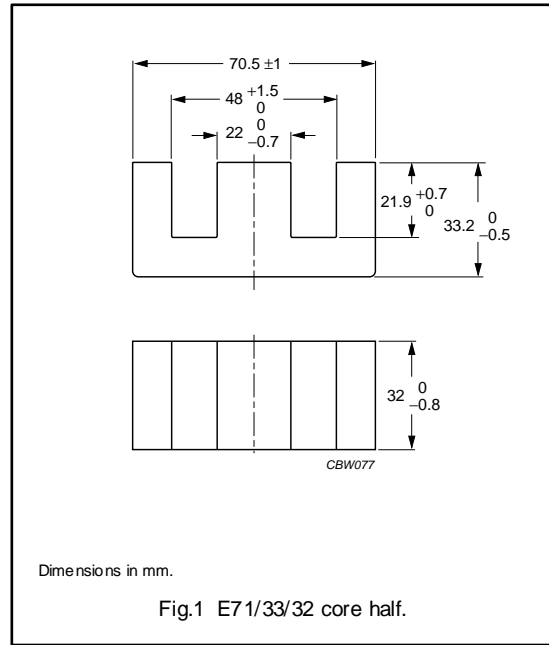
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	steel, zinc (Zn) plated	3	CLA-E65/32/27
Spring	steel, zinc (Zn) plated	4	SPR-E65/32/27



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.218	mm <sup>-1</sup>
$V_e$	effective volume	102 000	mm <sup>3</sup>
$l_e$	effective length	149	mm
$A_e$	effective area	683	mm <sup>2</sup>
$A_{min}$	minimum area	676	mm <sup>2</sup>
$m$	mass of core half	≈ 260	g



**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	100 ± 5% <sup>(1)</sup>	≈ 17	≈ 8900	E7 1/33/32-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 28	≈ 4810	E7 1/33/32-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 43	≈ 2640	E7 1/33/32-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 55	≈ 1950	E7 1/33/32-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 69	≈ 1430	E7 1/33/32-3C90-E400
	630 ± 10% <sup>(1)</sup>	≈ 109	≈ 810	E7 1/33/32-3C90-E630
	10800 ± 25%	≈ 1880	≈ 0	E7 1/33/32-3C90
3C92 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	8000 ± 25%	≈ 1390	≈ 0	E7 1/33/32-3C92
3C94	10800 ± 25%	≈ 1880	≈ 0	E7 1/33/32-3C94
3F3	100 ± 5% <sup>(1)</sup>	≈ 17	≈ 8900	E7 1/33/32-3F3-E100
	160 ± 5% <sup>(1)</sup>	≈ 28	≈ 4810	E7 1/33/32-3F3-E160
	250 ± 5% <sup>(1)</sup>	≈ 43	≈ 2640	E7 1/33/32-3F3-E250
	315 ± 5% <sup>(1)</sup>	≈ 55	≈ 1950	E7 1/33/32-3F3-E315
	400 ± 8% <sup>(1)</sup>	≈ 69	≈ 1430	E7 1/33/32-3F3-E400
	630 ± 10% <sup>(1)</sup>	≈ 109	≈ 810	E7 1/33/32-3F3-E630
	10000 ± 25%	≈ 1740	≈ 0	E7 1/33/32-3F3

**Note**

1. Measured in combination with an equal gapped core half.

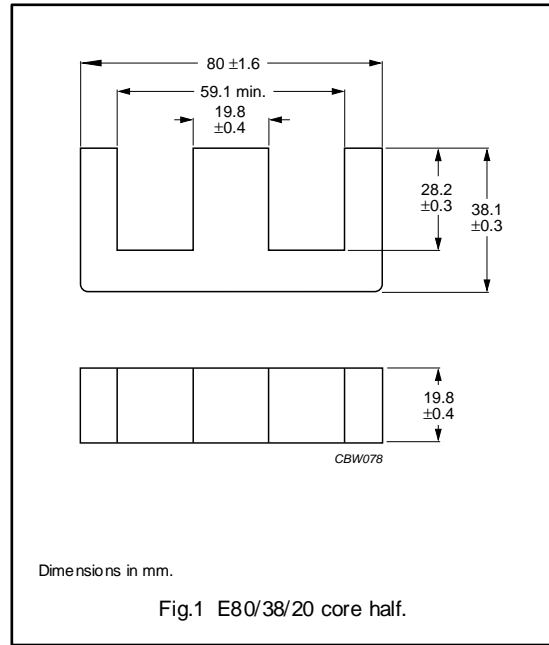
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥320	≤ 12	≤ 16.5	–	–
3C92	≥370	–	≤ 11.5	≤ 60	–
3C94	≥320	–	≤ 11.5	≤ 60	–
3F3	≥320	–	≤ 14	–	≤ 29

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.470	mm <sup>-1</sup>
$V_e$	effective volume	72300	mm <sup>3</sup>
$l_e$	effective length	184	mm
$A_e$	effective area	392	mm <sup>2</sup>
$A_{min}$	minimum area	392	mm <sup>2</sup>
$m$	mass of core half	≈ 180	g



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	100 ± 5% <sup>(1)</sup>	≈ 37	≈ 5600	E80/38/20-3C81-E100
	160 ± 5% <sup>(1)</sup>	≈ 60	≈ 2770	E80/38/20-3C81-E160
	250 ± 5% <sup>(1)</sup>	≈ 93	≈ 1450	E80/38/20-3C81-E250
	315 ± 5% <sup>(1)</sup>	≈ 118	≈ 1060	E80/38/20-3C81-E315
	400 ± 8% <sup>(1)</sup>	≈ 149	≈ 770	E80/38/20-3C81-E400
	630 ± 10% <sup>(1)</sup>	≈ 235	≈ 430	E80/38/20-3C81-E630
	6730 ± 25%	≈ 2510	≈ 0	E80/38/20-3C81
3C90	100 ± 5% <sup>(1)</sup>	≈ 37	≈ 5600	E80/38/20-3C90-E100
	160 ± 5% <sup>(1)</sup>	≈ 60	≈ 2770	E80/38/20-3C90-E160
	250 ± 5% <sup>(1)</sup>	≈ 93	≈ 1450	E80/38/20-3C90-E250
	315 ± 5% <sup>(1)</sup>	≈ 118	≈ 1060	E80/38/20-3C90-E315
	400 ± 8% <sup>(1)</sup>	≈ 149	≈ 770	E80/38/20-3C90-E400
	630 ± 10% <sup>(1)</sup>	≈ 235	≈ 430	E80/38/20-3C90-E630
	5070 ± 25%	≈ 1890	≈ 0	E80/38/20-3C90
3C91 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6730 ± 25%	≈ 2510	≈ 0	E80/38/20-3C91
3C92 <span style="border: 1px solid black; padding: 0 2px;">des</span>	3600 ± 25%	≈ 1350	≈ 0	E80/38/20-3C92
3C94	5070 ± 25%	≈ 1890	≈ 0	E80/38/20-3C94

## E cores and accessories

E80/38/20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	$100 \pm 5\%^{(1)}$	$\approx 37$	$\approx 5600$	E80/38/20-3F3-E100
	$160 \pm 5\%^{(1)}$	$\approx 60$	$\approx 2770$	E80/38/20-3F3-E160
	$250 \pm 5\%^{(1)}$	$\approx 93$	$\approx 1450$	E80/38/20-3F3-E250
	$315 \pm 5\%^{(1)}$	$\approx 118$	$\approx 1060$	E80/38/20-3F3-E315
	$400 \pm 8\%^{(1)}$	$\approx 149$	$\approx 770$	E80/38/20-3F3-E400
	$630 \pm 10\%^{(1)}$	$\approx 235$	$\approx 430$	E80/38/20-3F3-E630
	$4590 \pm 25\%$	$\approx 1710$	$\approx 0$	E80/38/20-3F3

**Note**

1. Measured in combination with an equal gapped core half.

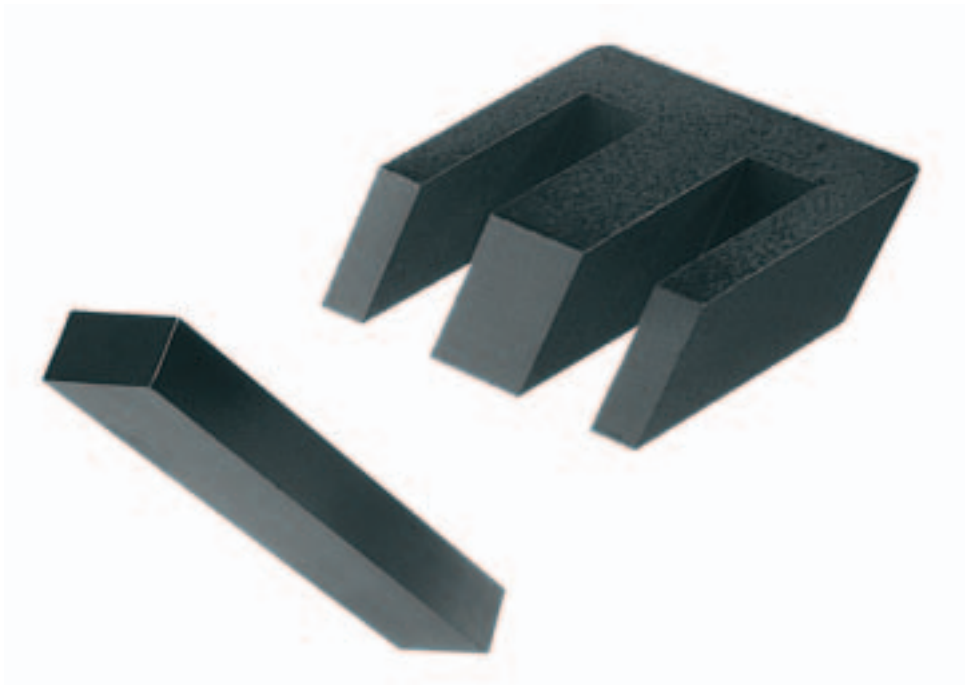
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 14.8$	–	–	–
3C90	$\geq 320$	$\leq 7.2$	$\leq 10$	–	–
3C91	$\geq 320$	–	$\leq 6.0^{(1)}$	$\leq 32^{(1)}$	–
3C92	$\geq 370$	–	$\leq 7.5$	$\leq 45$	–
3C94	$\geq 320$	–	$\leq 7.5$	$\leq 45$	–

**Note**

1. Measured at 60 °C.





MFP100

Soft Ferrites

EI cores

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EI cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
E16/12/5	701	19.4	2.7
I16/2.4/5	–	–	0.9
E20/14/5	913	22.8	3.8
I20/2.3/5/	–	–	1.1
E22/15/6	1450	33.1	5.9
I22/4/6	–	–	2.3
E25/17/6	2070	40.3	8.0
I25/3/6	–	–	2.5
E28/17/11	4120	83.7	17
I28/3.5/11	–	–	5.1
E30/21/11	6720	113	25
I30/5.5/11	–	–	8.6
E33/23/13	7910	118	31
I33/5/13	–	–	10
E35/24/10	6270	89.3	24
I35/5/10	–	–	7.4
E40/27/12	11 100	143	42
I40/7.5/12	–	–	17

Note :  
All effective dimensions for E/I combination

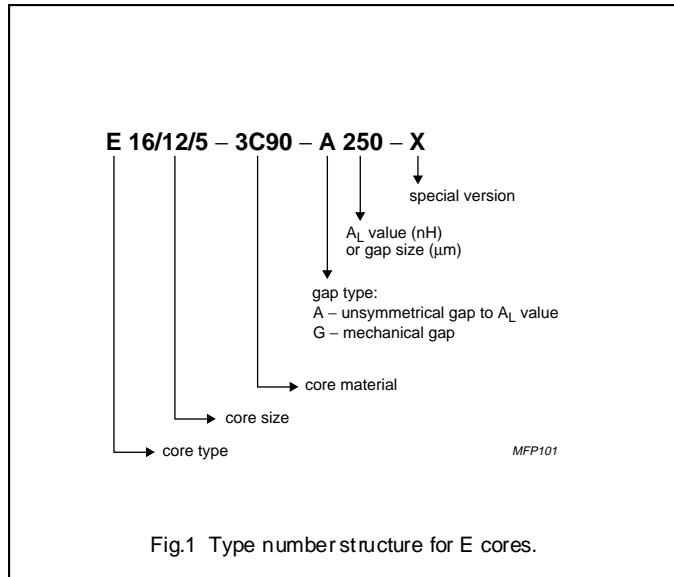


Fig.1 Type number structure for E cores.

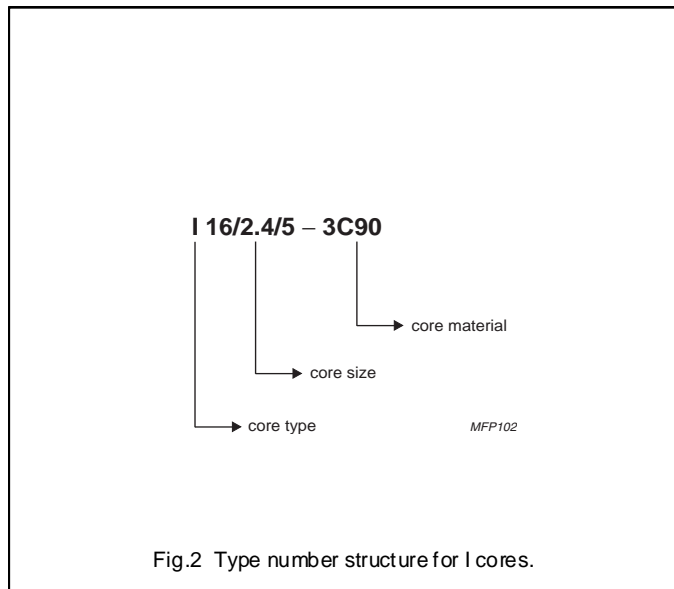


Fig.2 Type number structure for I cores.

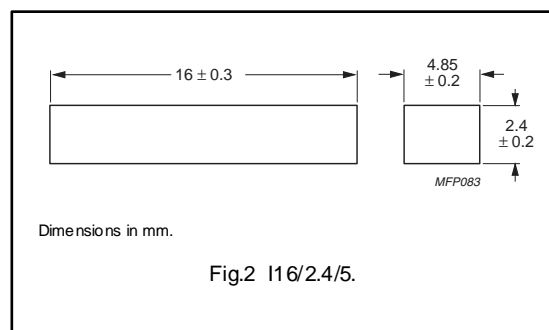
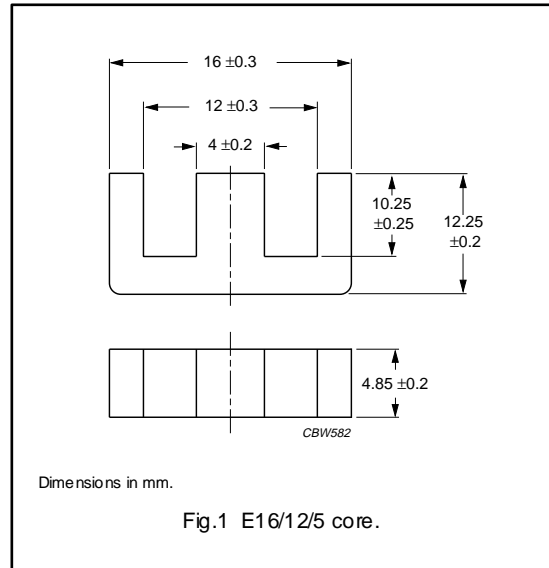
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.85	mm <sup>-1</sup>
$V_e$	effective volume	701	mm <sup>3</sup>
$l_e$	effective length	35.8	mm
$A_e$	effective area	19.4	mm <sup>2</sup>
$A_{min}$	minimum area	19.4	mm <sup>2</sup>
m	mass of E core	≈ 2.7	g
m	mass of I core	≈ 0.9	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I16/2.4/5-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $20 \pm 10$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$1000 \pm 25 \%$	≈ 1470	≈ 0	E16/12/5-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E16/12/5+I16/2.4/5-3C90	≥ 320	≤ 0.08	≤ 0.08

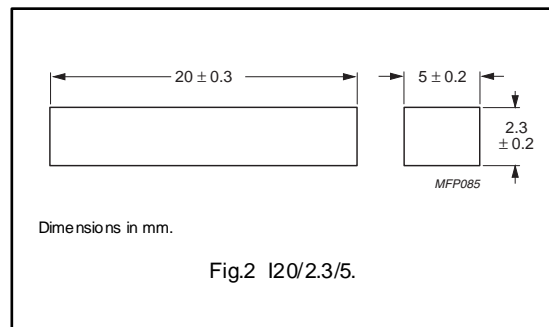
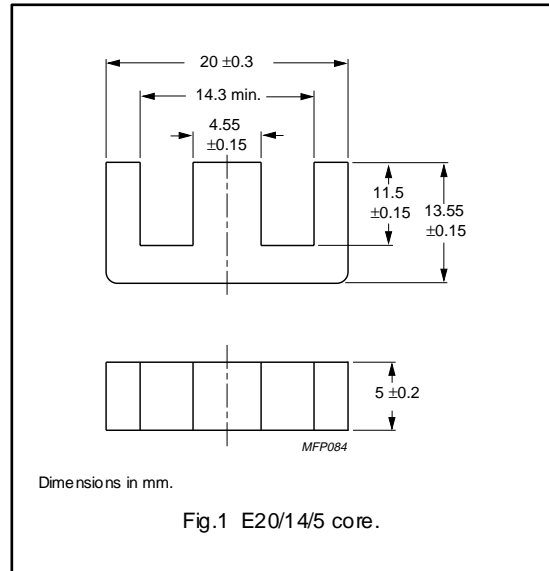
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.76	mm <sup>-1</sup>
$V_e$	effective volume	913	mm <sup>3</sup>
$l_e$	effective length	40.1	mm
$A_e$	effective area	22.8	mm <sup>2</sup>
$A_{min}$	minimum area	22.0	mm <sup>2</sup>
$m$	mass of E core	≈ 3.8	g
$m$	mass of I core	≈ 1.1	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I20/2.3/5-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $20 \pm 10$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	$1290 \pm 25 \%$	≈ 1810	≈ 0	E20/14/5-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E20/14/5+I20/2.3/5-3C90	≥ 320	≤ 0.11	≤ 0.11

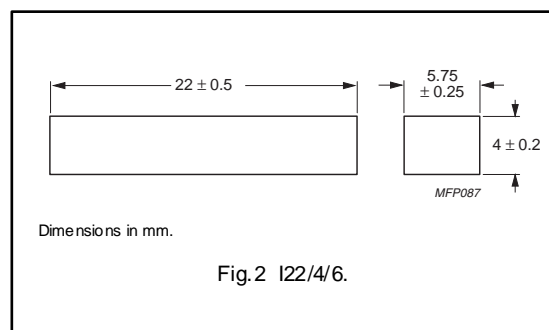
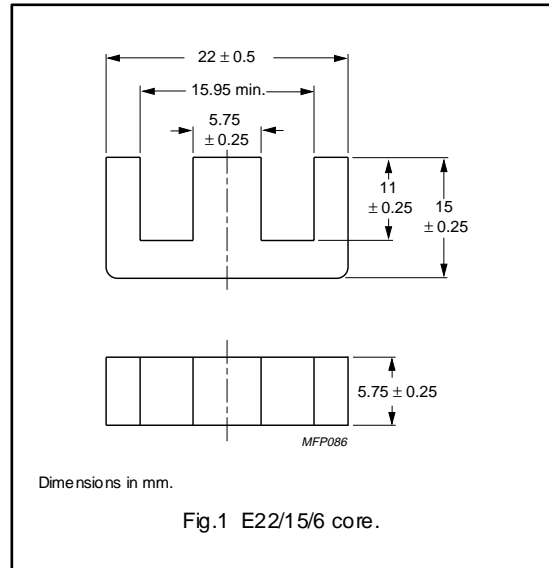
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.33	mm <sup>-1</sup>
$V_e$	effective volume	1450	mm <sup>3</sup>
$l_e$	effective length	44.0	mm
$A_e$	effective area	33.1	mm <sup>2</sup>
$A_{min}$	minimum area	32.0	mm <sup>2</sup>
m	mass of E core	≈ 5.9	g
m	mass of I core	≈ 2.3	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I22/4/6-3C90
3F3	I22/4/6-3F3



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $20 \pm 10$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	$1750 \pm 25$ %	≈ 1850	≈ 0	E22/15/6-3C90
3F3	$1500 \pm 25$ %	≈ 1590	≈ 0	E22/15/6-3F3

**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
E22/15/6+I22/4/6-3C90	≥ 330	≤ 0.17	≤ 0.17	–
E22/15/6+I22/4/6-3F3	≥ 320	–	≤ 0.17	≤ 0.32

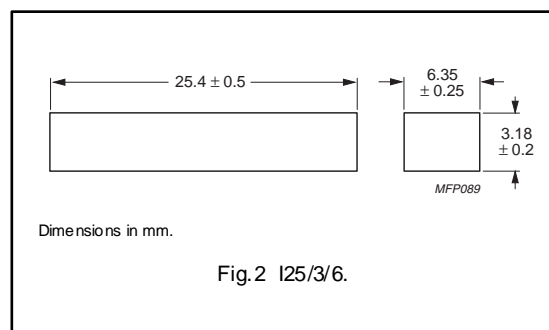
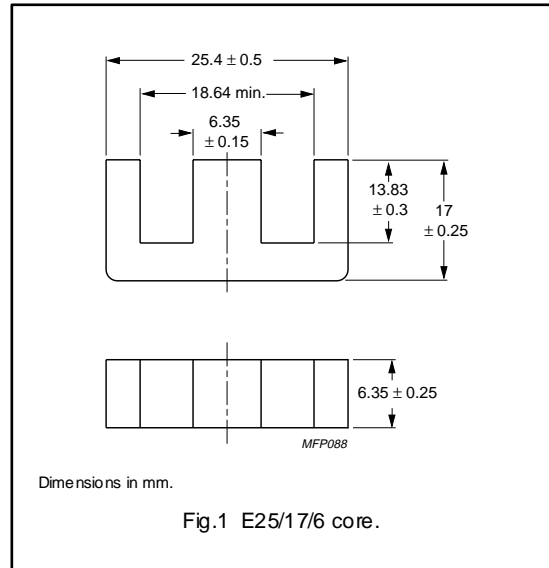
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.27	mm <sup>-1</sup>
$V_e$	effective volume	2070	mm <sup>3</sup>
$l_e$	effective length	51.3	mm
$A_e$	effective area	40.3	mm <sup>2</sup>
$A_{min}$	minimum area	39.0	mm <sup>2</sup>
m	mass of E core	≈ 8.0	g
m	mass of I core	≈ 2.5	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I25/3/6-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $20 \pm 10$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$1750 \pm 25 \%$	≈ 1770	≈ 0	E25/17/6-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E25/17/6+I25/3/6-3C90	≥ 330	≤ 0.24	≤ 0.24

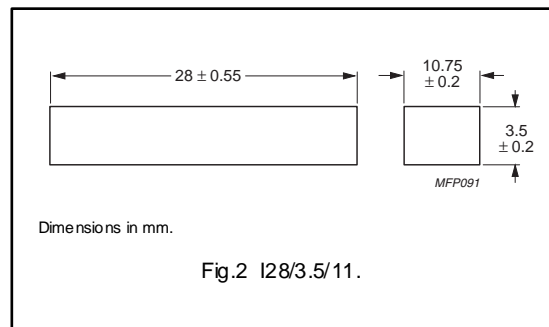
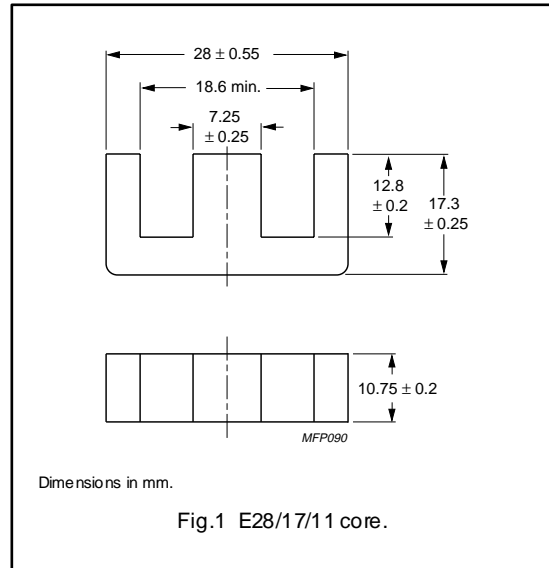
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.588	mm <sup>-1</sup>
$V_e$	effective volume	4120	mm <sup>3</sup>
$l_e$	effective length	49.2	mm
$A_e$	effective area	83.7	mm <sup>2</sup>
$A_{min}$	minimum area	83.7	mm <sup>2</sup>
m	mass of E core	≈ 17	g
m	mass of I core	≈ 5.1	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I28/3.5/11-3C90
3F3	I28/3.5/11-3F3



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $40 \pm 20$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	$3625 \pm 25$ %	≈ 1700	≈ 0	E28/17/11-3C90
3F3	$3420 \pm 25$ %	≈ 1600	≈ 0	E28/17/11-3F3

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; $\hat{B} = 200$ mT; T = 100 °C	f = 100 kHz; $\hat{B} = 100$ mT; T = 100 °C	f = 400 kHz; $\hat{B} = 50$ mT; T = 100 °C
E28/17/11+I28/3.5/11-3C90	≥ 330	≤ 0.5	≤ 0.5	–
E28/17/11+I28/3.5/11-3F3	≥ 320	–	≤ 0.5	≤ 0.9

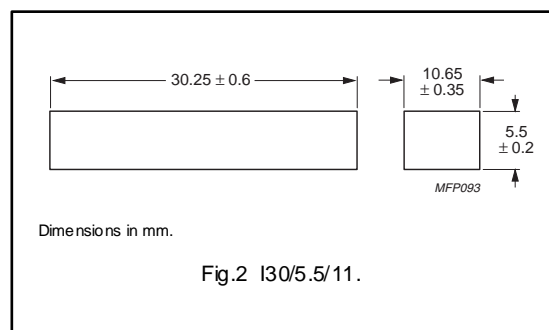
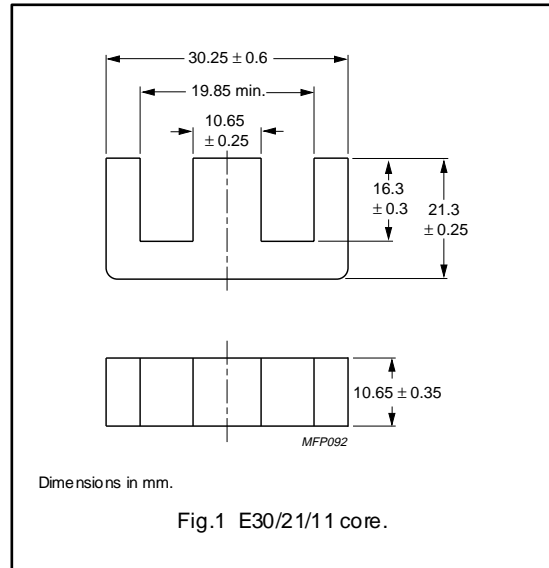
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.524	mm <sup>-1</sup>
$V_e$	effective volume	6720	mm <sup>3</sup>
$l_e$	effective length	59.2	mm
$A_e$	effective area	113	mm <sup>2</sup>
$A_{min}$	minimum area	104	mm <sup>2</sup>
m	mass of E core	≈ 25	g
m	mass of I core	≈ 8.6	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I30/5.5/11-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $40 \pm 20$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$4300 \pm 25 \%$	≈ 1790	≈ 0	E30/21/11-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E30/21/11+I30/5.5/11-3C90	≥ 330	≤ 0.8	≤ 0.8



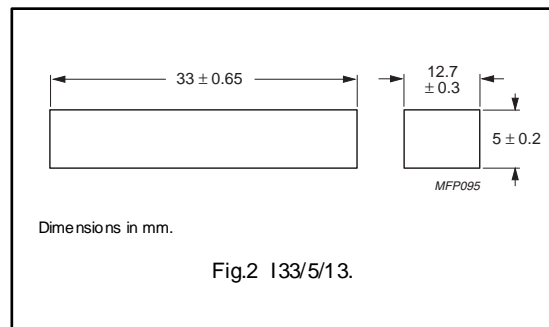
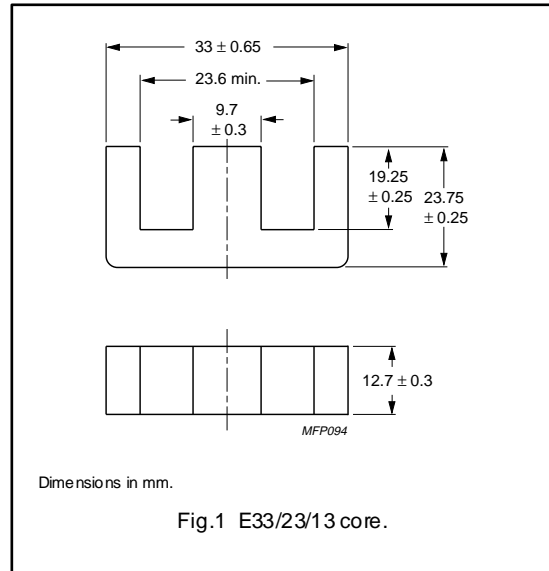
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.567	mm <sup>-1</sup>
$V_e$	effective volume	7910	mm <sup>3</sup>
$l_e$	effective length	66.9	mm
$A_e$	effective area	118	mm <sup>2</sup>
$A_{min}$	minimum area	114	mm <sup>2</sup>
m	mass of E core	≈ 31	g
m	mass of I core	≈ 10	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I33/5/13-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $40 \pm 20$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$4300 \pm 25 \%$	≈ 1940	≈ 0	E33/23/13-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E33/23/13+I33/5/13-3C90	≥ 330	≤ 0.95	≤ 0.95

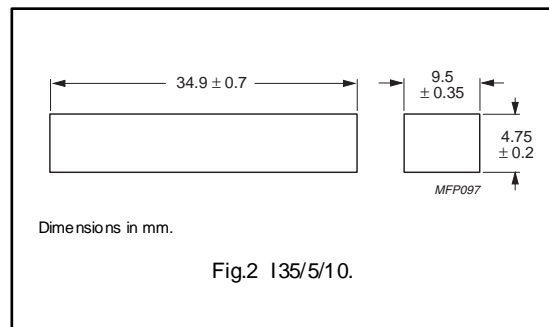
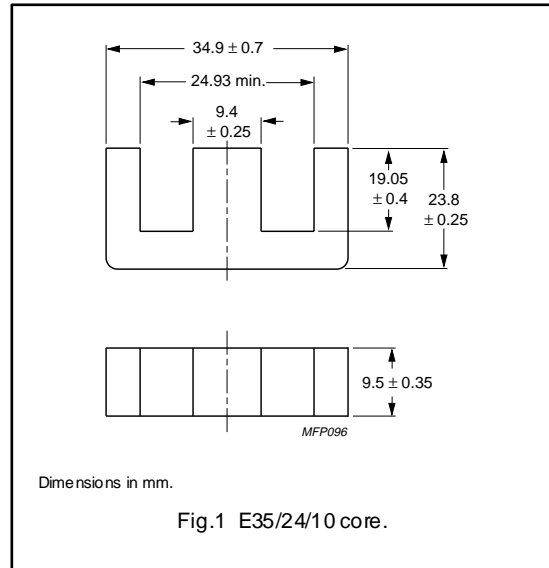
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.786	mm <sup>-1</sup>
$V_e$	effective volume	6270	mm <sup>3</sup>
$l_e$	effective length	70.2	mm
$A_e$	effective area	89.3	mm <sup>2</sup>
$A_{min}$	minimum area	88.0	mm <sup>2</sup>
m	mass of E core	≈ 24	g
m	mass of I core	≈ 7.4	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I35/5/10-3C90



**Core halves for use in combination with an I core**

$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $40 \pm 20$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$2960 \pm 25 \%$	≈ 1850	≈ 0	E35/24/10-3C90

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E35/24/10+I35/5/10-3C90	≥ 330	≤ 0.75	≤ 0.75

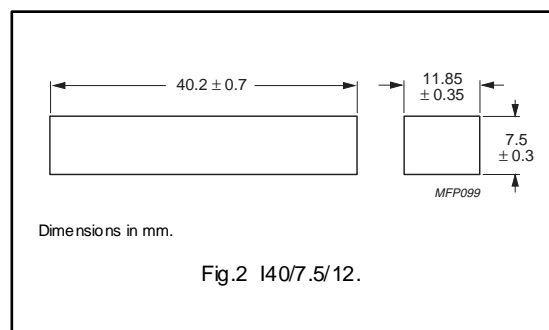
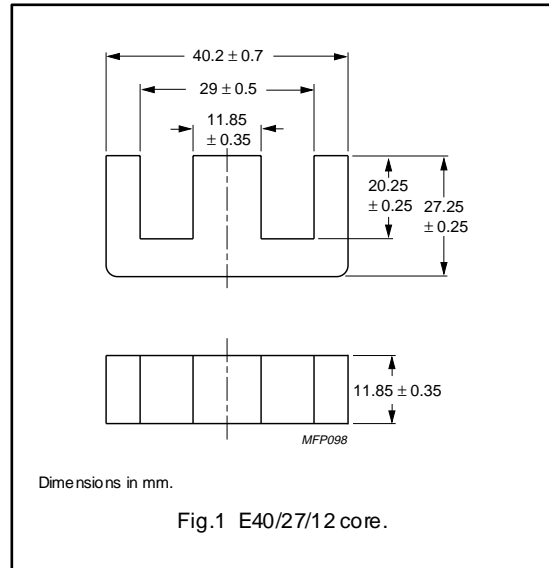
**CORES**

**Effective core parameters of an E / I combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.542	mm <sup>-1</sup>
$V_e$	effective volume	11 100	mm <sup>3</sup>
$l_e$	effective length	77.5	mm
$A_e$	effective area	143	mm <sup>2</sup>
$A_{min}$	minimum area	133	mm <sup>2</sup>
m	mass of E core	≈ 42	g
m	mass of I core	≈ 17	g

**Ordering information for I cores**

GRADE	TYPE NUMBER
3C90	I40/7.5/12-3C90



**Core halves for use in combination with an I core**

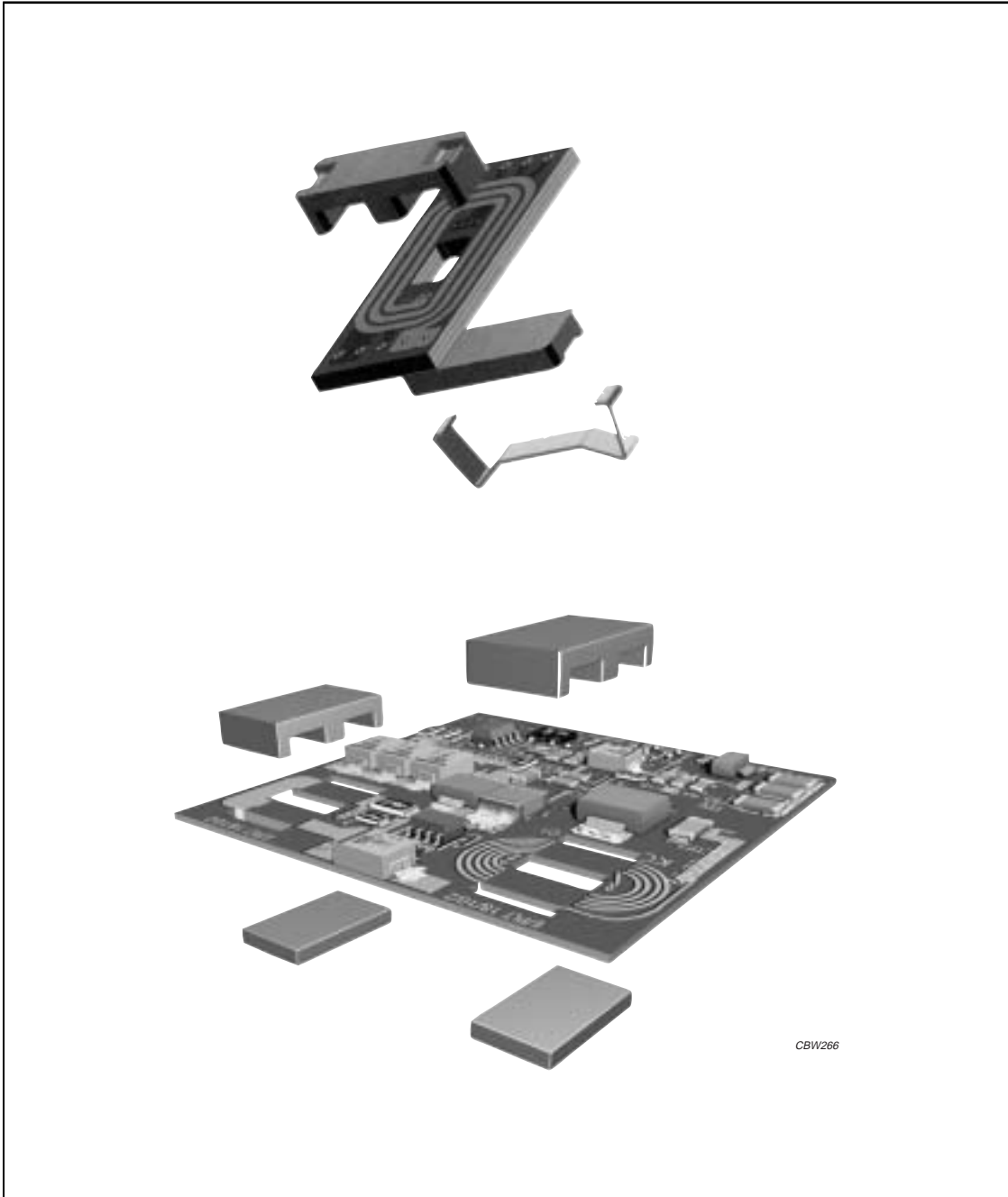
$A_L$  measured in combination with an I core, clamping force for  $A_L$  measurements  $40 \pm 20$  N;

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$4110 \pm 25 \%$	≈ 1770	≈ 0	E40/27/12-3C90

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
E40/27/12+I40/7.5/12-3C90	≥ 330	≤ 1.3	≤ 1.3





Soft Ferrites

Planar E cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Planar E cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	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
E32/6/20/R	-	-	13
PLT32/20/3/R	4560	130	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

• In accordance with IEC 61860 (will be replaced by 62313).

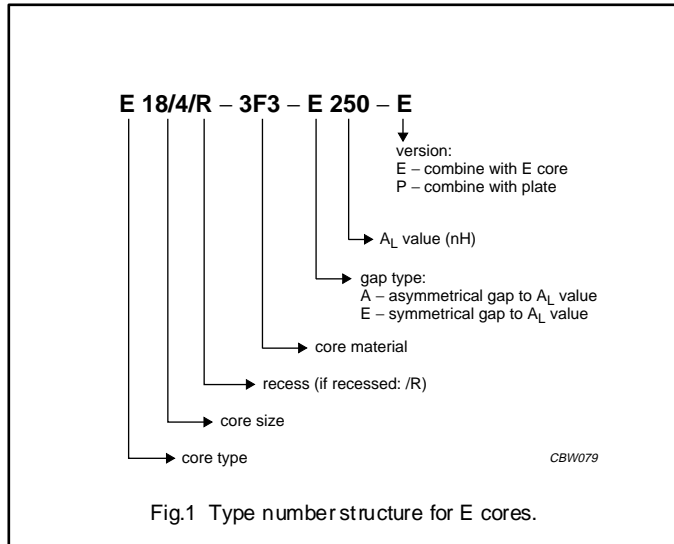


Fig.1 Type number structure for E cores.

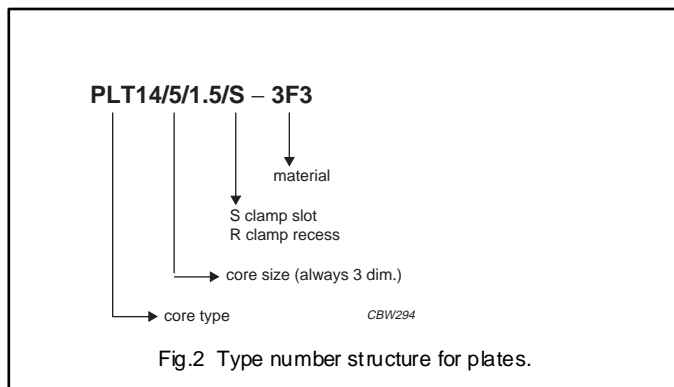


Fig.2 Type number structure for plates.

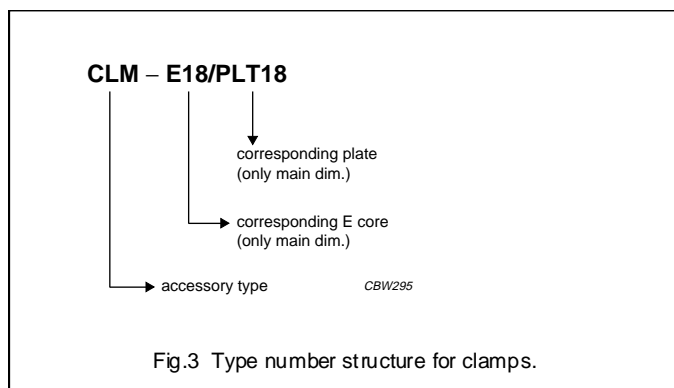


Fig.3 Type number structure for clamps.

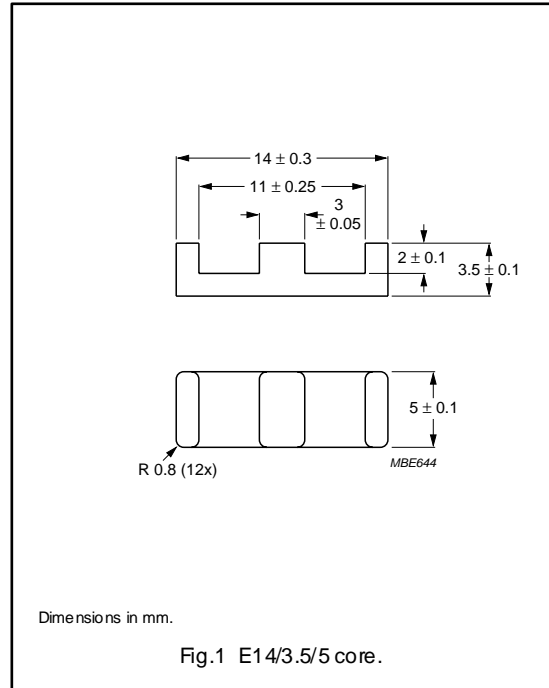
Planar E cores and accessories

E14/3.5/5

CORES

Effective core parameters of a set of E cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.43	mm <sup>-1</sup>
$V_e$	effective volume	300	mm <sup>3</sup>
$l_e$	effective length	20.7	mm
$A_e$	effective area	14.3	mm <sup>2</sup>
$A_{min}$	minimum area	14.3	mm <sup>2</sup>
m	mass of core half	≈ 0.6	g

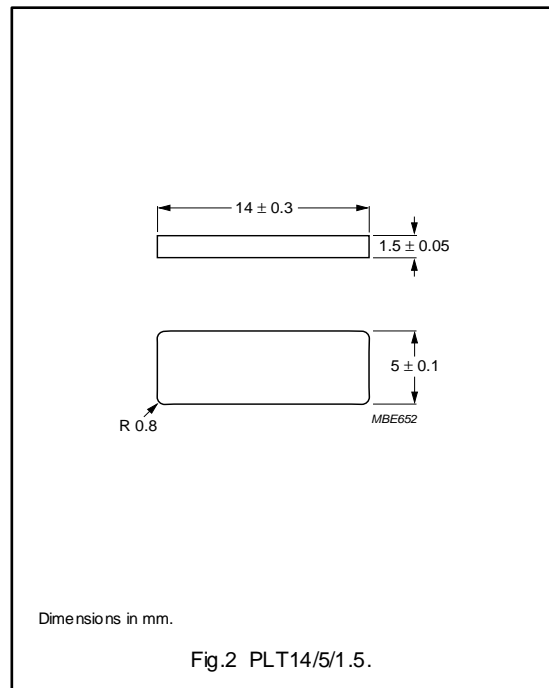


Effective core parameters of an E/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.16	mm <sup>-1</sup>
$V_e$	effective volume	240	mm <sup>3</sup>
$l_e$	effective length	16.7	mm
$A_e$	effective area	14.5	mm <sup>2</sup>
$A_{min}$	minimum area	14.5	mm <sup>2</sup>
m	mass of plate	≈ 0.5	g

Ordering information for plates

GRADE	TYPE NUMBER
3C90	PLT14/5/1.5-3C90
3C92 <small>des</small>	PLT14/5/1.5-3C92
3C93 <small>des</small>	PLT14/5/1.5-3C93
3C94	PLT14/5/1.5-3C94
3C96 <small>des</small>	PLT14/5/1.5-3C96
3F3	PLT14/5/1.5-3F3
3F35 <small>prot</small>	PLT14/5/1.5-3F35
3F4 <small>des</small>	PLT14/5/1.5-3F4
3F45 <small>prot</small>	PLT14/5/1.5-3F45
3E6	PLT14/5/1.5-3E6



## 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,  $10 \pm 5$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$63 \pm 3\%$	$\approx 72$	$\approx 530$	E14/3.5/5-3C90-A63-E
	$100 \pm 5\%$	$\approx 114$	$\approx 270$	E14/3.5/5-3C90-A100-E
	$160 \pm 8\%$	$\approx 182$	$\approx 130$	E14/3.5/5-3C90-A160-E
	$1280 \pm 25\%$	$\approx 1450$	$\approx 0$	E14/3.5/5-3C90
3C92 <small>des</small>	$960 \pm 25\%$	$\approx 1090$	$\approx 0$	E14/3.5/5-3C92
3C93 <small>des</small>	$1100 \pm 25\%$	$\approx 1250$	$\approx 0$	E14/3.5/5-3C93
3C94	$63 \pm 3\%$	$\approx 72$	$\approx 530$	E14/3.5/5-3C94-A63-E
	$100 \pm 5\%$	$\approx 114$	$\approx 270$	E14/3.5/5-3C94-A100-E
	$160 \pm 8\%$	$\approx 182$	$\approx 130$	E14/3.5/5-3C94-A160-E
	$1280 \pm 25\%$	$\approx 1450$	$\approx 0$	E14/3.5/5-3C94
3C96 <small>des</small>	$1200 \pm 25\%$	$\approx 1360$	$\approx 0$	E14/3.5/5-3C96
3F3	$63 \pm 3\%$	$\approx 72$	$\approx 530$	E14/3.5/5-3F3-A63-E
	$100 \pm 5\%$	$\approx 114$	$\approx 270$	E14/3.5/5-3F3-A100-E
	$160 \pm 8\%$	$\approx 182$	$\approx 130$	E14/3.5/5-3F3-A160-E
	$1100 \pm 25\%$	$\approx 1250$	$\approx 0$	E14/3.5/5-3F3
3F35 <small>prot</small>	$900 \pm 25\%$	$\approx 1020$	$\approx 0$	E14/3.5/5-3F35
3F4 <small>des</small>	$63 \pm 3\%$	$\approx 72$	$\approx 530$	E14/3.5/5-3F4-A63-E
	$100 \pm 5\%$	$\approx 114$	$\approx 270$	E14/3.5/5-3F4-A100-E
	$160 \pm 8\%$	$\approx 182$	$\approx 130$	E14/3.5/5-3F4-A160-E
	$650 \pm 25\%$	$\approx 740$	$\approx 0$	E14/3.5/5-3F4
3F45 <small>prot</small>	$650 \pm 25\%$	$\approx 740$	$\approx 0$	E14/3.5/5-3F45
3E6	$5600 +40/-30\%$	$\approx 6360$	$\approx 0$	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,  $10 \pm 5$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5-3C90-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5-3C90-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5-3C90-A160-P
	$1500 \pm 25\%$	$\approx 1400$	$\approx 0$	E14/3.5/5-3C90
3C92 <b>des</b>	$1130 \pm 25\%$	$\approx 1040$	$\approx 0$	E14/3.5/5-3C92
3C93 <b>des</b>	$1300 \pm 25\%$	$\approx 1200$	$\approx 0$	E14/3.5/5-3C93
3C94	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5-3C94-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5-3C94-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5-3C94-A160-P
	$1500 \pm 25\%$	$\approx 1400$	$\approx 0$	E14/3.5/5-3C94
3C96 <b>des</b>	$1350 \pm 25\%$	$\approx 1260$	$\approx 0$	E14/3.5/5-3C96
3F3	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5-3F3-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5-3F3-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5-3F3-A160-P
	$1300 \pm 25\%$	$\approx 1200$	$\approx 0$	E14/3.5/5-3F3
3F35 <b>prot</b>	$1050 \pm 25\%$	$\approx 980$	$\approx 0$	E14/3.5/5-3F35
3F4 <b>des</b>	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5-3F4-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5-3F4-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5-3F4-A160-P
	$780 \pm 25\%$	$\approx 720$	$\approx 0$	E14/3.5/5-3F4
3F45 <b>prot</b>	$780 \pm 25\%$	$\approx 720$	$\approx 0$	E14/3.5/5-3F45
3E6	$6400 +40/-30\%$	$\approx 5900$	$\approx 0$	E14/3.5/5-3E6

## Planar E cores and accessories

E14/3.5/5

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E+E14-3C90	≥320	≤ 0.030	–	–	–
E+PLT14-3C90	≥320	≤ 0.026	–	–	–
E+E14-3C92	≥370	≤ 0.024	≤ 0.16	–	–
E+PLT14-3C92	≥370	≤ 0.021	≤ 0.15	–	–
E+E14-3C93	≥320	≤ 0.024 <sup>(1)</sup>	≤ 0.16 <sup>(1)</sup>	–	–
E+PLT14-3C93	≥320	≤ 0.021 <sup>(1)</sup>	≤ 0.15 <sup>(1)</sup>	–	–
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	≤ 0.11
E+PLT14-3C96	≥340	≤ 0.016	≤ 0.12	≤ 0.045	≤ 0.09
E+E14-3F3	≥300	≤ 0.033	–	≤ 0.06	–
E+PLT14-3F3	≥300	≤ 0.027	–	≤ 0.047	–
E+E14-3F35	≥300	–	–	≤ 0.03	≤ 0.05
E+PLT14-3F35	≥300	–	–	≤ 0.024	≤ 0.035

1. Measured at 140 °C.

## 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; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E14-3F35	≥300	≤ 0.35	–	–	–
E+PLT14-3F35	≥300	≤ 0.27	–	–	–
E+E14-3F4	≥250	–	≤ 0.09	–	≤ 0.15
E+PLT14-3F4	≥250	–	≤ 0.07	–	≤ 0.11
E+E14-3F45	≥250	–	≤ 0.06	≤ 0.15	≤ 0.11
E+PLT14-3F45	≥250	–	≤ 0.05	≤ 0.12	≤ 0.085

**MOUNTING INFORMATION**

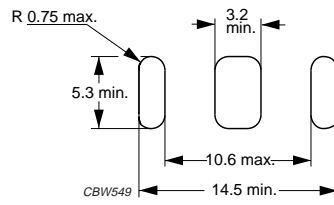
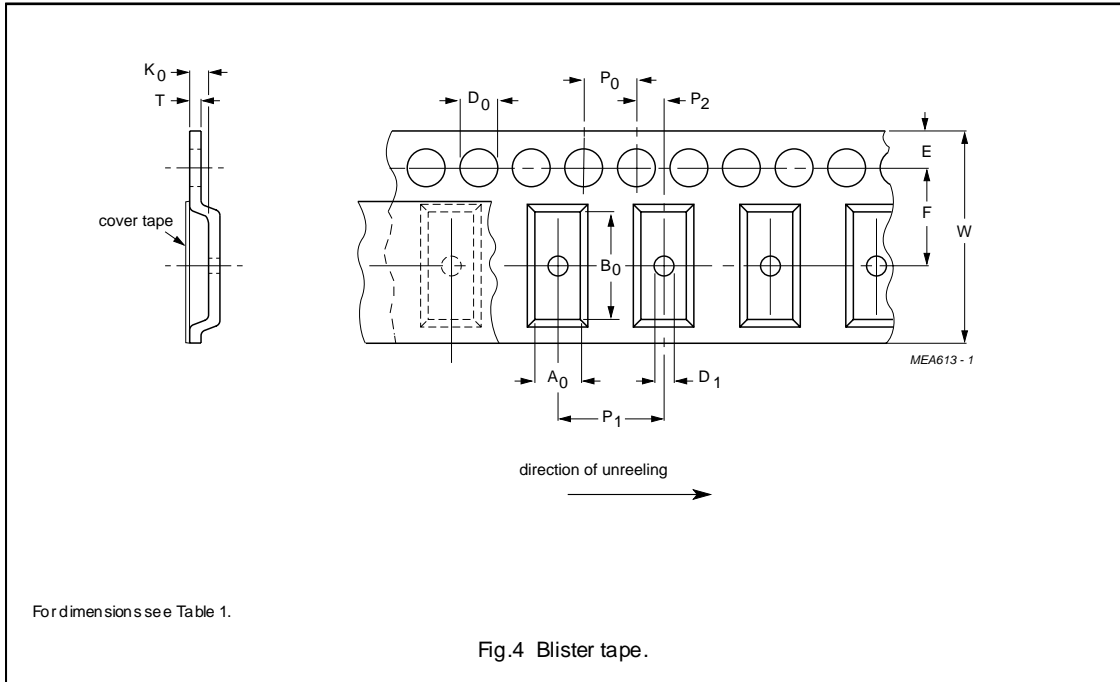


Fig.3 Recommended PCB cut-out for glued planar E14/3.5/5 cores.

**BLISTER TAPE AND REEL DIMENSIONS** prot



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

SIZE	DIMENSIONS (mm)
$A_0$	$5.4 \pm 0.2$
$B_0$	$14.6 \pm 0.2$
$K_0$	$4.0 \pm 0.2$
$T$	$0.3 \pm 0.05$
$W$	$24.0 \pm 0.3$
$E$	$1.75 \pm 0.1$
$F$	$11.5 \pm 0.1$
$D_0$	$1.5 \pm 0.1$
$D_1$	$\geq 1.5$
$P_0$	$4.0 \pm 0.1$
$P_1$	$8.0 \pm 0.1$
$P_2$	$2.0 \pm 0.1$

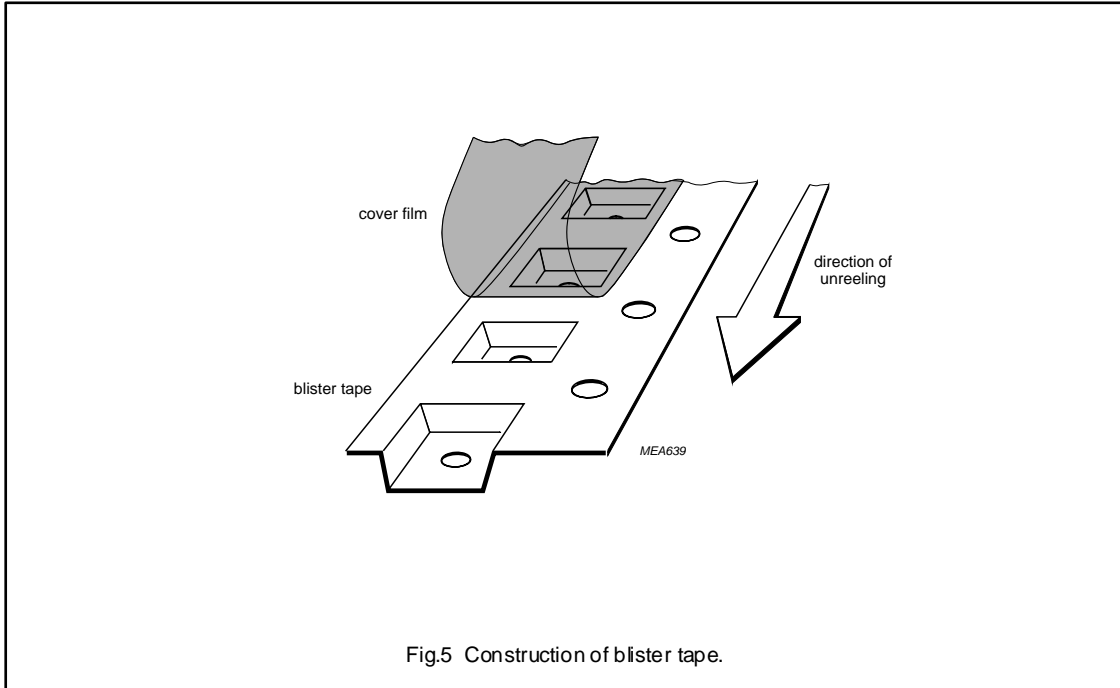


Fig.5 Construction of blister tape.

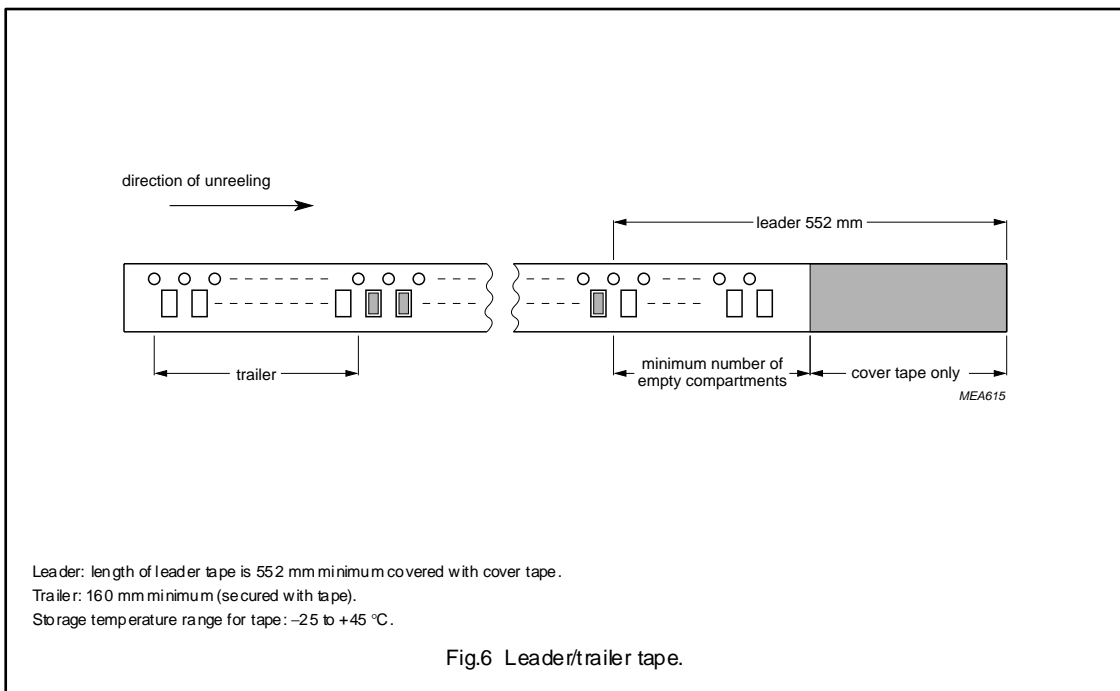
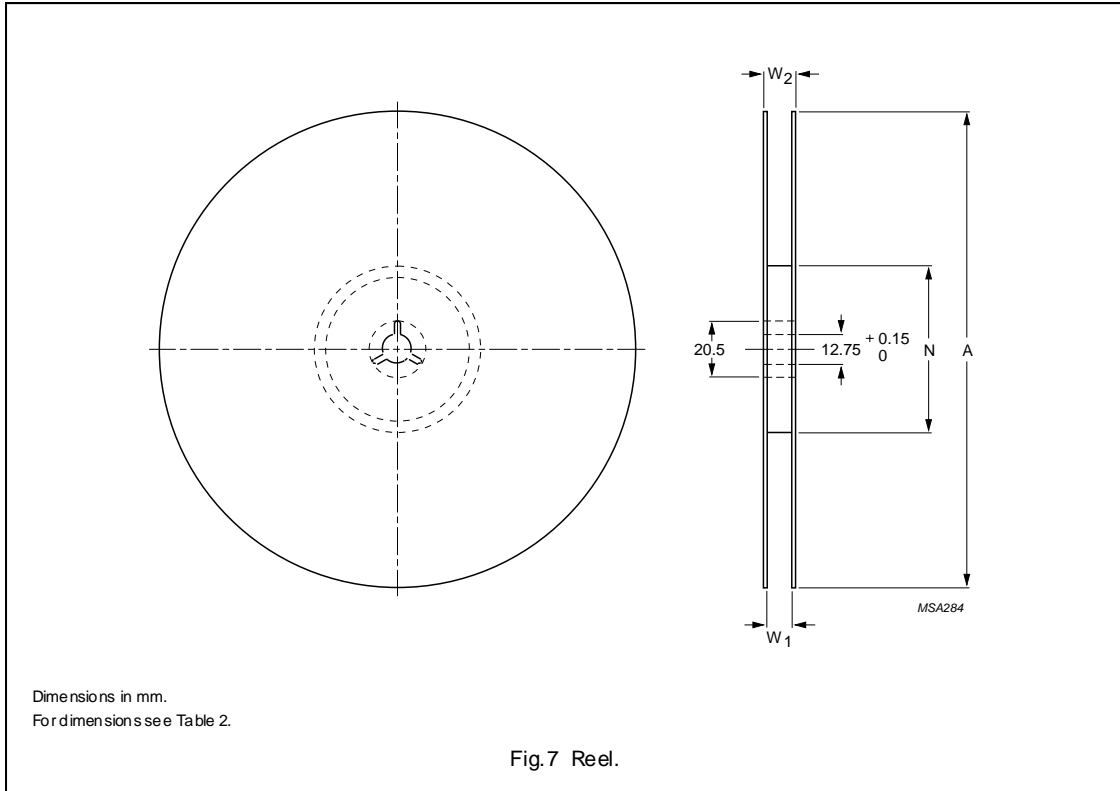


Fig.6 Leader/trailer tape.



**Table 2** Reel dimensions; see Fig.7

SIZE	DIMENSIONS (mm)			
	A	N	W <sub>1</sub>	W <sub>2</sub>
24	330	100 ±5	24.4	≤28.4

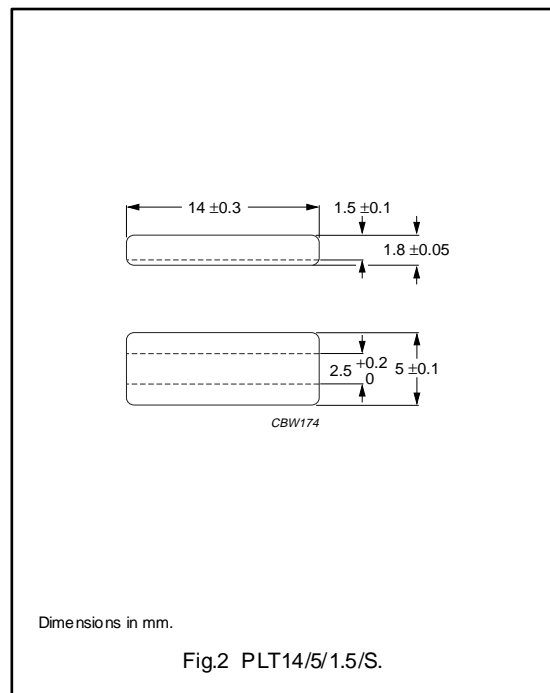
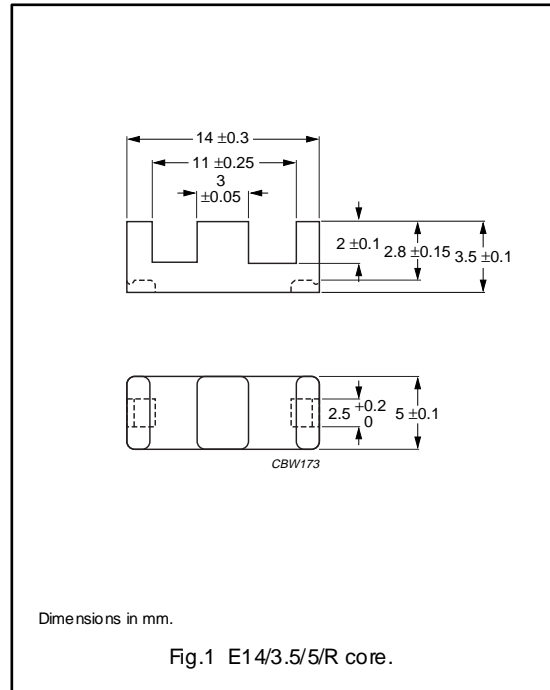
**CORES**

**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.15	mm <sup>-1</sup>
$V_e$	effective volume	230	mm <sup>3</sup>
$l_e$	effective length	16.4	mm
$A_e$	effective area	14.2	mm <sup>2</sup>
$A_{min}$	minimum area	10.9	mm <sup>2</sup>
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
3C92 <small>des</small>	PLT14/5/1.5/S-3C92
3C93 <small>des</small>	PLT14/5/1.5/S-3C93
3C94	PLT14/5/1.5/S-3C94
3C96 <small>des</small>	PLT14/5/1.5/S-3C96
3F3	PLT14/5/1.5/S-3F3
3F35 <small>prot</small>	PLT14/5/1.5/S-3F35
3F4 <small>des</small>	PLT14/5/1.5/S-3F4
3F45 <small>prot</small>	PLT14/5/1.5/S-3F45
3E6	PLT14/5/1.5/S-3E6



## Planar E cores and accessories

E14/3.5/5/R

**Core halves for use in combination with a slotted plate (PLT/S)**

$A_L$  measured in combination with a slotted plate (PLT/S) clamping force for  $A_L$  measurements  $10 \pm 5$  N; measurement coil as for E14/3.5/5.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5/R-3C90-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5/R-3C90-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5/R-3C90-A160-P
	$1500 \pm 25\%$	$\approx 1380$	$\approx 0$	E14/3.5/5/R-3C90
3C92 <b>des</b>	$1130 \pm 25\%$	$\approx 1040$	$\approx 0$	E14/3.5/5/R-3C92
3C93 <b>des</b>	$1300 \pm 25\%$	$\approx 1200$	$\approx 0$	E14/3.5/5/R-3C93
3C94	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5/R-3C94-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5/R-3C94-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5/R-3C94-A160-P
	$1500 \pm 25\%$	$\approx 1380$	$\approx 0$	E14/3.5/5/R-3C94
3C96 <b>des</b>	$1350 \pm 25\%$	$\approx 1240$	$\approx 0$	E14/3.5/5/R-3C96
3F3	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5/R-3F3-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5/R-3F3-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5/R-3F3-A160-P
	$1300 \pm 25\%$	$\approx 1200$	$\approx 0$	E14/3.5/5/R-3F3
3F35 <b>prot</b>	$1050 \pm 25\%$	$\approx 970$	$\approx 0$	E14/3.5/5/R-3F35
3F4 <b>des</b>	$63 \pm 3\%$	$\approx 58$	$\approx 600$	E14/3.5/5/R-3F4-A63-P
	$100 \pm 5\%$	$\approx 92$	$\approx 300$	E14/3.5/5/R-3F4-A100-P
	$160 \pm 8\%$	$\approx 148$	$\approx 150$	E14/3.5/5/R-3F4-A160-P
	$780 \pm 25\%$	$\approx 710$	$\approx 0$	E14/3.5/5/R-3F4
3F45 <b>prot</b>	$780 \pm 25\%$	$\approx 710$	$\approx 0$	E14/3.5/5/R-3F45
3E6	$6400 +40/-30\%$	$\approx 5900$	$\approx 0$	E14/3.5/5/R-3E6



## Planar E cores and accessories

E14/3.5/5/R

## Properties of 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	≤ 0.026	–	–	–
E14/R+PLT14/S-3C92	≥370	≤ 0.021	≤ 0.15	–	–
E14/R+PLT14/S-3C93	≥320	≤ 0.021 <sup>(1)</sup>	≤ 0.15 <sup>(1)</sup>	–	–
E14/R+PLT14/S-3C94	≥320	≤ 0.021	≤ 0.15	–	–
E14/R+PLT14/S-3C96	≥340	≤ 0.016	≤ 0.12	≤ 0.045	≤ 0.09
E14/R+PLT14/S-3F3	≥300	≤ 0.027	–	≤ 0.047	–
E14/R+PLT14/S-3F35	≥300	–	–	≤ 0.024	≤ 0.035
E14/R+PLT14/S-3F4	≥250	–	–	–	–
E14/R+PLT14/S-3F45	≥250	–	–	–	–

1. Measured at 140 °C.

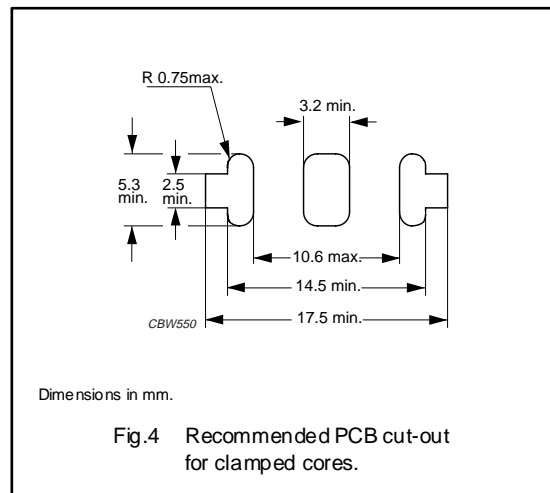
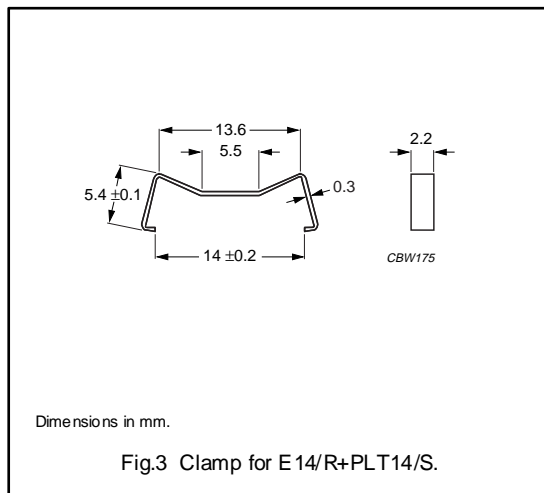
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E14/R+PLT14/S-3C90	≥320	–	–	–	–
E14/R+PLT14/S-3C92	≥370	–	–	–	–
E14/R+PLT14/S-3C93	≥320	–	–	–	–
E14/R+PLT14/S-3C94	≥320	–	–	–	–
E14/R+PLT14/S-3C96	≥340	–	–	–	–
E14/R+PLT14/S-3F3	≥300	–	–	–	–
E14/R+PLT14/S-3F35	≥300	≤ 0.027	–	–	–
E14/R+PLT14/S-3F4	≥250	–	≤ 0.07	–	≤ 0.11
E14/R+PLT14/S-3F45	≥250	–	≤ 0.05	≤ 0.12	≤ 0.085

**MOUNTING PARTS**

**General data and ordering information**

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E14/PLT14



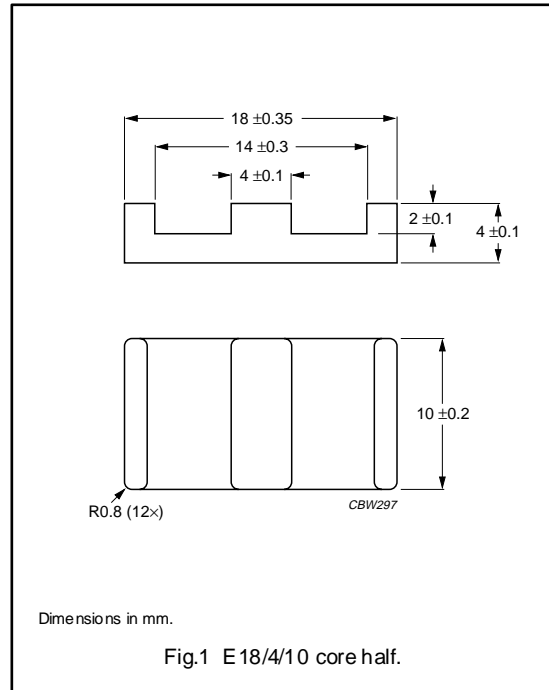
**BLISTER TAPE AND REEL**

For blister tape dimensions and construction and reel dimensions, see data sheet "E14/3.5/5".

**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.616	mm <sup>-1</sup>
$V_e$	effective volume	960	mm <sup>3</sup>
$l_e$	effective length	24.3	mm
$A_e$	effective area	39.3	mm <sup>2</sup>
$A_{min}$	minimum area	39.3	mm <sup>2</sup>
$m$	mass of core half	≈ 2.4	g

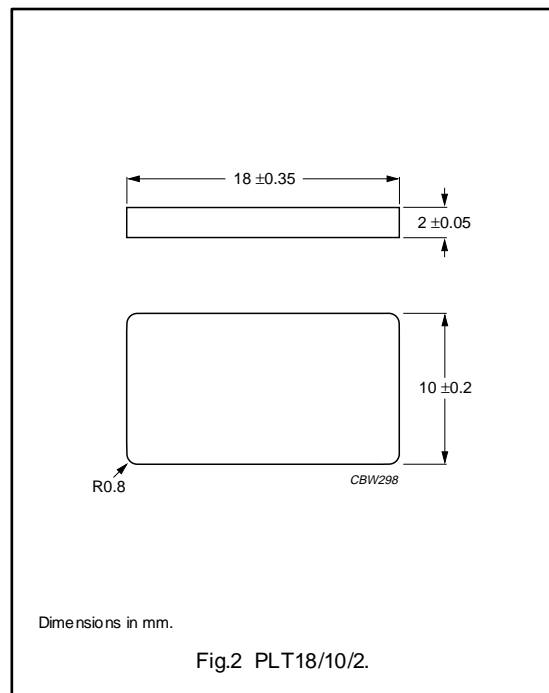


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.514	mm <sup>-1</sup>
$V_e$	effective volume	800	mm <sup>3</sup>
$l_e$	effective length	20.3	mm
$A_e$	effective area	39.5	mm <sup>2</sup>
$A_{min}$	minimum area	39.5	mm <sup>2</sup>
$m$	mass of plate	≈ 1.7	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT18/10/2-3C90
3C92 <small>des</small>	PLT18/10/2-3C92
3C93 <small>des</small>	PLT18/10/2-3C93
3C94	PLT18/10/2-3C94
3C96 <small>des</small>	PLT18/10/2-3C96
3F3	PLT18/10/2-3F3
3F35 <small>prot</small>	PLT18/10/2-3F35
3F4 <small>des</small>	PLT18/10/2-3F4
3F45 <small>prot</small>	PLT18/10/2-3F45
3E6	PLT18/10/2-3E6









## Planar E cores and accessories

E18/4/10

**Core halves for use in combination with a non-gapped E core**

$A_L$  measured in combination with a non-gapped core half, clamping force for  $A_L$  measurements,  $20 \pm 10$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	100 $\pm$ 3%	$\approx$ 49	$\approx$ 800	E18/4/10-3C90-A100-E
	160 $\pm$ 3%	$\approx$ 78	$\approx$ 420	E18/4/10-3C90-A160-E
	250 $\pm$ 5%	$\approx$ 123	$\approx$ 220	E18/4/10-3C90-A250-E
	315 $\pm$ 8%	$\approx$ 154	$\approx$ 170	E18/4/10-3C90-A315-E
	3200 $\pm$ 25%	$\approx$ 1560	$\approx$ 0	E18/4/10-3C90
3C92 	2330 $\pm$ 25%	$\approx$ 1140	$\approx$ 0	E18/4/10-3C92
3C93 	2700 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E18/4/10-3C93
3C94	100 $\pm$ 3%	$\approx$ 49	$\approx$ 800	E18/4/10-3C94-A100-E
	160 $\pm$ 3%	$\approx$ 78	$\approx$ 420	E18/4/10-3C94-A160-E
	250 $\pm$ 5%	$\approx$ 123	$\approx$ 220	E18/4/10-3C94-A250-E
	315 $\pm$ 8%	$\approx$ 154	$\approx$ 170	E18/4/10-3C94-A315-E
	3200 $\pm$ 25%	$\approx$ 1560	$\approx$ 0	E18/4/10-3C94
3C96 	2900 $\pm$ 25%	$\approx$ 1410	$\approx$ 0	E18/4/10-3C96
3F3	100 $\pm$ 3%	$\approx$ 49	$\approx$ 800	E18/4/10-3F3-A100-E
	160 $\pm$ 3%	$\approx$ 78	$\approx$ 420	E18/4/10-3F3-A160-E
	250 $\pm$ 5%	$\approx$ 123	$\approx$ 220	E18/4/10-3F3-A250-E
	315 $\pm$ 8%	$\approx$ 154	$\approx$ 170	E18/4/10-3F3-A315-E
	2700 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E18/4/10-3F3
3F35 	2200 $\pm$ 25%	$\approx$ 1070	$\approx$ 0	E18/4/10-3F35
3F4 	100 $\pm$ 3%	$\approx$ 49	$\approx$ 800	E18/4/10-3F4-A100-E
	160 $\pm$ 3%	$\approx$ 78	$\approx$ 420	E18/4/10-3F4-A160-E
	250 $\pm$ 5%	$\approx$ 123	$\approx$ 220	E18/4/10-3F4-A250-E
	315 $\pm$ 8%	$\approx$ 154	$\approx$ 170	E18/4/10-3F4-A315-E
	1550 $\pm$ 25%	$\approx$ 760	$\approx$ 0	E18/4/10-3F4
3F45 	1550 $\pm$ 25%	$\approx$ 760	$\approx$ 0	E18/4/10-3F45
3E6	13 500 $\pm$ 40/-30%	$\approx$ 6600	$\approx$ 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,  $20 \pm 10$  N, using a PCB coil containing 4 layers of 8 tracks each, total height 1.6 mm.

GRADE	$A_L^{(1)}$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	100 $\pm$ 3%	$\approx$ 41	$\approx$ 870	E18/4/10-3C90-A100-P
	160 $\pm$ 3%	$\approx$ 65	$\approx$ 470	E18/4/10-3C90-A160-P
	250 $\pm$ 5%	$\approx$ 102	$\approx$ 240	E18/4/10-3C90-A250-P
	315 $\pm$ 8%	$\approx$ 129	$\approx$ 170	E18/4/10-3C90-A315-P
	3680 $\pm$ 25%	$\approx$ 1500	$\approx$ 0	E18/4/10-3C90
3C92 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	2690 $\pm$ 25%	$\approx$ 1100	$\approx$ 0	E18/4/10-3C92
3C93 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	3100 $\pm$ 25%	$\approx$ 1270	$\approx$ 0	E18/4/10-3C93
3C94	100 $\pm$ 3%	$\approx$ 41	$\approx$ 870	E18/4/10-3C94-A100-P
	160 $\pm$ 3%	$\approx$ 65	$\approx$ 470	E18/4/10-3C94-A160-P
	250 $\pm$ 5%	$\approx$ 102	$\approx$ 240	E18/4/10-3C94-A250-P
	315 $\pm$ 8%	$\approx$ 129	$\approx$ 170	E18/4/10-C94-A315-P
	3680 $\pm$ 25%	$\approx$ 1500	$\approx$ 0	E18/4/10-3C94
3C96 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	3250 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E18/4/10-3C96
3F3	100 $\pm$ 3%	$\approx$ 41	$\approx$ 870	E18/4/10-3F3-A100-P
	160 $\pm$ 3%	$\approx$ 65	$\approx$ 470	E18/4/10-3F3-A160-P
	250 $\pm$ 5%	$\approx$ 102	$\approx$ 240	E18/4/10-3F3-A250-P
	<span style="background-color: black; color: white; padding: 0 2px;">prot</span> 315 $\pm$ 8%	$\approx$ 129	$\approx$ 170	E18/4/10-3F3-A315-P
	3100 $\pm$ 25%	$\approx$ 1270	$\approx$ 0	E18/4/10-3F3
3F35 <span style="background-color: black; color: white; padding: 0 2px;">prot</span>	2500 $\pm$ 25%	$\approx$ 1020	$\approx$ 0	E18/4/10-3F35
3F4 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	100 $\pm$ 3%	$\approx$ 41	$\approx$ 870	E18/4/10-3F4-A100-P
	160 $\pm$ 3%	$\approx$ 65	$\approx$ 470	E18/4/10-3F4-A160-P
	250 $\pm$ 5%	$\approx$ 102	$\approx$ 240	E18/4/10-3F4-A250-P
	315 $\pm$ 8%	$\approx$ 129	$\approx$ 170	E18/4/10-3F4-A315-P
	1800 $\pm$ 25%	$\approx$ 740	$\approx$ 0	E18/4/10-3F4
3F45 <span style="background-color: black; color: white; padding: 0 2px;">prot</span>	1800 $\pm$ 25%	$\approx$ 740	$\approx$ 0	E18/4/10-3F45
3E6	15 500 $\pm$ 40/-30%	$\approx$ 6400	$\approx$ 0	E18/4/10-3E6

## Planar E cores and accessories

E18/4/10

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E+E18-3C90	≥320	≤ 0.105	–	–	–
E+PLT18-3C90	≥320	≤ 0.095	–	–	–
E+E18-3C92	≥370	≤ 0.085	≤ 0.6	–	–
E+PLT18-3C92	≥370	≤ 0.075	≤ 0.5	–	–
E+E18-3C93	≥320	≤ 0.085 <sup>(1)</sup>	≤ 0.6 <sup>(1)</sup>	–	–
E+PLT18-3C93	≥320	≤ 0.075 <sup>(1)</sup>	≤ 0.5 <sup>(1)</sup>	–	–
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	≤ 0.35
E+PLT18-3C96	≥320	≤ 0.06	≤ 0.4	≤ 0.15	≤ 0.3
E+E18-3F3	≥300	≤ 0.11	–	≤ 0.19	–
E+PLT18-3F3	≥300	≤ 0.09	–	≤ 0.16	–
E+E18-3F35	≥300	–	–	≤ 0.09	≤ 0.13
E+PLT18-3F35	≥300	–	–	≤ 0.08	≤ 0.12

1. Measured at 140 °C.

## 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; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E18-3F35	≥300	≤ 1.0	–	–	–
E+PLT18-3F35	≥300	≤ 0.9	–	–	–
E+E18-3F4	≥250	–	≤ 0.3	–	≤ 0.45
E+PLT18-3F4	≥250	–	≤ 0.24	–	≤ 0.39
E+E18-3F45	≥250	–	≤ 0.2	≤ 0.48	≤ 0.35
E+PLT18-3F45	≥250	–	≤ 0.16	≤ 0.4	≤ 0.3

**MOUNTING INFORMATION**

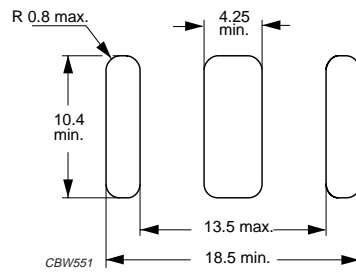
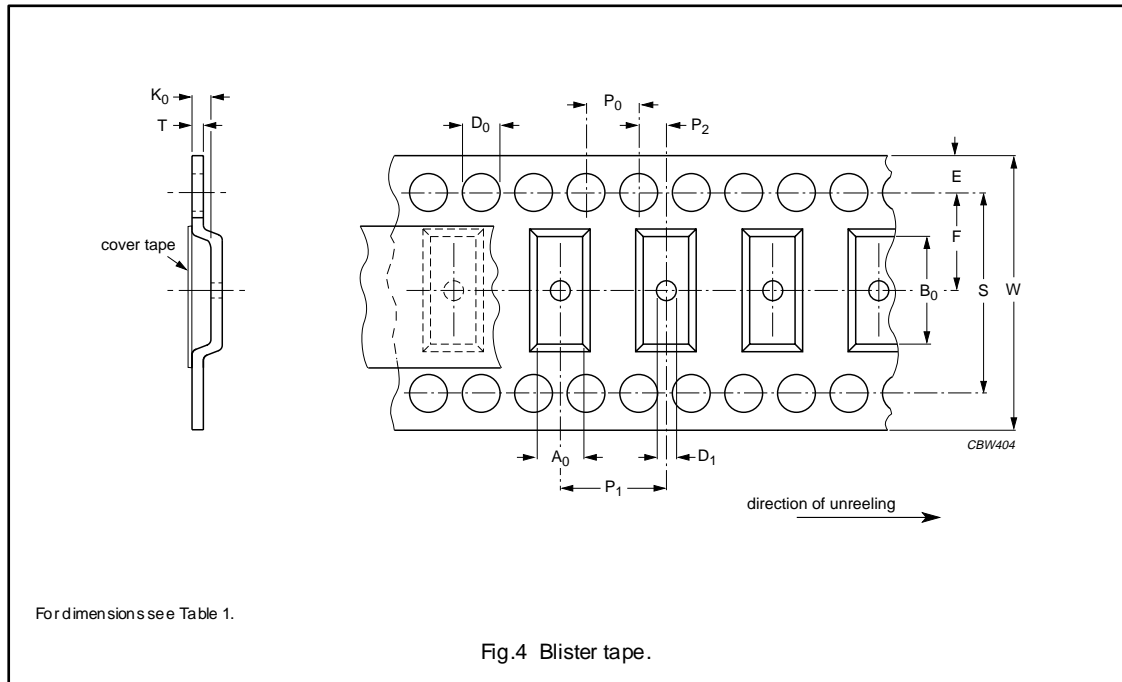


Fig.3 Recommended PCB cut-out for glued planar E18/4/10 cores.

**BLISTER TAPE AND REEL DIMENSIONS** prot



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

SIZE	DIMENSIONS (mm)
$A_0$	$10.5 \pm 0.2$
$B_0$	$18.7 \pm 0.2$
$K_0$	$4.5 \pm 0.2$
$T$	$0.3 \pm 0.05$
$W$	$32.0 \pm 0.3$
$E$	$1.75 \pm 0.1$
$F$	$14.2 \pm 0.1$
$D_0$	$1.5 \pm 0.1$
$D_1$	$\geq 2.0$
$P_0$	$4.0 \pm 0.1$
$P_1$	$16.0 \pm 0.1$
$P_2$	$2.0 \pm 0.1$
$S$	$28.4 \pm 0.1$



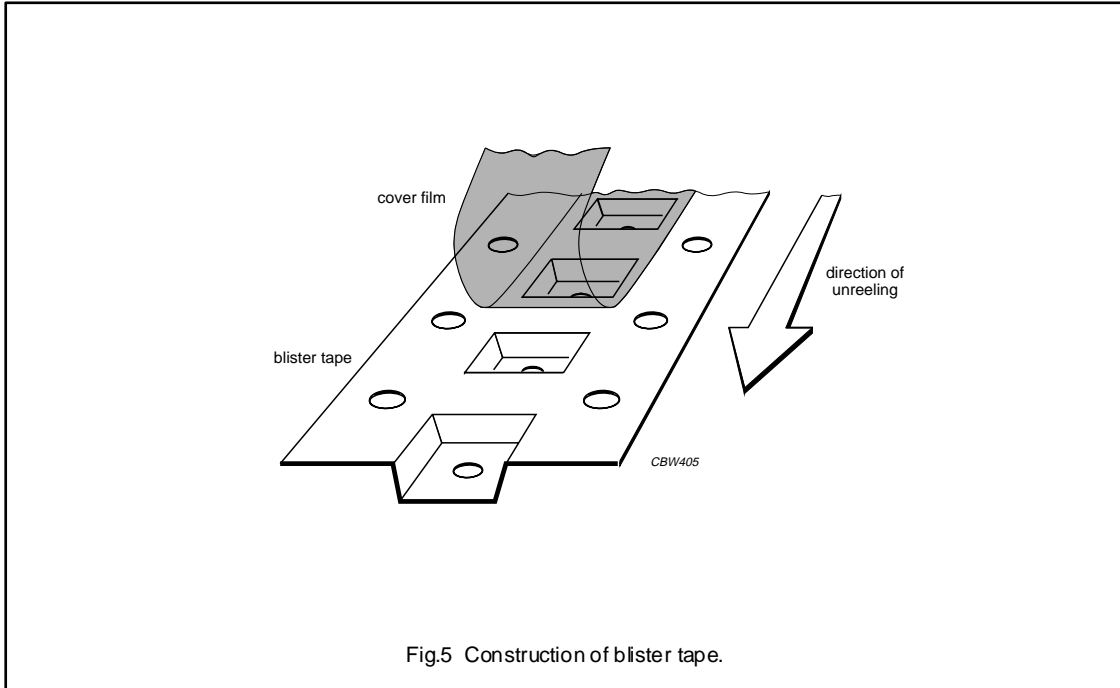
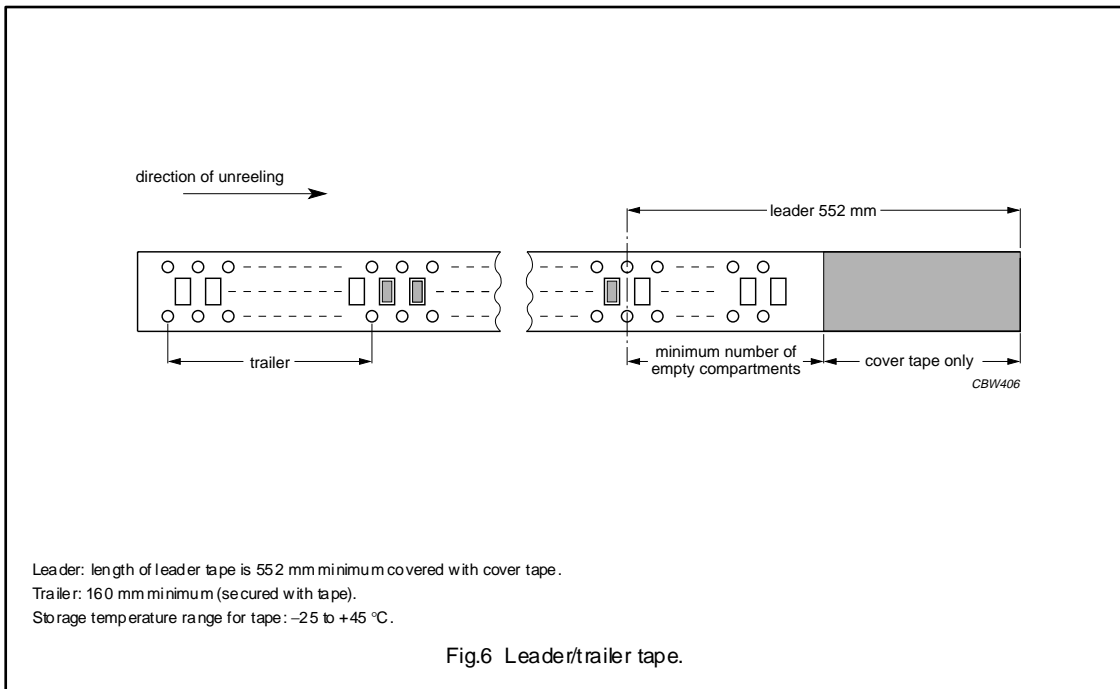
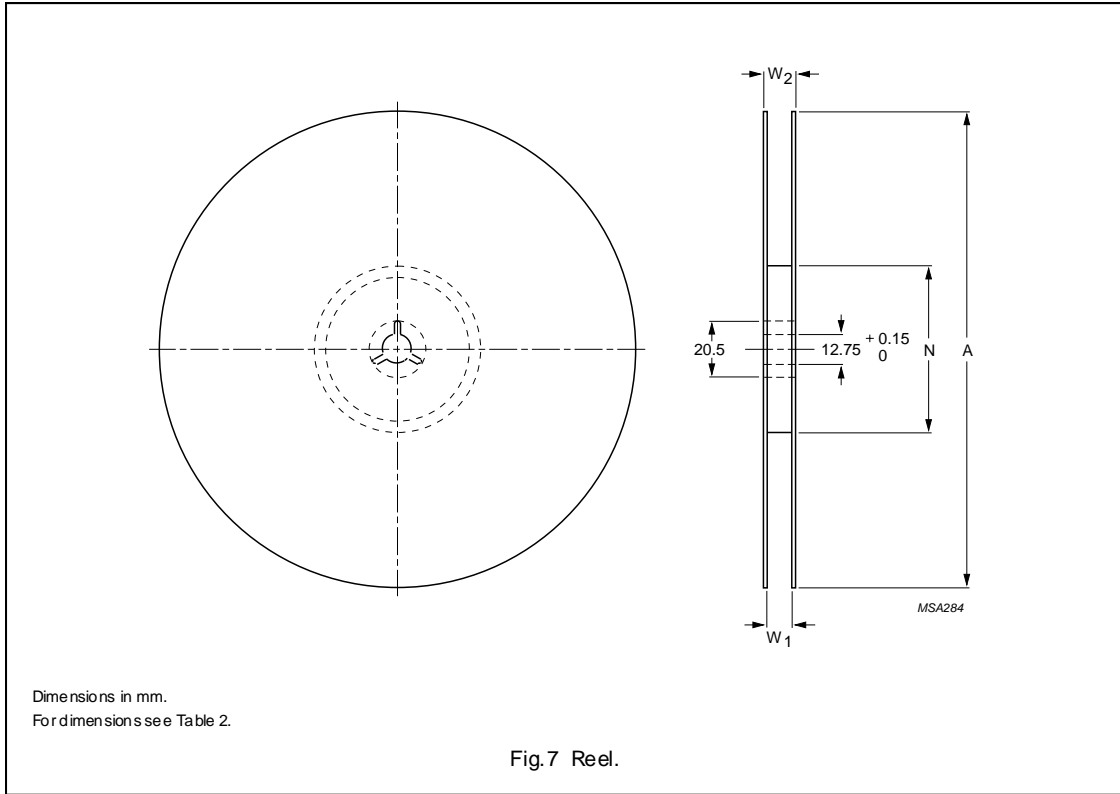


Fig.5 Construction of blister tape.



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.



**Table 2** Reel dimensions; see Fig.7

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
32	330	100 ±5	32.4	≤36.4

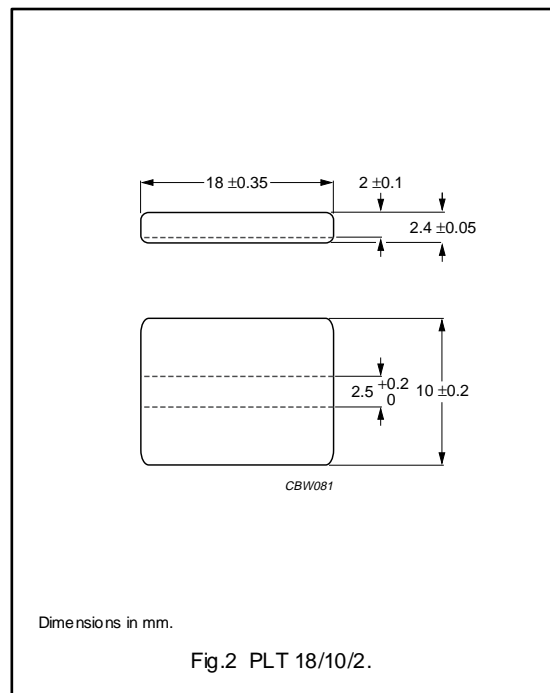
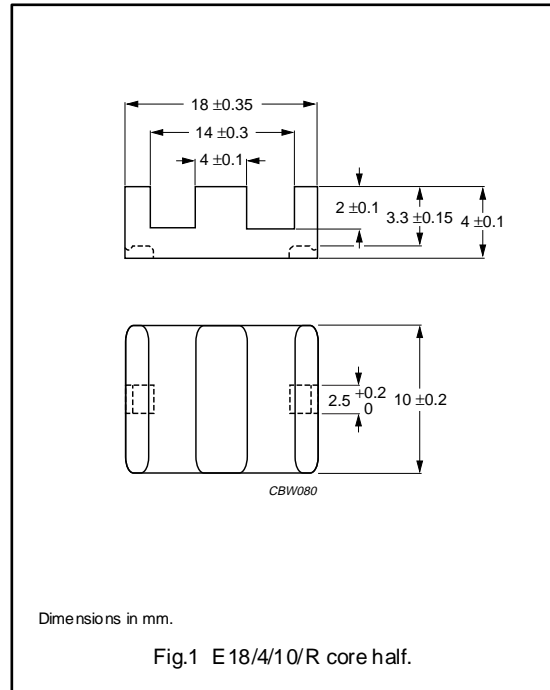
**CORES**

**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.498	mm <sup>-1</sup>
$V_e$	effective volume	830	mm <sup>3</sup>
$l_e$	effective length	20.3	mm
$A_e$	effective area	39.5	mm <sup>2</sup>
$A_{min}$	minimum area	35.9	mm <sup>2</sup>
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
3C92 <small>des</small>	PLT18/10/2/S-3C92
3C93 <small>des</small>	PLT18/10/2/S-3C93
3C94	PLT18/10/2/S-3C94
3C96 <small>des</small>	PLT18/10/2/S-3C96
3F3	PLT18/10/2/S-3F3
3F35 <small>prot</small>	PLT18/10/2/S-3F35
3F4 <small>des</small>	PLT18/10/2/S-3F4
3F45 <small>prot</small>	PLT18/10/2/S-3F45
3E6	PLT18/10/2/S-3E6



## 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,  $20 \pm 10$  N; measurement coil as for E18/4/10.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$100 \pm 3\%$	$\approx 41$	$\approx 870$	E18/4/10/R-3C90-A100-P
	$160 \pm 3\%$	$\approx 65$	$\approx 470$	E18/4/10/R-3C90-A160-P
	$250 \pm 5\%$	$\approx 102$	$\approx 240$	E18/4/10/R-3C90-A250-P
	$315 \pm 8\%$	$\approx 129$	$\approx 170$	E18/4/10/R-3C90-A315-P
	$3680 \pm 25\%$	$\approx 1500$	$\approx 0$	E18/4/10/R-3C90
3C92 <small>des</small>	$2690 \pm 25\%$	$\approx 1070$	$\approx 0$	E18/4/10/R-3C92
3C93 <small>des</small>	$3100 \pm 25\%$	$\approx 1230$	$\approx 0$	E18/4/10/R-3C93
3C94	$100 \pm 3\%$	$\approx 41$	$\approx 870$	E18/4/10/R-3C94-A100-P
	$160 \pm 3\%$	$\approx 65$	$\approx 470$	E18/4/10/R-3C94-A160-P
	$250 \pm 5\%$	$\approx 102$	$\approx 240$	E18/4/10/R-3C94-A250-P
	$315 \pm 8\%$	$\approx 129$	$\approx 170$	E18/4/10/R-3C94-A315-P
	$3680 \pm 25\%$	$\approx 1500$	$\approx 0$	E18/4/10/R-3C94
3C96 <small>des</small>	$3250 \pm 25\%$	$\approx 1320$	$\approx 0$	E18/4/10/R-3C96
3F3 <small>prot</small>	$100 \pm 3\%$	$\approx 41$	$\approx 870$	E18/4/10/R-3F3-A100-P
	$160 \pm 3\%$	$\approx 65$	$\approx 470$	E18/4/10/R-3F3-A160-P
	$250 \pm 5\%$	$\approx 102$	$\approx 240$	E18/4/10/R-3F3-A250-P
	$315 \pm 8\%$	$\approx 129$	$\approx 170$	E18/4/10/R-3F3-A315-P
	$3100 \pm 25\%$	$\approx 1270$	$\approx 0$	E18/4/10/R-3F3
3F35 <small>prot</small>	$2500 \pm 25\%$	$\approx 1020$	$\approx 0$	E18/4/10/R-3F35
3F4 <small>des</small>	$100 \pm 3\%$	$\approx 41$	$\approx 870$	E18/4/10/R-3F4-A100-P
	$160 \pm 3\%$	$\approx 65$	$\approx 470$	E18/4/10/R-3F4-A160-P
	$250 \pm 5\%$	$\approx 102$	$\approx 240$	E18/4/10/R-3F4-A250-P
	$315 \pm 8\%$	$\approx 129$	$\approx 170$	E18/4/10/R-3F4-A315-P
	$1800 \pm 25\%$	$\approx 740$	$\approx 0$	E18/4/10/R-3F4
3F45 <small>prot</small>	$1800 \pm 25\%$	$\approx 740$	$\approx 0$	E18/4/10/R-3F45
3E6	$15500 +40/-30\%$	$\approx 6400$	$\approx 0$	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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	≤ 0.095	–	–	–
E18/R+PLT18/S-3C92	≥370	≤ 0.075	≤ 0.5	–	–
E18/R+PLT18/S-3C93	≥320	≤ 0.075 <sup>(1)</sup>	≤ 0.5 <sup>(1)</sup>	–	–
E18/R+PLT18/S-3C94	≥320	≤ 0.075	≤ 0.5	–	–
E18/R+PLT18/S-3C96	≥320	≤ 0.06	≤ 0.4	≤ 0.15	≤ 0.3
E18/R+PLT18/S-3F3	≥300	≤ 0.09	–	≤ 0.16	–
E18/R+PLT18/S-3F35	≥300	–	–	≤ 0.08	≤ 0.12
E18/R+PLT18/S-3F4	≥250	–	–	–	–
E18/R+PLT18/S-3F45	≥250	–	–	–	–

1. Measured at 140 °C.

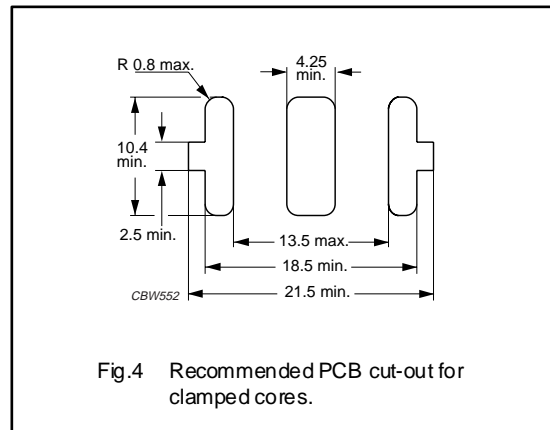
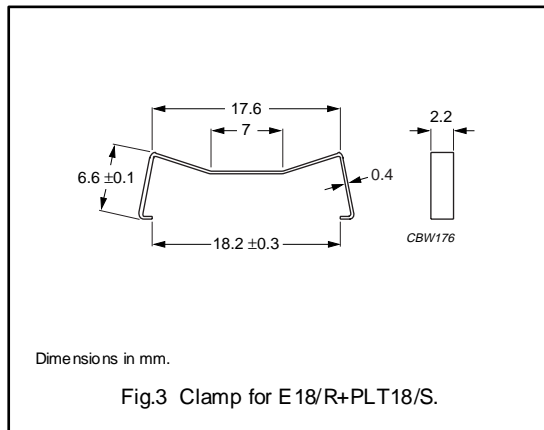
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E18/R+PLT18/S-3C90	≥320	–	–	–	–
E18/R+PLT18/S-3C92	≥370	–	–	–	–
E18/R+PLT18/S-3C93	≥320	–	–	–	–
E18/R+PLT18/S-3C94	≥320	–	–	–	–
E18/R+PLT18/S-3C96	≥320	–	–	–	–
E18/R+PLT18/S-3F3	≥300	–	–	–	–
E18/R+PLT18/S-3F35	≥300	≤ 0.9	–	–	–
E18/R+PLT18/S-3F4	≥250	–	≤ 0.24	–	≤ 0.39
E18/R+PLT18/S-3F45	≥250	–	≤ 0.16	≤ 0.4	≤ 0.3

**MOUNTING PARTS**

**General data and ordering information**

ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E 18/PLT18



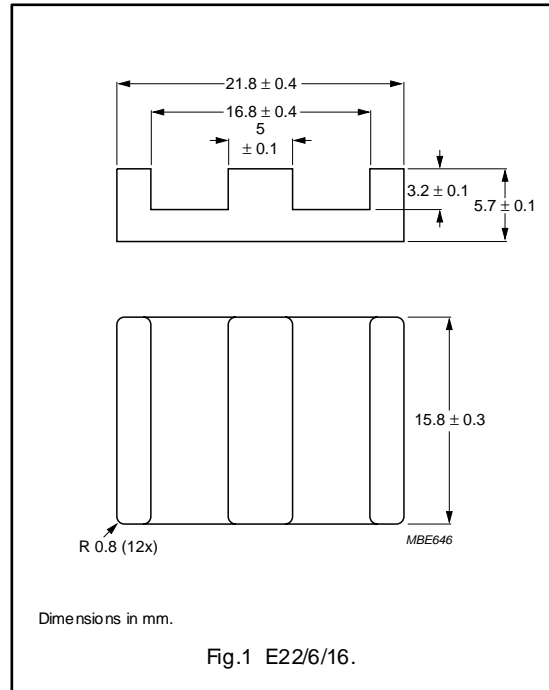
**BLISTER TAPE AND REEL**

For blister tape dimensions and construction and reel dimensions, see data sheet "E18/4/10".

**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.414	mm <sup>-1</sup>
$V_e$	effective volume	2550	mm <sup>3</sup>
$l_e$	effective length	32.5	mm
$A_e$	effective area	78.3	mm <sup>2</sup>
$A_{min}$	minimum area	78.3	mm <sup>2</sup>
$m$	mass of core half	≈ 6.5	g

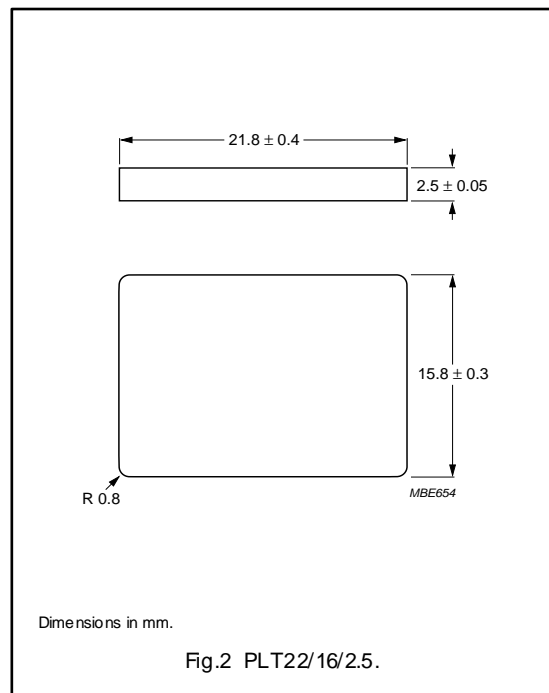


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.332	mm <sup>-1</sup>
$V_e$	effective volume	2040	mm <sup>3</sup>
$l_e$	effective length	26.1	mm
$A_e$	effective area	78.5	mm <sup>2</sup>
$A_{min}$	minimum area	78.5	mm <sup>2</sup>
$m$	mass of plate	≈ 4	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT22/16/2.5-3C90
3C92 <small>des</small>	PLT22/16/2.5-3C92
3C93 <small>des</small>	PLT22/16/2.5-3C93
3C94	PLT22/16/2.5-3C94
3C96 <small>des</small>	PLT22/16/2.5-3C96
3F3	PLT22/16/2.5-3F3
3F35 <small>prot</small>	PLT22/16/2.5-3F35
3F4 <small>des</small>	PLT22/16/2.5-3F4
3F45 <small>prot</small>	PLT22/16/2.5-3F45
3E6	PLT22/16/2.5-3E6



## Planar E cores and accessories

E22/6/16

**Core halves for use in combination with a non-gapped E core**

$A_L$  measured in combination with a non-gapped core half, clamping force for  $A_L$  measurements,  $20 \pm 10$  N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	160 $\pm$ 3%	$\approx$ 53	$\approx$ 900	E22/6/16-3C90-A160-E
	250 $\pm$ 3%	$\approx$ 82	$\approx$ 490	E22/6/16-3C90-A250-E
	315 $\pm$ 3%	$\approx$ 104	$\approx$ 360	E22/6/16-3C90-A315-E
	400 $\pm$ 5%	$\approx$ 132	$\approx$ 280	E22/6/16-3C90-A400-E
	630 $\pm$ 8%	$\approx$ 208	$\approx$ 160	E22/6/16-3C90-A630-E
	5150 $\pm$ 25%	$\approx$ 1700	$\approx$ 0	E22/6/16-3C90
3C92 <small>des</small>	3700 $\pm$ 25%	$\approx$ 1220	$\approx$ 0	E22/6/16-3C92
3C93 <small>des</small>	4300 $\pm$ 25%	$\approx$ 1420	$\approx$ 0	E22/6/16-3C93
3C94	160 $\pm$ 3%	$\approx$ 53	$\approx$ 900	E22/6/16-3C94-A160-E
	250 $\pm$ 3%	$\approx$ 82	$\approx$ 490	E22/6/16-3C94-A250-E
	315 $\pm$ 3%	$\approx$ 104	$\approx$ 360	E22/6/16-3C94-A315-E
	400 $\pm$ 5%	$\approx$ 132	$\approx$ 280	E22/6/16-3C94-A400-E
	630 $\pm$ 8%	$\approx$ 208	$\approx$ 160	E22/6/16-3C94-A630-E
	5150 $\pm$ 25%	$\approx$ 1700	$\approx$ 0	E22/6/16-3C94
3C96 <small>des</small>	4600 $\pm$ 25%	$\approx$ 1520	$\approx$ 0	E22/6/16-3C96
3F3	160 $\pm$ 3%	$\approx$ 53	$\approx$ 900	E22/6/16-3F3-A160-E
	250 $\pm$ 3%	$\approx$ 82	$\approx$ 490	E22/6/16-3F3-A250-E
	315 $\pm$ 3%	$\approx$ 104	$\approx$ 360	E22/6/16-3F3-A315-E
	400 $\pm$ 5%	$\approx$ 132	$\approx$ 280	E22/6/16-3F3-A400-E
	630 $\pm$ 8%	$\approx$ 208	$\approx$ 160	E22/6/16-3F3-A630-E
	4300 $\pm$ 25%	$\approx$ 1420	$\approx$ 0	E22/6/16-3F3
	3500 $\pm$ 25%	$\approx$ 1160	$\approx$ 0	E22/6/16-3F35
3F4 <small>des</small>	160 $\pm$ 3%	$\approx$ 53	$\approx$ 900	E22/6/16-3F4-A160-E
	250 $\pm$ 3%	$\approx$ 82	$\approx$ 490	E22/6/16-3F4-A250-E
	315 $\pm$ 3%	$\approx$ 104	$\approx$ 360	E22/6/16-3F4-A315-E
	400 $\pm$ 5%	$\approx$ 132	$\approx$ 280	E22/6/16-3F4-A400-E
	630 $\pm$ 8%	$\approx$ 208	$\approx$ 160	E22/6/16-3F4-A630-E
	2400 $\pm$ 25%	$\approx$ 790	$\approx$ 0	E22/6/16-3F4
	2400 $\pm$ 25%	$\approx$ 790	$\approx$ 0	E22/6/16-3F45
3F45 <small>prot</small>	2400 $\pm$ 25%	$\approx$ 790	$\approx$ 0	E22/6/16-3F45
3E6	22000 $\pm$ 40/-30%	$\approx$ 7250	$\approx$ 0	E22/6/16-3E6



## Planar E cores and accessories

E22/6/16

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

$A_L$  measured in combination with a plate (PLT), clamping force for  $A_L$  measurements,  $20 \pm 10$  N, using a PCB coil containing 5 layers of 20 tracks each, total height 2.5 mm.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16-3C90-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16-3C90-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16-3C90-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16-3C90-A630-P
	6150 $\pm$ 25%	$\approx$ 1620	$\approx$ 0	E22/6/16-3C90
3C92 <small>des</small>	4410 $\pm$ 25%	$\approx$ 1170	$\approx$ 0	E22/6/16-3C92
3C93 <small>des</small>	5000 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E22/6/16-3C93
3C94	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16-3C94-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16-3C94-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16-3C94-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16-3C94-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16-3C94-A630-P
	6150 $\pm$ 25%	$\approx$ 1620	$\approx$ 0	E22/6/16-3C94
3C96 <small>des</small>	5450 $\pm$ 25%	$\approx$ 1440	$\approx$ 0	E22/6/16-3C96
3F3	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16-3F3-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16-3F3-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16-3F3-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16-3F3-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16-3F3-A630-P
	5000 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E22/6/16-3F3
3F35 <small>prot</small>	4100 $\pm$ 25%	$\approx$ 1080	$\approx$ 0	E22/6/16-3F35
3F4 <small>des</small>	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16-3F4-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16-3F4-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16-3F4-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16-3F4-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16-3F4-A630-P
	2900 $\pm$ 25%	$\approx$ 770	$\approx$ 0	E22/6/16-3F4
3F45 <small>prot</small>	2900 $\pm$ 25%	$\approx$ 770	$\approx$ 0	E22/6/16-3F45
3E6	26000 $\pm$ 40/-30%	$\approx$ 6900	$\approx$ 0	E22/6/16-3E6

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E+E22-3C90	≥320	≤ 0.28	–	–	–
E+PLT22-3C90	≥320	≤ 0.23	–	–	–
E+E22-3C92	≥370	≤ 0.22	≤ 1.5	–	–
E+PLT22-3C92	≥370	≤ 0.18	≤ 1.25	–	–
E+E22-3C93	≥320	≤ 0.22 <sup>(1)</sup>	≤ 1.5 <sup>(1)</sup>	–	–
E+PLT22-3C93	≥320	≤ 0.18 <sup>(1)</sup>	≤ 1.25 <sup>(1)</sup>	–	–
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	≤ 1.0
E+PLT22-3C96	≥320	≤ 0.14	≤ 1.0	≤ 0.38	≤ 0.75
E+E22-3F3	≥300	≤ 0.28	–	≤ 0.5	–
E+PLT22-3F3	≥300	≤ 0.23	–	≤ 0.40	–
E+E22-3F35	≥300	–	–	≤ 0.25	≤ 0.4
E+PLT22-3F35	≥300	–	–	≤ 0.2	≤ 0.3

1. Measured at 140 °C.

## Properties of core sets under power conditions (continued)

GRADE	B (mT) at				
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E22-3F35	≥300	≤ 3.0	–	–	–
E+PLT22-3F35	≥300	≤ 2.2	–	–	–
E+E22-3F4	≥250	–	≤ 0.8	–	≤ 1.2
E+PLT22-3F4	≥250	–	≤ 0.6	–	≤ 1.0
E+E22-3F45	≥250	–	≤ 0.51	≤ 1.3	≤ 0.9
E+PLT22-3F45	≥250	–	≤ 0.41	≤ 1.1	≤ 0.72

**MOUNTING INFORMATION**

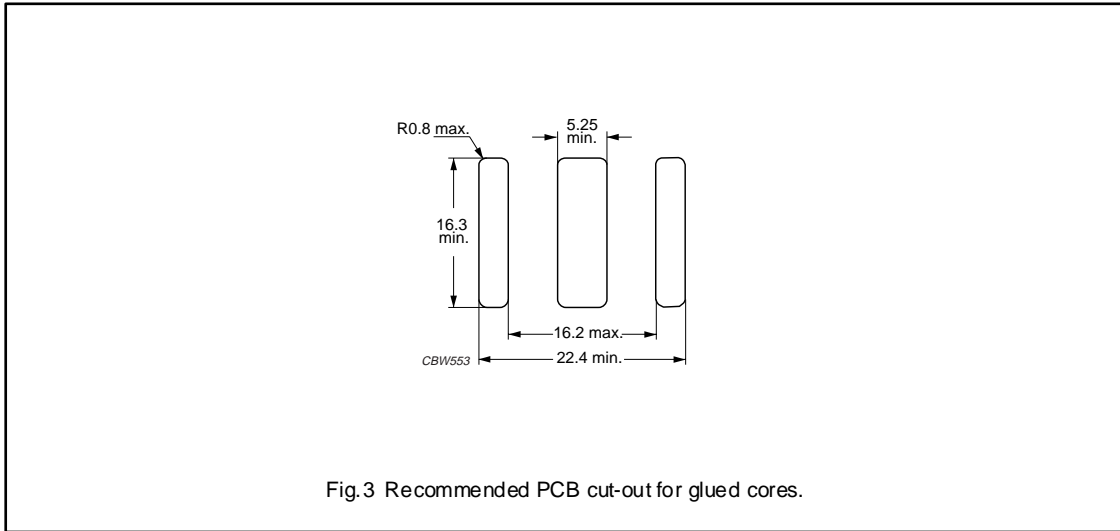


Fig.3 Recommended PCB cut-out for glued cores.

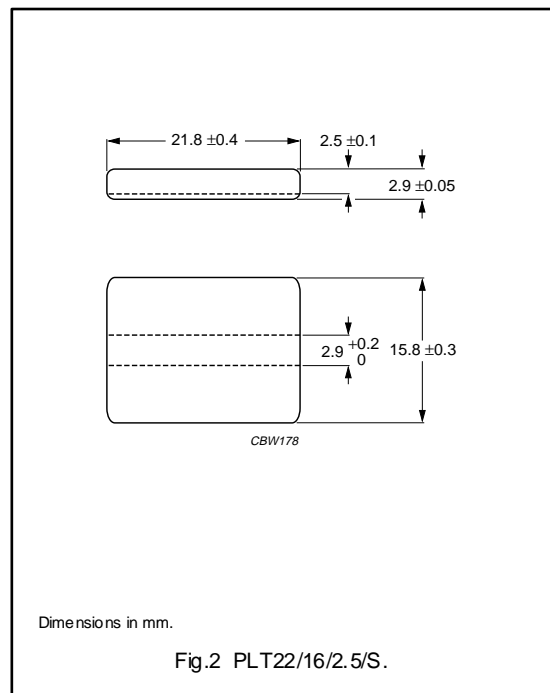
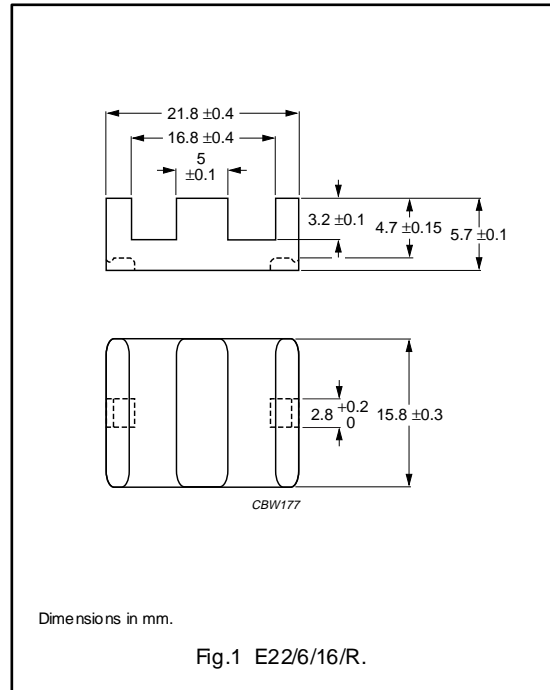
**CORES**

**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.324	mm <sup>-1</sup>
$V_e$	effective volume	2100	mm <sup>3</sup>
$l_e$	effective length	26.1	mm
$A_e$	effective area	78.5	mm <sup>2</sup>
$A_{min}$	minimum area	72.6	mm <sup>2</sup>
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
3C92 <small>des</small>	PLT22/16/2.5/S-3C92
3C93 <small>des</small>	PLT22/16/2.5/S-3C93
3C94	PLT22/16/2.5/S-3C94
3C96 <small>des</small>	PLT22/16/2.5/S-3C96
3F3	PLT22/16/2.5/S-3F3
3F35 <small>prot</small>	PLT22/16/2.5/S-3F35
3F4 <small>des</small>	PLT22/16/2.5/S-3F4
3F45 <small>prot</small>	PLT22/16/2.5/S-3F45
3E6	PLT22/16/2.5/S-3E6



## 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,  $20 \pm 10$  N; measurement coil as for E22/6/16.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16/R-3C90-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16/R-3C90-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16/R-3C90-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16/R-3C90-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16/R-3C90-A630-P
	6150 $\pm$ 25%	$\approx$ 1620	$\approx$ 0	E22/6/16/R-3C90
3C92 <small>des</small>	4410 $\pm$ 25%	$\approx$ 1140	$\approx$ 0	E22/6/16/R-3C92
3C93 <small>des</small>	5000 $\pm$ 25%	$\approx$ 1290	$\approx$ 0	E22/6/16/R-3C93
3C94	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16/R-3C94-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16/R-3C94-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16/R-3C94-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16/R-3C94-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16/R-3C94-A630-P
	6150 $\pm$ 25%	$\approx$ 1620	$\approx$ 0	E22/6/16/R-3C94
3C96 <small>des</small>	5450 $\pm$ 25%	$\approx$ 1440	$\approx$ 0	E22/6/16/R-3C96
3F3	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16/R-3F3-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16/R-3F3-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16/R-3F3-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16/R-3F3-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16/R-3F3-A630-P
	5000 $\pm$ 25%	$\approx$ 1320	$\approx$ 0	E22/6/16/R-3F3
3F35 <small>prot</small>	4100 $\pm$ 25%	$\approx$ 1080	$\approx$ 0	E22/6/16/R-3F35
3F4 <small>des</small>	160 $\pm$ 3%	$\approx$ 42	$\approx$ 950	E22/6/16/R-3F4-A160-P
	250 $\pm$ 3%	$\approx$ 66	$\approx$ 550	E22/6/16/R-3F4-A250-P
	315 $\pm$ 3%	$\approx$ 83	$\approx$ 400	E22/6/16/R-3F4-A315-P
	400 $\pm$ 5%	$\approx$ 106	$\approx$ 280	E22/6/16/R-3F4-A400-P
	630 $\pm$ 8%	$\approx$ 166	$\approx$ 160	E22/6/16/R-3F4-A630-P
	2900 $\pm$ 25%	$\approx$ 770	$\approx$ 0	E22/6/16/R-3F4
3F45 <small>prot</small>	2900 $\pm$ 25%	$\approx$ 770	$\approx$ 0	E22/6/16/R-3F45
3E6	26000 $\pm$ 40/-30%	$\approx$ 6900	$\approx$ 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
E22/R+PLT22/S-3C90	≥320	≤ 0.23	–	–	–
E22/R+PLT22/S-3C92	≥370	≤ 0.18	≤ 1.25	–	–
E22/R+PLT22/S-3C93	≥320	≤ 0.18 <sup>(1)</sup>	≤ 1.25 <sup>(1)</sup>	–	–
E22/R+PLT22/S-3C94	≥320	≤ 0.18	≤ 1.25	–	–
E22/R+PLT22/S-3C96	≥320	≤ 0.14	≤ 1.0	≤ 0.38	≤ 0.75
E22/R+PLT22/S-3F3	≥300	≤ 0.23	–	≤ 0.4	–
E22/R+PLT22/S-3F35	≥300	–	–	≤ 0.2	≤ 0.3
E22/R+PLT22/S-3F4	≥250	–	–	–	–
E22/R+PLT22/S-3F45	≥250	–	–	–	–

1. Measured at 140 °C.

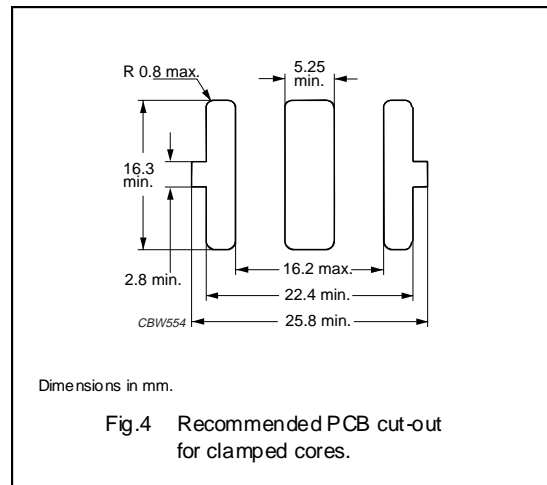
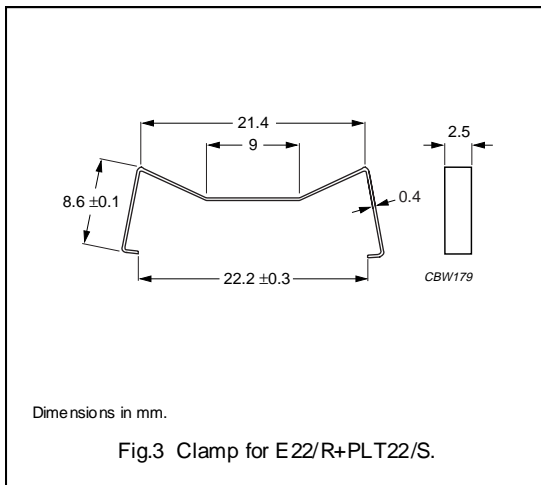
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E22/R+PLT22/S-3C90	≥320	–	–	–	–
E22/R+PLT22/S-3C92	≥370	–	–	–	–
E22/R+PLT22/S-3C93	≥320	–	–	–	–
E22/R+PLT22/S-3C94	≥320	–	–	–	–
E22/R+PLT22/S-3C96	≥320	–	–	–	–
E22/R+PLT22/S-3F3	≥300	–	–	–	–
E22/R+PLT22/S-3F35	≥300	≤ 2.2	–	–	–
E22/R+PLT22/S-3F4	≥250	–	≤ 0.6	–	≤ 1.0
E22/R+PLT22/S-3F45	≥250	–	≤ 0.41	≤ 1.1	≤ 0.72

**MOUNTING PARTS**

**General data and ordering information**

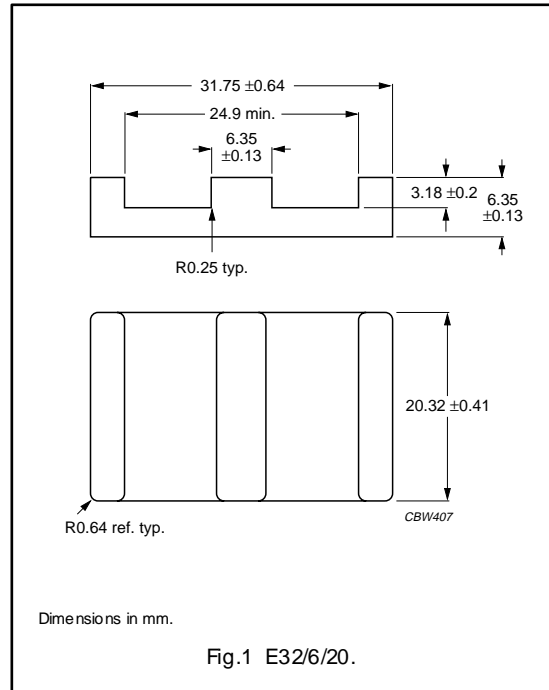
ITEM	MATERIAL	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-E 22/PLT22



**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.323	mm <sup>-1</sup>
$V_e$	effective volume	5 380	mm <sup>3</sup>
$l_e$	effective length	41.4	mm
$A_e$	effective area	130	mm <sup>2</sup>
$A_{min}$	minimum area	130	mm <sup>2</sup>
$m$	mass of core half	≈ 13	g

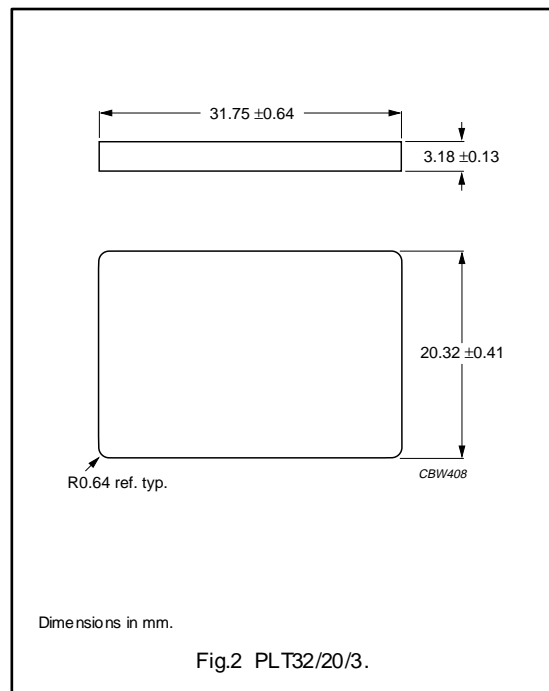


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.278	mm <sup>-1</sup>
$V_e$	effective volume	4560	mm <sup>3</sup>
$l_e$	effective length	35.1	mm
$A_e$	effective area	130	mm <sup>2</sup>
$A_{min}$	minimum area	130	mm <sup>2</sup>
$m$	mass of plate	≈ 10	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT32/20/3-3C90
3C92 <small>des</small>	PLT32/20/3-3C92
3C93 <small>des</small>	PLT32/20/3-3C93
3C94	PLT32/20/3-3C94
3C96 <small>des</small>	PLT32/20/3-3C96
3F3	PLT32/20/3-3F3
3F4 <small>des</small>	PLT32/20/3-3F4





## Planar E cores and accessories

E32/6/20

**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,  $30 \pm 10$  N, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$160 \pm 3\%^{(1)}$	$\approx 41$	$\approx 1200$	E32/6/20-3C90-E160-E
	$250 \pm 3\%^{(1)}$	$\approx 64$	$\approx 700$	E32/6/20-3C90-E250-E
	$315 \pm 3\%$	$\approx 81$	$\approx 550$	E32/6/20-3C90-A315-E
	$400 \pm 5\%$	$\approx 103$	$\approx 450$	E32/6/20-3C90-A400-E
	$630 \pm 8\%$	$\approx 162$	$\approx 260$	E32/6/20-3C90-A630-E
	$6425 \pm 25\%$	$\approx 1650$	$\approx 0$	E32/6/20-3C90
3C92 <b>des</b>	$5000 \pm 25\%$	$\approx 1290$	$\approx 0$	E32/6/20-3C92
3C93 <b>des</b>	$5900 \pm 25\%$	$\approx 1520$	$\approx 0$	E32/6/20-3C93
3C94	$160 \pm 3\%^{(1)}$	$\approx 41$	$\approx 1200$	E32/6/20-3C94-E160-E
	$250 \pm 3\%^{(1)}$	$\approx 64$	$\approx 700$	E32/6/20-3C94-E250-E
	$315 \pm 3\%$	$\approx 81$	$\approx 550$	E32/6/20-3C94-A315-E
	$400 \pm 5\%$	$\approx 103$	$\approx 450$	E32/6/20-3C94-A400-E
	$630 \pm 8\%$	$\approx 162$	$\approx 260$	E32/6/20-3C94-A630-E
	$6425 \pm 25\%$	$\approx 1650$	$\approx 0$	E32/6/20-3C94
3C96 <b>des</b>	$6425 \pm 25\%$	$\approx 1650$	$\approx 0$	E32/6/20-3C96
3F3	$160 \pm 3\%^{(1)}$	$\approx 41$	$\approx 1200$	E32/6/20-3F3-E160-E
	$250 \pm 3\%^{(1)}$	$\approx 64$	$\approx 700$	E32/6/20-3F3-E250-E
	$315 \pm 3\%$	$\approx 81$	$\approx 550$	E32/6/20-3F3-A315-E
	$400 \pm 5\%$	$\approx 103$	$\approx 450$	E32/6/20-3F3-A400-E
	$630 \pm 8\%$	$\approx 162$	$\approx 260$	E32/6/20-3F3-A630-E
	$5900 \pm 25\%$	$\approx 1520$	$\approx 0$	E32/6/20-3F3
3F4 <b>des</b>	$160 \pm 3\%^{(1)}$	$\approx 41$	$\approx 1200$	E32/6/20-3F4-E160-E
	$250 \pm 3\%^{(1)}$	$\approx 64$	$\approx 700$	E32/6/20-3F4-E250-E
	$315 \pm 3\%$	$\approx 81$	$\approx 550$	E32/6/20-3F4-A315-E
	$400 \pm 5\%$	$\approx 103$	$\approx 450$	E32/6/20-3F4-A400-E
	$630 \pm 8\%$	$\approx 162$	$\approx 260$	E32/6/20-3F4-A630-E
	$3200 \pm 25\%$	$\approx 820$	$\approx 0$	E32/6/20-3F4

**Note**

1. Measured in combination with an equal gapped E core half, clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

## Planar E cores and accessories

E32/6/20

**Core halves for use in combination with a plate (PLT)** $A_L$  measured in combination with a plate (PLT), clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20-3C90-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20-3C90-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20-3C90-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20-3C90-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20-3C90-A630-P
	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20-3C90
3C92 <small>des</small>	$5760 \pm 25\%$	$\approx 1270$	$\approx 0$	E32/6/20-3C92
3C93 <small>des</small>	$6780 \pm 25\%$	$\approx 1500$	$\approx 0$	E32/6/20-3C93
3C94	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20-3C94-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20-3C94-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20-3C94-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20-3C94-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20-3C94-A630-P
	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20-3C94
3C96 <small>des</small>	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20-3C96
3F3	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20-3F3-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20-3F3-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20-3F3-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20-3F3-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20-3F3-A630-P
	$6780 \pm 25\%$	$\approx 1490$	$\approx 0$	E32/6/20-3F3
3F4 <small>des</small>	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20-3F4-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20-3F4-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20-3F4-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20-3F4-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20-3F4-A630-P
	$3700 \pm 25\%$	$\approx 810$	$\approx 0$	E32/6/20-3F4

## Planar E cores and accessories

E32/6/20

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E+E32-3C90	≥320	≤ 0.65	–	–
E+PLT32-3C90	≥320	≤ 0.55	–	–
E+E32-3C92	≥370	≤ 0.48	≤ 3.4	–
E+PLT32-3C92	≥370	≤ 0.41	≤ 2.9	–
E+E32-3C93	≥320	≤ 0.48 <sup>(1)</sup>	≤ 3.4 <sup>(1)</sup>	–
E+PLT32-3C93	≥320	≤ 0.41 <sup>(1)</sup>	≤ 2.9 <sup>(1)</sup>	–
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	–	–	–

1. Measured at 140 °C.

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E32-3C90	≥320	–	–	–	–
E+PLT32-3C90	≥320	–	–	–	–
E+E32-3C92	≥370	–	–	–	–
E+PLT32-3C92	≥370	–	–	–	–
E+E32-3C93	≥320	–	–	–	–
E+PLT32-3C93	≥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

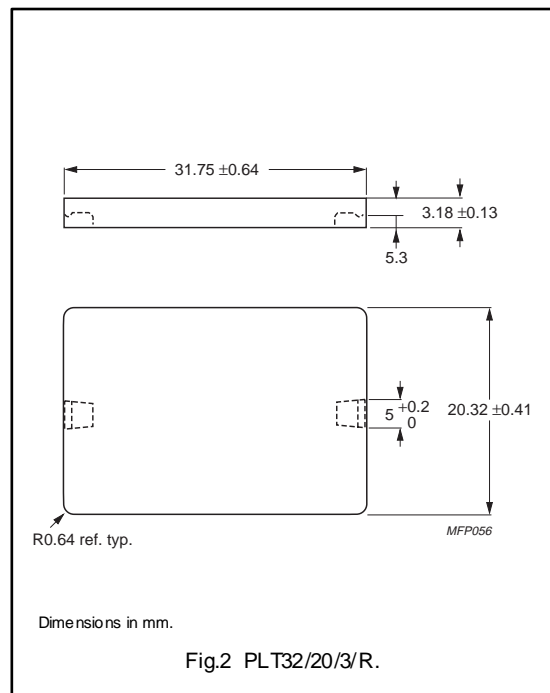
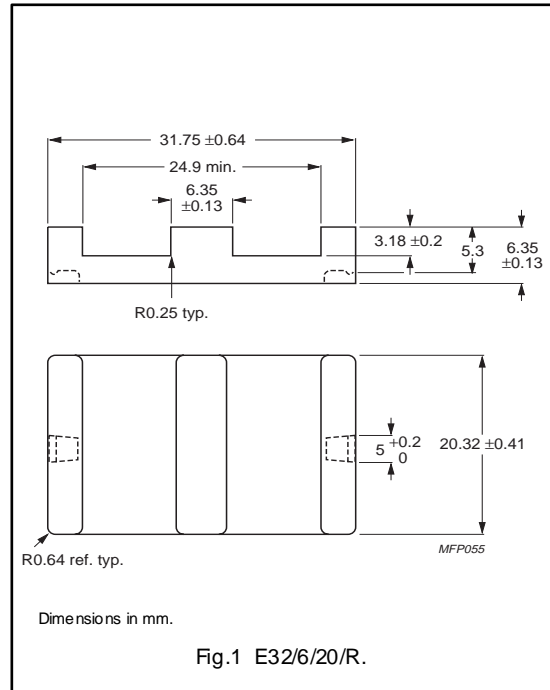
**CORES**

**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.278	mm <sup>-1</sup>
$V_e$	effective volume	4560	mm <sup>3</sup>
$l_e$	effective length	35.1	mm
$A_e$	effective area	130	mm <sup>2</sup>
$A_{min}$	minimum area	119	mm <sup>2</sup>
$m$	mass of plate	≈ 10	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT32/20/3/R-3C90
3C92 <small>des</small>	PLT32/20/3/R-3C92
3C93 <small>des</small>	PLT32/20/3/R-3C93
3C94	PLT32/20/3/R-3C94
3C96 <small>des</small>	PLT32/20/3/R-3C96
3F3	PLT32/20/3/R-3F3
3F4 <small>des</small>	PLT32/20/3/R-3F4



## Planar E cores and accessories

E32/6/20/R

**Core halves for use in combination with a recessed plate (PLT/R)** $A_L$  measured in combination with a recessed plate (PLT/R), clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20/R-3C90-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20/R-3C90-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20/R-3C90-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20/R-3C90-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20/R-3C90-A630-P
	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20/R-3C90
3C92 <small>des</small>	$5760 \pm 25\%$	$\approx 1270$	$\approx 0$	E32/6/20/R-3C92
3C93 <small>des</small>	$6780 \pm 25\%$	$\approx 1500$	$\approx 0$	E32/6/20/R-3C93
3C94	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20/R-3C94-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20/R-3C94-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20/R-3C94-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20/R-3C94-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20/R-3C94-A630-P
	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20/R-3C94
3C96 <small>des</small>	$7350 \pm 25\%$	$\approx 1610$	$\approx 0$	E32/6/20/R-3C96
3F3	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20/R-3F3-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20/R-3F3-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20/R-3F3-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20/R-3F3-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20/R-3F3-A630-P
	$6780 \pm 25\%$	$\approx 1490$	$\approx 0$	E32/6/20/R-3F3
3F4 <small>des</small>	$160 \pm 3\%$	$\approx 35$	$\approx 1200$	E32/6/20/R-3F4-A160-P
	$250 \pm 3\%$	$\approx 55$	$\approx 700$	E32/6/20/R-3F4-A250-P
	$315 \pm 3\%$	$\approx 69$	$\approx 550$	E32/6/20/R-3F4-A315-P
	$400 \pm 5\%$	$\approx 87$	$\approx 450$	E32/6/20/R-3F4-A400-P
	$630 \pm 8\%$	$\approx 138$	$\approx 260$	E32/6/20/R-3F4-A630-P
	$3700 \pm 25\%$	$\approx 810$	$\approx 0$	E32/6/20/R-3F4

## Planar E cores and accessories

E32/6/20/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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E32/R+PLT32/R-3C90	≥320	≤ 0.55	–	–
E32/R+PLT32/R-3C92	≥370	≤ 0.41	≤ 2.9	–
E32/R+PLT32/R-3C93	≥320	≤ 0.41 <sup>(1)</sup>	≤ 2.9 <sup>(1)</sup>	–
E32/R+PLT32/R-3C94	≥320	≤ 0.41	≤ 2.9	–
E32/R+PLT32/R-3C96	≥320	≤ 0.3	≤ 2.2	≤ 0.8
E32/R+PLT32/R-3F3	≥300	≤ 0.6	–	≤ 0.85
E32/R+PLT32/R-3F4	≥250	–	–	–

1. Measured at 140 °C.

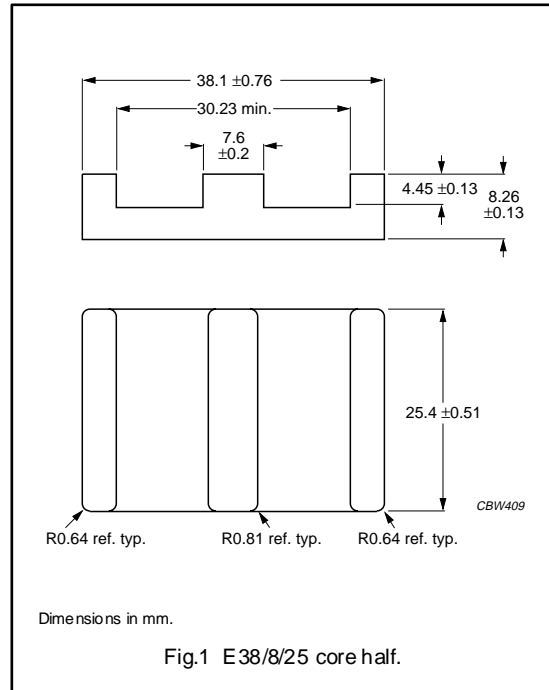
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E32/R+PLT32/R-3C90	≥320	–	–	–	–
E32/R+PLT32/R-3C92	≥370	–	–	–	–
E32/R+PLT32/R-3C93	≥320	–	–	–	–
E32/R+PLT32/R-3C94	≥320	–	–	–	–
E32/R+PLT32/R-3C96	≥320	≤ 1.7	–	–	–
E32/R+PLT32/R-3F3	≥300	–	–	–	–
E32/R+PLT32/R-3F4	≥250	–	–	≤ 1.36	≤ 2.2

**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.272	mm <sup>-1</sup>
$V_e$	effective volume	10200	mm <sup>3</sup>
$l_e$	effective length	52.4	mm
$A_e$	effective area	194	mm <sup>2</sup>
$A_{min}$	minimum area	194	mm <sup>2</sup>
$m$	mass of core half	≈ 25	g

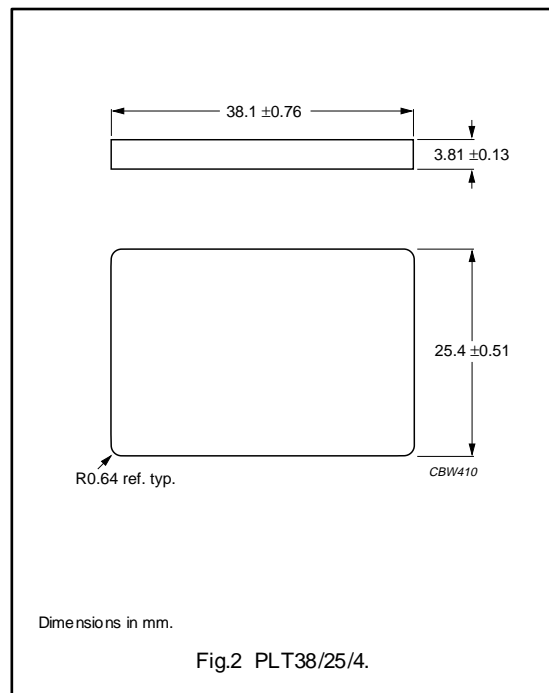


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.226	mm <sup>-1</sup>
$V_e$	effective volume	8460	mm <sup>3</sup>
$l_e$	effective length	43.7	mm
$A_e$	effective area	194	mm <sup>2</sup>
$A_{min}$	minimum area	194	mm <sup>2</sup>
$m$	mass of plate	≈ 18	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT38/25/4-3C90
3C92 <small>des</small>	PLT38/25/4-3C92
3C93 <small>des</small>	PLT38/25/4-3C93
3C94	PLT38/25/4-3C94
3F3	PLT38/25/4-3F3
3F4 <small>des</small>	PLT38/25/4-3F4



## 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,  $40 \pm 15$  N, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$250 \pm 3\%^{(1)}$	$\approx 54$	$\approx 1100$	E38/8/25-3C90-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 68$	$\approx 850$	E38/8/25-3C90-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 86$	$\approx 650$	E38/8/25-3C90-E400-E
	$630 \pm 5\%$	$\approx 136$	$\approx 400$	E38/8/25-3C90-A630-E
	$1000 \pm 10\%$	$\approx 216$	$\approx 250$	E38/8/25-3C90-A1000-E
	$7940 \pm 25\%$	$\approx 1720$	$\approx 0$	E38/8/25-3C90
3C92 <b>des</b>	$6100 \pm 25\%$	$\approx 1320$	$\approx 0$	E38/8/25-3C92
3C93 <b>des</b>	$7250 \pm 25\%$	$\approx 1570$	$\approx 0$	E38/8/25-3C93
3C94	$250 \pm 3\%^{(1)}$	$\approx 54$	$\approx 1100$	E38/8/25-3C94-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 68$	$\approx 850$	E38/8/25-3C94-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 86$	$\approx 650$	E38/8/25-3C94-E400-E
	$630 \pm 5\%$	$\approx 136$	$\approx 400$	E38/8/25-3C94-A630-E
	$1000 \pm 10\%$	$\approx 216$	$\approx 250$	E38/8/25-3C94-A1000-E
	$7940 \pm 25\%$	$\approx 1720$	$\approx 0$	E38/8/25-3C94
3F3	$250 \pm 3\%^{(1)}$	$\approx 54$	$\approx 1100$	E38/8/25-3F3-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 68$	$\approx 850$	E38/8/25-3F3-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 86$	$\approx 650$	E38/8/25-3F3-E400-E
	$630 \pm 5\%$	$\approx 136$	$\approx 400$	E38/8/25-3F3-A630-E
	$1000 \pm 10\%$	$\approx 216$	$\approx 250$	E38/8/25-3F3-A1000-E
	$7250 \pm 25\%$	$\approx 1570$	$\approx 0$	E38/8/25-3F3
3F4 <b>des</b>	$250 \pm 3\%^{(1)}$	$\approx 54$	$\approx 1100$	E38/8/25-3F4-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 68$	$\approx 850$	E38/8/25-3F4-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 86$	$\approx 650$	E38/8/25-3F4-E400-E
	$630 \pm 5\%$	$\approx 136$	$\approx 400$	E38/8/25-3F4-A630-E
	$1000 \pm 10\%$	$\approx 216$	$\approx 250$	E38/8/25-3F4-A1000-E
	$3880 \pm 25\%$	$\approx 840$	$\approx 0$	E38/8/25-3F4

**Note**

1. Measured in combination with an equal gapped core half, clamping force for  $A_L$  measurements,  $40 \pm 15$  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,  $40 \pm 15$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E38/8/25-3C90-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 850$	E38/8/25-3C90-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 650$	E38/8/25-3C90-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E38/8/25-3C90-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E38/8/25-3C90-A1000-P
	$9250 \pm 25\%$	$\approx 1660$	$\approx 0$	E38/8/25-3C90
3C92 <small>des</small>	$7150 \pm 25\%$	$\approx 1290$	$\approx 0$	E38/8/25-3C92
3C93 <small>des</small>	$8500 \pm 25\%$	$\approx 1530$	$\approx 0$	E38/8/25-3C93
3C94	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E38/8/25-3C94-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 850$	E38/8/25-3C94-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 650$	E38/8/25-3C94-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E38/8/25-3C94-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E38/8/25-3C94-A1000-P
	$9250 \pm 25\%$	$\approx 1660$	$\approx 0$	E38/8/25-3C94
3F3	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E38/8/25-3F3-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 850$	E38/8/25-3F3-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 650$	E38/8/25-3F3-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E38/8/25-3F3-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E38/8/25-3F3-A1000-P
	$8500 \pm 25\%$	$\approx 1520$	$\approx 0$	E38/8/25-3F3
3F4 <small>des</small>	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E38/8/25-3F4-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 850$	E38/8/25-3F4-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 650$	E38/8/25-3F4-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E38/8/25-3F4-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E38/8/25-3F4-A1000-P
	$4600 \pm 25\%$	$\approx 830$	$\approx 0$	E38/8/25-3F4

## Planar E cores and accessories

E38/8/25

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E+E38-3C90	≥320	≤ 1.25	–	–
E+PLT38-3C90	≥320	≤ 1.05	–	–
E+E38-3C92	≥370	≤ 1.0	≤ 6.0	–
E+PLT38-3C92	≥370	≤ 0.85	≤ 5.0	–
E+E38-3C93	≥320	≤ 1.0 <sup>(1)</sup>	≤ 6.0 <sup>(1)</sup>	–
E+PLT38-3C93	≥320	≤ 0.85 <sup>(1)</sup>	≤ 5.0 <sup>(1)</sup>	–
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	–	–	–

1. Measured at 140 °C.

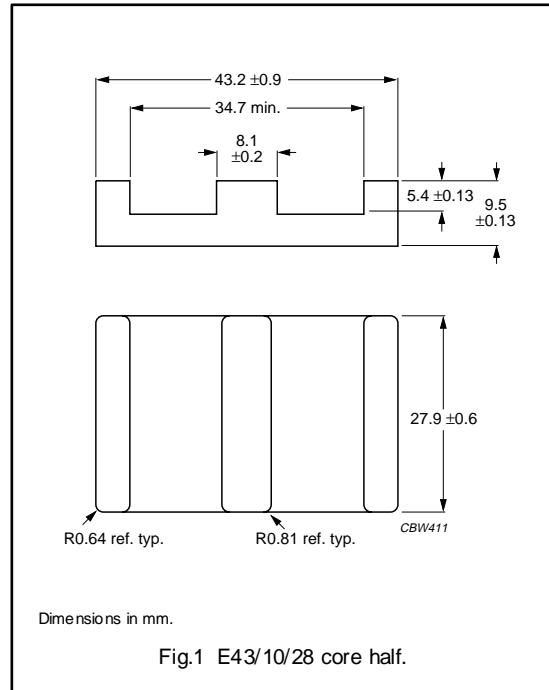
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E38-3C90	≥320	–	–	–	–
E+PLT38-3C90	≥320	–	–	–	–
E+E38-3C92	≥370	–	–	–	–
E+PLT38-3C92	≥370	–	–	–	–
E+E38-3C93	≥320	–	–	–	–
E+PLT38-3C93	≥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
$\Sigma(l/A)$	core factor (C1)	0.276	mm <sup>-1</sup>
$V_e$	effective volume	13900	mm <sup>3</sup>
$l_e$	effective length	61.1	mm
$A_e$	effective area	229	mm <sup>2</sup>
$A_{min}$	minimum area	229	mm <sup>2</sup>
$m$	mass of core half	≈ 35	g

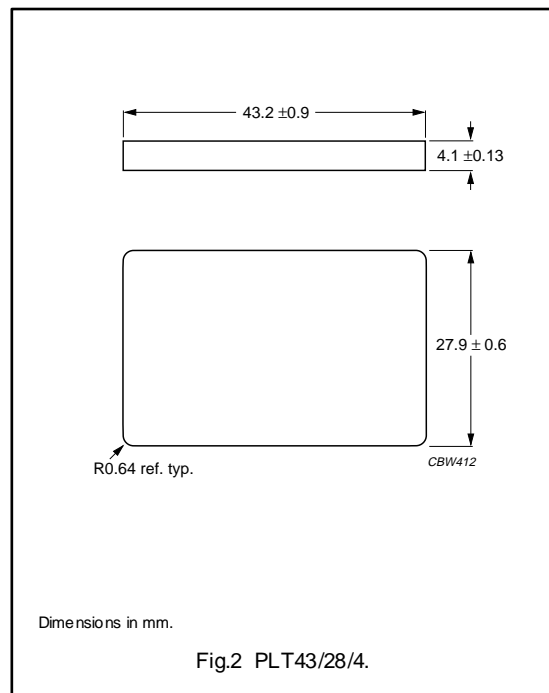


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.226	mm <sup>-1</sup>
$V_e$	effective volume	11500	mm <sup>3</sup>
$l_e$	effective length	50.4	mm
$A_e$	effective area	229	mm <sup>2</sup>
$A_{min}$	minimum area	229	mm <sup>2</sup>
$m$	mass of core half	≈ 24	g

**Ordering information**

GRADE	TYPE NUMBER
3C90	PLT43/28/4-3C90
3C92 <small>des</small>	PLT43/28/4-3C92
3C93 <small>des</small>	PLT43/28/4-3C93
3C94	PLT43/28/4-3C94
3F3	PLT43/28/4-3F3
3F4 <small>des</small>	PLT43/28/4-3F4



## 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,  $40 \pm 20$  N, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$250 \pm 3\%^{(1)}$	$\approx 55$	$\approx 1100$	E43/10/28-3C90-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 69$	$\approx 800$	E43/10/28-3C90-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 87$	$\approx 700$	E43/10/28-3C90-E400-E
	$630 \pm 5\%$	$\approx 138$	$\approx 400$	E43/10/28-3C90-A630-E
	$1000 \pm 10\%$	$\approx 219$	$\approx 250$	E43/10/28-3C90-A1000-E
	$8030 \pm 25\%$	$\approx 1710$	$\approx 0$	E43/10/28-3C90
3C92 <b>des</b>	$6300 \pm 25\%$	$\approx 1380$	$\approx 0$	E43/10/28-3C92
3C93 <b>des</b>	$7310 \pm 25\%$	$\approx 1610$	$\approx 0$	E43/10/28-3C93
3C94	$250 \pm 3\%^{(1)}$	$\approx 55$	$\approx 1100$	E43/10/28-3C94-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 69$	$\approx 800$	E43/10/28-3C94-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 87$	$\approx 700$	E43/10/28-3C94-E400-E
	$630 \pm 5\%$	$\approx 138$	$\approx 400$	E43/10/28-3C94-A630-E
	$1000 \pm 10\%$	$\approx 219$	$\approx 250$	E43/10/28-3C94-A1000-E
	$8030 \pm 25\%$	$\approx 1710$	$\approx 0$	E43/10/28-3C94
3F3	$250 \pm 3\%^{(1)}$	$\approx 55$	$\approx 1100$	E43/10/28-3F3-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 69$	$\approx 800$	E43/10/28-3F3-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 87$	$\approx 700$	E43/10/28-3F3-E400-E
	$630 \pm 5\%$	$\approx 138$	$\approx 400$	E43/10/28-3F3-A630-E
	$1000 \pm 10\%$	$\approx 219$	$\approx 250$	E43/10/28-3F3-A1000-E
	$7310 \pm 25\%$	$\approx 1600$	$\approx 0$	E43/10/28-3F3
3F4 <b>des</b>	$250 \pm 3\%^{(1)}$	$\approx 55$	$\approx 1100$	E43/10/28-3F4-E250-E
	$315 \pm 3\%^{(1)}$	$\approx 69$	$\approx 800$	E43/10/28-3F4-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 87$	$\approx 700$	E43/10/28-3F4-E400-E
	$630 \pm 5\%$	$\approx 138$	$\approx 400$	E43/10/28-3F4-A630-E
	$1000 \pm 10\%$	$\approx 219$	$\approx 250$	E43/10/28-3F4-A1000-E
	$3860 \pm 25\%$	$\approx 850$	$\approx 0$	E43/10/28-3F4

**Note**

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

## Planar E cores and accessories

E43/10/28

**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,  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E43/10/28-3C90-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 800$	E43/10/28-3C90-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 700$	E43/10/28-3C90-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E43/10/28-3C90-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E43/10/28-3C90-A1000-P
	$9250 \pm 25\%$	$\approx 1710$	$\approx 0$	E43/10/28-3C90
3C92 <small>des</small>	$7460 \pm 25\%$	$\approx 1340$	$\approx 0$	E43/10/28-3C92
3C93 <small>des</small>	$8700 \pm 25\%$	$\approx 1560$	$\approx 0$	E43/10/28-3C93
3C94	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E43/10/28-3C94-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 800$	E43/10/28-3C94-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 700$	E43/10/28-3C94-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E43/10/28-3C94-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E43/10/28-3C94-A1000-P
	$9250 \pm 25\%$	$\approx 1710$	$\approx 0$	E43/10/28-3C94
3F3	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E43/10/28-3F3-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 800$	E43/10/28-3F3-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 700$	E43/10/28-3F3-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E43/10/28-3F3-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E43/10/28-3F3-A1000-P
	$8700 \pm 25\%$	$\approx 1560$	$\approx 0$	E43/10/28-3F3
3F4 <small>des</small>	$250 \pm 3\%$	$\approx 45$	$\approx 1100$	E43/10/28-3F4-A250-P
	$315 \pm 3\%$	$\approx 57$	$\approx 800$	E43/10/28-3F4-A315-P
	$400 \pm 3\%$	$\approx 72$	$\approx 700$	E43/10/28-3F4-A400-P
	$630 \pm 5\%$	$\approx 113$	$\approx 400$	E43/10/28-3F4-A630-P
	$1000 \pm 10\%$	$\approx 180$	$\approx 250$	E43/10/28-3F4-A1000-P
	$4660 \pm 25\%$	$\approx 850$	$\approx 0$	E43/10/28-3F4

## Planar E cores and accessories

E43/10/28

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E+E43-3C90	≥320	≤ 1.8	–	–
E+PLT43-3C90	≥320	≤ 1.5	–	–
E+E43-3C92	≥370	≤ 1.4	≤ 8.0	–
E+PLT43-3C92	≥370	≤ 1.2	≤ 7.0	–
E+E43-3C93	≥320	≤ 1.4 <sup>(1)</sup>	≤ 8.0 <sup>(1)</sup>	–
E+PLT43-3C93	≥320	≤ 1.2 <sup>(1)</sup>	≤ 7.0 <sup>(1)</sup>	–
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	–	–	–

1. Measured at 140 °C.

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E43-3C90	≥320	–	–	–	–
E+PLT43-3C90	≥320	–	–	–	–
E+E43-3C92	≥370	–	–	–	–
E+PLT43-3C92	≥370	–	–	–	–
E+E43-3C93	≥320	–	–	–	–
E+PLT43-3C93	≥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

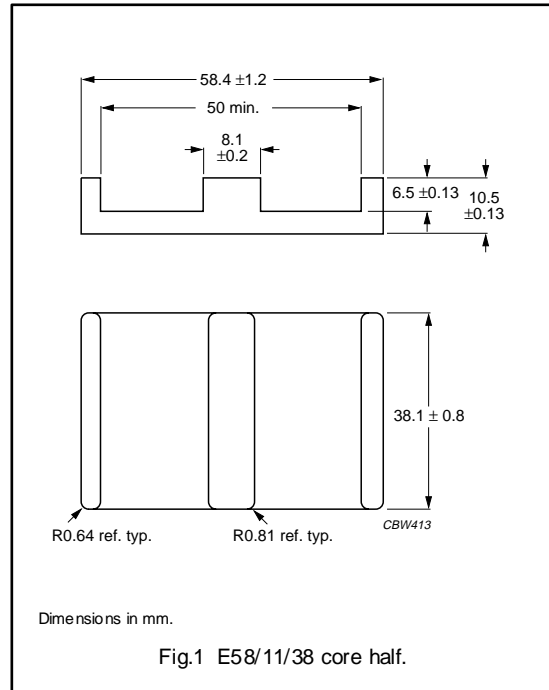
Planar E cores and accessories

E58/11/38

**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.268	mm <sup>-1</sup>
$V_e$	effective volume	24600	mm <sup>3</sup>
$l_e$	effective length	80.6	mm
$A_e$	effective area	308	mm <sup>2</sup>
$A_{min}$	minimum area	308	mm <sup>2</sup>
$m$	mass of core half	≈ 62	g

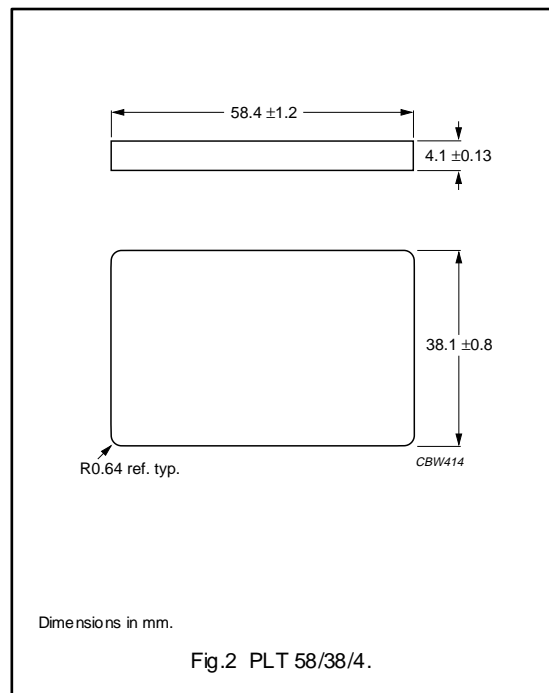


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.224	mm <sup>-1</sup>
$V_e$	effective volume	20800	mm <sup>3</sup>
$l_e$	effective length	67.7	mm
$A_e$	effective area	310	mm <sup>2</sup>
$A_{min}$	minimum area	310	mm <sup>2</sup>
$m$	mass of core half	≈ 44	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT58/38/4-3C90
3C92 <small>des</small>	PLT58/38/4-3C92
3C93 <small>des</small>	PLT58/38/4-3C93
3C94	PLT58/38/4-3C94
3F3	PLT58/38/4-3F3
3F4 <small>des</small>	PLT58/38/4-3F4



## 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,  $40 \pm 20$  N, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$315 \pm 3\%^{(1)}$	$\approx 67$	$\approx 1400$	E58/11/38-3C90-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 85$	$\approx 1100$	E58/11/38-3C90-E400-E
	$630 \pm 5\%^{(1)}$	$\approx 134$	$\approx 650$	E58/11/38-3C90-E630-E
	$1000 \pm 5\%$	$\approx 213$	$\approx 400$	E58/11/38-3C90-A1000-E
	$1600 \pm 10\%$	$\approx 341$	$\approx 200$	E58/11/38-3C90-A1600-E
	$8480 \pm 25\%$	$\approx 1800$	$\approx 0$	E58/11/38-3C90
3C92 <b>des</b>	$6600 \pm 25\%$	$\approx 1410$	$\approx 0$	E58/11/38-3C92
3C93 <b>des</b>	$7710 \pm 25\%$	$\approx 1640$	$\approx 0$	E58/11/38-3C93
3C94	$315 \pm 3\%^{(1)}$	$\approx 67$	$\approx 1400$	E58/11/38-3C94-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 85$	$\approx 1100$	E58/11/38-3C94-E400-E
	$630 \pm 5\%^{(1)}$	$\approx 134$	$\approx 650$	E58/11/38-3C94-E630-E
	$1000 \pm 5\%$	$\approx 213$	$\approx 400$	E58/11/38-3C94-A1000-E
	$1600 \pm 10\%$	$\approx 341$	$\approx 200$	E58/11/38-3C94-A1600-E
	$8480 \pm 25\%$	$\approx 1800$	$\approx 0$	E58/11/38-3C94
3F3	$315 \pm 3\%^{(1)}$	$\approx 67$	$\approx 1400$	E58/11/38-3F3-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 85$	$\approx 1100$	E58/11/38-3F3-E400-E
	$630 \pm 5\%^{(1)}$	$\approx 134$	$\approx 650$	E58/11/38-3F3-E630-E
	$1000 \pm 5\%$	$\approx 213$	$\approx 400$	E58/11/38-3F3-A1000-E
	$1600 \pm 10\%$	$\approx 341$	$\approx 200$	E58/11/38-3F3-A1600-E
	$7710 \pm 25\%$	$\approx 1640$	$\approx 0$	E58/11/38-3F3
3F4 <b>des</b>	$315 \pm 3\%^{(1)}$	$\approx 67$	$\approx 1400$	E58/11/38-3F4-E315-E
	$400 \pm 3\%^{(1)}$	$\approx 85$	$\approx 1100$	E58/11/38-3F4-E400-E
	$630 \pm 5\%^{(1)}$	$\approx 134$	$\approx 650$	E58/11/38-3F4-E630-E
	$1000 \pm 5\%$	$\approx 213$	$\approx 400$	E58/11/38-3F4-A1000-E
	$1600 \pm 10\%$	$\approx 341$	$\approx 200$	E58/11/38-3F4-A1600-E
	$4030 \pm 25\%$	$\approx 860$	$\approx 0$	E58/11/38-3F4

**Note**

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



## Planar E cores and accessories

E58/11/38

**Core halves for use in combination with a plate (PLT)**A<sub>L</sub> measured in combination with a plate (PLT), clamping force for A<sub>L</sub> measurements, 40 ±20 N.

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	AIR GAP (μm)	TYPE NUMBER
3C90	315 ±3%	≈ 56	≈ 1400	E58/11/38-3C90-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11/38-3C90-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11/38-3C90-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11/38-3C90-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11/38-3C90-A1600-P
	9970 ±25%	≈ 780	≈ 0	E58/11/38-3C90
3C92 <small>des</small>	7770 ±25%	≈ 1390	≈ 0	E58/11/38-3C92
3C93 <small>des</small>	9070 ±25%	≈ 1620	≈ 0	E58/11/38-3C93
3C94	315 ±3%	≈ 56	≈ 1400	E58/11/38-3C94-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11/38-3C94-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11/38-3C94-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11/38-3C94-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11/38-3C94-A1600-P
	9970 ±25%	≈ 780	≈ 0	E58/11/38-3C94
3F3	315 ±3%	≈ 56	≈ 1400	E58/11/38-3F3-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11/38-3F3-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11/38-3F3-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11/38-3F3-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11/38-3F3-A1600-P
	9070 ±25%	≈ 1620	≈ 0	E58/11/38-3F3
3F4 <small>des</small>	315 ±3%	≈ 56	≈ 1400	E58/11/38-3F4-A315-P
	400 ±3%	≈ 71	≈ 1100	E58/11/38-3F4-A400-P
	630 ±5%	≈ 112	≈ 650	E58/11/38-3F4-A630-P
	1000 ±5%	≈ 178	≈ 400	E58/11/38-3F4-A1000-P
	1600 ±10%	≈ 285	≈ 200	E58/11/38-3F4-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E+E58-3C90	≥320	≤ 3.0	–	–
E+PLT58-3C90	≥320	≤ 2.6	–	–
E+E58-3C92	≥370	≤ 2.4	≤ 15	–
E+PLT58-3C92	≥370	≤ 2.0	≤ 13	–
E+E58-3C93	≥320	≤ 2.4 <sup>(1)</sup>	≤ 15 <sup>(1)</sup>	–
E+PLT58-3C93	≥320	≤ 2.0 <sup>(1)</sup>	≤ 13 <sup>(1)</sup>	–
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	–	–	–

1. Measured at 140 °C.

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E58-3C90	≥320	–	–	–	–
E+PLT58-3C90	≥320	–	–	–	–
E+E58-3C92	≥370	–	–	–	–
E+PLT58-3C92	≥370	–	–	–	–
E+E58-3C93	≥320	–	–	–	–
E+PLT58-3C93	≥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

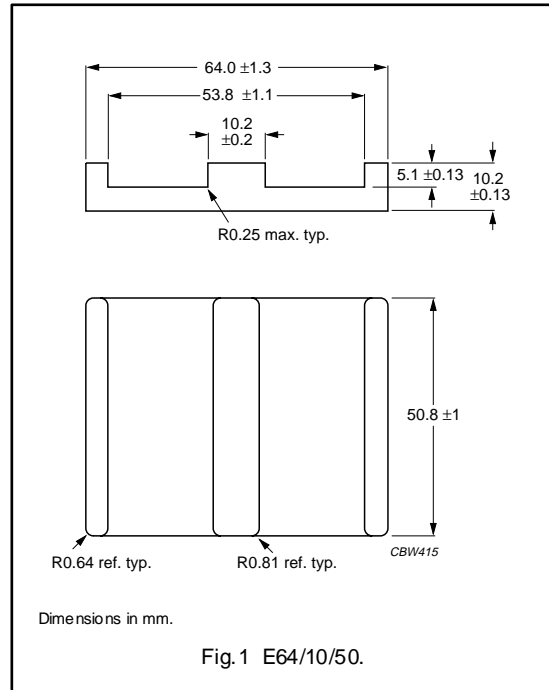
Planar E cores and accessories

E64/10/50

**CORES**

**Effective core parameters of a set of E cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.156	mm <sup>-1</sup>
$V_e$	effective volume	40700	mm <sup>3</sup>
$l_e$	effective length	79.9	mm
$A_e$	effective area	519	mm <sup>2</sup>
$A_{min}$	minimum area	519	mm <sup>2</sup>
$m$	mass of core half	≈ 100	g

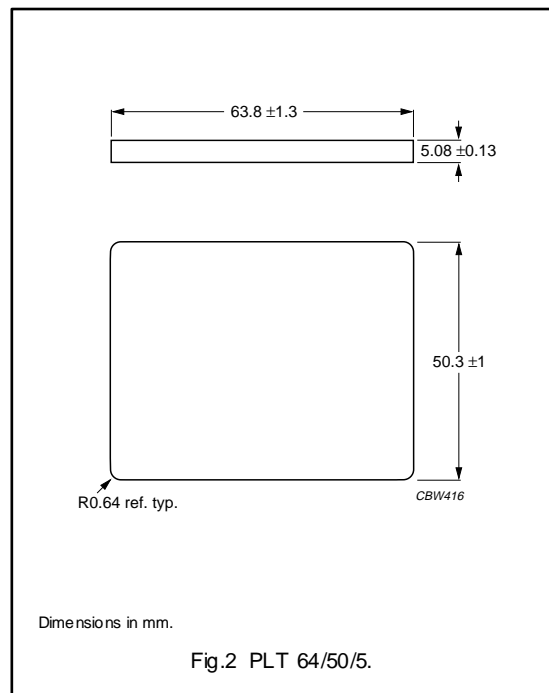


**Effective core parameters of an E/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.136	mm <sup>-1</sup>
$V_e$	effective volume	35500	mm <sup>3</sup>
$l_e$	effective length	69.7	mm
$A_e$	effective area	519	mm <sup>2</sup>
$A_{min}$	minimum area	519	mm <sup>2</sup>
$m$	mass of plate	≈ 78	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C90	PLT64/50/5-3C90
3C92 <small>des</small>	PLT64/50/5-3C92
3C93 <small>des</small>	PLT64/50/5-3C93
3C94	PLT64/50/5-3C94
3F3	PLT64/50/5-3F3
3F4 <small>des</small>	PLT64/50/5-3F4



## Planar E cores and accessories

E64/10/50

**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	630 ±3% <sup>(1)</sup>	≈ 78	≈ 1100	E64/10/50-3C90-E630-E
	1000 ±3% <sup>(1)</sup>	≈ 124	≈ 660	E64/10/50-3C90-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10/50-3C90-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10/50-3C90-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10/50-3C90-A3150-E
	14640 ±25%	≈ 1 820	≈ 0	E64/10/50-3C90
3C92 <b>des</b>	11200 ±25%	≈ 1390	≈ 0	E64/10/50-3C92
3C93 <b>des</b>	13300 ±25%	≈ 1650	≈ 0	E64/10/50-3C93
3C94	630 ±3% <sup>(1)</sup>	≈ 78	≈ 1100	E64/10/50-3C94-E630-E
	1000 ±3% <sup>(1)</sup>	≈ 124	≈ 660	E64/10/50-3C94-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10/50-3C94-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10/50-3C94-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10/50-3C94-A3150-E
	14640 ±25%	≈ 1 820	≈ 0	E64/10/50-3C94
3F3	630 ±3% <sup>(1)</sup>	≈ 78	≈ 1100	E64/10/50-3F3-E630-E
	1000 ±3% <sup>(1)</sup>	≈ 124	≈ 660	E64/10/50-3F3-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10/50-3F3-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10/50-3F3-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10/50-3F3-A3150-E
	13300 ±25%	≈ 1 650	≈ 0	E64/10/50-3F3
3F4 <b>des</b>	630 ±3% <sup>(1)</sup>	≈ 78	≈ 1100	E64/10/50-3F4-E630-E
	1000 ±3% <sup>(1)</sup>	≈ 124	≈ 660	E64/10/50-3F4-E1000-E
	1600 ±5%	≈ 199	≈ 385	E64/10/50-3F4-A1600-E
	2500 ±10%	≈ 310	≈ 225	E64/10/50-3F4-A2500-E
	3150 ±10%	≈ 391	≈ 170	E64/10/50-3F4-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,  $100 \pm 30$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$630 \pm 3\%$	$\approx 78$	$\approx 1100$	E64/10/50-3C90-A-630-P
	$1000 \pm 3\%$	$\approx 124$	$\approx 660$	E64/10/50-3C90-A-1000-P
	$1600 \pm 5\%$	$\approx 199$	$\approx 385$	E64/10/50-3C90-A-1600-P
	$2500 \pm 10\%$	$\approx 310$	$\approx 225$	E64/10/50-3C90-A-2500-P
	$3150 \pm 10\%$	$\approx 391$	$\approx 170$	E64/10/50-3C90-A-3150-P
	$16540 \pm 25\%$	$\approx 1790$	$\approx 0$	E64/10/50-3C90
3C92 <small>des</small>	$12700 \pm 25\%$	$\approx 1370$	$\approx 0$	E64/10/50-3C92
3C93 <small>des</small>	$15050 \pm 25\%$	$\approx 1630$	$\approx 0$	E64/10/50-3C93
3C94	$630 \pm 3\%$	$\approx 78$	$\approx 1100$	E64/10/50-3C94-A-630-P
	$1000 \pm 3\%$	$\approx 124$	$\approx 660$	E64/10/50-3C94-A-1000-P
	$1600 \pm 5\%$	$\approx 199$	$\approx 385$	E64/10/50-3C94-A-1600-P
	$2500 \pm 10\%$	$\approx 310$	$\approx 225$	E64/10/50-3C94-A-2500-P
	$3150 \pm 10\%$	$\approx 391$	$\approx 170$	E64/10/50-3C94-A-3150-P
	$16540 \pm 25\%$	$\approx 1790$	$\approx 0$	E64/10/50-3C94
3F3	$630 \pm 3\%$	$\approx 78$	$\approx 1100$	E64/10/50-3F3-A-630-P
	$1000 \pm 3\%$	$\approx 124$	$\approx 660$	E64/10/50-3F3-A-1000-P
	$1600 \pm 5\%$	$\approx 199$	$\approx 385$	E64/10/50-3F3-A-1600-P
	$2500 \pm 10\%$	$\approx 310$	$\approx 225$	E64/10/50-3F3-A-2500-P
	$3150 \pm 10\%$	$\approx 391$	$\approx 170$	E64/10/50-3F3-A-3150-P
	$15050 \pm 25\%$	$\approx 1630$	$\approx 0$	E64/10/50-3F3
3F4 <small>des</small>	$630 \pm 3\%$	$\approx 78$	$\approx 1100$	E64/10/50-3F4-A-630-P
	$1000 \pm 3\%$	$\approx 124$	$\approx 660$	E64/10/50-3F4-A-1000-P
	$1600 \pm 5\%$	$\approx 199$	$\approx 385$	E64/10/50-3F4-A-1600-P
	$2500 \pm 10\%$	$\approx 310$	$\approx 225$	E64/10/50-3F4-A-2500-P
	$3150 \pm 10\%$	$\approx 391$	$\approx 170$	E64/10/50-3F4-A-3150-P
	$7920 \pm 25\%$	$\approx 860$	$\approx 0$	E64/10/50-3F4

## Planar E cores and accessories

E64/10/50

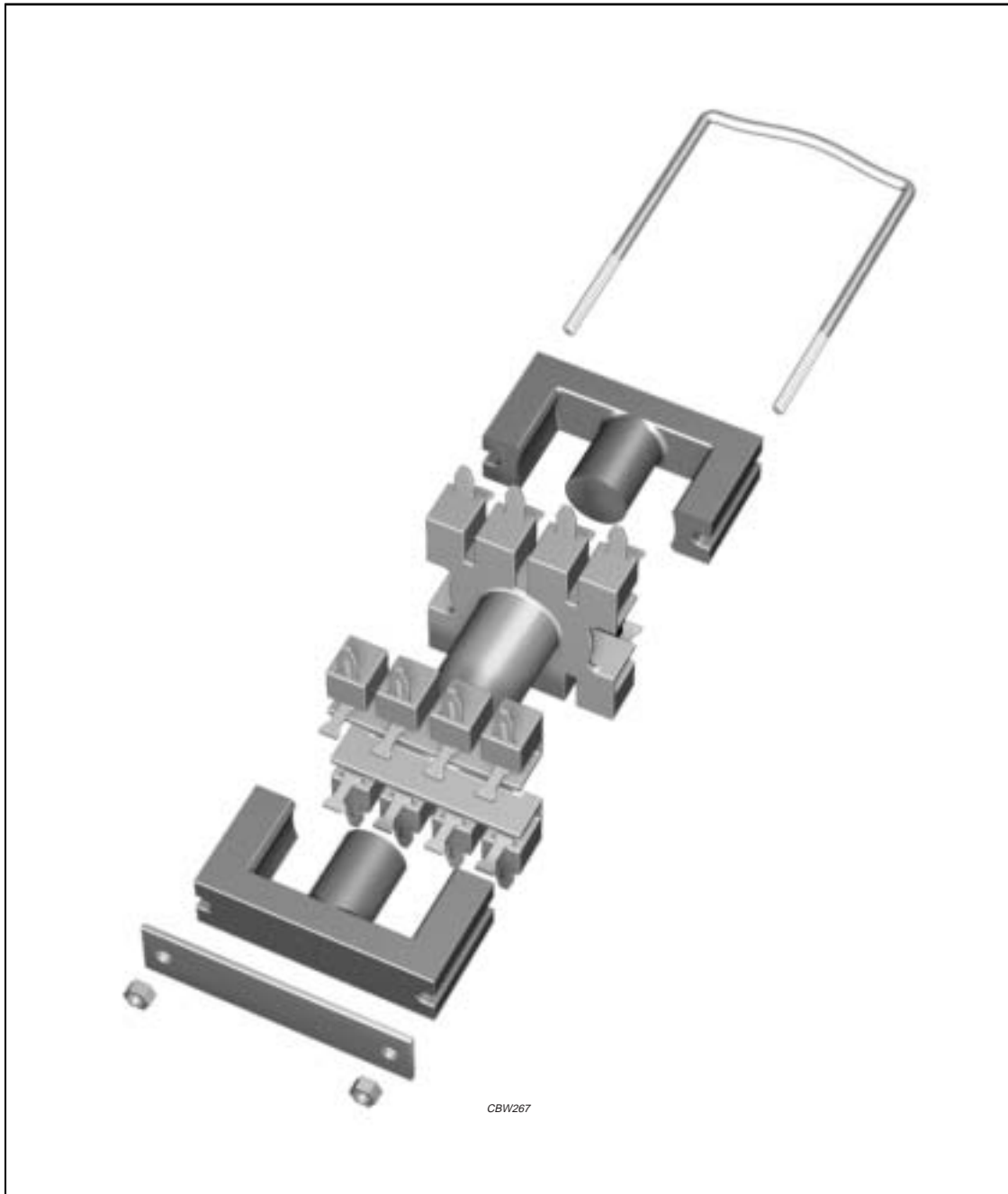
## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
E+E64-3C90	≥320	≤ 4.8	–	–
E+PLT64-3C90	≥320	≤ 4.2	–	–
E+E64-3C92	≥370	≤ 3.6	≤ 25	–
E+PLT64-3C92	≥370	≤ 3.2	≤ 23	–
E+E64-3C93	≥320	≤ 3.6 <sup>(1)</sup>	≤ 25 <sup>(1)</sup>	–
E+PLT64-3C93	≥320	≤ 3.2 <sup>(1)</sup>	≤ 23 <sup>(1)</sup>	–
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	–	–	–

1. Measured at 140 °C.

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
E+E64-3C90	≥320	–	–	–	–
E+PLT64-3C90	≥320	–	–	–	–
E+E64-3C92	≥370	–	–	–	–
E+PLT64-3C92	≥370	–	–	–	–
E+E64-3C93	≥320	–	–	–	–
E+PLT64-3C93	≥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



**PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE**

**Product overview EC cores**

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
EC35	6530	84.3	19
EC41	10800	121	30
EC52	18800	180	56
EC70	40100	279	127

• In accordance with IEC 60647.

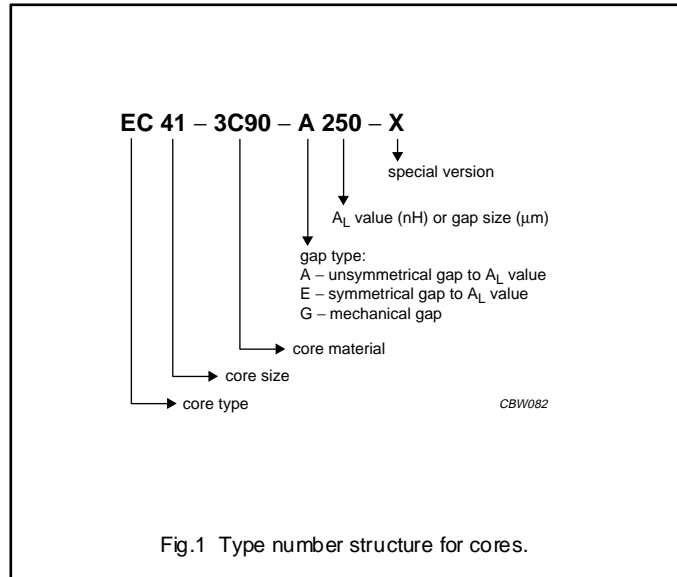


Fig.1 Type number structure for cores.

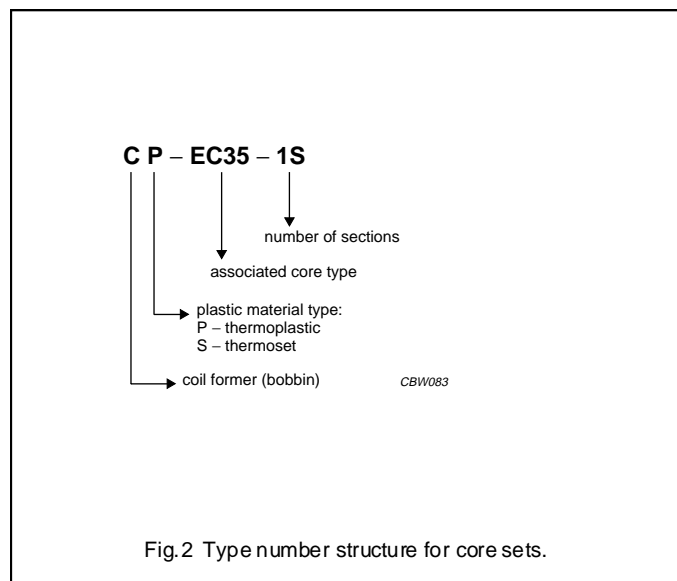


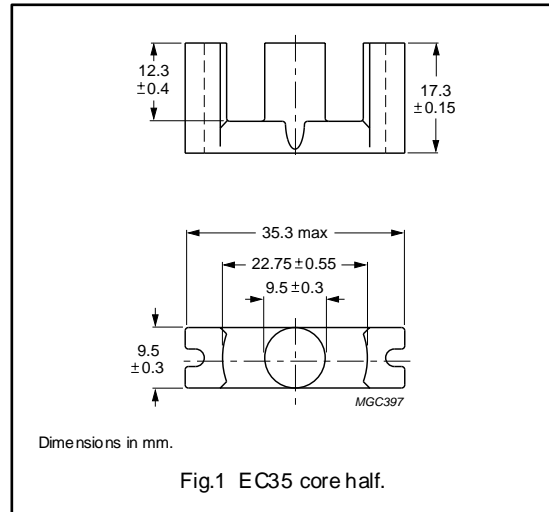
Fig.2 Type number structure for core sets.



**CORE SETS**

**Effective core parameters**

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



**Core halves**

$A_L$  measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	100 ± 3% <sup>(1)</sup>	≈ 73	≈ 1470	EC35-3C81-E100
	160 ± 3% <sup>(1)</sup>	≈ 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>sup</sup>	100 ± 3% <sup>(1)</sup>	≈ 73	≈ 1470	EC35-3C90-E100
	160 ± 3% <sup>(1)</sup>	≈ 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).

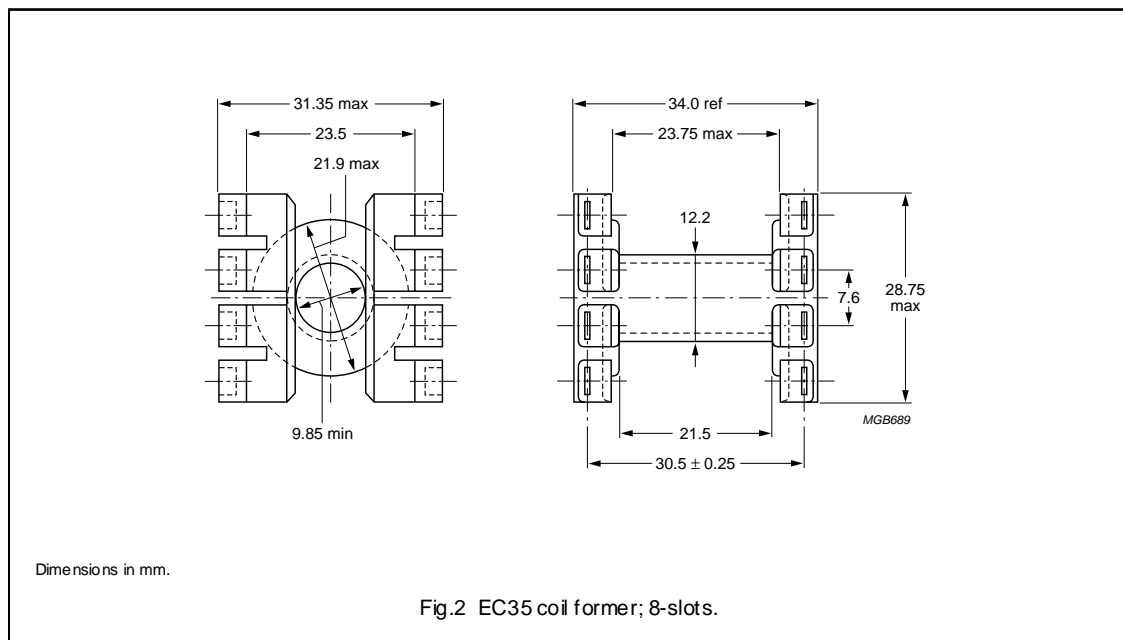
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; 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



**Winding data 8-slots EC35 coil former for insertable pins**

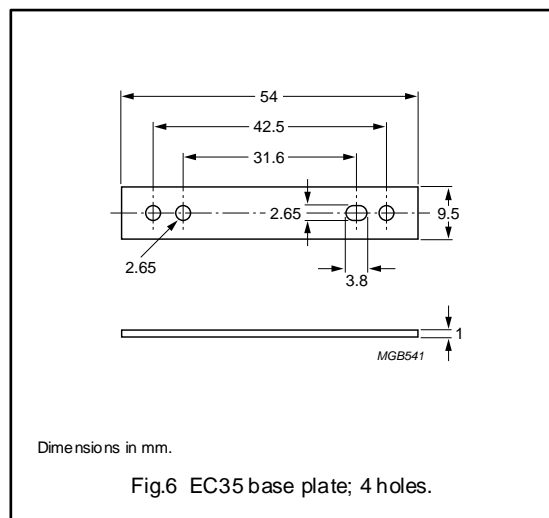
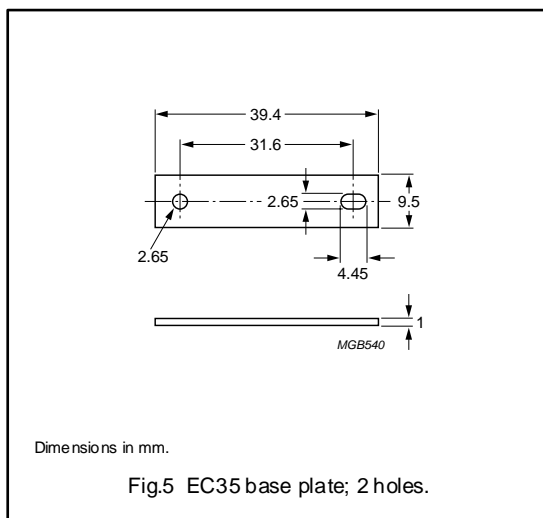
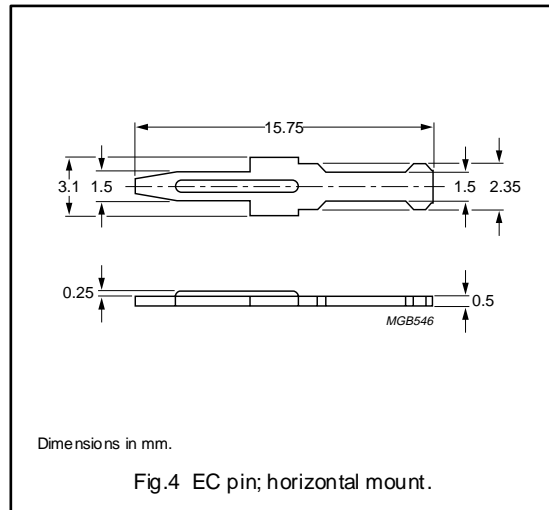
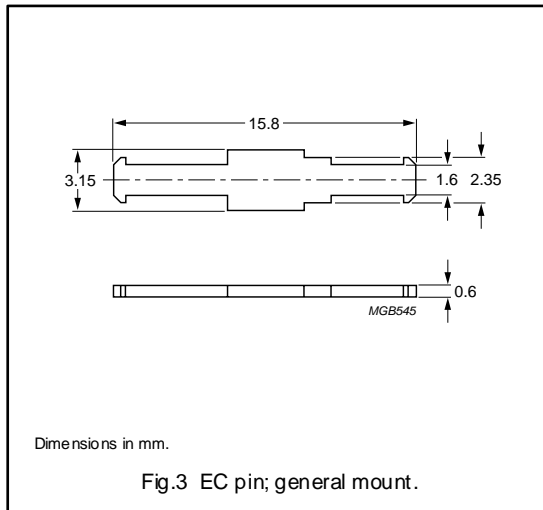
Coil formers with inserted pins are available on request.

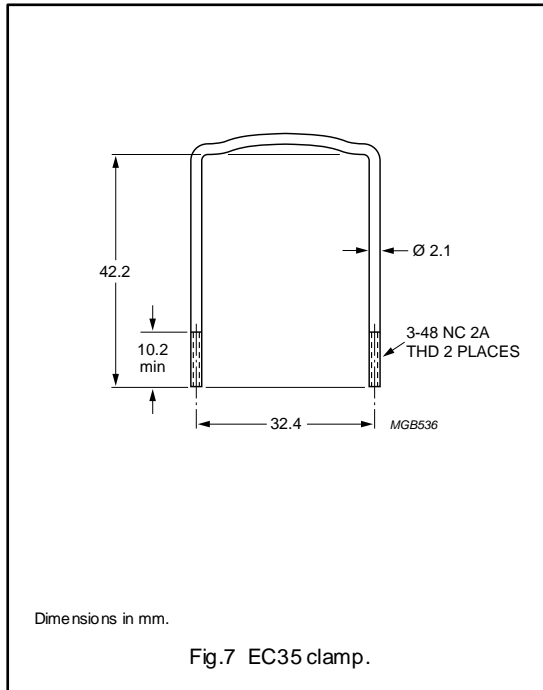
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	97.1	21.5	53.1	CP-EC35-1S

**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, transition to lead-free (Sn) ongoing.	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

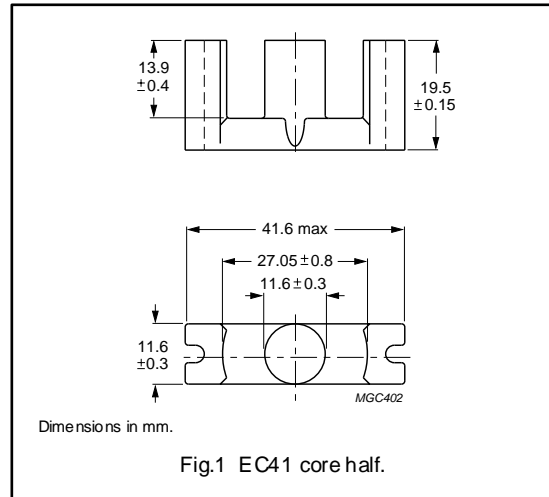




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.735	mm <sup>-1</sup>
$V_e$	effective volume	10 800	mm <sup>3</sup>
$l_e$	effective length	89.3	mm
$A_e$	effective area	121	mm <sup>2</sup>
$A_{min}$	minimum area	106	mm <sup>2</sup>
$m$	mass of core half	≈ 30	g



**Core halves**

$A_L$  measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	$100 \pm 3\%^{(1)}$	≈ 59	≈ 2200	EC41-3C81-E100
	$160 \pm 3\%^{(1)}$	≈ 94	≈ 1220	EC41-3C81-E160
	$250 \pm 3\%^{(1)}$	≈ 147	≈ 705	EC41-3C81-E250
	$315 \pm 5\%$	≈ 186	≈ 530	EC41-3C81-A315
	$400 \pm 5\%$	≈ 236	≈ 390	EC41-3C81-A400
	$\geq 2800$	$\geq 1640$	≈ 0	EC41-3C81
3C90 <sup>sup</sup>	$100 \pm 3\%^{(1)}$	≈ 59	≈ 2200	EC41-3C90-E100
	$160 \pm 3\%^{(1)}$	≈ 94	≈ 1220	EC41-3C90-E160
	$250 \pm 3\%^{(1)}$	≈ 147	≈ 705	EC41-3C90-E250
	$315 \pm 5\%$	≈ 186	≈ 530	EC41-3C90-A315
	$400 \pm 5\%$	≈ 236	≈ 390	EC41-3C90-A400
	$2700 \pm 25\%$	≈ 1580	≈ 0	EC41-3C90

**Note**

1. Measured in combination with an equal gapped core half (symmetrical air gap).

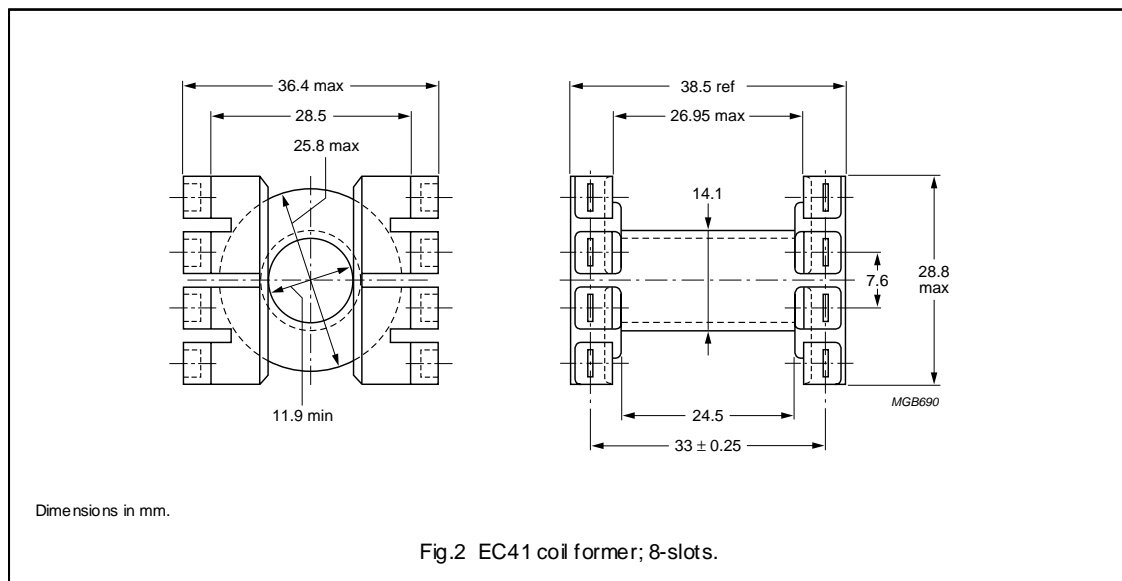
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; 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



**Winding data 8-slots EC41 coil former for insertable pins**

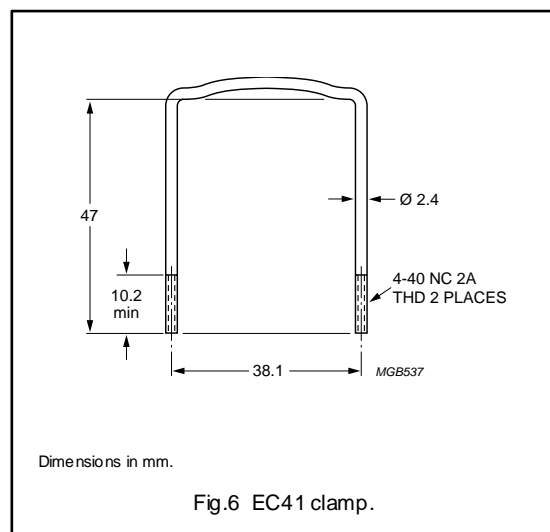
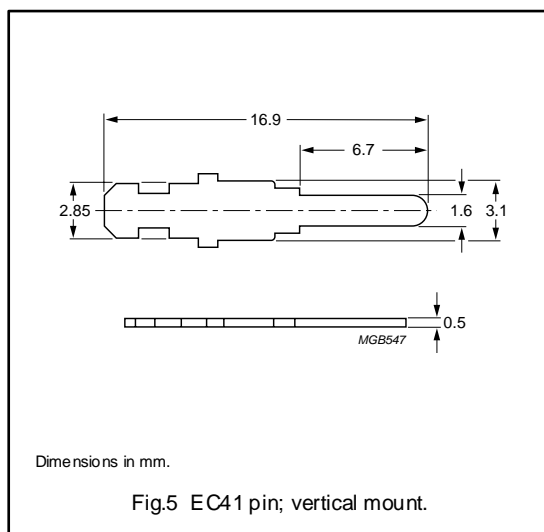
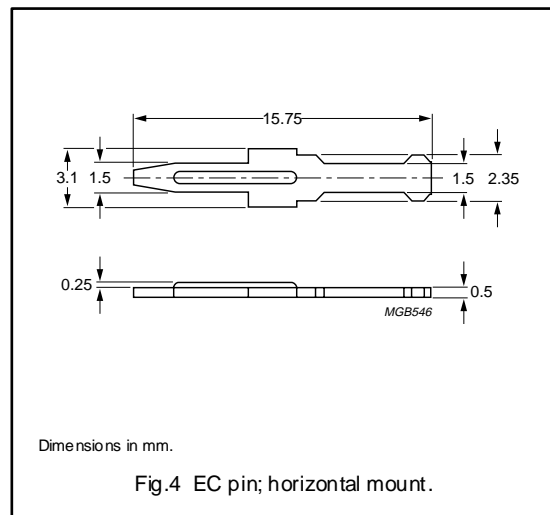
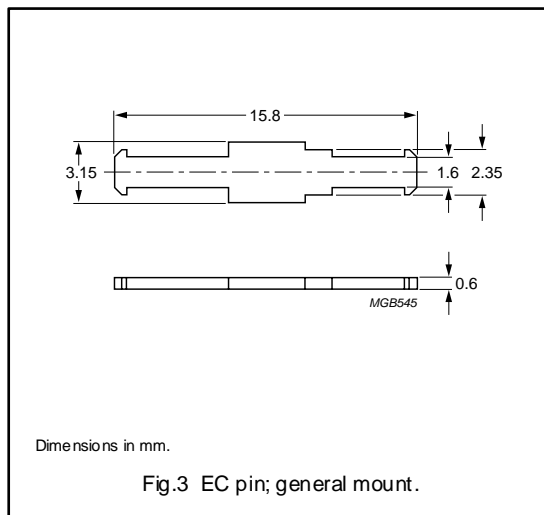
Coil formers with inserted pins are available on request.

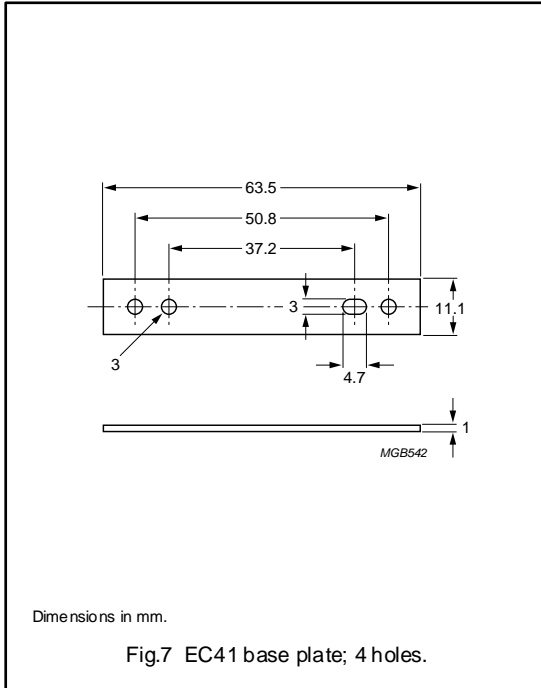
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	137.5	24.5	62.4	CP-EC41-1S

**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, transition to lead-free (Sn) ongoing.	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



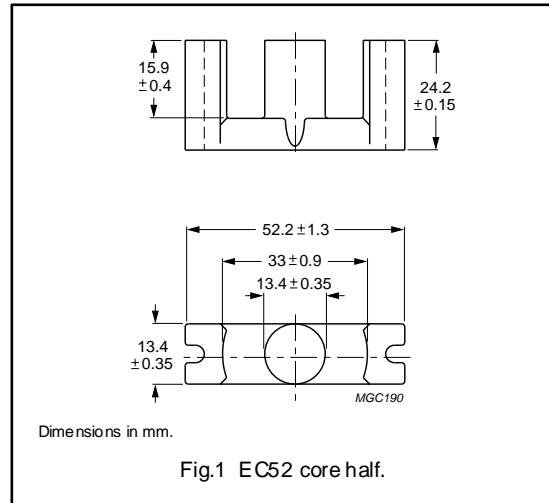




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.581	mm <sup>-1</sup>
$V_e$	effective volume	18 800	mm <sup>3</sup>
$l_e$	effective length	105	mm
$A_e$	effective area	180	mm <sup>2</sup>
$A_{min}$	minimum area	141	mm <sup>2</sup>
$m$	mass of core half	≈ 56	g



**Core halves**

$A_L$  measured in combination with a non-gapped core half, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	160 ± 3% <sup>(1)</sup>	≈ 74	≈ 1920	EC52-3C81-E160
	250 ± 3% <sup>(1)</sup>	≈ 116	≈ 1100	EC52-3C81-E250
	315 ± 3% <sup>(1)</sup>	≈ 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>sup</sup>	160 ± 3% <sup>(1)</sup>	≈ 74	≈ 1920	EC52-3C90-E160
	250 ± 3% <sup>(1)</sup>	≈ 116	≈ 1100	EC52-3C90-E250
	315 ± 3% <sup>(1)</sup>	≈ 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).

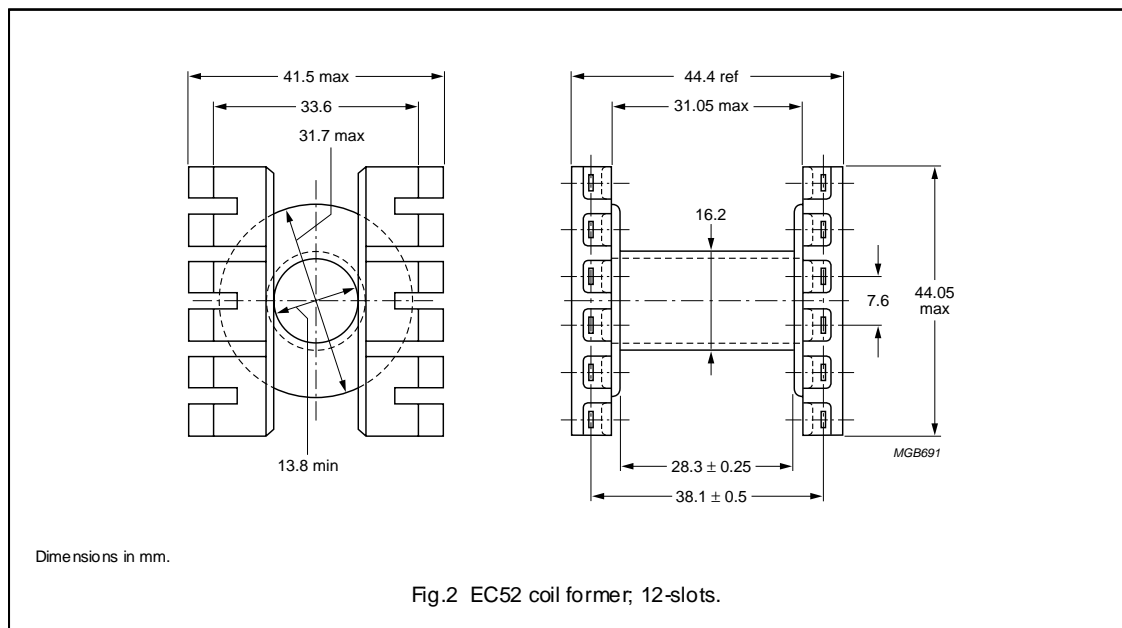
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; 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



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

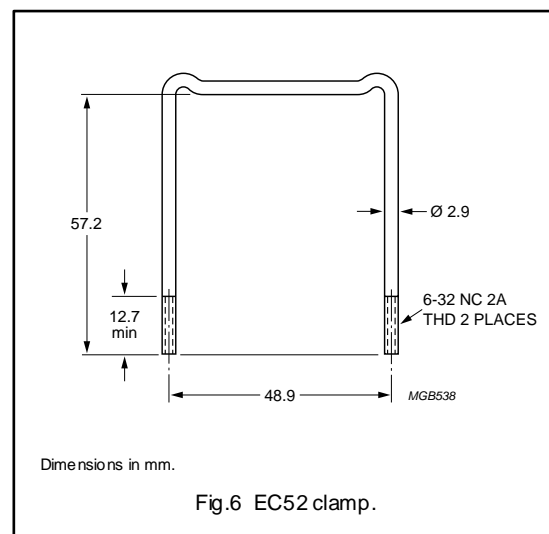
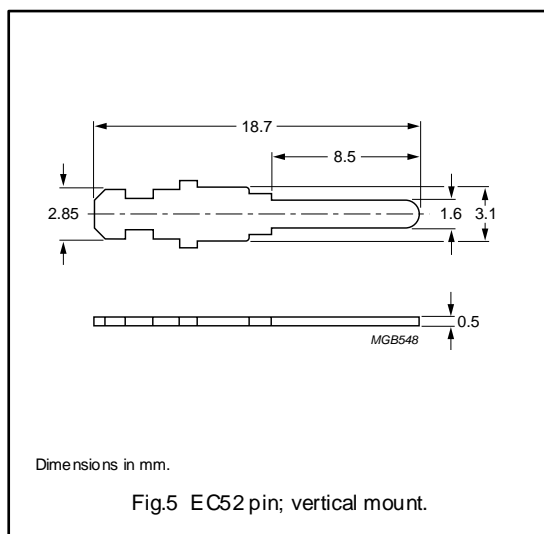
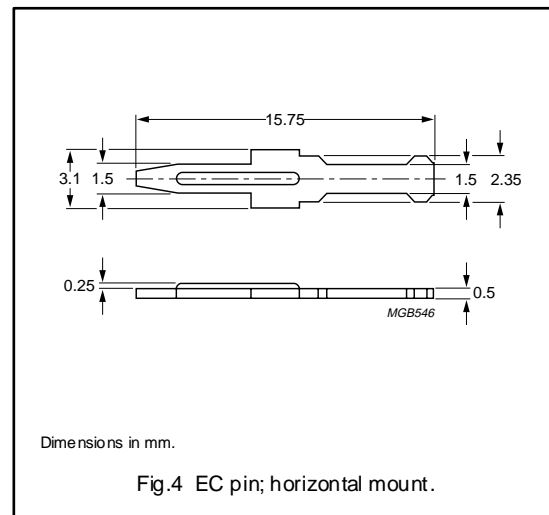
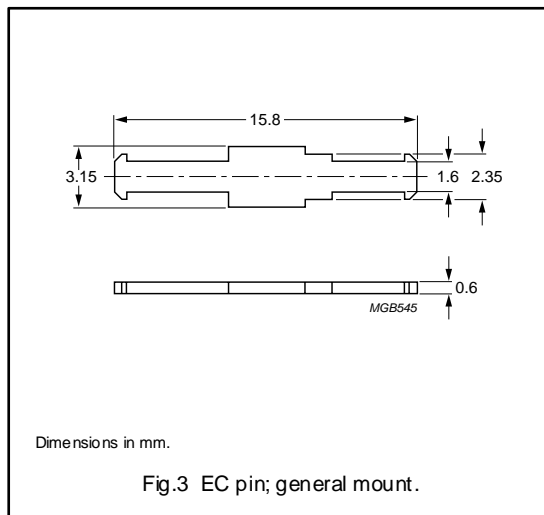
Coil formers with inserted pins are available on request.

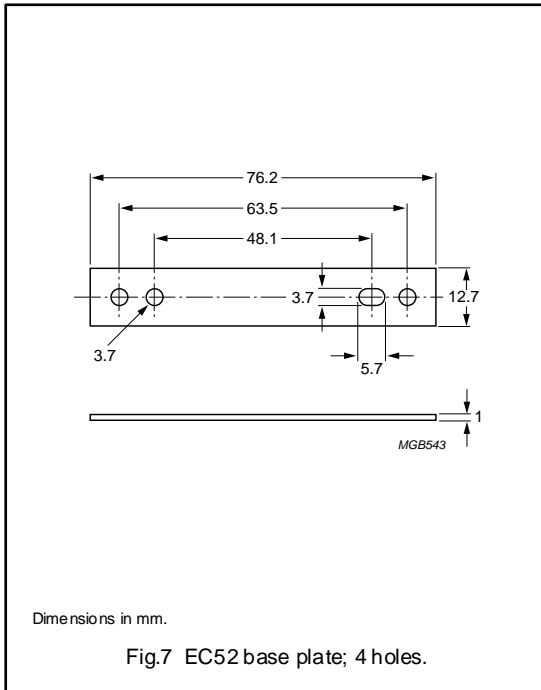
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	212	28.3	74.9	CP-EC52-1S

**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, transition to lead-free (Sn) ongoing.	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





**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.514	mm <sup>-1</sup>
$V_e$	effective volume	40 100	mm <sup>3</sup>
$l_e$	effective length	144	mm
$A_e$	effective area	279	mm <sup>2</sup>
$A_{min}$	minimum area	211	mm <sup>2</sup>
$m$	mass of core half	≈ 127	g

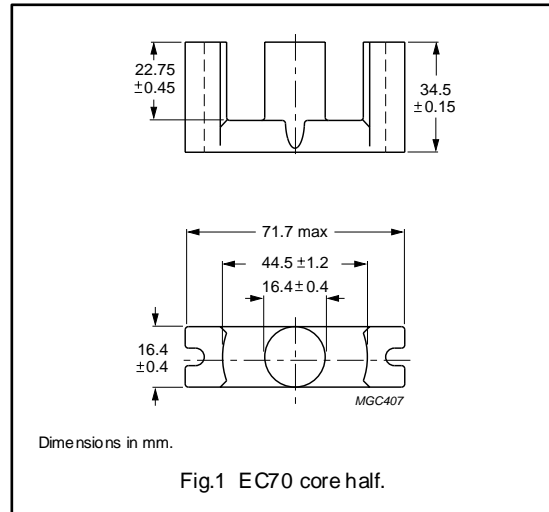


Fig.1 EC70 core half.

**Core halves**

$A_L$  measured in combination with an non-gapped core half, unless stated otherwise.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	250 ± 3% <sup>(1)</sup>	≈ 102	≈ 1830	EC70-3C81-E250
	315 ± 3% <sup>(1)</sup>	≈ 130	≈ 1370	EC70-3C81-E315
	400 ± 3% <sup>(1)</sup>	≈ 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>sup</sup>	250 ± 3% <sup>(1)</sup>	≈ 102	≈ 1830	EC70-3C90-E250
	315 ± 3% <sup>(1)</sup>	≈ 130	≈ 1370	EC70-3C90-E315
	400 ± 3% <sup>(1)</sup>	≈ 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).

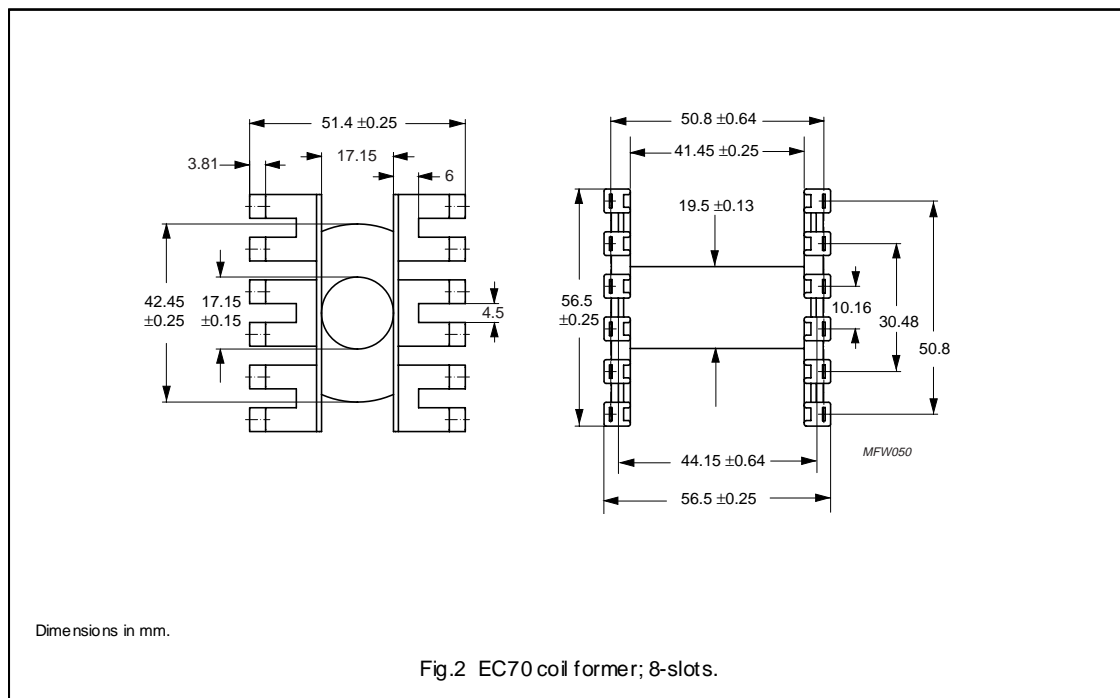
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; 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



**Winding data 8-slots EC70 coil former for insertable pins; see note 1**

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

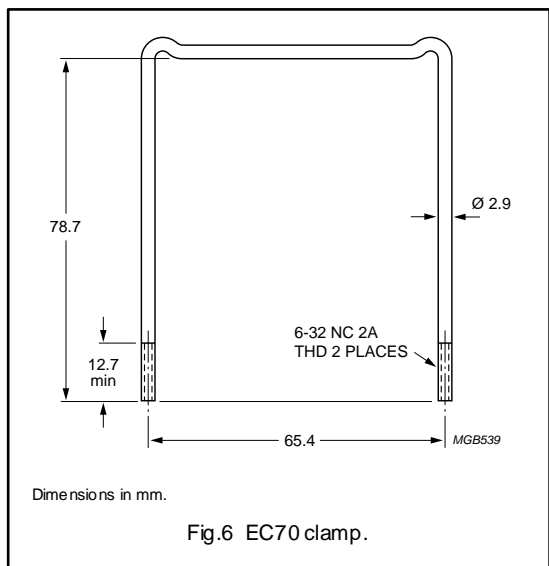
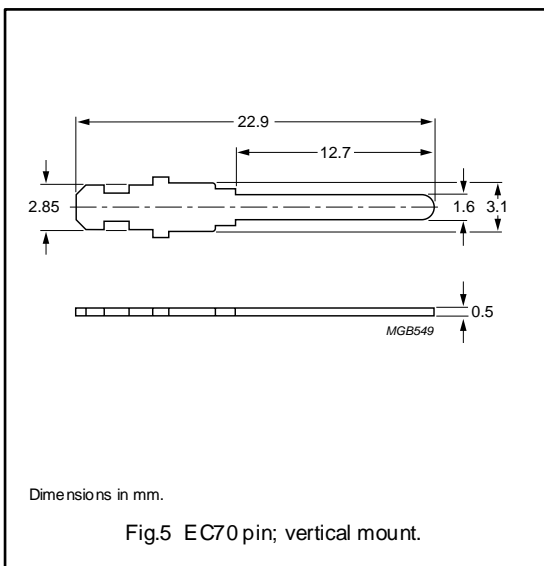
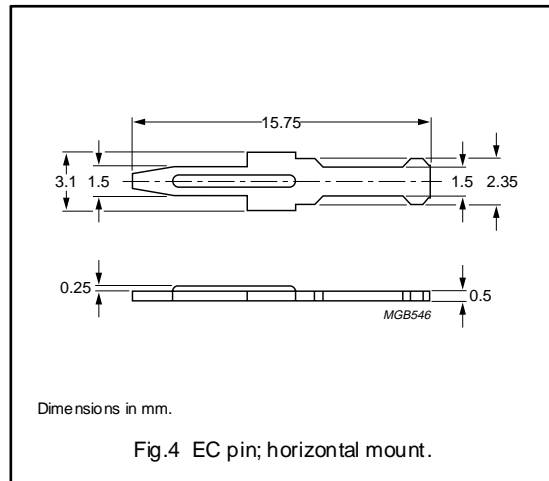
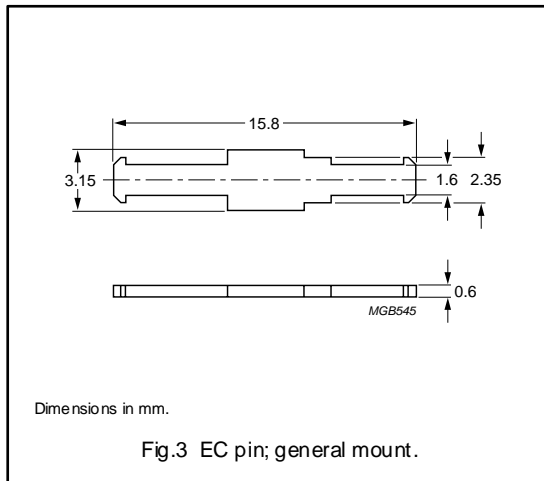
**Note**

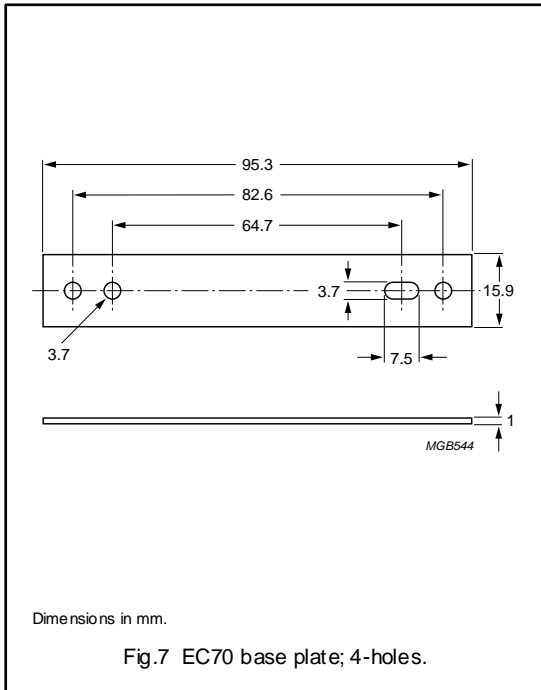
1. Coil formers with inserted pins are available on request.

**MOUNTING PARTS**

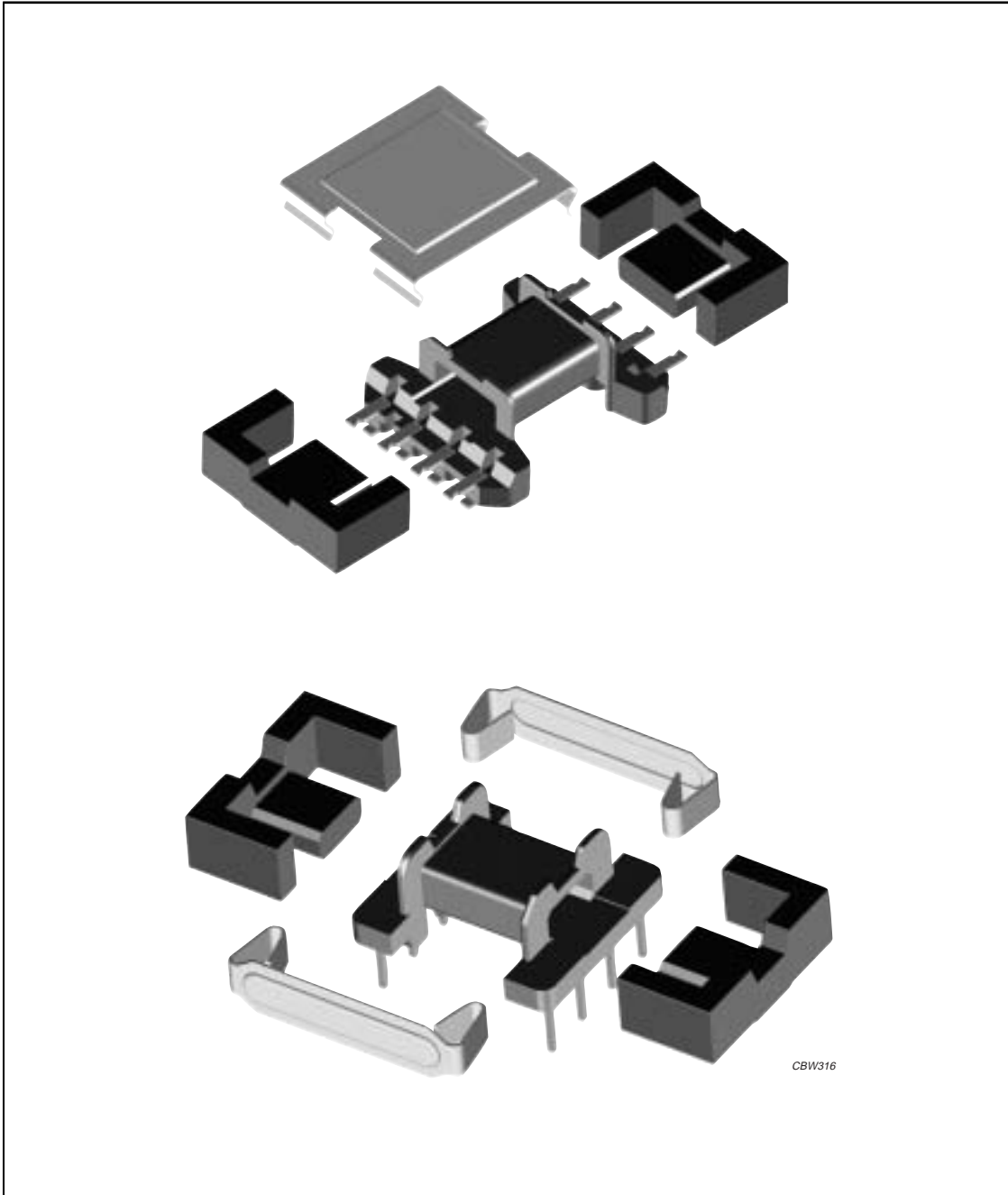
**General data and ordering information**

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, transition to lead-free (Sn) ongoing.	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









Soft Ferrites

EFD cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EFD cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
EFD10/5/3	171	7.2	0.45
EFD12/6/3.5	325	11.4	0.9
EFD15/8/5	510	15.0	1.4
EFD20/10/7	1460	31.0	3.5
EFD25/13/9	3300	58.0	8
EFD30/15/9	4700	69.0	12

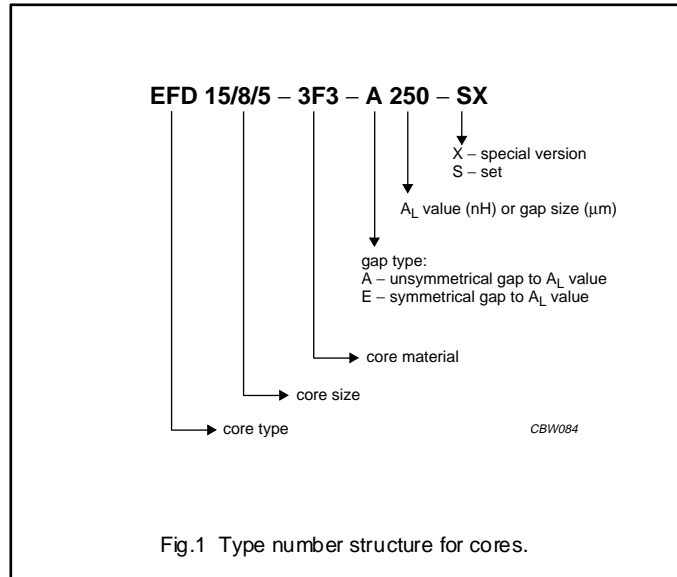


Fig.1 Type number structure for cores.

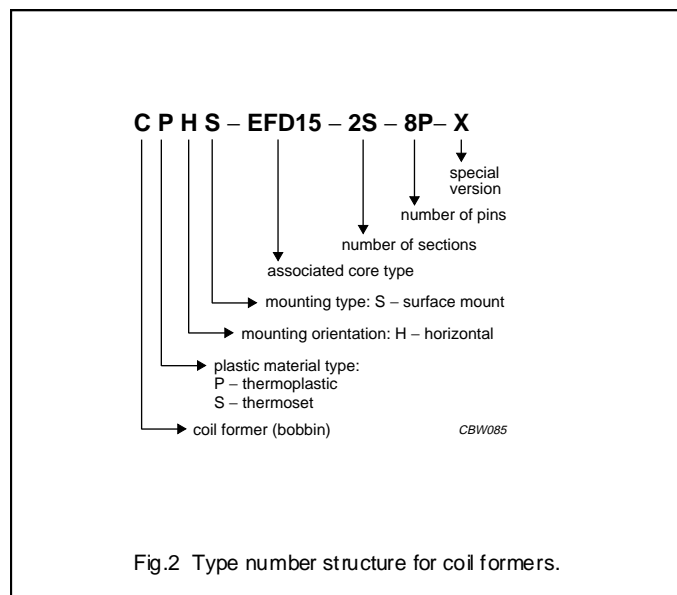
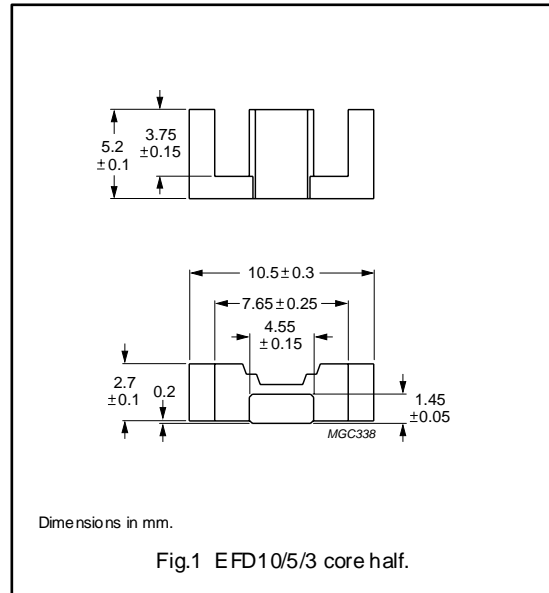


Fig.2 Type number structure for coil formers.

**CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.29	mm <sup>-1</sup>
$V_e$	effective volume	171	mm <sup>3</sup>
$l_e$	effective length	23.7	mm
$A_e$	effective area	7.2	mm <sup>2</sup>
$A_{min}$	minimum area	6.5	mm <sup>2</sup>
$m$	mass of core half	≈ 0.45	g



**Core sets**

Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3C90-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3C90-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3C90-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10/5/3-3C90-S
3C94	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3C94-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3C94-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3C94-A63-S
	585 ±25%	≈ 1510	≈ 0	EFD10/5/3-3C94-S
3C96 <b>des</b>	525 ±25%	≈ 1360	≈ 0	EFD10/5/3-3C96-S
3F3	25 ±5%	≈ 66	≈ 610	EFD10/5/3-3F3-A25-S
	40 ±8%	≈ 105	≈ 310	EFD10/5/3-3F3-A40-S
	63 ±10%	≈ 165	≈ 170	EFD10/5/3-3F3-A63-S
	500 ±25%	≈ 1290	≈ 0	EFD10/5/3-3F3-S
3F35 <b>prot</b>	400 ±25%	≈ 1030	≈ 0	EFD10/5/3-3F35-S
3F4 <b>des</b>	25 ±5%	≈ 66	≈ 570	EFD10/5/3-3F4-A25-S
	40 ±8%	≈ 105	≈ 280	EFD10/5/3-3F4-A40-S
	63 ±10%	≈ 165	≈ 150	EFD10/5/3-3F4-A63-S
	280 ±25%	≈ 730	≈ 0	EFD10/5/3-3F4-S
3F45 <b>prot</b>	280 ±25%	≈ 730	≈ 0	EFD10/5/3-3F45-S

## EFD cores and accessories

EFD10/5/3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5\text{N}$ .

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	2000 +40/-30%	$\approx 5240$	$\approx 0$	EFD10/5/3-3E5-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.019$	–	–	–
3C94	$\geq 320$	$\leq 0.015$	$\leq 0.09$	–	–
3C96	$\geq 340$	$\leq 0.01$	$\leq 0.07$	$\leq 0.03$	$\leq 0.06$
3F35	$\geq 300$	–	–	$\leq 0.015$	$\leq 0.03$
3F3	$\geq 315$	$\leq 0.020$	–	$\leq 0.035$	–
3F4	$\geq 250$	–	–	–	–

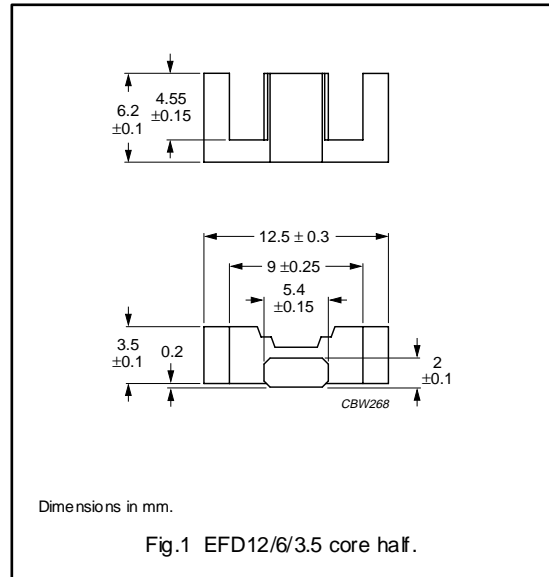
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 320$	–	–	–	–
3F35	$\geq 300$	$\leq 0.2$	–	–	–
3F3	$\geq 315$	–	–	–	–
3F4	$\geq 250$	–	$\leq 0.05$	–	$\leq 0.08$
3F45	$\geq 250$	–	$\leq 0.034$	$\leq 0.086$	$\leq 0.06$

**CORES**

**Effective core parameters**

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



**Core sets**

Clamping force for  $A_L$  measurements, 15 ±5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	40 ±5%	≈ 80	≈ 540	EFD12/6/3.5-3C90-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12/6/3.5-3C90-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12/6/3.5-3C90-A100-S
	825 ±25%	≈ 1610	≈ 0	EFD12/6/3.5-3C90-S
3C94	40 ±5%	≈ 80	≈ 540	EFD12/6/3.5-3C94-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12/6/3.5-3C94-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12/6/3.5-3C94-A100-S
	825 ±25%	≈ 1610	≈ 0	EFD12/6/3.5-3C94-S
3C96 <small>des</small>	750 ±25%	≈ 1460	≈ 0	EFD12/6/3.5-3C96-S
3F3	40 ±5%	≈ 80	≈ 540	EFD12/6/3.5-3F3-A40-S
	63 ±8%	≈ 125	≈ 290	EFD12/6/3.5-3F3-A63-S
	100 ±10%	≈ 200	≈ 160	EFD12/6/3.5-3F3-A100-S
	700 ±25%	≈ 1370	≈ 0	EFD12/6/3.5-3F3-S
3F35 <small>prot</small>	550 ±25%	≈ 1070	≈ 0	EFD12/6/3.5-3F35-S
3F4 <small>des</small>	40 ±5%	≈ 80	≈ 500	EFD12/6/3.5-3F4-A40-S
	63 ±8%	≈ 125	≈ 260	EFD12/6/3.5-3F4-A63-S
	100 ±10%	≈ 200	≈ 130	EFD12/6/3.5-3F4-A100-S
	380 ±25%	≈ 730	≈ 0	EFD12/6/3.5-3F4-S
3F45 <small>prot</small>	380 ±25%	≈ 730	≈ 0	EFD12/6/3.5-3F45-S

## EFD cores and accessories

EFD12/6/3.5

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5\text{N}$ .

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	2800 +40/-30%	$\approx 5570$	$\approx 0$	EFD12/6/3.5-3E5-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.036$	–	–	–
3C94	$\geq 320$	$\leq 0.029$	$\leq 0.2$	–	–
3C96	$\geq 340$	$\leq 0.022$	$\leq 0.15$	$\leq 0.06$	$\leq 0.12$
3F35	$\geq 300$	–	–	$\leq 0.03$	$\leq 0.045$
3F3	$\geq 315$	$\leq 0.04$	–	$\leq 0.065$	–
3F4	$\geq 250$	–	–	–	–

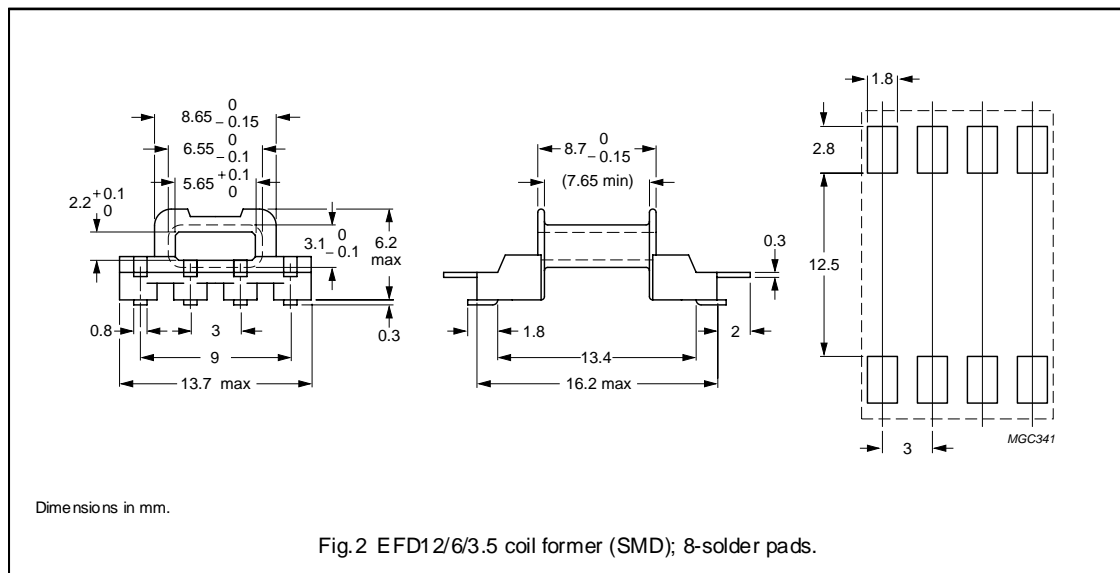
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	–	–	–	–
3F35	$\geq 300$	$\leq 0.35$	–	–	–
3F3	$\geq 315$	–	–	–	–
3F4	$\geq 250$	–	$\leq 0.09$	–	$\leq 0.15$
3F45	$\geq 250$	–	$\leq 0.065$	$\leq 0.16$	$\leq 0.11$

**COIL FORMERS**

**General data**

ITEM	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E83005(M)
Solder pad material	copper-tin alloy (CuSn), tin (Sn) 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



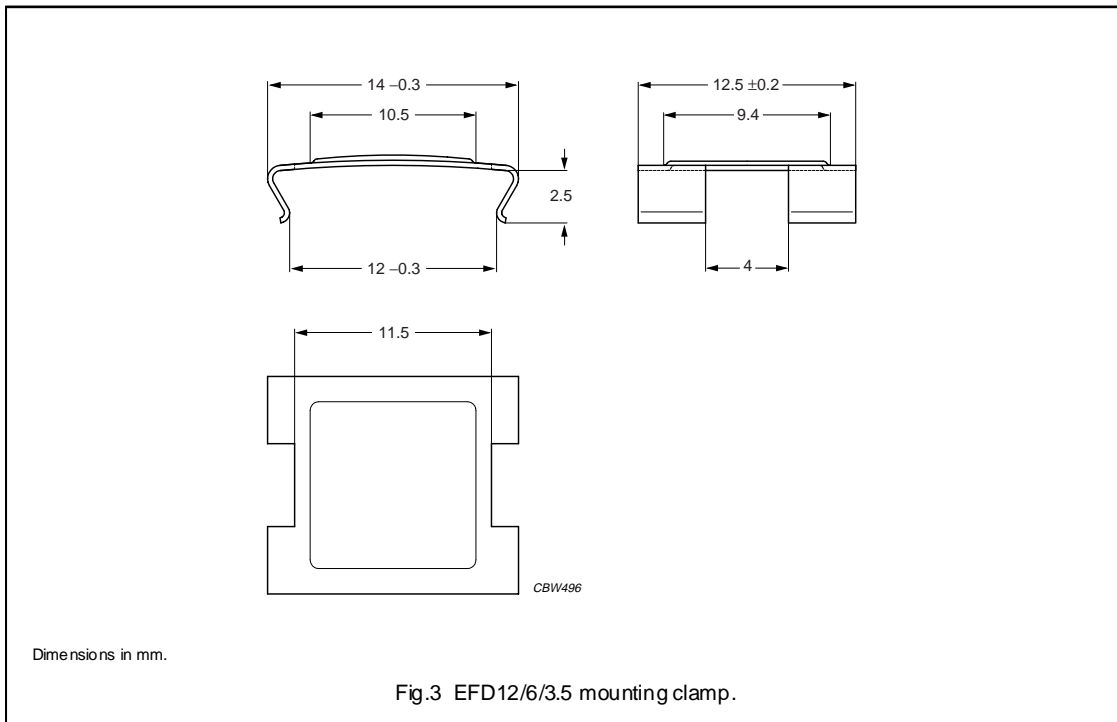
**Winding data for EFD12/6/3.5 coil former (SMD) with 8-solder pads**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	MINIMUM WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.5	7.65	18.6	CPHS-EFD12-1S-8P-Z

**MOUNTING PARTS**

**General data**

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force $\approx 20$ N	3	CLM-EFD12

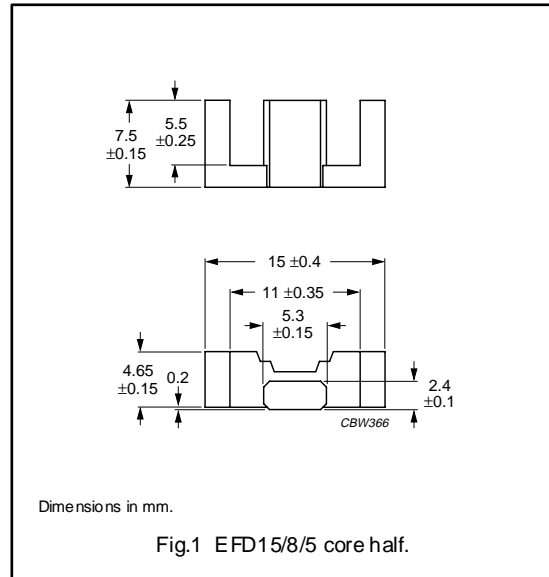




**CORES**

**Effective core parameters**

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



**Core sets**

Clamping force for  $A_L$  measurements, 20 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	63 ± 5%	≈ 115	≈ 400	EFD15/8/5-3C90-A63-S
	100 ± 8%	≈ 180	≈ 220	EFD15/8/5-3C90-A100-S
	160 ± 10%	≈ 290	≈ 120	EFD15/8/5-3C90-A160-S
	950 ± 25%	≈ 1700	≈ 0	EFD15/8/5-3C90-S
3C94	63 ± 5%	≈ 115	≈ 400	EFD15/8/5-3C94-A63-S
	100 ± 8%	≈ 180	≈ 220	EFD15/8/5-3C94-A100-S
	160 ± 10%	≈ 290	≈ 120	EFD15/8/5-3C94-A160-S
	950 ± 25%	≈ 1700	≈ 0	EFD15/8/5-3C94-S
3C96 <small>des</small>	850 ± 25%	≈ 1520	≈ 0	EFD15/8/5-3C96-S
3F3	63 ± 5%	≈ 115	≈ 400	EFD15/8/5-3F3-A63-S
	100 ± 8%	≈ 180	≈ 220	EFD15/8/5-3F3-A100-S
	160 ± 10%	≈ 290	≈ 120	EFD15/8/5-3F3-A160-S
	780 ± 25%	≈ 1400	≈ 0	EFD15/8/5-3F3-S
3F35 <small>prot</small>	630 ± 25%	≈ 1130	≈ 0	EFD15/8/5-3F35-S
3F4 <small>des</small>	63 ± 5%	≈ 115	≈ 360	EFD15/8/5-3F4-A63-S
	100 ± 8%	≈ 180	≈ 190	EFD15/8/5-3F4-A100-S
	160 ± 10%	≈ 290	≈ 90	EFD15/8/5-3F4-A160-S
	400 ± 25%	≈ 720	≈ 0	EFD15/8/5-3F4-S
3F45 <small>prot</small>	400 ± 25%	≈ 720	≈ 0	EFD15/8/5-3F45-S

## EFD cores and accessories

EFD15/8/5

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5\text{N}$ .

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	3600 +40/-30%	$\approx 6500$	$\approx 0$	EFD15/8/5-3E5-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.057$	–	–	–
3C94	$\geq 320$	$\leq 0.045$	$\leq 0.28$	–	–
3C96	$\geq 340$	$\leq 0.035$	$\leq 0.22$	$\leq 0.09$	$\leq 0.19$
3F35	$\geq 300$	–	–	$\leq 0.05$	$\leq 0.06$
3F3	$\geq 315$	$\leq 0.06$	–	$\leq 0.1$	–
3F4	$\geq 250$	–	–	–	–

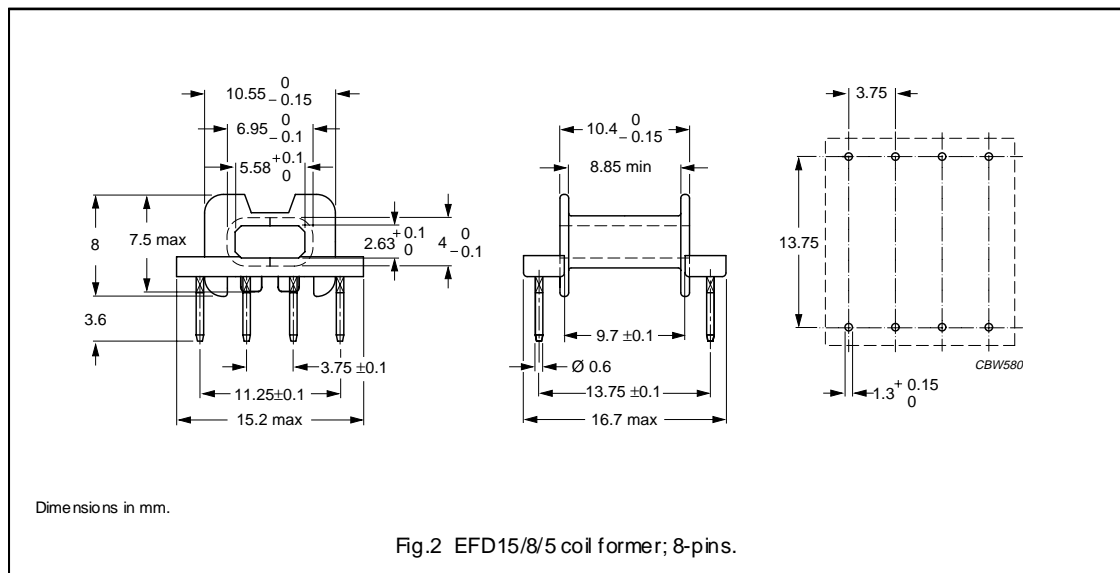
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	–	–	–	–
3F35	$\geq 300$	$\leq 0.5$	–	–	–
3F3	$\geq 315$	–	–	–	–
3F4	$\geq 250$	–	$\leq 0.15$	–	$\leq 0.24$
3F45	$\geq 250$	–	$\leq 0.1$	$\leq 0.26$	$\leq 0.18$

**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, see note 1
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



**Winding data for EFD15/8/5 coil former with 8-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

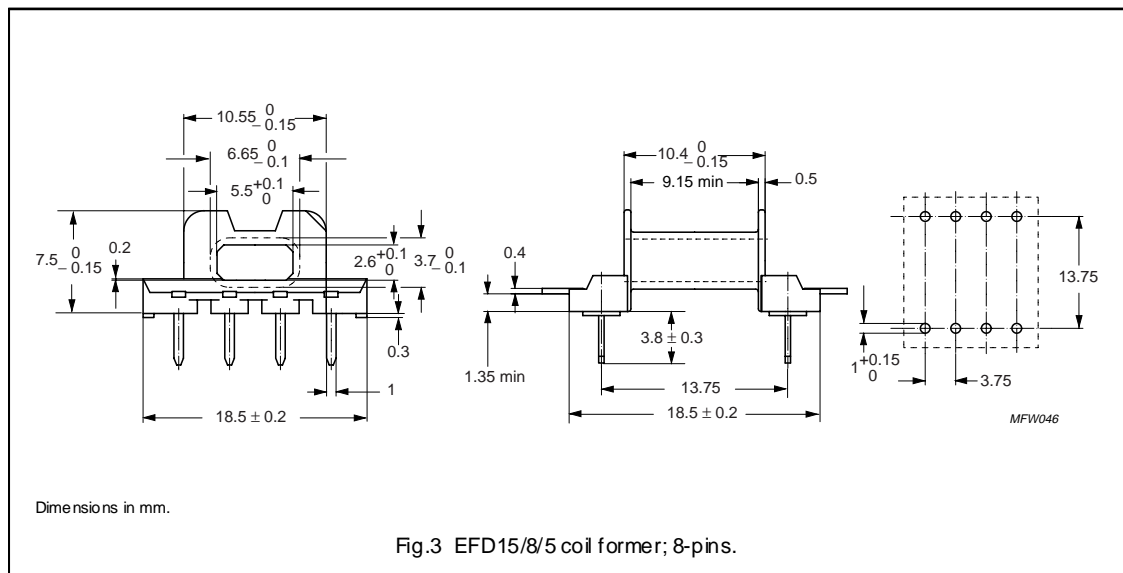
**Note**

1. Also available with post-inserted lead-free 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 (Sn) 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



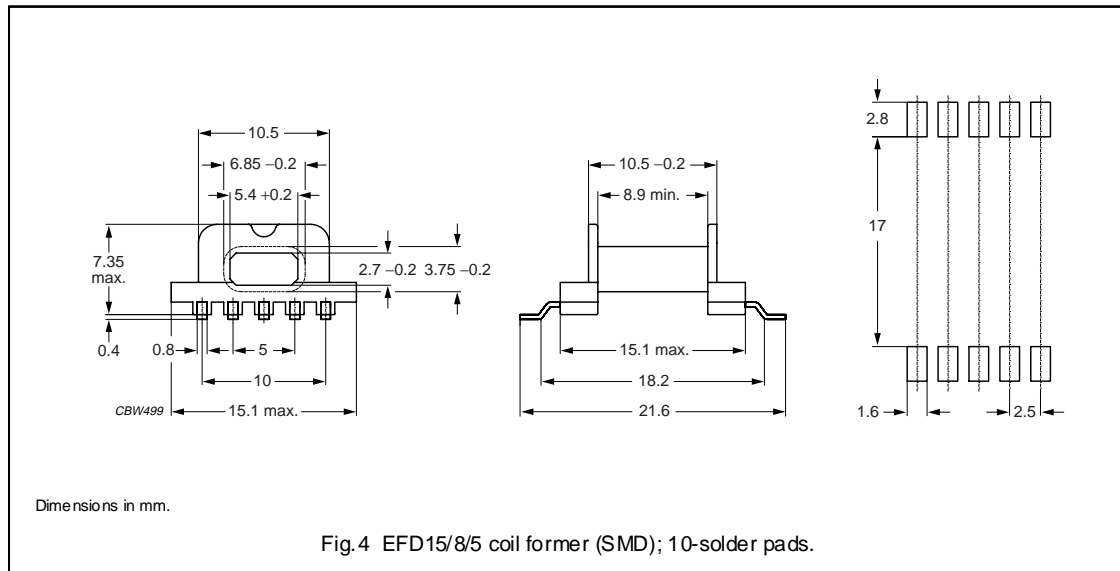
**Winding data for EFD15/8/5 coil former (PCB) with 8-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.15	25.6	CPH-EFD15-1S-8PD-Z

**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, transition to lead-free (Sn) ongoing.
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



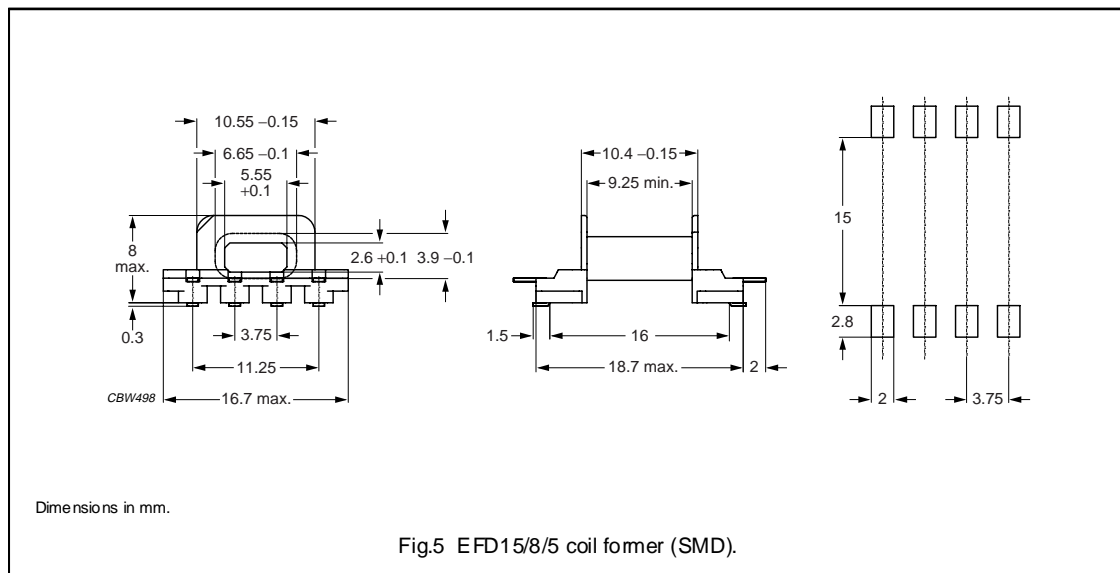
**Winding data for EFD15/8/5 coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	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 (Sn) 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



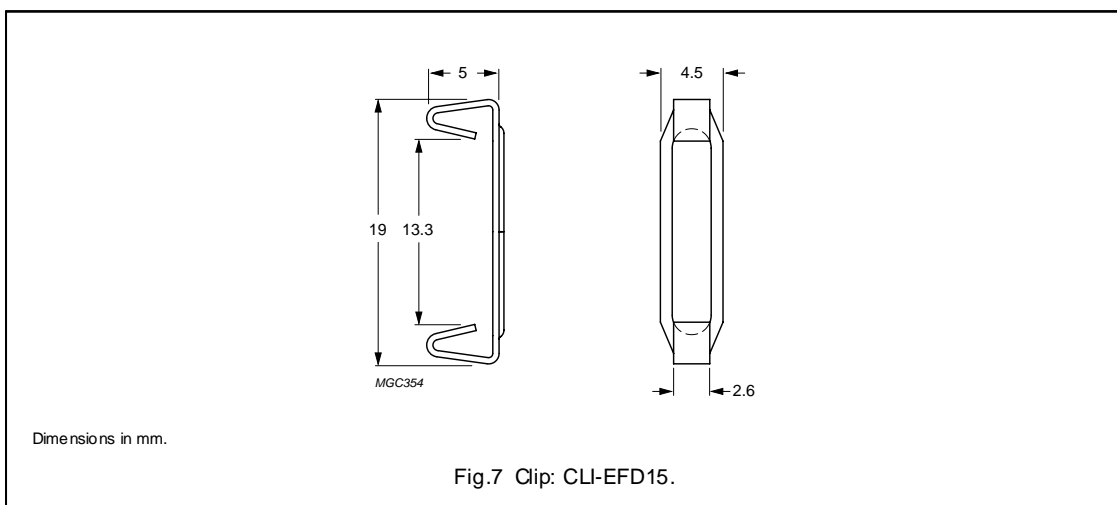
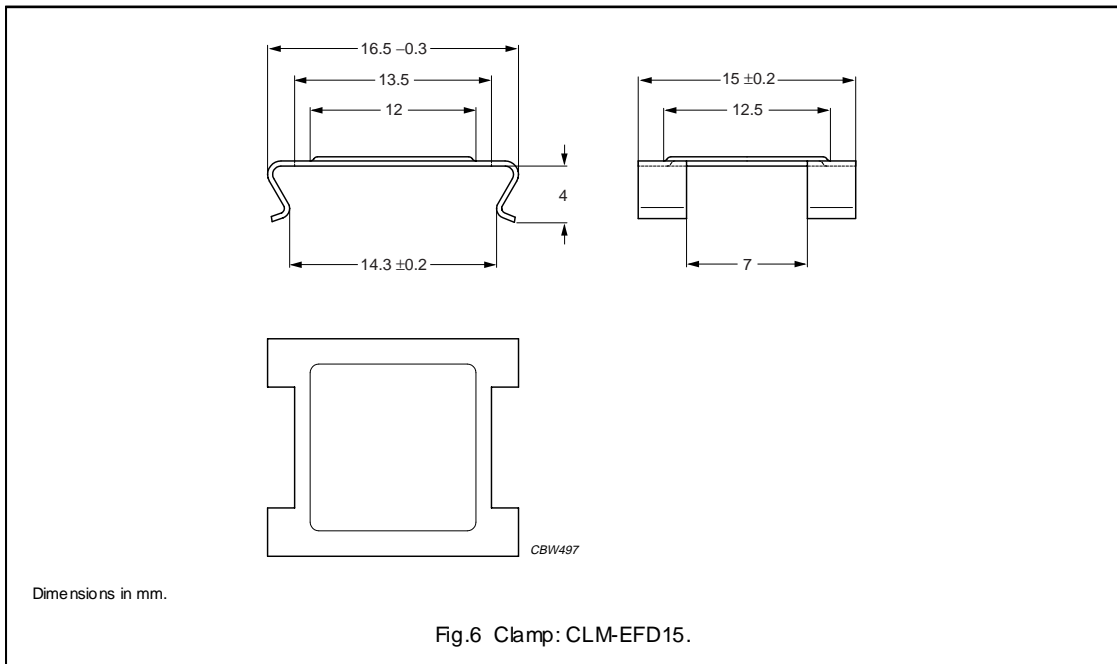
**Winding data for EFD15/8/5 (SMD) coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	16.7	9.25	24.1	CSHS-EFD15-1S-8P-Z

**MOUNTING PARTS**

**General data**

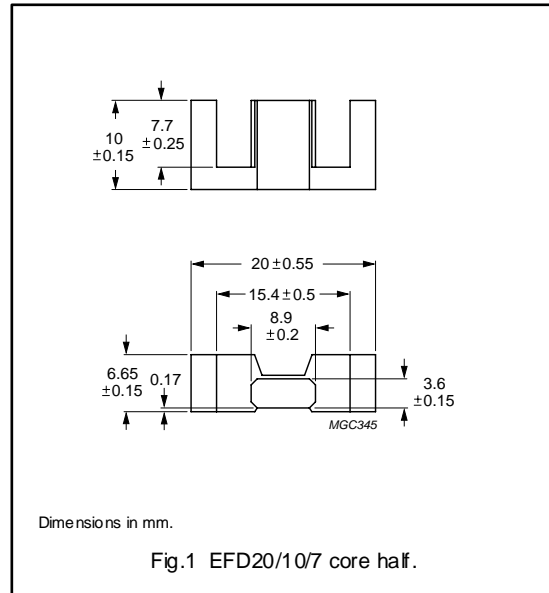
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force $\approx 25$ N	6	CLM-EFD15
Clip	stainless steel (CrNi); clamping force $\approx 12.5$ N	7	CLI-EFD15



**CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.52	mm <sup>-1</sup>
$V_e$	effective volume	1460	mm <sup>3</sup>
$l_e$	effective length	47.0	mm
$A_e$	effective area	31.0	mm <sup>2</sup>
$A_{min}$	minimum area	29	mm <sup>2</sup>
$m$	mass of core half	≈ 3.5	g



**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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	63 ± 3% <sup>(1)</sup>	≈ 76	≈ 960	EFD20/10/7-3C90-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3C90-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3C90-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3C90-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3C90-A315
	1300 ± 25%	≈ 1570	≈ 0	EFD20/10/7-3C90
3C94	63 ± 3% <sup>(1)</sup>	≈ 76	≈ 960	EFD20/10/7-3C94-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3C94-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3C94-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3C94-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3C94-A315
	1300 ± 25%	≈ 1570	≈ 0	EFD20/10/7-3C94
3C96 <small>des</small>	1200 ± 25%	≈ 1450	≈ 0	EFD20/10/7-3C96
3F3	63 ± 3% <sup>(1)</sup>	≈ 76	≈ 960	EFD20/10/7-3F3-E63
	100 ± 3%	≈ 121	≈ 510	EFD20/10/7-3F3-A100
	160 ± 5%	≈ 193	≈ 280	EFD20/10/7-3F3-A160
	250 ± 8%	≈ 302	≈ 160	EFD20/10/7-3F3-A250
	315 ± 10%	≈ 380	≈ 120	EFD20/10/7-3F3-A315
	1200 ± 25%	≈ 1450	≈ 0	EFD20/10/7-3F3



## EFD cores and accessories

EFD20/10/7

GRADE	$A_L$ (nH)	$H_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F35 	$920 \pm 25\%$	$\approx 1110$	$\approx 0$	EFD20/10/7-3F35
3F4 	$63 \pm 3\%^{(1)}$	$\approx 76$	$\approx 900$	EFD20/10/7-3F4-E63
	$100 \pm 3\%$	$\approx 121$	$\approx 450$	EFD20/10/7-3F4-A100
	$160 \pm 5\%$	$\approx 193$	$\approx 230$	EFD20/10/7-3F4-A160
	$250 \pm 8\%$	$\approx 302$	$\approx 120$	EFD20/10/7-3F4-A250
	$315 \pm 10\%$	$\approx 380$	$\approx 80$	EFD20/10/7-3F4-A315
	$650 \pm 25\%$	$\approx 780$	$\approx 0$	EFD20/10/7-3F4
3F45 	$650 \pm 25\%$	$\approx 780$	$\approx 0$	EFD20/10/7-3F45

**Note**

1. Measured in combination with an equal gapped core half, clamping force for  $A_L$  measurements,  $20 \pm 10$  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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 330$	$\leq 0.16$	$\leq 0.17$	–	–
3C94	$\geq 330$	–	$\leq 0.13$	$\leq 0.8$	–
3C96	$\geq 330$	–	$\leq 0.1$	$\leq 0.6$	$\leq 0.26$
3F35	$\geq 300$	–	–	–	$\leq 0.13$
3F3	$\geq 315$	–	$\leq 0.17$	–	$\leq 0.28$
3F4	$\geq 300$	–	–	–	–

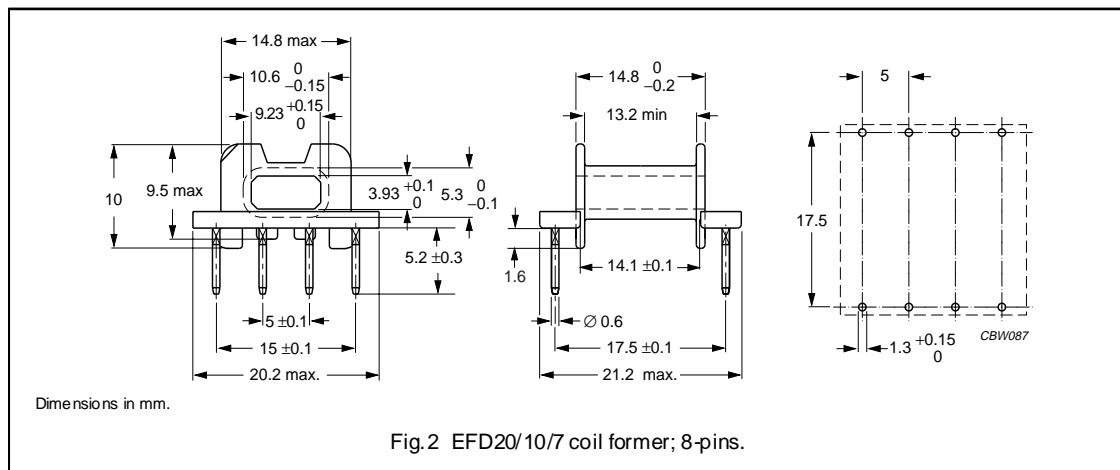
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 330$	–	–	–	–	–
3C94	$\geq 330$	–	–	–	–	–
3C96	$\geq 330$	$\leq 0.5$	–	–	–	–
3F35	$\geq 300$	$\leq 0.2$	$\leq 1.5$	–	–	–
3F3	$\geq 315$	–	–	–	–	–
3F4	$\geq 300$	–	–	$\leq 0.4$	–	$\leq 0.7$
3F45	$\geq 300$	–	–	$\leq 0.3$	$\leq 0.73$	$\leq 0.5$

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL94 V-0"; UL file number E 167521(M)
Pin material	copper-tin alloy (CuSn), Ni flash, tin-lead alloy (SnPb) plated, see note 1
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



**Winding data for EFD20 coil former with 8-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

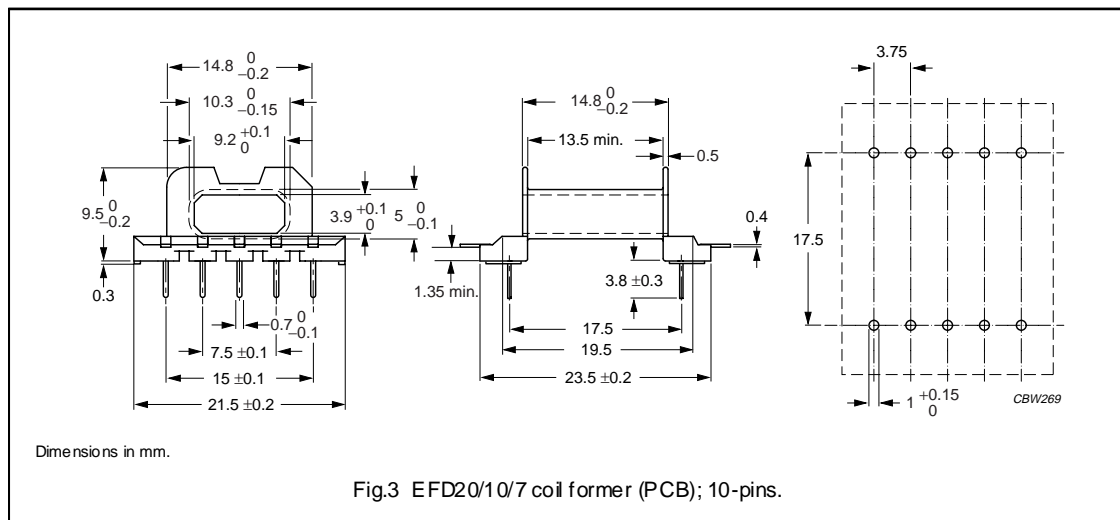
**Note**

- Also available with post-inserted lead-free 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 (Sn) 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



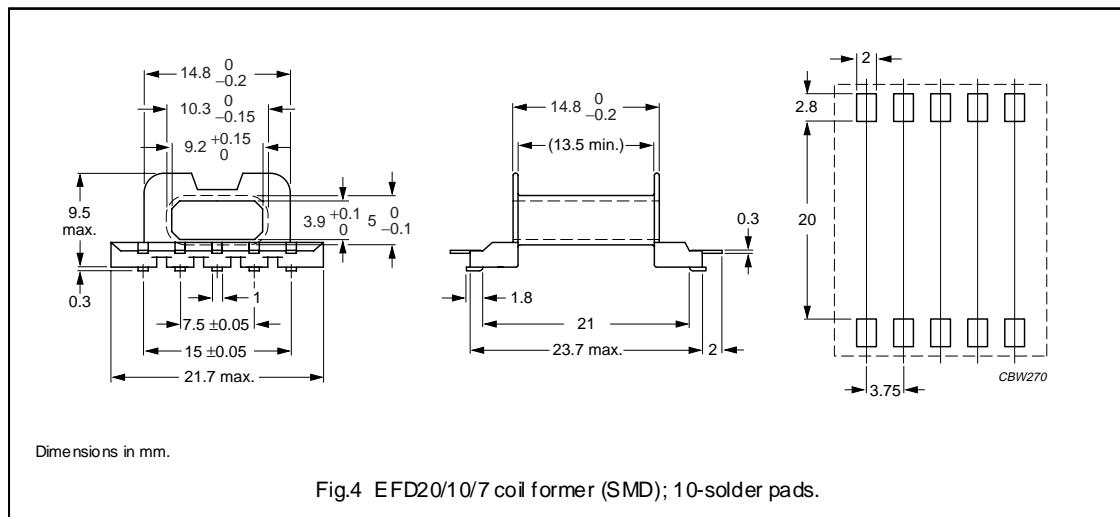
**Winding data for EFD20/10/7 coil former (PCB) with 10-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	27.7	13.5	34.1	CPH-EFD20-1S-10PD-Z

**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, transition to lead-free (Sn) ongoing.
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



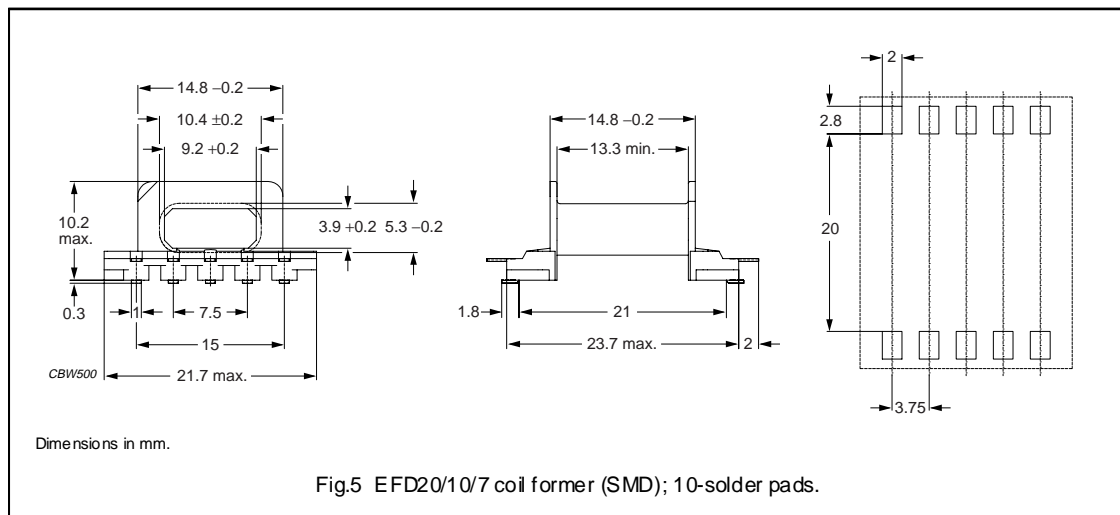
**Winding data for EFD20/10/7 coil former (SMD) with 10-solder pads**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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 (Sn) 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



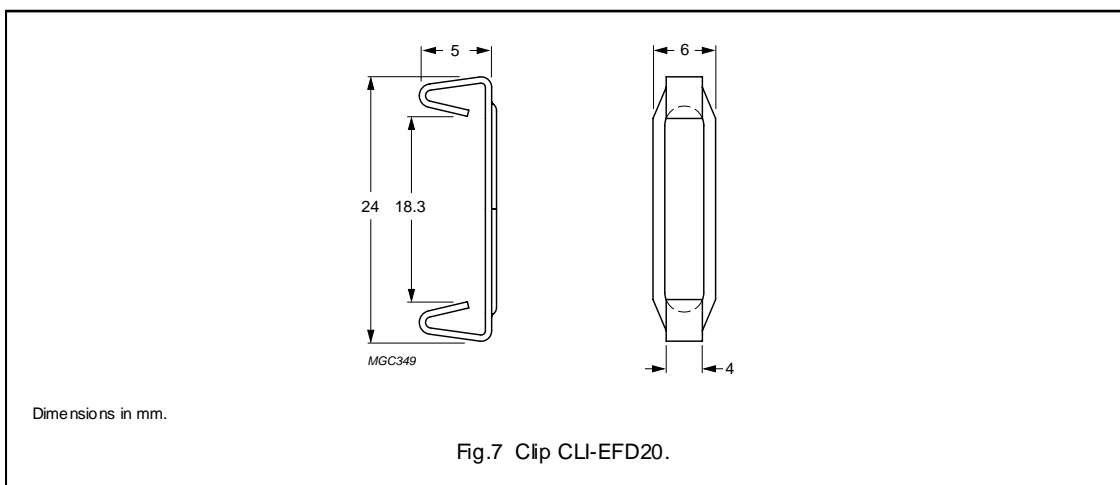
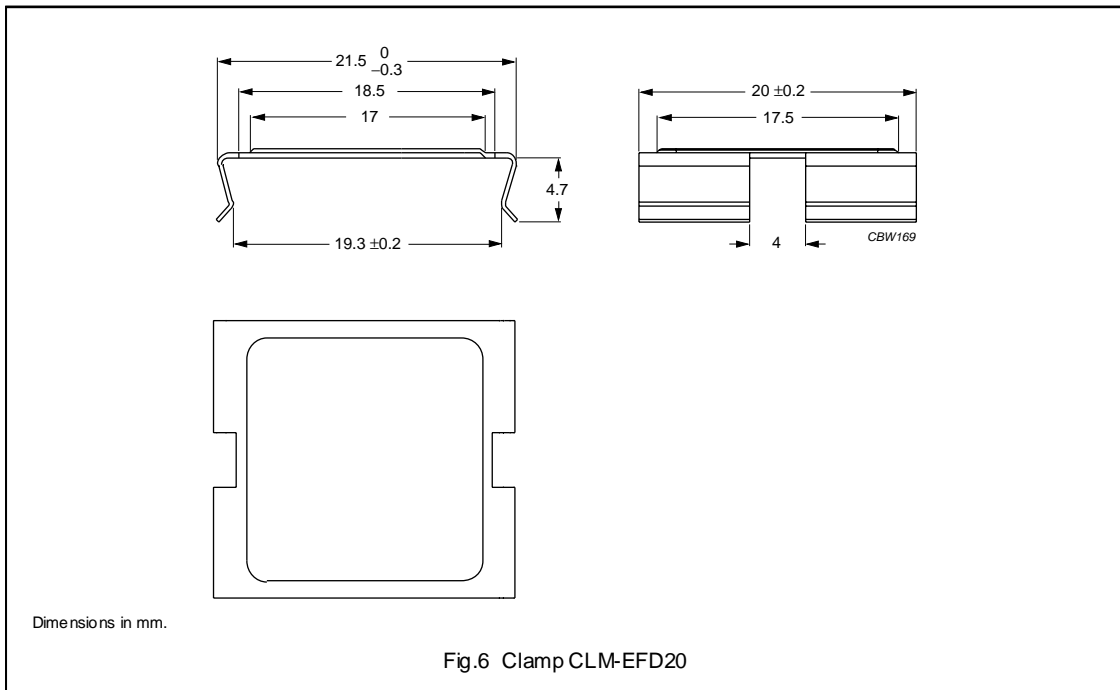
**Winding data for EFD20/10/7 coil former (SMD) with 10-solder pads**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	10	27.2	13.3	34.9	CSSH-EFD20-1S-10P-Z

**MOUNTING PARTS**

**General data**

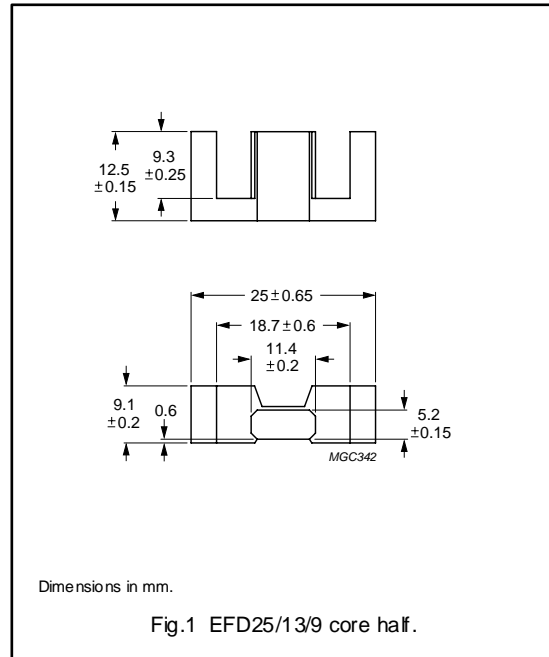
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force $\approx 30$ N	6	CLM-EFD20
Clip	stainless steel (CrNi); clamping force $\approx 20$ N	7	CLI-EFD20



**CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.00	mm <sup>-1</sup>
$V_e$	effective volume	3300	mm <sup>3</sup>
$l_e$	effective length	57.0	mm
$A_e$	effective area	58.0	mm <sup>2</sup>
$A_{min}$	minimum area	55.0	mm <sup>2</sup>
$m$	mass of core half	≈ 8	g



**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)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	160 ±3%	≈ 125	≈ 570	EFD25/13/9-3C90-A160
	250 ±3%	≈ 196	≈ 320	EFD25/13/9-3C90-A250
	315 ±5%	≈ 246	≈ 240	EFD25/13/9-3C90-A315
	400 ±8%	≈ 313	≈ 180	EFD25/13/9-3C90-A400
	630 ±10%	≈ 493	≈ 100	EFD25/13/9-3C90-A630
	2200 ±25%	≈ 1720	≈ 0	EFD25/13/9-3C90
3C94	160 ±3%	≈ 125	≈ 570	EFD25/13/9-3C94-A160
	250 ±3%	≈ 196	≈ 320	EFD25/13/9-3C94-A250
	315 ±5%	≈ 246	≈ 240	EFD25/13/9-3C94-A315
	400 ±8%	≈ 313	≈ 180	EFD25/13/9-3C94-A400
	630 ±10%	≈ 493	≈ 100	EFD25/13/9-3C94-A630
	2200 ±25%	≈ 1720	≈ 0	EFD25/13/9-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	2000 ±25%	≈ 1560	≈ 0	EFD25/13/9-3C96

## EFD cores and accessories

EFD25/13/9

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm$ 3%	$\approx$ 125	$\approx$ 570	EFD25/13/9-3F3-A160
	250 $\pm$ 3%	$\approx$ 196	$\approx$ 320	EFD25/13/9-3F3-A250
	315 $\pm$ 5%	$\approx$ 246	$\approx$ 240	EFD25/13/9-3F3-A315
	400 $\pm$ 8%	$\approx$ 313	$\approx$ 180	EFD25/13/9-3F3-A400
	630 $\pm$ 10%	$\approx$ 493	$\approx$ 100	EFD25/13/9-3F3-A630
	2000 $\pm$ 25%	$\approx$ 1560	$\approx$ 0	EFD25/13/9-3F3
3F35 <b>des</b>	1500 $\pm$ 25%	$\approx$ 1170	$\approx$ 0	EFD25/13/9-3F35
3F4 <b>des</b>	160 $\pm$ 3%	$\approx$ 125	$\approx$ 500	EFD25/13/9-3F4-A160
	250 $\pm$ 3%	$\approx$ 196	$\approx$ 270	EFD25/13/9-3F4-A250
	315 $\pm$ 5%	$\approx$ 246	$\approx$ 290	EFD25/13/9-3F4-A315
	400 $\pm$ 8%	$\approx$ 313	$\approx$ 130	EFD25/13/9-3F4-A400
	630 $\pm$ 10%	$\approx$ 493	$\approx$ 60	EFD25/13/9-3F4-A630
	1000 $\pm$ 25%	$\approx$ 780	$\approx$ 0	EFD25/13/9-3F4
3F45 <b>prot</b>	1000 $\pm$ 25%	$\approx$ 780	$\approx$ 0	EFD25/13/9-3F45

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq$ 330	$\leq$ 0.35	$\leq$ 0.38	–	–
3C94	$\geq$ 330	–	$\leq$ 0.30	$\leq$ 1.8	–
3C96	$\geq$ 330	–	$\leq$ 0.22	$\leq$ 1.4	$\leq$ 0.6
3F35	$\geq$ 300	–	–	–	$\leq$ 0.28
3F3	$\geq$ 315	–	$\leq$ 0.38	–	$\leq$ 0.66
3F4	$\geq$ 300	–	–	–	–

## Properties of core sets under power conditions (continued)

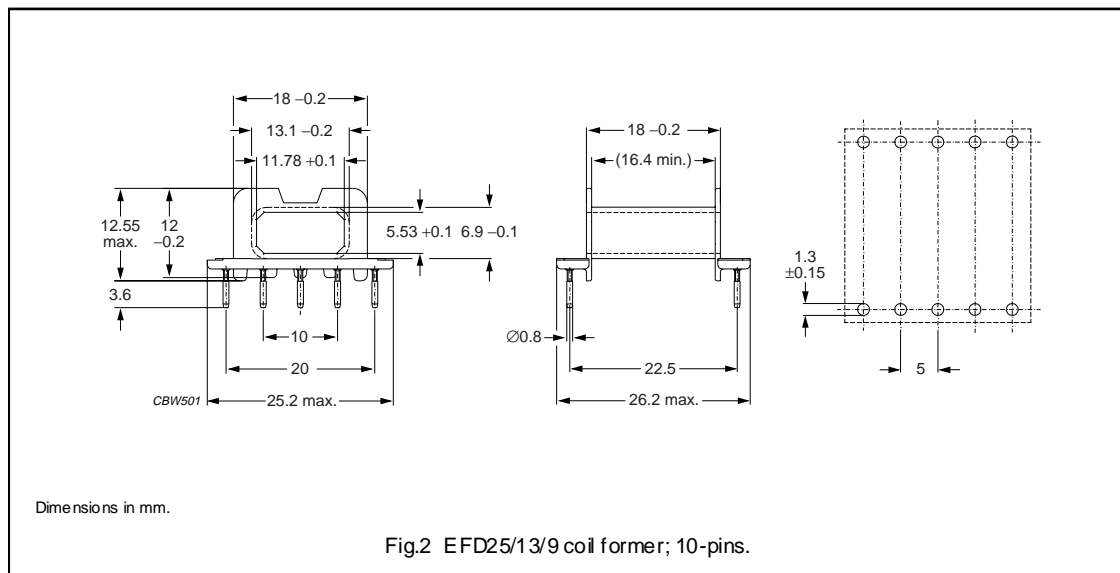
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq$ 330	–	–	–	–	–
3C94	$\geq$ 330	–	–	–	–	–
3C96	$\geq$ 330	$\leq$ 1.2	–	–	–	–
3F35	$\geq$ 300	$\leq$ 0.42	$\leq$ 3.4	–	–	–
3F3	$\geq$ 315	–	–	–	–	–
3F4	$\geq$ 300	–	–	$\leq$ 1.0	–	$\leq$ 1.6
3F45	$\geq$ 300	–	–	$\leq$ 0.66	$\leq$ 1.6	$\leq$ 1.1



**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E 167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, see note 1
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



**Winding data for EFD25/13/9 coil former with 10-pins**

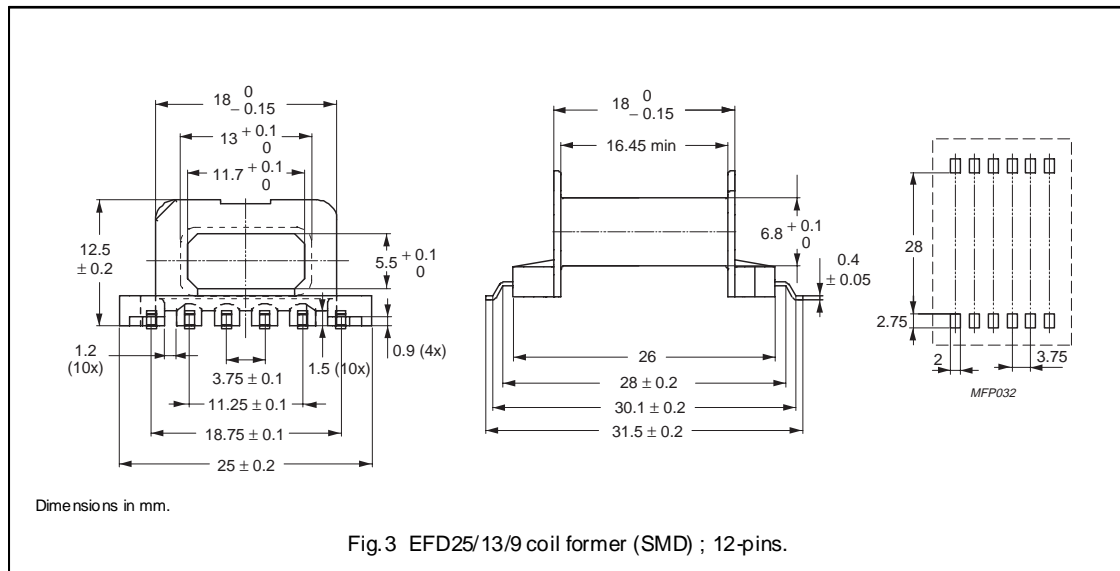
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	40.2	16.4	46.4	CSH-EFD25-1S-10P <sup>(1)</sup>

1. Also available with post-inserted lead-free pins.

**COIL FORMERS**

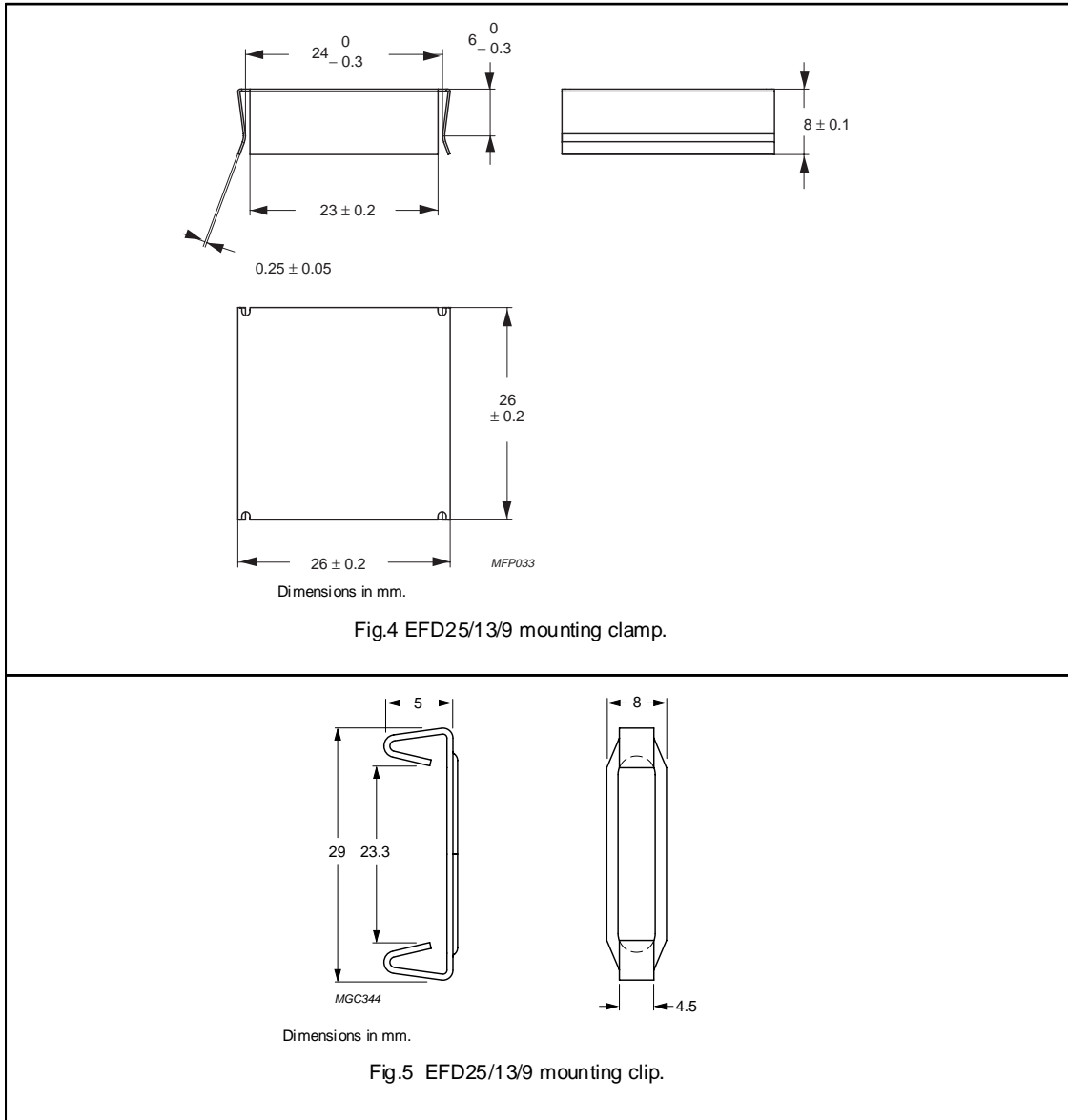
**General data**

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM-9630 (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E 41 429
Pin material	copper-tin alloy (CuSn), Gold (Au) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s



**Winding data for EFD25/13/9 coil former with 12-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	39.0	16.45	46.4	CSHS-EFD25-1S-12P



**MOUNTING PARTS**

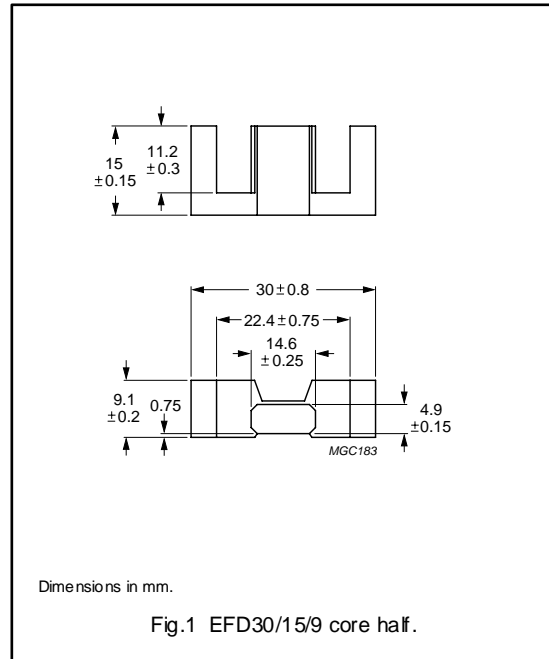
**General data**

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force ≈ 30 N	4	CLI-EFD25
Clamp	stainless steel (CrNi); clamping force ≈ 30 N	5	CLM-EFD25

**CORES**

**Effective core parameters**

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



**Core halves**

$A_L$  measured in combination with a non-gapped core half, clamping force for  $A_L$  measurements  $70 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	160 ± 3%	≈ 125	≈ 690	EFD30/15/9-3C90-A 160
	250 ± 3%	≈ 196	≈ 390	EFD30/15/9-3C90-A 250
	315 ± 5%	≈ 247	≈ 290	EFD30/15/9-3C90-A 315
	400 ± 8%	≈ 314	≈ 210	EFD30/15/9-3C90-A 400
	630 ± 10%	≈ 494	≈ 120	EFD30/15/9-3C90-A 630
	2100 ± 25%	≈ 1720	≈ 0	EFD30/15/9-3C90
3C94	160 ± 3%	≈ 125	≈ 690	EFD30/15/9-3C94-A 160
	250 ± 3%	≈ 196	≈ 390	EFD30/15/9-3C94-A 250
	315 ± 5%	≈ 247	≈ 290	EFD30/15/9-3C94-A 315
	400 ± 8%	≈ 314	≈ 210	EFD30/15/9-3C94-A 400
	630 ± 10%	≈ 494	≈ 120	EFD30/15/9-3C94-A 630
	2100 ± 25%	≈ 1720	≈ 0	EFD30/15/9-3C94
3C96 <small>des</small>	1900 ± 25%	≈ 1560	≈ 0	EFD30/15/9-3C96

## EFD cores and accessories

EFD30/15/9

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm$ 3%	$\approx$ 125	$\approx$ 690	EFD30/15/9-3F3-A160
	250 $\pm$ 3%	$\approx$ 196	$\approx$ 390	EFD30/15/9-3F3-A250
	315 $\pm$ 5%	$\approx$ 247	$\approx$ 290	EFD30/15/9-3F3-A315
	400 $\pm$ 8%	$\approx$ 314	$\approx$ 210	EFD30/15/9-3F3-A400
	630 $\pm$ 10%	$\approx$ 494	$\approx$ 120	EFD30/15/9-3F3-A630
	1900 $\pm$ 25%	$\approx$ 1560	$\approx$ 0	EFD30/15/9-3F3
3F35 <small>des</small>	1450 $\pm$ 25%	$\approx$ 1170	$\approx$ 0	EFD30/15/9-3F35
3F4 <small>des</small>	160 $\pm$ 3%	$\approx$ 125	$\approx$ 620	EFD30/15/9-3F4-A160
	250 $\pm$ 3%	$\approx$ 196	$\approx$ 320	EFD30/15/9-3F4-A250
	315 $\pm$ 5%	$\approx$ 247	$\approx$ 230	EFD30/15/9-3F4-A315
	400 $\pm$ 8%	$\approx$ 314	$\approx$ 160	EFD30/15/9-3F4-A400
	630 $\pm$ 10%	$\approx$ 494	$\approx$ 65	EFD30/15/9-3F4-A630
	1000 $\pm$ 25%	$\approx$ 780	$\approx$ 0	EFD30/15/9-3F4
3F45 <small>prot</small>	1000 $\pm$ 25%	$\approx$ 780	$\approx$ 0	EFD30/15/9-3F45

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq$ 330	$\leq$ 0.50	$\leq$ 0.54	–	–
3C94	$\geq$ 330	–	$\leq$ 0.43	$\leq$ 2.6	–
3C96	$\geq$ 340	–	$\leq$ 0.32	$\leq$ 2.0	$\leq$ 0.82
3F35	$\geq$ 300	–	–	–	$\leq$ 0.4
3F3	$\geq$ 315	–	$\leq$ 0.54	–	$\leq$ 0.91
3F4	$\geq$ 300	–	–	–	–

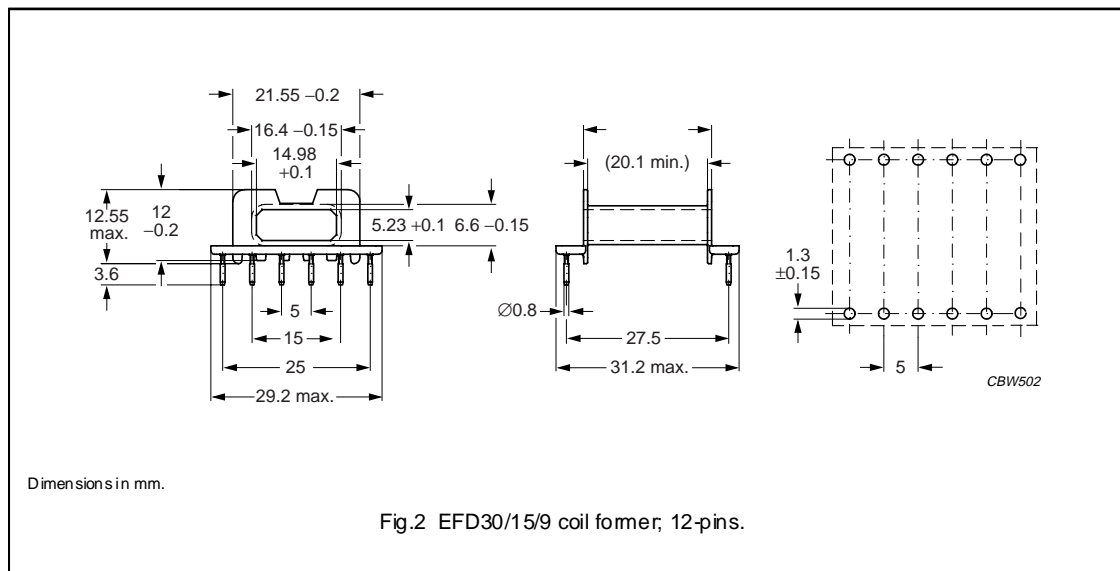
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq$ 330	–	–	–	–	–
3C94	$\geq$ 330	–	–	–	–	–
3C96	$\geq$ 340	$\leq$ 1.7	–	–	–	–
3F35	$\geq$ 300	$\leq$ 0.6	$\leq$ 4.5	–	–	–
3F3	$\geq$ 315	–	–	–	–	–
3F4	$\geq$ 300	–	–	$\leq$ 1.4	–	$\leq$ 2.2
3F45	$\geq$ 300	–	–	$\leq$ 0.94	$\leq$ 2.3	$\leq$ 1.6

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E167521 (M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, see note 1
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



**Winding data for EFD30/15/9 coil former with 12-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

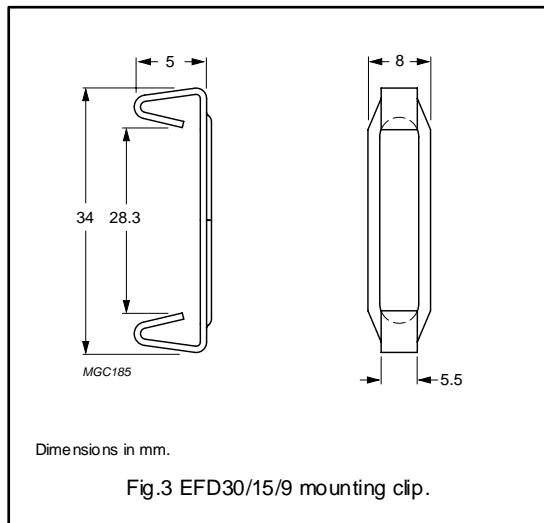
**Note**

- Also available with post-inserted lead-free pins.

**MOUNTING PARTS**

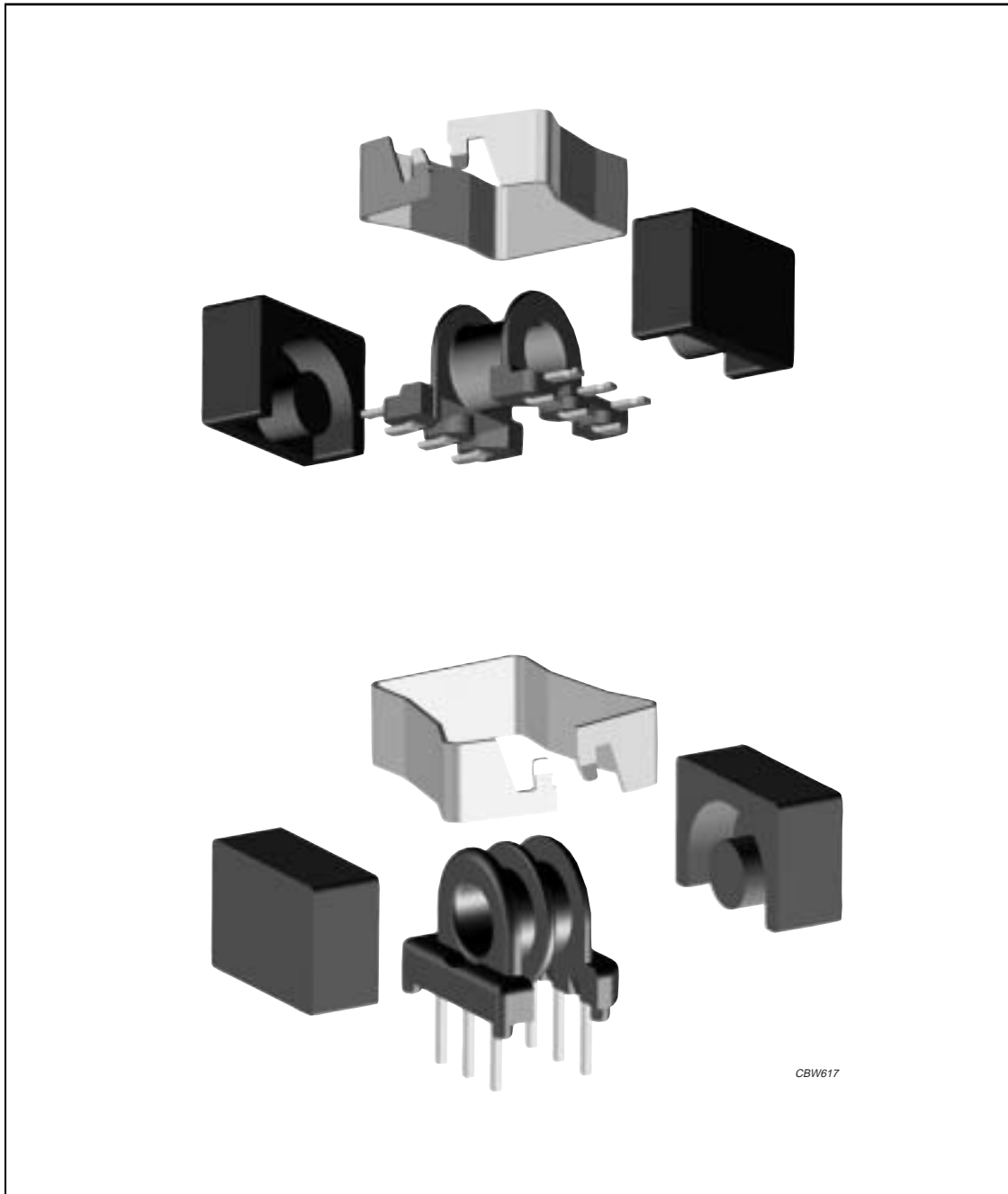
**General data**

ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force $\approx 35$ N	3	CLI-EFD30









Soft Ferrites

EP cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EP cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	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

• In accordance with IEC 61596.

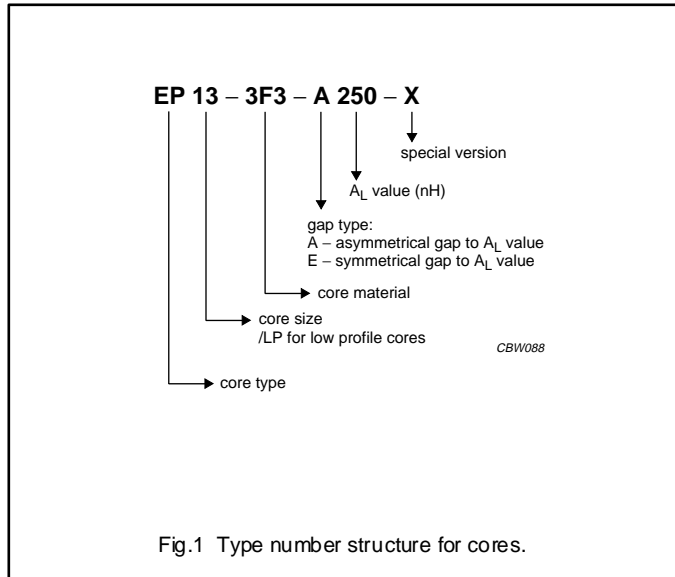


Fig.1 Type number structure for cores.

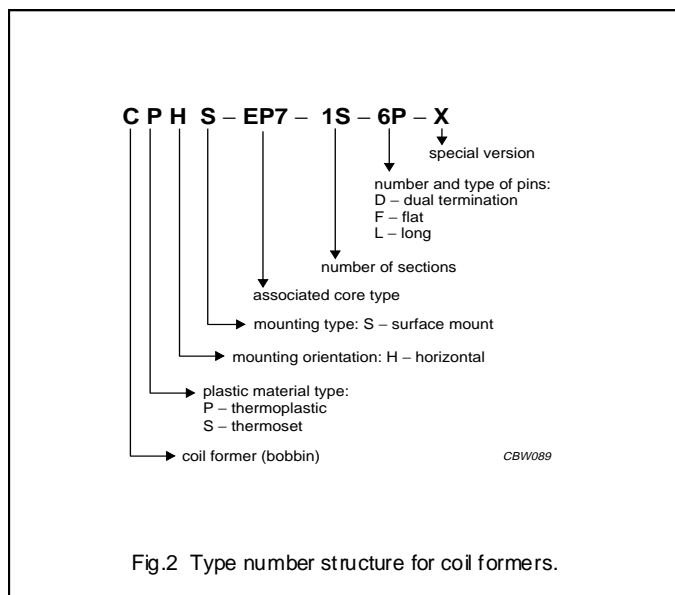
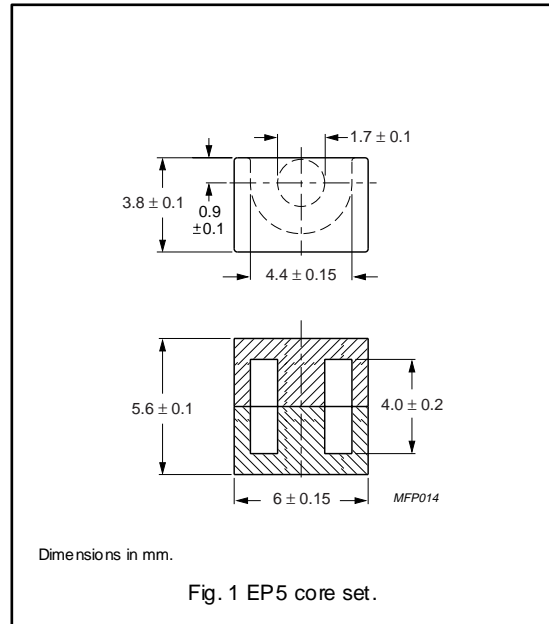


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.20	mm <sup>-1</sup>
$V_e$	effective volume	28.7	mm <sup>3</sup>
$l_e$	effective length	9.70	mm
$A_e$	effective area	3.00	mm <sup>2</sup>
$A_{min}$	minimum area	2.27	mm <sup>2</sup>
$m$	mass of core set	≈ 0.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$H_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C94	$16 \pm 3 \%$	≈ 41	≈ 320	EP5-3C94-A16
	$25 \pm 3 \%$	≈ 64	≈ 170	EP5-3C94-A25
	$40 \pm 5 \%$	≈ 102	≈ 90	EP5-3C94-A40
	$63 \pm 8 \%$	≈ 160	≈ 50	EP5-3C94-A63
	$400 \pm 25 \%$	≈ 1020	≈ 0	EP5-3C94
3C96 <small>des</small>	$380 \pm 25 \%$	≈ 970	≈ 0	EP5-3C96
3F35 <small>prot</small>	$16 \pm 3 \%$	≈ 41	≈ 320	EP5-3F35-A16
	$25 \pm 3 \%$	≈ 64	≈ 170	EP5-3F35-A25
	$40 \pm 5 \%$	≈ 102	≈ 90	EP5-3F35-A40
	$63 \pm 8 \%$	≈ 160	≈ 50	EP5-3F35-A63
	$320 \pm 25 \%$	≈ 815	≈ 0	EP5-3F35

## EP cores and accessories

EP5

**Core sets for filter applications**Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3B46 <small>des</small>	$500 \pm 25 \%$	$\approx 1280$	$\approx 0$	EP5-3B46

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$16 \pm 3 \%$	$\approx 41$	$\approx 320$	EP5-3E55-A16
	$25 \pm 3 \%$	$\approx 64$	$\approx 170$	EP5-3E55-A25
	$40 \pm 5 \%$	$\approx 102$	$\approx 90$	EP5-3E55-A40
	$63 \pm 8 \%$	$\approx 160$	$\approx 50$	EP5-3E55-A63
	$2000+40 / -30 \%$	$\approx 5100$	$\approx 0$	EP5-3E55
3E6	$2200+40 / -30 \%$	$\approx 5600$	$\approx 0$	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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C
3C94	$\geq 320$	$\leq 0.002$	$\leq 0.014$	–	–
3C96	$\geq 340$	–	$\leq 0.011$	$\leq 0.009$	–
3F35	$\geq 300$	–	–	$\leq 0.003$	$\leq 0.025$

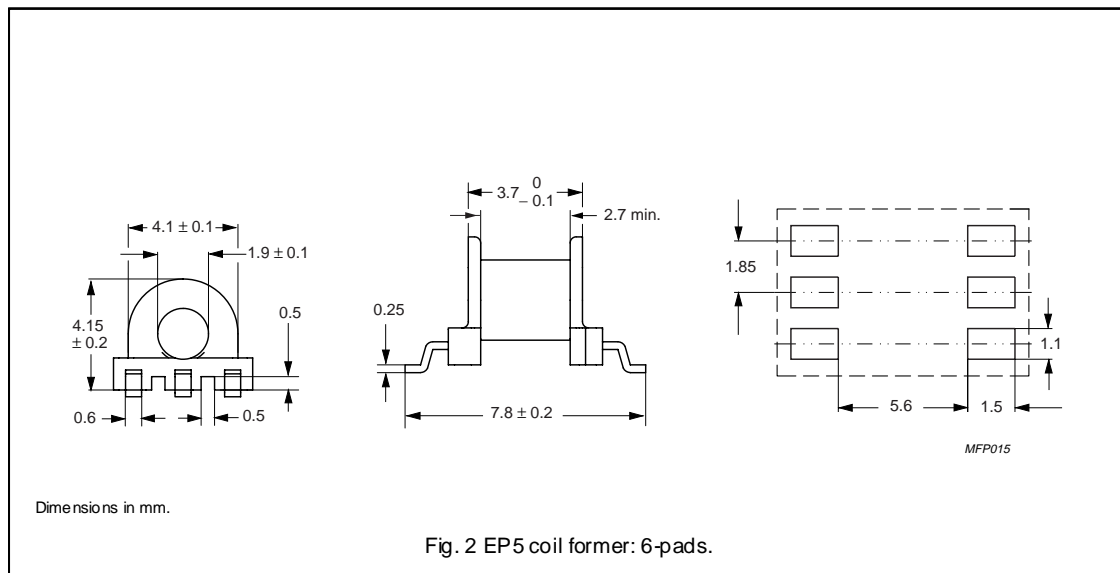
EP cores and accessories

EP5

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, transition to lead-free (Sn) ongoing.
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



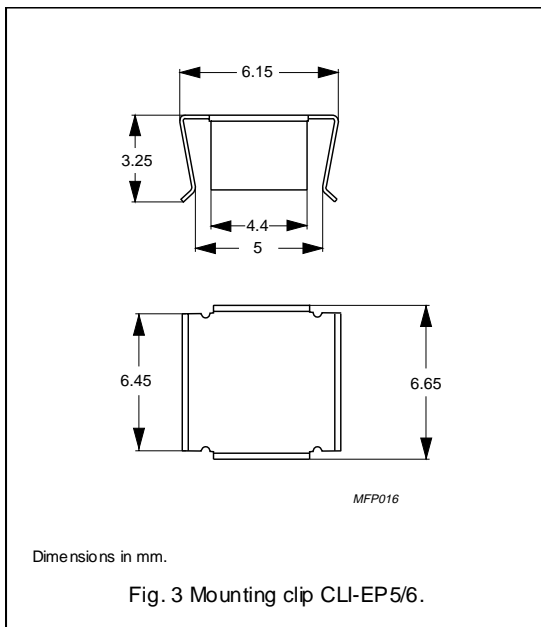
Winding data for 6-pads EP5 coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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**

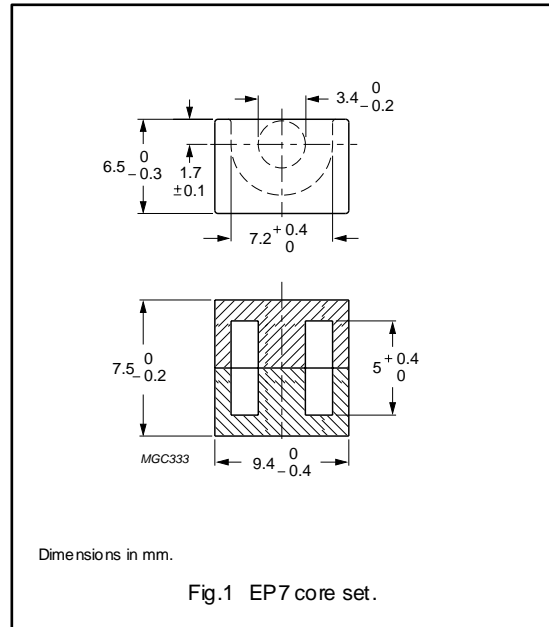
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CPHS-EP5-1S-6P	3	CLI-EP5/6



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.45	mm <sup>-1</sup>
$V_e$	effective volume	165	mm <sup>3</sup>
$l_e$	effective length	15.5	mm
$A_e$	effective area	10.7	mm <sup>2</sup>
$A_{min}$	minimum area	8.55	mm <sup>2</sup>
$m$	mass of core set	≈ 1.4	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 20 ±10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3D3	40 ±3%	≈ 48	≈ 450	EP7-3D3-A40
	63 ±3%	≈ 76	≈ 250	EP7-3D3-A63
	100 ±3%	≈ 121	≈ 130	EP7-3D3-A 100
	530 ±25%	≈ 610	≈ 0	EP7-3D3
3H3	63 ±3%	≈ 73	≈ 270	EP7-3H3-A63
	100 ±3%	≈ 115	≈ 150	EP7-3H3-A 100
	160 ±5%	≈ 184	≈ 90	EP7-3H3-A 160
	1120 ±25%	≈ 1290	≈ 0	EP7-3H3
3B46 <span style="border: 1px solid black; padding: 0 2px;">des</span>	1500 ±25%	≈ 1730	≈ 0	EP7-3B46

## EP cores and accessories

EP7

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	$25 \pm 3\%$	$\approx 29$	$\approx 880$	EP7-3C81-E25
	$40 \pm 3\%$	$\approx 46$	$\approx 480$	EP7-3C81-A40
	$63 \pm 3\%$	$\approx 73$	$\approx 270$	EP7-3C81-A63
	$100 \pm 3\%$	$\approx 115$	$\approx 150$	EP7-3C81-A100
	$160 \pm 5\%$	$\approx 184$	$\approx 90$	EP7-3C81-A160
	$1300 \pm 25\%$	$\approx 1500$	$\approx 0$	EP7-3C81
3C91 <small>des</small>	$1300 \pm 25\%$	$\approx 1500$	$\approx 0$	EP7-3C91
3C94	$25 \pm 3\%$	$\approx 29$	$\approx 880$	EP7-3C94-E25
	$40 \pm 3\%$	$\approx 46$	$\approx 480$	EP7-3C94-A40
	$63 \pm 3\%$	$\approx 73$	$\approx 270$	EP7-3C94-A63
	$100 \pm 3\%$	$\approx 115$	$\approx 150$	EP7-3C94-A100
	$160 \pm 5\%$	$\approx 184$	$\approx 90$	EP7-3C94-A160
	$1200 \pm 25\%$	$\approx 1380$	$\approx 0$	EP7-3C94
3C96 <small>des</small>	$1120 \pm 25\%$	$\approx 1290$	$\approx 0$	EP7-3C96
3F3	$25 \pm 3\%$	$\approx 29$	$\approx 880$	EP7-3F3-E25
	$40 \pm 3\%$	$\approx 46$	$\approx 480$	EP7-3F3-A40
	$63 \pm 3\%$	$\approx 73$	$\approx 270$	EP7-3F3-A63
	$100 \pm 3\%$	$\approx 115$	$\approx 150$	EP7-3F3-A100
	$160 \pm 5\%$	$\approx 184$	$\approx 90$	EP7-3F3-A160
	$1000 \pm 25\%$	$\approx 1150$	$\approx 0$	EP7-3F3
3F35 <small>prot</small>	$850 \pm 25\%$	$\approx 980$	$\approx 0$	EP7-3F35

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3E27	$3400 \pm 25\%$	$\approx 3920$	EP7-3E27
3E5	$5200 +40/-30\%$	$\approx 5990$	EP7-3E5
3E55 <small>des</small>	$5200 +40/-30\%$	$\approx 5990$	EP7-3E55
3E6	$5800 +40/-30\%$	$\approx 6680$	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; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C81	≥320	≤0.04	–	–	–
3C91	≥320	–	≤0.11 <sup>(1)</sup>	≤0.06 <sup>(1)</sup>	–
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; B̂ = 50 mT; T = 100 °C	f = 500 kHz; B̂ = 100 mT; T = 100 °C	f = 1 MHz; B̂ = 30 mT; T = 100 °C	f = 3 MHz; B̂ = 10 mT; T = 100 °C
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.

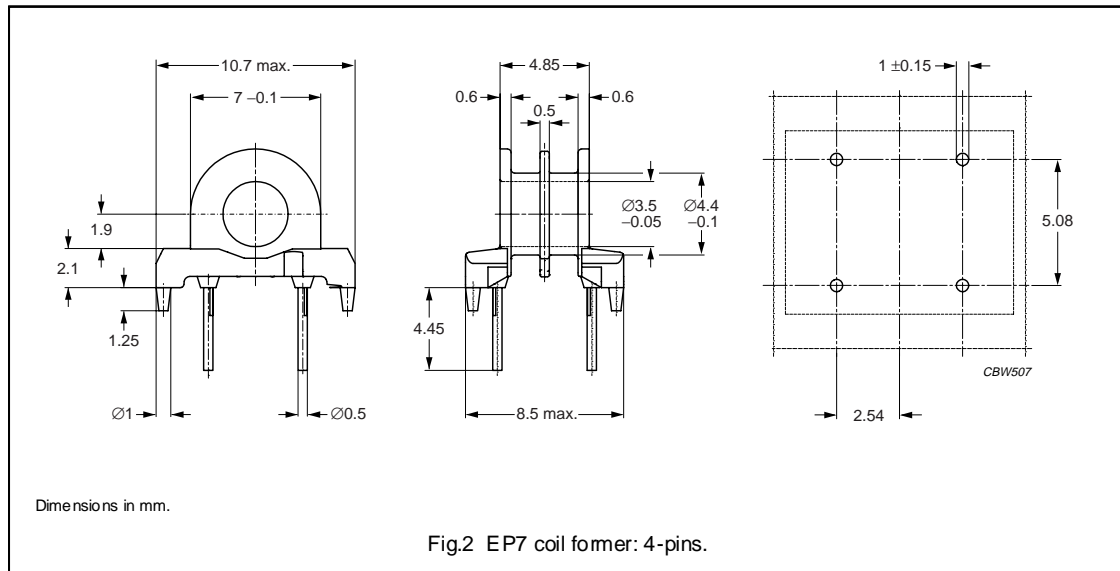
EP cores and accessories

EP7

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E41429(M)
Pin material	copper clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



Winding data for 4-pins EP7 coil former

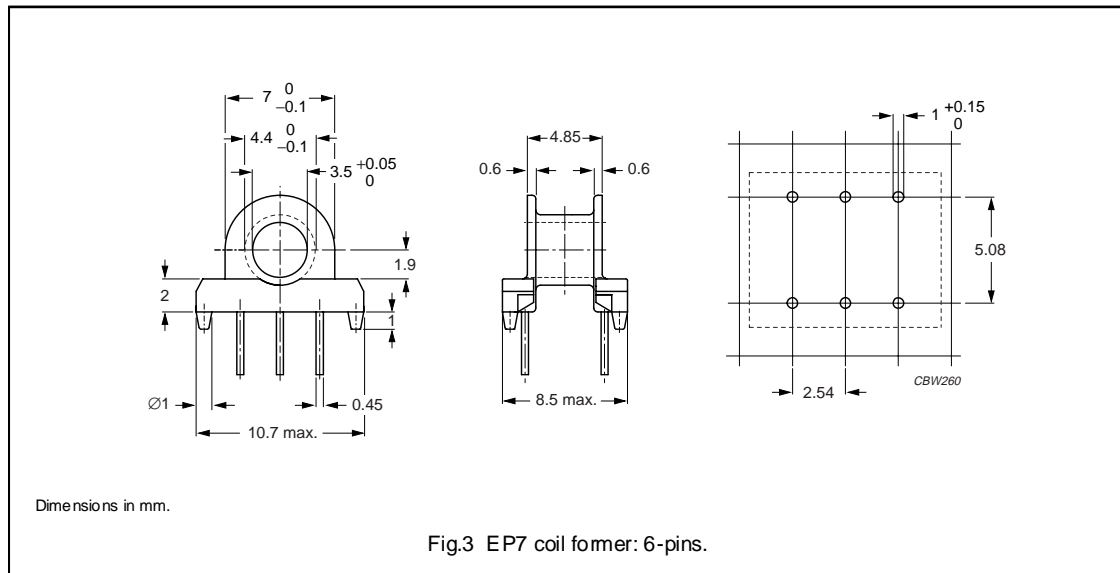
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
2	2 × 1.75	2 × 1.45	17.9	CSH-EP7-2S-4P-TA
1	4.3	3.4	17.9	CSH-EP7-1S-4P-TA

EP cores and accessories

EP7

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

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 (Sn) 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

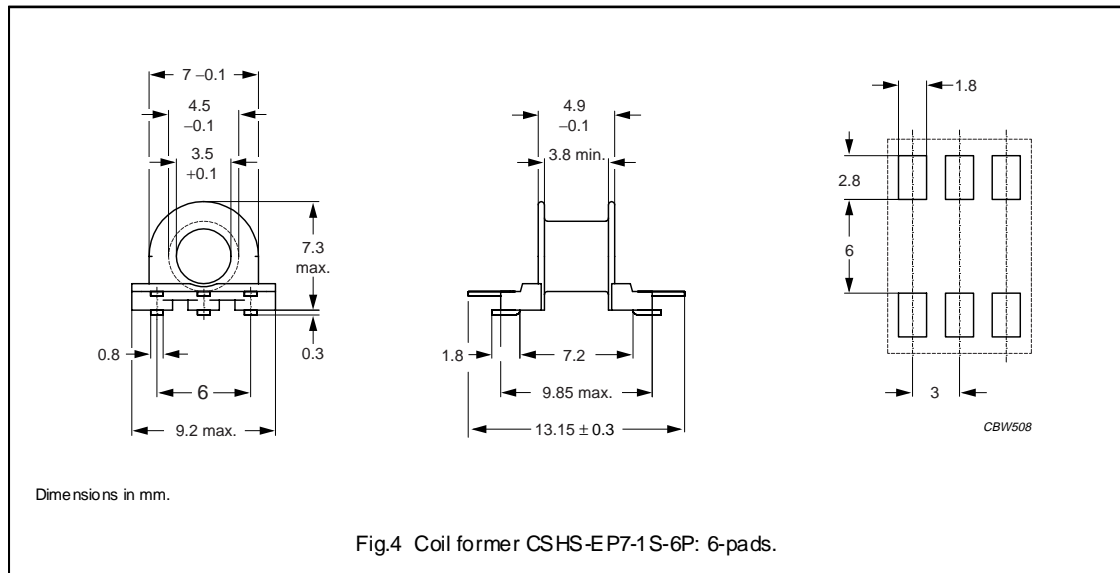


Winding data for 4 and 6-pins EP7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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 (Sn) 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



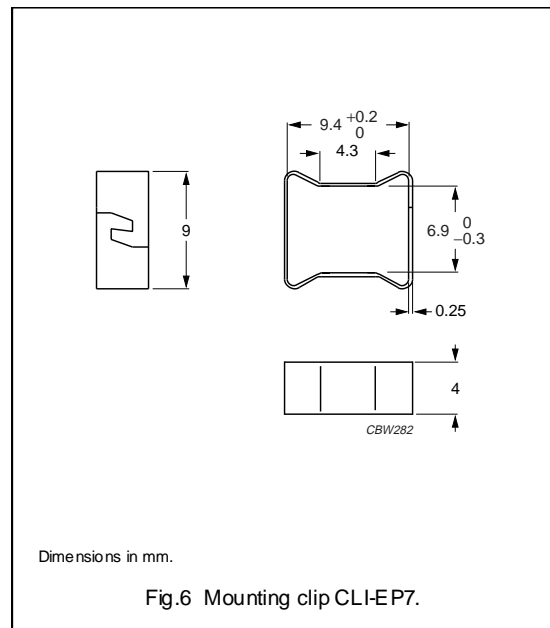
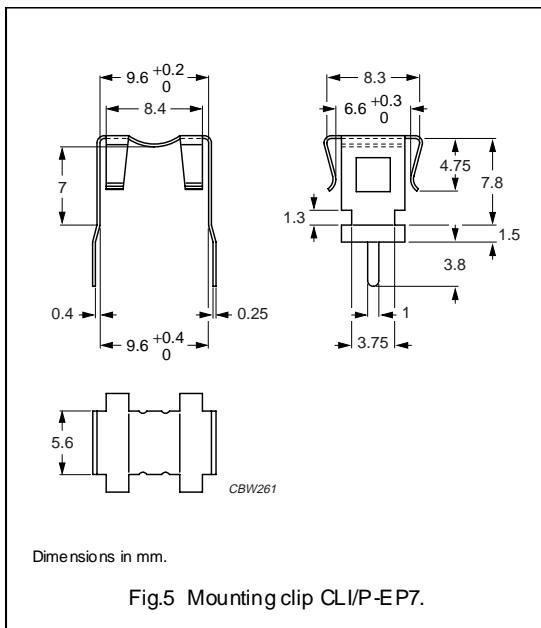
Winding data for 6-pads EP7 SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.7	3.9	17.9	CSHS-EP7-1 S-6P-Z

**MOUNTING PARTS**

**General data**

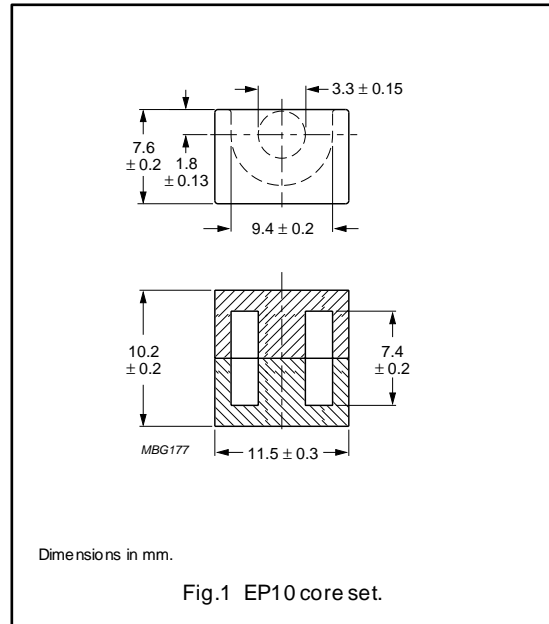
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	stainless steel (CrNi); to be used in combination with CSH-EP7-1S-6P-B	5	CLI/P-EP7
Mounting clip	stainless steel (CrNi); clamping force $\approx 22$ N	6	CLI-EP7



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.70	mm <sup>-1</sup>
$V_e$	effective volume	215	mm <sup>3</sup>
$l_e$	effective length	19.3	mm
$A_e$	effective area	11.3	mm <sup>2</sup>
$A_{min}$	minimum area	8.55	mm <sup>2</sup>
$m$	mass of core set	≈ 2.8	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3D3	40 ± 3%	≈ 54	≈ 500	EP 10-3D3-A40
	63 ± 3%	≈ 86	≈ 260	EP 10-3D3-A63
	100 ± 3%	≈ 136	≈ 140	EP 10-3D3-A100
	470 ± 25%	≈ 640	≈ 0	EP 10-3D3
3H3	40 ± 3%	≈ 34	≈ 1010	EP 10-3H3-A40
	63 ± 3%	≈ 54	≈ 530	EP 10-3H3-A63
	100 ± 3%	≈ 86	≈ 290	EP 10-3H3-A100
	160 ± 5%	≈ 136	≈ 160	EP 10-3H3-A160
	1000 ± 25%	≈ 1350	≈ 0	EP 10-3H3
3B46 <small>des</small>	1400 ± 25%	≈ 1890	≈ 0	EP 10-3B46

## EP cores and accessories

EP10

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	25 $\pm 3\%$	$\approx 34$	$\approx 1010$	EP 10-3C81-E25
	40 $\pm 3\%$	$\approx 54$	$\approx 530$	EP 10-3C81-A40
	63 $\pm 3\%$	$\approx 86$	$\approx 290$	EP 10-3C81-A63
	100 $\pm 3\%$	$\approx 136$	$\approx 160$	EP 10-3C81-A100
	160 $\pm 5\%$	$\approx 217$	$\approx 90$	EP 10-3C81-A160
	1200 $\pm 25\%$	$\approx 1630$	$\approx 0$	EP 10-3C81
3C91 <small>des</small>	1200 $\pm 25\%$	$\approx 1630$	$\approx 0$	EP 10-3C91
3C94	25 $\pm 3\%$	$\approx 34$	$\approx 1010$	EP 10-3C94-E25
	40 $\pm 3\%$	$\approx 54$	$\approx 530$	EP 10-3C94-A40
	63 $\pm 3\%$	$\approx 86$	$\approx 290$	EP 10-3C94-A63
	100 $\pm 3\%$	$\approx 136$	$\approx 160$	EP 10-3C94-A100
	160 $\pm 5\%$	$\approx 217$	$\approx 90$	EP 10-3C94-A160
	1140 $\pm 25\%$	$\approx 1550$	$\approx 0$	EP 10-3C94
3C96 <small>des</small>	1000 $\pm 25\%$	$\approx 1350$	$\approx 0$	EP 10-3C96
3F3	25 $\pm 3\%$	$\approx 34$	$\approx 1010$	EP 10-3F3-E25
	40 $\pm 3\%$	$\approx 54$	$\approx 530$	EP 10-3F3-A40
	63 $\pm 3\%$	$\approx 86$	$\approx 290$	EP 10-3F3-A63
	100 $\pm 3\%$	$\approx 136$	$\approx 160$	EP 10-3F3-A100
	160 $\pm 5\%$	$\approx 217$	$\approx 90$	EP 10-3F3-A160
	1000 $\pm 25\%$	$\approx 1360$	$\approx 0$	EP 10-3F3
3F35 <small>prot</small>	800 $\pm 25\%$	$\approx 1090$	$\approx 0$	EP 10-3F35

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	3400 $\pm 25\%$	$\approx 4630$	$\approx 0$	EP 10-3E27
3E5	4800 +40/-30%	$\approx 6530$	$\approx 0$	EP 10-3E5
3E55 <small>des</small>	4800 +40/-30%	$\approx 6530$	$\approx 0$	EP 10-3E55
3E6	5400 +40/-30%	$\approx 7340$	$\approx 0$	EP 10-3E6

## 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥315	≤ 0.043	–	–	–
3C91	≥315	–	≤ 0.014 <sup>(1)</sup>	≤ 0.08 <sup>(1)</sup>	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; 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**

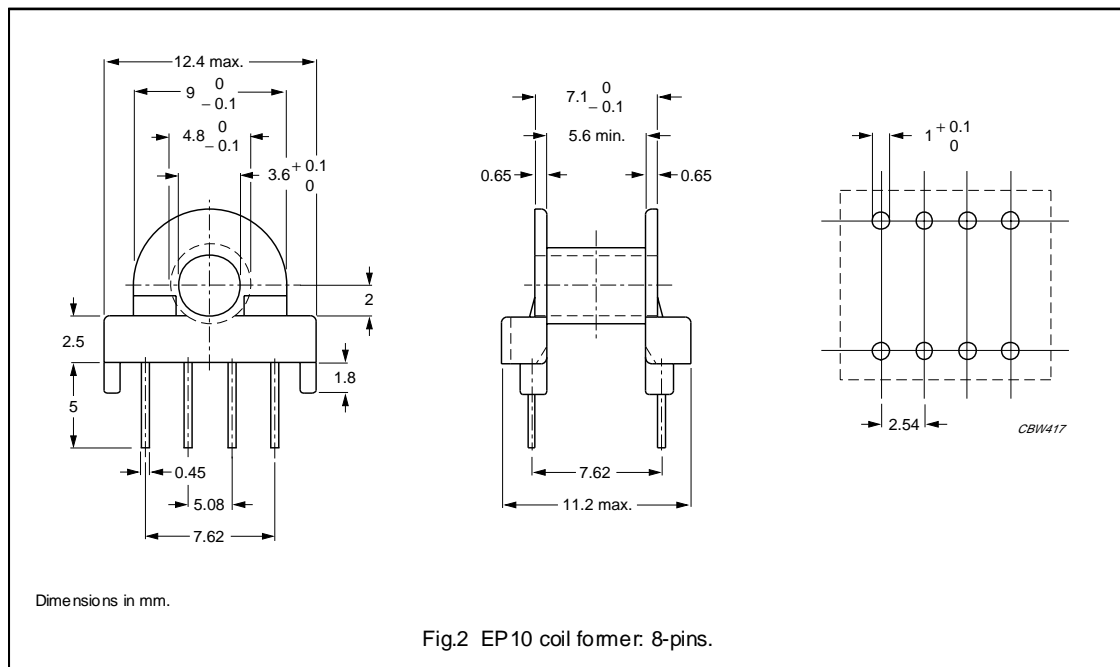
1. Measured at 60 °C.



**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 (Sn) 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

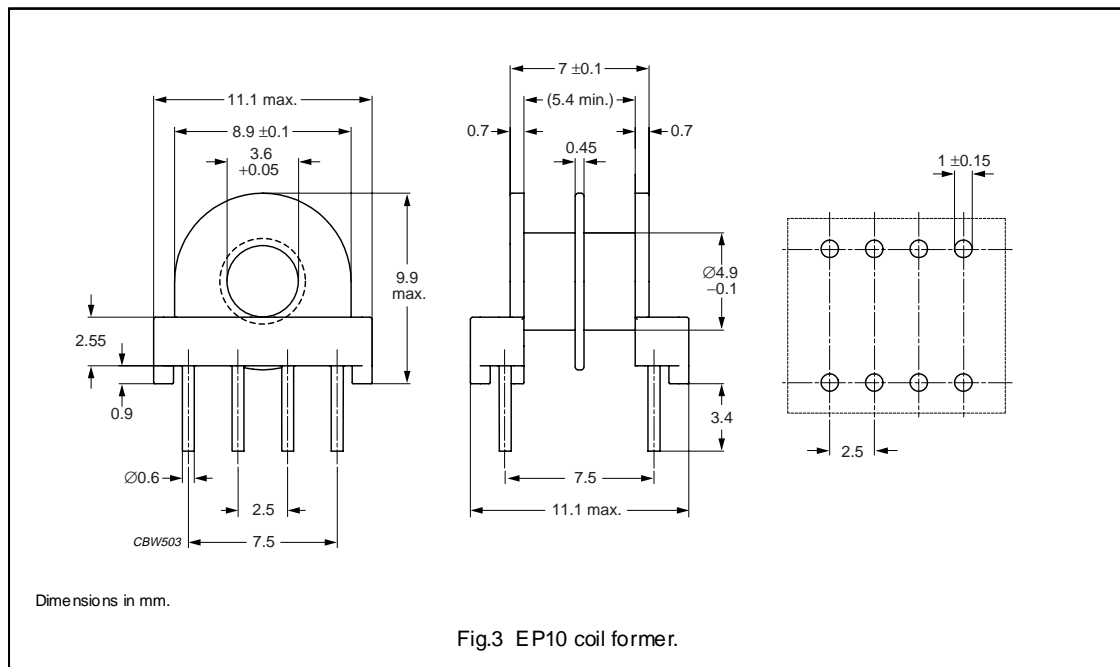


**Winding data for 8-pins EP10 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing.
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

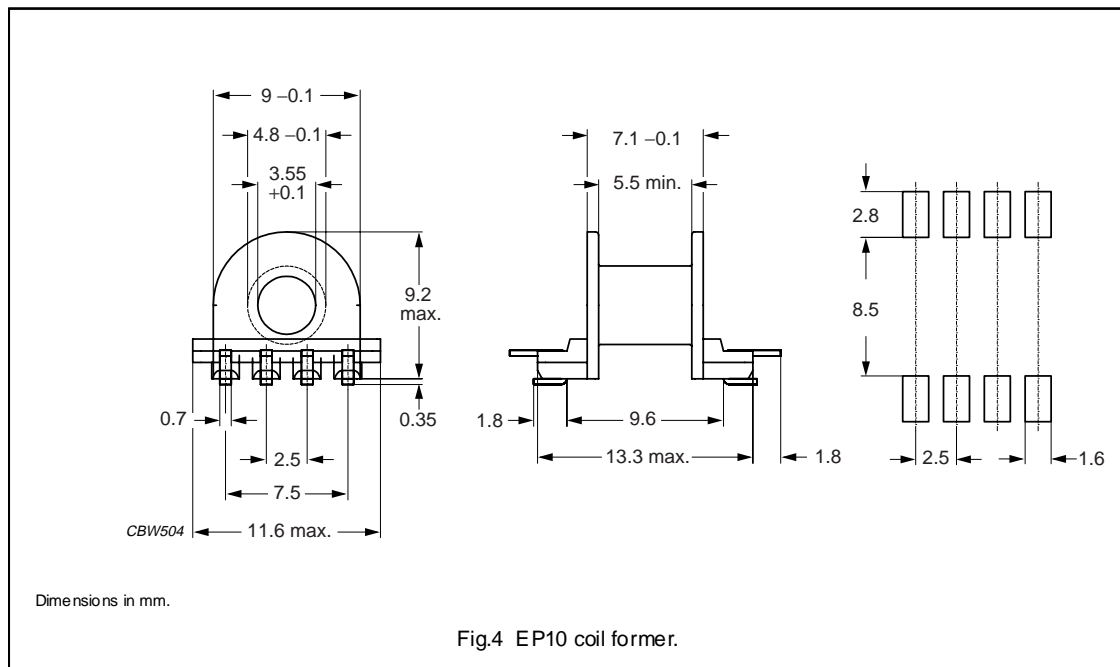


Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing.
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



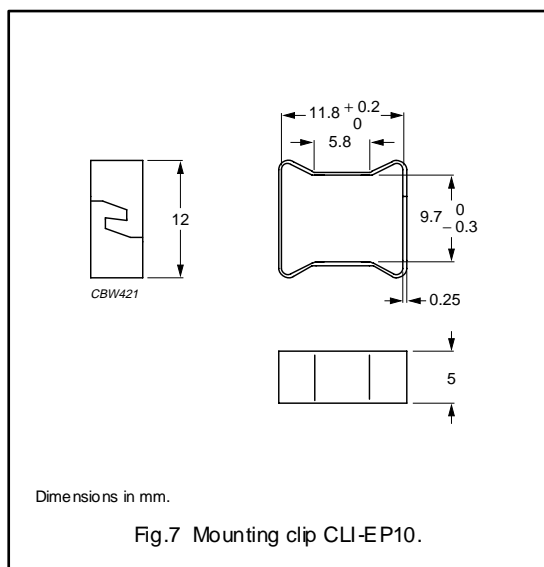
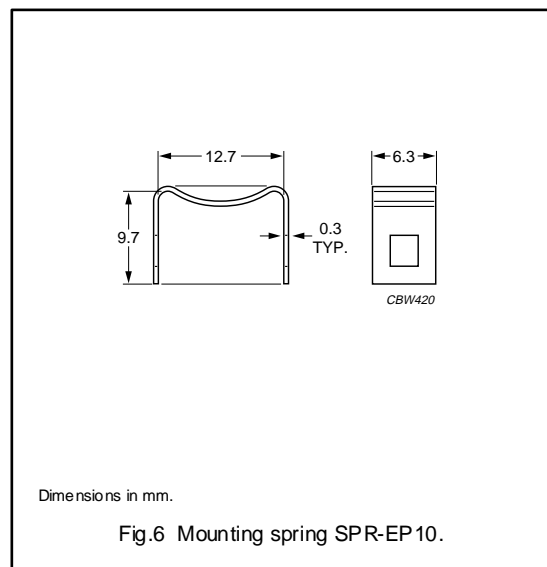
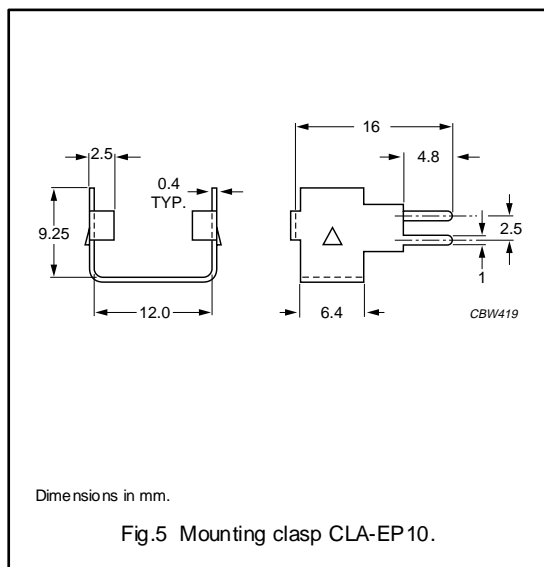
Winding data for EP10 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

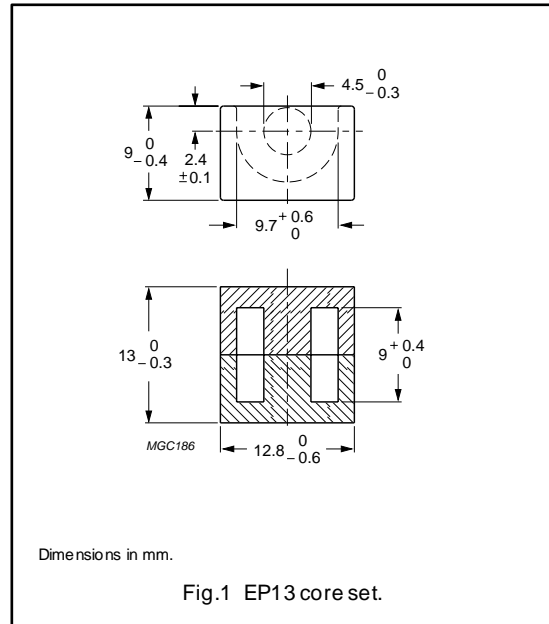
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	5	CLA-EP10
Spring	copper-nickel-zinc alloy (nickel silver)	6	SPR-EP10
Clip	stainless steel (CrNi); clamping force $\approx 27$ N	7	CLI-EP10



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.24	mm <sup>-1</sup>
$V_e$	effective volume	472	mm <sup>3</sup>
$l_e$	effective length	24.2	mm
$A_e$	effective area	19.5	mm <sup>2</sup>
$A_{min}$	minimum area	14.9	mm <sup>2</sup>
$m$	mass of core set	≈ 4.7	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ±10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3D3	63 ±3%	≈ 62	≈ 500	EP 13-3D3-A63
	100 ±3%	≈ 100	≈ 270	EP 13-3D3-A100
	160 ±3%	≈ 160	≈ 140	EP 13-3D3-A160
	670 ±25%	≈ 660	≈ 0	EP 13-3D3
3H3	63 ±3%	≈ 62	≈ 540	EP 13-3H3-A63
	100 ±3%	≈ 99	≈ 300	EP 13-3H3-A100
	160 ±3%	≈ 158	≈ 170	EP 13-3H3-A160
	1500 ±25%	≈ 1460	≈ 0	EP 13-3H3
3B46 <span style="border: 1px solid black; padding: 0 2px;">des</span>	21 50 ±25%	≈ 2090	≈ 0	EP 13-3B46

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	40 $\pm 3\%$	$\approx 40$	$\approx 1000$	EP 13-3C81-E40
	63 $\pm 3\%$	$\approx 62$	$\approx 540$	EP 13-3C81-A63
	100 $\pm 3\%$	$\approx 99$	$\approx 300$	EP 13-3C81-A100
	160 $\pm 3\%$	$\approx 158$	$\approx 170$	EP 13-3C81-A160
	250 $\pm 5\%$	$\approx 247$	$\approx 100$	EP 13-3C81-A250
	1700 $\pm 25\%$	$\approx 1680$	$\approx 0$	EP 13-3C81
3C91 <small>des</small>	1700 $\pm 25\%$	$\approx 1680$	$\approx 0$	EP 13-3C91
3C94	40 $\pm 3\%$	$\approx 40$	$\approx 1000$	EP 13-3C94-E40
	63 $\pm 3\%$	$\approx 62$	$\approx 540$	EP 13-3C94-A63
	100 $\pm 3\%$	$\approx 99$	$\approx 300$	EP 13-3C94-A100
	160 $\pm 3\%$	$\approx 158$	$\approx 170$	EP 13-3C94-A160
	250 $\pm 5\%$	$\approx 247$	$\approx 100$	EP 13-3C94-A250
	1650 $\pm 25\%$	$\approx 1630$	$\approx 0$	EP 13-3C94
3C96 <small>des</small>	1500 $\pm 25\%$	$\approx 1480$	$\approx 0$	EP 13-3C96
3F3	40 $\pm 3\%$	$\approx 40$	$\approx 1000$	EP 13-3F3-E40
	63 $\pm 3\%$	$\approx 62$	$\approx 540$	EP 13-3F3-A63
	100 $\pm 3\%$	$\approx 99$	$\approx 300$	EP 13-3F3-A100
	160 $\pm 3\%$	$\approx 158$	$\approx 170$	EP 13-3F3-A160
	250 $\pm 5\%$	$\approx 247$	$\approx 100$	EP 13-3F3-A250
	1325 $\pm 25\%$	$\approx 1310$	$\approx 0$	EP 13-3F3
3F35 <small>prot</small>	1100 $\pm 25\%$	$\approx 1090$	$\approx 0$	EP 13-3F35

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	4600 $\pm 25\%$	$\approx 4540$	$\approx 0$	EP 13-3E27
3E5	7000 +40/-30%	$\approx 6900$	$\approx 0$	EP 13-3E5
3E55 <small>des</small>	100 $\pm 3\%$	$\approx 99$	$\approx 310$	EP 13-3E55-A100
	160 $\pm 3\%$	$\approx 158$	$\approx 180$	EP 13-3E55-A160
	250 $\pm 5\%$	$\approx 247$	$\approx 110$	EP 13-3E55-A250
	315 $\pm 5\%$	$\approx 311$	$\approx 80$	EP 13-3E55-A315
	400 $\pm 8\%$	$\approx 395$	$\approx 65$	EP 13-3E55-A400
	630 $\pm 15\%$	$\approx 622$	$\approx 40$	EP 13-3E55-A630
	7000 +40/-30%	$\approx 6900$	$\approx 0$	EP 13-3E55
3E6	8500 +40/-30%	$\approx 8400$	$\approx 0$	EP 13-3E6

## 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥315	≤0.1	–	–	–
3C91	≥315	–	≤0.03 <sup>(1)</sup>	≤0.17 <sup>(1)</sup>	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤0.15	–	–	–
3F35	≥300	≤0.06	≤0.45	–	–
3F3	≥315	–	–	–	–

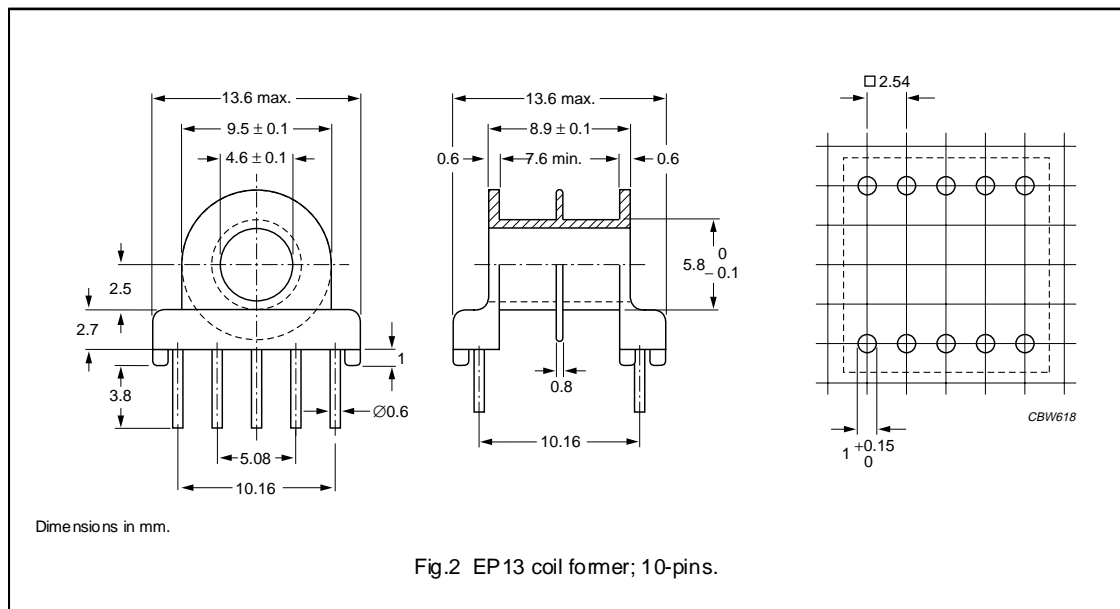
**Note**

1. Measured at 60 °C.

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number: E41429(M)
Pin material	copper clad steel, tin (Sn) 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



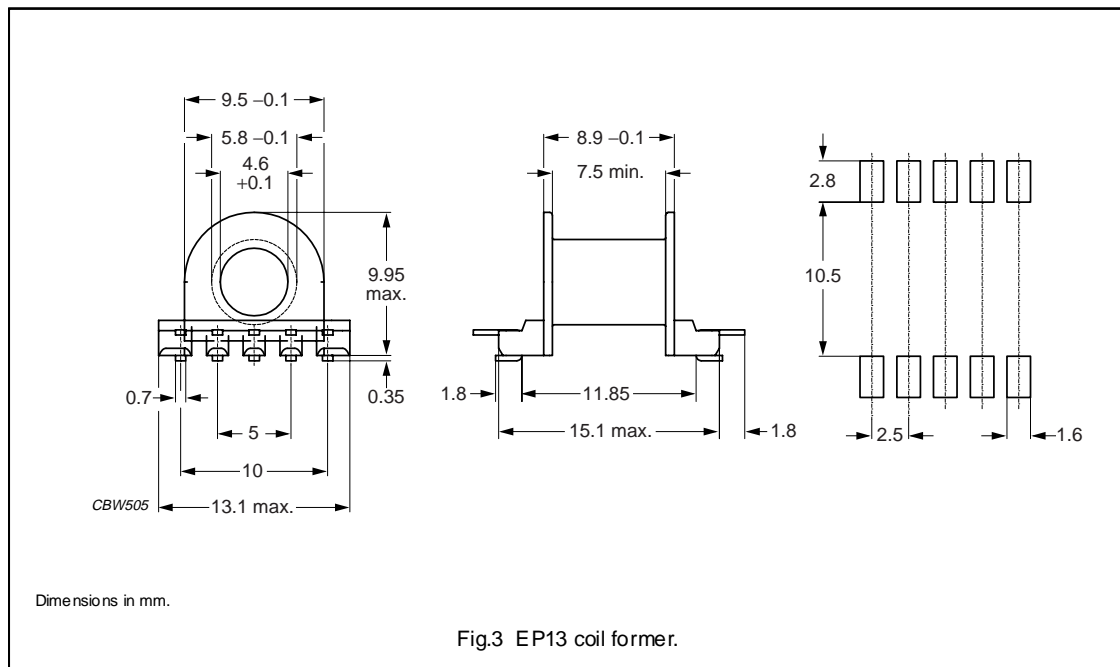
**Winding data for 10-pins EP13 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing.
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



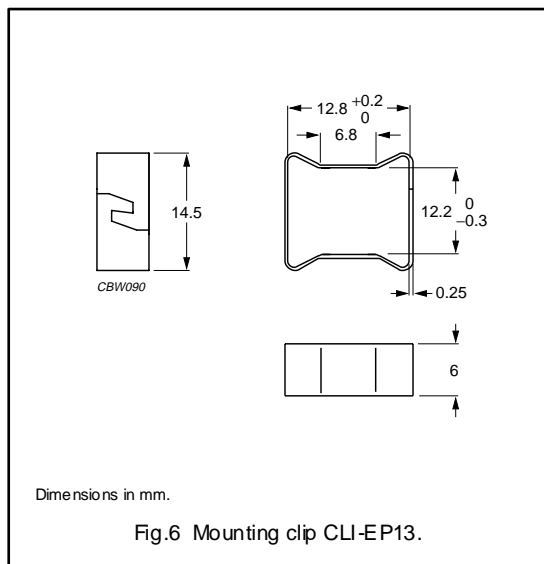
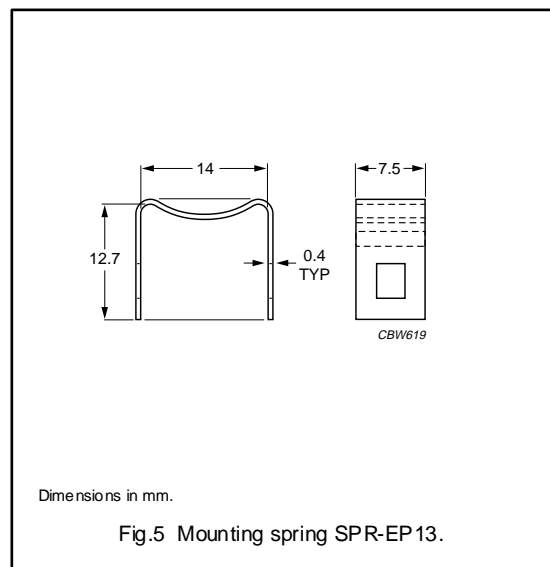
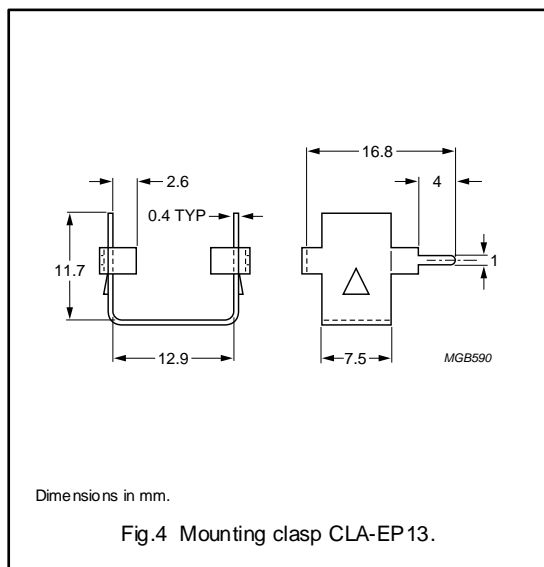
Winding data for EP13 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

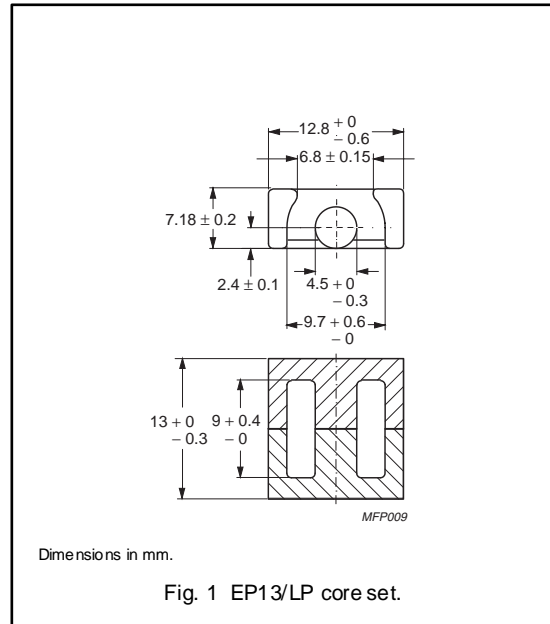
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	4	CLA-EP13
Spring	copper-nickel-zinc alloy (nickel silver)	5	SPR-EP13
Clip	stainless steel (CrNi); clamping force $\approx 32$ N	6	CLI-EP13



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.42	mm <sup>-1</sup>
$V_e$	effective volume	501	mm <sup>3</sup>
$l_e$	effective length	26.7	mm
$A_e$	effective area	18.8	mm <sup>2</sup>
$A_{min}$	minimum area	14.9	mm <sup>2</sup>
$m$	mass of core set	≈ 2.4	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C94	1400 ± 25 %	≈ 1580	≈ 0	EP 13/LP-3C94
3C96 <small>des</small>	1200 ± 25 %	≈ 1360	≈ 0	EP 13/LP-3C96
3F35 <small>prot</small>	950 ± 25 %	≈ 1070	≈ 0	EP 13/LP-3F35

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	2000 ± 25 %	≈ 2260	≈ 0	EP 13/LP-3B46

## EP cores and accessories

EP13/LP

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$100 \pm 3 \%$	$\approx 113$	$\approx 300$	EP 13/LP-3E55-A100
	$160 \pm 3 \%$	$\approx 181$	$\approx 170$	EP 13/LP-3E55-A160
	$250 \pm 5 \%$	$\approx 282$	$\approx 100$	EP 13/LP-3E55-A250
	$315 \pm 5 \%$	$\approx 356$	$\approx 80$	EP 13/LP-3E55-A315
	$400 \pm 8 \%$	$\approx 452$	$\approx 60$	EP 13/LP-3E55-A400
	$630 \pm 15 \%$	$\approx 712$	$\approx 35$	EP 13/LP-3E55-A630
	$6000 + 40 / - 30 \%$	$\approx 6780$	$\approx 0$	EP 13/LP-3E55
3E6	$6700 + 40 / - 30 \%$	$\approx 7570$	$\approx 0$	EP 13/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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C
3C94	$\geq 320$	$\leq 0.04$	$\leq 0.25$	–	–
3C96	$\geq 340$	$\leq 0.03$	$\leq 0.2$	$\leq 0.16$	–
3F35	$\geq 300$	–	–	$\leq 0.06$	$\leq 0.5$

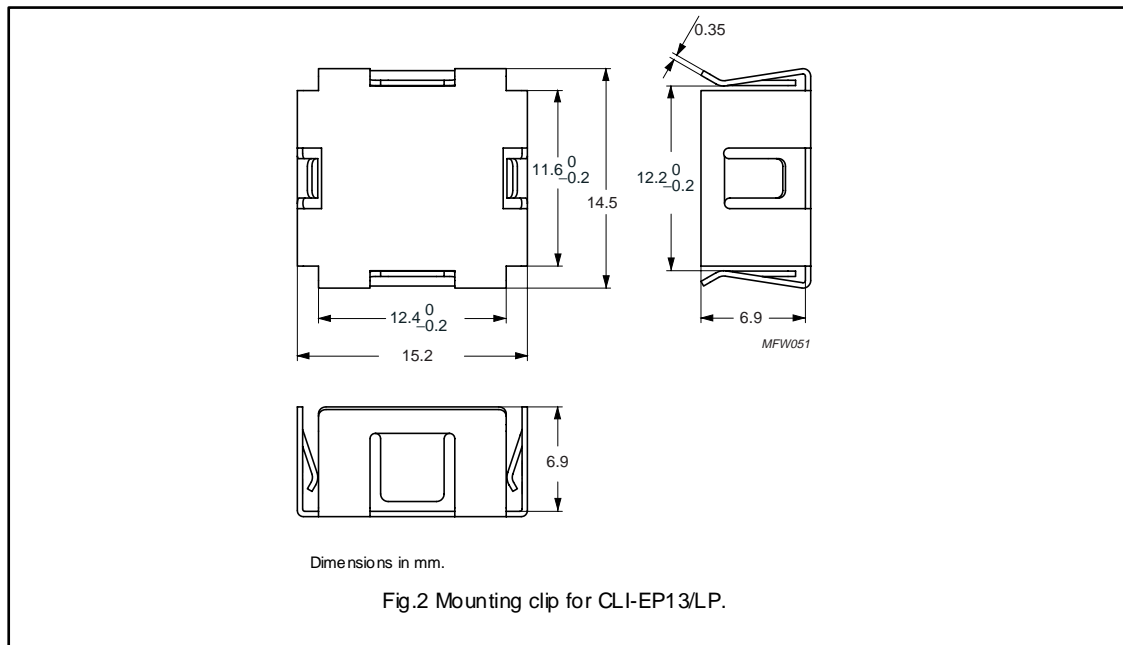
**BOBBINS AND ACCESSORIES**

For bobbins, winding data and other mounting parts, see data sheet, "EP13".

**MOUNTING PARTS**

**General data**

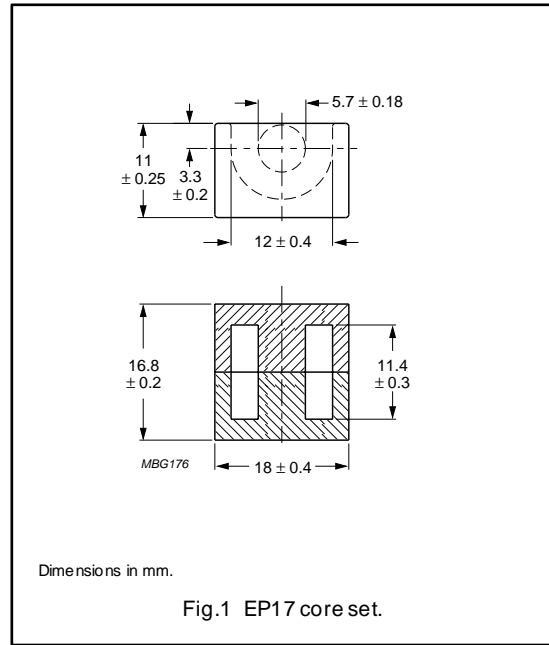
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clip	stainless steel (CrNi); clamping force $\approx$ 32 N	2	CLI-EP13/LP



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.870	mm <sup>-1</sup>
$V_e$	effective volume	999	mm <sup>3</sup>
$l_e$	effective length	29.5	mm
$A_e$	effective area	33.7	mm <sup>2</sup>
$A_{min}$	minimum area	25.5	mm <sup>2</sup>
$m$	mass of set	≈ 12	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 40 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	63 ± 3%	≈ 44	≈ 1020	EP 17-3C81-E63
	100 ± 3%	≈ 70	≈ 560	EP 17-3C81-A100
	160 ± 3%	≈ 111	≈ 310	EP 17-3C81-A160
	250 ± 3%	≈ 174	≈ 180	EP 17-3C81-A250
	315 ± 5%	≈ 219	≈ 135	EP 17-3C81-A315
	2670 ± 25%	≈ 1860	≈ 0	EP 17-3C81
3C91 <small>des</small>	2670 ± 25%	≈ 1860	≈ 0	EP 17-3C91
3C94	63 ± 3%	≈ 44	≈ 1020	EP 17-3C94-E63
	100 ± 3%	≈ 70	≈ 560	EP 17-3C94-A100
	160 ± 3%	≈ 111	≈ 310	EP 17-3C94-A160
	250 ± 3%	≈ 174	≈ 180	EP 17-3C94-A250
	315 ± 5%	≈ 219	≈ 135	EP 17-3C94-A315
	2500 ± 25%	≈ 1740	≈ 0	EP 17-3C94
3C96 <small>des</small>	2200 ± 25%	≈ 1530	≈ 0	EP 17-3C96

## EP cores and accessories

EP17

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	63 $\pm$ 3%	$\approx$ 44	$\approx$ 1020	EP17-3F3-E63
	100 $\pm$ 3%	$\approx$ 70	$\approx$ 560	EP17-3F3-A100
	160 $\pm$ 3%	$\approx$ 111	$\approx$ 310	EP17-3F3-A160
	250 $\pm$ 3%	$\approx$ 174	$\approx$ 180	EP17-3F3-A250
	315 $\pm$ 5%	$\approx$ 219	$\approx$ 135	EP17-3F3-A315
	2200 $\pm$ 25%	$\approx$ 1530	$\approx$ 0	EP17-3F3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements, 40  $\pm$  10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	7100 $\pm$ 25%	$\approx$ 4950	$\approx$ 0	EP17-3E27
3E5	10000 +40/-30%	$\approx$ 6970	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥315	≤0.23	–	–	–
3C91	≥315	–	≤0.06 <sup>(1)</sup>	≤0.36 <sup>(1)</sup>	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	≥315	–	–	–	–
3C91	≥315	–	–	–	–
3C94	≥320	–	–	–	–
3C96	≥340	≤0.3	–	–	–
3F3	≥315	–	–	–	–

**Note**

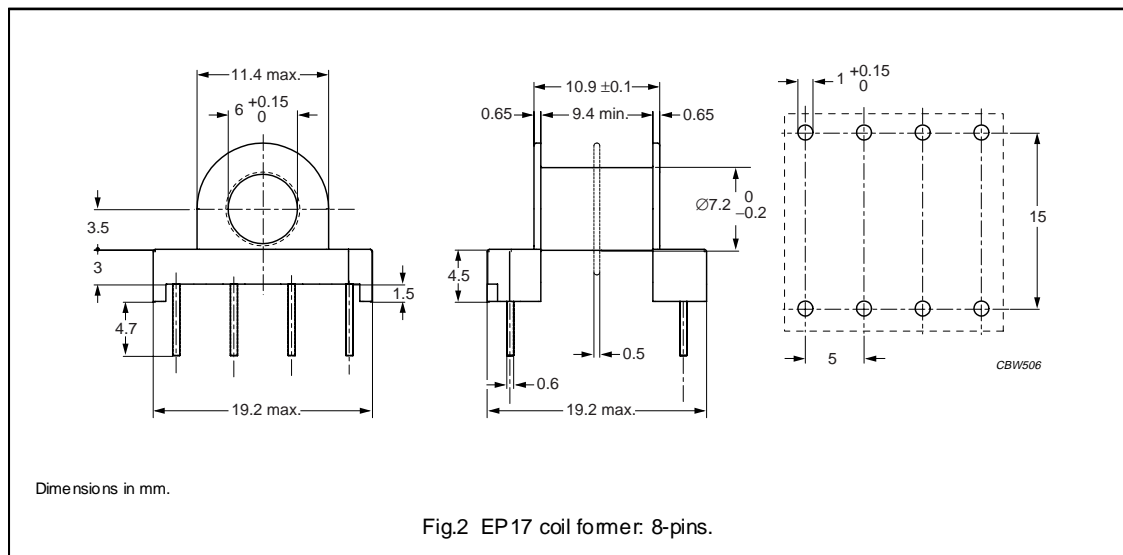
1. Measured at 60 °C.



**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, transition to lead-free (Sn) ongoing.
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



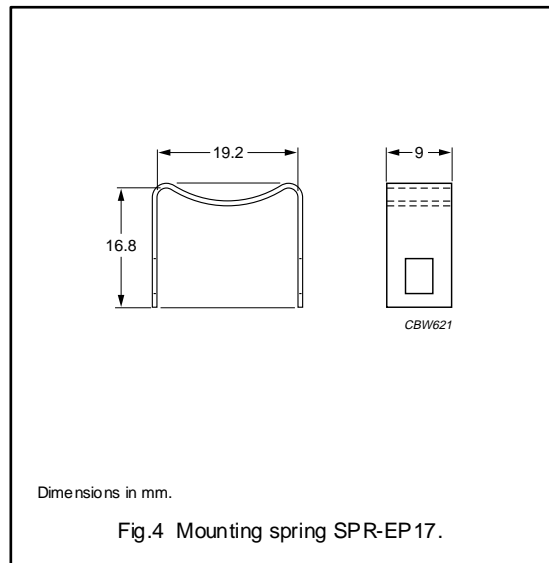
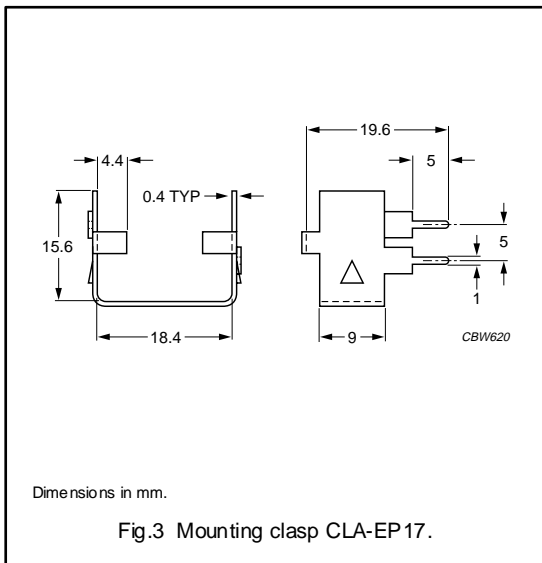
**Winding data for 8-pins EP17 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	18.0	9.45	28.9	CSH-EP 17-1 S-8P
2	2 × 8.3	2 × 4.6	28.9	CSH-EP 17-2 S-8P

**MOUNTING PARTS**

**General data**

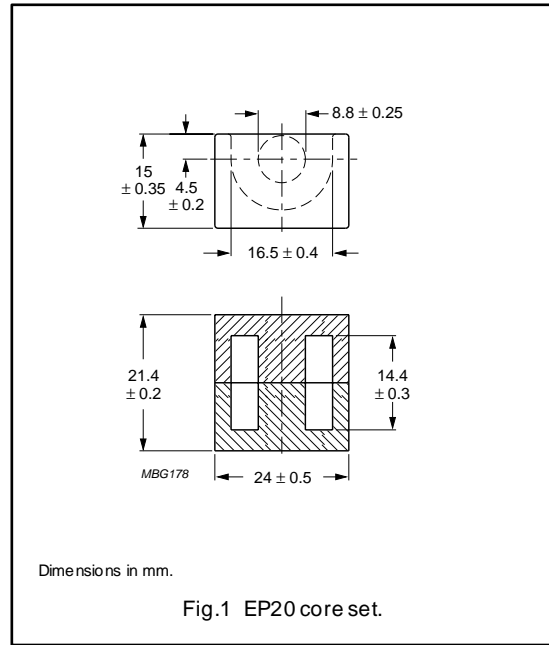
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clasp	copper-nickel-zinc alloy (nickel silver)	3	CLA-EP17
Spring	copper-nickel-zinc alloy (nickel silver)	4	SPR-EP17



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.520	mm <sup>-1</sup>
$V_e$	effective volume	3230	mm <sup>3</sup>
$l_e$	effective length	41.1	mm
$A_e$	effective area	78.7	mm <sup>2</sup>
$A_{min}$	minimum area	60.8	mm <sup>2</sup>
$m$	mass of set	≈27	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 60 ±20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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 <small>des</small>	4900 ±25%	≈ 2040	≈ 0	EP20-3C91
3C94	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 <small>des</small>	3850 ±25%	≈ 1600	≈ 0	EP20-3C96

## EP cores and accessories

EP20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm$ 3%	$\approx$ 67	$\approx$ 790	EP20-3F3-E160
	250 $\pm$ 3%	$\approx$ 104	$\approx$ 460	EP20-3F3-A250
	315 $\pm$ 3%	$\approx$ 131	$\approx$ 350	EP20-3F3-A315
	400 $\pm$ 3%	$\approx$ 166	$\approx$ 260	EP20-3F3-A400
	630 $\pm$ 5%	$\approx$ 262	$\approx$ 150	EP20-3F3-A630
	3550 $\pm$ 25%	$\approx$ 1480	$\approx$ 0	EP20-3F3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements, 60  $\pm$ 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	11600 $\pm$ 25%	$\approx$ 4820	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 315	$\leq$ 0.75	–	–	–
3C91	$\geq$ 315	–	$\leq$ 0.2 <sup>(1)</sup>	$\leq$ 1.3 <sup>(1)</sup>	–
3C94	$\geq$ 320	–	$\leq$ 0.25	$\leq$ 1.6	–
3C96	$\geq$ 340	–	$\leq$ 0.2	$\leq$ 1.3	$\leq$ 0.5
3F3	$\geq$ 315	–	$\leq$ 0.36	–	$\leq$ 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq$ 315	–	–	–	–
3C91	$\geq$ 315	–	–	–	–
3C94	$\geq$ 320	–	–	–	–
3C96	$\geq$ 340	$\leq$ 1.0	–	–	–
3F3	$\geq$ 315	–	–	–	–

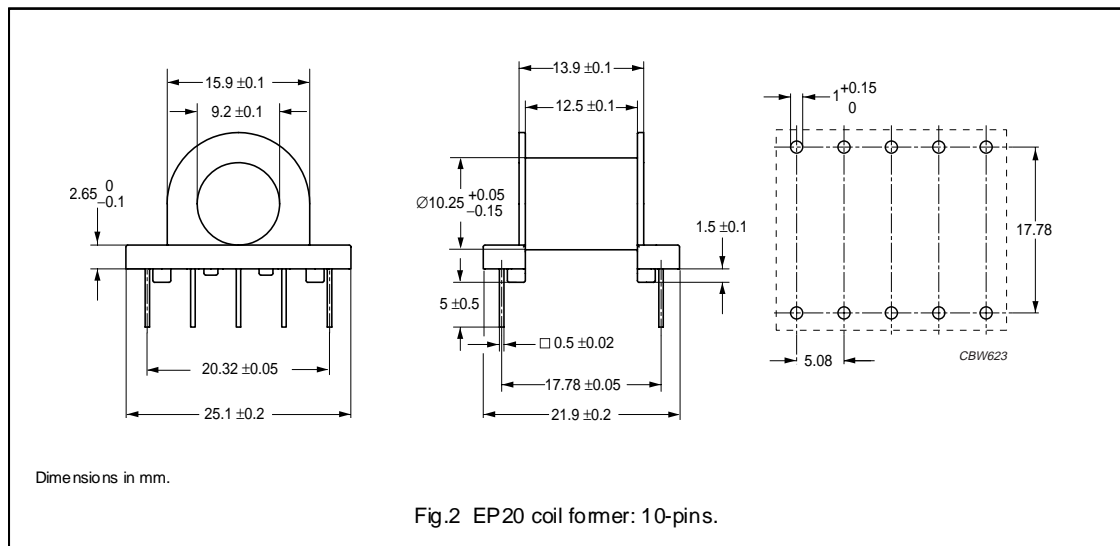
**Note**

1. Measured at 60 °C.

**COIL FORMER**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E41429(M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



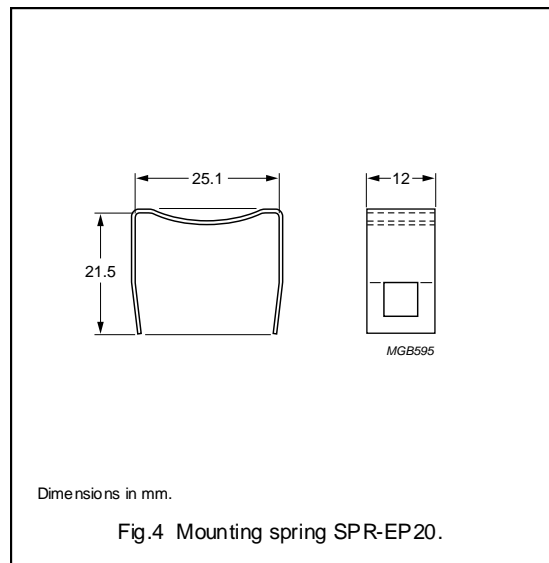
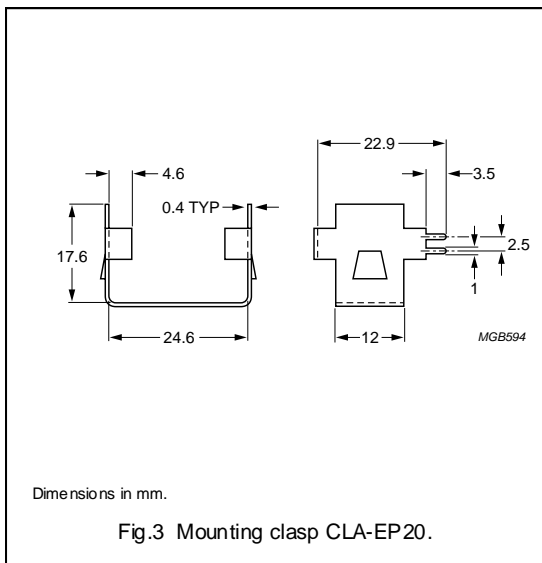
**Winding data for 10-pins EP20 coil former**

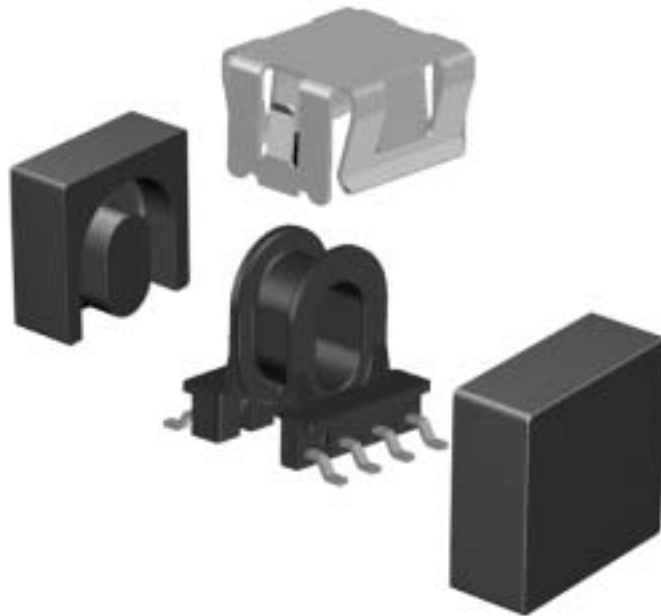
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	40.3	12.4	39.4	CSH-EP20-1S-10P-T

**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





MFW063

Soft Ferrites

EPX cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview EPX cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
EPX7	255	16.5	2.1
EPX8	279	16.4	2.3
EPX9	304	16.3	2.5
EPX10	325	15.0	2.5

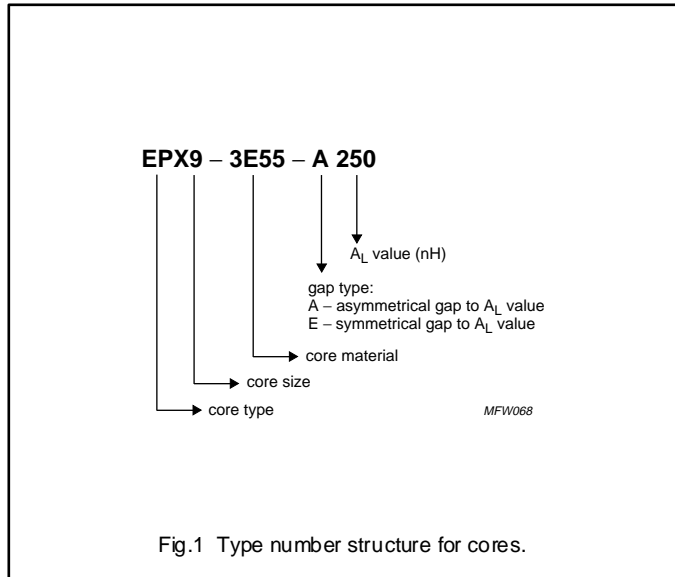


Fig.1 Type number structure for cores.

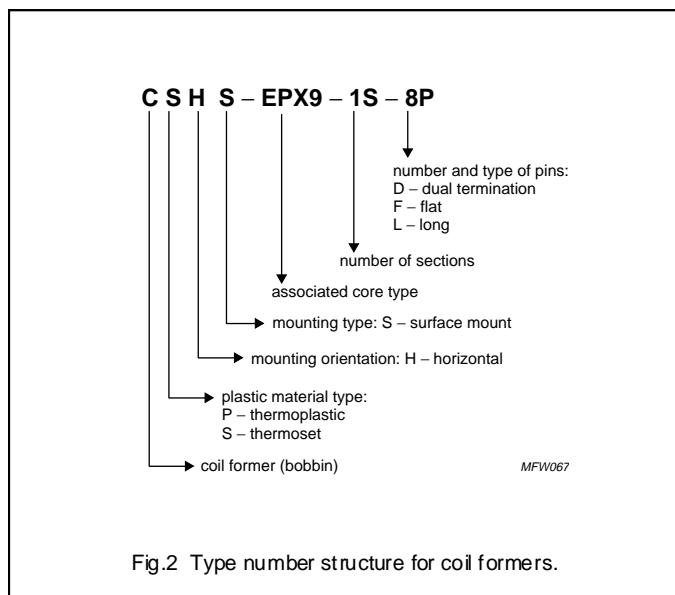


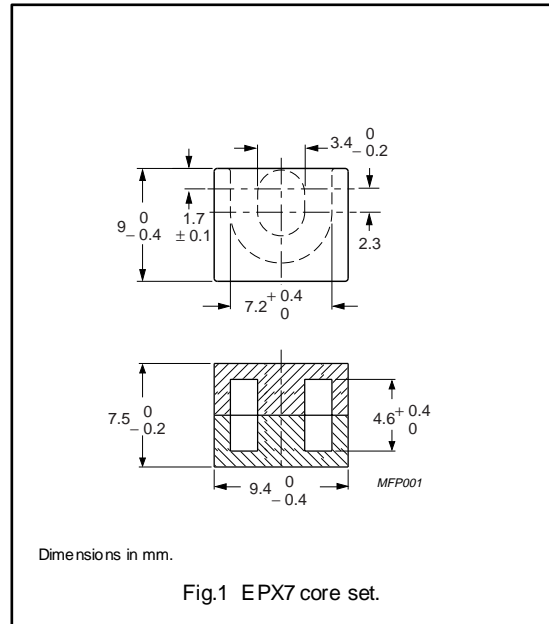
Fig.2 Type number structure for coil formers.



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.931	mm <sup>-1</sup>
$V_e$	effective volume	255	mm <sup>3</sup>
$l_e$	effective length	15.4	mm
$A_e$	effective area	16.5	mm <sup>2</sup>
$A_{min}$	minimum area	14.5	mm <sup>2</sup>
$m$	mass of core set	≈ 2.1	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C94	1950 ± 25 %	≈ 1440	≈ 0	EPX7-3C94
3C96 <small>des</small>	1750 ± 25 %	≈ 1300	≈ 0	EPX7-3C96
3F35 <small>prot</small>	1400 ± 25 %	≈ 1040	≈ 0	EPX7-3F35

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	2500 ± 25 %	≈ 1850	≈ 0	EPX7-3B46

## EPX cores and accessories

## EPX7

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$63 \pm 3 \%$	$\approx 47$	$\approx 450$	EPX7-3E55-A63
	$100 \pm 3 \%$	$\approx 74$	$\approx 250$	EPX7-3E55-A100
	$160 \pm 3 \%$	$\approx 119$	$\approx 150$	EPX7-3E55-A160
	$250 \pm 5 \%$	$\approx 185$	$\approx 90$	EPX7-3E55-A250
	$315 \pm 5 \%$	$\approx 233$	$\approx 70$	EPX7-3E55-A315
	$400 \pm 8 \%$	$\approx 296$	$\approx 50$	EPX7-3E55-A400
	$8400 + 40 / - 30 \%$	$\approx 6220$	$\approx 0$	EPX7-3E55
3E6	$9300 + 40 / - 30 \%$	$\approx 6890$	$\approx 0$	EPX7-3E6

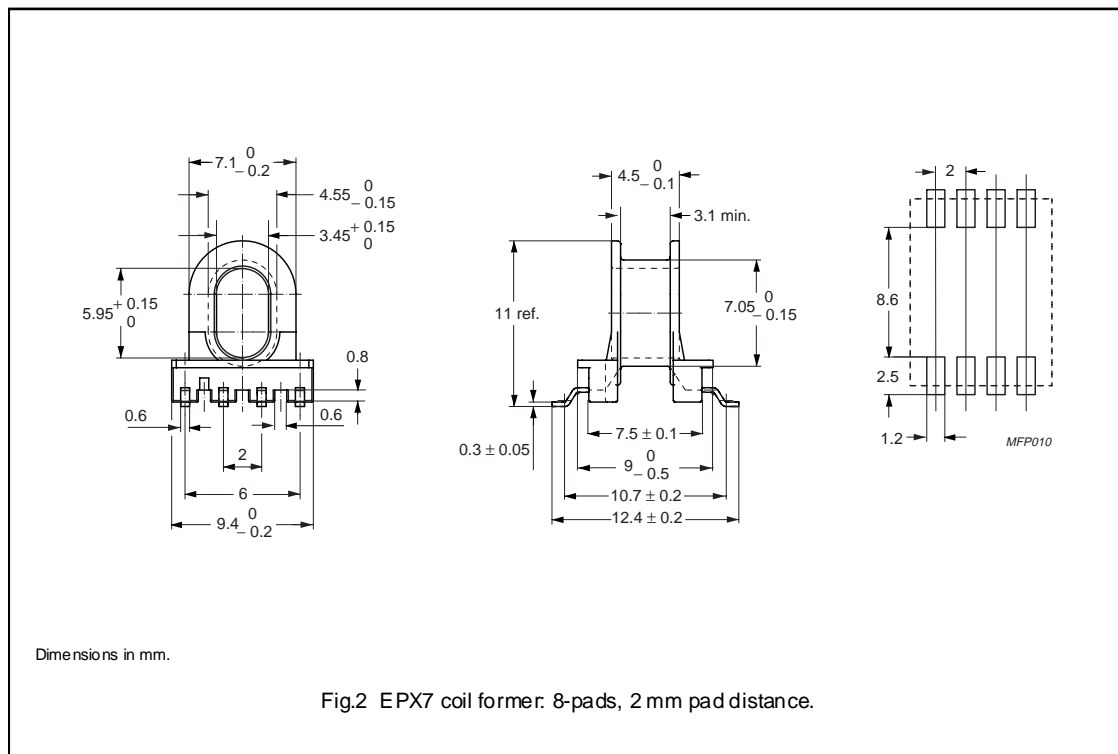
**Properties under power conditions**

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; 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	$\geq 320$	$\leq 0.02$	$\leq 0.13$	–	–
3C96	$\geq 340$	$\leq 0.015$	$\leq 0.1$	$\leq 0.08$	–
3F35	$\geq 300$	–	–	$\leq 0.03$	$\leq 0.25$

**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

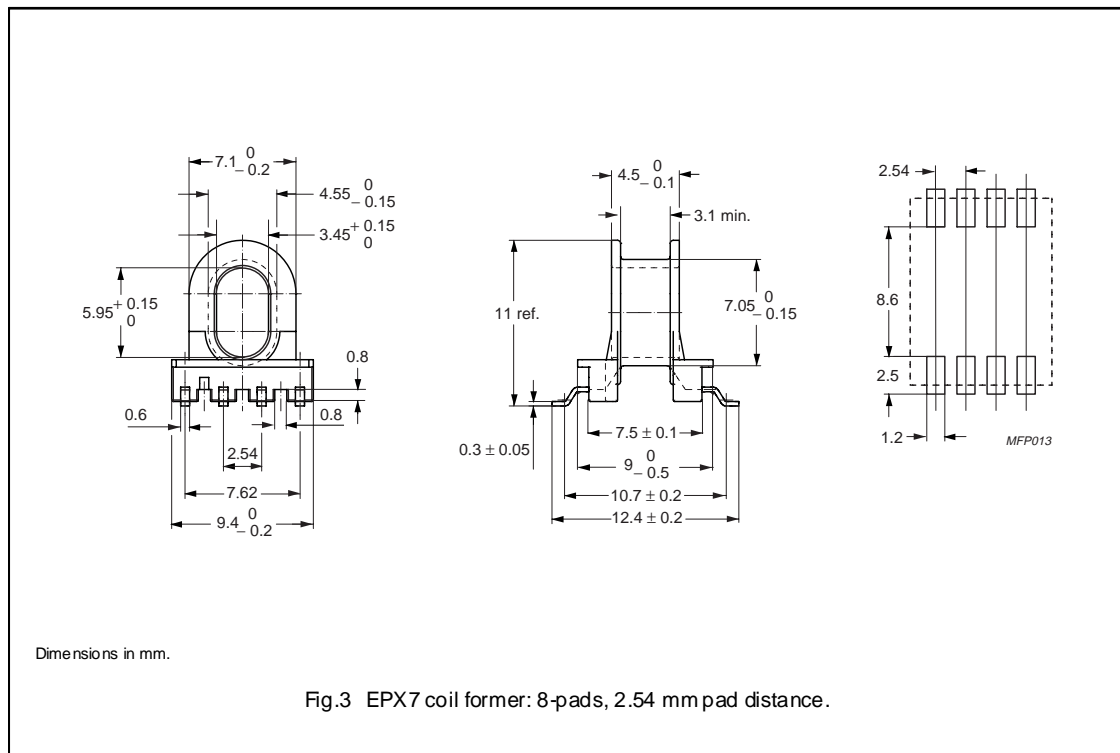


**Winding data for 8-pads EPX7 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E 41429(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 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



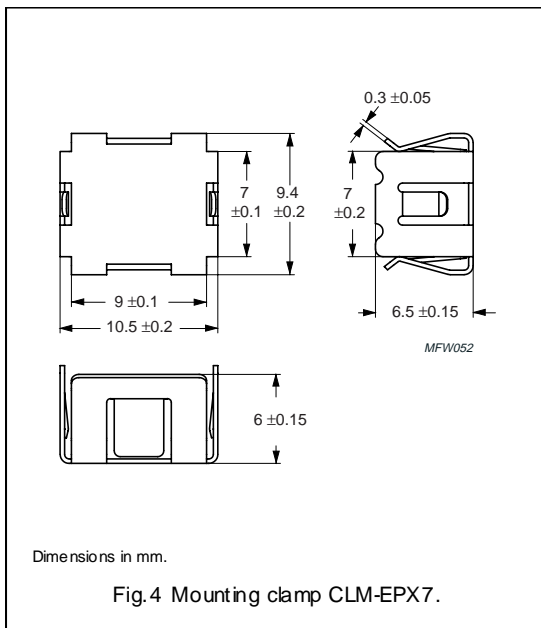
Winding data for 8-pads EPX7 coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

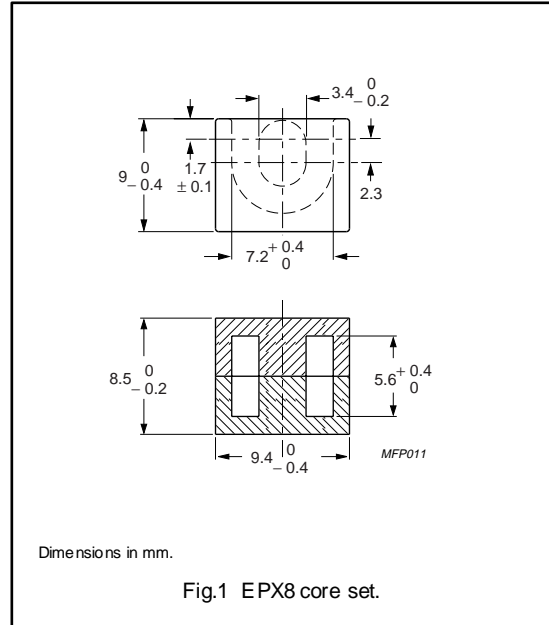
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clamp	stainless steel (CrNi); to be used in combination with CSHS-EPX7-1S-8P or CSHS-EPX7-1S-8P-T	4	CLM-EPX7



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.04	mm <sup>-1</sup>
$V_e$	effective volume	279	mm <sup>3</sup>
$l_e$	effective length	17.0	mm
$A_e$	effective area	16.4	mm <sup>2</sup>
$A_{min}$	minimum area	14.5	mm <sup>2</sup>
$m$	mass of core set	≈ 2.3	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C94	1800 ± 25 %	≈ 1490	≈ 0	EPX8-3C94
3C96 <small>des</small>	1650 ± 25 %	≈ 1365	≈ 0	EPX8-3C96
3F35 <small>prot</small>	1300 ± 25 %	≈ 1075	≈ 0	EPX8-3F35

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	2400 ± 25 %	≈ 1990	≈ 0	EPX8-3B46

## EPX cores and accessories

EPX8

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$63 \pm 3 \%$	$\approx 52$	$\approx 440$	EPX8-3E55-A63
	$100 \pm 3 \%$	$\approx 83$	$\approx 250$	EPX8-3E55-A100
	$160 \pm 3 \%$	$\approx 132$	$\approx 150$	EPX8-3E55-A160
	$250 \pm 5 \%$	$\approx 207$	$\approx 90$	EPX8-3E55-A250
	$315 \pm 5 \%$	$\approx 261$	$\approx 70$	EPX8-3E55-A315
	$400 \pm 8 \%$	$\approx 331$	$\approx 50$	EPX8-3E55-A400
	$7800 + 40 / - 30 \%$	$\approx 6455$	$\approx 0$	EPX8-3E55
3E6	$8700 + 40 / - 30 \%$	$\approx 7200$	$\approx 0$	EPX8-3E6

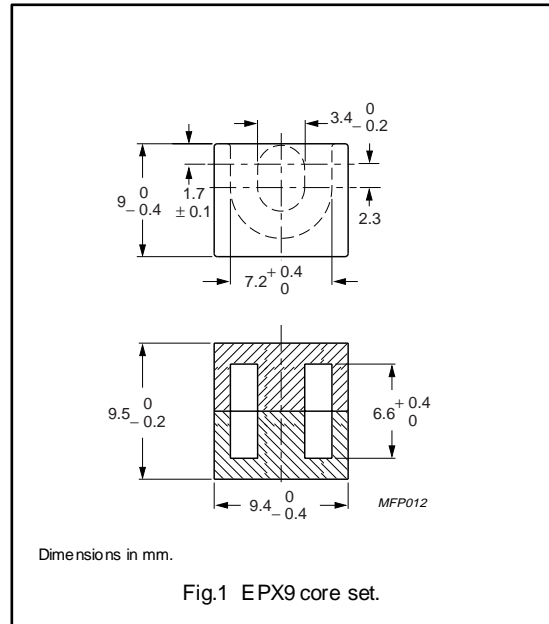
**Properties under power conditions**

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 <sub>c</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>c</sub> = 500 kHz; $\hat{B} = 50$ mT; T = 100 °C	f <sub>c</sub> = 500 kHz; $\hat{B} = 100$ mT; T = 100 °C
3C94	$\geq 320$	$\leq 0.022$	$\leq 0.14$	–	–
3C96	$\geq 340$	$\leq 0.017$	$\leq 0.11$	$\leq 0.09$	–
3F35	$\geq 300$	–	–	$\leq 0.032$	$\leq 0.27$

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.15	mm <sup>-1</sup>
$V_e$	effective volume	304	mm <sup>3</sup>
$l_e$	effective length	18.7	mm
$A_e$	effective area	16.3	mm <sup>2</sup>
$A_{min}$	minimum area	14.5	mm <sup>2</sup>
$m$	mass of core set	≈ 2.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C94	1700 ± 25 %	≈ 1560	≈ 0	EPX9-3C94
3C96 <small>des</small>	1550 ± 25 %	≈ 1420	≈ 0	EPX9-3C96
3F35 <small>prot</small>	1200 ± 25 %	≈ 1100	≈ 0	EPX9-3F35

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	2300 ± 25 %	≈ 2110	≈ 0	EPX9-3B46



## EPX cores and accessories

## EPX9

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$63 \pm 3 \%$	$\approx 58$	$\approx 440$	EPX9-3E55-A63
	$100 \pm 3 \%$	$\approx 92$	$\approx 250$	EPX9-3E55-A100
	$160 \pm 3 \%$	$\approx 146$	$\approx 150$	EPX9-3E55-A160
	$250 \pm 5 \%$	$\approx 229$	$\approx 90$	EPX9-3E55-A250
	$315 \pm 5 \%$	$\approx 288$	$\approx 70$	EPX9-3E55-A315
	$400 \pm 8 \%$	$\approx 366$	$\approx 50$	EPX9-3E55-A400
	$7300 + 40 / - 30 \%$	$\approx 6680$	$\approx 0$	EPX9-3E55
3E6	$8200 + 40 / - 30 \%$	$\approx 7500$	$\approx 0$	EPX9-3E6

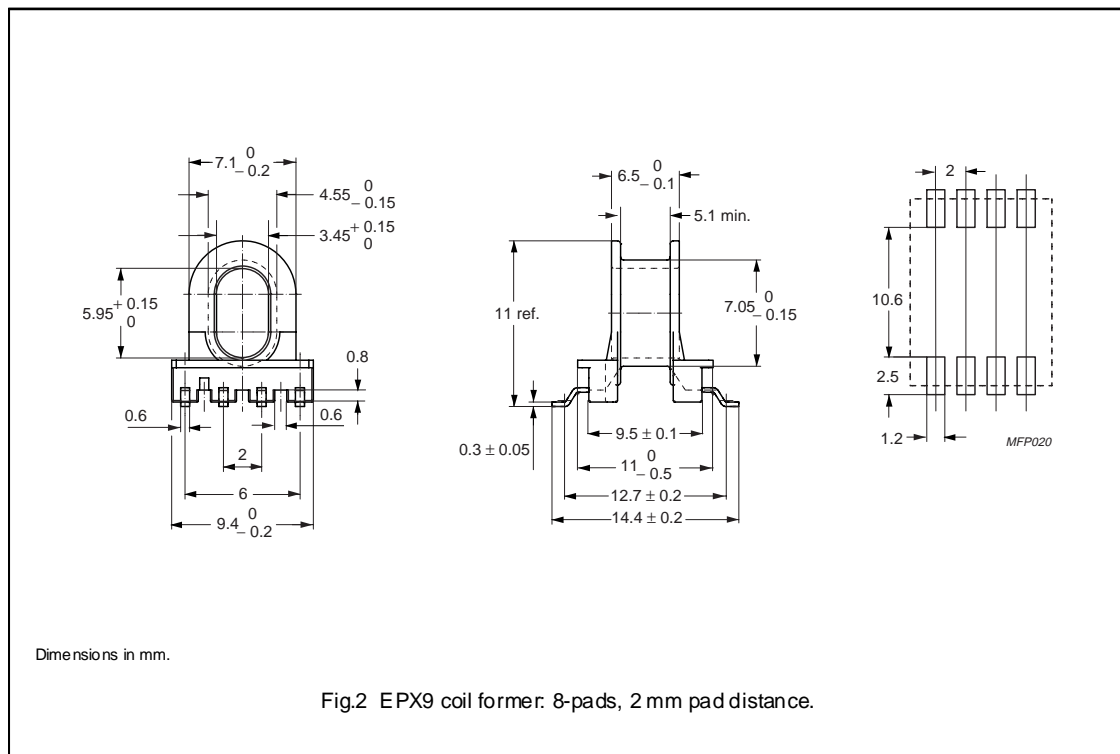
**Properties under power conditions**

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; 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	$\geq 320$	$\leq 0.023$	$\leq 0.15$	–	–
3C96	$\geq 340$	$\leq 0.018$	$\leq 0.12$	$\leq 0.1$	–
3F35	$\geq 300$	–	–	$\leq 0.035$	$\leq 0.3$

**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

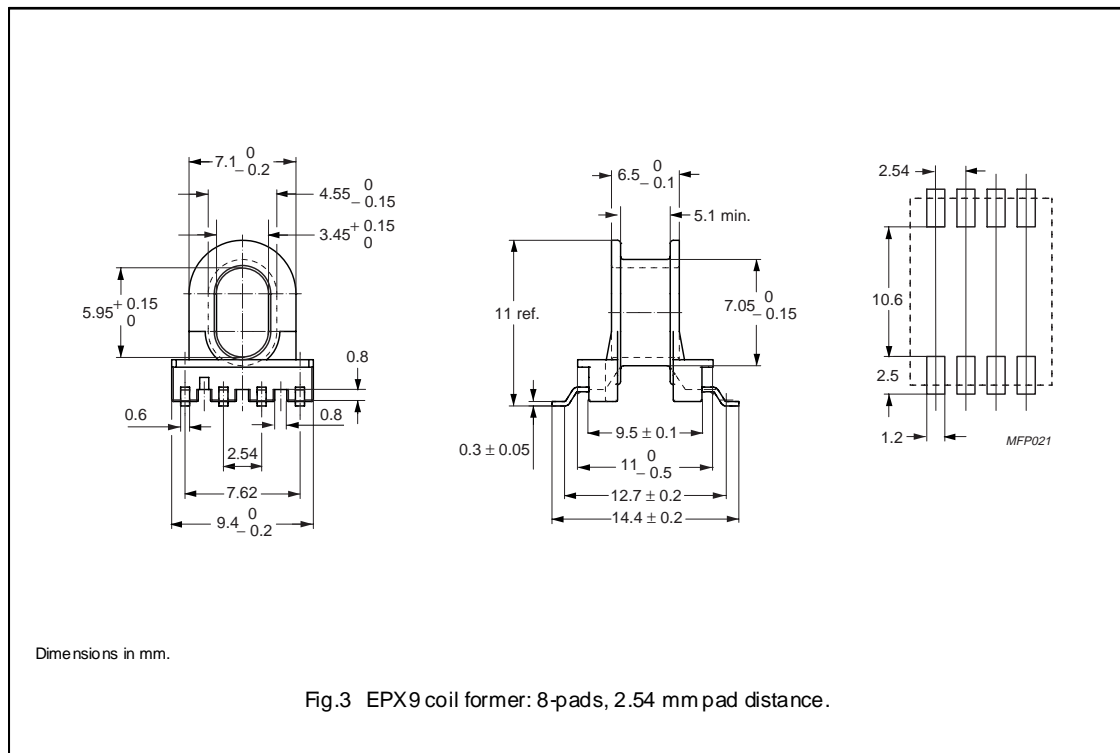


**Winding data for 8-pads EPX9 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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**

PARAMETER	SPECIFICATION
Coil former material	Sumikon PM9630 (PF), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E 41429(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 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1, 235 °C, 2 s



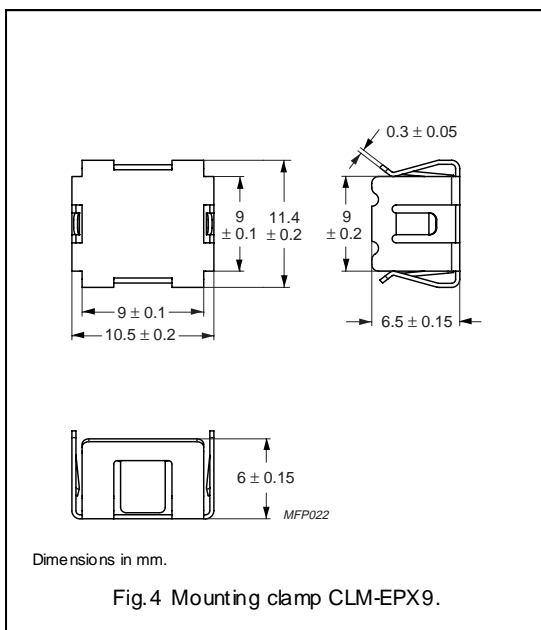
**Winding data for 8-pads EPX9 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

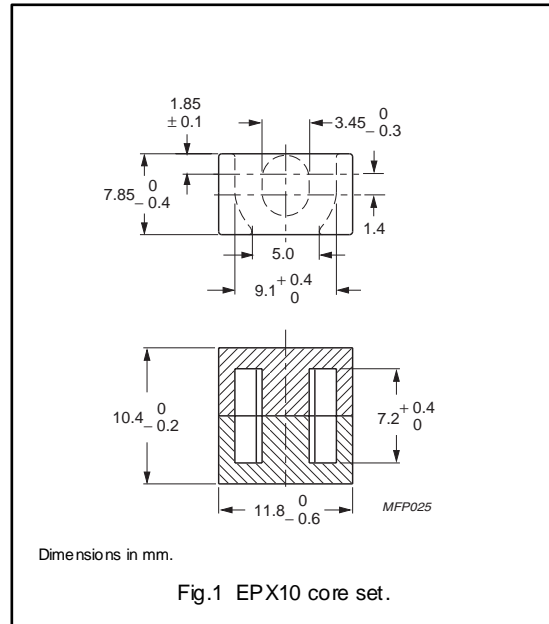
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clamp	stainless steel (CrNi); to be used in combination with CSHS-EPX9-1S-8P or CSHS-EPX9-1S-8P-T	4	CLM-EPX9



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.45	mm <sup>-1</sup>
$V_e$	effective volume	325	mm <sup>3</sup>
$l_e$	effective length	21.7	mm
$A_e$	effective area	15.0	mm <sup>2</sup>
$A_{min}$	minimum area	12.5	mm <sup>2</sup>
$m$	mass of core set	≈ 2.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C94	1400 ± 25 %	≈ 1620	≈ 0	EPX10-3C94
3C96 <small>des</small>	1250 ± 25 %	≈ 1440	≈ 0	EPX10-3C96
3F35 <small>prot</small>	950 ± 25 %	≈ 1100	≈ 0	EPX10-3F35

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	1900 ± 25 %	≈ 2200	≈ 0	EPX10-3B46

## EPX cores and accessories

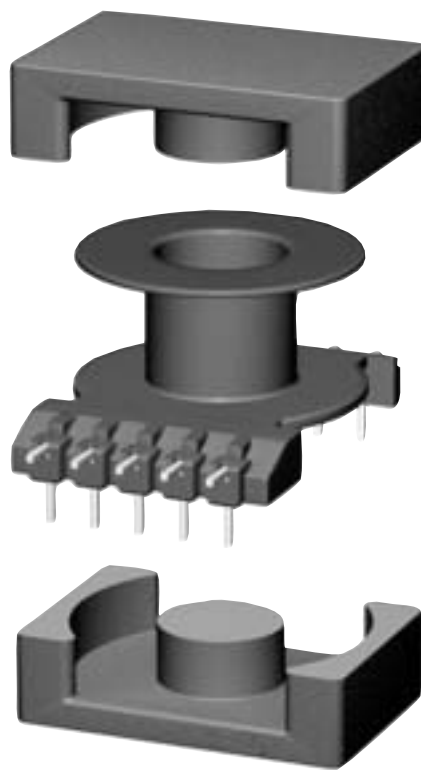
EPX10

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E55 <small>des</small>	$63 \pm 3 \%$	$\approx 73$	$\approx 410$	EPX10-3E55-A63
	$100 \pm 3 \%$	$\approx 115$	$\approx 230$	EPX10-3E55-A100
	$160 \pm 3 \%$	$\approx 185$	$\approx 135$	EPX10-3E55-A160
	$250 \pm 5 \%$	$\approx 288$	$\approx 80$	EPX10-3E55-A250
	$315 \pm 5 \%$	$\approx 363$	$\approx 60$	EPX10-3E55-A315
	$400 \pm 8 \%$	$\approx 462$	$\approx 50$	EPX10-3E55-A400
	$6000 + 40 / - 30 \%$	$\approx 6920$	$\approx 0$	EPX10-3E55
3E6	$6600 + 40 / - 30 \%$	$\approx 7620$	$\approx 0$	EPX10-3E6

**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 <sub>∞</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>∞</sub> = 500 kHz; B = 50 mT; T = 100 °C	f <sub>∞</sub> = 500 kHz; B = 100 mT; T = 100 °C
3C94	$\geq 320$	$\leq 0.025$	$\leq 0.16$	–	–
3C96	$\geq 340$	$\leq 0.018$	$\leq 0.13$	$\leq 0.1$	–
3F35	$\geq 300$	–	–	$\leq 0.04$	$\leq 0.3$



CBW586

Soft Ferrites

EQ cores and accessories

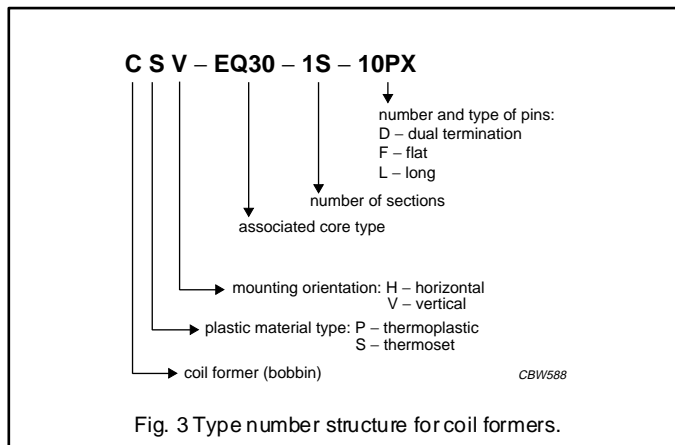
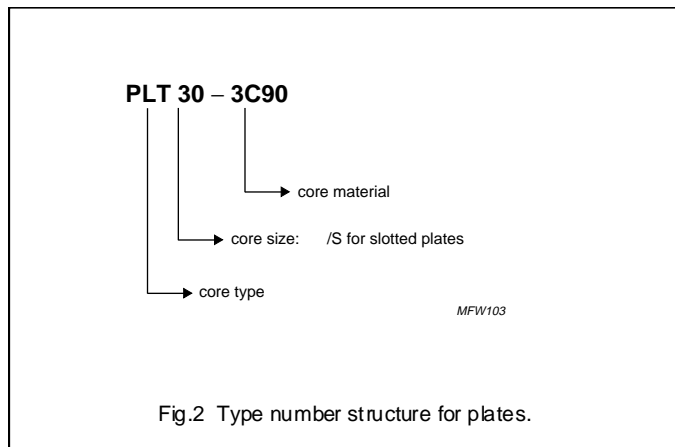
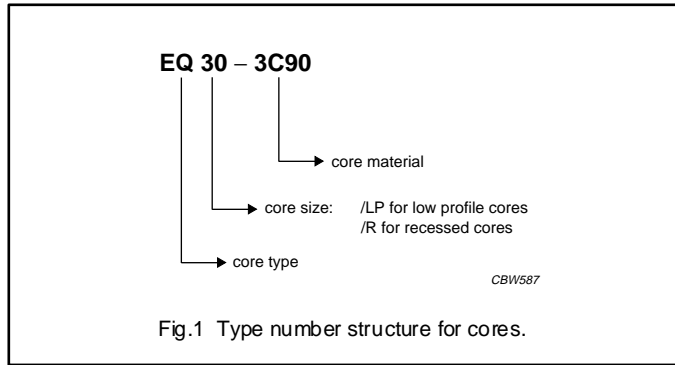
PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Overview EQ cores and plates (PLT)

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
EQ13	348	19.9	0.8
PLT13	315	19.8	0.6
EQ20/R	1960	59.0	5.1
PLT20/S	1500	59.8	3.0
EQ25	4145	100	11
EQ25/LP	2370 <sup>(1)</sup>	89.7 <sup>(1)</sup>	8.2
PLT25	-	-	4.9
EQ30	4970	108	13.2
PLT30	3400	108	7.6

Note:

(1) In combination with PLT25

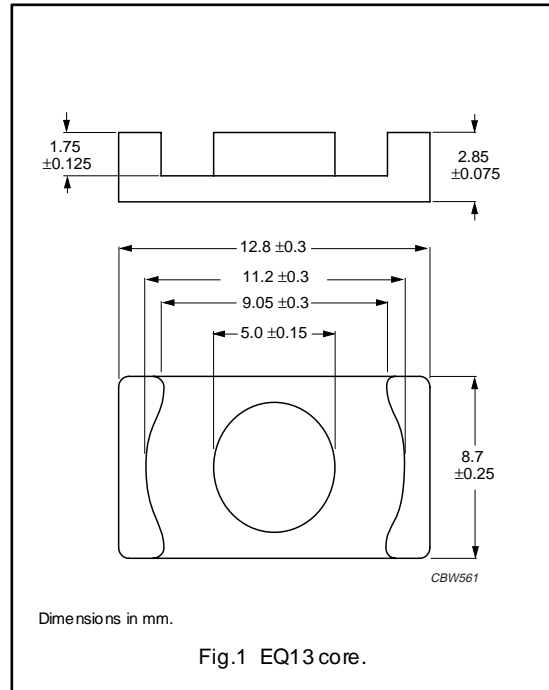




**CORES**

**Effective core parameters of a set of EQ cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.911	mm <sup>-1</sup>
$V_e$	effective volume	348	mm <sup>3</sup>
$l_e$	effective length	17.5	mm
$A_e$	effective area	19.9	mm <sup>2</sup>
$A_{min}$	minimum area	19.2	mm <sup>2</sup>
$m$	mass of core half	≈ 0.8	g

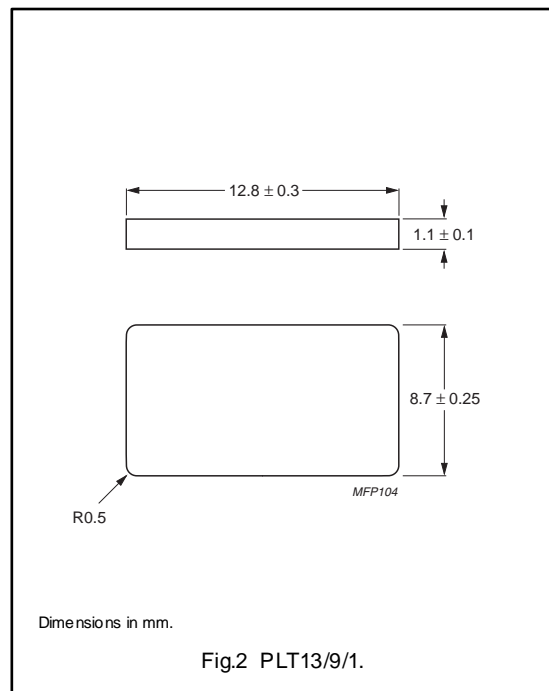


**Effective core parameters of an EQ/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.803	mm <sup>-1</sup>
$V_e$	effective volume	315	mm <sup>3</sup>
$l_e$	effective length	15.9	mm
$A_e$	effective area	19.8	mm <sup>2</sup>
$A_{min}$	minimum area	19.2	mm <sup>2</sup>
$m$	mass of plate	≈ 0.6	g

**Ordering information for plates**





GRADE	TYPE NUMBER
3C94	PLT13/9/1-3C94
3C96 <small>des</small>	PLT13/9/1-3C96
3F35 <small>prot</small>	PLT13/9/1-3F35
3F4 <small>des</small>	PLT13/9/1-3F4
3F45 <small>prot</small>	PLT13/9/1-3F45







## EQ cores and accessories

EQ13

**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,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$1700 \pm 25 \%$	$\approx 1230$	$\approx 0$	EQ 13-3C94
3C96 	$1600 \pm 25 \%$	$\approx 1160$	$\approx 0$	EQ 13-3C96
3F35 	$1300 \pm 25 \%$	$\approx 942$	$\approx 0$	EQ 13-3F35
3F4 	$950 \pm 25 \%$	$\approx 689$	$\approx 0$	EQ 13-3F4
3F45 	$950 \pm 25 \%$	$\approx 689$	$\approx 0$	EQ 13-3F45

**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,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$1800 \pm 25 \%$	$\approx 1150$	$\approx 0$	EQ 13-3C94
3C96 	$1700 \pm 25 \%$	$\approx 1085$	$\approx 0$	EQ 13-3C96
3F35 	$1350 \pm 25 \%$	$\approx 863$	$\approx 0$	EQ 13-3F35
3F4 	$1000 \pm 25 \%$	$\approx 639$	$\approx 0$	EQ 13-3F4
3F45 	$1000 \pm 25 \%$	$\approx 639$	$\approx 0$	EQ 13-3F45

**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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
EQ+EQ 13-3C94	$\geq 320$	$\leq 0.031$	$\leq 0.21$	–
EQ+PLT 13-3C94	$\geq 320$	$\leq 0.028$	$\leq 0.19$	–
EQ+EQ 13-3C96	$\geq 340$	$\leq 0.023$	$\leq 0.16$	$\leq 0.13$
EQ+PLT 13-3C96	$\geq 340$	$\leq 0.021$	$\leq 0.14$	$\leq 0.12$
EQ+EQ 13-3F35	$\geq 300$	–	–	$\leq 0.047$
EQ+PLT 13-3F35	$\geq 300$	–	–	$\leq 0.043$

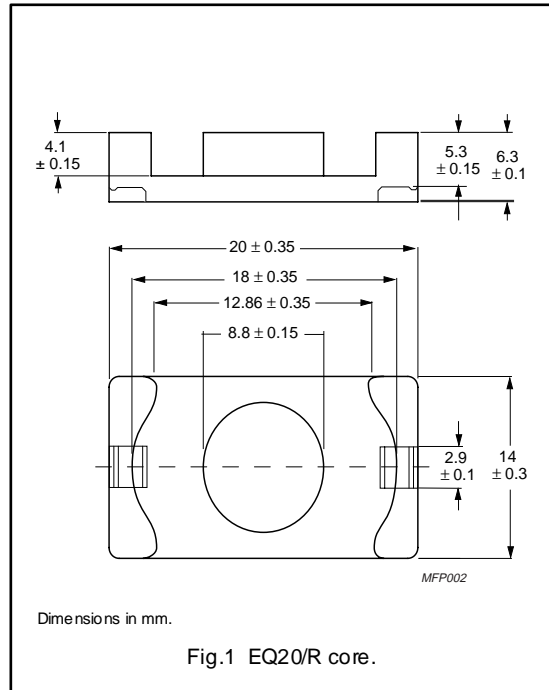
**Properties of core sets under power conditions (continued)**

CORE COMBINATION	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
EQ+EQ 13-3F35	$\geq 300$	$\leq 0.36$	–	–	–
EQ+PLT 13-3F35	$\geq 300$	$\leq 0.33$	–	–	–
EQ+EQ 13-3F4	$\geq 300$	–	$\leq 0.1$	–	$\leq 0.17$
EQ+PLT 13-3F4	$\geq 300$	–	$\leq 0.095$	–	$\leq 0.15$
EQ+EQ 13-3F45	$\geq 300$	–	$\leq 0.7$	$\leq 0.18$	$\leq 0.12$
EQ+PLT 13-3F45	$\geq 300$	–	$\leq 0.063$	$\leq 0.16$	$\leq 0.11$

**CORES**

**Effective core parameters of a set of EQ cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.563	mm <sup>-1</sup>
$V_e$	effective volume	1960	mm <sup>3</sup>
$l_e$	effective length	33.2	mm
$A_e$	effective area	59.0	mm <sup>2</sup>
$A_{min}$	minimum area	55.0	mm <sup>2</sup>
$m$	mass of core half	≈ 5.1	g

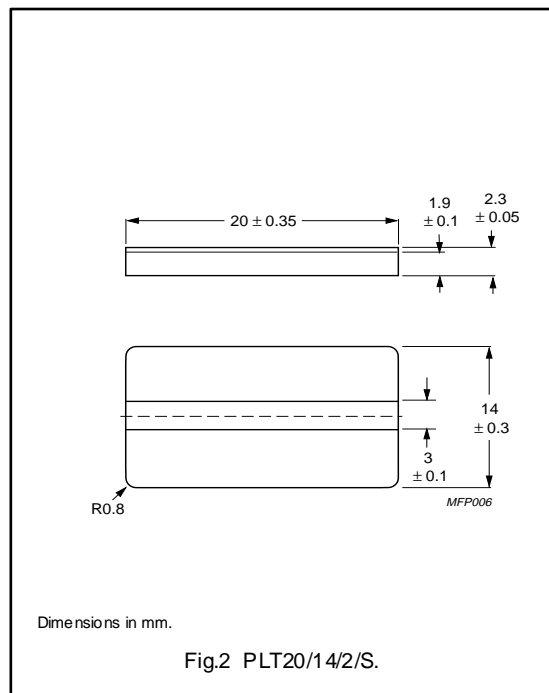


**Effective core parameters of an EQ/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.420	mm <sup>-1</sup>
$V_e$	effective volume	1500	mm <sup>3</sup>
$l_e$	effective length	25.1	mm
$A_e$	effective area	59.8	mm <sup>2</sup>
$A_{min}$	minimum area	55.0	mm <sup>2</sup>
$m$	mass of plate	≈ 3.0	g

**Ordering information for plates**





GRADE	TYPE NUMBER
3C94	PLT20/14/2/S-3C94
3C96 <small>des</small>	PLT20/14/2/S-3C96
3F35 <small>prot</small>	PLT20/14/2/S-3F35
3F4 <small>des</small>	PLT20/14/2/S-3F4
3F45 <small>prot</small>	PLT20/14/2/S-3F45







## EQ cores and accessories

EQ20/R

**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,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$3500 \pm 25 \%$	$\approx 1570$	$\approx 0$	EQ20/R-3C94
3C96 	$3150 \pm 25 \%$	$\approx 1410$	$\approx 0$	EQ20/R-3C96
3F35 	$2400 \pm 25 \%$	$\approx 1075$	$\approx 0$	EQ20/R-3F35
3F4 	$1700 \pm 25 \%$	$\approx 762$	$\approx 0$	EQ20/R-3F4
3F45 	$1700 \pm 25 \%$	$\approx 762$	$\approx 0$	EQ20/R-3F45

**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,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$4750 \pm 25 \%$	$\approx 1590$	$\approx 0$	EQ20/R-3C94
3C96 	$4350 \pm 25 \%$	$\approx 1450$	$\approx 0$	EQ20/R-3C96
3F35 	$3300 \pm 25 \%$	$\approx 1100$	$\approx 0$	EQ20/R-3F35
3F4 	$2200 \pm 25 \%$	$\approx 735$	$\approx 0$	EQ20/R-3F4
3F45 	$2200 \pm 25 \%$	$\approx 735$	$\approx 0$	EQ20/R-3F45

**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; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
EQ+EQ20/R-3C94	$\geq 320$	$\leq 0.17$	$\leq 1.2$	–
EQ+PLT20/S-3C94	$\geq 320$	$\leq 0.13$	$\leq 0.9$	–
EQ+EQ20/R-3C96	$\geq 340$	$\leq 0.13$	$\leq 0.9$	$\leq 0.74$
EQ+PLT20/S-3C96	$\geq 340$	$\leq 0.091$	$\leq 0.68$	$\leq 0.56$
EQ+EQ20/R-3F35	$\geq 300$	–	–	$\leq 0.27$
EQ+PLT20/S-3F35	$\geq 300$	–	–	$\leq 0.2$

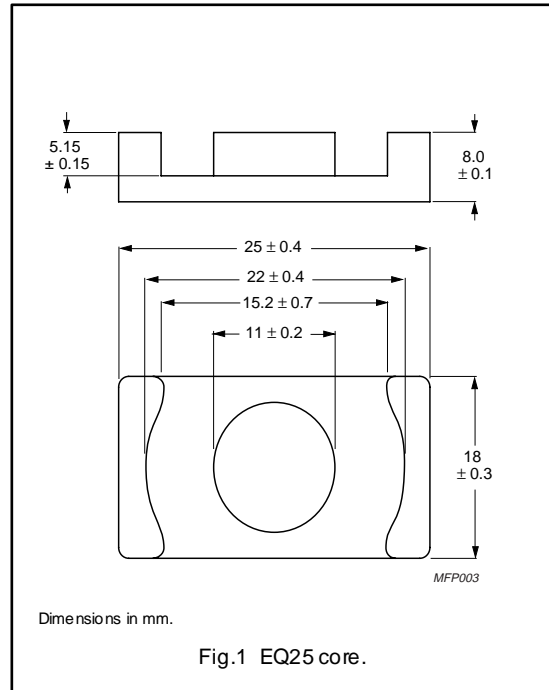
**Properties of core sets under power conditions (continued)**

CORE COMBINATION	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; $\hat{B} = 30$ mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; $\hat{B} = 10$ mT; T = 100 °C
EQ+EQ20/R-3F35	$\geq 300$	$\leq 2.1$	–	–	–
EQ+PLT20/S-3F35	$\geq 300$	$\leq 1.6$	–	–	–
EQ+EQ20/R-3F4	$\geq 300$	–	$\leq 0.6$	–	$\leq 0.94$
EQ+PLT20/S-3F4	$\geq 300$	–	$\leq 0.45$	–	$\leq 0.72$
EQ+EQ20/R-3F45	$\geq 300$	–	$\leq 0.39$	$\leq 0.98$	$\leq 0.69$
EQ+PLT20/S-3F45	$\geq 300$	–	$\leq 0.3$	$\leq 0.75$	$\leq 0.53$

**CORES**

Effective core parameters of a set of EQ cores

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.414	mm <sup>-1</sup>
$V_e$	effective volume	4145	mm <sup>3</sup>
$l_e$	effective length	41.4	mm
$A_e$	effective area	100	mm <sup>2</sup>
$A_{min}$	minimum area	95.0	mm <sup>2</sup>
$m$	mass of core half	≈ 11	g



**Core halves for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C94	$4800 \pm 25 \%$	≈ 1580	≈ 0	EQ25-3C94
3C96 <small>des</small>	$4400 \pm 25 \%$	≈ 1450	≈ 0	EQ25-3C96
3F35 <small>prot</small>	$3350 \pm 25 \%$	≈ 1100	≈ 0	EQ25-3F35
3F4 <small>des</small>	$2300 \pm 25 \%$	≈ 758	≈ 0	EQ25-3F4
3F45 <small>prot</small>	$2300 \pm 25 \%$	≈ 758	≈ 0	EQ25-3F45

## 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; 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

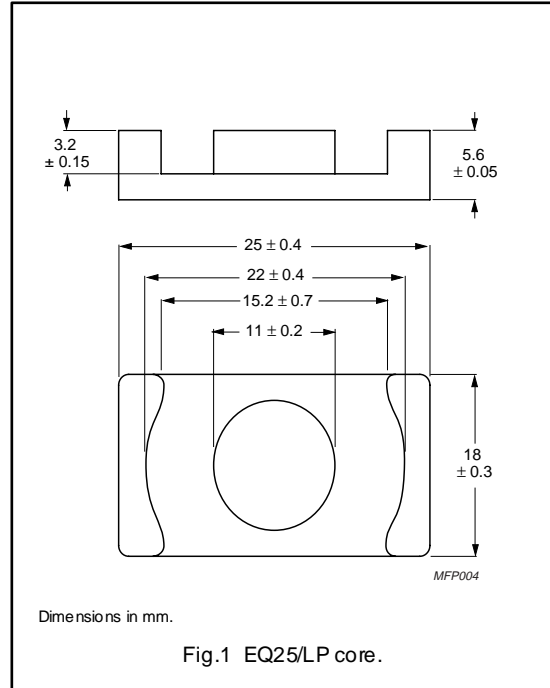
## Properties of core sets under power conditions (continued)

CORE COMBINATION	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
EQ+EQ25-3F35	≥ 300	≤ 4.3	–	–	–
EQ+EQ25-3F4	≥ 300	–	≤ 1.25	–	≤ 2.0
EQ+EQ25-3F45	≥ 300	–	≤ 0.83	≤ 2.1	≤ 1.5

**CORES**

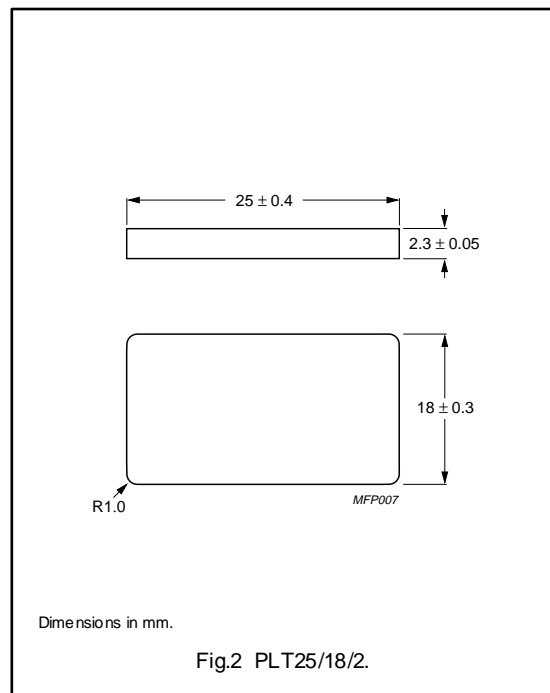
Effective core parameters of a EQ/LP/PLT combination

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.294	mm <sup>-1</sup>
$V_e$	effective volume	2370	mm <sup>3</sup>
$l_e$	effective length	26.4	mm
$A_e$	effective area	89.7	mm <sup>2</sup>
$A_{min}$	minimum area	82.8	mm <sup>2</sup>
m	mass of core half	≈ 8.2	g
m	mass of plate	≈ 4.9	g



Ordering information for plates

GRADE	TYPE NUMBER
3C94	PLT25/18/2-3C94
3C96 <small>des</small>	PLT25/18/2-3C96
3F35 <small>prot</small>	PLT25/18/2-3F35
3F4 <small>des</small>	PLT25/18/2-3F4
3F45 <small>prot</small>	PLT25/18/2-3F45



## EQ cores and accessories

EQ25/LP

**Core halves for use in combination with a plate (PLT)**A<sub>L</sub> measured in combination with a plate (PLT), clamping force for A<sub>L</sub> measurements, 40 ±20 N.

GRADE	A <sub>L</sub> (nH)	μ <sub>e</sub>	AIR GAP (μm)	TYPE NUMBER
3C94	6100 ± 25 %	≈ 1430	≈ 0	EQ25/LP-3C94
3C96 <small>des</small>	5600 ± 25 %	≈ 1310	≈ 0	EQ25/LP-3C96
3F35 <small>prot</small>	4350 ± 25 %	≈ 1020	≈ 0	EQ25/LP-3F35
3F4 <small>des</small>	3100 ± 25 %	≈ 725	≈ 0	EQ25/LP-3F4
3F45 <small>prot</small>	3100 ± 25 %	≈ 725	≈ 0	EQ25/LP-3F45

**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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; 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)**

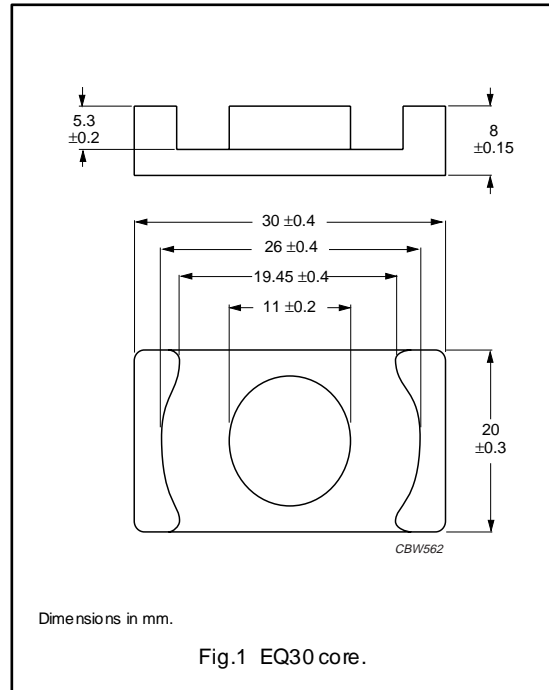
CORE COMBINATION	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
EQ/LP+PLT25-3F35	≥ 300	≤ 2.5	–	–	–
EQ/LP+PLT25-3F4	≥ 300	–	≤ 0.71	–	≤ 1.14
EQ/LP+PLT25-3F45	≥ 300	–	≤ 0.48	≤ 1.2	≤ 0.83



**CORES**

**Effective core parameters of a set of EQ cores**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.426	mm <sup>-1</sup>
$V_e$	effective volume	4970	mm <sup>3</sup>
$l_e$	effective length	46.0	mm
$A_e$	effective area	108	mm <sup>2</sup>
$A_{min}$	minimum area	95.0	mm <sup>2</sup>
$m$	mass of core half	≈ 13.2	g

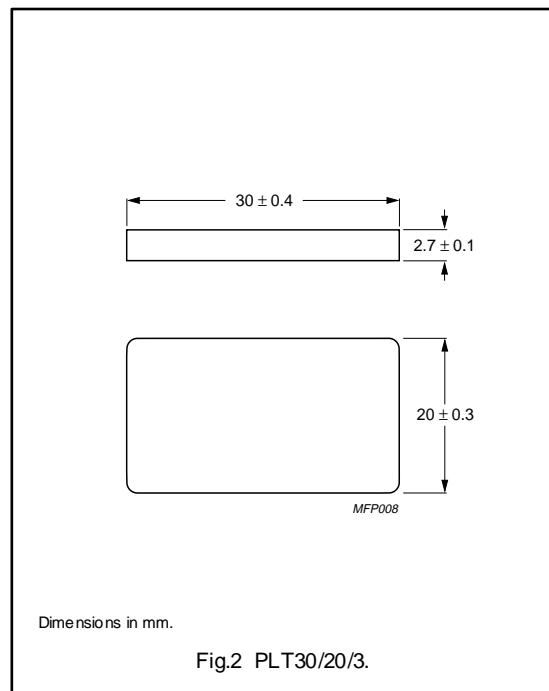


**Effective core parameters of an EQ/PLT combination**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.335	mm <sup>-1</sup>
$V_e$	effective volume	3910	mm <sup>3</sup>
$l_e$	effective length	36.2	mm
$A_e$	effective area	108	mm <sup>2</sup>
$A_{min}$	minimum area	95.0	mm <sup>2</sup>
$m$	mass of plate	≈ 7.6	g

**Ordering information for plates**

GRADE	TYPE NUMBER
3C94	PLT30/20/3-3C94
3C96 <small>des</small>	PLT30/20/3-3C96
3F35 <small>prot</small>	PLT30/20/3-3F35
3F4 <small>des</small>	PLT30/20/3-3F4
3F45 <small>prot</small>	PLT30/20/3-3F45







EQ cores and accessories

EQ30





**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,  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$5400 \pm 25 \%$	$\approx 1440$	$\approx 0$	EQ30-3C94
3C96 	$4900 \pm 25 \%$	$\approx 1310$	$\approx 0$	EQ30-3C96
3F35 	$3600 \pm 25 \%$	$\approx 960$	$\approx 0$	EQ30-3F35
3F4 	$2400 \pm 25 \%$	$\approx 640$	$\approx 0$	EQ30-3F4
3F45 	$2400 \pm 25 \%$	$\approx 640$	$\approx 0$	EQ30-3F45

**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,  $40 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C94	$6550 \pm 25 \%$	$\approx 1520$	$\approx 0$	EQ30-3C94
3C96 	$6000 \pm 25 \%$	$\approx 1395$	$\approx 0$	EQ30-3C96
3F35 	$4600 \pm 25 \%$	$\approx 1070$	$\approx 0$	EQ30-3F35
3F4 	$3200 \pm 25 \%$	$\approx 744$	$\approx 0$	EQ30-3F4
3F45 	$3200 \pm 25 \%$	$\approx 744$	$\approx 0$	EQ30-3F45

**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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
EQ+EQ30-3C94	$\geq 320$	$\leq 0.45$	$\leq 3.0$	–
EQ+PLT30-3C94	$\geq 320$	$\leq 0.35$	$\leq 2.3$	–
EQ+EQ30-3C96	$\geq 340$	$\leq 0.34$	$\leq 2.3$	$\leq 1.9$
EQ+PLT30-3C96	$\geq 340$	$\leq 0.23$	$\leq 1.7$	$\leq 1.4$
EQ+EQ30-3F35	$\geq 300$	–	–	$\leq 0.67$
EQ+PLT30-3F35	$\geq 300$	–	–	$\leq 0.52$

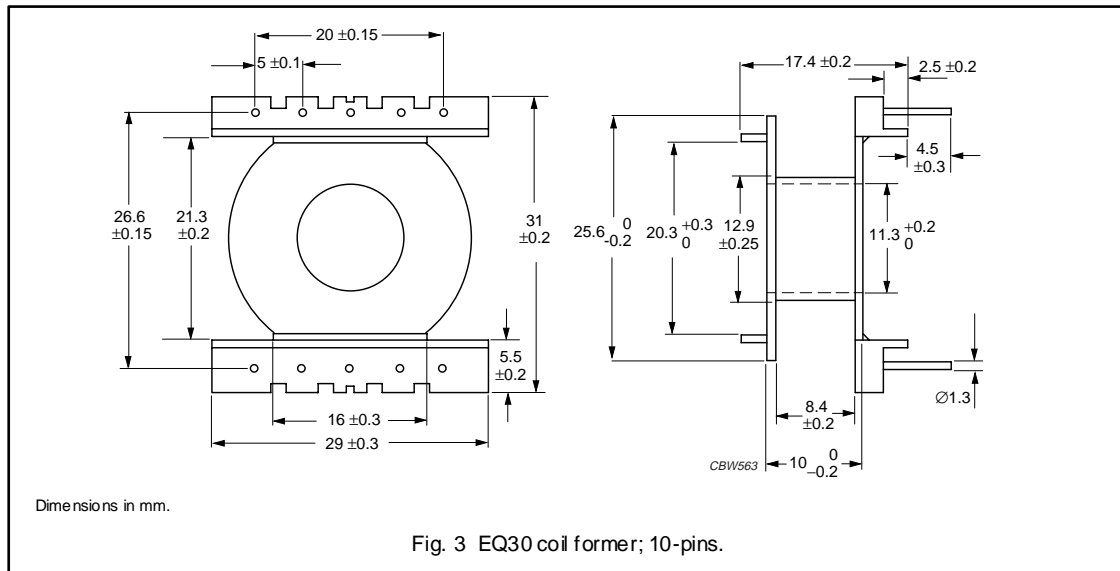
**Properties of core sets under power conditions (continued)**

CORE COMBINATION	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
EQ+EQ30-3F35	$\geq 300$	$\leq 5.2$	–	–	–
EQ+PLT30-3F35	$\geq 300$	$\leq 4.1$	–	–	–
EQ+EQ30-3F4	$\geq 300$	–	$\leq 1.5$	–	$\leq 2.4$
EQ+PLT30-3F4	$\geq 300$	–	$\leq 1.1$	–	$\leq 1.8$
EQ+EQ30-3F45	$\geq 300$	–	$\leq 1.0$	$\leq 2.5$	$\leq 1.7$
EQ+PLT30-3F45	$\geq 300$	–	$\leq 0.78$	$\leq 1.9$	$\leq 1.4$

**COIL FORMERS**

**General data**

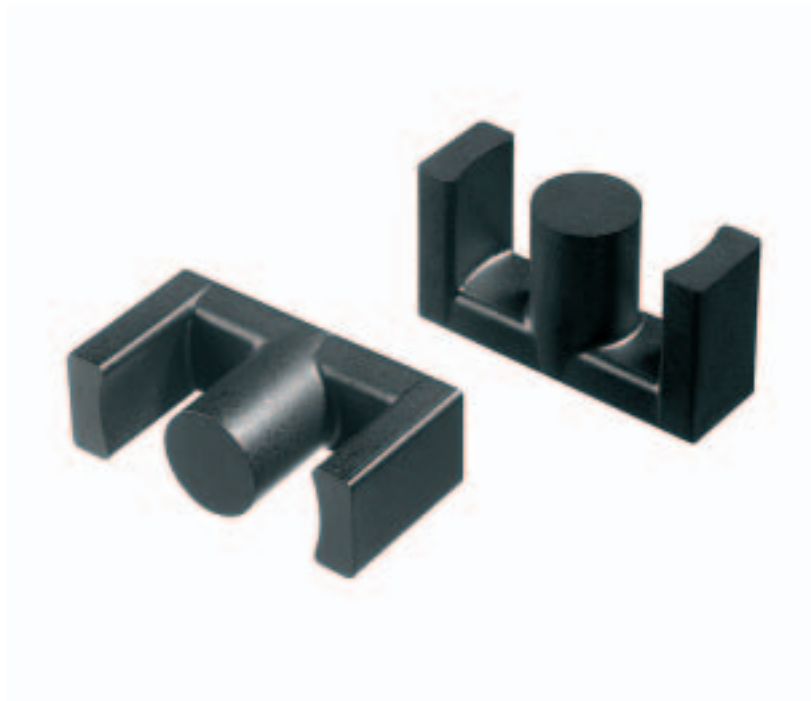
PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
Maximum operating temperature	180 °C, "IEC 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



**Winding data for EQ30 coil former with 10 pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.2	8.2	60	CSV-EQ30-1S-10P





MFP105

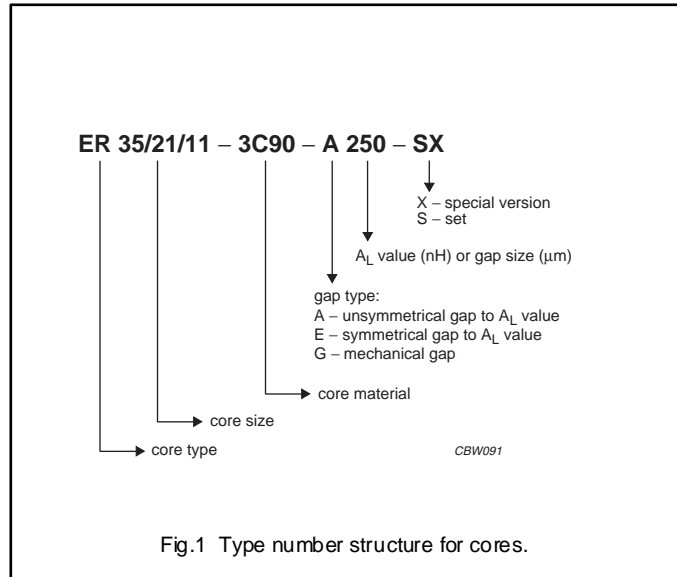
Soft Ferrites

ER cores and accessories

PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE

Product overview ER cores

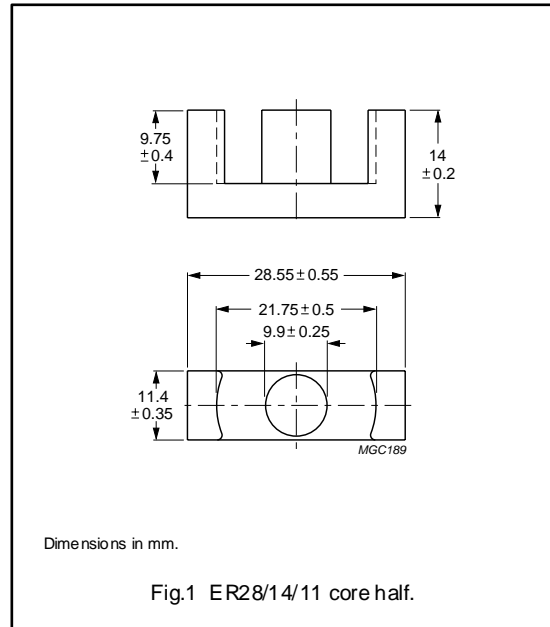
CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
ER28/14/11	5260	81.4	14
ER28/17/11	6140	81.4	16
ER35/21/11	9710	107	23
ER35W/21/11	9548	103	27
ER40/22/13	14600	149	37
ER42/22/16	19200	194	50
ER42/22/15	16800	170	42
ER48/21/21	25500	255	64
ER48/18/18	20300	231	51
ER54/18/18	23000	250	61



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.786	mm <sup>-1</sup>
$V_e$	effective volume	5260	mm <sup>3</sup>
$l_e$	effective length	64.0	mm
$A_e$	effective area	81.4	mm <sup>2</sup>
$A_{min}$	minimum area	77.0	mm <sup>2</sup>
$m$	mass of core half	≈ 14	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	2900 ± 25%	≈ 1 800	≈ 0	ER28/14/11-3C90
3C94	2900 ± 25%	≈ 1 800	≈ 0	ER28/14/11-3C94

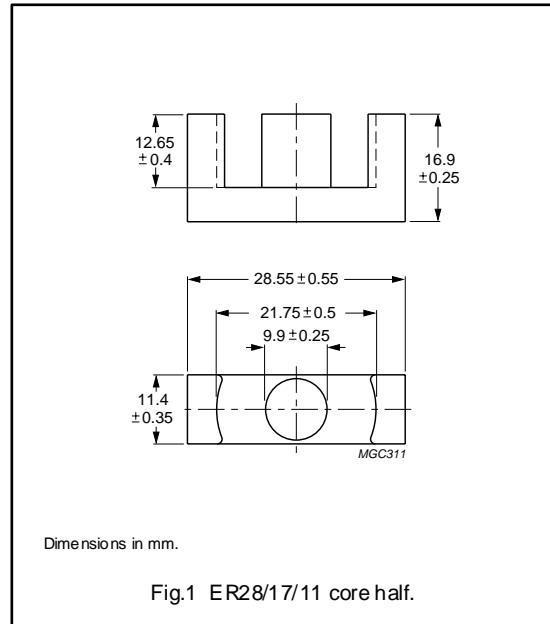
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.928	mm <sup>-1</sup>
$V_e$	effective volume	6 140	mm <sup>3</sup>
$l_e$	effective length	75.5	mm
$A_e$	effective area	81.4	mm <sup>2</sup>
$A_{min}$	minimum area	77.0	mm <sup>2</sup>
$m$	mass of core half	≈ 16	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	2 500 ± 25%	≈ 1900	≈ 0	ER28/17/11-3C90
3C94	2 500 ± 25%	≈ 1900	≈ 0	ER28/17/11-3C94

**Properties of core sets under power conditions**

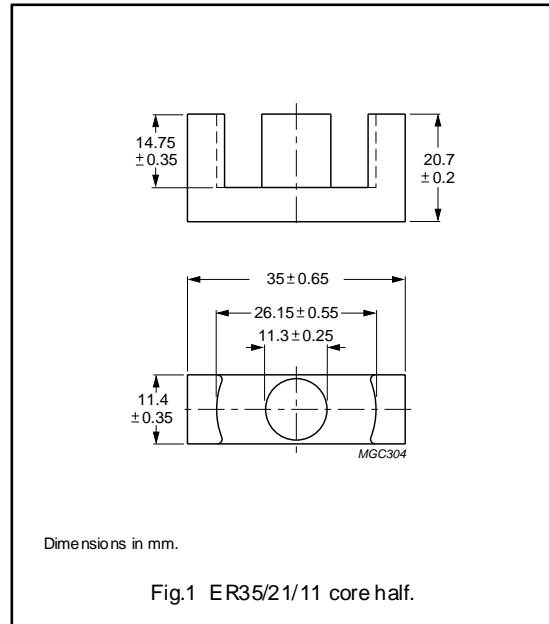
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 0.74	≤ 0.77	–
3C94	≥ 320	–	≤ 0.58	≤ 3.7



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.849	mm <sup>-1</sup>
$V_e$	effective volume	9710	mm <sup>3</sup>
$l_e$	effective length	90.8	mm
$A_e$	effective area	107	mm <sup>2</sup>
$A_{min}$	minimum area	100	mm <sup>2</sup>
$m$	mass of core half	≈ 23	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	2 800 ± 25%	≈ 1900	≈ 0	ER35/21/11-3C90
3C94	2 800 ± 25%	≈ 1900	≈ 0	ER35/21/11-3C94

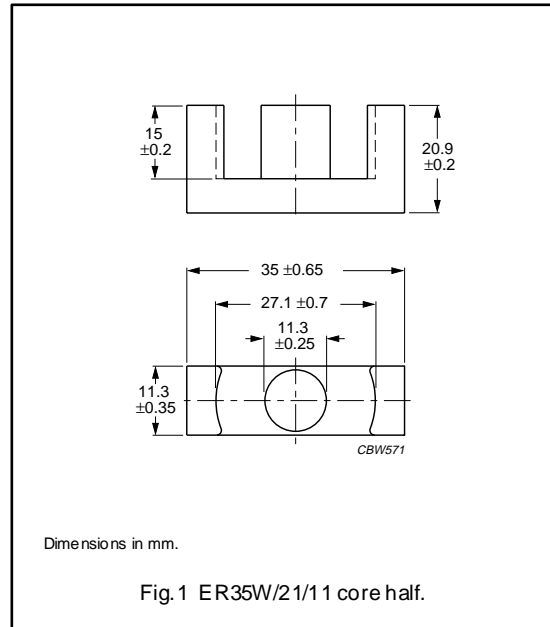
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.900	mm <sup>-1</sup>
$V_e$	effective volume	9548	mm <sup>3</sup>
$l_e$	effective length	92.7	mm
$A_e$	effective area	103	mm <sup>2</sup>
$A_{min}$	minimum area	100	mm <sup>2</sup>
$m$	mass of core half	≈ 27	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	3 000 ± 25%	≈ 2150	≈ 0	ER35W/21/11-3C90

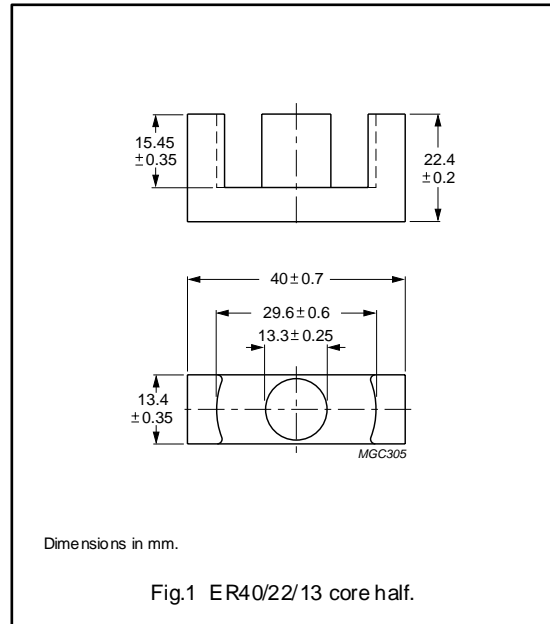
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 1.2	≤ 1.3

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.658	mm <sup>-1</sup>
$V_e$	effective volume	14600	mm <sup>3</sup>
$l_e$	effective length	98.0	mm
$A_e$	effective area	149	mm <sup>2</sup>
$A_{min}$	minimum area	139	mm <sup>2</sup>
$m$	mass of core half	≈ 37	g



**Core halves**

Clamping force for  $A_L$  measurements, 50 ± 20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	3 600 ± 25%	≈ 1900	≈ 0	ER40/22/13-3C90
3C94	3 600 ± 25%	≈ 1900	≈ 0	ER40/22/13-3C94

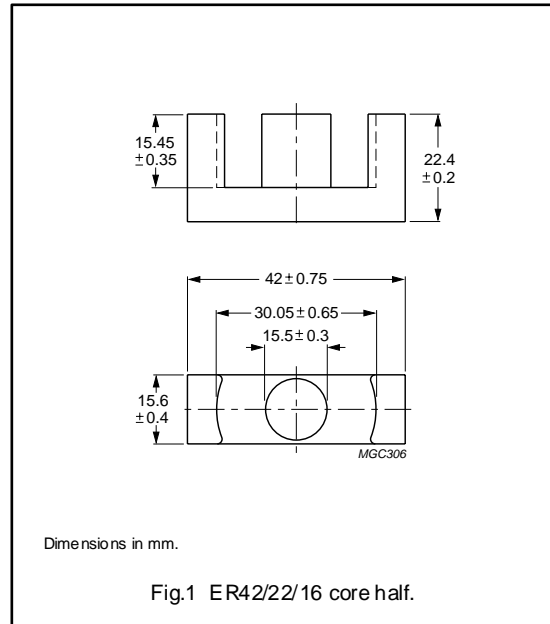
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.509	mm <sup>-1</sup>
$V_e$	effective volume	19200	mm <sup>3</sup>
$l_e$	effective length	98.8	mm
$A_e$	effective area	194	mm <sup>2</sup>
$A_{min}$	minimum area	189	mm <sup>2</sup>
$m$	mass of core half	≈ 50	g



**Core halves**

Clamping force for  $A_L$  measurements, 50 ± 20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	4 600 ± 25%	≈ 1900	≈ 0	ER42/22/16-3C90
3C94	4 600 ± 25%	≈ 1900	≈ 0	ER42/22/16-3C94

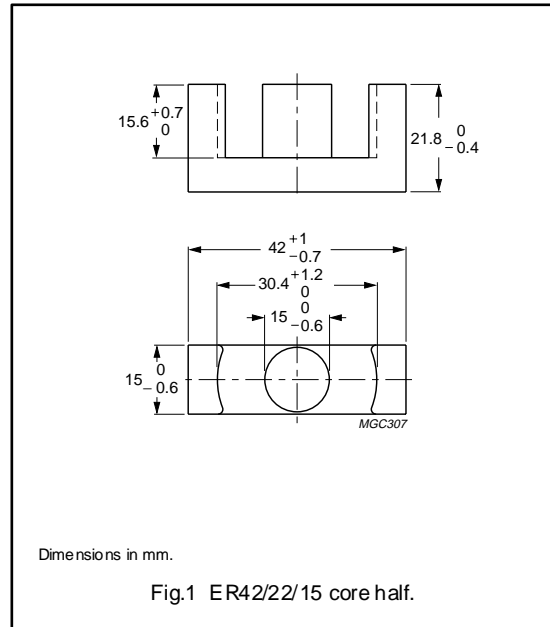
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.582	mm <sup>-1</sup>
$V_e$	effective volume	16800	mm <sup>3</sup>
$l_e$	effective length	99.0	mm
$A_e$	effective area	170	mm <sup>2</sup>
$A_{min}$	minimum area	170	mm <sup>2</sup>
$m$	mass of core half	≈ 42	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	4 000 ±25%	≈ 1900	≈ 0	ER42/22/15-3C90
3C94	4 000 ±25%	≈ 1900	≈ 0	ER42/22/15-3C94

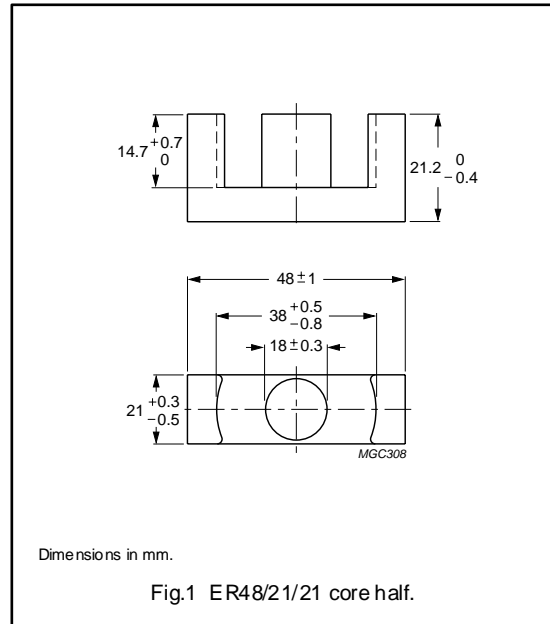
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.392	mm <sup>-1</sup>
$V_e$	effective volume	25500	mm <sup>3</sup>
$l_e$	effective length	100	mm
$A_e$	effective area	255	mm <sup>2</sup>
$A_{min}$	minimum area	248	mm <sup>2</sup>
$m$	mass of core half	≈ 64	g



**Core halves**

Clamping force for  $A_L$  measurements, 50 ± 20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	5 700 ± 25%	≈ 1900	≈ 0	ER48/21/21-3C90
3C94	5 700 ± 25%	≈ 1900	≈ 0	ER48/21/21-3C94

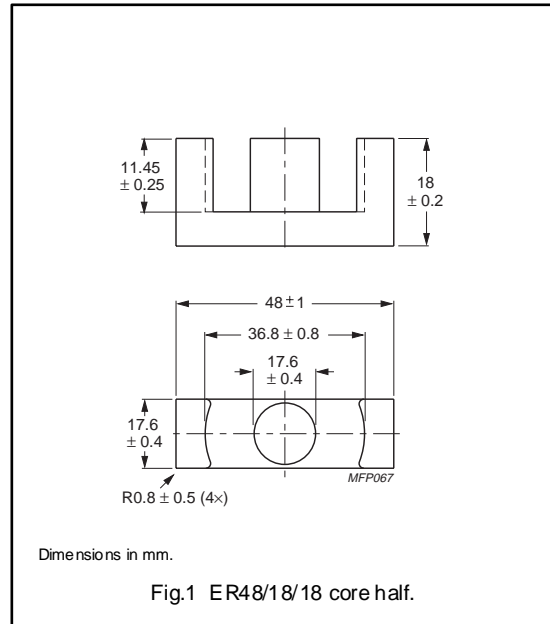
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	0.377	mm <sup>-1</sup>
$V_e$	effective volume	20300	mm <sup>3</sup>
$l_e$	effective length	87.0	mm
$A_e$	effective area	231	mm <sup>2</sup>
$A_{min}$	minimum area	221	mm <sup>2</sup>
$m$	mass of core half	≈ 51	g



**Core halves**

Clamping force for  $A_L$  measurements, 50 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	180 ± 5%	≈ 54	≈ 2500	ER48/18/18-3C90-E 180
	265 ± 5%	≈ 77	≈ 1500	ER48/18/18-3C90-E 265
	309 ± 5%	≈ 93	≈ 1250	ER48/18/18-3C90-E 309
	370 ± 5%	≈ 111	≈ 1000	ER48/18/18-3C90-E 370
	465 ± 5%	≈ 140	≈ 750	ER48/18/18-3C90-E 465
	6400 ± 25%	≈ 1920	≈ 0	ER48/18/18-3C90

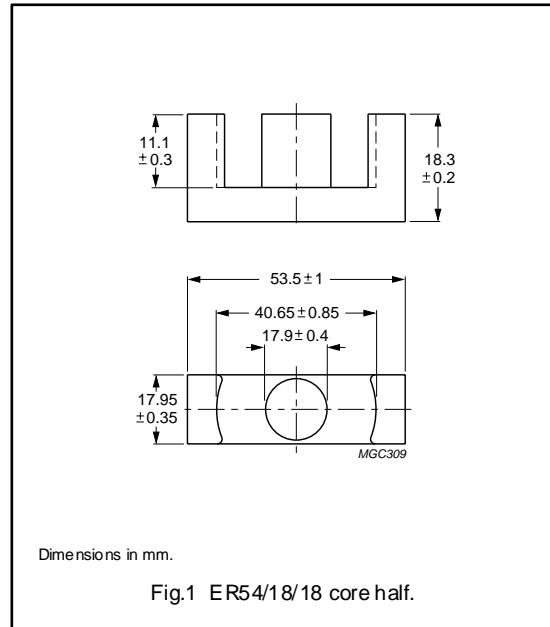
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥330	≤ 2.4	≤ 2.5

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.370	mm <sup>-1</sup>
$V_e$	effective volume	23000	mm <sup>3</sup>
$l_e$	effective length	91.8	mm
$A_e$	effective area	250	mm <sup>2</sup>
$A_{min}$	minimum area	240	mm <sup>2</sup>
$m$	mass of core half	≈ 61	g



**Core halves**

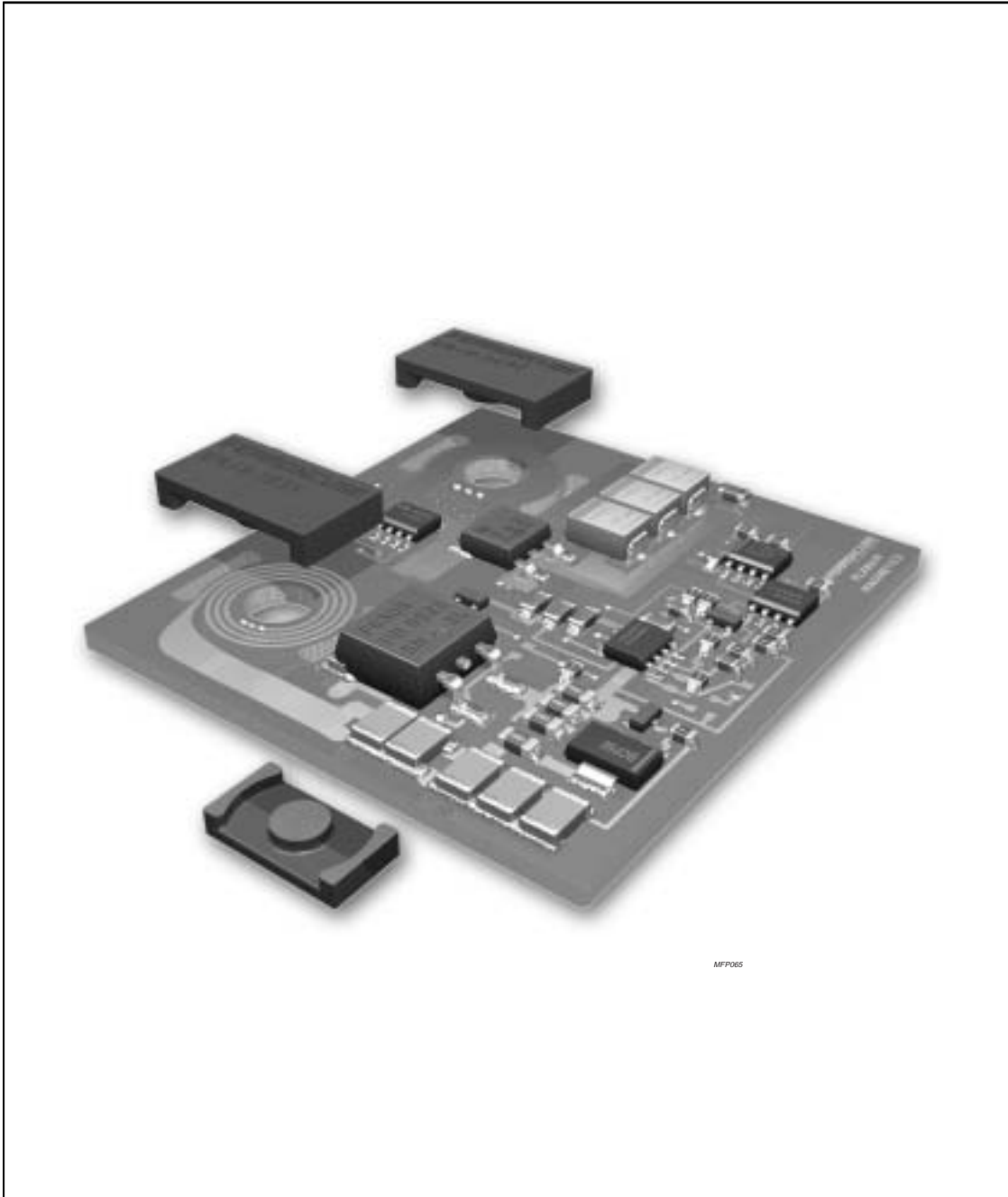
Clamping force for  $A_L$  measurements, 50 ± 20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	6 100 ± 25%	≈ 1800	≈ 0	ER54/18/18-3C90
3C94	6 100 ± 25%	≈ 1800	≈ 0	ER54/18/18-3C94

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 2.8	≤ 2.9	–
3C94	≥ 320	–	≤ 2.3	≤ 12.5





Soft Ferrites

Planar ER cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview Planar ER cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
ER9.5/2.5/5	120	8.47	0.35
ER11/2.5/6	174	11.9	0.5
ER14.5/3/7	333	17.6	0.9
ER18/3/10	667	30.2	1.6
ER23/4/13	1340	50.2	3.2
ER32/6/25	5400	141	16

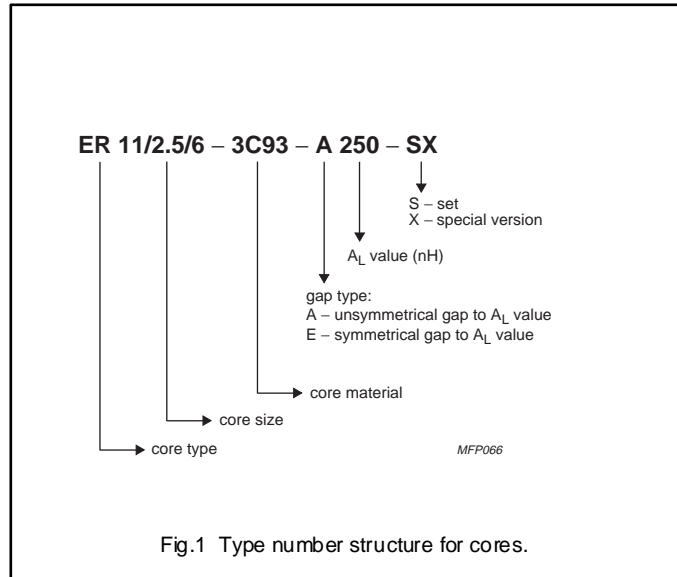


Fig.1 Type number structure for cores.

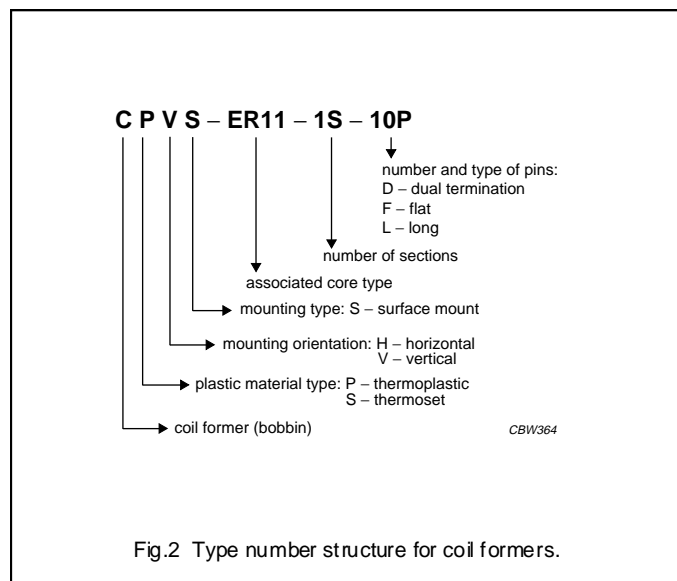
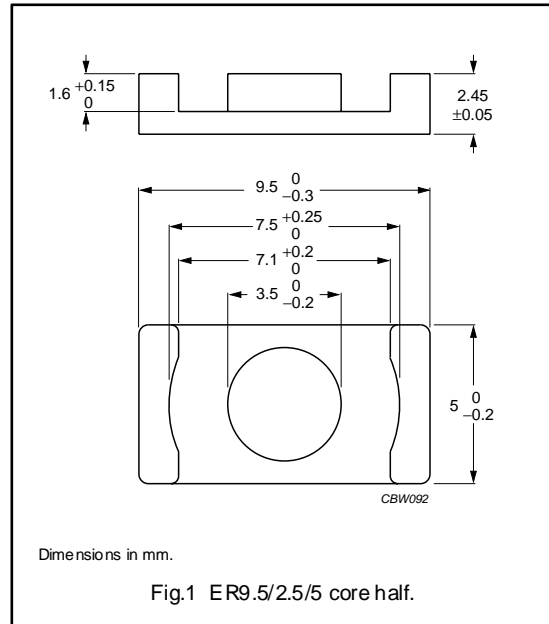


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.67	mm <sup>-1</sup>
$V_e$	effective volume	120	mm <sup>3</sup>
$l_e$	effective length	14.2	mm
$A_e$	effective area	8.47	mm <sup>2</sup>
$A_{min}$	minimum area	7.60	mm <sup>2</sup>
$m$	mass of core half	≈ 0.35	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	750 ± 25%	≈ 1000	≈ 0	ER9.5/2.5/5-3C92-S
3C93 <small>des</small>	850 ± 25%	≈ 1130	≈ 0	ER9.5/2.5/5-3C93-S
3C94	63 ± 3%	≈ 84	≈ 200	ER9.5/2.5/5-3C94-A63-S
	100 ± 5%	≈ 133	≈ 120	ER9.5/2.5/5-3C94-A100-S
	160 ± 8%	≈ 213	≈ 70	ER9.5/2.5/5-3C94-A160-S
	1000 ± 25%	≈ 1330	≈ 0	ER9.5/2.5/5-3C94-S
3C96 <small>des</small>	900 ± 25%	≈ 1200	≈ 0	ER9.5/2.5/5-3C96-S
3F3	63 ± 3%	≈ 84	≈ 200	ER9.5/2.5/5-3F3-A63-S
	100 ± 5%	≈ 133	≈ 120	ER9.5/2.5/5-3F3-A 100-S
	160 ± 8%	≈ 213	≈ 70	ER9.5/2.5/5-3F3-A 160-S
	850 ± 25%	≈ 1130	≈ 0	ER9.5/2.5/5-3F3-S
3F35 <small>prot</small>	700 ± 25%	≈ 930	≈ 0	ER9.5/2.5/5-3F35-S
3F4 <small>des</small>	40 ± 3%	≈ 53	≈ 340	ER9.5/2.5/5-3F4-A40-S
	63 ± 5%	≈ 84	≈ 190	ER9.5/2.5/5-3F4-A63-S
	100 ± 5%	≈ 133	≈ 100	ER9.5/2.5/5-3F4-A 100-S
	525 ± 25%	≈ 700	≈ 0	ER9.5/2.5/5-3F4-S
3F45 <small>prot</small>	525 ± 25%	≈ 700	≈ 0	ER9.5/2.5/5-3F45-S

## Planar ER cores and accessories

ER9.5/2.5/5

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	3600 +40/-30%	$\approx 4800$	$\approx 0$	ER9.5/2.5/5-3E5-S
3E6	4800 +40/-30%	$\approx 6400$	$\approx 0$	ER9.5/2.5/5-3E6-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C92	$\geq 370$	$\leq 0.011$	$\leq 0.072$	–	–
3C93	$\geq 320$	$\leq 0.011^{(1)}$	$\leq 0.072^{(1)}$	–	–
3C94	$\geq 320$	$\leq 0.011$	$\leq 0.072$	–	–
3C96	$\geq 340$	$\leq 0.0085$	$\leq 0.058$	$\leq 0.018$	$\leq 0.045$
3F3	$\geq 300$	$\leq 0.015$	–	$\leq 0.025$	–
3F35	$\geq 300$	–	–	$\leq 0.011$	$\leq 0.016$
3F4	$\geq 250$	–	–	–	–

1. Measured at 140 °C.

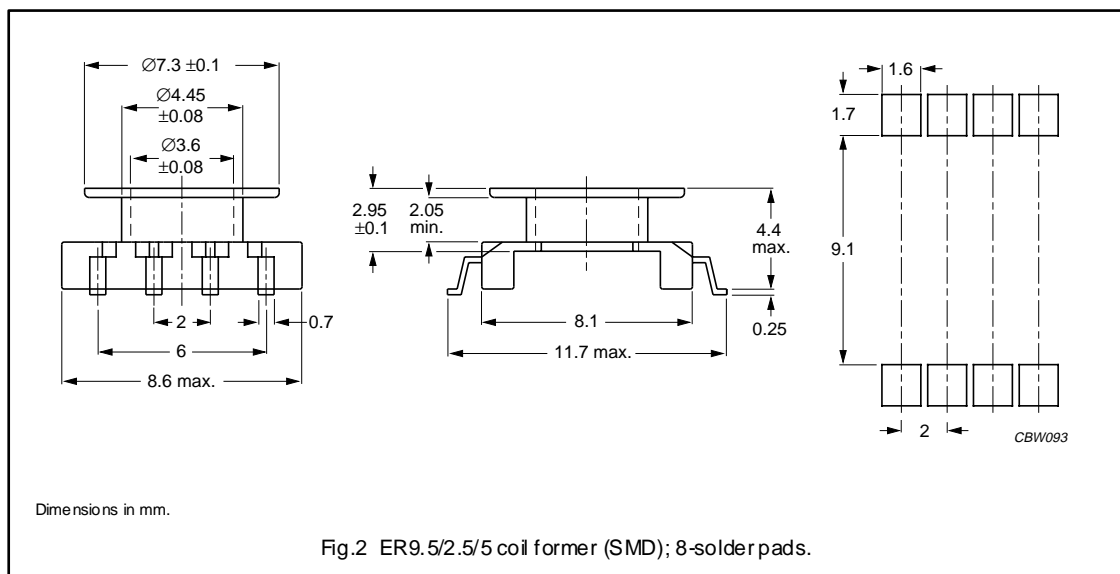
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	$\geq 370$	–	–	–	–
3C93	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	–	–	–	–
3F3	$\geq 300$	–	–	–	–
3F35	$\geq 300$	$\leq 0.13$	–	–	–
3F4	$\geq 250$	–	$\leq 0.036$	–	$\leq 0.056$
3F45	$\geq 250$	–	$\leq 0.024$	$\leq 0.06$	$\leq 0.042$

**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 (Sn) 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



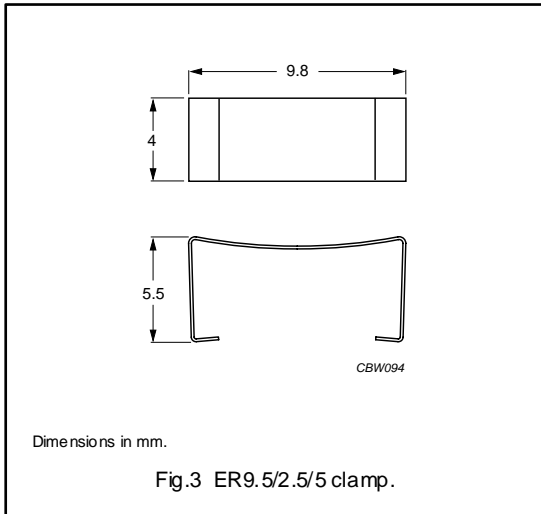
**Winding data for ER9.5/2.5/5 coil former (SMD) with 8 solder pads**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	2.05	18.4	CPVS-ER9.5-1S-8P-Z

**MOUNTING PARTS**

**General data and ordering information**

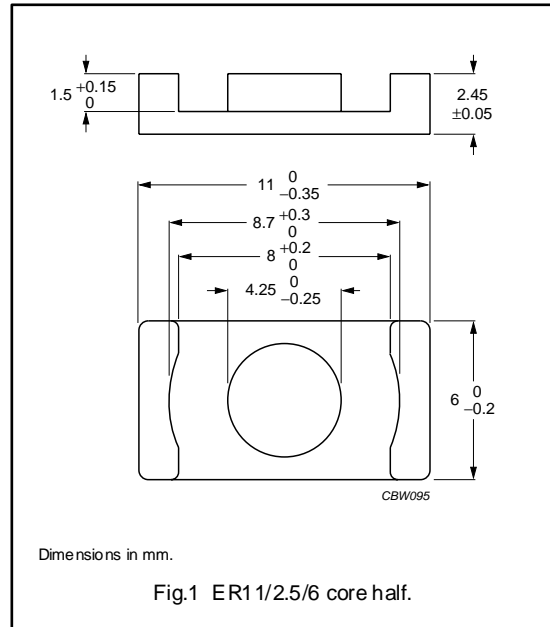
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi); clamping force $\approx$ 20 N	3	CLM-ER9.5



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm <sup>-1</sup>
$V_e$	effective volume	174	mm <sup>3</sup>
$l_e$	effective length	14.7	mm
$A_e$	effective area	11.9	mm <sup>2</sup>
$A_{min}$	minimum area	10.3	mm <sup>2</sup>
$m$	mass of core half	≈ 0.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 15 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C92 <small>des</small>	1050 ± 25%	≈ 1030	≈ 0	ER11/2.5/6-3C92-S
3C93 <small>des</small>	1200 ± 25%	≈ 1170	≈ 0	ER11/2.5/6-3C93-S
3C94	100 ± 3%	≈ 98	≈ 170	ER11/2.5/6-3C94-A100-S
	160 ± 5%	≈ 157	≈ 100	ER11/2.5/6-3C94-A160-S
	250 ± 8%	≈ 246	≈ 60	ER11/2.5/6-3C94-A250-S
	1400 ± 25%	≈ 1370	≈ 0	ER11/2.5/6-3C94-S
3C96 <small>des</small>	1250 ± 25%	≈ 1220	≈ 0	ER11/2.5/6-3C96-S
3F3	100 ± 3%	≈ 98	≈ 170	ER11/2.5/6-3F3-A100-S
	160 ± 5%	≈ 157	≈ 100	ER11/2.5/6-3F3-A160-S
	250 ± 8%	≈ 246	≈ 60	ER11/2.5/6-3F3-A250-S
	1200 ± 25%	≈ 1170	≈ 0	ER11/2.5/6-3F3-S
3F35 <small>prot</small>	1000 ± 25%	≈ 980	≈ 0	ER11/2.5/6-3F35-S
3F4 <small>des</small>	63 ± 3%	≈ 62	≈ 280	ER11/2.5/6-3F4-A63-S
	100 ± 5%	≈ 98	≈ 160	ER11/2.5/6-3F4-A100-S
	160 ± 8%	≈ 157	≈ 85	ER11/2.5/6-3F4-A160-S
	725 ± 25%	≈ 710	≈ 0	ER11/2.5/6-3F4-S
3F45 <small>prot</small>	725 ± 25%	≈ 710	≈ 0	ER11/2.5/6-3F45-S

## Planar ER cores and accessories

ER11/2.5/6

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	5000 +40/-30%	$\approx 4920$	$\approx 0$	ER11/2.5/6-3E5-S
3E6	6700 +40/-30%	$\approx 6590$	$\approx 0$	ER11/2.5/6-3E6-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C92	$\geq 370$	$\leq 0.018$	$\leq 0.1$	–	–
3C93	$\geq 320$	$\leq 0.018^{(1)}$	$\leq 0.1^{(1)}$	–	–
3C94	$\geq 320$	$\leq 0.018$	$\leq 0.1$	–	–
3C96	$\geq 340$	$\leq 0.014$	$\leq 0.08$	$\leq 0.033$	$\leq 0.065$
3F3	$\geq 300$	$\leq 0.025$	–	$\leq 0.04$	–
3F35	$\geq 300$	–	–	$\leq 0.016$	$\leq 0.023$
3F4	$\geq 250$	–	–	–	–

1. Measured at 140 °C.

**Properties of core sets under power conditions (continued)**

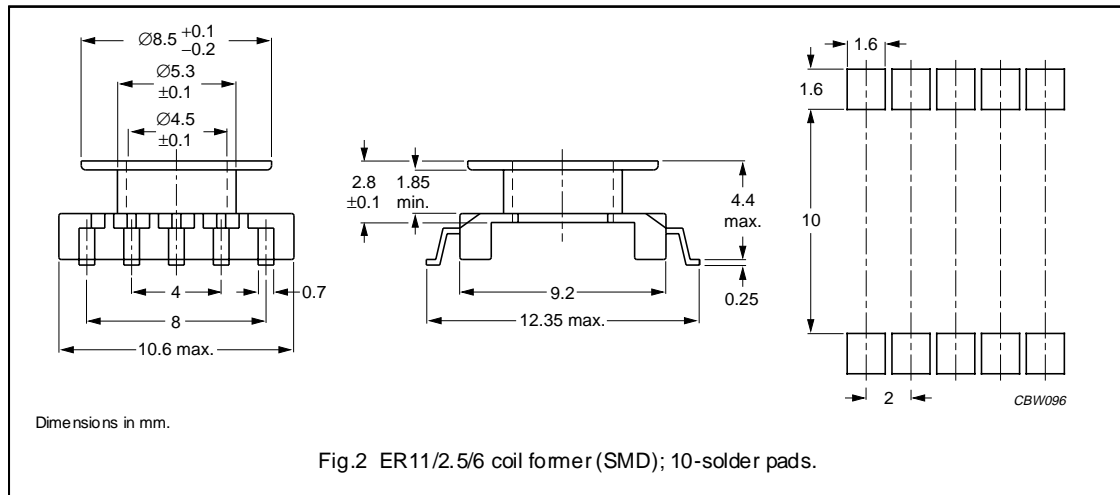
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	$\geq 370$	–	–	–	–
3C93	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	–	–	–	–
3F3	$\geq 300$	–	–	–	–
3F35	$\geq 300$	$\leq 0.18$	–	–	–
3F4	$\geq 250$	–	$\leq 0.052$	–	$\leq 0.084$
3F45	$\geq 250$	–	$\leq 0.035$	$\leq 0.087$	$\leq 0.06$



**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 (Sn) plated for 10P, tin-lead alloy (SnPb) plated for 12P, transition to lead-free ongoing
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



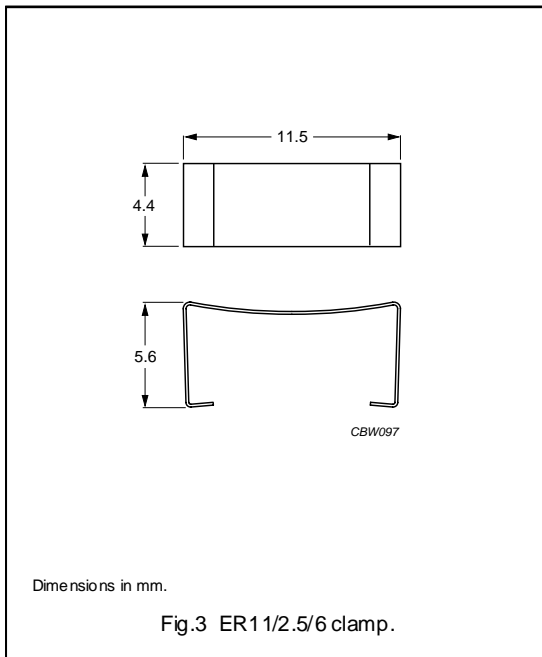
**Winding data for ER11/2.5/6 coil former (SMD)**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	2.8	1.85	21.6	CPVS-ER11-1S-10P-Z
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 $\approx 25$ N	3	CLM-ER11



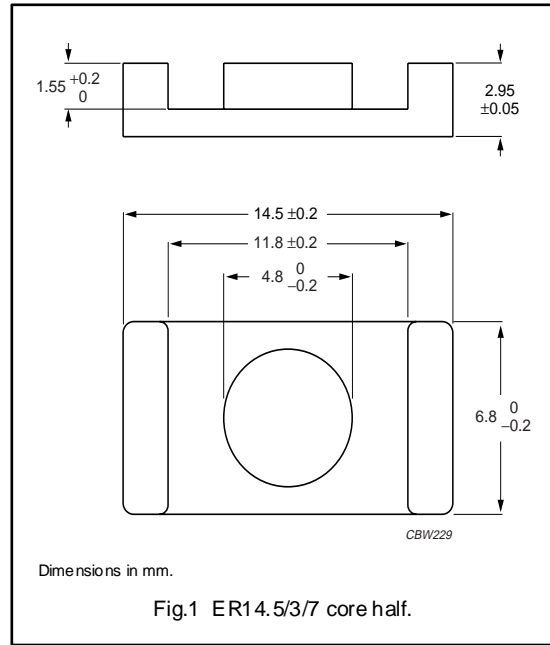
Planar ER cores and accessories

ER14.5/3/7

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm <sup>-1</sup>
$V_e$	effective volume	333	mm <sup>3</sup>
$l_e$	effective length	19.0	mm
$A_e$	effective area	17.6	mm <sup>2</sup>
$A_{min}$	minimum area	17.3	mm <sup>2</sup>
$m$	mass of core half	≈ 0.9	g



Core sets for general purpose transformers and power applications

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	1250 ± 25%	≈ 1070	≈ 0	ER14.5/3/7-3C92-S
3C93 <small>des</small>	1400 ± 25%	≈ 1200	≈ 0	ER14.5/3/7-3C93-S
3C94	100 ± 3%	≈ 86	≈ 250	ER14.5/3/7-3C94-A100-S
	160 ± 5%	≈ 137	≈ 150	ER14.5/3/7-3C94-A160-S
	250 ± 8%	≈ 215	≈ 90	ER14.5/3/7-3C94-A250-S
	1600 ± 25%	≈ 1370	≈ 0	ER14.5/3/7-3C94-S
3C96 <small>des</small>	1500 ± 25%	≈ 1290	≈ 0	ER14.5/3/7-3C96-S
3F3	100 ± 3%	≈ 86	≈ 250	ER14.5/3/7-3F3-A100-S
	160 ± 5%	≈ 137	≈ 150	ER14.5/3/7-3F3-A160-S
	250 ± 8%	≈ 215	≈ 90	ER14.5/3/7-3F3-A250-S
	1400 ± 25%	≈ 1200	≈ 0	ER14.5/3/7-3F3-S
3F35 <small>prot</small>	1150 ± 25%	≈ 990	≈ 0	ER14.5/3/7-3F35-S
3F4 <small>des</small>	100 ± 3%	≈ 86	≈ 240	ER14.5/3/7-3F4-A100-S
	160 ± 5%	≈ 137	≈ 130	ER14.5/3/7-3F4-A160-S
	250 ± 8%	≈ 215	≈ 70	ER14.5/3/7-3F4-A250-S
	850 ± 25%	≈ 730	≈ 0	ER14.5/3/7-3F4-S
3F45 <small>prot</small>	850 ± 25%	≈ 730	≈ 0	ER14.5/3/7-3F45-S

## Planar ER cores and accessories

ER14.5/3/7

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E6	7900 +40/-30%	$\approx 6800$	$\approx 0$	ER14.5/3/7-3E6-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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C92	$\geq 370$	$\leq 0.032$	$\leq 0.2$	–	–
3C93	$\geq 320$	$\leq 0.032^{(1)}$	$\leq 0.2^{(1)}$	–	–
3C94	$\geq 320$	$\leq 0.032$	$\leq 0.2$	–	–
3C96	$\geq 340$	$\leq 0.025$	$\leq 0.16$	$\leq 0.06$	$\leq 0.13$
3F3	$\geq 300$	$\leq 0.043$	–	$\leq 0.061$	–
3F35	$\geq 300$	–	–	$\leq 0.03$	$\leq 0.045$
3F4	$\geq 250$	–	–	–	–

1. Measured at 140 °C.

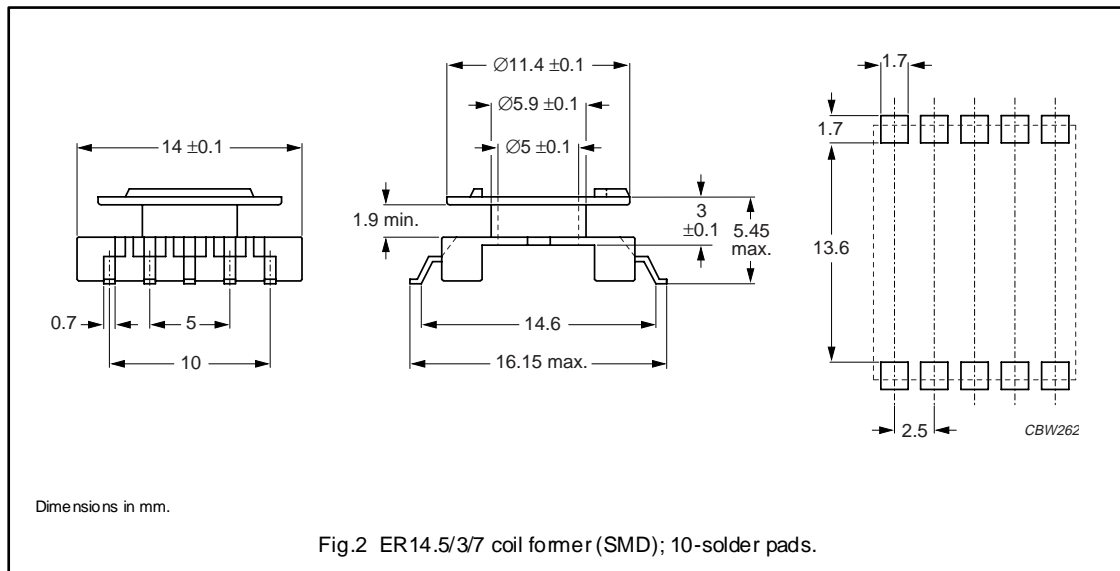
**Properties of core sets under power conditions (continued)**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C92	$\geq 370$	–	–	–	–
3C93	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	–	–	–	–
3F3	$\geq 300$	–	–	–	–
3F35	$\geq 300$	$\leq 0.35$	–	–	–
3F4	$\geq 250$	–	$\leq 0.1$	–	$\leq 0.16$
3F45	$\geq 250$	–	$\leq 0.67$	$\leq 0.17$	$\leq 0.12$

**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 (Sn) 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



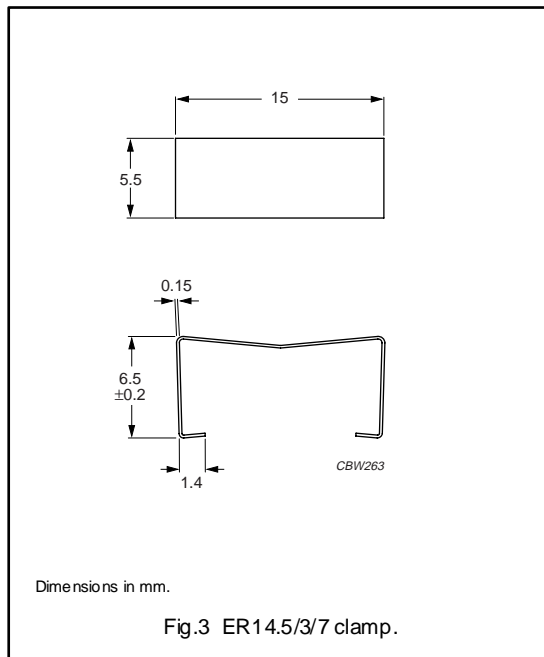
**Winding data for ER14.5/3/7 coil former (SMD) with 10 solder pads**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	5.1	1.9	27	CPVS-ER14.5-1S-10P-Z

**MOUNTING PARTS**

**General data and ordering information**

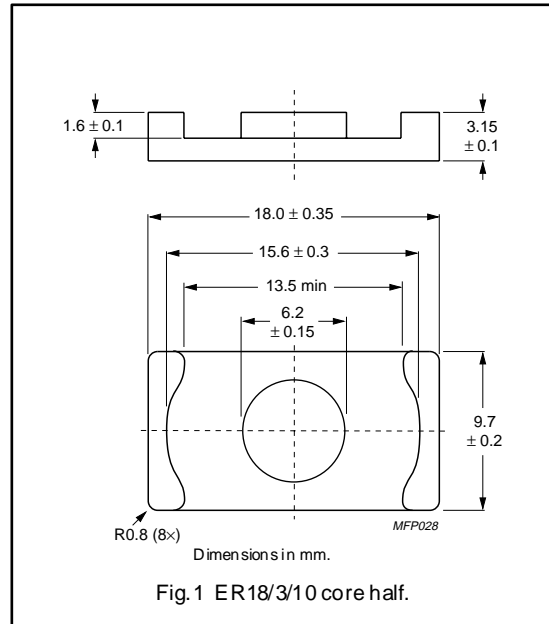
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	stainless steel (CrNi)	3	CLM-ER14.5



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.730	mm <sup>-1</sup>
$V_e$	effective volume	667	mm <sup>3</sup>
$l_e$	effective length	22.1	mm
$A_e$	effective area	30.2	mm <sup>2</sup>
$A_{min}$	minimum area	30.1	mm <sup>2</sup>
$m$	mass of core half	≈ 1.6	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	160 ± 3 %	≈ 93	≈ 260	ER18/3/10-3C92-A160-S
	250 ± 5 %	≈ 146	≈ 150	ER18/3/10-3C92-A250-S
	400 ± 8 %	≈ 232	≈ 85	ER18/3/10-3C92-A400-S
	1900 ± 25 %	≈ 1100	≈ 0	ER18/3/10-3C92-S
3C93 <small>des</small>	2200 ± 25 %	≈ 1270	≈ 0	ER18/3/10-3C93-S
3C96 <small>des</small>	160 ± 3 %	≈ 93	≈ 260	ER18/3/10-3C96-A160-S
	250 ± 5 %	≈ 146	≈ 155	ER18/3/10-3C96-A250-S
	400 ± 8 %	≈ 232	≈ 90	ER18/3/10-3C96-A400-S
	2400 ± 25 %	≈ 1100	≈ 0	ER18/3/10-3C96-S
3F35 <small>prot</small>	160 ± 3 %	≈ 93	≈ 260	ER18/3/10-3F35-A160-S
	250 ± 5 %	≈ 146	≈ 150	ER18/3/10-3F35-A250-S
	400 ± 8 %	≈ 232	≈ 85	ER18/3/10-3F35-A400-S
	1800 ± 25 %	≈ 1100	≈ 0	ER18/3/10-3F35-S
3F4 <small>des</small>	1300 ± 25 %	≈ 794	≈ 0	ER18/3/10-3F4-S
3F45 <small>prot</small>	1300 ± 25 %	≈ 794	≈ 0	ER18/3/10-3F45-S

Planar ER cores and accessories

ER18/3/10

Properties of core sets under power condition

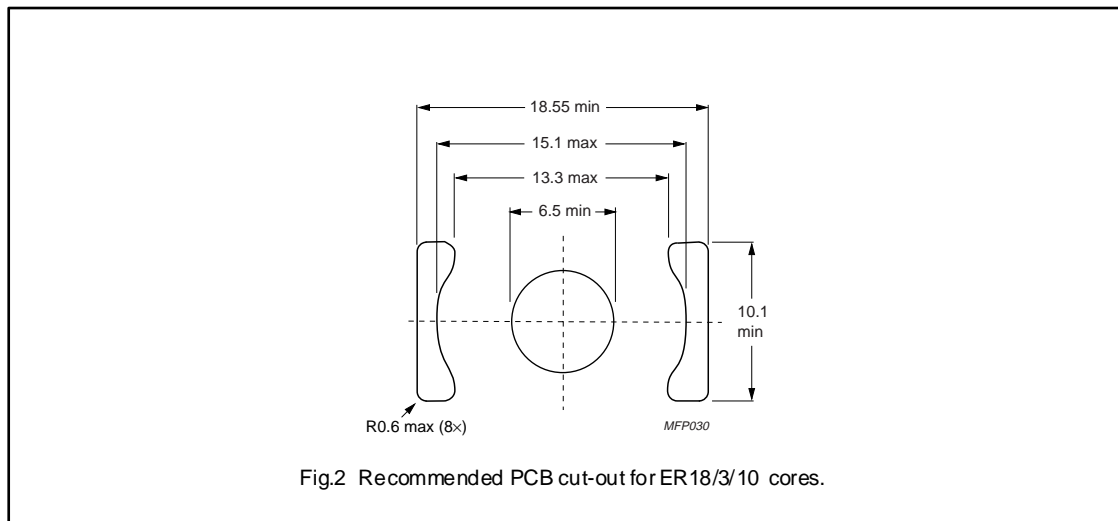
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f̂ = 100 kHz; B̂ = 100 mT; T = 100 °C	f̂ = 100 kHz; B̂ = 200 mT; T = 100 °C	f̂ = 500 kHz; B̂ = 50 mT; T = 100 °C	f̂ = 500 kHz; B̂ = 100 mT; T = 100 °C
3C92	≥ 370	≤ 0.052	≤ 0.35	–	–
3C93	≥ 320	≤ 0.052 <sup>(1)</sup>	≤ 0.35 <sup>(1)</sup>	–	–
3C96	≥ 340	≤ 0.035	≤ 0.26	≤ 0.22	–
3F35	≥ 300	–	–	≤ 0.078	≤ 0.61

1. Measured at 140 °C.

Properties of core sets under power condition (continued)

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 1200 A/m; f = 25 kHz; T = 100 °C	f̂ = 1 MHz; B̂ = 30 mT; T = 100 °C	f̂ = 1 MHz; B̂ = 50 mT; T = 100 °C	f̂ = 3 MHz; B̂ = 10 mT; T = 100 °C
3F4	≥ 250	≤ 0.17	–	≤ 0.3
3F45	≥ 250	≤ 0.13	≤ 0.34	≤ 0.24

MOUNTING INFORMATION



Winding data for ER18/3/10 planar core

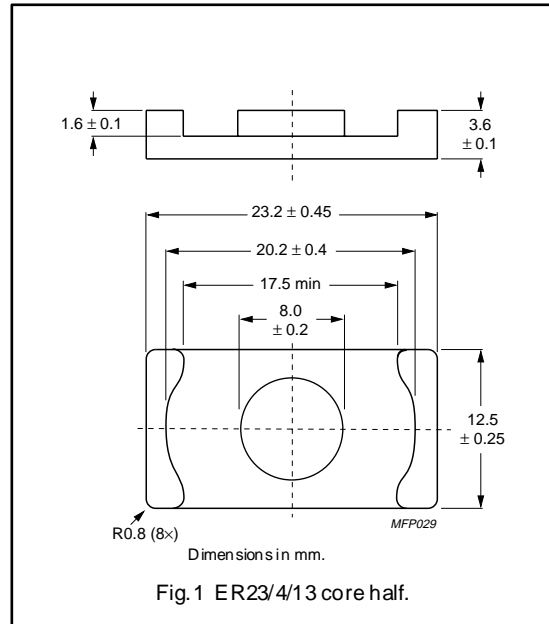
WINDING AREA (mm <sup>2</sup> )	AVERAGE TRACK LENGTH (mm)	FOOTPRINT AREA (mm <sup>2</sup> )
15.0	34.2	225



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.530	mm <sup>-1</sup>
$V_e$	effective volume	1340	mm <sup>3</sup>
$l_e$	effective length	26.6	mm
$A_e$	effective area	50.2	mm <sup>2</sup>
$A_{min}$	minimum area	50.0	mm <sup>2</sup>
$m$	mass of core half	≈ 3.2	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C92 <b>des</b>	250 ± 3 %	≈ 105	≈ 260	ER23/4/13-3C92-A250-S
	400 ± 5 %	≈ 169	≈ 150	ER23/4/13-3C92-A400-S
	630 ± 8 %	≈ 266	≈ 85	ER23/4/13-3C92-A630-S
	2800 ± 25 %	≈ 1180	≈ 0	ER23/4/13-3C92-S
3C93 <b>des</b>	3200 ± 25 %	≈ 1350	≈ 0	ER23/4/13-3C93-S
3C96 <b>des</b>	250 ± 3 %	≈ 105	≈ 270	ER23/4/13-3C96-A250-S
	400 ± 5 %	≈ 169	≈ 155	ER23/4/13-3C96-A400-S
	630 ± 8 %	≈ 266	≈ 90	ER23/4/13-3C96-A630-S
	3400 ± 25 %	≈ 1180	≈ 0	ER23/4/13-3C96-S
3F35 <b>prot</b>	250 ± 3 %	≈ 105	≈ 260	ER23/4/13-3F35-A250-S
	400 ± 5 %	≈ 169	≈ 150	ER23/4/13-3F35-A400-S
	630 ± 8 %	≈ 266	≈ 85	ER23/4/13-3F35-A630-S
	2600 ± 25 %	≈ 1180	≈ 0	ER23/4/13-3F35-S
3F4 <b>des</b>	1850 ± 25 %	≈ 840	≈ 0	ER23/4/13-3F4-S
3F45 <b>prot</b>	1850 ± 25 %	≈ 840	≈ 0	ER23/4/13-3F45-S

Properties of core sets under power condition

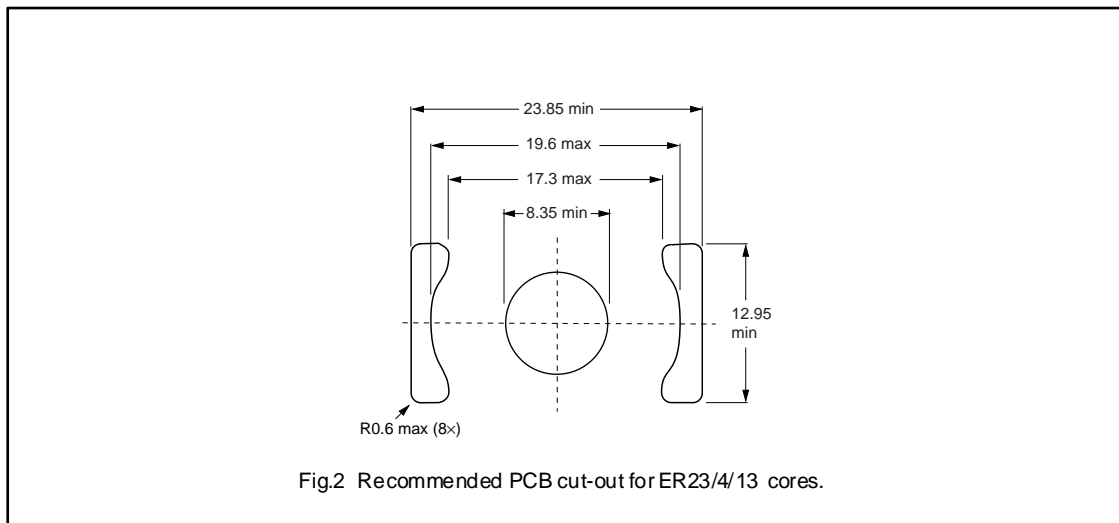
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C
3C92	≥ 370	≤ 0.11	≤ 0.70	–	–
3C93	≥ 320	≤ 0.11 <sup>(1)</sup>	≤ 0.70 <sup>(1)</sup>	–	–
3C96	≥ 340	≤ 0.070	≤ 0.52	≤ 0.44	–
3F35	≥ 300	–	–	≤ 0.16	≤ 1.2

1. Measured at 140 °C.

Properties of core sets under power condition (continued)

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 1200 A/m; f = 25 kHz; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3F4	≥ 250	≤ 0.35	–	≤ 0.6
3F45	≥ 250	≤ 0.27	≤ 0.67	≤ 0.47

MOUNTING INFORMATION



Winding data for ER23/4/13 planar core

WINDING AREA (mm <sup>2</sup> )	AVERAGE TRACK LENGTH (mm)	FOOTPRINT AREA (mm <sup>2</sup> )
19.5	44.3	375

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.270	mm <sup>-1</sup>
$V_e$	effective volume	5400	mm <sup>3</sup>
$l_e$	effective length	38.2	mm
$A_e$	effective area	141	mm <sup>2</sup>
$A_{min}$	minimum area	121	mm <sup>2</sup>
$m$	mass of core half	≈ 16	g

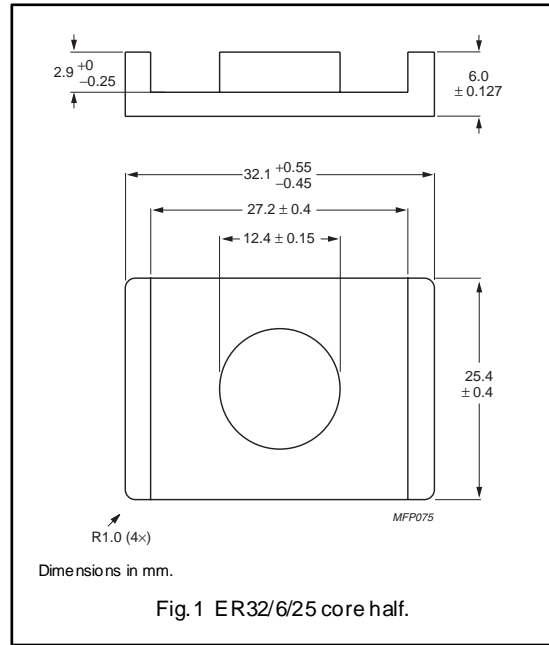


Fig.1 ER32/6/25 core half.

**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $50 \pm 20$  N.

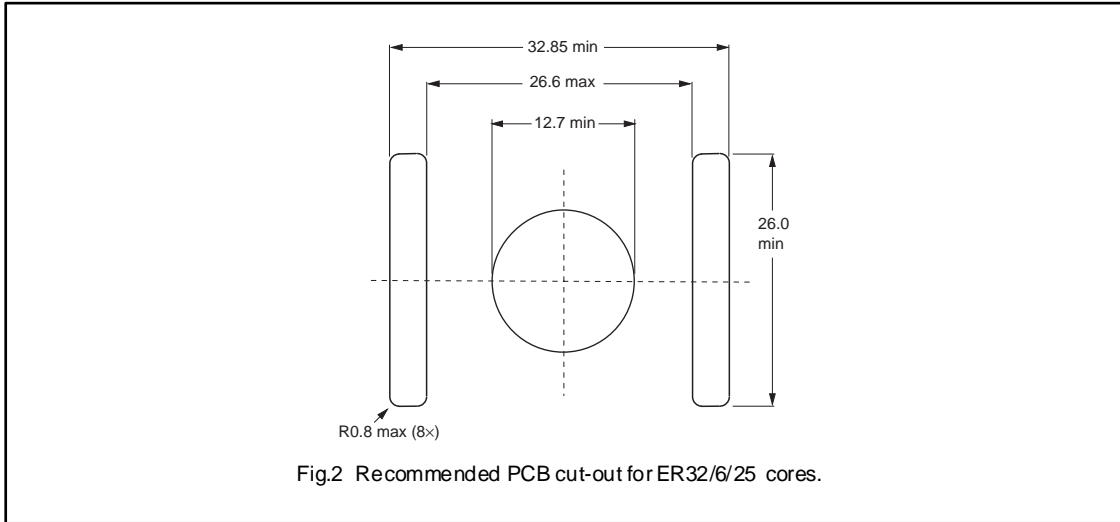
GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C92 <small>des</small>	$5700 \pm 25\%$	≈ 1220	≈ 0	ER32/6/25-3C92-S
3C93 <small>des</small>	$6600 \pm 25\%$	≈ 1420	≈ 0	ER32/6/25-3C93-S
3C96 <small>des</small>	$7160 \pm 25\%$	≈ 1540	≈ 0	ER32/6/25-3C96-S

**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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C92	≥ 370	≤ 0.45	≤ 3.0	–
3C93	≥ 320	≤ 0.45 <sup>(1)</sup>	≤ 3.0 <sup>(1)</sup>	–
3C96	≥ 340	≤ 0.3	≤ 2.2	≤ 1.9

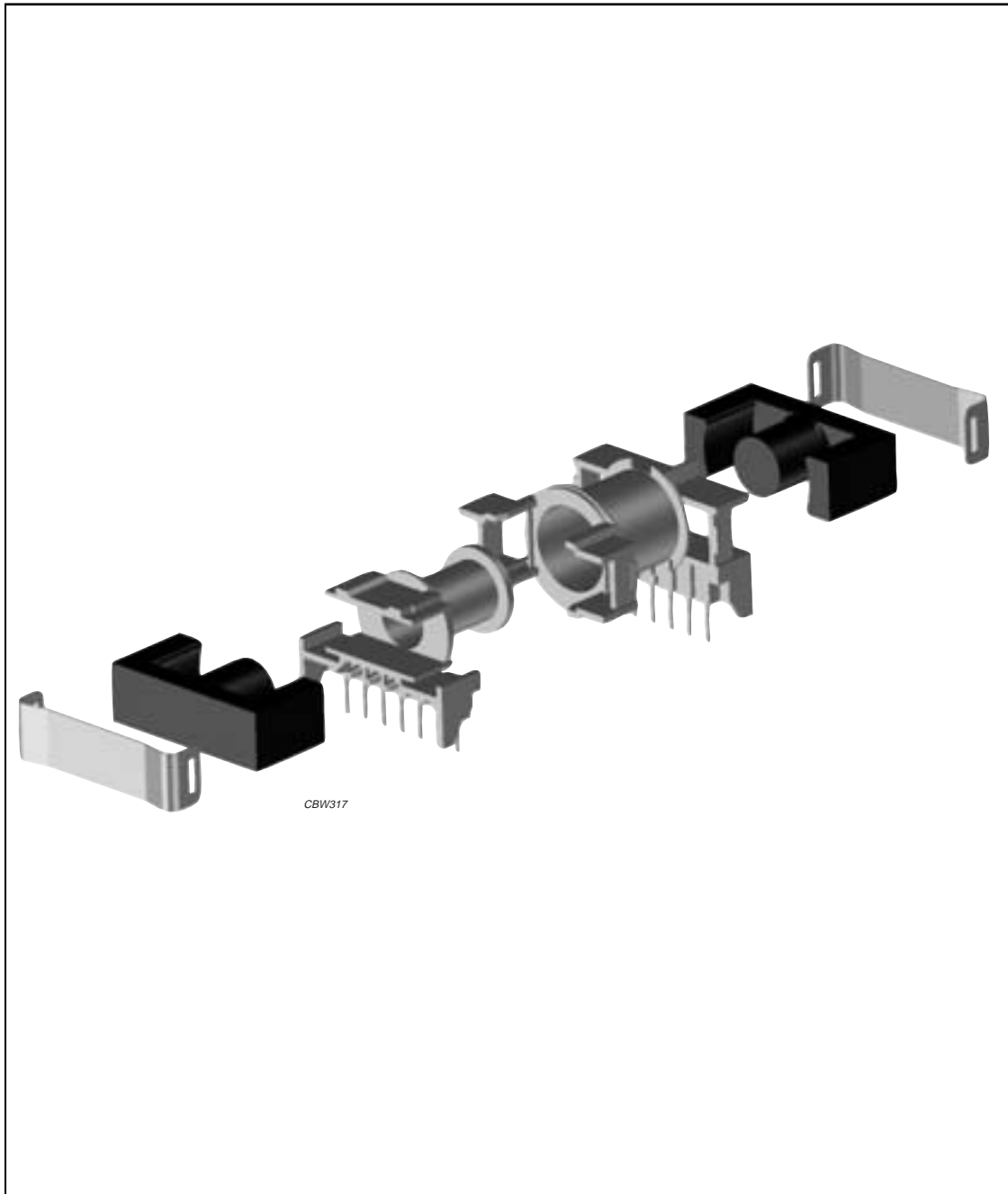
1. Measured at 140 °C.

**MOUNTING INFORMATION**



**Winding data for ER32/6/25 planar core**

WINDING AREA (mm <sup>2</sup> )	AVERAGE TRACK LENGTH (mm)	FOOTPRINT AREA (mm <sup>2</sup> )
41.1	62.2	828



Soft Ferrites

ETD cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview ETD cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
ETD29/16/10	5470	76.0	14
ETD34/17/11	7640	97.1	20
ETD39/20/13	11500	125	30
ETD44/22/15	17800	173	47
ETD49/25/16	24000	211	62
ETD54/28/19	35500	280	90
ETD59/31/22	51500	368	130

• In accordance with IEC 61185.

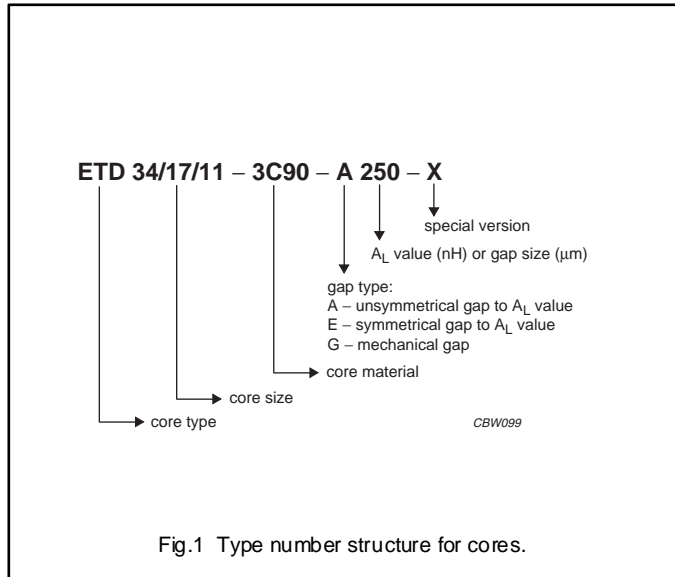


Fig.1 Type number structure for cores.

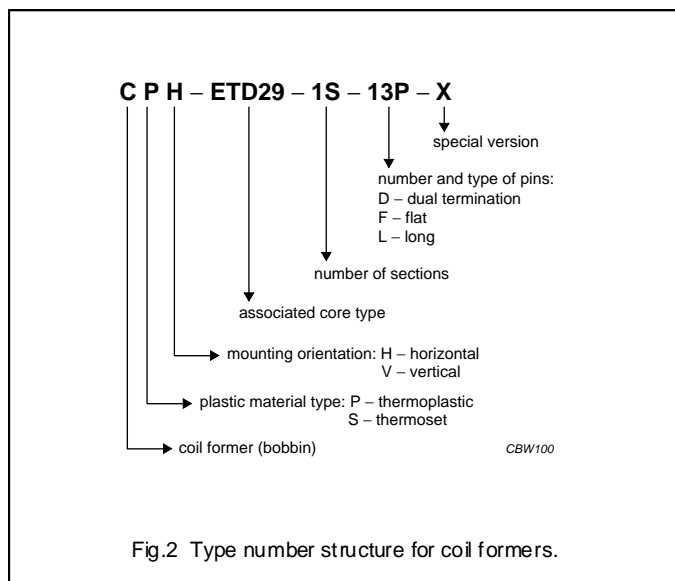
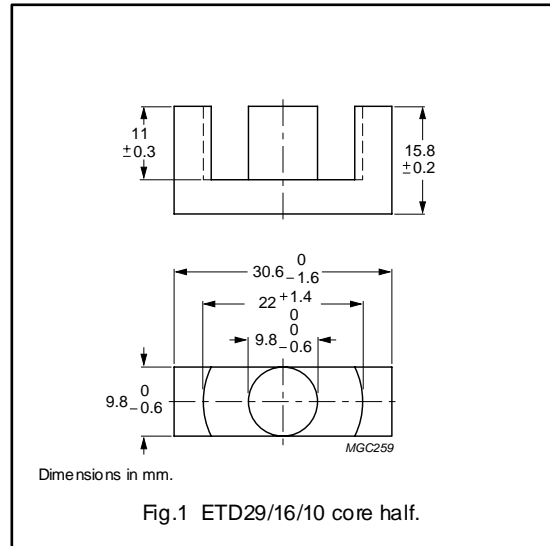


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.947	mm <sup>-1</sup>
$V_e$	effective volume	547.0	mm <sup>3</sup>
$l_e$	effective length	72.0	mm
$A_e$	effective area	76.0	mm <sup>2</sup>
$A_{min}$	minimum area	71.0	mm <sup>2</sup>
$m$	mass of core half	≈ 14	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	2350 ± 25%	≈ 1770	≈ 0	ETD29/16/10-3C90
3C94	2350 ± 25%	≈ 1770	≈ 0	ETD29/16/10-3C94
3C96 <small>des</small>	2200 ± 25%	≈ 1660	≈ 0	ETD29/16/10-3C96
3F3	2200 ± 25%	≈ 1660	≈ 0	ETD29/16/10-3F3
3F35 <small>prot</small>	1600 ± 25%	≈ 1210	≈ 0	ETD29/16/10-3F35

## 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 2.0	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 0.74	≤ 5.7	–	–



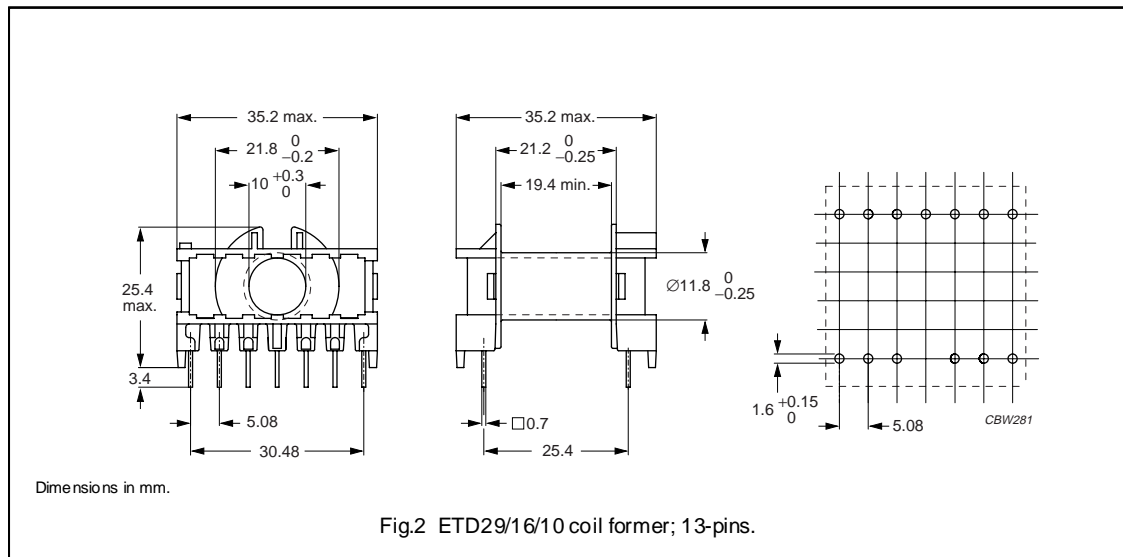
ETD cores and accessories

ETD29/16/10

**COIL FORMER**

**General data 13-pins ETD29/16/10 coil former**

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 (Sn) 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



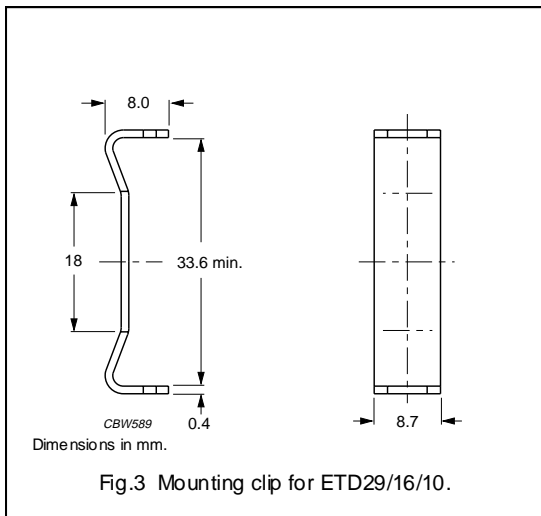
**Winding data for 13-pins ETD29/16/10 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	95	19.4	53	CPH-ETD29-1S-13P

**MOUNTING PARTS**

**General data**

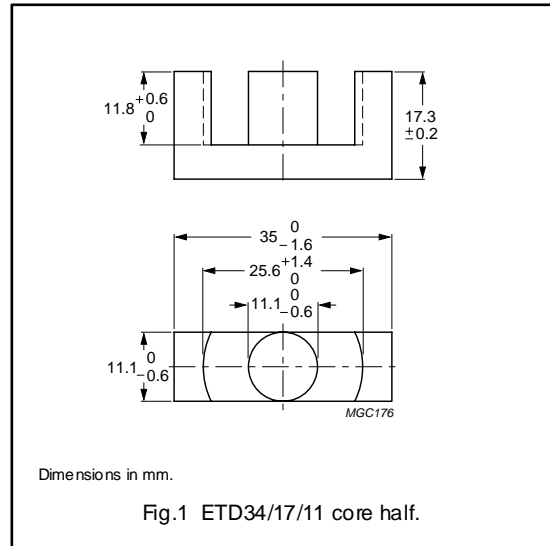
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD29



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.810	mm <sup>-1</sup>
$V_e$	effective volume	7640	mm <sup>3</sup>
$l_e$	effective length	78.6	mm
$A_e$	effective area	97.1	mm <sup>2</sup>
$A_{min}$	minimum area	91.6	mm <sup>2</sup>
$m$	mass of core half	≈ 20	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	2700 ± 25%	≈ 1740	≈ 0	ETD34/17/11-3C90
3C94	2700 ± 25%	≈ 1740	≈ 0	ETD34/17/11-3C94
3C96 <small>des</small>	2500 ± 25%	≈ 1610	≈ 0	ETD34/17/11-3C96
3F3	2500 ± 25%	≈ 1610	≈ 0	ETD34/17/11-3F3
3F35 <small>prot</small>	1850 ± 25%	≈ 1190	≈ 0	ETD34/17/11-3F35

## 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	≥330	–	–	–	–
3C94	≥330	–	–	–	–
3C96	≥340	≤ 2.8	–	–	–
3F3	≥320	–	–	–	–
3F35	≥300	≤ 1.0	≤ 8.0	–	–

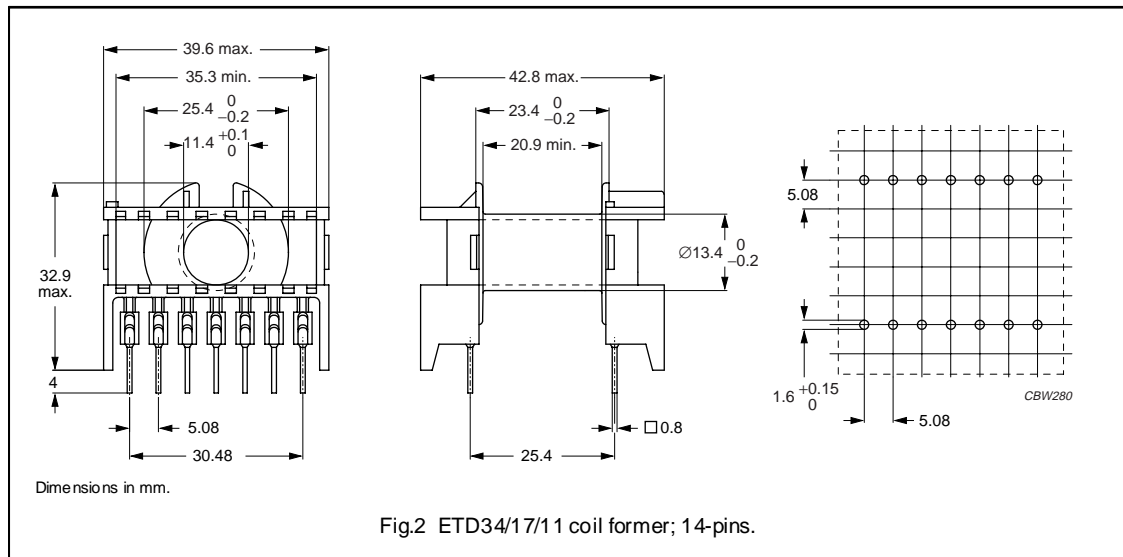
ETD cores and accessories

ETD34/17/11

**COIL FORMERS**

**General data 14-pins ETD34/17/11 coil former**

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, transition to lead-free (Sn) ongoing.
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



**Winding data for 14-pins ETD34/17/11 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	123	20.9	60	CPH-ETD34-1S-14P <sup>(1)</sup>

**Note**

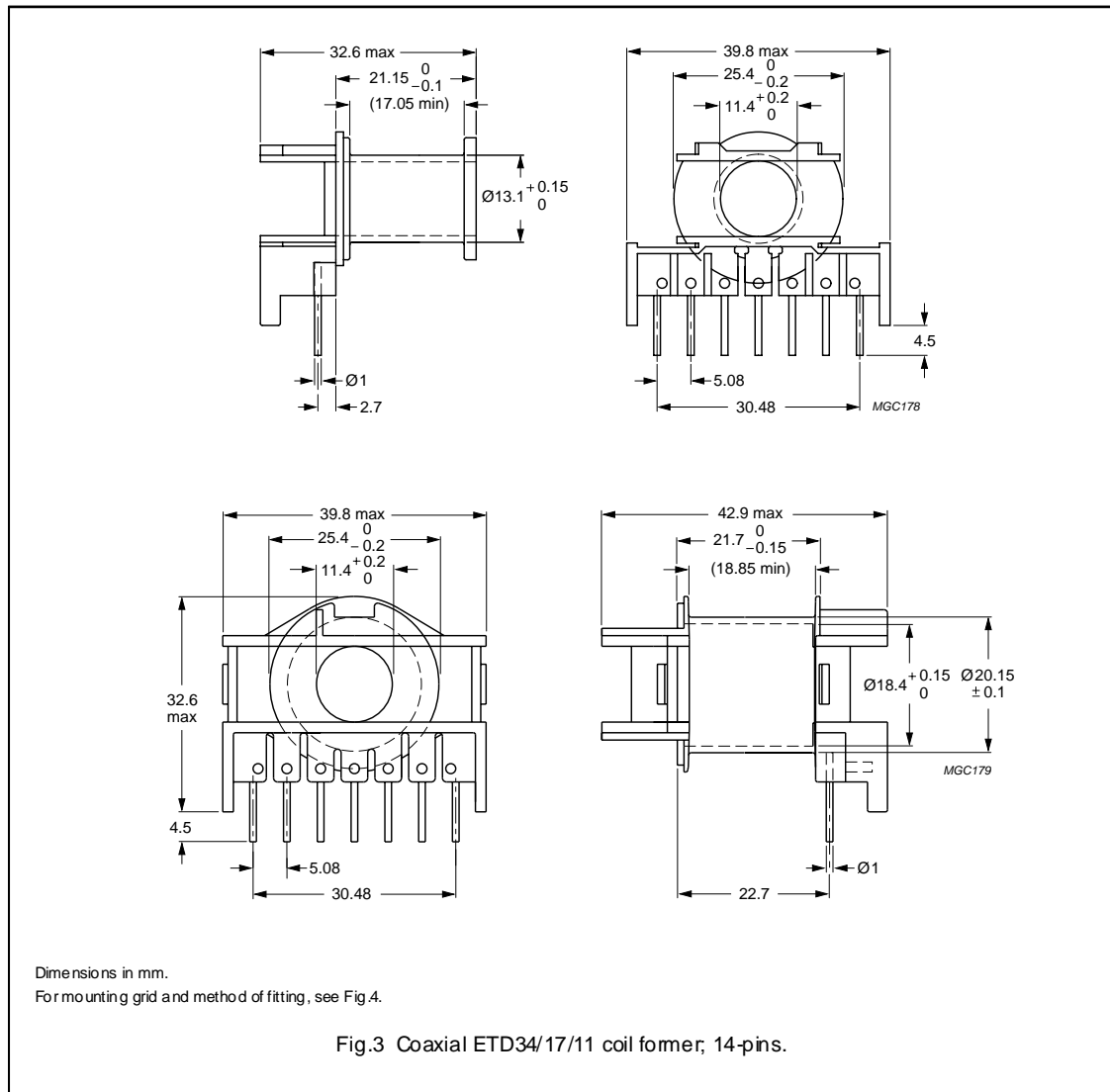
- Also available with Ø1.0 mm pins.

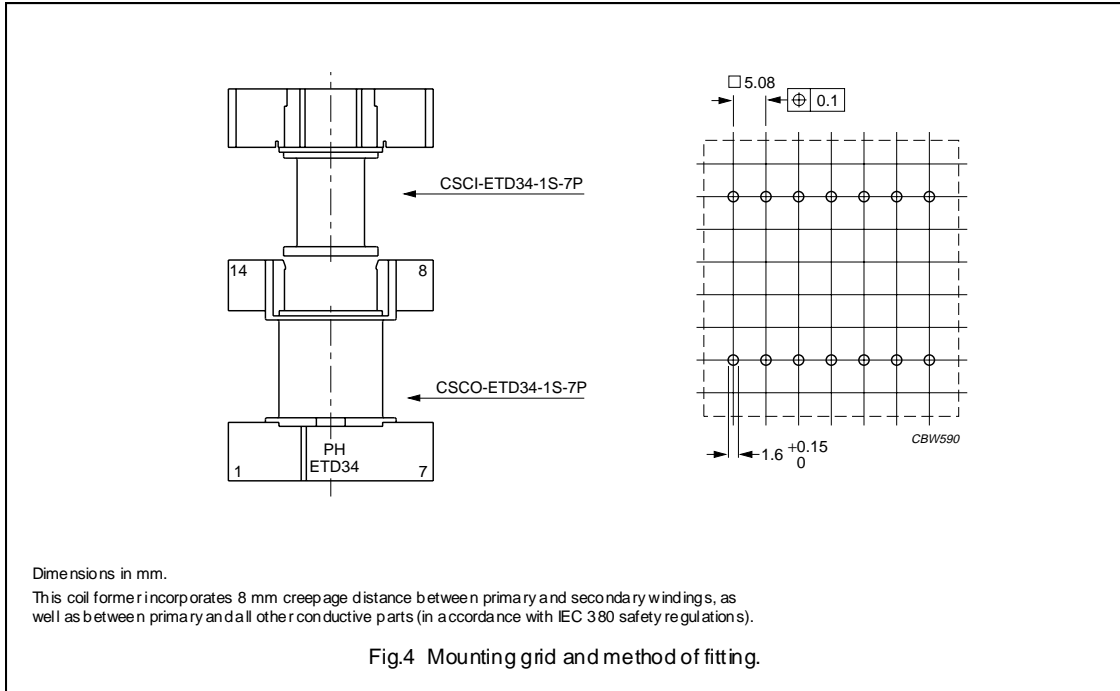
ETD cores and accessories

ETD34/17/11

General data 14-pins coaxial ETD34/17/11 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, transition to lead-free (Sn) ongoing.
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





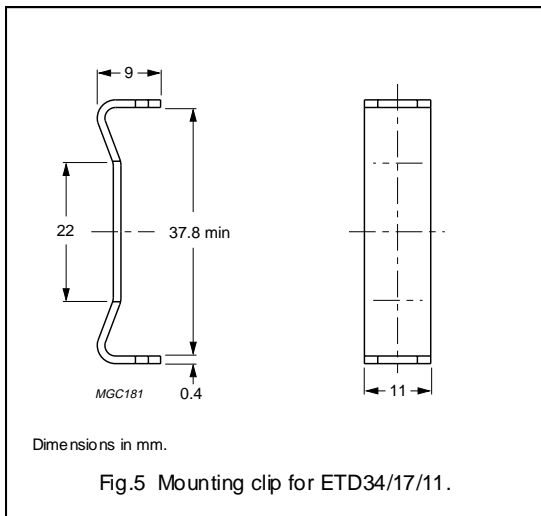
Winding data for coaxial ETD34/17/11 coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

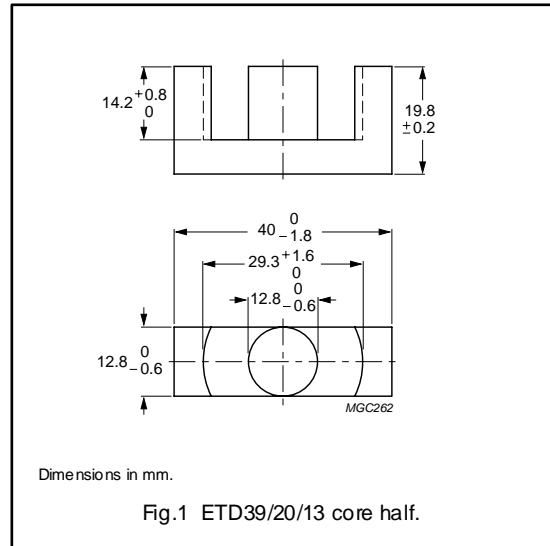




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.737	mm <sup>-1</sup>
$V_e$	effective volume	11500	mm <sup>3</sup>
$l_e$	effective length	92.2	mm
$A_e$	effective area	125	mm <sup>2</sup>
$A_{min}$	minimum area	123	mm <sup>2</sup>
$m$	mass of core half	≈ 30	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	3000 ± 25%	≈ 1760	≈ 0	ETD39/20/13-3C90
3C94	3000 ± 25%	≈ 1760	≈ 0	ETD39/20/13-3C94
3F3	2800 ± 25%	≈ 1640	≈ 0	ETD39/20/13-3F3

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥ 330	≤ 1.4	≤ 1.5	–	–
3C94	≥ 330	–	≤ 1.2	≤ 6.0	–
3F3	≥ 320	–	≤ 1.4	–	≤ 2.5

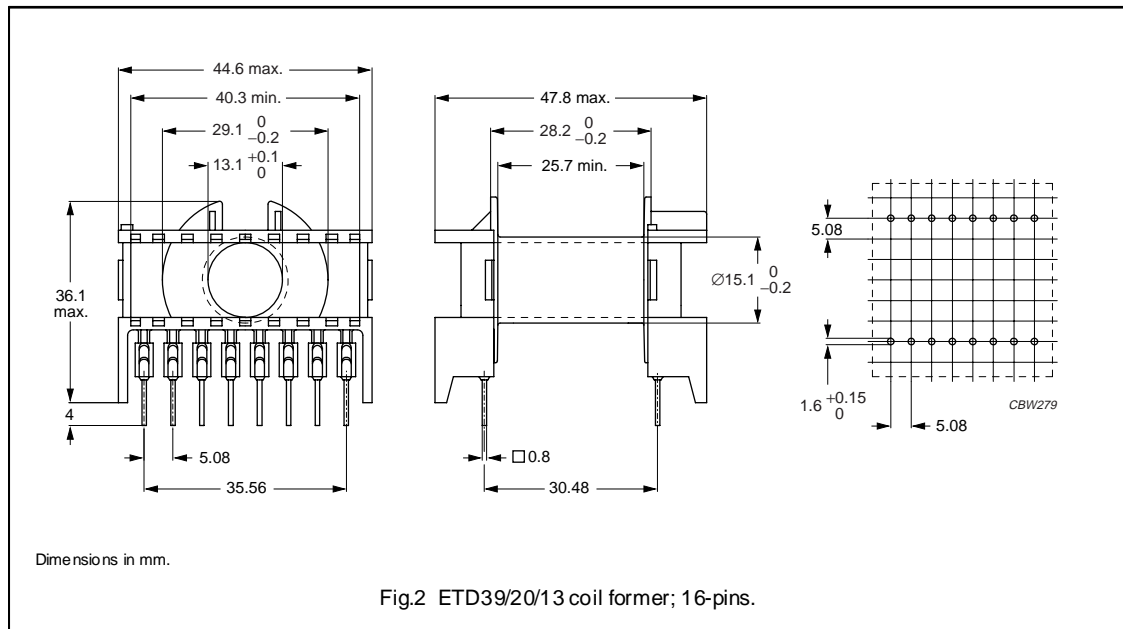
ETD cores and accessories

ETD39/20/13

**COIL FORMER**

**General data 16-pins ETD39/20/13 coil former**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephtalate (PBT), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E45329(R)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



**Winding data for 16-pins ETD39/20/13 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	177	25.7	69	CPH-ETD39-1S-16P <sup>(1)</sup>

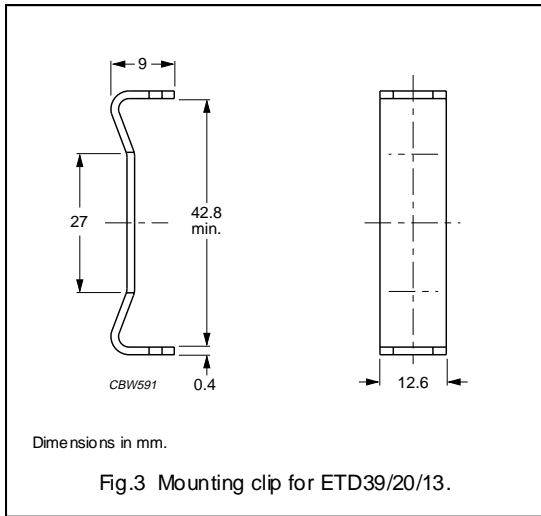
**Note**

- Also available with Ø1.0 mm pins.

**MOUNTING PARTS**

**General data**

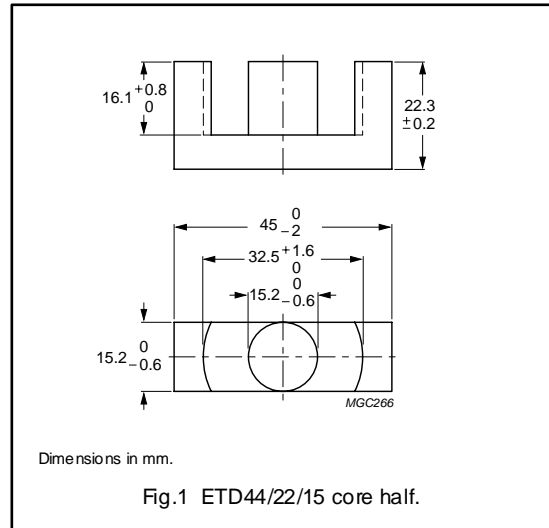
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD39



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.589	mm <sup>-1</sup>
$V_e$	effective volume	17800	mm <sup>3</sup>
$l_e$	effective length	103	mm
$A_e$	effective area	173	mm <sup>2</sup>
$A_{min}$	minimum area	172	mm <sup>2</sup>
$m$	mass of core half	≈ 47	g



**Core halves**

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

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	3800 ± 25%	≈ 1800	≈ 0	ETD44/22/15-3C90
3C94	3800 ± 25%	≈ 1800	≈ 0	ETD44/22/15-3C94
3F3	3500 ± 25%	≈ 1660	≈ 0	ETD44/22/15-3F3

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥ 330	≤ 2.2	≤ 2.3	–	–
3C94	≥ 330	–	≤ 1.7	≤ 9.4	–
3F3	≥ 320	–	≤ 2.2	–	≤ 3.9

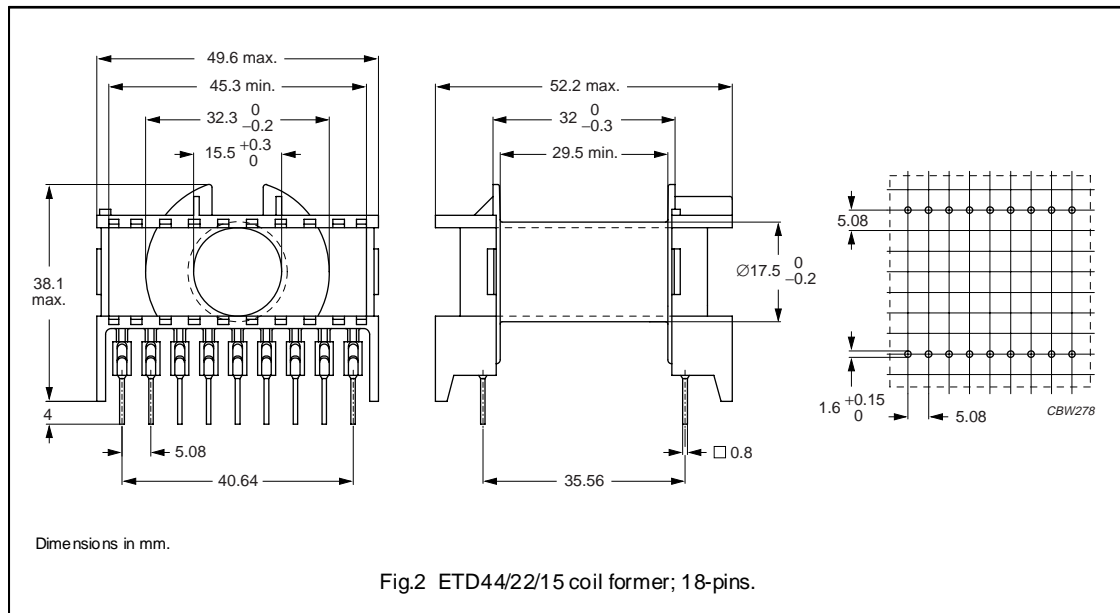
ETD cores and accessories

ETD44/22/15

**COIL FORMERS**

**General data 18-pins ETD44/22/15 coil former**

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, transition to lead-free (Sn) ongoing.
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



**Winding data for 18-pins ETD44/22/15 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	214	29.5	77	CPH-ETD44-1S-18P <sup>(1)</sup>

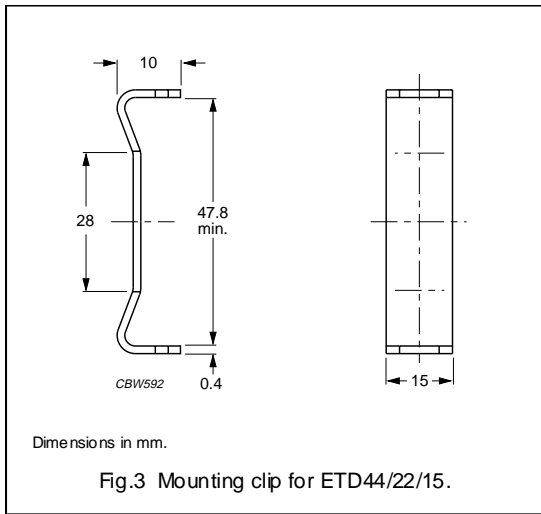
**Note**

1. Also available with Ø1.0 mm pins.

**MOUNTING PARTS**

**General data**

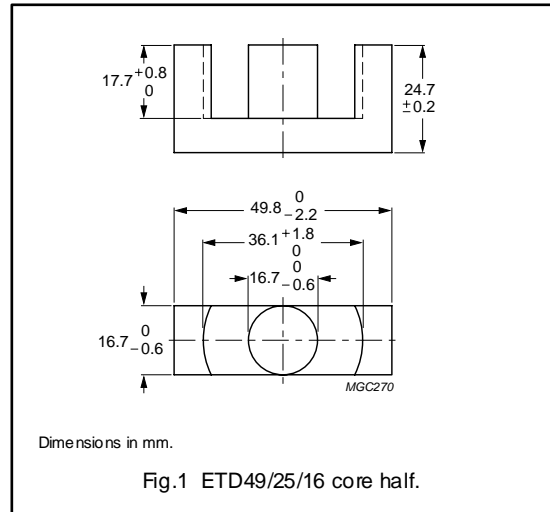
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD44



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.534	mm <sup>-1</sup>
$V_e$	effective volume	24000	mm <sup>3</sup>
$l_e$	effective length	114	mm
$A_e$	effective area	211	mm <sup>2</sup>
$A_{min}$	minimum area	209	mm <sup>2</sup>
$m$	mass of core half	≈ 62	g



**Core halves**

Clamping force for  $A_L$  measurements, 50±20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	4200 ±25%	≈ 1810	≈ 0	ETD49/25/16-3C90
3C94	4200 ±25%	≈ 1810	≈ 0	ETD49/25/16-3C94
3F3	3900 ±25%	≈ 1680	≈ 0	ETD49/25/16-3F3

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 200 mT; T = 100 °C	f = 400 kHz; B̂ = 50 mT; T = 100 °C
3C90	≥330	≤2.9	≤3.1	–	–
3C94	≥330	–	≤2.3	≤12.4	–
3F3	≥320	–	≤3.0	–	≤5.4

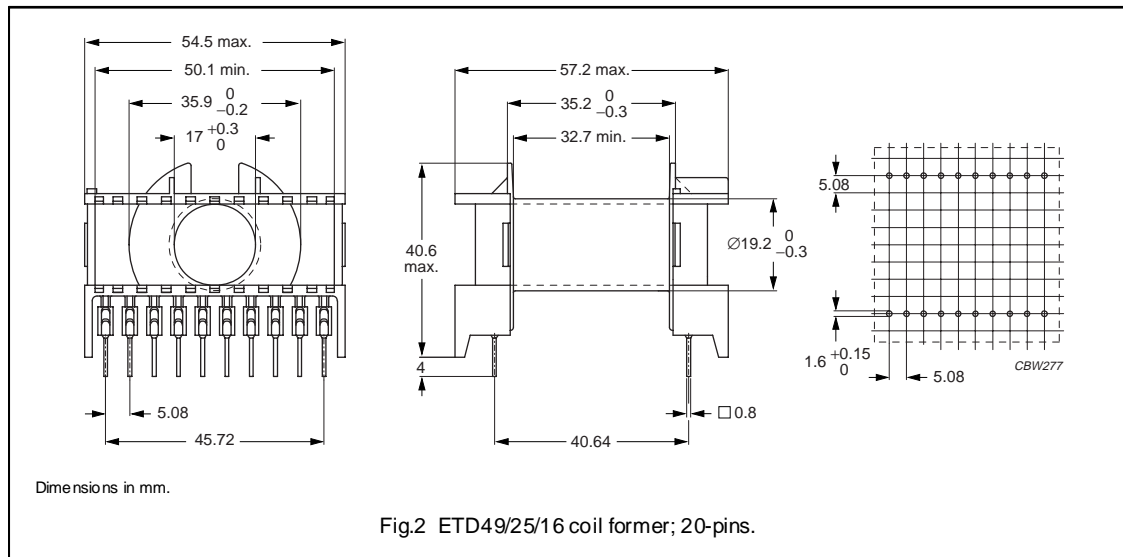
ETD cores and accessories

ETD49/25/16

**COIL FORMERS**

**General data 20-pins ETD49/25/16 coil former**

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, transition to lead-free (Sn) ongoing.
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



**Winding data for 20-pins ETD49/25/16 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	273	32.7	85	CPH-ETD49-1S-20P <sup>(1)</sup>

**Note**

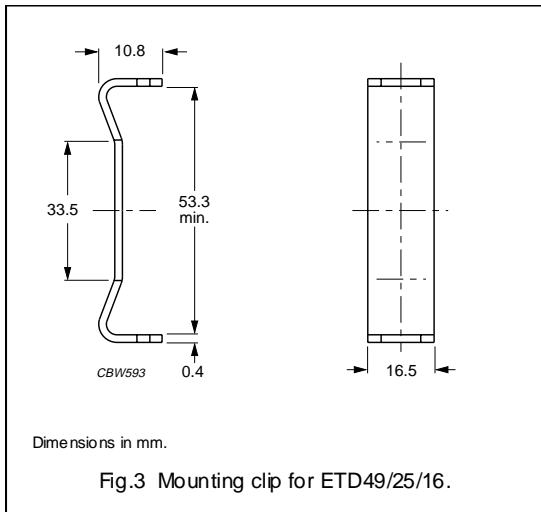
1. Also available with Ø1.0 mm pins.



**MOUNTING PARTS**

**General data**

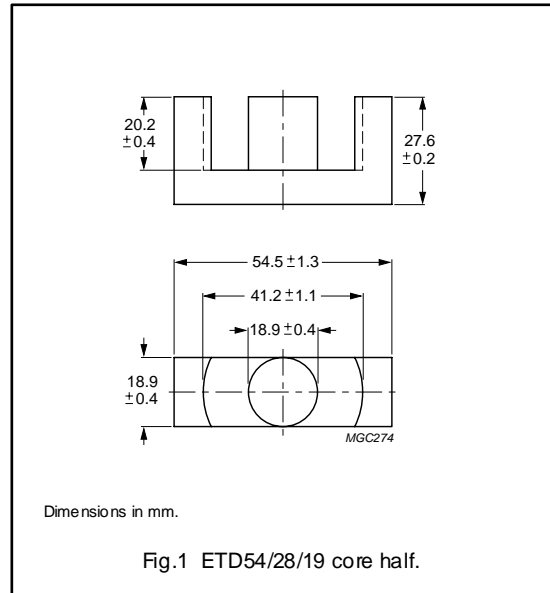
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD49



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.454	mm <sup>-1</sup>
$V_e$	effective volume	35500	mm <sup>3</sup>
$l_e$	effective length	127	mm
$A_e$	effective area	280	mm <sup>2</sup>
$A_{min}$	minimum area	270	mm <sup>2</sup>
$m$	mass of core half	≈ 90	g



**Core halves**

Clamping force for  $A_L$  measurements, 50±20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	5000 ±25%	≈ 1810	≈ 0	ETD54/28/19-3C90
3C94	5000 ±25%	≈ 1810	≈ 0	ETD54/28/19-3C94
3F3	4600 ±25%	≈ 1660	≈ 0	ETD54/28/19-3F3

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤ 4.3	≤ 4.8	–	–
3C94	≥330	–	≤ 3.6	≤ 21	–
3F3	≥320	–	≤ 4.5	–	≤ 8.5

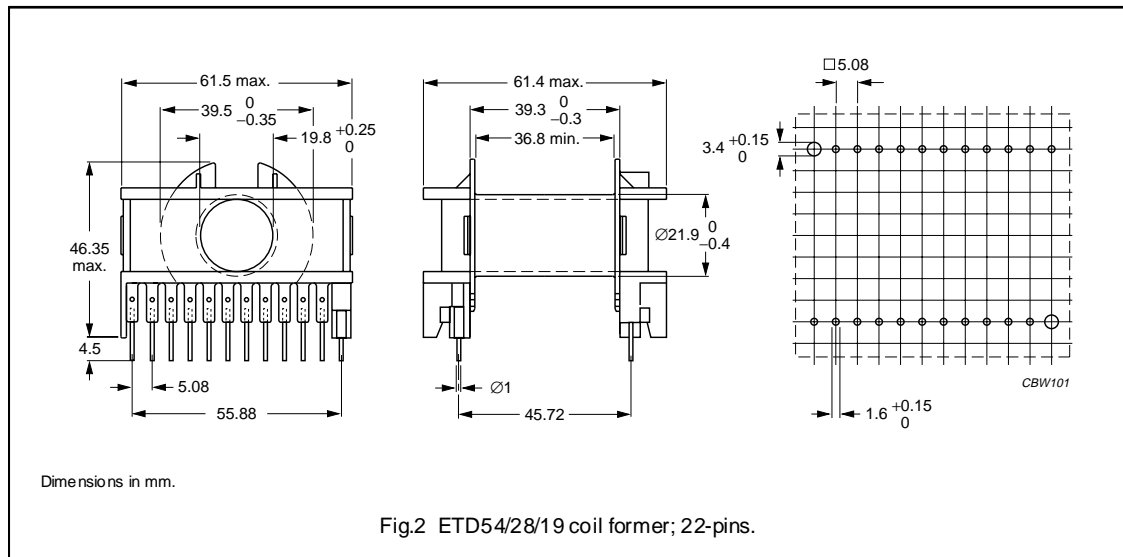
ETD cores and accessories

ETD54/28/19

**COIL FORMERS**

**General data 22-pins ETD54/28/19 coil former**

ITEM	SPECIFICATION
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, transition to lead-free (Sn) ongoing.
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



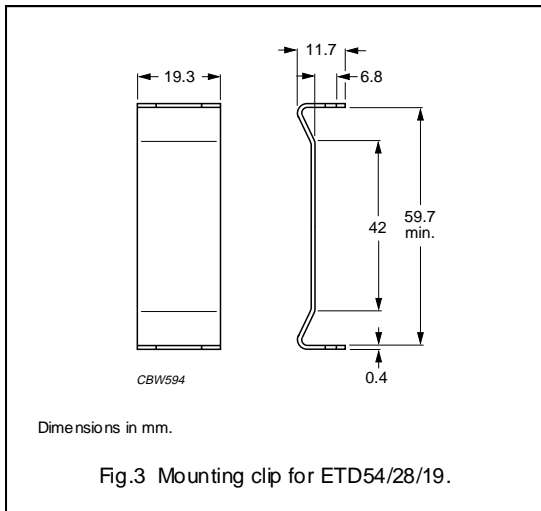
**Winding data for 22-pins ETD54/28/19 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	316	36.8	96	CPH-ETD54-1S-22P

**MOUNTING PARTS**

**General data**

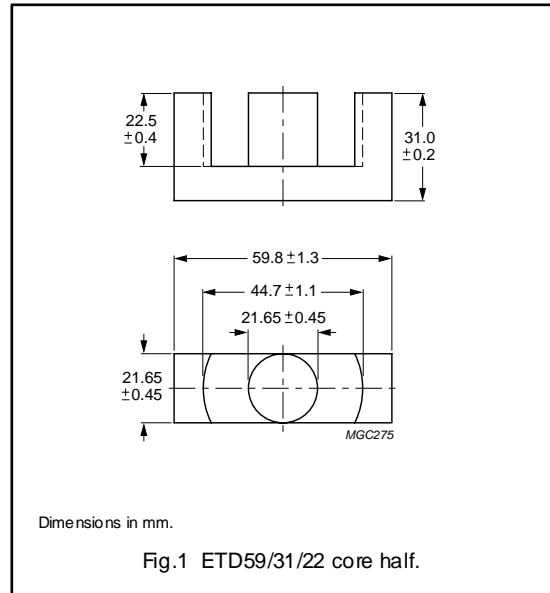
ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD54



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.378	mm <sup>-1</sup>
$V_e$	effective volume	51 500	mm <sup>3</sup>
$l_e$	effective length	139	mm
$A_e$	effective area	368	mm <sup>2</sup>
$A_{min}$	minimum area	360	mm <sup>2</sup>
$m$	mass of core half	≈ 130	g



**Core halves**

Clamping force for  $A_L$  measurements, 70±20 N. Gapped cores are available on request.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	6000 ±25%	≈ 1800	≈ 0	ETD59/31/22-3C90
3C94	6000 ±25%	≈ 1800	≈ 0	ETD59/31/22-3C94
3F3	5600 ±25%	≈ 1680	≈ 0	ETD59/31/22-3F3

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥330	≤ 6.2	≤ 7.3	–	–
3C94	≥330	–	≤ 5.2	≤ 31	–
3F3	≥320	–	≤ 6.7	–	≤ 12.8

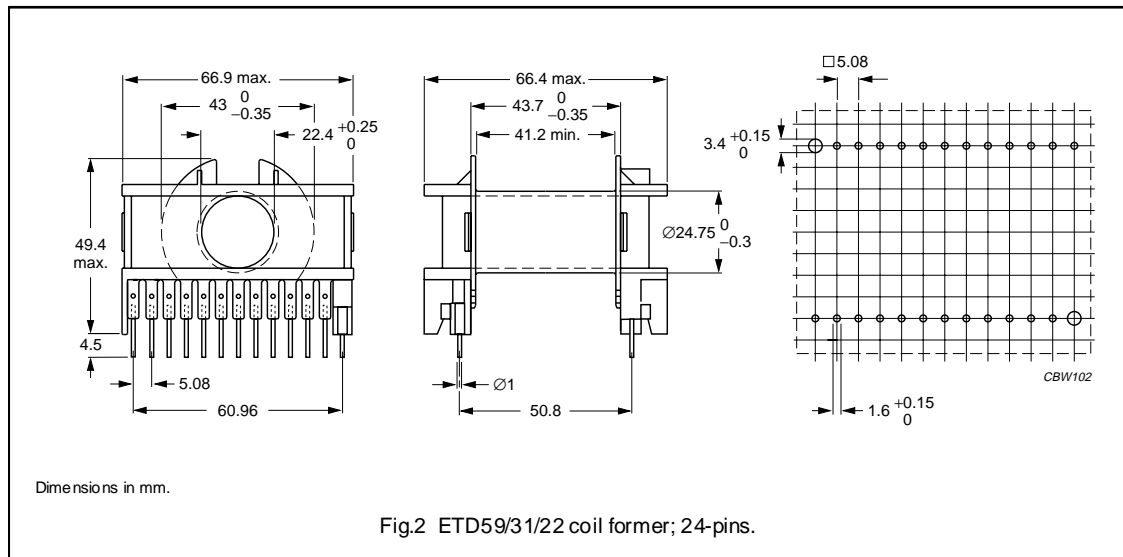
ETD cores and accessories

ETD59/31/22

**COIL FORMER**

**General data 24-pins ETD59/31/22 coil former**

PARAMETER	SPECIFICATION
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, transition to lead-free (Sn) ongoing.
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



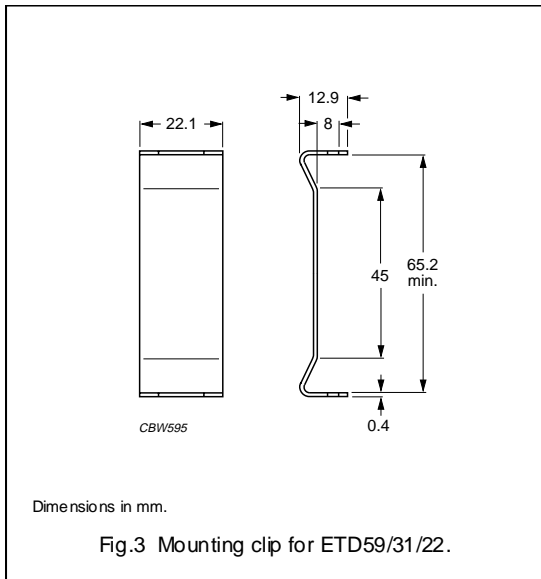
**Winding data for 24-pins ETD59/31/22 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	366	41.2	106	CPH-ETD59-1S-24P

**MOUNTING PARTS**

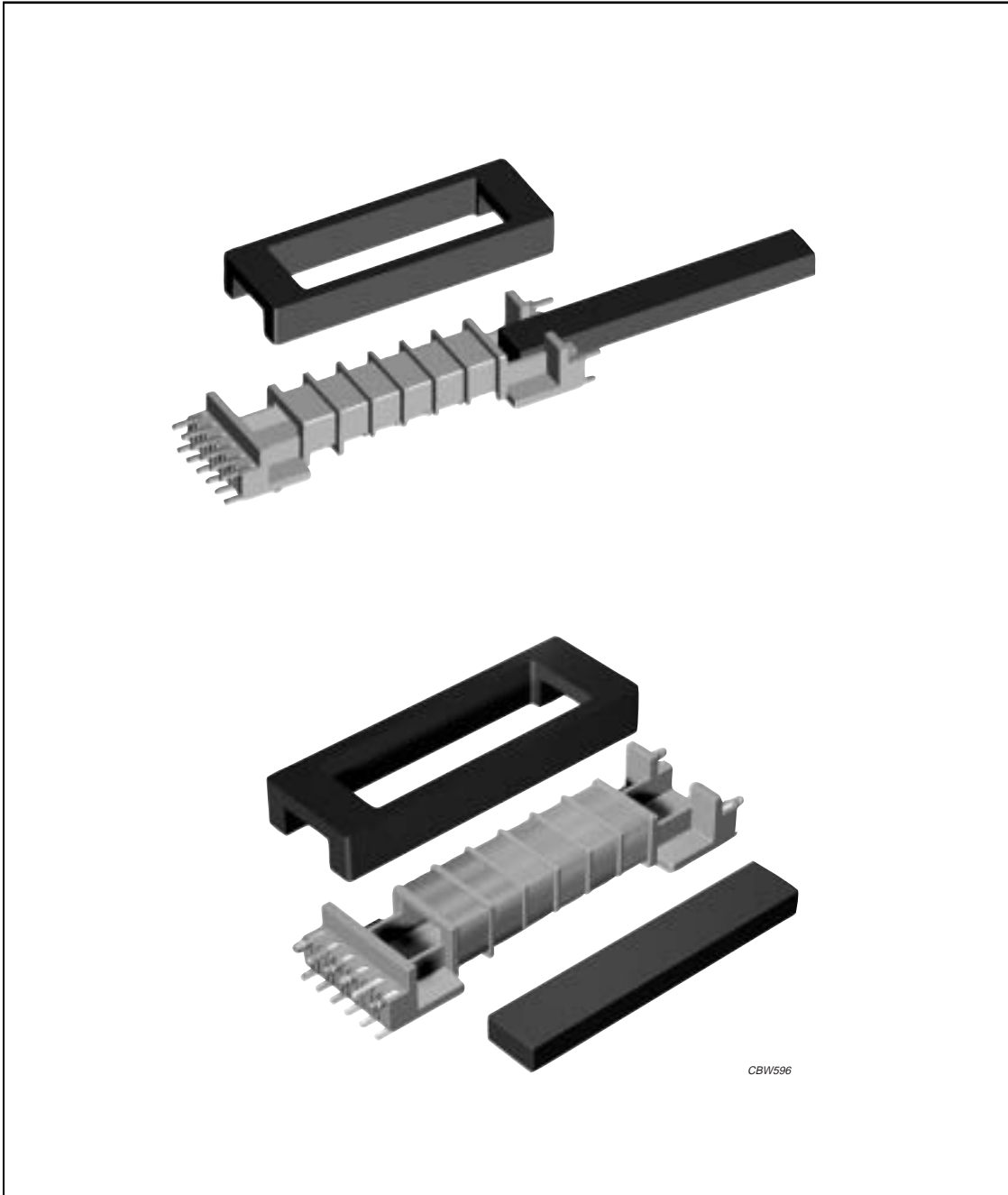
**General data**

ITEM	REMARKS	FIGURE	TYPE NUMBER
Mounting clip	material: stainless steel	3	CLI-ETD59









**Soft Ferrites**

**Frame and Bar cores and accessories**

**PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE**

**Product overview Frame and Bar cores**

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	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 24/3.9/10	370	8.1	1.3
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

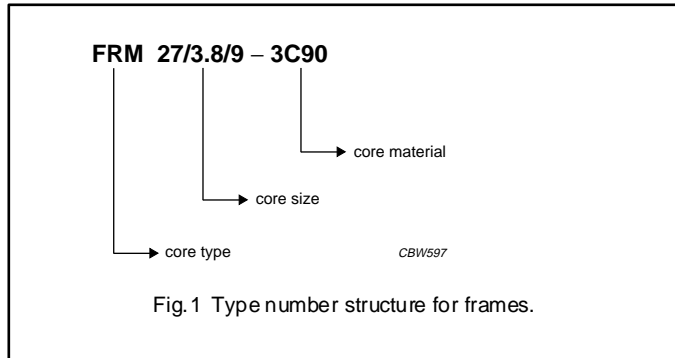


Fig.1 Type number structure for frames.

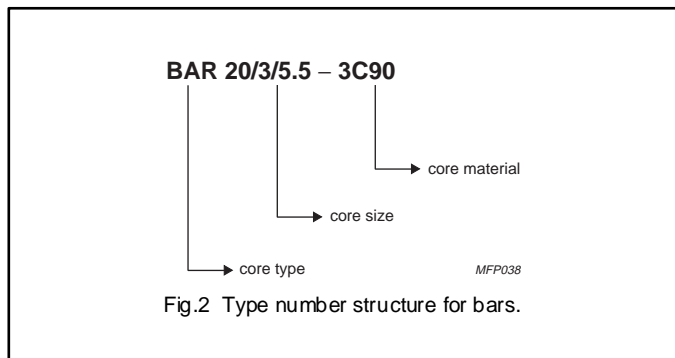


Fig.2 Type number structure for bars.

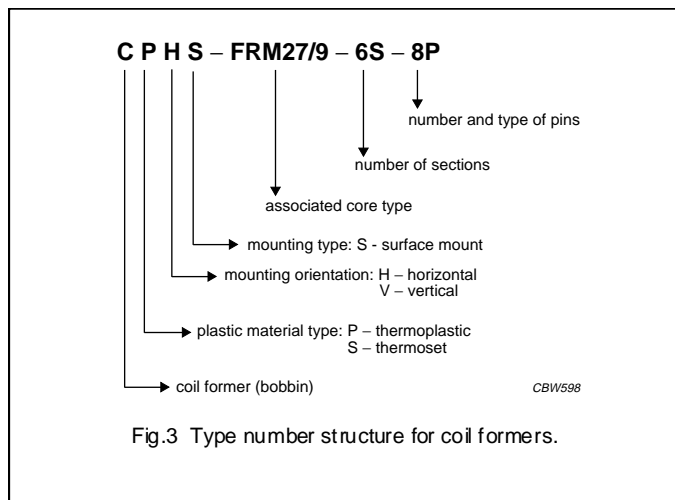
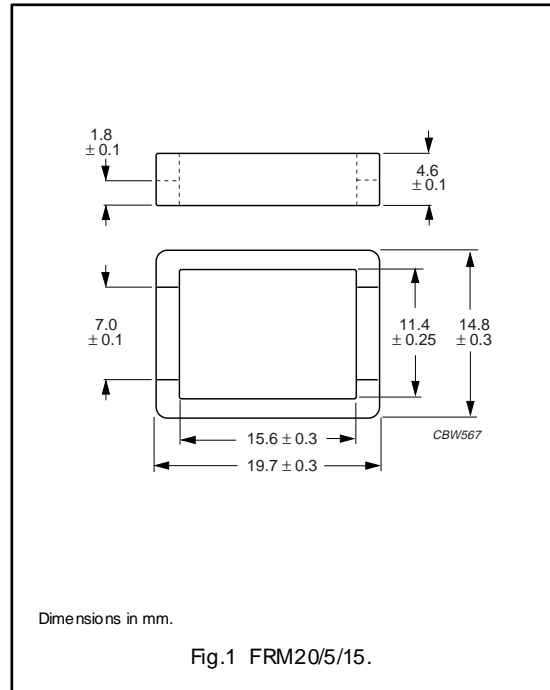


Fig.3 Type number structure for coil formers.

**CORE SETS**

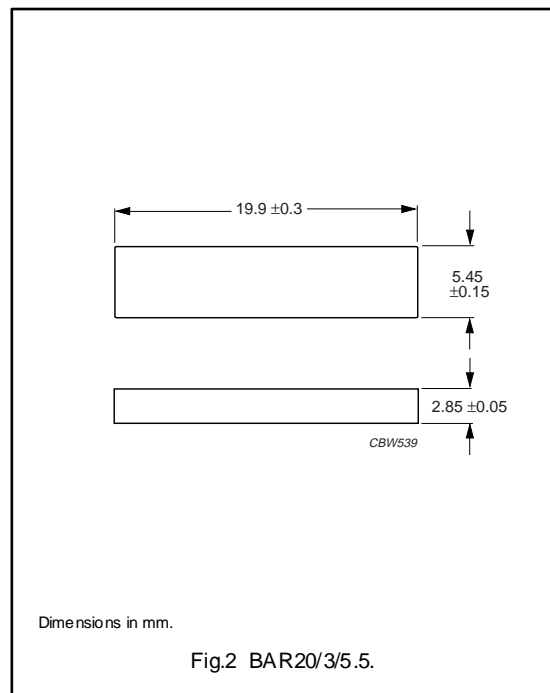
**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.29	mm <sup>-1</sup>
$V_e$	effective volume	655	mm <sup>3</sup>
$l_e$	effective length	46	mm
$A_e$	effective area	14	mm <sup>2</sup>
$A_{min}$	minimum area	7.4	mm <sup>2</sup>
m	mass of frame	≈ 2.1	g
m	mass of bar	≈ 1.5	g



**Ordering information for bar cores**

GRADE	TYPE NUMBER
3C90	BAR20/3/5.5-3C90
3C91	BAR20/3/5.5-3C91



## Frame and Bar cores and accessories

FRM20/5/15

**Frame cores for use in combination with matching bar cores** $A_L$  measured in combination with bar core

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	500 $\pm 25\%$	$\approx 1310$	$\approx 0$	FRM20/5/15-3C90
3C91	600 $\pm 25\%$	$\approx 1570$	$\approx 0$	FRM20/5/15-3C91

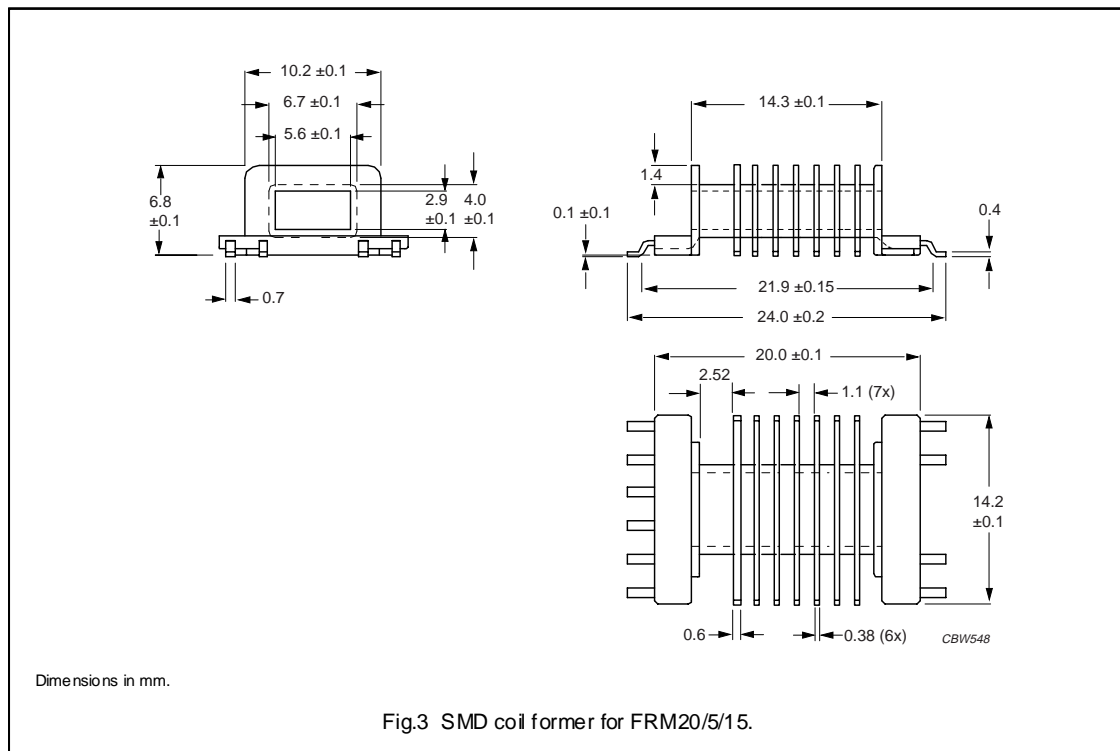
**Properties of Frame and Bar combinations under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 60 °C	f = 100 kHz; B = 200 mT; T = 60 °C
3C90	$\geq 320$	$\leq 0.073$	$\leq 0.080$	–	–
3C91	$\geq 320$	–	–	$\leq 0.033$	$\leq 0.26$

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



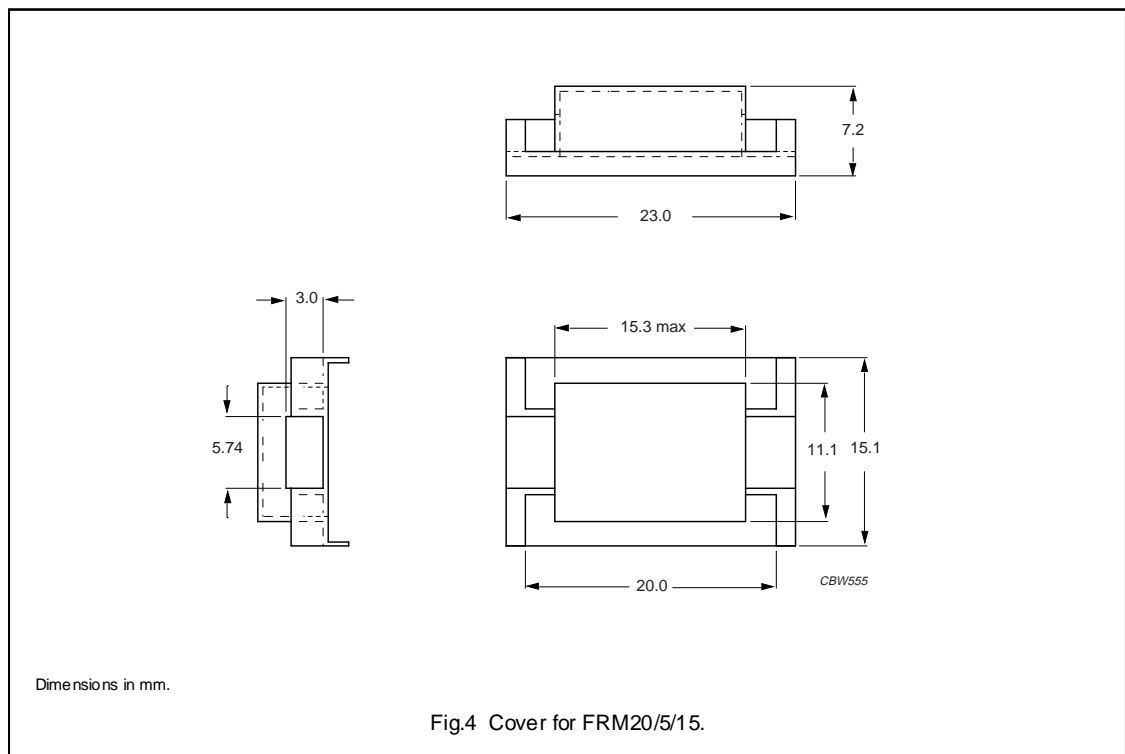
**Winding data**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	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**

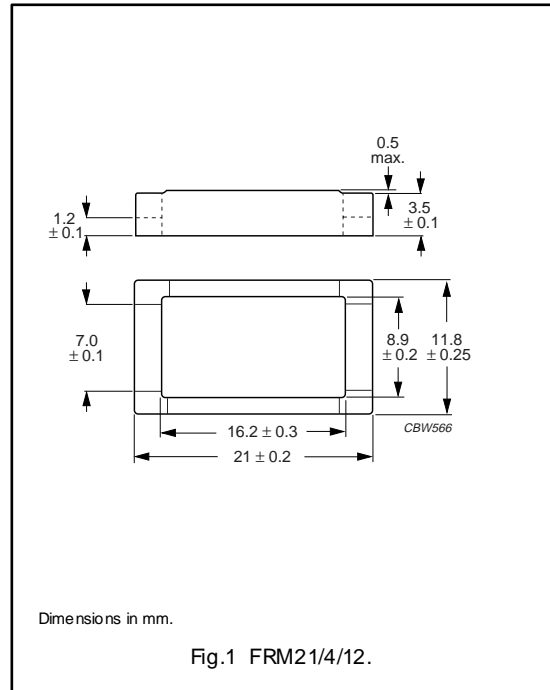
PARAMETER	SPECIFICATION
Cover material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E54705(M)
Maximum operating temperature	155 °C, "IEC 60085", class F



**CORE SETS**

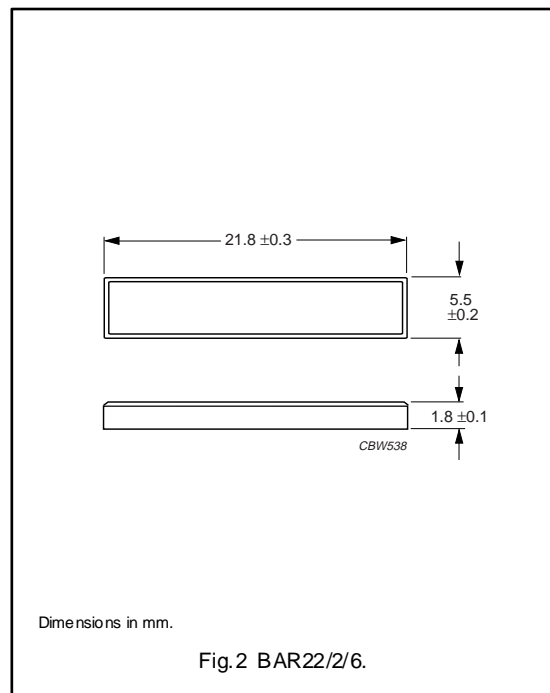
**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.06	mm <sup>-1</sup>
$V_e$	effective volume	312	mm <sup>3</sup>
$l_e$	effective length	40	mm
$A_e$	effective area	7.9	mm <sup>2</sup>
$A_{min}$	minimum area	5.7	mm <sup>2</sup>
m	mass of frame	≈ 1.5	g
m	mass of bar	≈ 1.0	g



**Ordering information for bar cores**

GRADE	TYPE NUMBER
3C90	BAR22/2/6-3C90
3C91	BAR22/2/6-3C91



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**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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	400 $\pm 25\%$	$\approx 1610$	$\approx 0$	FRM21/4/12-3C90
3C91	470 $\pm 25\%$	$\approx 1890$	$\approx 0$	FRM21/4/12-3C91

**Properties of Frame and Bar combinations under power conditions**

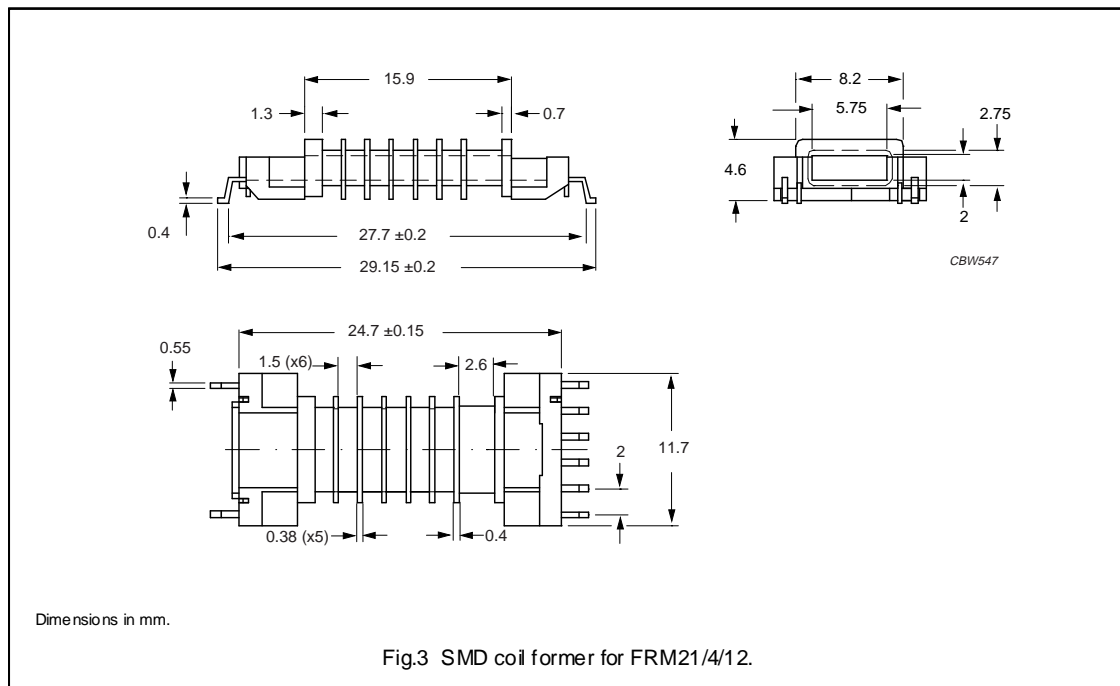
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 60 °C	f = 100 kHz; B = 200 mT; T = 60 °C
3C90	$\geq 320$	$\leq 0.034$	$\leq 0.037$	–	–
3C91	$\geq 320$	–	–	$\leq 0.020$	$\leq 0.14$



**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



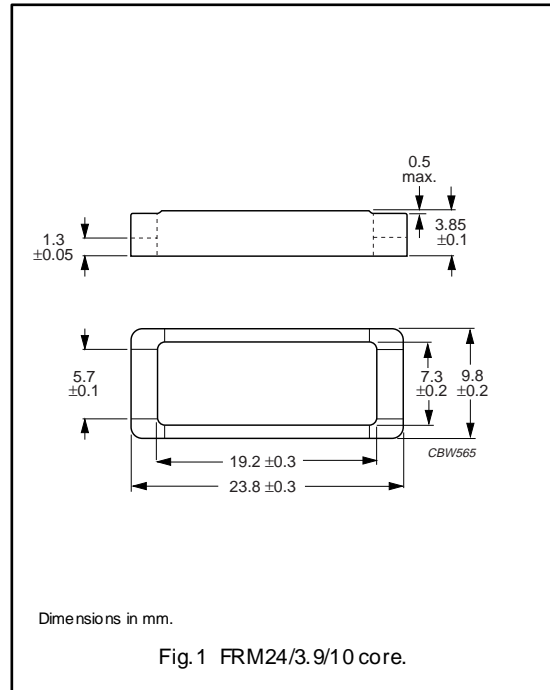
**Winding data**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	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

**CORE SETS**

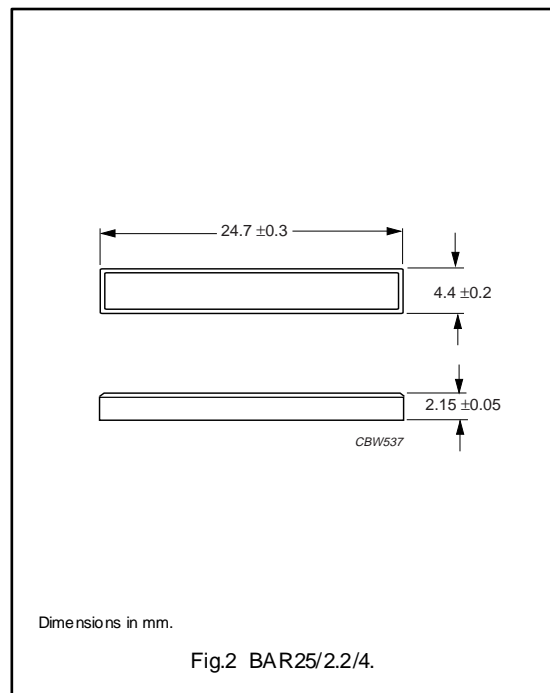
**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.65	mm <sup>-1</sup>
$V_e$	effective volume	370	mm <sup>3</sup>
$l_e$	effective length	45.8	mm
$A_e$	effective area	8.1	mm <sup>2</sup>
$A_{min}$	minimum area	6.0	mm <sup>2</sup>
m	mass of frame	≈ 1.3	g
m	mass of bar	≈ 1.2	g



**Ordering information for bar cores**

GRADE	TYPE NUMBER
3C90	BAR25/2.2/4-3C90
3C91	BAR25/2.2/4-3C91



## 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 <sub>L</sub> (nH)	μ <sub>e</sub>	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

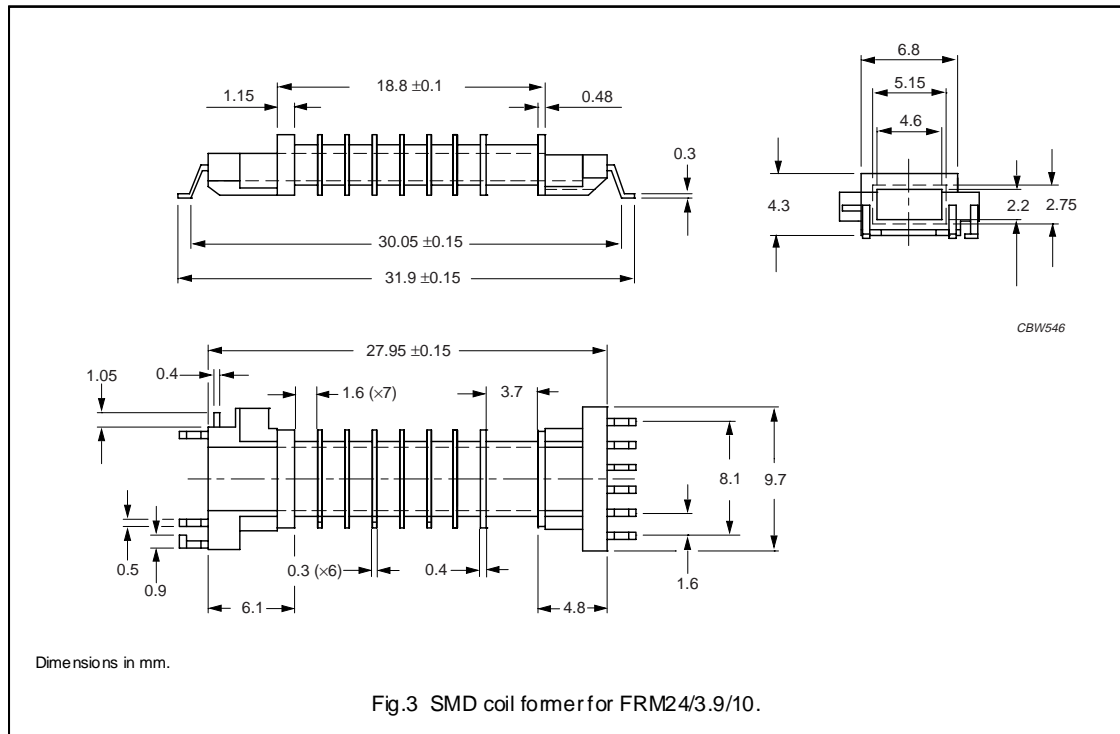
**Properties of Frame and Bar combinations under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 60 °C	f = 100 kHz; B̂ = 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 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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



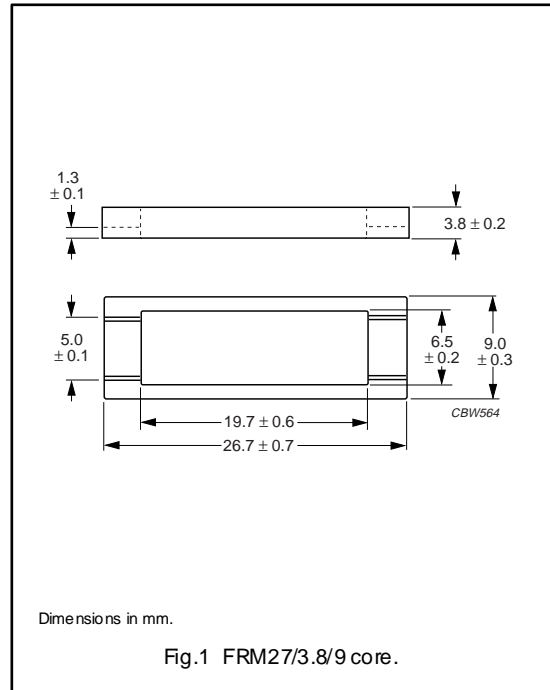
**Winding data**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	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**

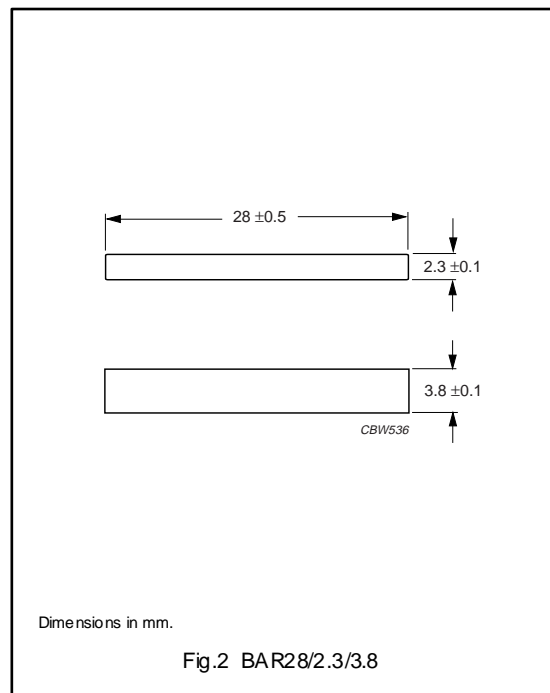
**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.56	mm <sup>-1</sup>
$V_e$	effective volume	504	mm <sup>3</sup>
$l_e$	effective length	52.1	mm
$A_e$	effective area	9.7	mm <sup>2</sup>
$A_{min}$	minimum area	8.7	mm <sup>2</sup>
m	mass of frame	≈ 1.6	g
m	mass of bar	≈ 1.2	g



**Ordering information for bar cores**

GRADE	TYPE NUMBER
3C90	BAR28/2.3/3.8-3C90
3C91	BAR28/2.3/3.8-3C91



## 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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	350 $\pm 20\%$	$\approx 1550$	$\approx 0$	FRM27/3.8/9-3C90
3C91	420 $\pm 20\%$	$\approx 1860$	$\approx 0$	FRM27/3.8/9-3C91

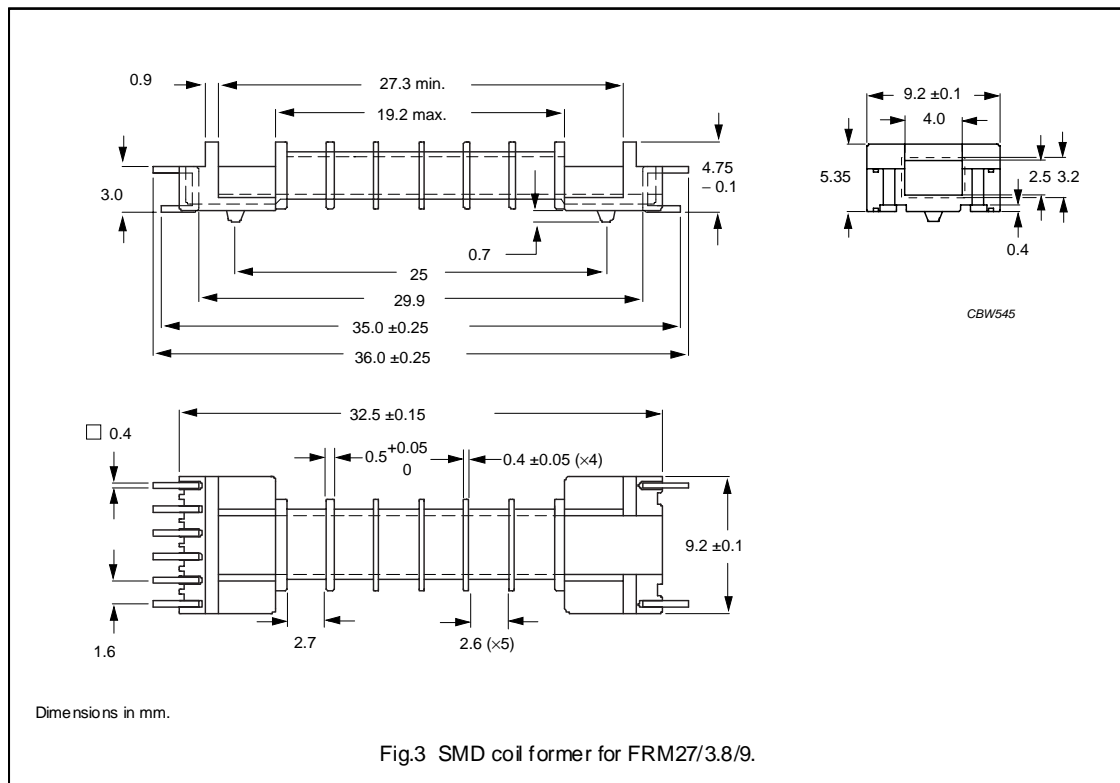
**Properties of Frame and Bar combinations under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 10 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 60 °C	f = 100 kHz; B = 200 mT; T = 60 °C
3C90	$\geq 320$	$\leq 0.056$	$\leq 0.060$	–	–
3C91	$\geq 320$	–	–	$\leq 0.025$	$\leq 0.2$

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	liquid crystal polymer (LCP), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E54705(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing.
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

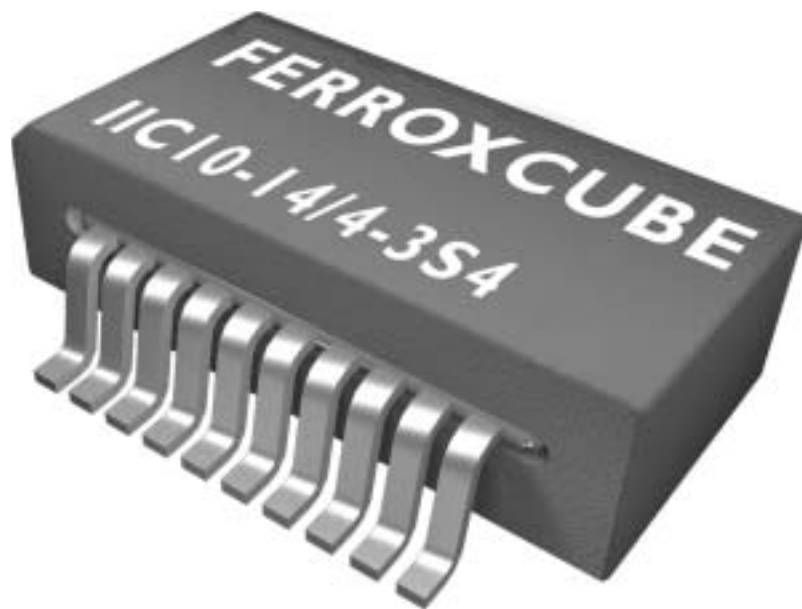


**Winding data**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
6	8	1.75 + 5 × 1.7	2.7 + 5 × 2.6	18.5	CPHS-FRM27/9-6S-8P







CBW630

**Soft Ferrites**

**Integrated inductive components**

**PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE**

**Product overview IIC**

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
IIC10-14/4	33.8	11.7	≈ 1.85
IIC10P-14/4	33.8	11.7	≈ 1.85
IIC10G-14/4	33.8	11.7	≈ 1.85

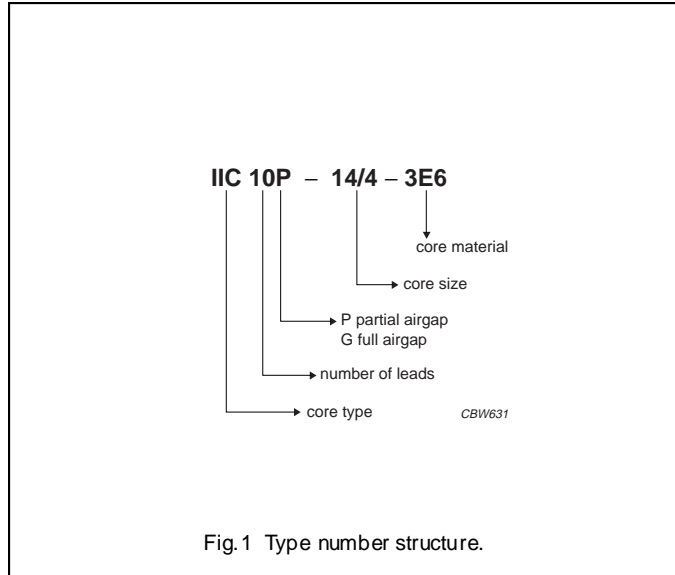


Fig.1 Type number structure.

Integrated inductive components

IIC10-14/4  
IIC10P-14/4 IIC10G-14/4

IIC10P-14/4

Effective core parameters

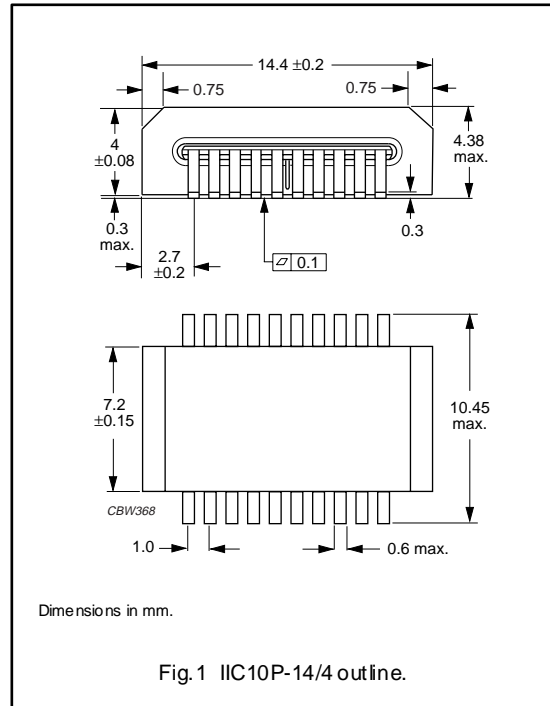
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.47	mm <sup>-1</sup>
$V_e$	effective volume	338	mm <sup>3</sup>
$l_e$	effective length	28.9	mm
$A_e$	effective area	11.7	mm <sup>2</sup>
m	mass of core half	≈1.85	g

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 adapted by track layout.

APPLICATIONS

- Power inductor
- Output choke
- EMI choke with bias current.



IICs with partial air gap for use as power inductors

GRADE	L (μH) FOR 10 TURNS NO BIAS CURRENT			L (μH) FOR 10 TURNS WITH A BIAS CURRENT OF 1 A			TYPE NUMBER
	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 100 kHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	
3C30 <small>des</small>	92 ± 25%	–	–	≥ 5	–	–	IIC10P-14/4-3C30
3F4 <small>des</small>	–	–	45 ± 25%	–	–	≥ 5	IIC10P-14/4-3F4
3F35 <small>des</small>	–	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; B = 100 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	
3C30	≤ 30	–	–	IIC10P-14/4-3C30
3F4	–	–	≤ 70	IIC10P-14/4-3F4
3F35	–	≤ 40	–	IIC10P-14/4-3F35

Integrated inductive components

IIC10-14/4  
IIC10P-14/4 IIC10G-14/4

IIC10G-14/4

Effective core parameters

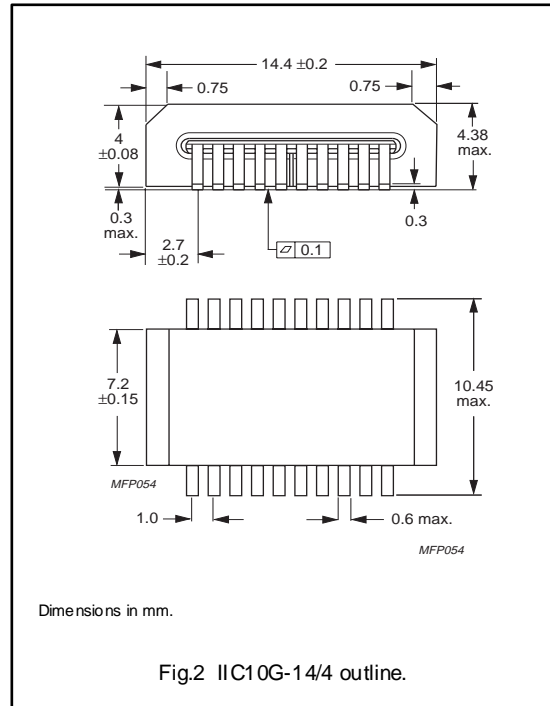
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.47	mm <sup>-1</sup>
$V_e$	effective volume	338	mm <sup>3</sup>
$l_e$	effective length	28.9	mm
$A_e$	effective area	11.7	mm <sup>2</sup>
m	mass of core half	≈ 1.85	g

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Full air gap to resist saturation.
- Number of turns can be adapted by track layout.

APPLICATIONS

- Power inductor
- Output choke
- EMI choke with bias current.



IICs with full 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 4 A		TYPE NUMBER
	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	f = 500 kHz; T = 25 °C	f = 1 MHz; T = 25 °C	
3F35 <small>des</small>	8 ± 15 %	–	≥ 6	–	IIC10G-14/4-3F35
3F4 <small>des</small>	–	7.5 ± 15 %	–	≥ 5.5	IIC10G-14/4-3F4

IICs with full air gap under power conditions

GRADE	CORE LOSS (mW) at		TYPE NUMBER
	f = 500 kHz; B = 50 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	
3F35	≤ 40	–	IIC10G-14/4-3F35
3F4	–	≤ 70	IIC10G-14/4-3F4

Integrated inductive components

IIC10-14/4  
IIC10P-14/4 IIC10G-14/4

IIC10-14/4

Effective core parameters

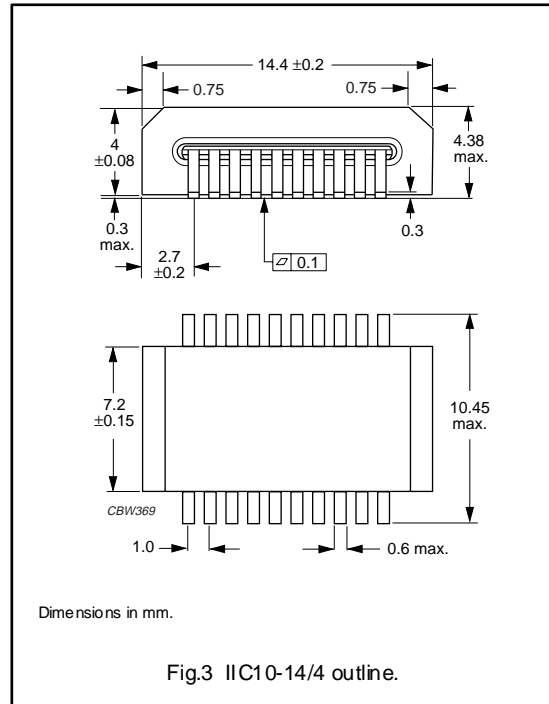
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.47	mm <sup>-1</sup>
$V_e$	effective volume	338	mm <sup>3</sup>
$l_e$	effective length	28.9	mm
$A_e$	effective area	11.7	mm <sup>2</sup>
m	mass of core half	≈1.85	g

FEATURES

- Inductive SMD component that looks like a standard IC.
- Windings are completed by PCB tracks.
- Suitable for reflow soldering.
- Several magnetic functions, depending on track layout.

APPLICATIONS

- Common-mode choke
- Multi-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; B = 50 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	
3F4 <small>des</small>	–	–	450 ±25%	–	≤70	IIC10-14/4-3F4
3E6 <small>des</small>	6000 ±30%	–	–	–	–	IIC10-14/4-3E6
3F35 <small>des</small>	–	700 ±25%	–	≤40	–	IIC10-14/4-3F35

IIC for use as a common-mode choke or multi-line choke

GRADE	$ Z_{typ} $ Ω for 1 turn at f = 100 MHz; T = 25 °C <sup>(1)</sup>	TYPE NUMBER
3S4 <small>des</small>	≈35	IIC10-14/4-3S4

Note

1. Minimum value,  $|Z|_{min}$  is -20%.

IIC with rectangular hysteresis loop for use in magnetic regulators

GRADE	E·t product (V·μs) at		TYPE NUMBER
	f = 100 kHz; H = 800 A/m; T = 100 °C; $I_{res et} = 70$ mA; 10 turns	f = 100 kHz; H = 800 A/m; T = 100 °C; $I_{res et} = 0$ mA; 10 turns	
3R1 <small>des</small>	≥33	≤12	IIC10-14/4-3R1

Integrated inductive components

IIC10-14/4  
IIC10P-14/4 IIC10G-14/4

**GENERAL DATA**

ITEM	SPECIFICATION
Leadframe material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Moulding material	liquid crystal polymer (LCP), flame retardant in accordance with "ULV94-0"
Solderability	"IEC 60 068-2-58", Part 2, Test Ta, method 1
Taping method	"IEC 60 286-3" and "EIA 481-1"

**R<sub>dc</sub>**

≈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 2 and 3)

**Leakage inductance**

2 windings of 5 turns:

unifilar ≈1.8 μH

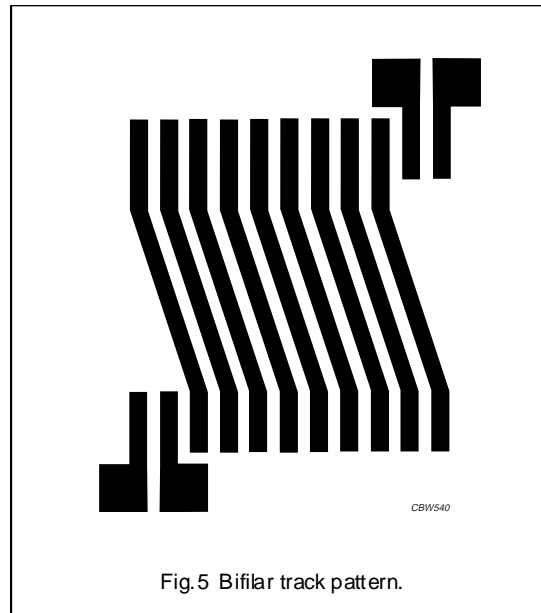
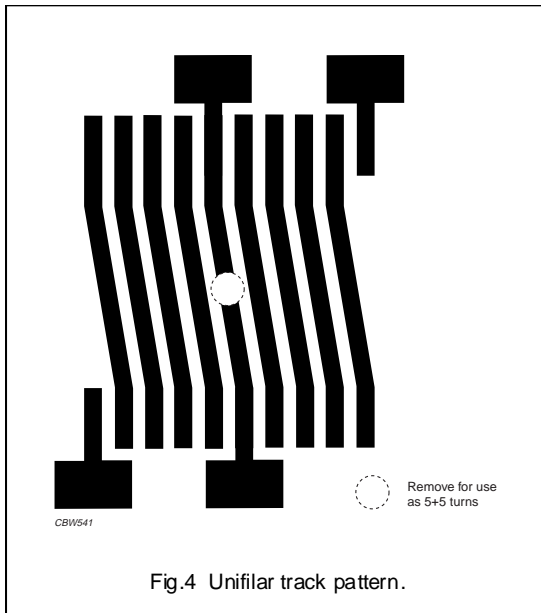
bifilar ≈0.2 μH.

**Maximum continuous current (DC)**

4 A (depending on copper track thickness on PCB).

**Maximum peak current**

10 A.



**MOUNTING**

**Soldering information**

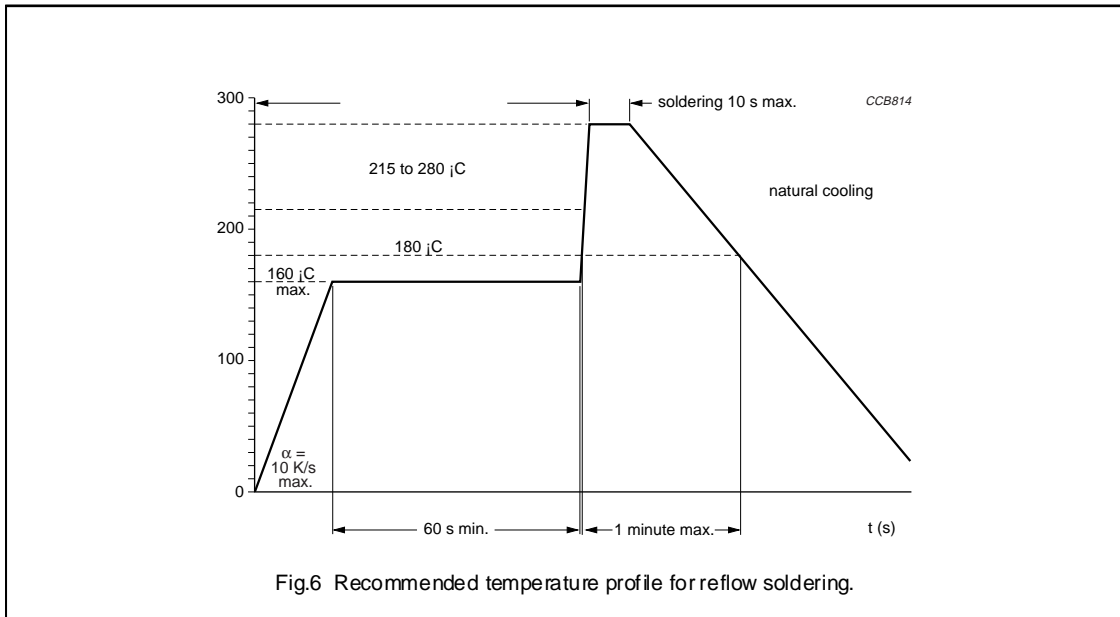


Fig.6 Recommended temperature profile for reflow soldering.

**RECOMMENDED SOLDER LANDS**

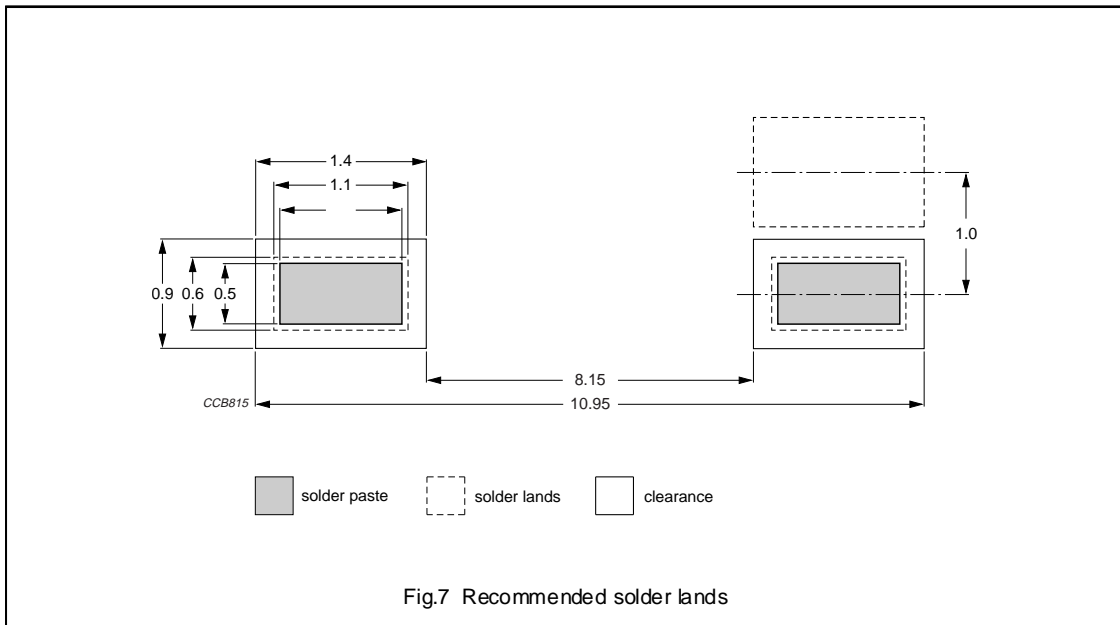


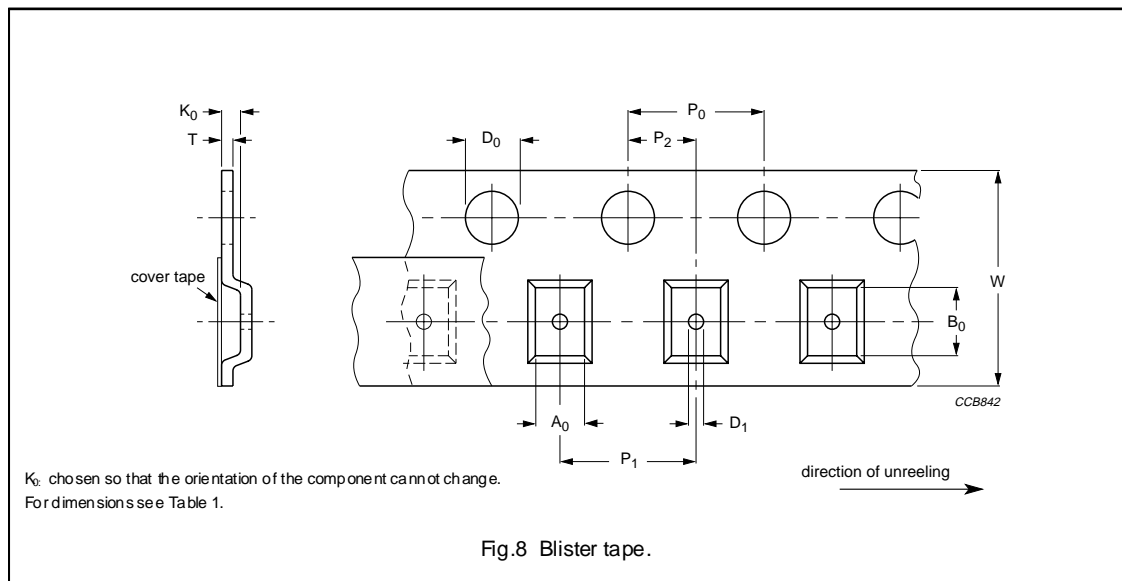
Fig.7 Recommended solder lands

**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 8 and 9, and Table 1.

**Blister tape**



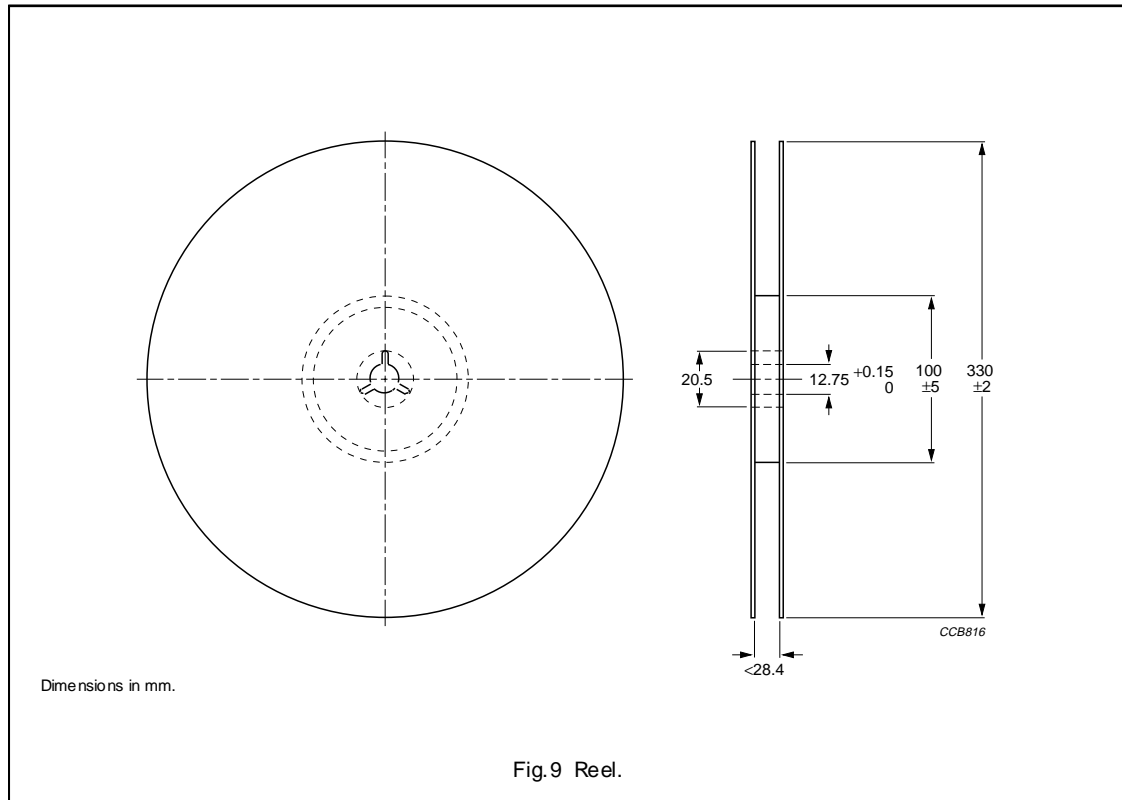
**Table 1** Dimensions of blister tape; see Fig.8

SYMBOL	DIMENSIONS	TOL.	UNIT
$A_0$	10.6	$\pm 0.1$	mm
$B_0$	14.75	$\pm 0.1$	mm
$K_0$	4.75	$\pm 0.1$	mm
$W$	24	$\pm 0.3$	mm
$D_0$	1.5	$\pm 0.1$	mm
$D_1$	1.5	$\pm 0.25$	mm
$P_0$ ; note 1	4	$\pm 0.1$	mm
$P_1$	12	$\pm 0.1$	mm
$P_2$	6	$\pm 0.1$	mm
$T$	0.3	$\pm 0.1$	mm

**Note**

- $P_0$  pitch tolerance over any 10 pitches is  $\pm 0.2$  mm.

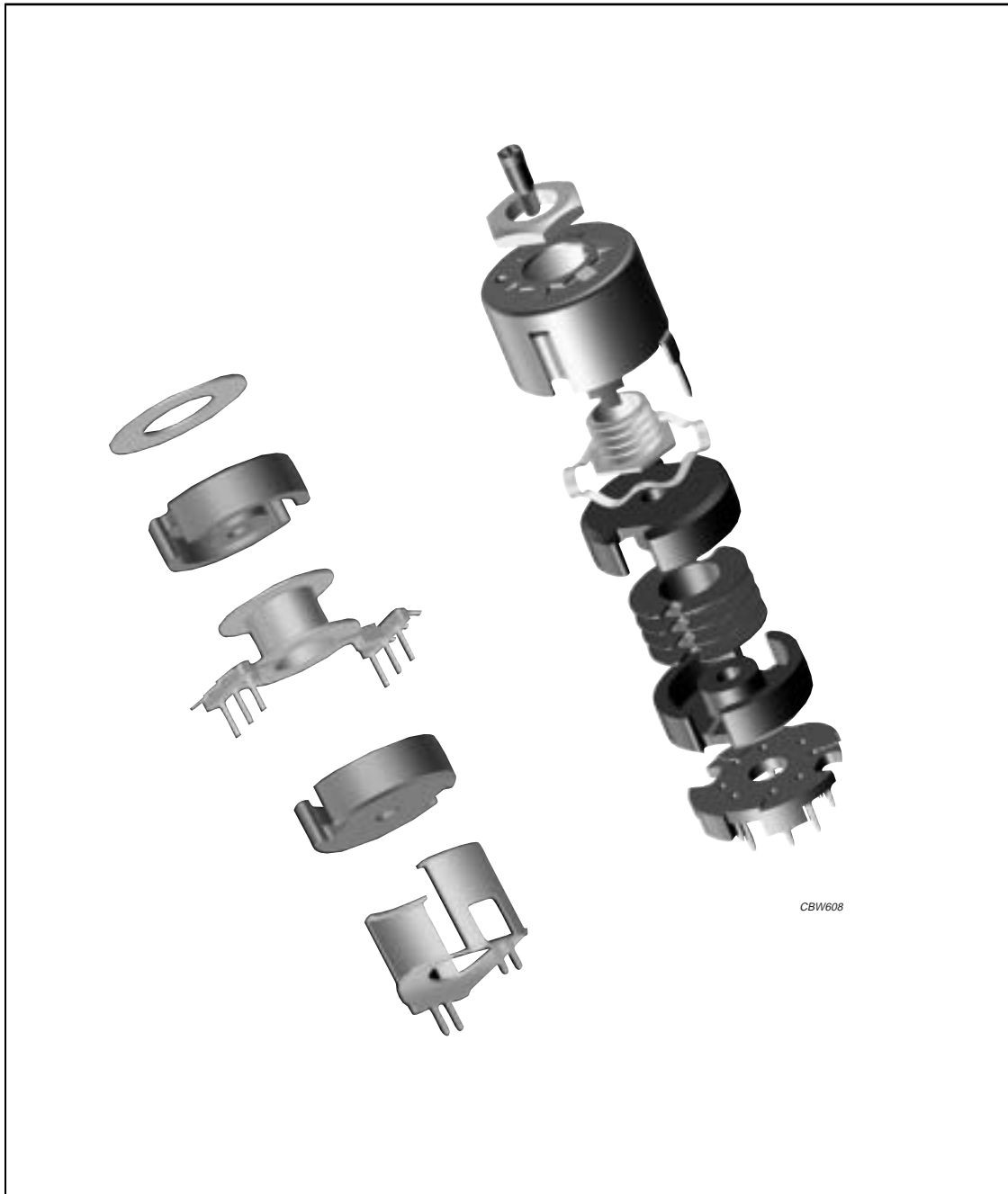


**Reel specifications****Storage requirements**

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.





Soft Ferrites

P, P/I cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview P cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
P9/5	126	10.1	0.8
P11/7	251	16.2	1.8
P11/7/l	309	19.0	1.9
P14/8	495	25.1	3.2
P14/18/l	628	29.9	3.5
P18/11	1120	43.3	6.0
P18/11/l	1270	47.5	7
P22/13	2000	63.4	12
P22/13/l	2460	73.4	13
P26/16	3530	93.9	20
P26/16/l	4370	110	21
P30/19	6190	137	34
P36/22	10700	202	54
P42/29	18200	265	104
P66/56	88200	717	550

• In accordance with IEC 60133.

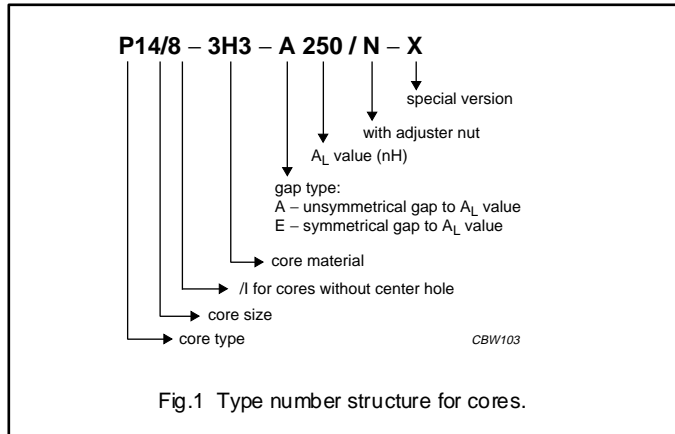


Fig.1 Type number structure for cores.

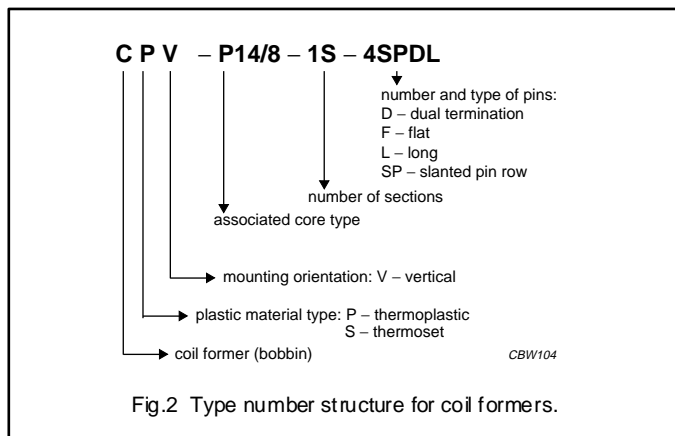


Fig.2 Type number structure for coil formers.

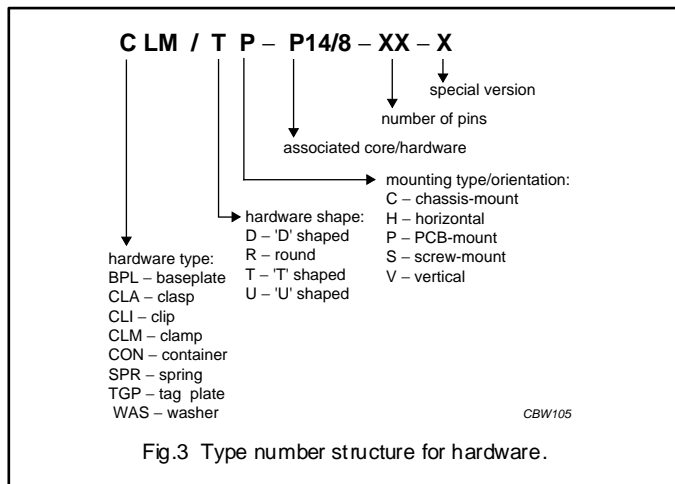
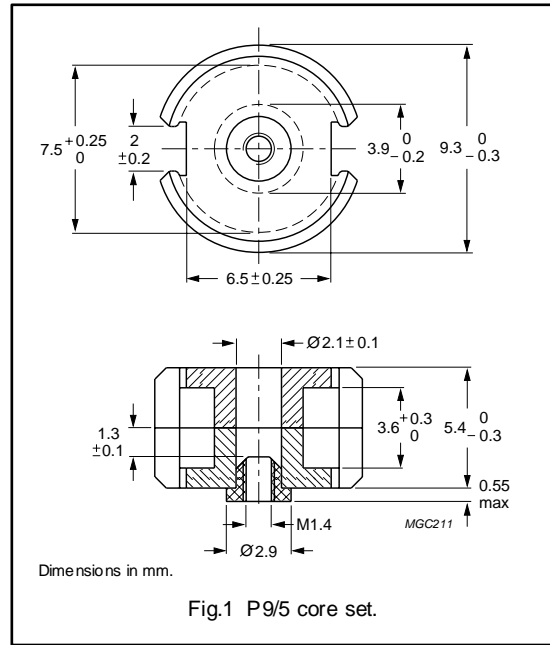


Fig.3 Type number structure for hardware.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.24	mm <sup>-1</sup>
$V_e$	effective volume	126	mm <sup>3</sup>
$l_e$	effective length	12.5	mm
$A_e$	effective area	10.1	mm <sup>2</sup>
$A_{min}$	minimum area	7.9	mm <sup>2</sup>
$m$	mass of set	≈ 0.8	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 25 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</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>sup</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
3B46 <sup>des</sup>	1550 ± 25%	≈ 1520	≈ 0	—	P9/5-3B46

**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	1350 ± 25%	≈ 1 200	≈ 0	P9/5-3C81
3C91 <sup>des</sup>	1350 ± 25%	≈ 1200	≈ 0	P9/5-3C91
3F3	1 100 ± 25%	≈ 1080	≈ 0	P9/5-3F3

## P cores and accessories

P9/5

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $25 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	2300 $\pm 25\%$	$\approx 2020$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.035$	–	–	–
3C91	$\geq 315$	–	$\leq 0.008^{(1)}$	$\leq 0.06^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.015$	–	$\leq 0.03$

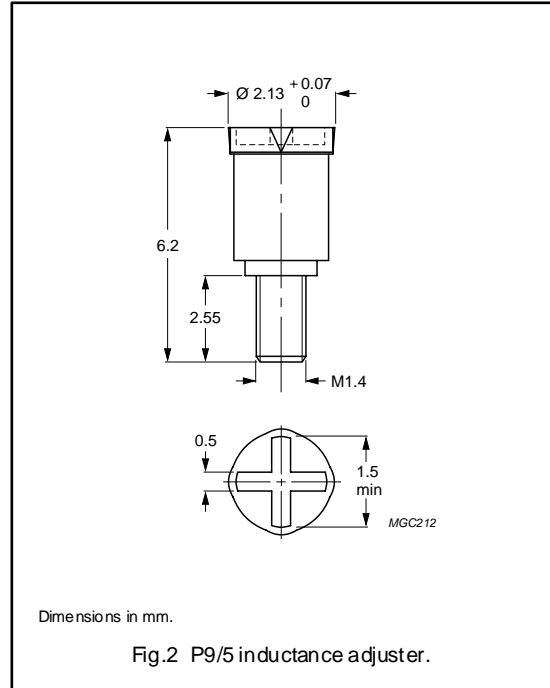
**Note**

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



**Inductance adjuster selection chart <sup>sup</sup> ( applies to all types)**

GRADE	AL (nH)	TYPES FOR LOW ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR MEDIUM ADJUSTMENT	$\Delta L/L^{(1)}$	TYPES FOR HIGH ADJUSTMENT	$\Delta L/L^{(1)}$
3D3	40	–	–	ADJ-P9/P11-YELLOW	11	–	–
	63	–	–	–	18	ADJ-P9/P11-BROWN	31

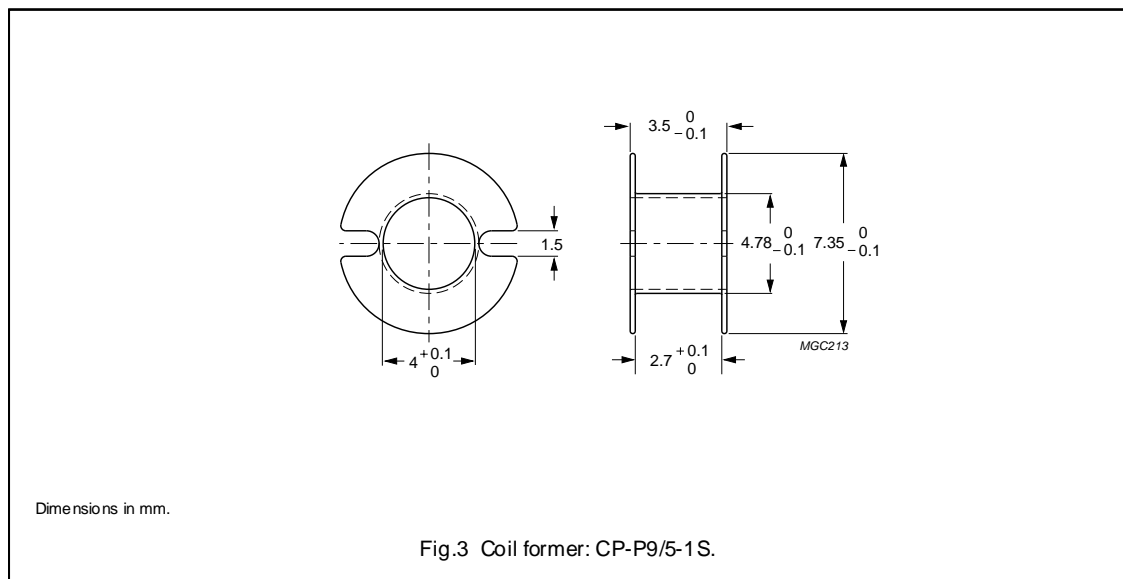
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data for coil former CP-P9/5-1S**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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



**Winding data for coil former CP-P9/5-1S**

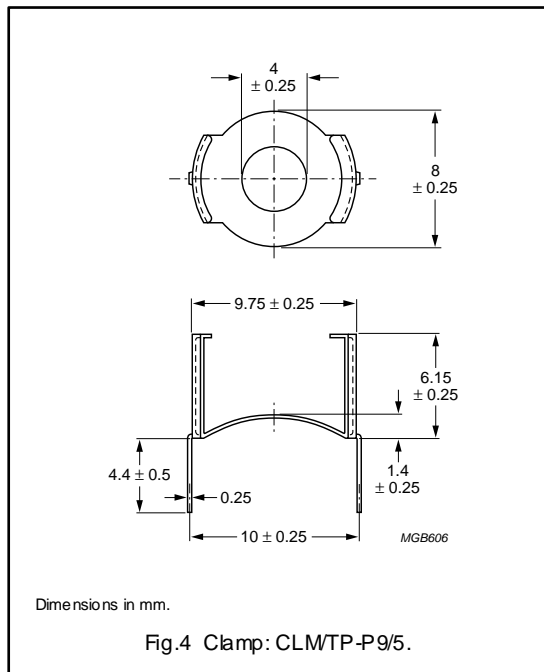
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	3.1	2.5	18.9	CP-P9/5-1S



**MOUNTING PARTS**

**General data**

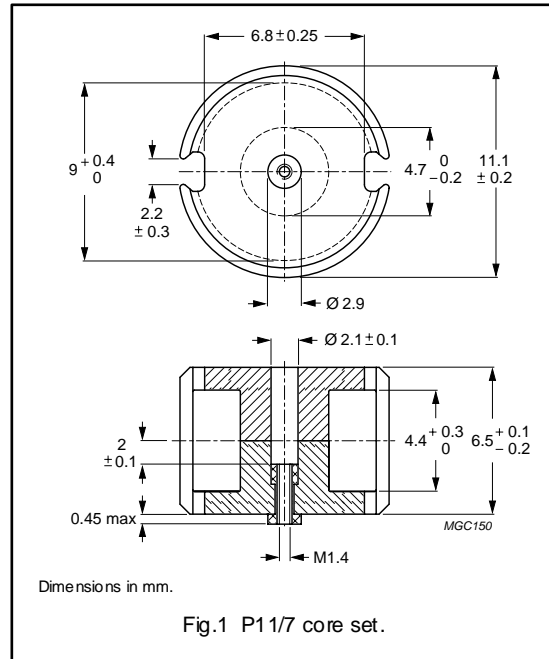
ITEM	REMARKS	FIGURE	TYPE NUMBER
Clamp	spring steel, tin plated	4	CLM/TP-P9/5



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.956	mm <sup>-1</sup>
$V_e$	effective volume	251	mm <sup>3</sup>
$l_e$	effective length	15.5	mm
$A_e$	effective area	16.2	mm <sup>2</sup>
$A_{min}$	minimum area	13.2	mm <sup>2</sup>
$m$	mass of set	≈ 1.8	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 35 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</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>sup</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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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

## P cores and accessories

P11/7

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C91 <small>des</small>	2050 $\pm$ 25%	$\approx$ 1 560	$\approx$ 0	P11/7-3C91
3F3	100 $\pm$ 3%	$\approx$ 76	$\approx$ 240	P11/7-3F3-A100
	160 $\pm$ 3%	$\approx$ 122	$\approx$ 140	P11/7-3F3-A160
	250 $\pm$ 5%	$\approx$ 190	$\approx$ 80	P11/7-3F3-A250
	1650 $\pm$ 25%	$\approx$ 1 260	$\approx$ 0	P11/7-3F3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $35 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	3400 $\pm$ 25%	$\approx$ 2600	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 0.05	–	–	–
3C91	$\geq$ 315	–	$\leq$ 0.015 <sup>(1)</sup>	$\leq$ 0.12 <sup>(1)</sup>	–
3F3	$\geq$ 315	–	$\leq$ 0.03	–	$\leq$ 0.05

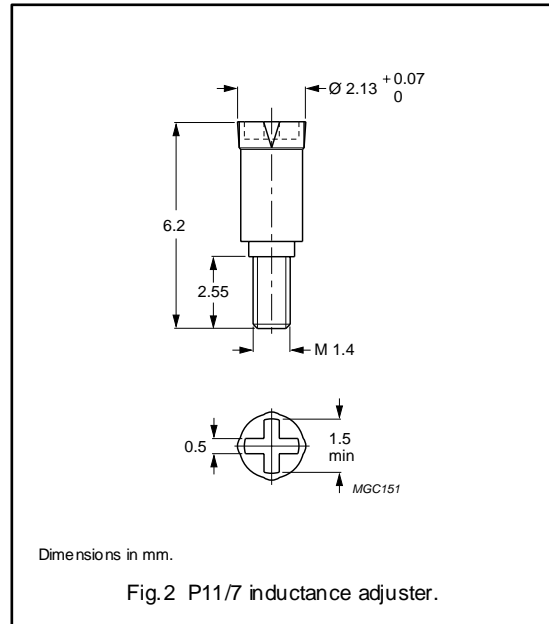
**Note**

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



**Inductance adjuster selection chart<sup>sup</sup> (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L <sup>(1)</sup>
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	–	–

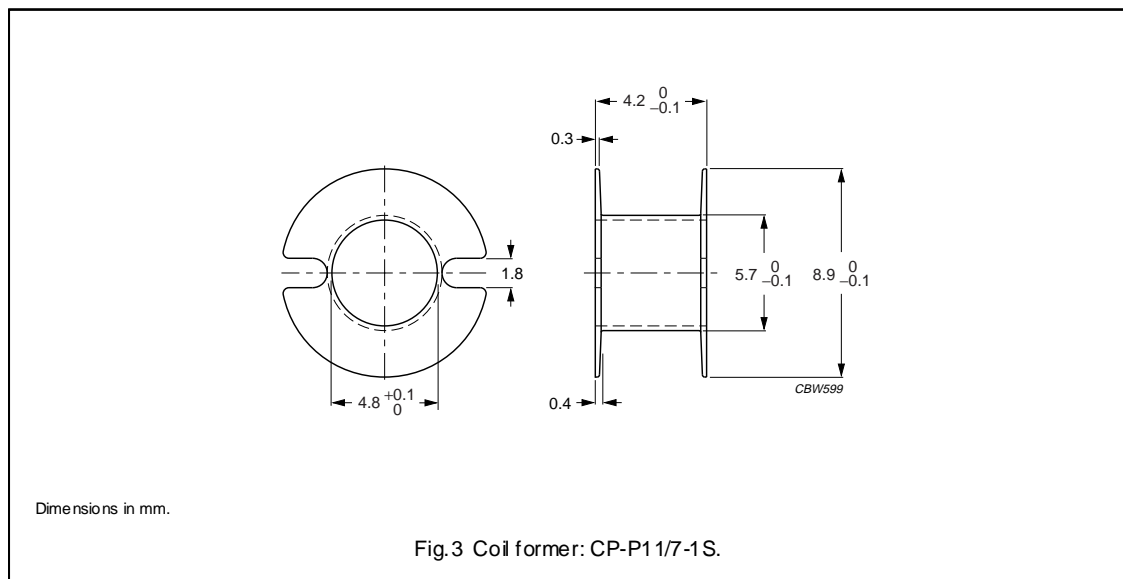
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data CP-P11/7-1S coil former**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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

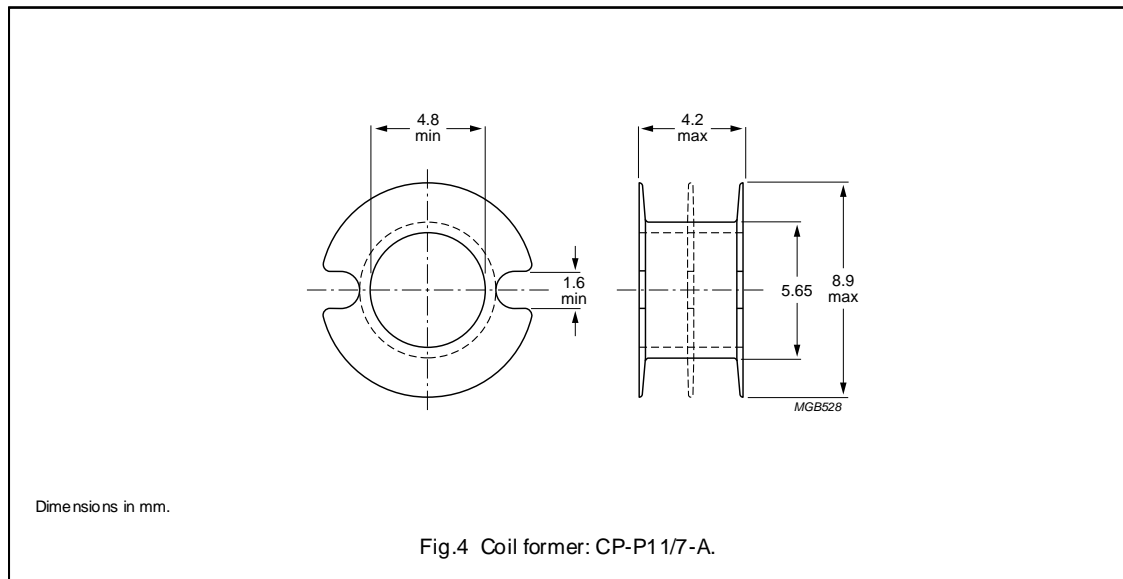


**Winding data for CP-P11/7-1S coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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



Winding data for CP-P11/7-A coil former

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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 <sup>(1)</sup>

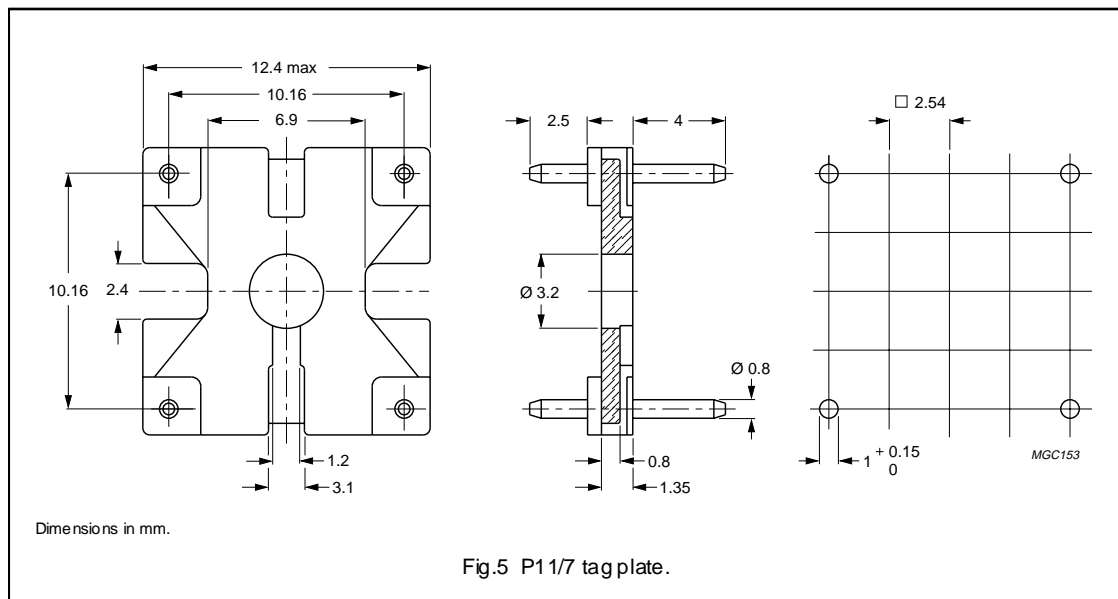
Note

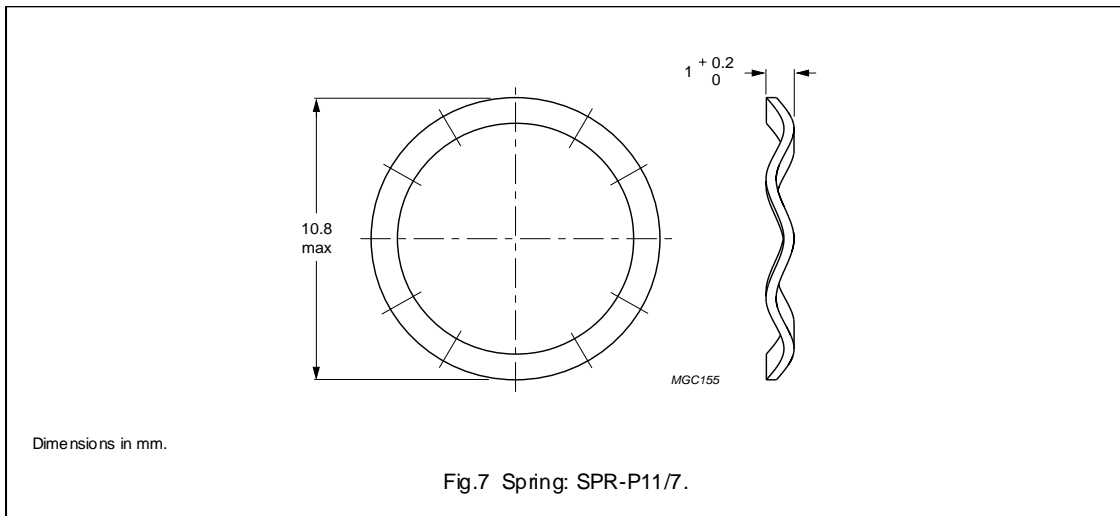
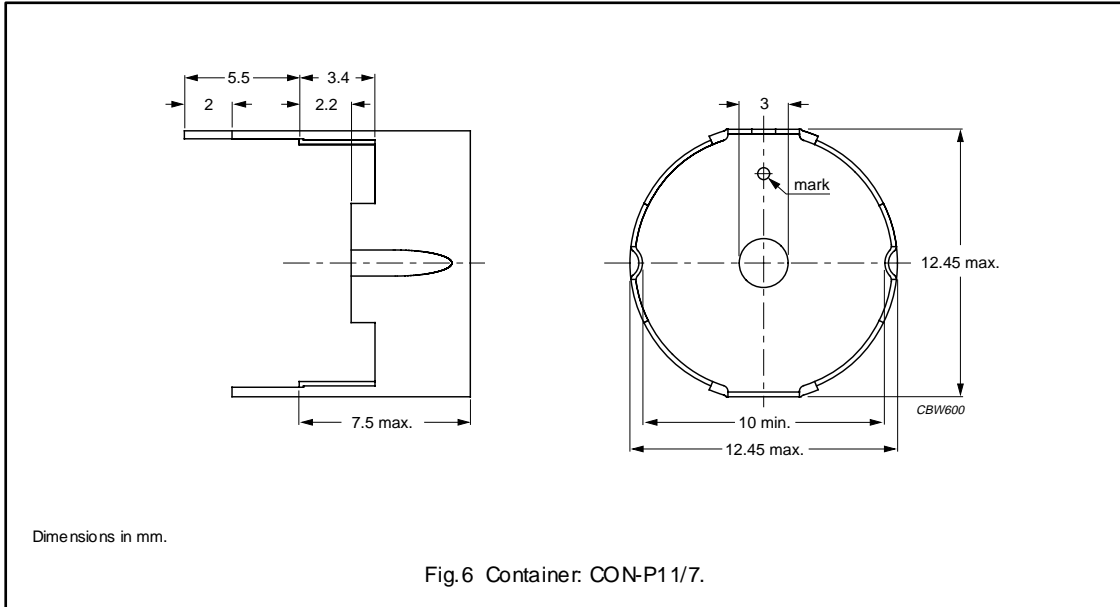
1. UL file number E93370(M).

**MOUNTING PARTS**

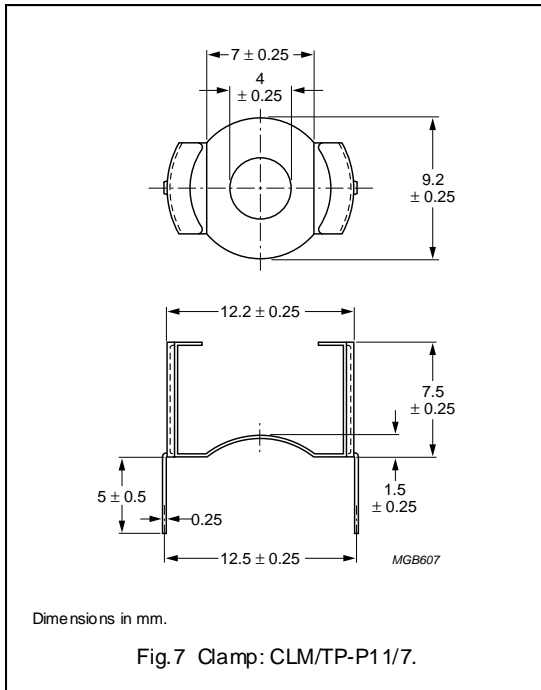
**General data**

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 E 167521(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, transition to lead-free (Sn) ongoing	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	7	CLM/TP-P11/7





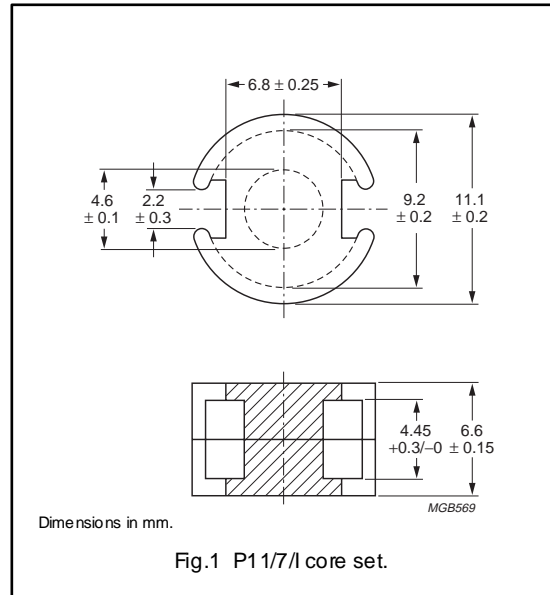




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.860	mm <sup>-1</sup>
$V_e$	effective volume	309	mm <sup>3</sup>
$l_e$	effective length	16.3	mm
$A_e$	effective area	19.0	mm <sup>2</sup>
$A_{min}$	minimum area	13.7	mm <sup>2</sup>
$m$	mass of set	≈ 1.9	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3B46 <small>des</small>	2500 ± 25%	≈ 1700	≈ 0	P11/7/I-3B46

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.07	–	–	–
3C91	≥315	–	≤ 0.016 <sup>(1)</sup>	≤ 0.12 <sup>(1)</sup>	–
3F3	≥315	–	≤ 0.04	–	≤ 0.06

**Note**

1. Measured at 60 °C.

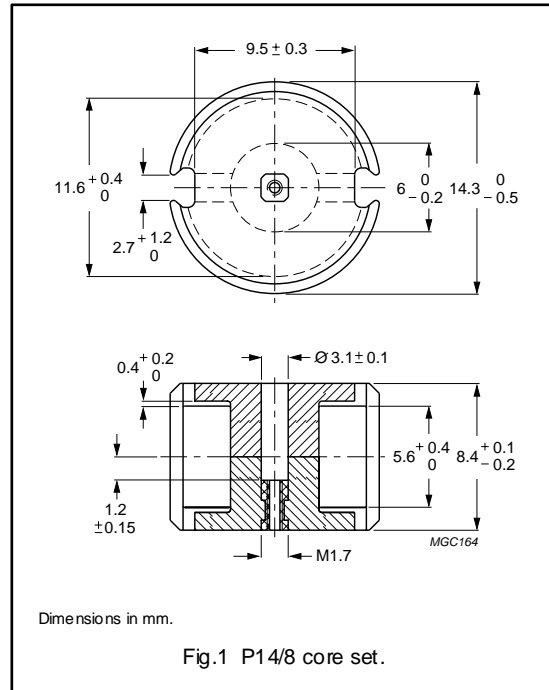
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P11/7".

**CORE SETS**

**Effective core parameters**

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



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 60 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	40 ± 3%	≈ 25	≈ 1170	P14/8-3D3-E 40/N	P14/8-3D3-E40
	63 ± 3%	≈ 40	≈ 650	P14/8-3D3-E 63/N	P14/8-3D3-E63
	100 ± 3%	≈ 63	≈ 360	P14/8-3D3-E 100/N	P14/8-3D3-E100
	1000 ± 25%	≈ 630	≈ 0	–	P14/8-3D3
3H3 <sup>sup</sup>	160 ± 3%	≈ 100	≈ 220	P14/8-3H3-A 160/N	P14/8-3H3-A160
	250 ± 3%	≈ 157	≈ 130	P14/8-3H3-A 250/N	P14/8-3H3-A250
	315 ± 3%	≈ 198	≈ 100	P14/8-3H3-A 315/N	P14/8-3H3-A315
	400 ± 3%	≈ 251	≈ 75	P14/8-3H3-A 400/N	P14/8-3H3-A400
	2150 ± 25%	≈ 1350	≈ 0	–	P14/8-3H3

## P cores and accessories

P14/8

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	$63 \pm 3\%$	$\approx 40$	$\approx 680$	P14/8-3C81-E63
	$100 \pm 3\%$	$\approx 63$	$\approx 390$	P14/8-3C81-A100
	$160 \pm 3\%$	$\approx 100$	$\approx 220$	P14/8-3C81-A160
	$250 \pm 3\%$	$\approx 157$	$\approx 130$	P14/8-3C81-A250
	$315 \pm 3\%$	$\approx 198$	$\approx 100$	P14/8-3C81-A315
	$2800 \pm 25\%$	$\approx 1760$	$\approx 0$	P14/8-3C81
3C91 <small>des</small>	$2800 \pm 25\%$	$\approx 1760$	$\approx 0$	P14/8-3C91
3F3	$63 \pm 3\%$	$\approx 40$	$\approx 680$	P14/8-3F3-E63
	$100 \pm 3\%$	$\approx 63$	$\approx 390$	P14/8-3F3-A100
	$160 \pm 3\%$	$\approx 100$	$\approx 220$	P14/8-3F3-A160
	$250 \pm 3\%$	$\approx 157$	$\approx 130$	P14/8-3F3-A250
	$315 \pm 3\%$	$\approx 198$	$\approx 100$	P14/8-3F3-A315
	$2000 \pm 25\%$	$\approx 1260$	$\approx 0$	P14/8-3F3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$5750 \pm 25\%$	$\approx 3610$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.1$	–	–	–
3C91	$\geq 315$	–	$\leq 0.03^{(1)}$	$\leq 0.22^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.06$	–	$\leq 0.1$

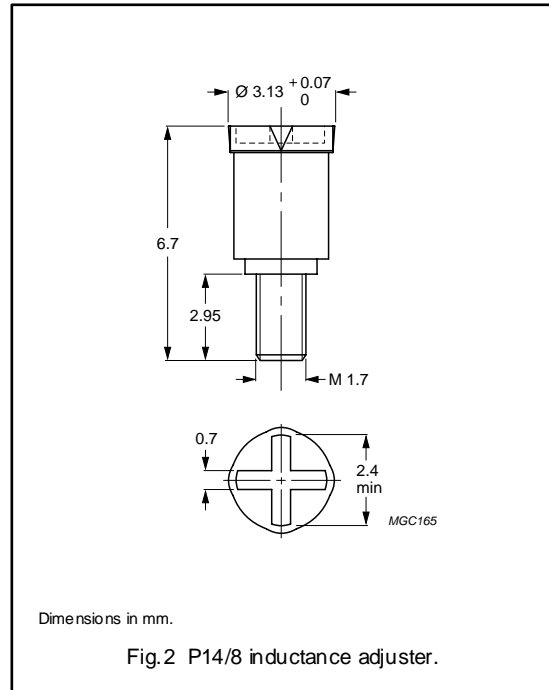
**Note**

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



**Inductance adjuster selection chart<sup>sup</sup> (applies to all types)**

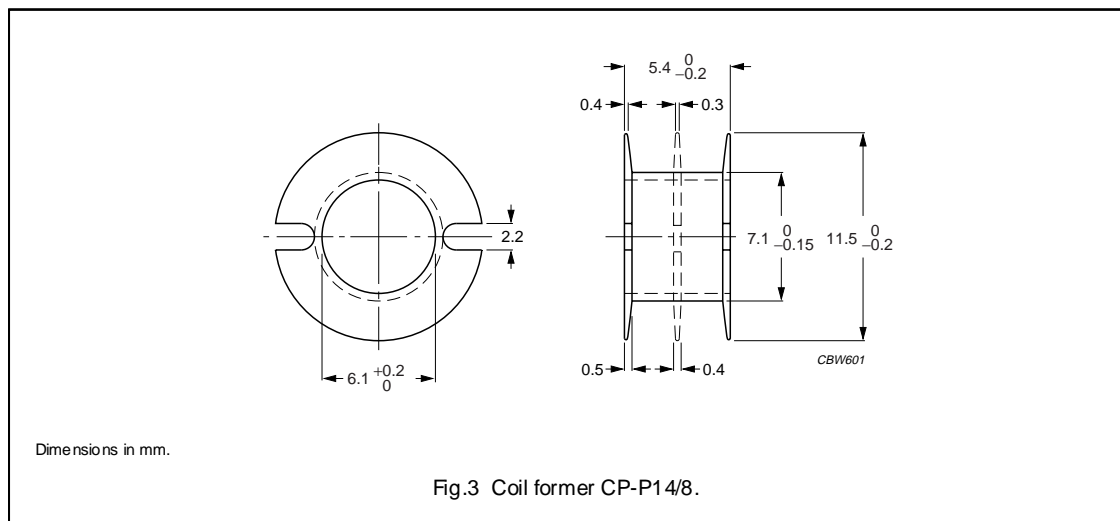
GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L <sup>(1)</sup>
3H3	100	–	–	ADJ-P14-ORANGE	14	–	–
	160	–	–	ADJ-P14-WHITE	17	ADJ-P14-BROWN	24
	250	ADJ-P14-WHITE	10	ADJ-P14-BROWN	15	–	–
	315	ADJ-P14-WHITE	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**

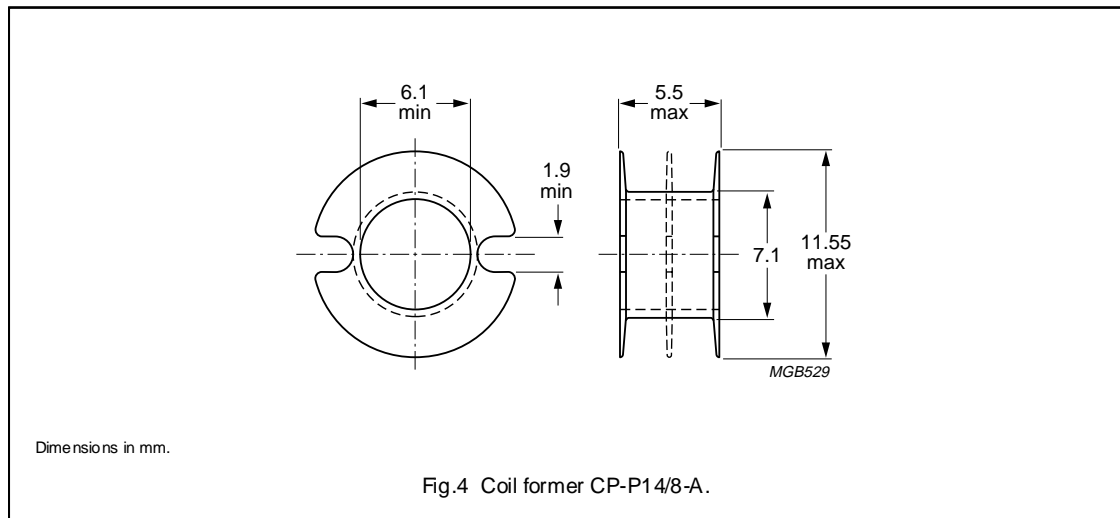
PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (PBT), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E45329 (R)
Maximum operating temperature	155 °C, "IEC 60085", class F

**Winding data for CP-P14/8 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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	155 °C, "IEC 60085", class F



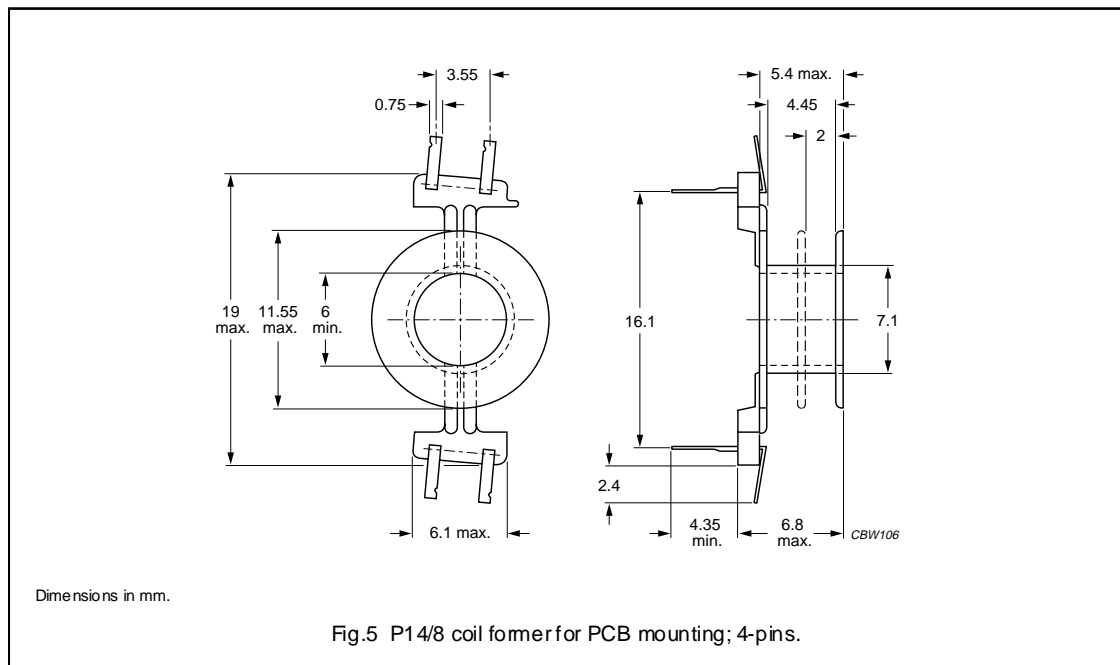
**Winding data for CP-P14/8-A coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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

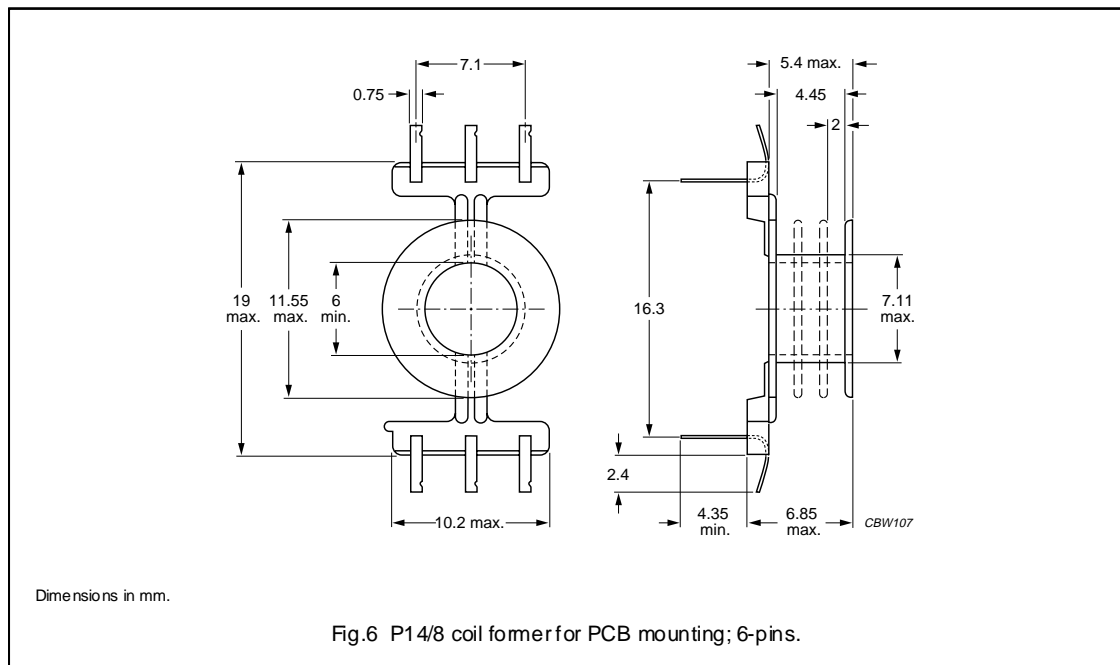


**Data for 4-pins P14/8 coil former for PCB mounting**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



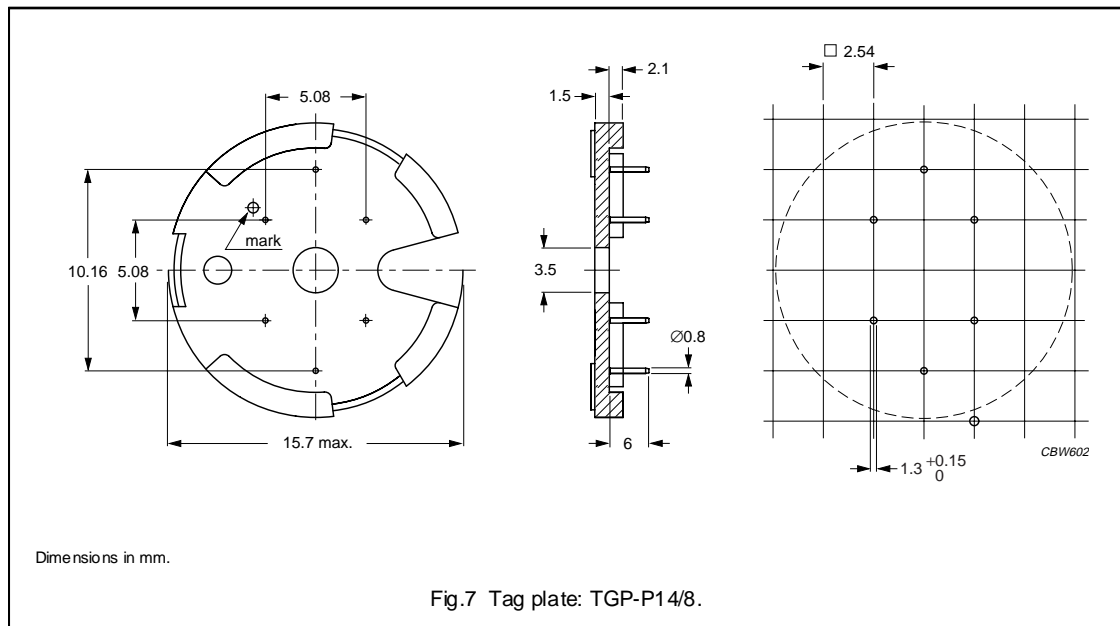
**Data for 6-pins P14/8 coil former for PCB mounting**

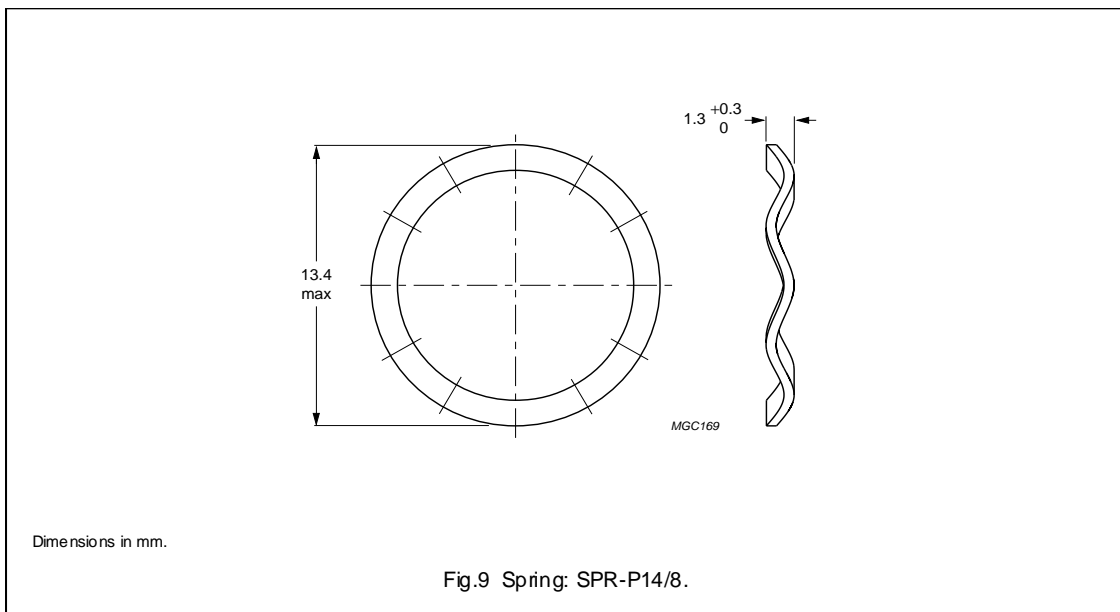
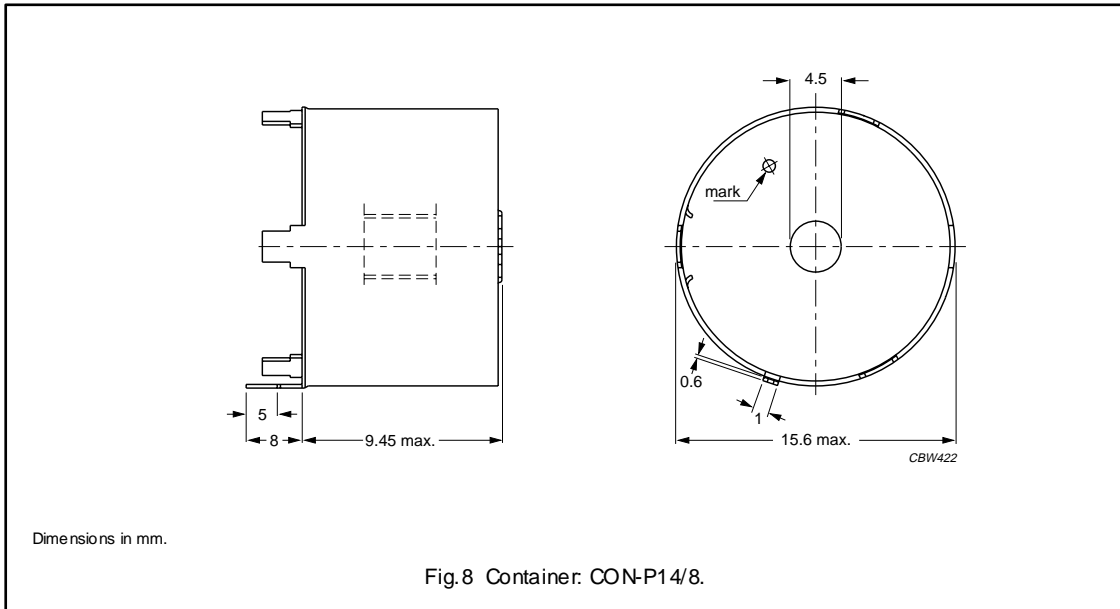
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	8.65	4.4	29.0	4.4	CPV-P14/8-1S-6PD
1	8.65	4.4	29.0	6.8	CPV-P14/8-1S-6PDL
2	2 × 3.87	2 × 2.0	29.0	4.4	CPV-P14/8-2S-6PD
2	2 × 3.87	2 × 2.0	29.0	6.8	CPV-P14/8-2S-6PDL

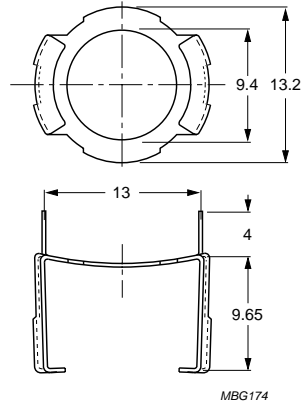
**MOUNTING PARTS**

**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, transition to lead-free (Sn) ongoing	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

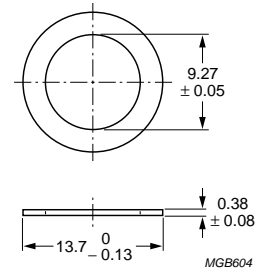






Dimensions in mm.

Fig.10 Clamp: CLMTP-P14/8.



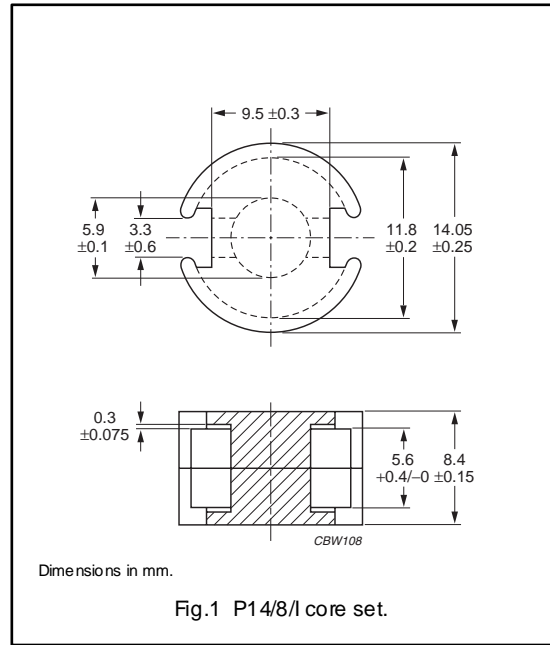
Dimensions in mm.

Fig.11 Washer: WAS-CLM/TP-P14/8.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.700	mm <sup>-1</sup>
$V_e$	effective volume	628	mm <sup>3</sup>
$l_e$	effective length	21.0	mm
$A_e$	effective area	29.9	mm <sup>2</sup>
$A_{min}$	minimum area	23.6	mm <sup>2</sup>
$m$	mass of set	≈ 3.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 15 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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%	≈ 1 620	≈ 0	P14/8/I-3C81
3C91 <small>des</small>	2900 ± 25%	≈ 1 620	≈ 0	P14/8/I-3C91
3F3	100 ± 3%	≈ 56	≈ 470	P14/8/I-3F3-A 100
	160 ± 3%	≈ 89	≈ 270	P14/8/I-3F3-A 160
	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%	≈ 1 340	≈ 0	P14/8/I-3F3

## P cores and accessories

P14/8/I

## Core sets for filter applications

Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3B46 <small>des</small>	$3600 \pm 25\%$	$\approx 2010$	$\approx 0$	P14/8/I-3B46

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.15$	–	–	–
3C91	$\geq 315$	–	$\leq 0.032^{(1)}$	$\leq 0.24^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.07$	–	$\leq 0.12$

## Note

1. Measured at 60 °C.

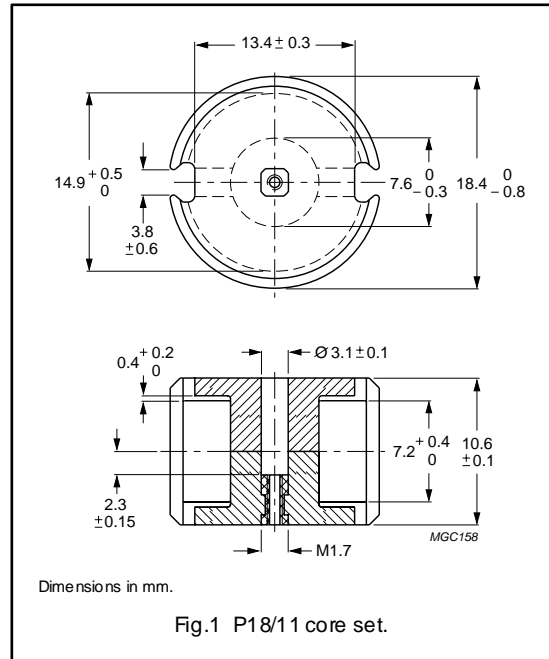
## BOBBINS AND ACCESSORIES

For coil formers, winding data and mounting parts, see data sheet, "P14/8".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.597	mm <sup>-1</sup>
$V_e$	effective volume	1120	mm <sup>3</sup>
$l_e$	effective length	25.8	mm
$A_e$	effective area	43.3	mm <sup>2</sup>
$A_{min}$	minimum area	36.0	mm <sup>2</sup>
$m$	mass of set	≈6.0	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 80 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</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>sup</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



## P cores and accessories

P18/11

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $80 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	100 $\pm 3\%$	$\approx 47$	$\approx 710$	P18/11-3C81-E100
	160 $\pm 3\%$	$\approx 76$	$\approx 400$	P18/11-3C81-A160
	250 $\pm 3\%$	$\approx 119$	$\approx 240$	P18/11-3C81-A250
	315 $\pm 3\%$	$\approx 149$	$\approx 180$	P18/11-3C81-A315
	400 $\pm 3\%$	$\approx 190$	$\approx 140$	P18/11-3C81-A400
	4000 $\pm 25\%$	$\approx 1900$	$\approx 0$	P18/11-3C81
3C91 <small>des</small>	4000 $\pm 25\%$	$\approx 1900$	$\approx 0$	P18/11-3C91
3F3	100 $\pm 3\%$	$\approx 47$	$\approx 710$	P18/11-3F3-E100
	160 $\pm 3\%$	$\approx 76$	$\approx 400$	P18/11-3F3-A160
	250 $\pm 3\%$	$\approx 119$	$\approx 240$	P18/11-3F3-A250
	315 $\pm 3\%$	$\approx 149$	$\approx 180$	P18/11-3F3-A315
	400 $\pm 3\%$	$\approx 190$	$\approx 140$	P18/11-3F3-A400
	2850 $\pm 25\%$	$\approx 1350$	$\approx 0$	P18/11-3F3

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	7500 $\pm 25\%$	$\approx 3560$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.26$	–	–	–
3C91	$\geq 315$	–	$\leq 0.07^{(1)}$	$\leq 0.45^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.13$	–	$\leq 0.22$

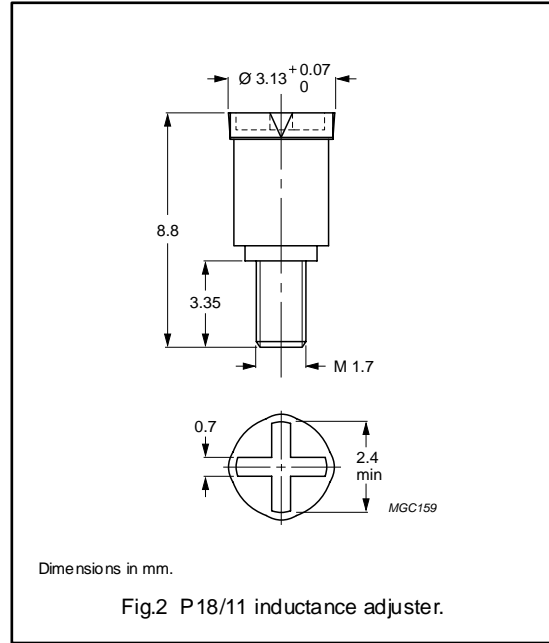
**Note**

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



**Inductance adjuster selection chart <sup>sup</sup> (applies to all types)**

GRADE	AL (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	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	–	–	–	–
3D3	1250	–	–	–	–	–	–
	40	–	–	–	–	ADJ-P18-YELLOW	19
	63	–	–	ADJ-P18-YELLOW	17	–	–
	100	–	–	–	–	ADJ-P18-RED	26
	160	–	–	ADJ-P18-RED	15	–	–

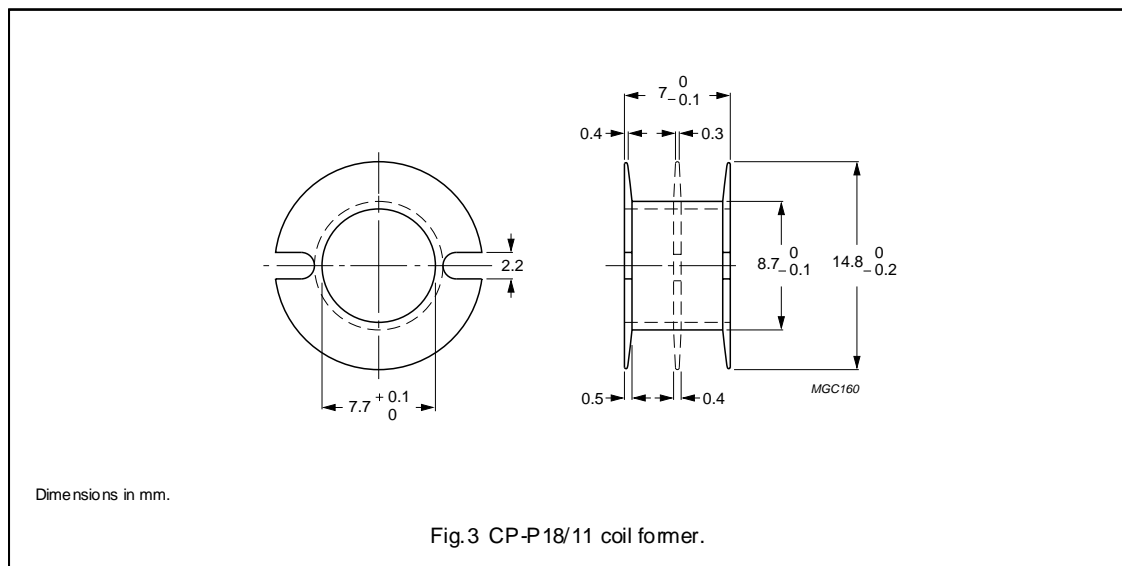
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data CP-P18/11**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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

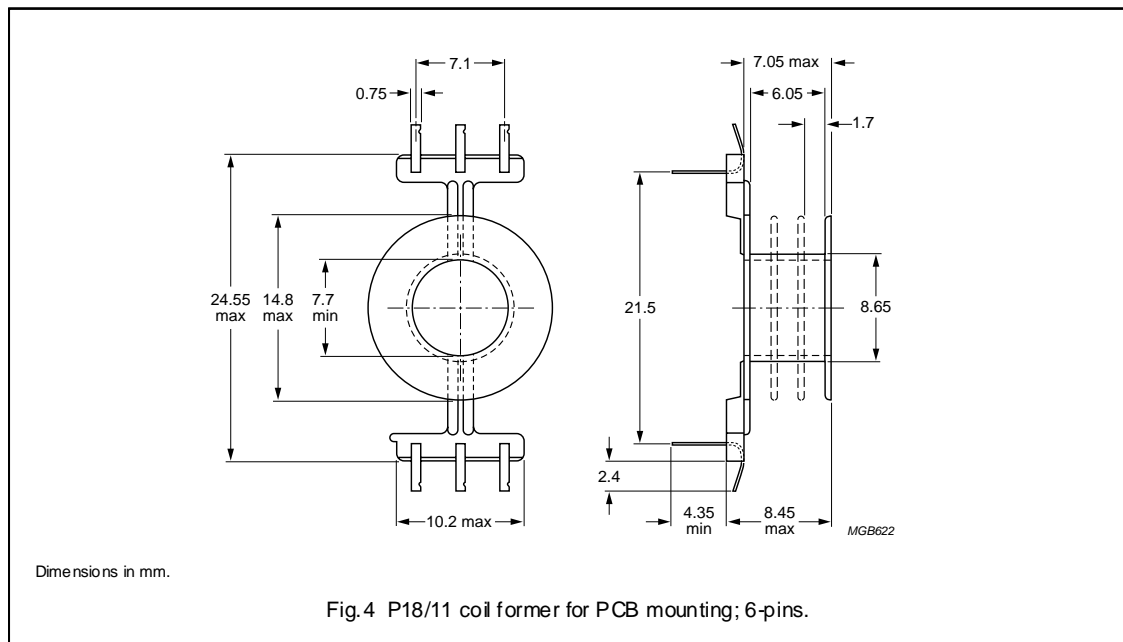


**Winding data for CP-P18/11 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



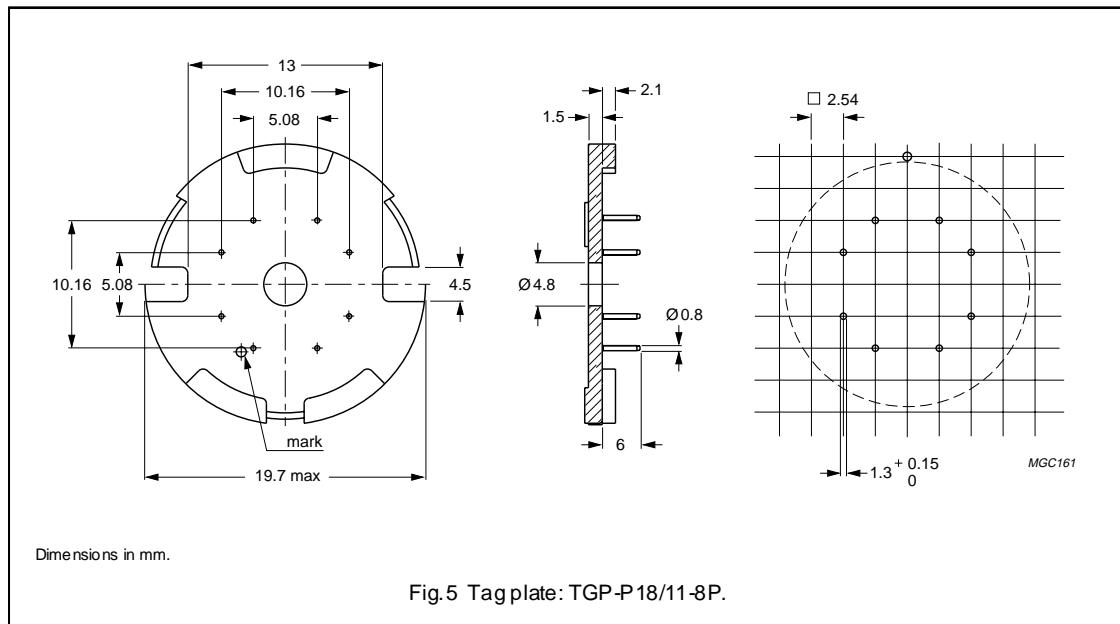
**Data for 6-pins P18/11 coil former for PCB mounting**

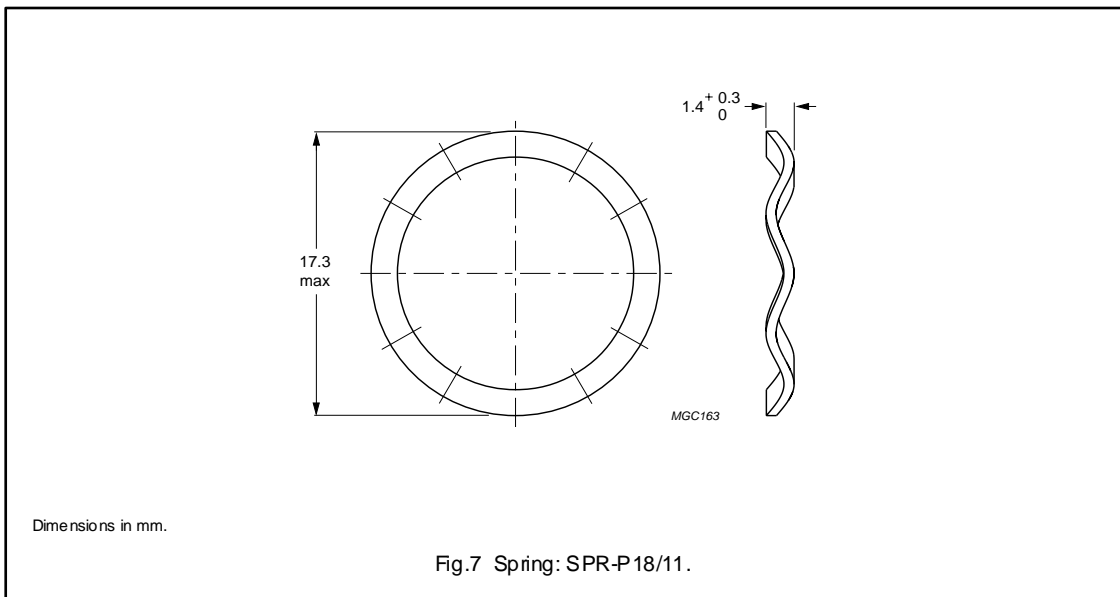
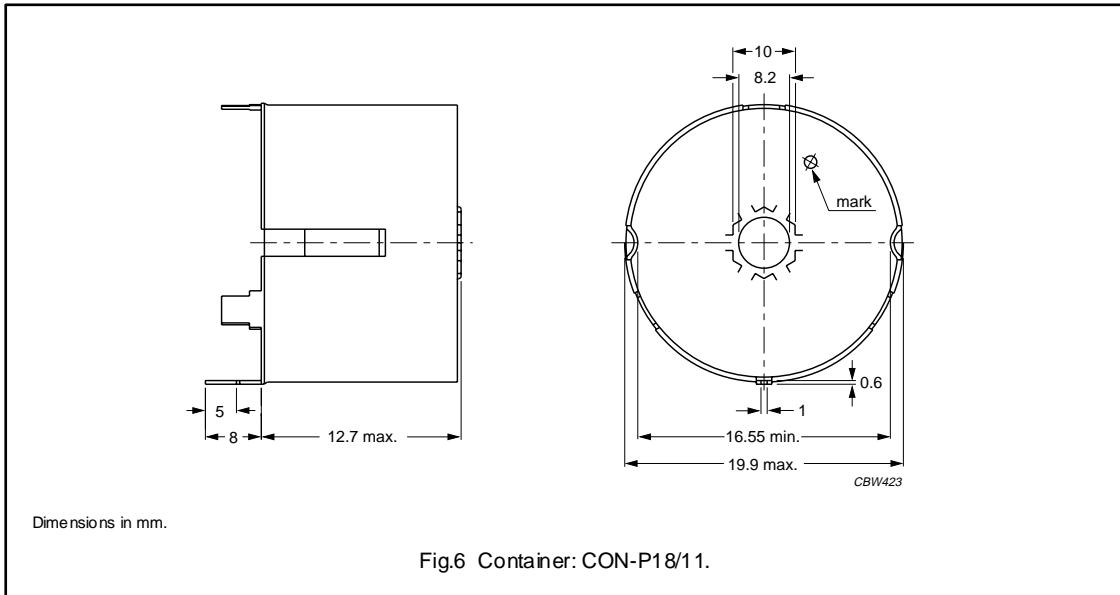
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	LENGTH OF PINS (mm)	TYPE NUMBER
1	16.8	6.0	36.7	4.4	CPV-P18/11-1S-6PD
1	16.8	6.0	36.7	6.8	CPV-P18/11-1S-6PDL
2	2 × 7.61	2 × 2.8	36.7	4.4	CPV-P18/11-2S-6PD
2	2 × 7.61	2 × 2.8	36.7	6.8	CPV-P18/11-2S-6PDL
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

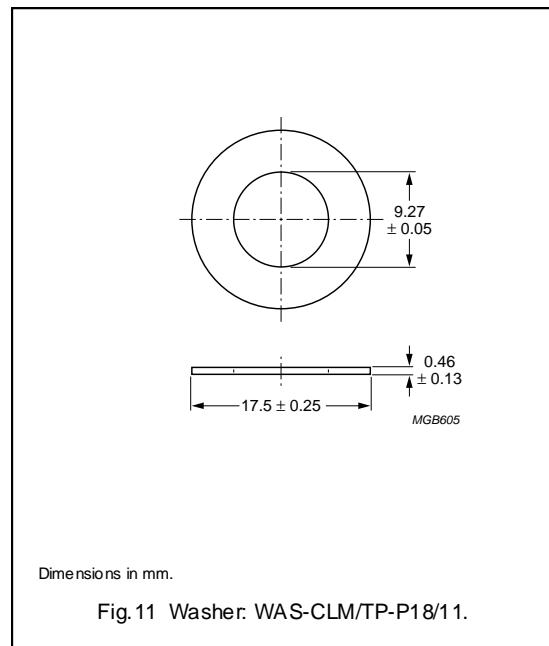
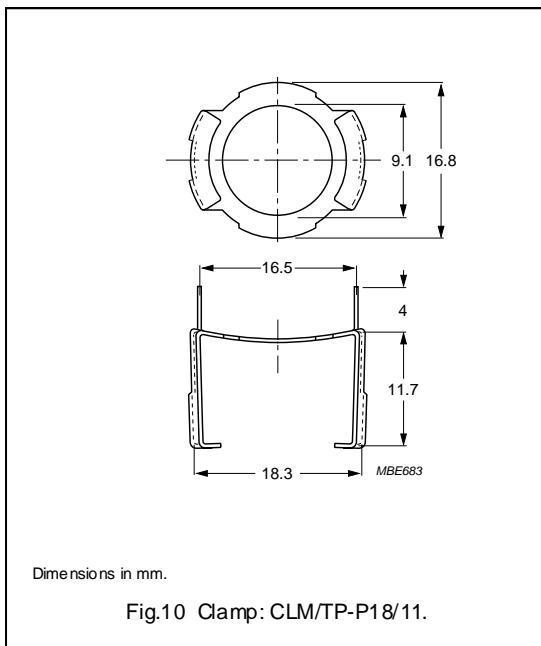
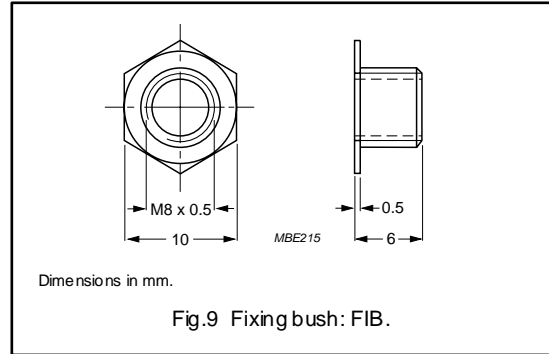
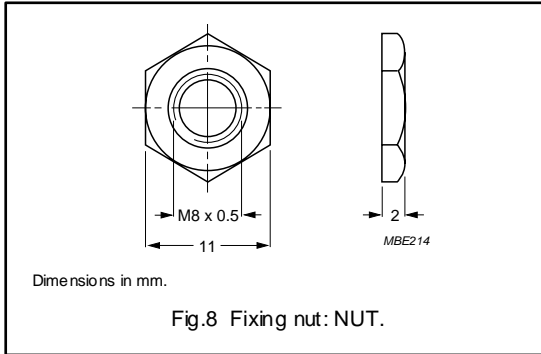
**MOUNTING PARTS**

**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, transition to lead-free (Sn) ongoing	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



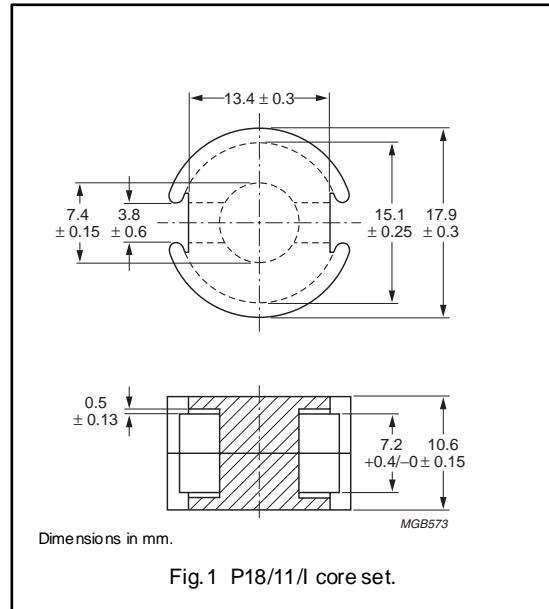




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.560	mm <sup>-1</sup>
$V_e$	effective volume	1270	mm <sup>3</sup>
$l_e$	effective length	26.7	mm
$A_e$	effective area	47.5	mm <sup>2</sup>
$A_{min}$	minimum area	37.5	mm <sup>2</sup>
$m$	mass of set	≈ 7	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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



**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.3	–	–	–
3C91	≥315	–	≤ 0.08 <sup>(1)</sup>	≤ 0.5 <sup>(1)</sup>	–
3F3	≥315	–	≤ 0.14	–	≤ 0.24

**Note**

1. Measured at 60 °C.

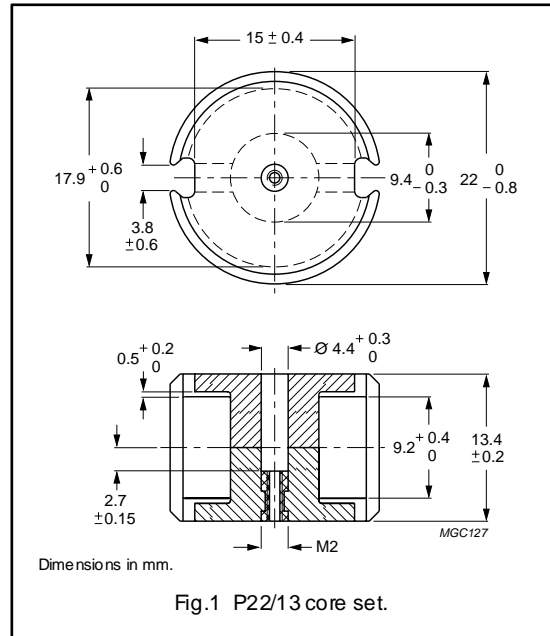
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P18/11".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.497	mm <sup>-1</sup>
$V_e$	effective volume	2000	mm <sup>3</sup>
$l_e$	effective length	31.5	mm
$A_e$	effective area	63.4	mm <sup>2</sup>
$A_{min}$	minimum area	50.9	mm <sup>2</sup>
$m$	mass of set	≈ 12	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 140 ±30 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</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>sup</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

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements, 140 ±30 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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 <small>des</small>	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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.46	–	–	–
3C91	≥315	–	≤0.12 <sup>(1)</sup>	≤0.9 <sup>(1)</sup>	–
3F3	≥315	–	≤0.22	–	≤0.4

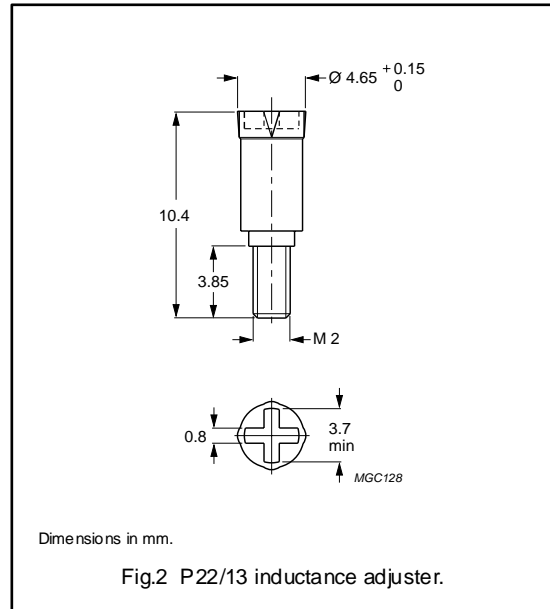
**Note**

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



**Inductance adjuster selection chart <sup>sup</sup>( applies to all types)**

GRADE	A <sub>L</sub> (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/RM8-RED	16	ADJ-P22/RM8-YELLOW	27
	160	ADJ-P22/RM8-RED	10	ADJ-P22/RM8-YELLOW	17	–	–
	250	ADJ-P22/RM8-YELLOW	–	–	–	–	–

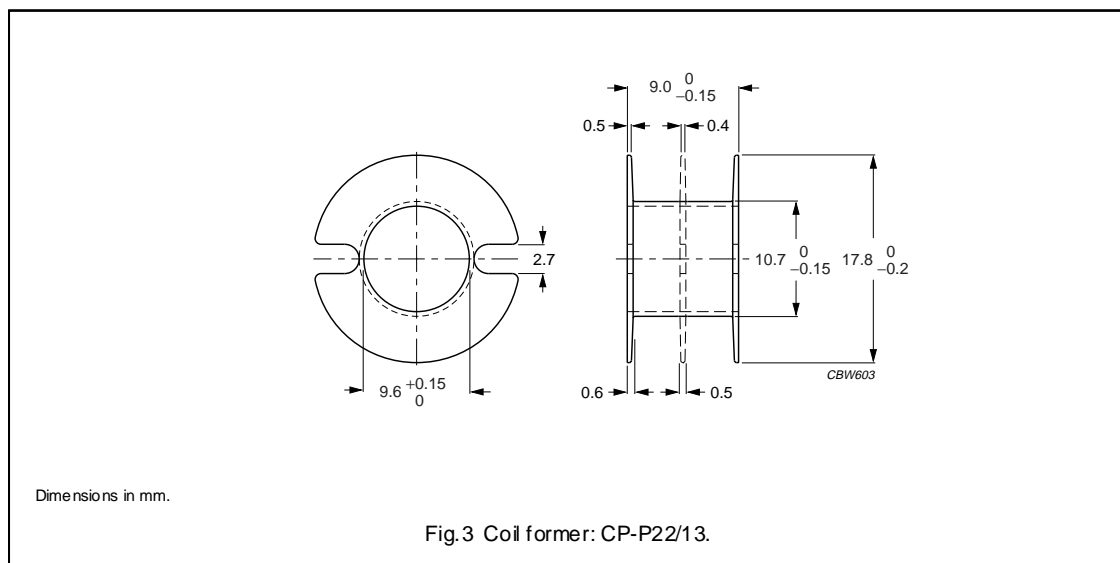
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data CP-P22/13 coil former**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (PBT), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E 45329 (R)
Maximum operating temperature	155 °C, "IEC 60085", class F



**Winding data for CP-P22/13 coil former**

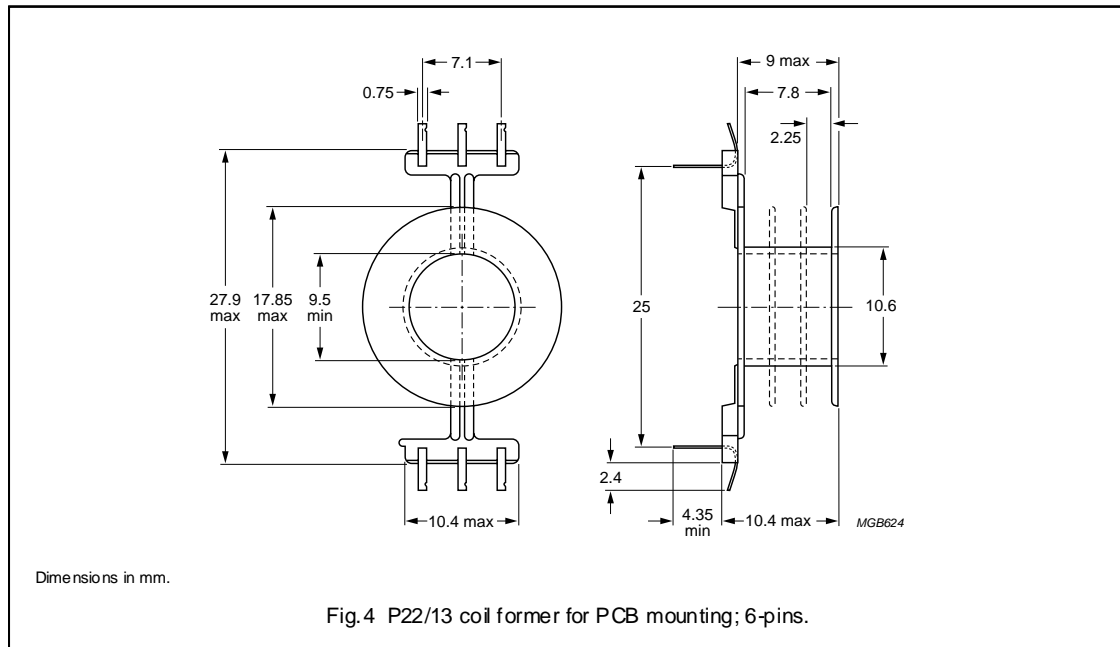
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	26.2	7.5	44.5	CP-P22/13-1S
2	2 × 12.2	2 × 3.45	44.5	CP-P22/13-2S
3	3 × 7.6	3 × 2.1	44.5	CP-P22/13-3S

P cores and accessories

P22/13

General data 6-pins P22/13 coil former for PCB mounting

PARAMETER	SPECIFICATION
Coil former material	polyamide (PA6.6), glass reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E41938(M)
Maximum operating temperature	130 °C, "IEC 60085", class B
Pin material	copper-zinc alloy (CuZn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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



Data for 6-pins P22/13 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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 <sup>(1)</sup>
3	3 × 7.03	3 × 2.2	44.5	6.8	CPV-P22/13-3S-6PDL <sup>(1)</sup>

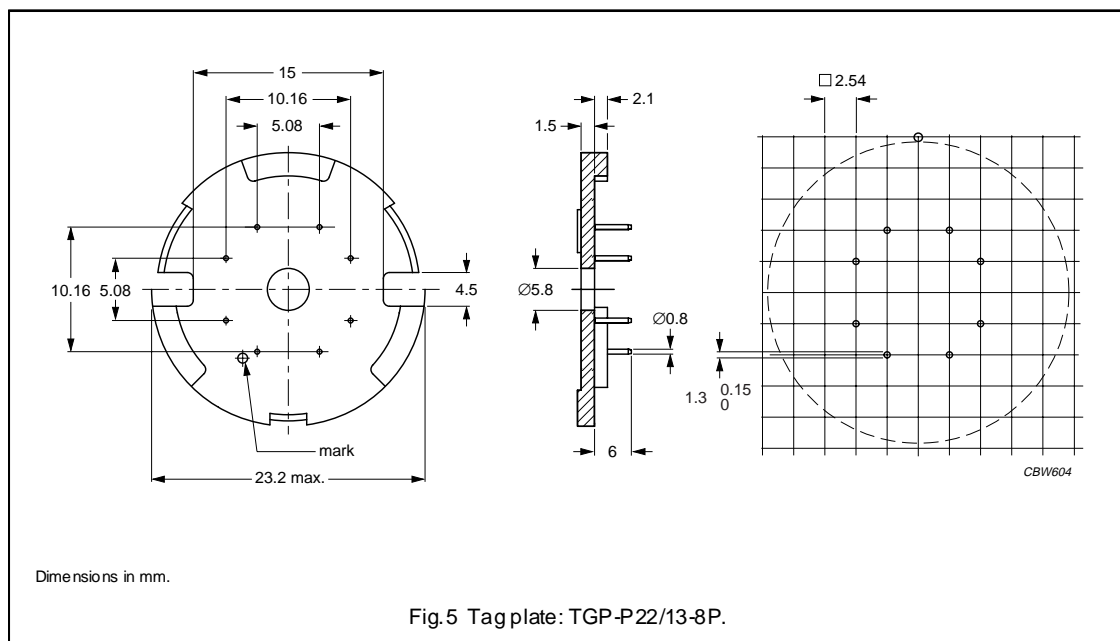
Note

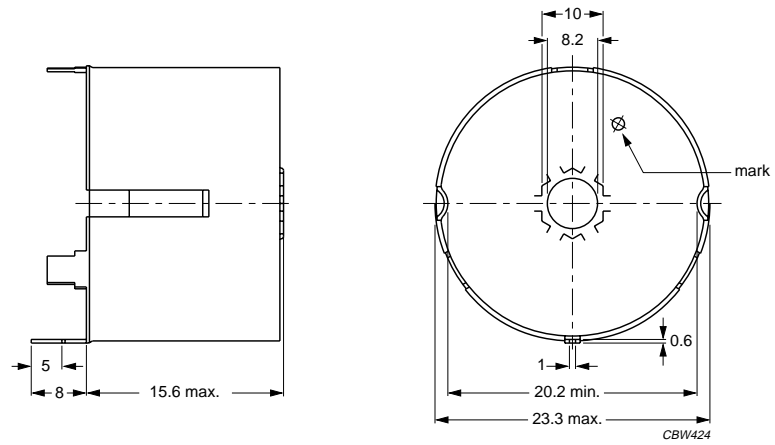
1. In accordance with "UL 94-HB".

**MOUNTING PARTS**

**General data and ordering information**

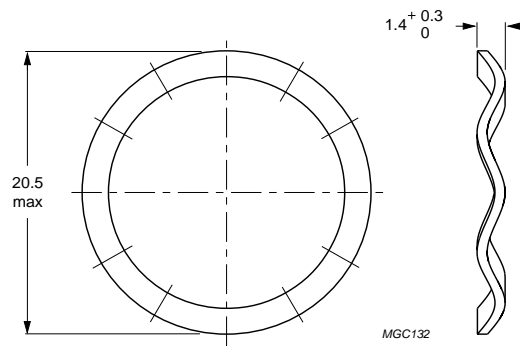
ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P22/13-8P
	flame retardant: in accordance with "UL 94V-0"; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, "IEC 60085", class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) 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, transition to lead-free (Sn) ongoing	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.

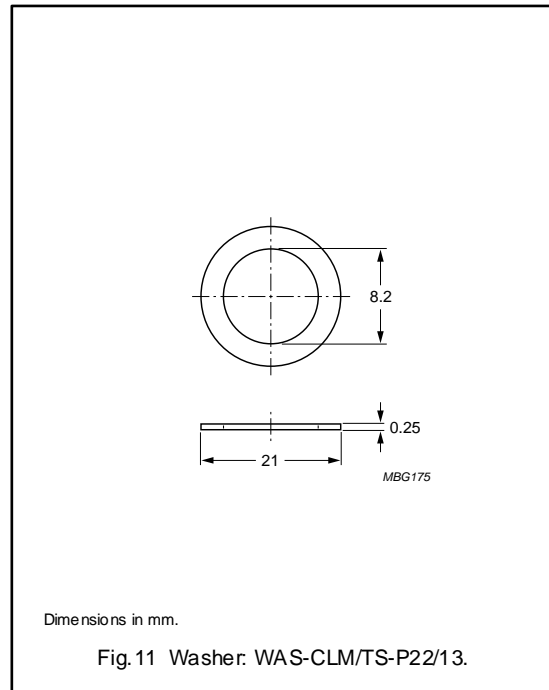
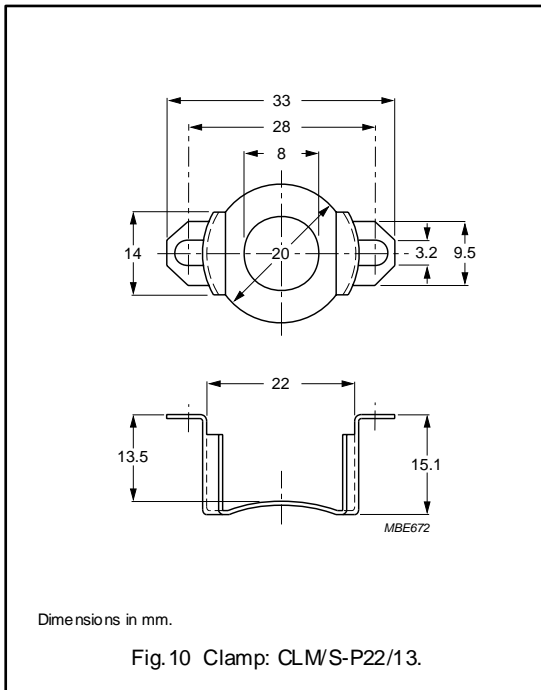
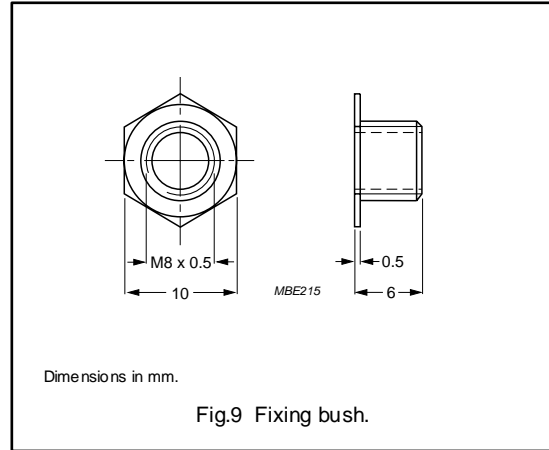
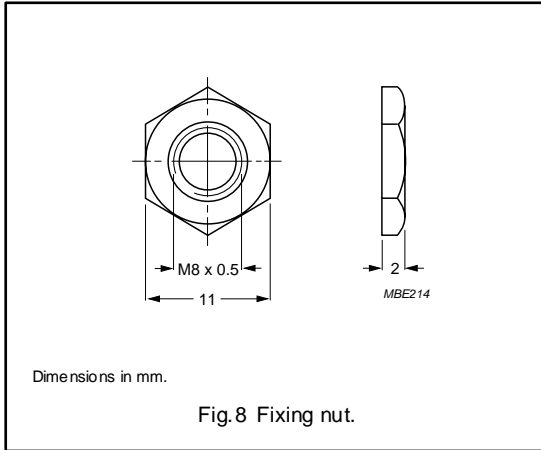
Fig.6 Container: CON-P22/13.



Dimensions in mm.

Fig.7 Spring: SPR-P22/13.

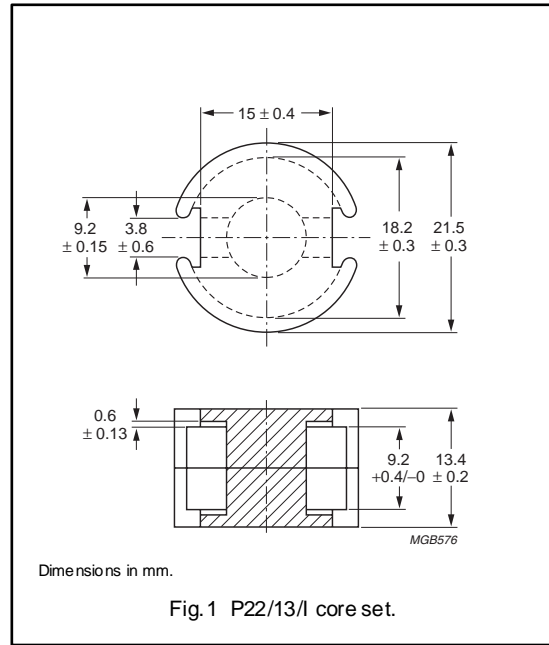




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.450	mm <sup>-1</sup>
$V_e$	effective volume	2460	mm <sup>3</sup>
$l_e$	effective length	33.3	mm
$A_e$	effective area	73.4	mm <sup>2</sup>
$A_{min}$	minimum area	58.1	mm <sup>2</sup>
$m$	mass of set	≈ 13	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 40 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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
	1 000 ± 5%	≈ 361	≈ 85	P22/13/I-3C81-A1000
	5330 ± 25%	≈ 1920	≈ 0	P22/13/I-3C81
3C91 <small>des</small>	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
	1 000 ± 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; B = 200 mT; T = 100 °C	f <sub>x</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>x</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>x</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.57	–	–	–
3C91	≥315	–	≤0.13 <sup>(1)</sup>	≤0.92 <sup>(1)</sup>	–
3F3	≥315	–	≤0.27	–	≤0.47

**Note**

1. Measured at 60 °C.

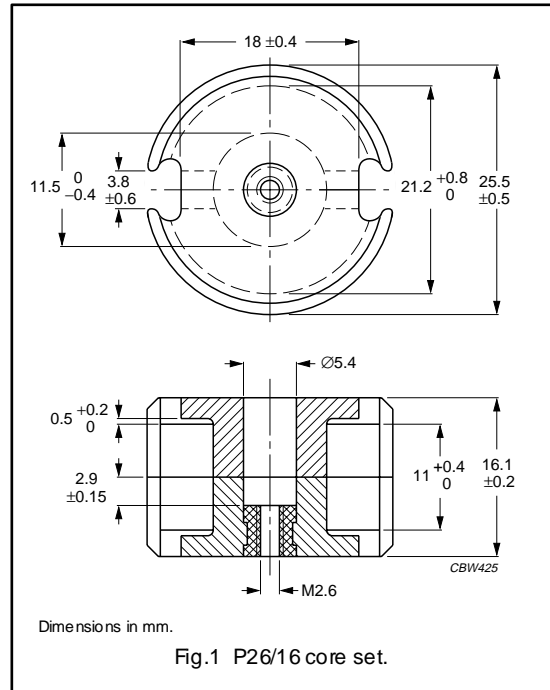
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P22/13".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.400	mm <sup>-1</sup>
$V_e$	effective volume	3530	mm <sup>3</sup>
$l_e$	effective length	37.6	mm
$A_e$	effective area	93.9	mm <sup>2</sup>
$A_{min}$	minimum area	77.4	mm <sup>2</sup>
$m$	mass of set	≈20	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 200 ±50 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	100 ±3%	≈ 32	≈ 1630	P26/16-3D3-E 100/N	P26/16-3D3-E100
	160 ±3%	≈ 51	≈ 890	P26/16-3D3-E 160/N	P26/16-3D3-E160
	250 ±3%	≈ 80	≈ 510	P26/16-3D3-E 250/N	P26/16-3D3-E250
	2150 ±25%	≈ 685	≈ 0	–	P26/16-3D3
3H3 <sup>sup</sup>	160 ±3%	≈ 51	≈ 940	P26/16-3H3-E 160/N	P26/16-3H3-E160
	250 ±3%	≈ 80	≈ 550	P26/16-3H3-E 250/N	P26/16-3H3-E250
	315 ±3%	≈ 100	≈ 420	P26/16-3H3-E 315/N	P26/16-3H3-E315
	400 ±3%	≈ 127	≈ 310	P26/16-3H3-E 400/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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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 <small>des</small>	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)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤0.82	–	–	–
3C91	≥315	–	≤0.21 <sup>(1)</sup>	≤1.6 <sup>(1)</sup>	–
3F3	≥315	–	≤0.4	–	≤0.65

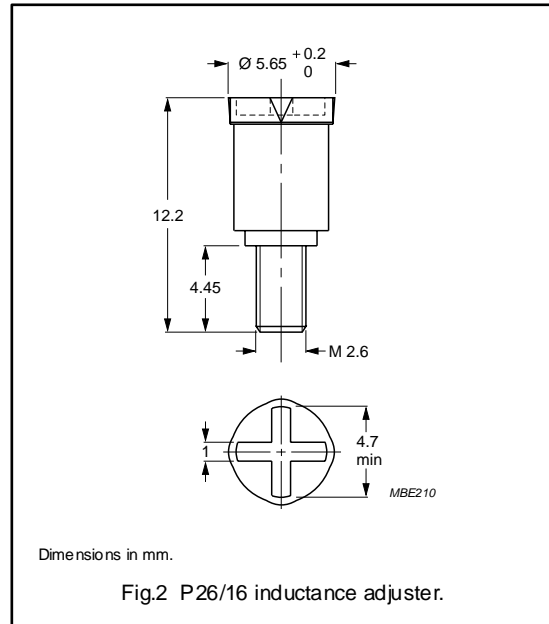
**Note**

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



**Inductance adjuster selection chart <sup>sup</sup> (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L <sup>(1)</sup>
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	–	–

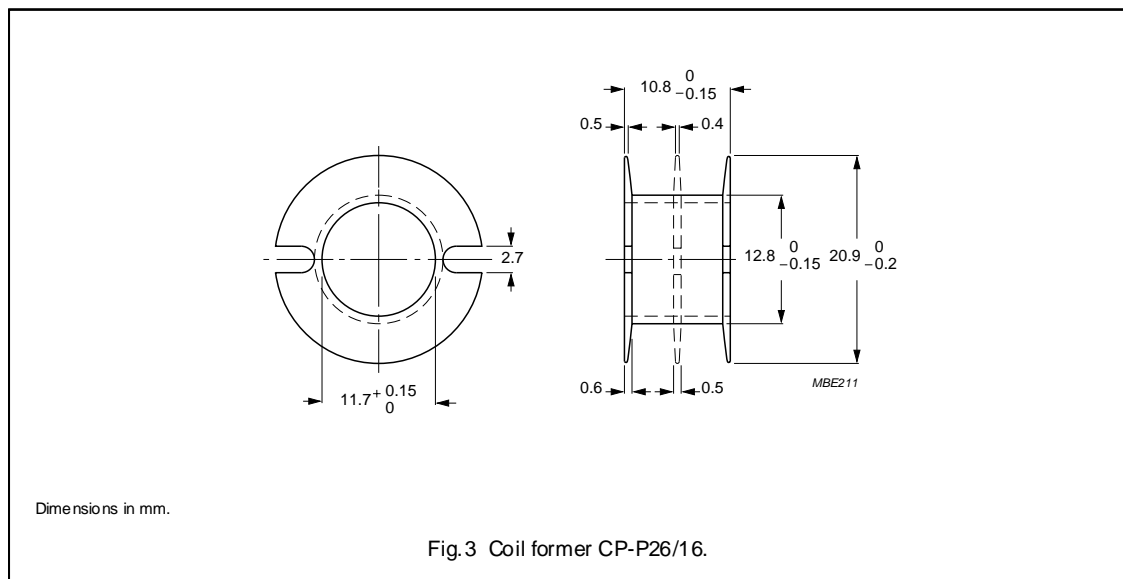
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data for CP-P26/16 coil former**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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



**Winding data for CP-P26/16 coil former**

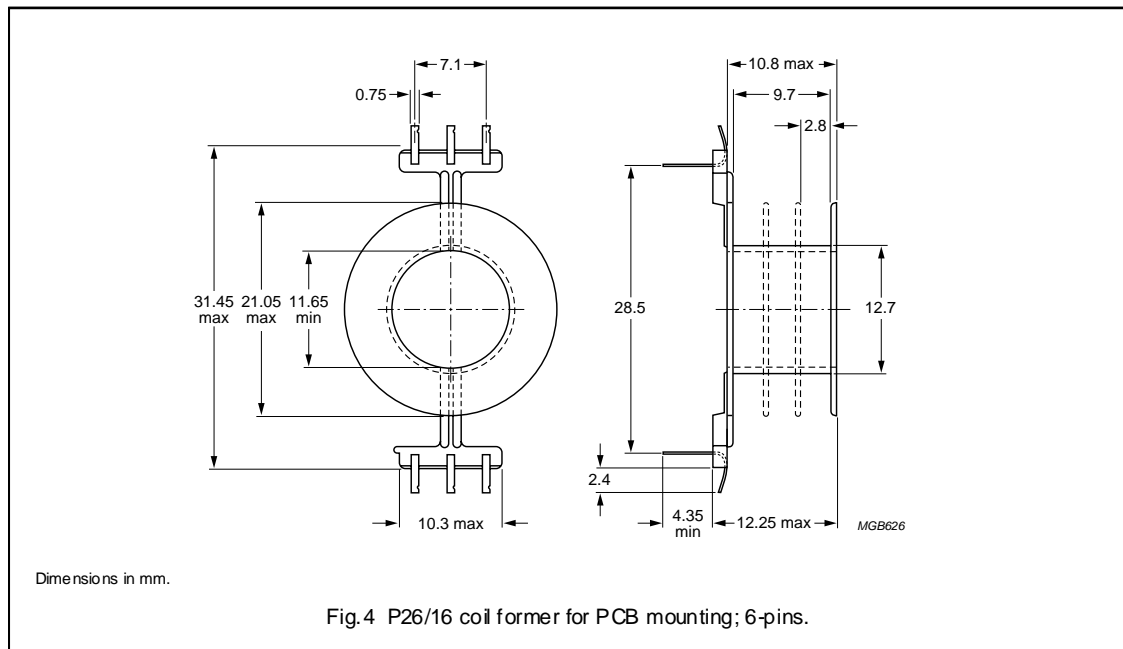
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	37.1	9.3	52.6	CP-P26/16-1S
2	2 × 17.5	2 × 4.35	52.6	CP-P26/16-2S
3	3 × 11	3 × 2.7	52.6	CP-P26/16-3S

P cores and accessories

P26/16

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, transition to lead-free (Sn) ongoing
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



Data for 6-pins P26/16 coil former for PCB mounting

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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 <sup>(1)</sup>
3	3 × 10.3	3 × 2.8	52.7	6.8	CPV-P26/16-3S-6PDL <sup>(1)</sup>

Note

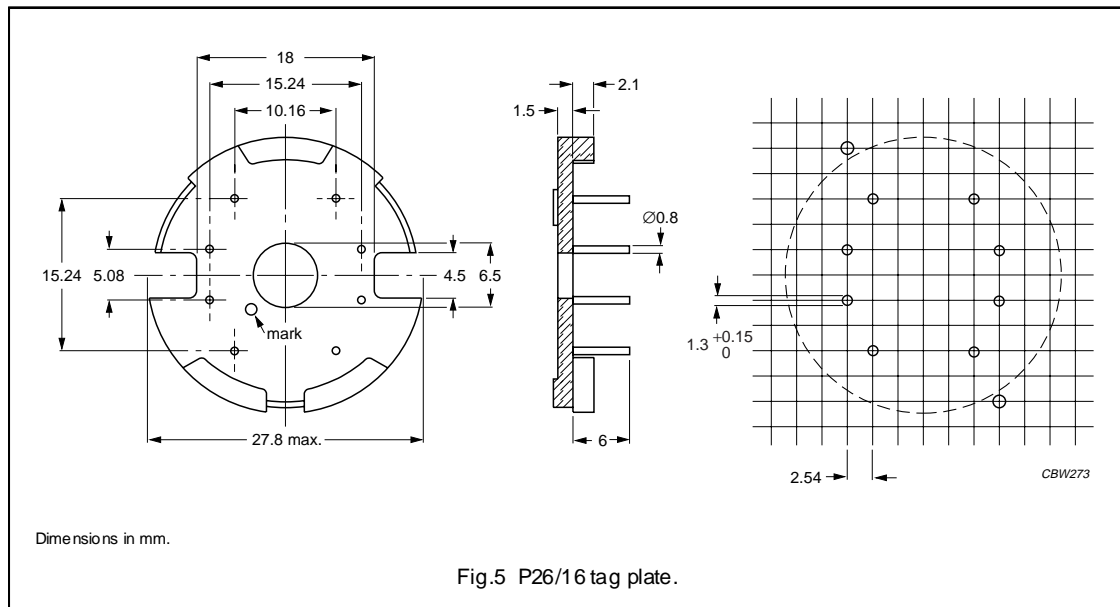
1. In accordance with "UL 94-HB".

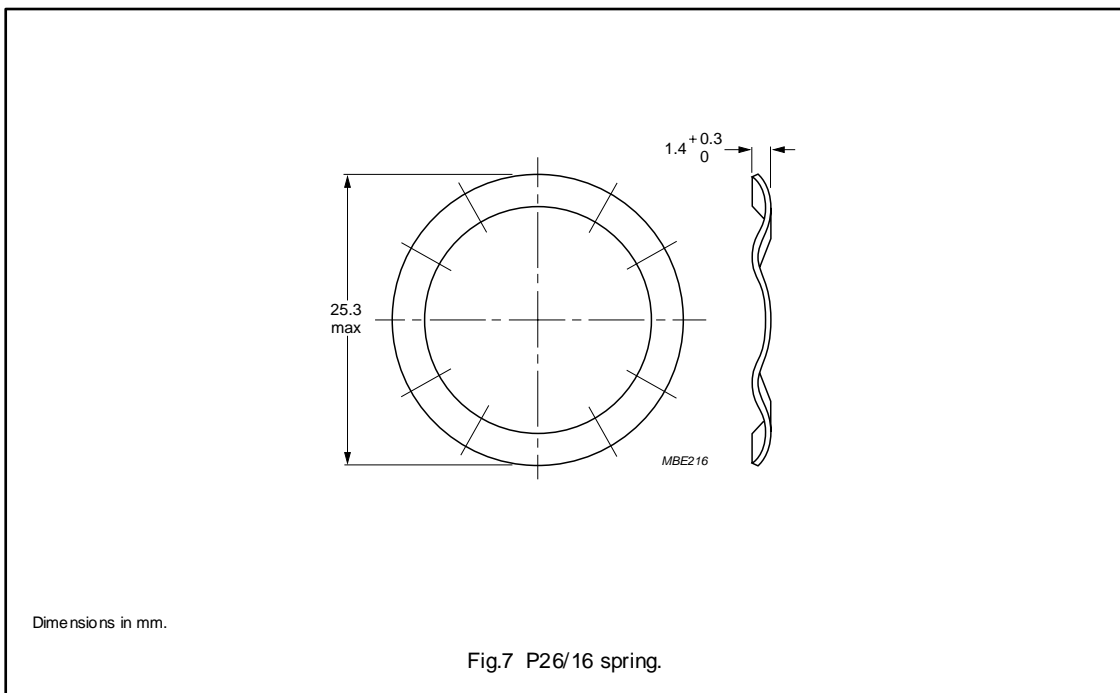
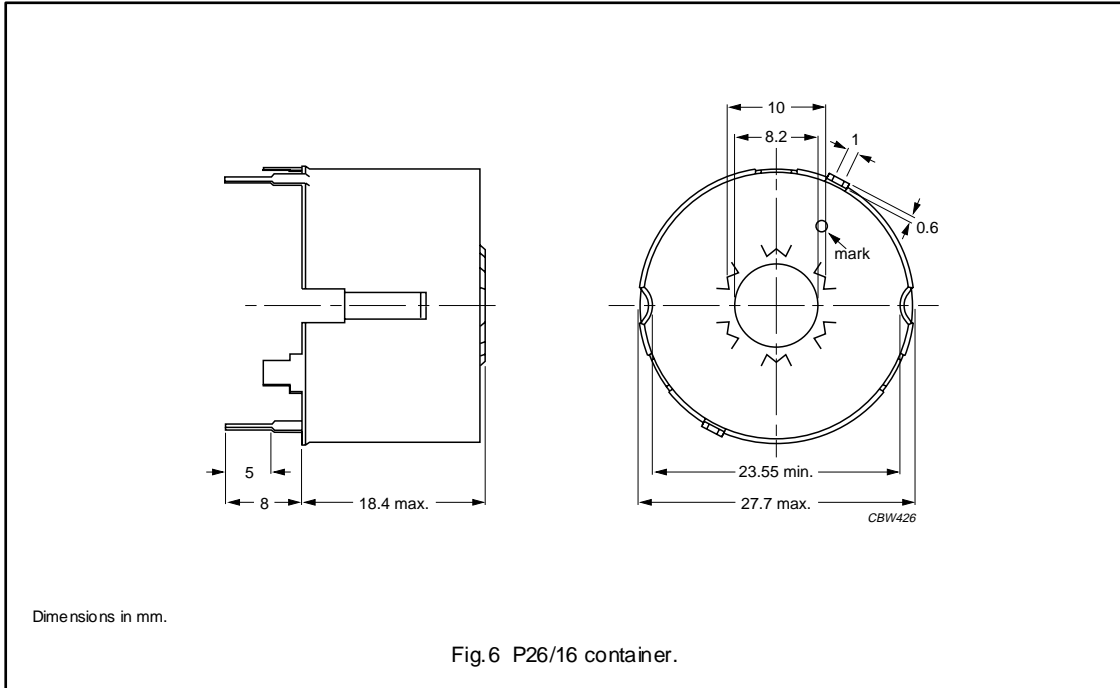


**MOUNTING PARTS**

**General data**

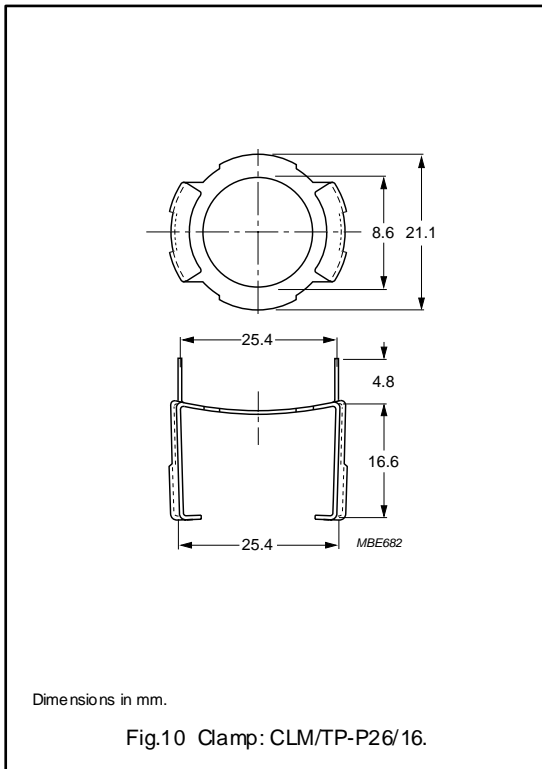
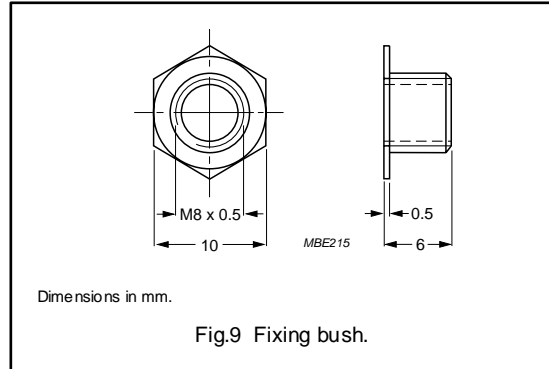
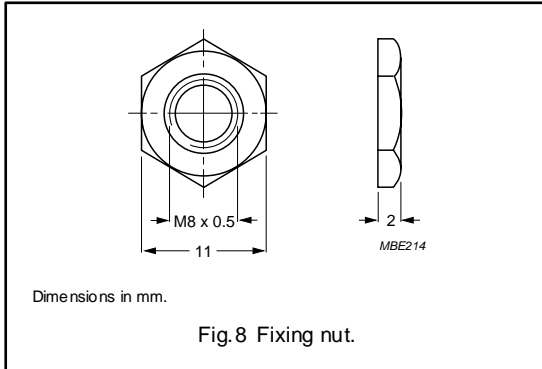
ITEM	REMARKS	FIGURE	TYPE NUMBER
Tag plate	material: phenolformaldehyde (PF), glass reinforced	5	TGP-P26/16-8P
	flame retardant: in accordance with "UL 94V-0"; UL file number E167521 (M)		
	maximum operating temperature: 180 °C, "IEC 60085", class H		
	pins: copper-tin alloy (CuSn), tin-lead alloy (SnPb) 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, transition to lead-free (Sn) ongoing	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





P cores and accessories

P26/16



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.360	mm <sup>-1</sup>
$V_e$	effective volume	4370	mm <sup>3</sup>
$l_e$	effective length	39.6	mm
$A_e$	effective area	110	mm <sup>2</sup>
$A_{min}$	minimum area	87.0	mm <sup>2</sup>
m	mass of set	≈ 21	g

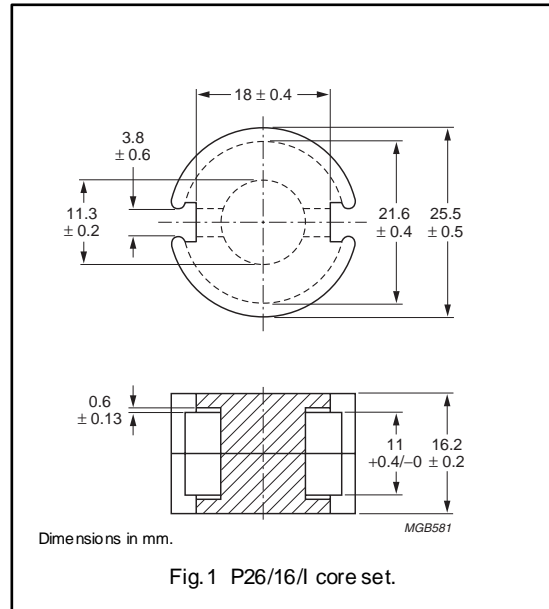


Fig.1 P26/16/l core set.

**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 50 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	250 ± 3%	≈ 72	≈ 660	P26/16/l-3C81-E250
	315 ± 3%	≈ 90	≈ 500	P26/16/l-3C81-A315
	400 ± 3%	≈ 115	≈ 380	P26/16/l-3C81-A400
	630 ± 3%	≈ 180	≈ 230	P26/16/l-3C81-A630
	1000 ± 3%	≈ 286	≈ 130	P26/16/l-3C81-A1000
	7000 ± 25%	≈ 2010	≈ 0	P26/16/l-3C81
3C91 <small>des</small>	7000 ± 25%	≈ 2010	≈ 0	P26/16/l-3C91
3F3	250 ± 3%	≈ 72	≈ 660	P26/16/l-3F3-E250
	315 ± 3%	≈ 90	≈ 500	P26/16/l-3F3-A315
	400 ± 3%	≈ 115	≈ 380	P26/16/l-3F3-A400
	630 ± 3%	≈ 180	≈ 230	P26/16/l-3F3-A630
	1000 ± 3%	≈ 286	≈ 130	P26/16/l-3F3-A1000
	5250 ± 25%	≈ 1505	≈ 0	P26/16/l-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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 1.0	–	–	–
3C91	≥315	–	≤ 0.22 <sup>(1)</sup>	≤ 1.6 <sup>(1)</sup>	–
3F3	≥315	–	≤ 0.48	–	≤ 0.83

**Note**

1. Measured at 60 °C.

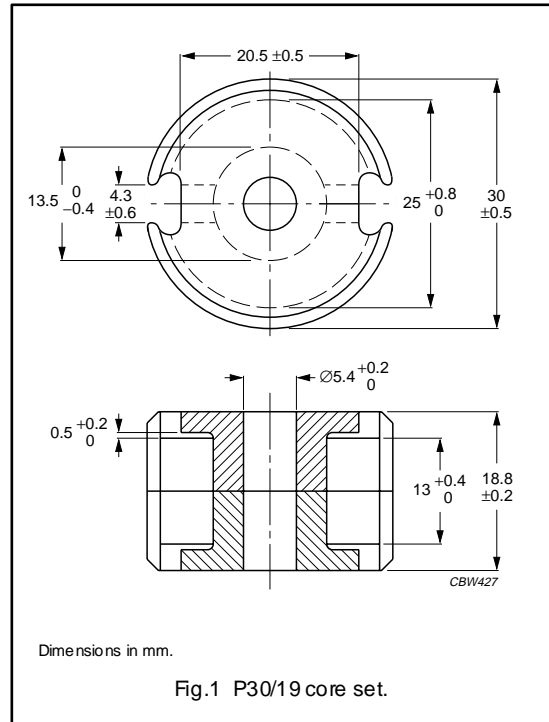
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P26/16".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.330	mm <sup>-1</sup>
$V_e$	effective volume	6190	mm <sup>3</sup>
$l_e$	effective length	45.2	mm
$A_e$	effective area	137	mm <sup>2</sup>
$A_{min}$	minimum area	116	mm <sup>2</sup>
$m$	mass of set	≈ 34	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 250 ± 50 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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,  $250 \pm 50$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$15100 \pm 25\%$	$\approx 3960$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 1.43$	–	–	–
3C91	$\geq 315$	–	$\leq 0.37^{(1)}$	$\leq 2.6^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.7$	–	$\leq 1.2$

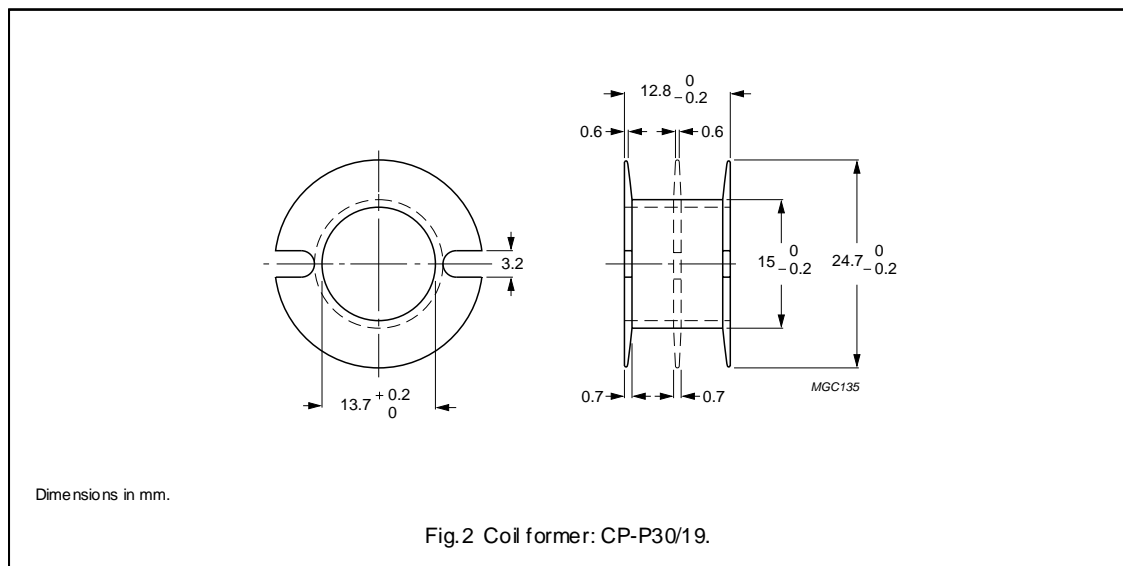
**Note**

1. Measured at 60 °C.

**COIL FORMERS**

**General data CP-P30/19 coil former**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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



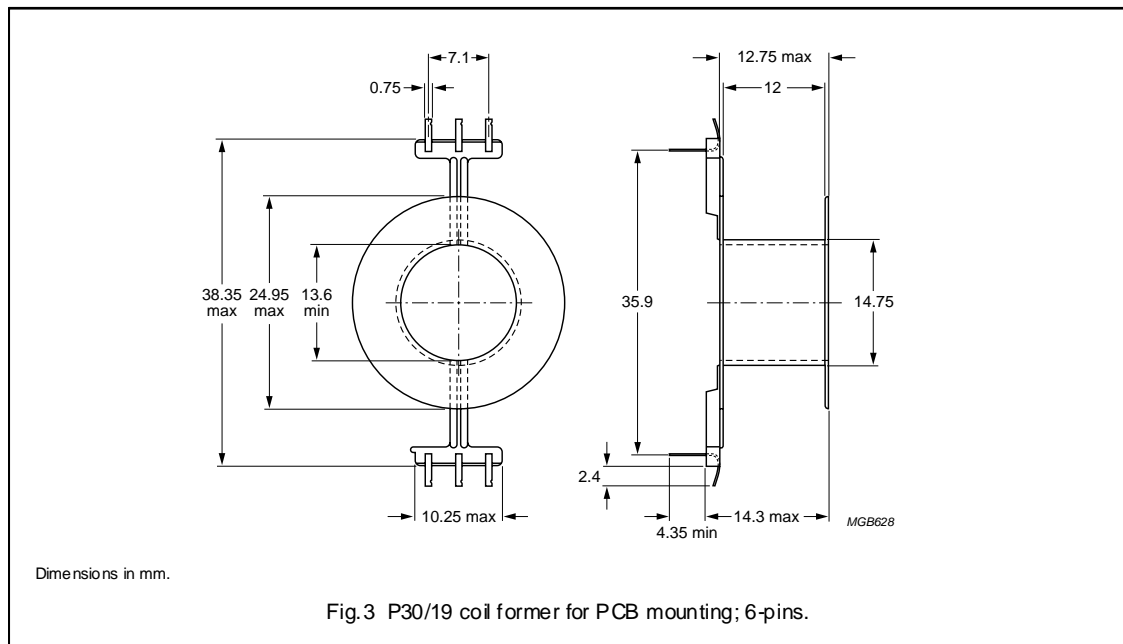
**Winding data for P30/19 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



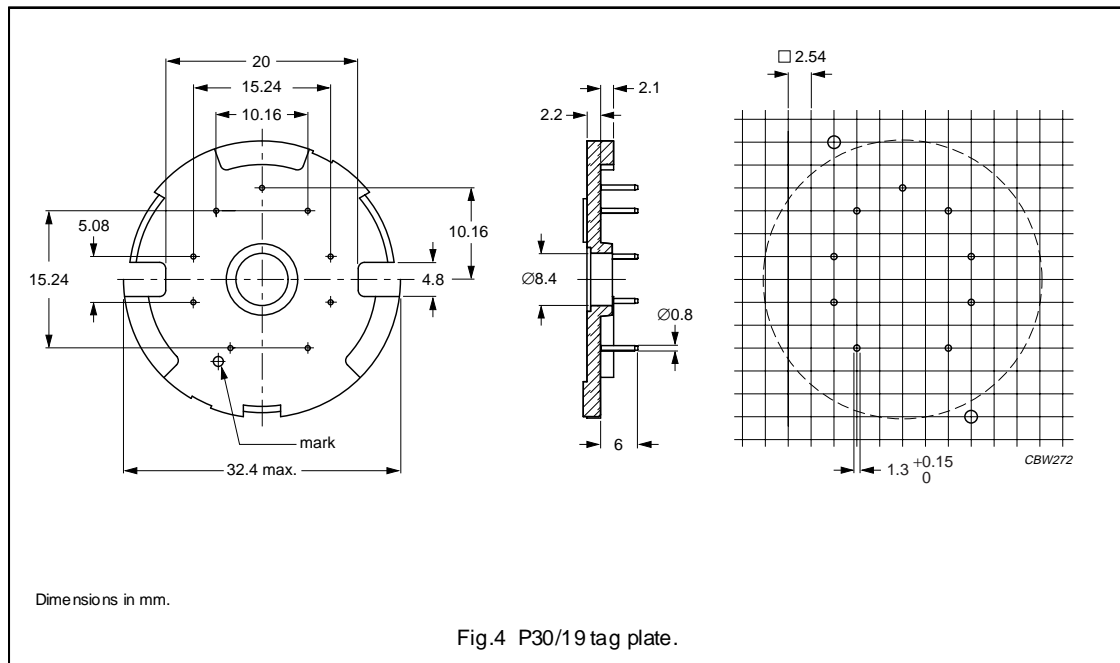
**Data for 6-pins P30/19 coil former for PCB mounting**

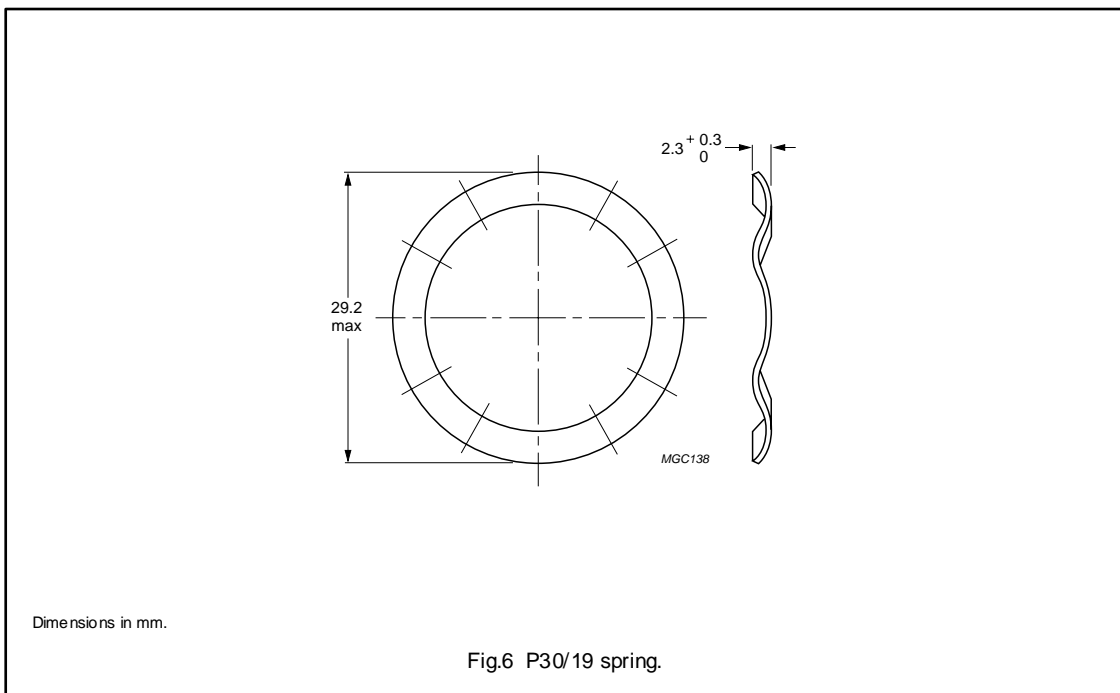
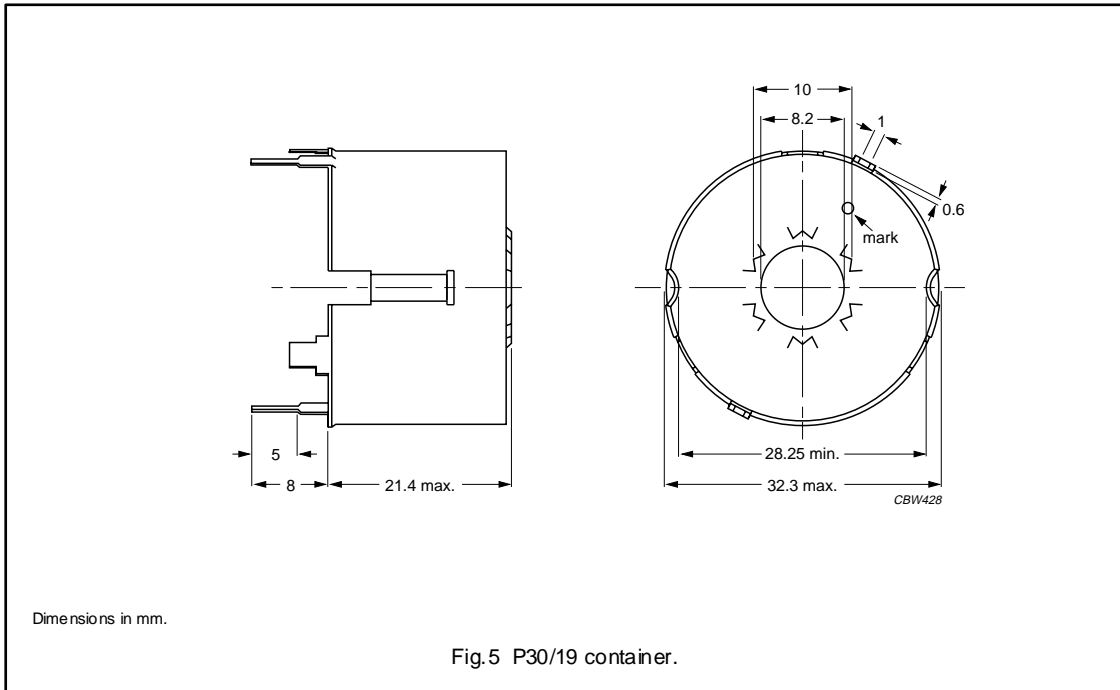
NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	MINIMUM LENGTH OF PINS (mm)	TYPE NUMBER
1	55.2	12.8	62.2	4.4	CPV-P30/19-1 S-6PD
1	55.2	12.8	62.2	6.8	CPV-P30/19-1 S-6PDL

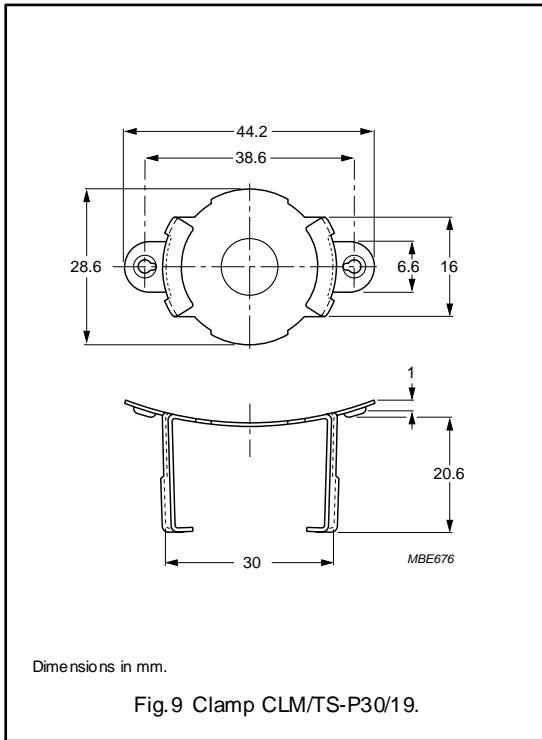
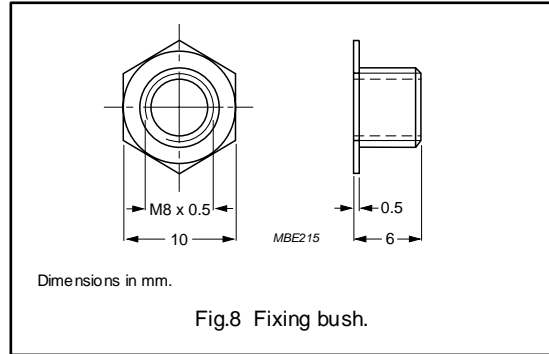
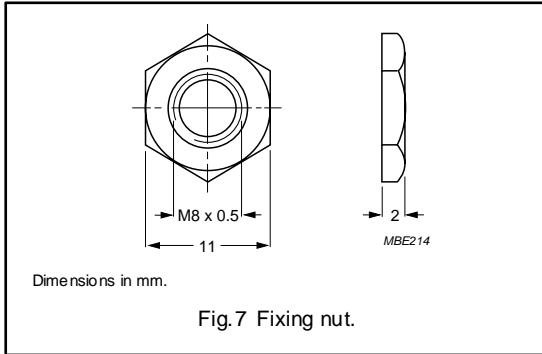
**MOUNTING PARTS**

**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, transition to lead-free (Sn) ongoing	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



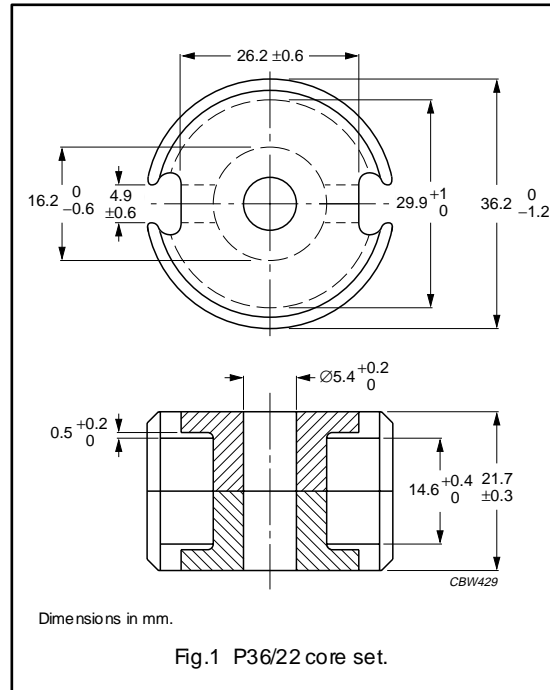




**CORE SETS**

**Effective core parameters**

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



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 350 ± 50 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	10800 ± 25%	≈ 2260	≈ 0	P36/22-3C91
3F3	250 ± 3%	≈ 52	≈ 1340	P36/22-3F3-E250
	315 ± 3%	≈ 66	≈ 970	P36/22-3F3-E315
	400 ± 3%	≈ 84	≈ 730	P36/22-3F3-E400
	630 ± 3%	≈ 132	≈ 430	P36/22-3F3-A630
	1000 ± 3%	≈ 210	≈ 250	P36/22-3F3-A1000
	1600 ± 5%	≈ 335	≈ 150	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,  $350 \pm 50$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$17500 \pm 25\%$	$\approx 3670$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 2.5$	–	–	–
3C91	$\geq 315$	–	$\leq 0.6^{(1)}$	$\leq 4.5^{(1)}$	–
3F3	$\geq 315$	–	$\leq 1.2$	–	$\leq 2.0$

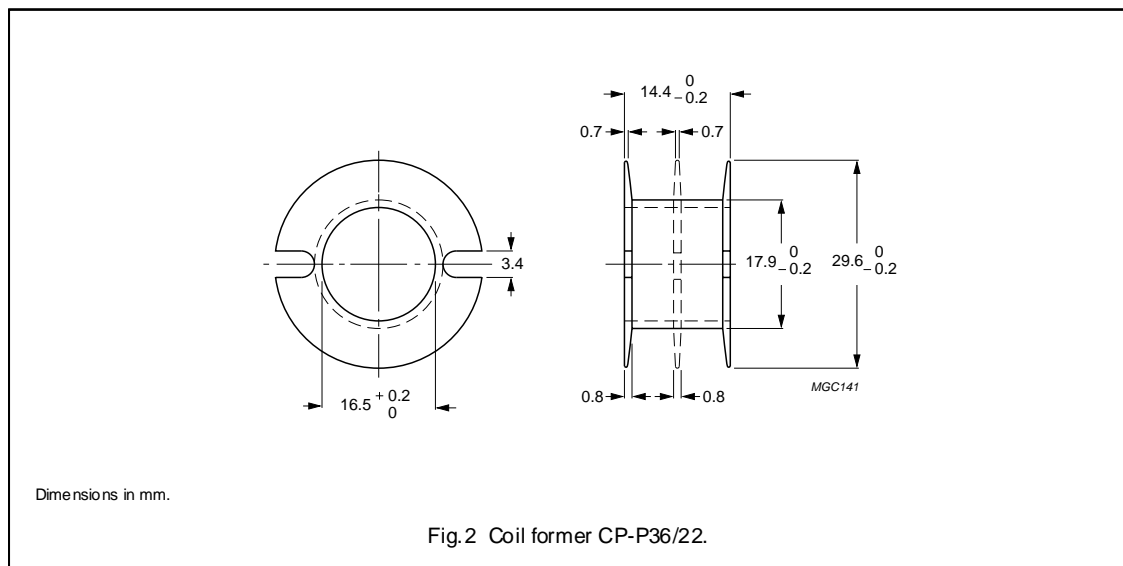
**Note**

1. Measured at 60 °C.

**COIL FORMERS**

**General data for coil former CP-P36/22**

PARAMETER	SPECIFICATION
Coil former material	polybutyleneterephthalate (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



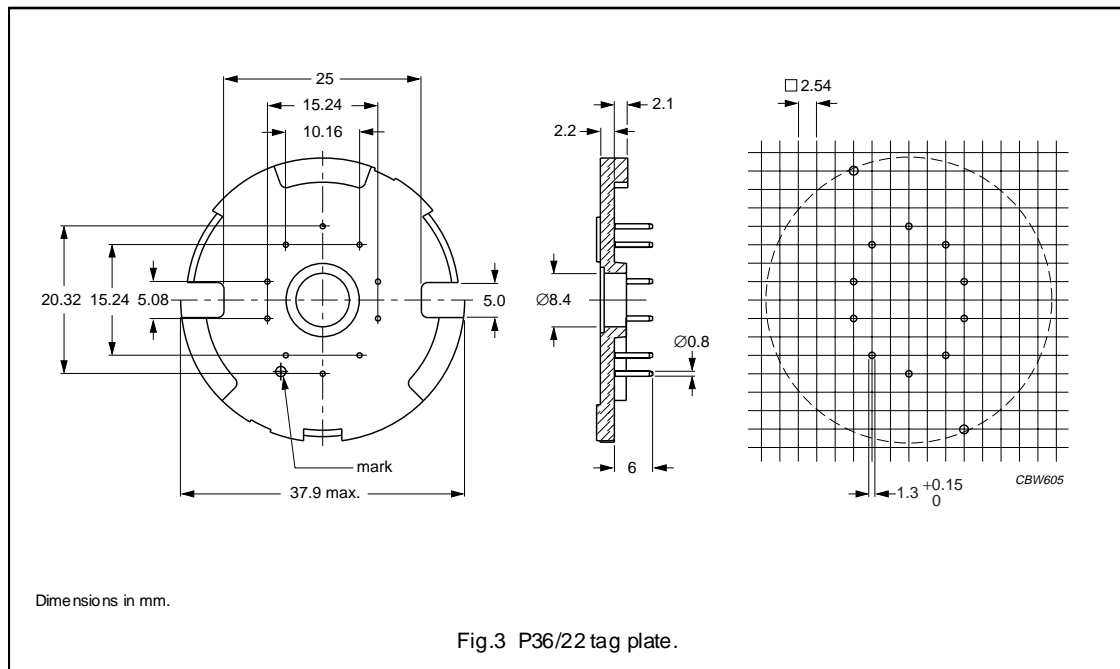
**Winding data for coil former CP-P36/22**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

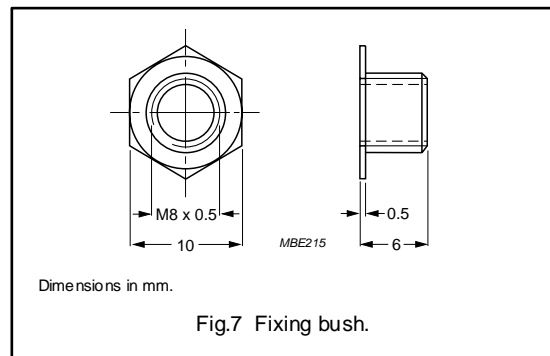
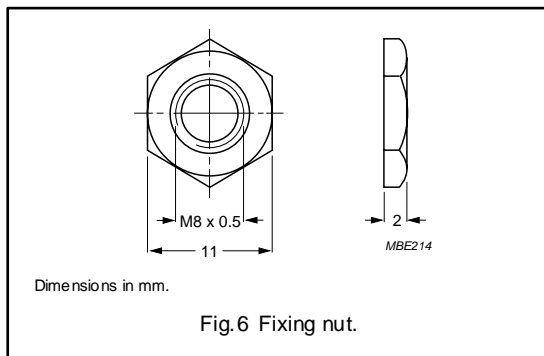
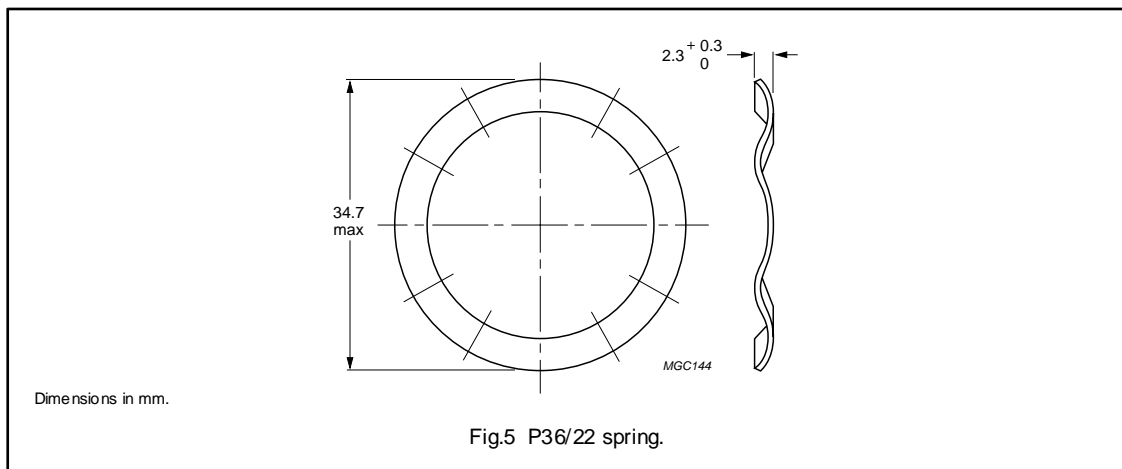
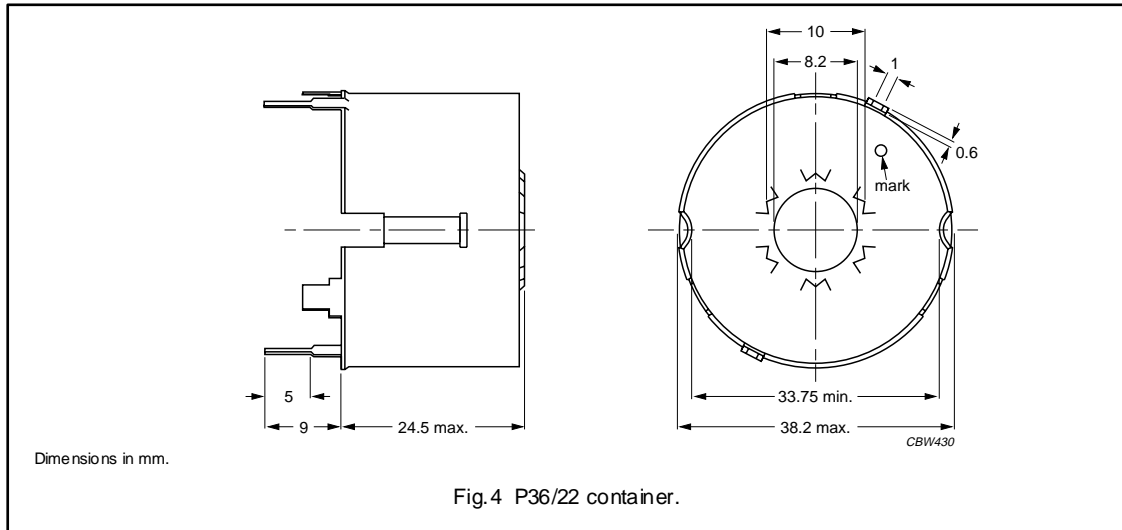
**MOUNTING PARTS**

**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, transition to lead-free (Sn) ongoing	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



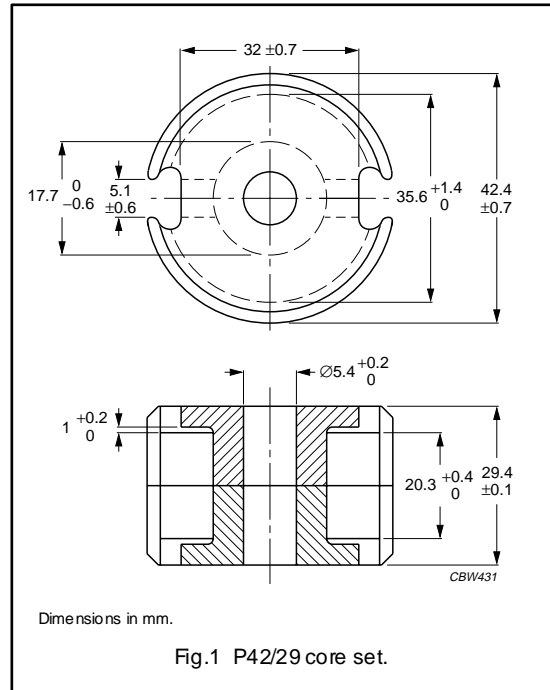




**CORE SETS**

**Effective core parameters**

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



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 550 ± 100 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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

## P cores and accessories

P42/29

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $550 \pm 100$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$19000 \pm 25\%$	$\approx 3910$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 4.2$	–	–	–
3C91	$\geq 315$	–	$\leq 0.9^{(1)}$	$\leq 7.0^{(1)}$	–
3F3	$\geq 315$	–	$\leq 2.0$	–	$\leq 3.5$

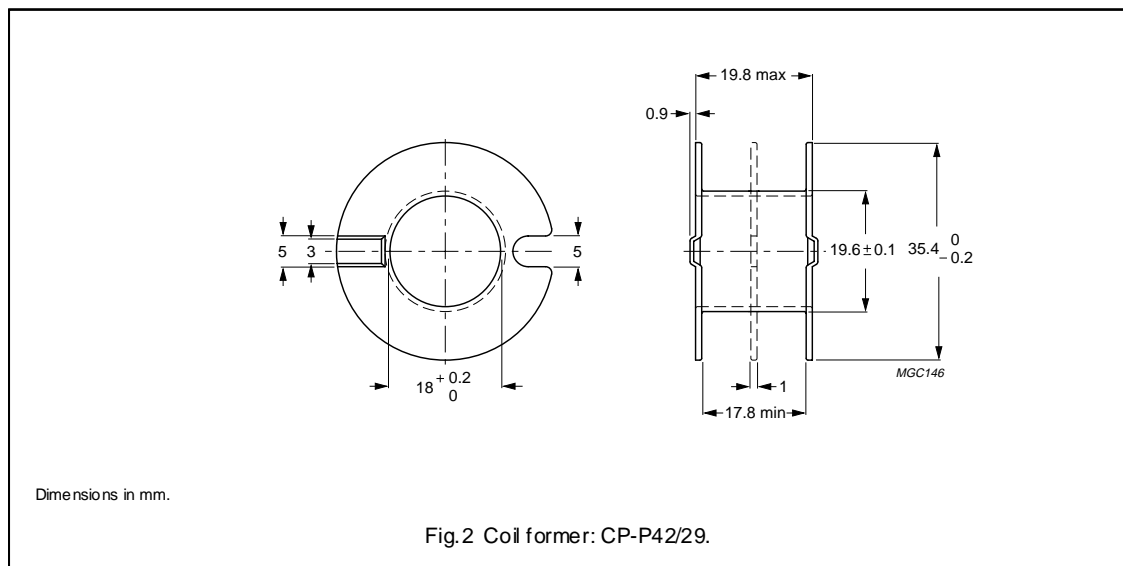
**Note**

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 94 V-2"; UL file number E41 613(M)
Maximum operating temperature	115 °C



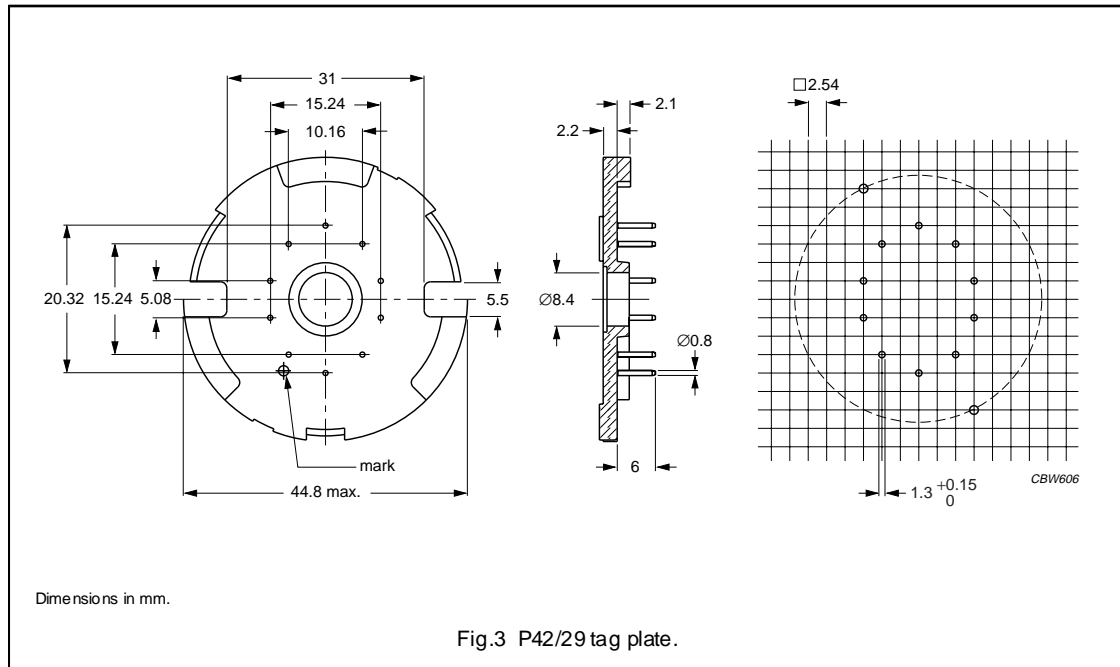
**Winding data for CP-P42/29 coil former**

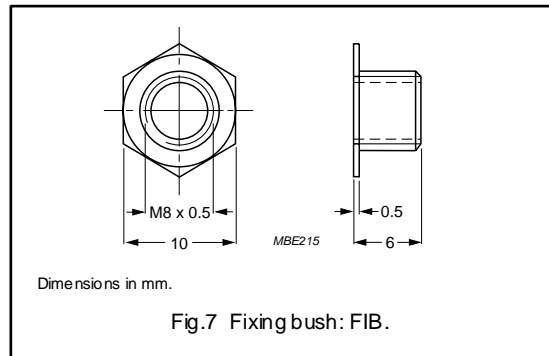
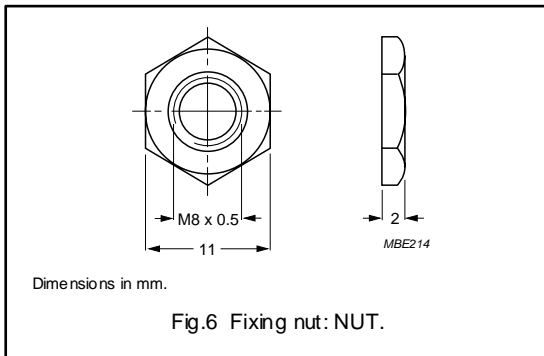
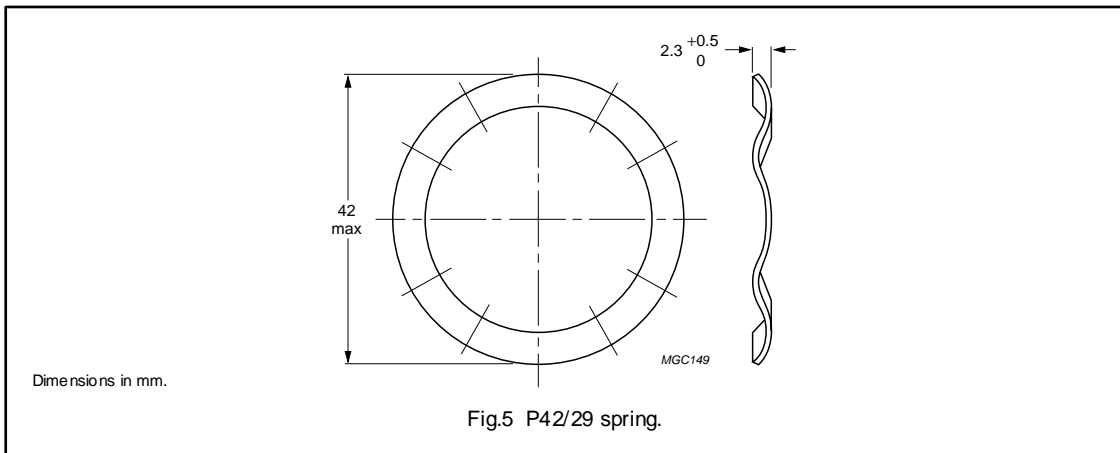
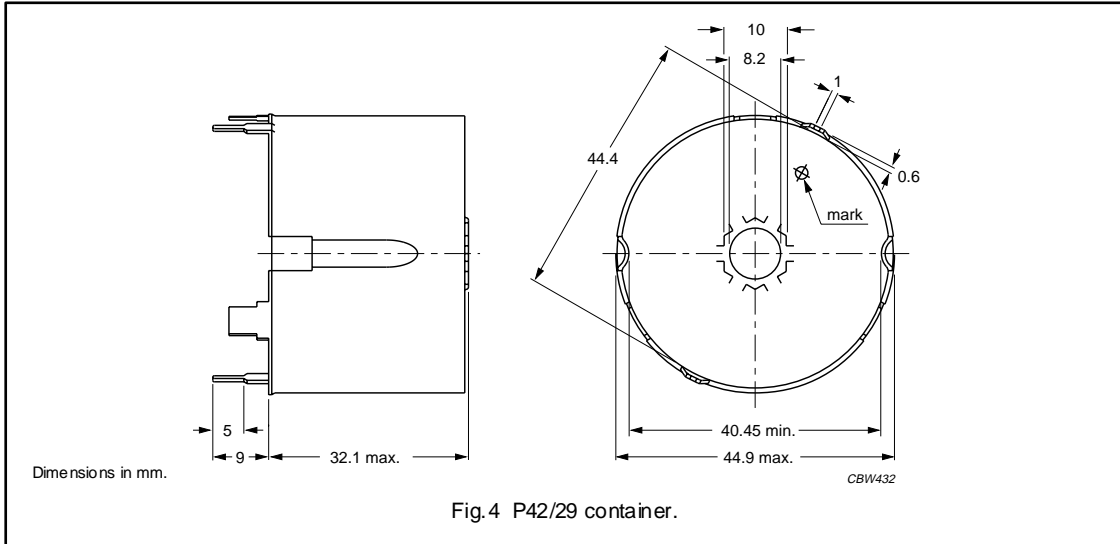
NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	140	17.8	86	CP-P42/29-1S
2	2 × 63	2 × 8	86	CP-P42/29-2S

**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, transition to lead-free (Sn) ongoing	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

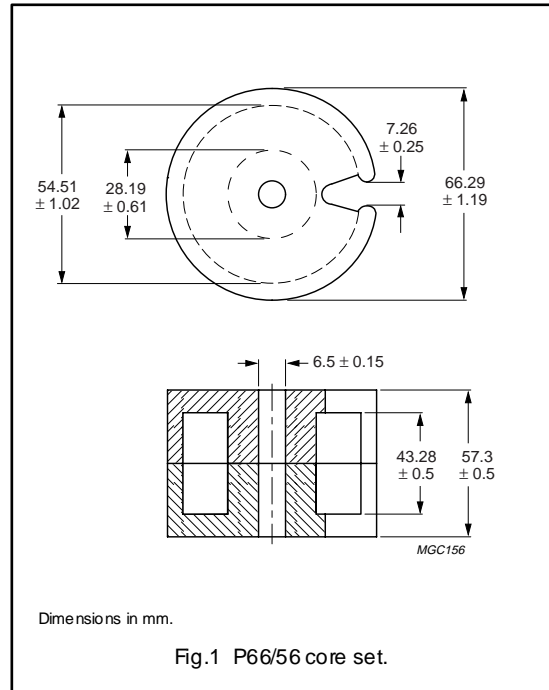




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.172	mm <sup>-1</sup>
$V_e$	effective volume	88200	mm <sup>3</sup>
$l_e$	effective length	123	mm
$A_e$	effective area	717	mm <sup>2</sup>
$A_{min}$	minimum area	591	mm <sup>2</sup>
$m$	mass of set	≈ 550	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 1000 ± 300 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81	18200 ± 25%	≈ 2490	≈ 0	P66/56-3C81
3C91 <small>des</small>	18200 ± 25%	≈ 2490	≈ 0	P66/56-3C91
3F3	12350 ± 25%	≈ 1690	≈ 0	P66/56-3F3

**Properties of core sets under power conditions**

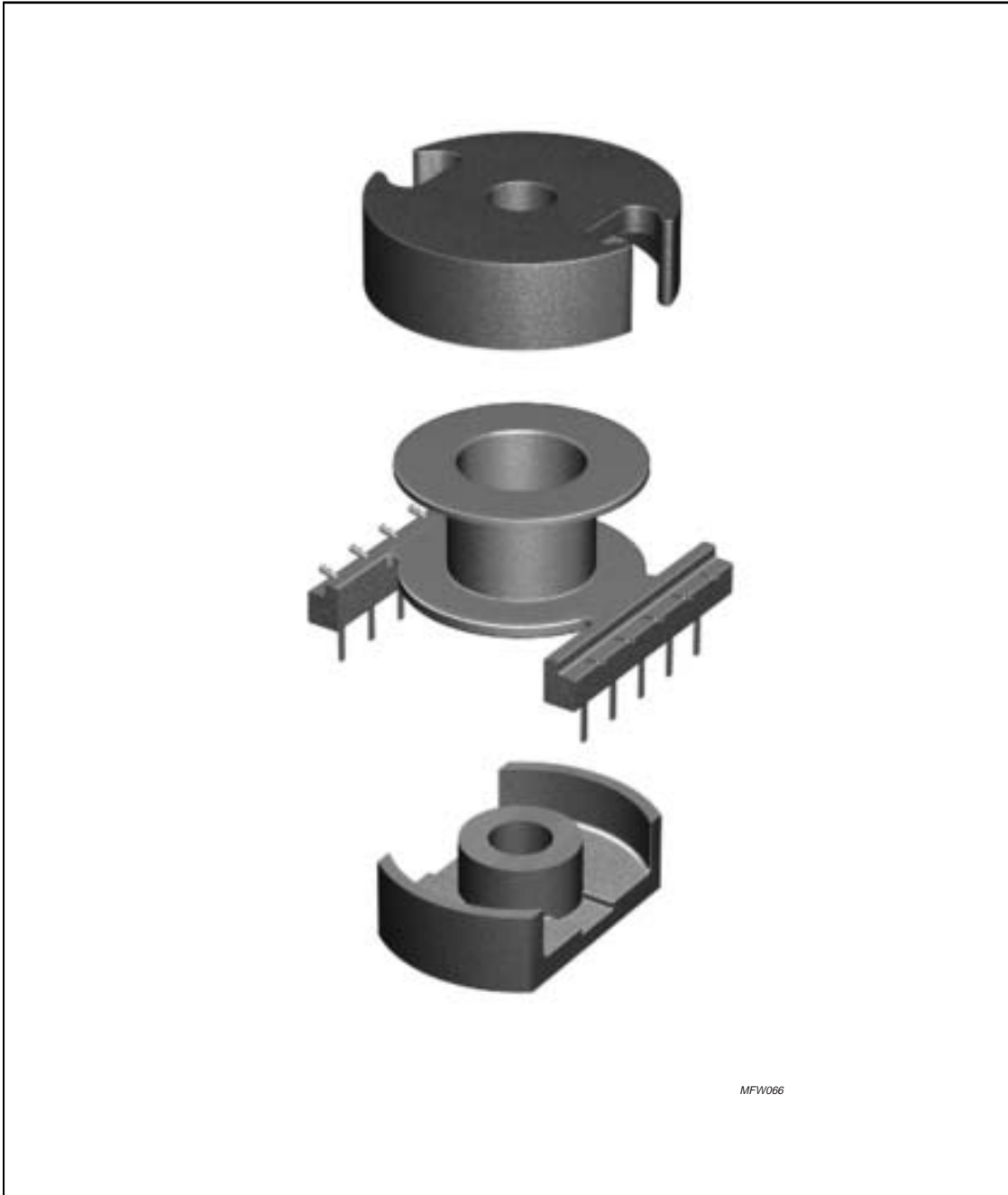
GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥ 320	≤ 25	–	–	–
3C91	≥ 315	–	≤ 4.7 <sup>(1)</sup>	≤ 33 <sup>(1)</sup>	–
3F3	≥ 315	–	≤ 10	–	≤ 20

**Note**

1. Measured at 60 °C.







MFW066

Soft Ferrites

PT, PTS, PTS/I cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PT, PTS, PTS/I cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	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
PTS30/19/I	5940	120	31
PTS34/19/I	8140	155	46
PTS40/27/I	14400	204	66

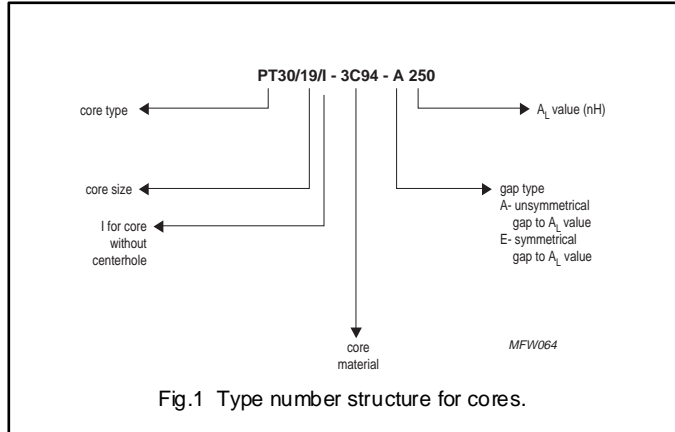


Fig.1 Type number structure for cores.

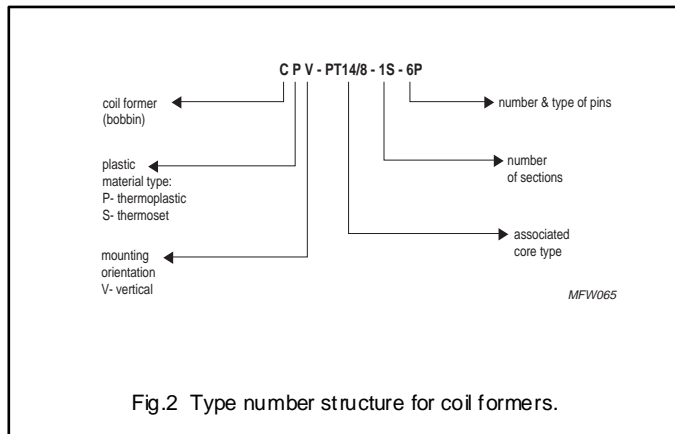
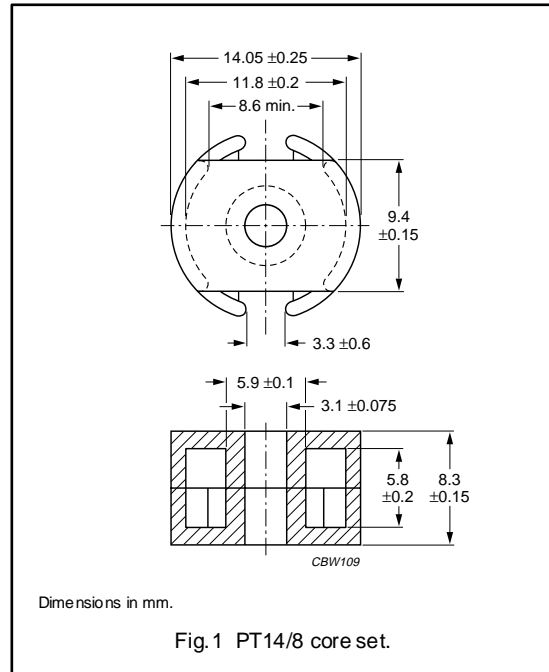


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.910	mm <sup>-1</sup>
$V_e$	effective volume	492	mm <sup>3</sup>
$l_e$	effective length	21.1	mm
$A_e$	effective area	23.3	mm <sup>2</sup>
$A_{min}$	minimum area	19.9	mm <sup>2</sup>
$m$	mass of set	≈ 2.8	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 15 ± 15 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81 <sup>sup</sup>	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 <sup>sup</sup>	2400 ± 25%	≈ 1730	≈ 0	PT14/8-3C91
3F3 <sup>sup</sup>	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

## PT, PTS, PTS/I cores and accessories

PT14/8  
(1408TS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27 <sup>sup</sup>	$4500 \pm 25\%$	$\approx 3240$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.11$	–	–	–
3C91	$\geq 320$	–	$\leq 0.03^{(1)}$	$\leq 0.22^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.06$	–	$\leq 0.1$

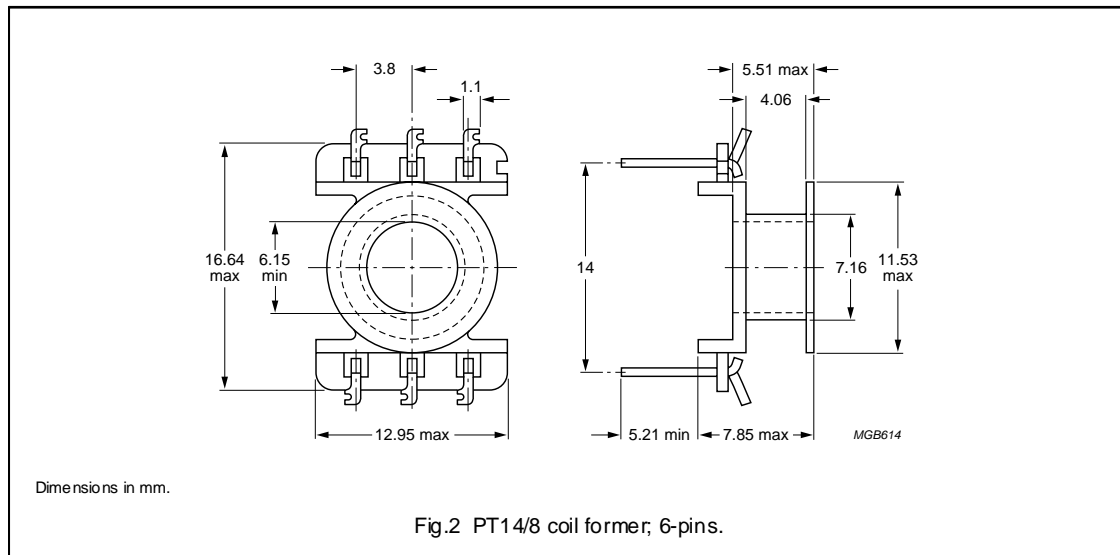
**Note**

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, transition to lead-free (Sn) ongoing
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



**Winding data for 6-pins PT14/8 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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".

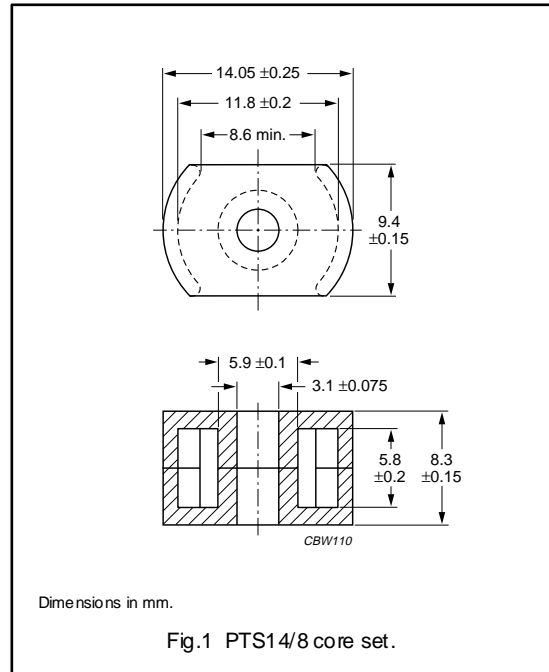
PT, PTS, PTS/I cores and accessories

PTS14/8  
(1408THS)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm <sup>-1</sup>
$V_e$	effective volume	495	mm <sup>3</sup>
$l_e$	effective length	22.5	mm
$A_e$	effective area	22.0	mm <sup>2</sup>
$A_{min}$	minimum area	19.9	mm <sup>2</sup>
$m$	mass of set	≈ 2.5	g



Core sets for general purpose transformers and power applications

Clamping force for  $A_L$  measurements, 15 ± 15 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	63 ± 3%	≈ 51	≈ 590	PTS 14/8-3C81-A63
	100 ± 3%	≈ 81	≈ 340	PTS 14/8-3C81-A100
	160 ± 3%	≈ 130	≈ 190	PTS 14/8-3C81-A160
	250 ± 3%	≈ 204	≈ 110	PTS 14/8-3C81-A250
	315 ± 5%	≈ 257	≈ 90	PTS 14/8-3C81-A315
	2330 ± 25%	≈ 1900	≈ 0	PTS 14/8-3C81
3C91 <small>des</small>	2330 ± 25%	≈ 1900	≈ 0	PTS 14/8-3C91
3F3	63 ± 3%	≈ 51	≈ 590	PTS 14/8-3F3-A63
	100 ± 3%	≈ 81	≈ 340	PTS 14/8-3F3-A100
	160 ± 3%	≈ 130	≈ 190	PTS 14/8-3F3-A160
	250 ± 3%	≈ 204	≈ 110	PTS 14/8-3F3-A250
	315 ± 5%	≈ 257	≈ 90	PTS 14/8-3F3-A315
	1625 ± 25%	≈ 1320	≈ 0	PTS 14/8-3F3

## PT, PTS, PTS/I cores and accessories

PTS14/8  
(1408THS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$4370 \pm 25\%$	$\approx 3540$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.1$	–	–	–
3C91	$\geq 320$	–	$\leq 0.026^{(1)}$	$\leq 0.19^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.054$	–	$\leq 0.94$

**Note**

1. Measured at 60 °C.

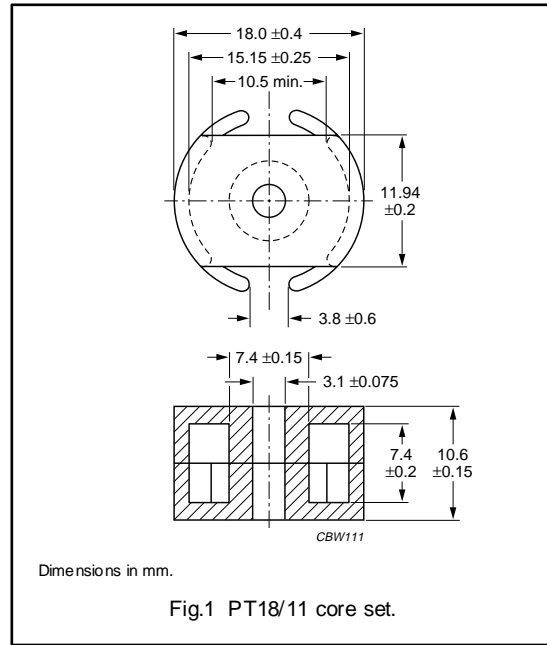
**BOBBINS AND ACCESSORIES**

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
$\Sigma(l/A)$	core factor (C1)	0.670	mm <sup>-1</sup>
$V_e$	effective volume	1110	mm <sup>3</sup>
$l_e$	effective length	27.2	mm
$A_e$	effective area	40.6	mm <sup>2</sup>
$A_{min}$	minimum area	32.9	mm <sup>2</sup>
$m$	mass of set	≈ 6.0	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 20 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	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 <sup>sup</sup>	3130 ± 25%	≈ 1670	≈ 0	PT18/11-3C91
3F3 <sup>sup</sup>	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, PTS/I cores and accessories

PT18/11  
(1811TS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27 <sup>sup</sup>	$5760 \pm 25\%$	$\approx 3075$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.23$	–	–	–
3C91	$\geq 320$	–	$\leq 0.06^{(1)}$	$\leq 0.5^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.12$	–	$\leq 0.21$

**Note**

1. Measured at 60 °C.

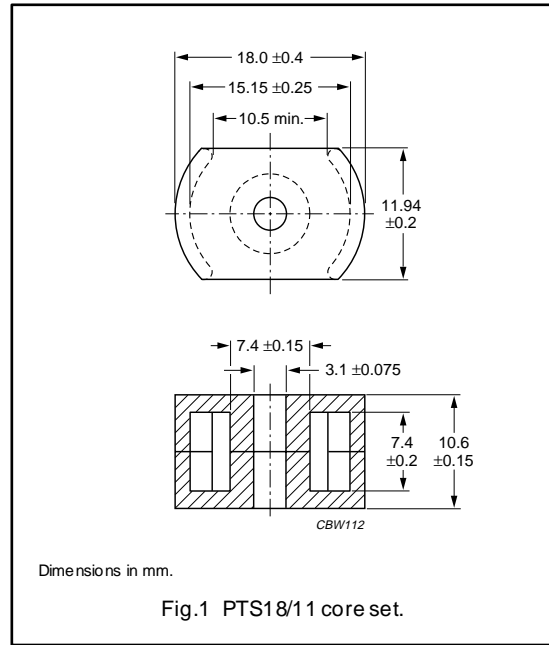
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P18/11".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.770	mm <sup>-1</sup>
$V_e$	effective volume	1070	mm <sup>3</sup>
$l_e$	effective length	28,7	mm
$A_e$	effective area	37.2	mm <sup>2</sup>
$A_{min}$	minimum area	31.0	mm <sup>2</sup>
$m$	mass of set	≈ 5.0	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 20 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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

## PT, PTS, PTS/I cores and accessories

PTS18/11  
(1811THS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $15 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$5140 \pm 25\%$	$\approx 3150$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.22$	–	–	–
3C91	$\geq 320$	–	$\leq 0.055^{(1)}$	$\leq 0.4^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.12$	–	$\leq 0.2$

**Note**

1. Measured at 60 °C.

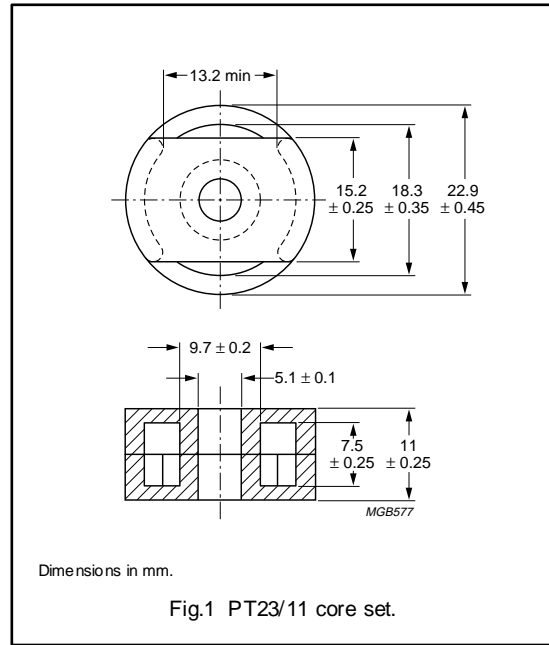
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P18/11".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.470	mm <sup>-1</sup>
$V_e$	effective volume	1740	mm <sup>3</sup>
$l_e$	effective length	28.6	mm
$A_e$	effective area	61.0	mm <sup>2</sup>
$A_{min}$	minimum area	53.6	mm <sup>2</sup>
$m$	mass of set	≈ 10.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C81 <sup>sup</sup>	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 <sup>sup</sup>	5500 ± 25%	≈ 2050	≈ 0	PT23/11-3C91
3F3 <sup>sup</sup>	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

## PT, PTS, PTS/I cores and accessories

PT23/11  
(2311TS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27 <sup>sup</sup>	$8400 \pm 25\%$	$\approx 3130$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.4$	–	–	–
3C91	$\geq 320$	–	$\leq 0.09^{(1)}$	$\leq 0.7^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.19$	–	$\leq 0.33$

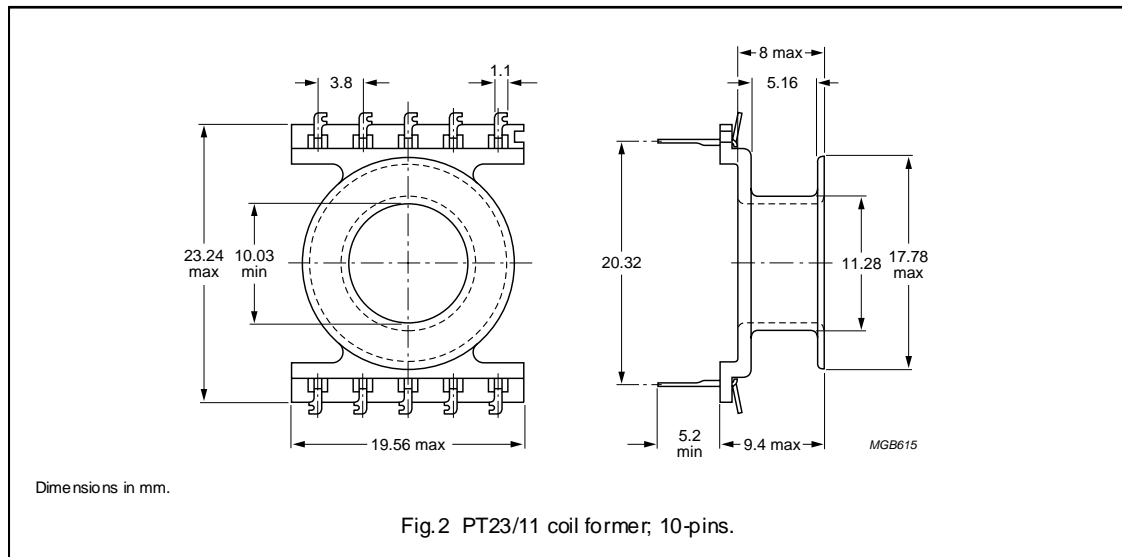
**Note**

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, transition to lead-free (Sn) ongoing
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



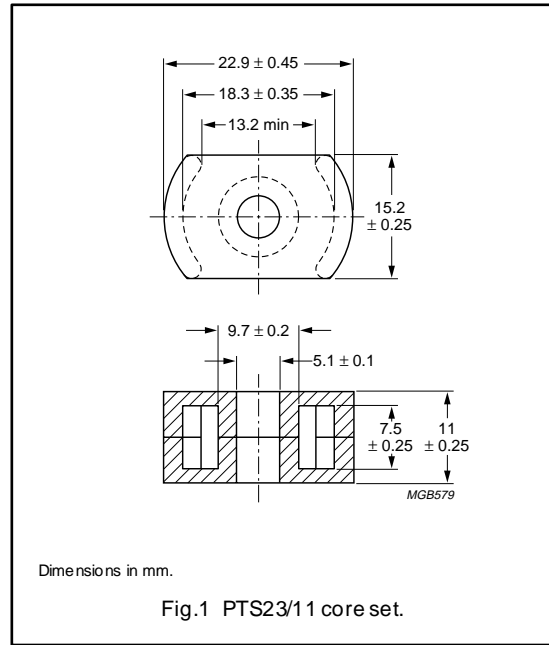
**Winding data for 10-pins PT23/11 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	15.1	5.2	45.2	CPV-PT23/11-1S-10P

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.550	mm <sup>-1</sup>
$V_e$	effective volume	1810	mm <sup>3</sup>
$l_e$	effective length	31.6	mm
$A_e$	effective area	57.2	mm <sup>2</sup>
$A_{min}$	minimum area	53.6	mm <sup>2</sup>
$m$	mass of set	≈ 9.0	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	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, PTS/I cores and accessories

PTS23/11  
(2311THS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$7250 \pm 25\%$	$\approx 3190$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.37$	–	–	–
3C91	$\geq 320$	–	$\leq 0.09^{(1)}$	$\leq 0.7^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.2$	–	$\leq 0.35$

**Note**

1. Measured at 60 °C.

**BOBBINS AND ACCESSORIES**

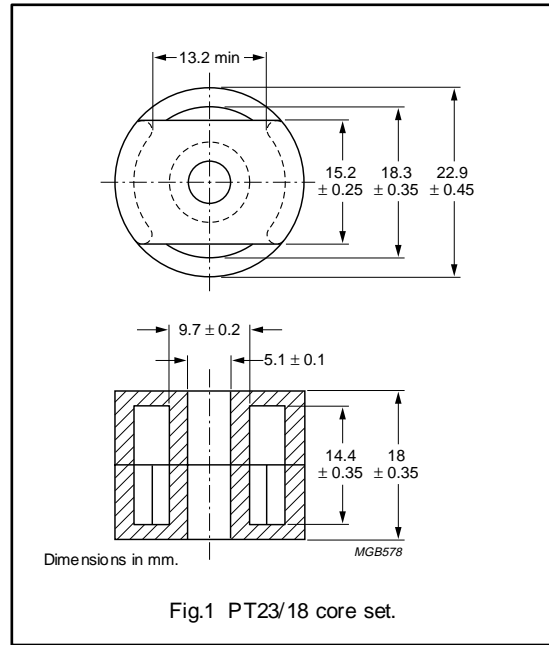
For coil formers, winding data and mounting parts, see data sheet, "PT23/11".



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.670	mm <sup>-1</sup>
$V_e$	effective volume	2590	mm <sup>3</sup>
$l_e$	effective length	41.6	mm
$A_e$	effective area	62.2	mm <sup>2</sup>
$A_{min}$	minimum area	53.6	mm <sup>2</sup>
$m$	mass of set	≈ 14	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81 <sup>sup</sup>	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
	4 100 ± 25%	≈ 2180	≈ 0	PT23/18-3C81
3C91 <sup>sup</sup>	4 100 ± 25%	≈ 2180	≈ 0	PT23/18-3C91
3F3 <sup>sup</sup>	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
	2 750 ± 25%	≈ 1460	≈ 0	PT23/18-3F3

## PT, PTS, PTS/I cores and accessories

PT23/18  
(2318TS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27 <sup>sup</sup>	6400 $\pm 25\%$	$\approx 3410$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.6$	–	–	–
3C91	$\geq 320$	–	$\leq 0.13^{(1)}$	$\leq 1.0^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.29$	–	$\leq 0.49$

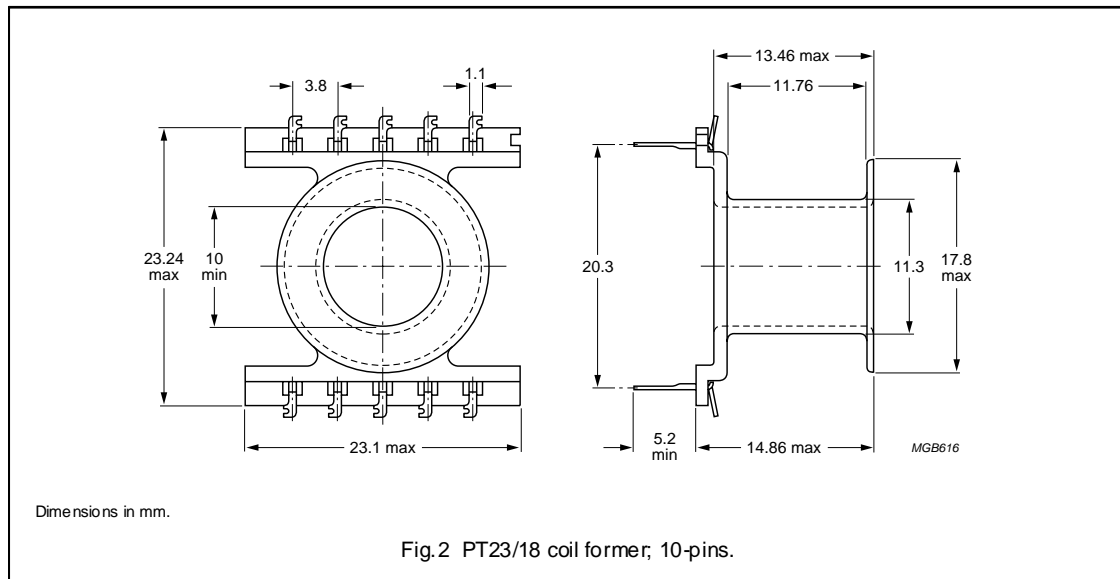
**Note**

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, transition to lead-free (Sn) ongoing
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



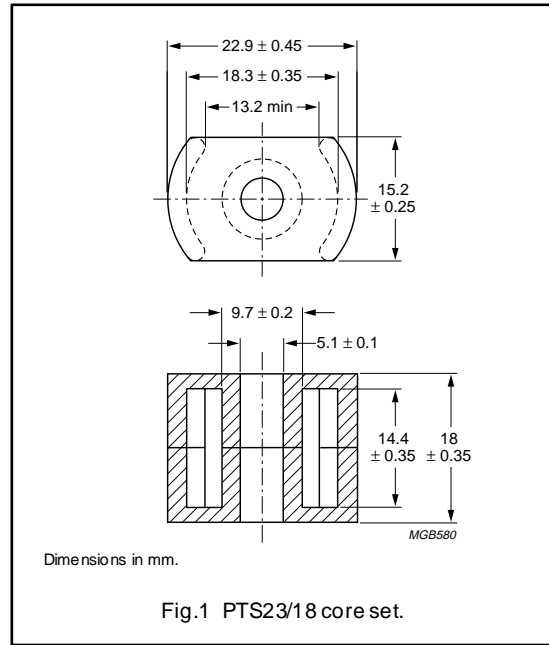
**Winding data for 10-pins PT23/18 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	36.0	11.8	45.2	CPV-PT23/18-1S-10P

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.770	mm <sup>-1</sup>
$V_e$	effective volume	2630	mm <sup>3</sup>
$l_e$	effective length	45.1	mm
$A_e$	effective area	58.3	mm <sup>2</sup>
$A_{min}$	minimum area	53.6	mm <sup>2</sup>
$m$	mass of set	≈ 13	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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, PTS/I cores and accessories

PTS23/18  
(2318THS)**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E27	$5945 \pm 25\%$	$\approx 3630$	$\approx 0$	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; B = 200 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.54$	–	–	–
3C91	$\geq 320$	–	$\leq 0.14^{(1)}$	$\leq 1.0^{(1)}$	–
3F3	$\geq 315$	–	$\leq 0.29$	–	$\leq 0.5$

**Note**

1. Measured at 60 °C.

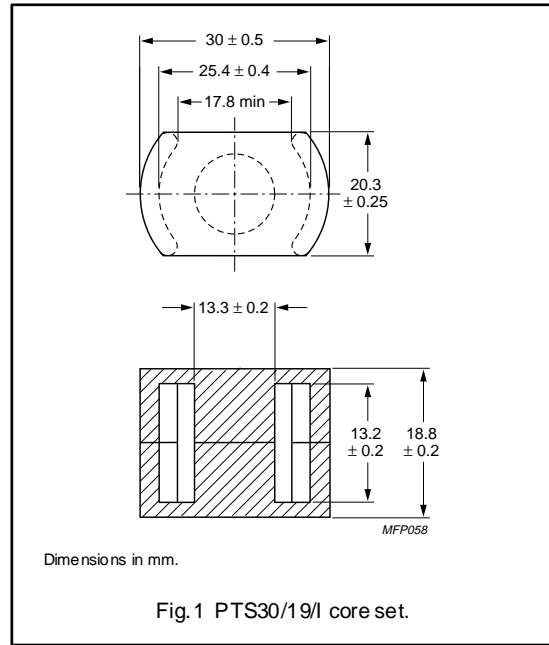
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "PT23/18".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.412	mm <sup>-1</sup>
$V_e$	effective volume	5940	mm <sup>3</sup>
$l_e$	effective length	49.5	mm
$A_e$	effective area	120	mm <sup>2</sup>
$A_{min}$	minimum area	111	mm <sup>2</sup>
$m$	mass of set	≈ 31	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 60 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	3830 ± 25 %	≈ 1260	≈ 0	PTS30/19/I-3C92
3C94	5400 ± 25 %	≈ 1770	≈ 0	PTS30/19/I-3C94
3C96 <small>des</small>	4840 ± 25 %	≈ 1590	≈ 0	PTS30/19/I-3C96

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>r</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>r</sub> = 500 kHz; B = 50 mT; T = 100 °C
3C92	≥ 320	≤ 0.53	≤ 3.5	–
3C94	≥ 320	≤ 0.53	≤ 3.5	–
3C96	≥ 315	≤ 0.4	≤ 2.7	≤ 2.2

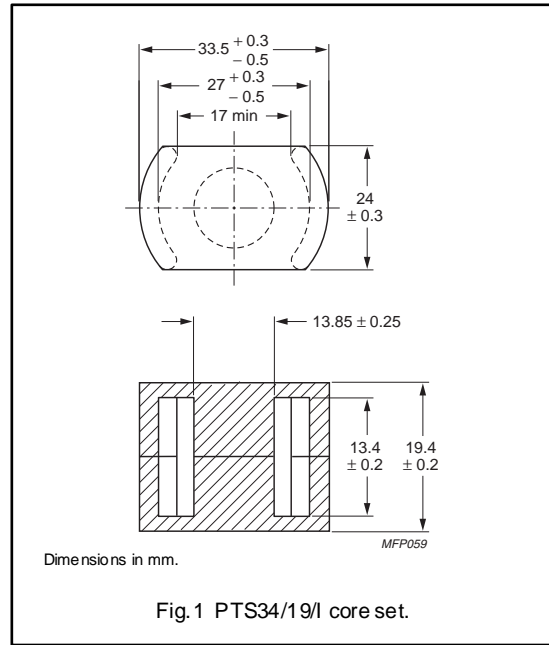
**BOBBINS AND ACCESSORIES**

For coil formers, winding data and mounting parts, see data sheet, "P30/19".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.339	mm <sup>-1</sup>
$V_e$	effective volume	8140	mm <sup>3</sup>
$l_e$	effective length	52.5	mm
$A_e$	effective area	155	mm <sup>2</sup>
$A_{min}$	minimum area	145	mm <sup>2</sup>
$m$	mass of set	≈ 46	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	4770 ± 25 %	≈ 1290	≈ 0	PTS34/19/I-3C92
3C94	6800 ± 25 %	≈ 1830	≈ 0	PTS34/19/I-3C94
3C96 <small>des</small>	6070 ± 25 %	≈ 1640	≈ 0	PTS34/19/I-3C96

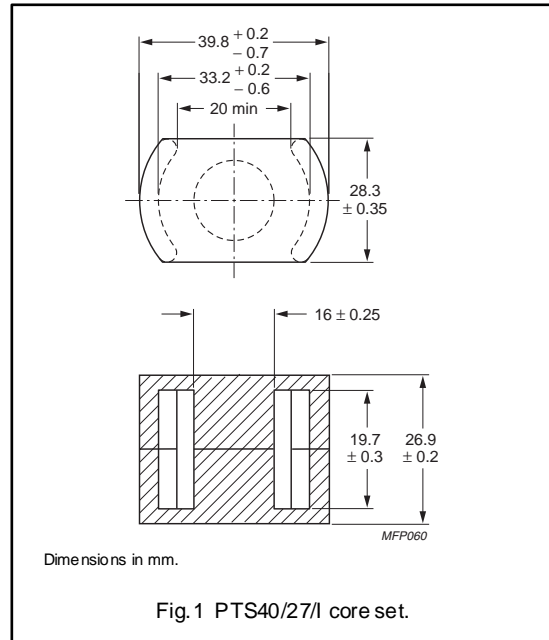
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C92	≥320	≤ 0.8	≤ 4.9	–
3C94	≥320	≤ 0.8	≤ 4.9	–
3C96	≥315	≤ 0.6	≤ 3.7	≤ 3.0

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.346	mm <sup>-1</sup>
$V_e$	effective volume	14400	mm <sup>3</sup>
$l_e$	effective length	70.5	mm
$A_e$	effective area	204	mm <sup>2</sup>
$A_{min}$	minimum area	201	mm <sup>2</sup>
$m$	mass of set	≈ 66	g



**Core sets for general purpose transformers and power applications**

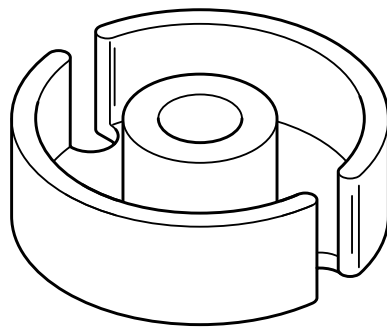
Clamping force for  $A_L$  measurements, 100 ± 25 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C92 <small>des</small>	4740 ± 25 %	≈ 1300	≈ 0	PTS40/27/I-3C92
3C94	6800 ± 25 %	≈ 1870	≈ 0	PTS40/27/I-3C94
3C96 <small>des</small>	6060 ± 25 %	≈ 1670	≈ 0	PTS40/27/I-3C96

**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f <sub>s</sub> = 100 kHz; B = 100 mT; T = 100 °C	f <sub>s</sub> = 100 kHz; B = 200 mT; T = 100 °C	f <sub>s</sub> = 500 kHz; B = 50 mT; T = 100 °C
3C92	≥320	≤ 1.5	≤ 8.6	–
3C94	≥320	≤ 1.5	≤ 8.6	–
3C96	≥315	≤ 1.1	≤ 6.5	≤ 5.4





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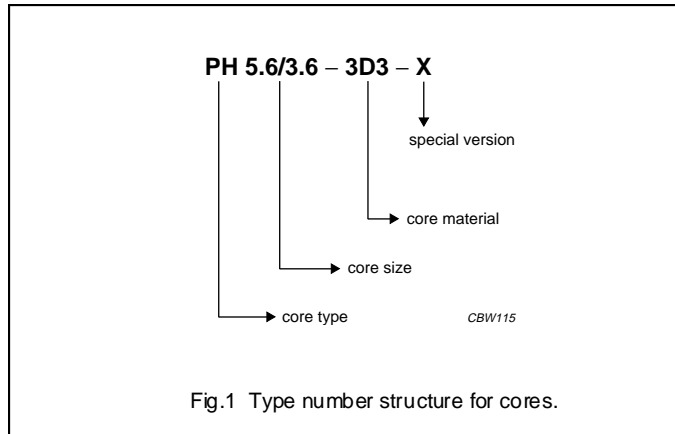
**Soft Ferrites**

**PH cores**

**PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE**

**Product overview PH cores**

CORE TYPE	MASS (g)
PH5.6/3.6	0.2
PH7.4/3.9	0.4
PH9.4/4.8	0.7
PH14/7.5	3
PH26/9.2	12

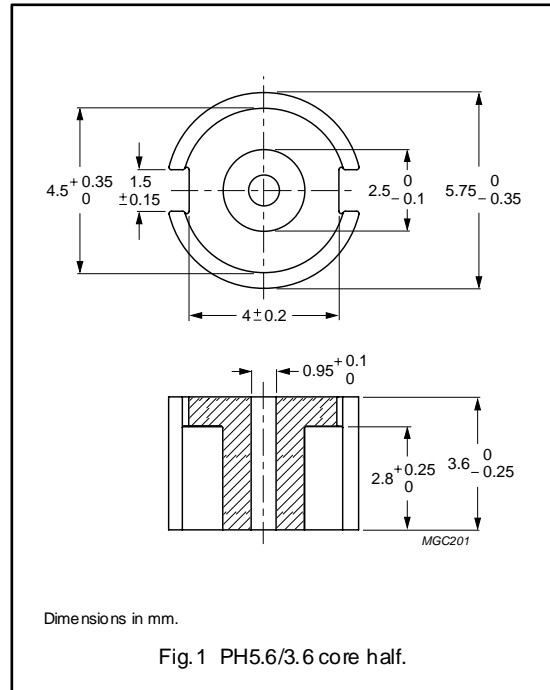


**CORE HALF**

**Ordering information**

GRADE	TYPE NUMBER
3D3	PH5.6/3.6-3D3

mass of core half  $\approx 0.2$  g



PH cores

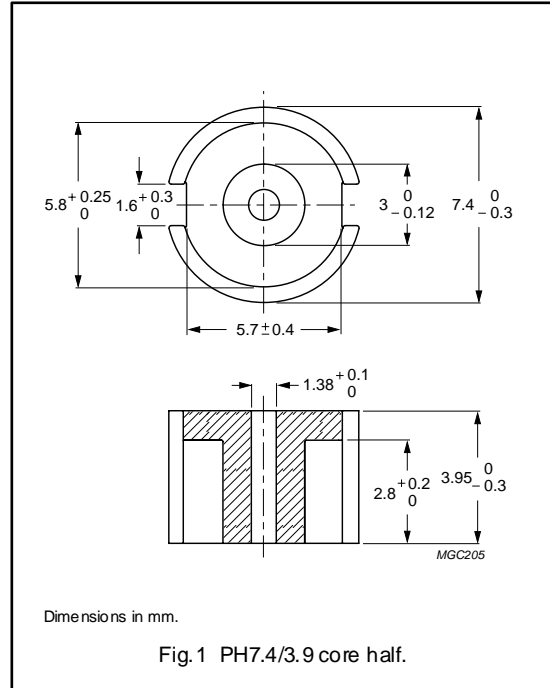
PH7.4/3.9

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH7.4/3.9-3D3

mass of core half  $\approx 0.4$  g

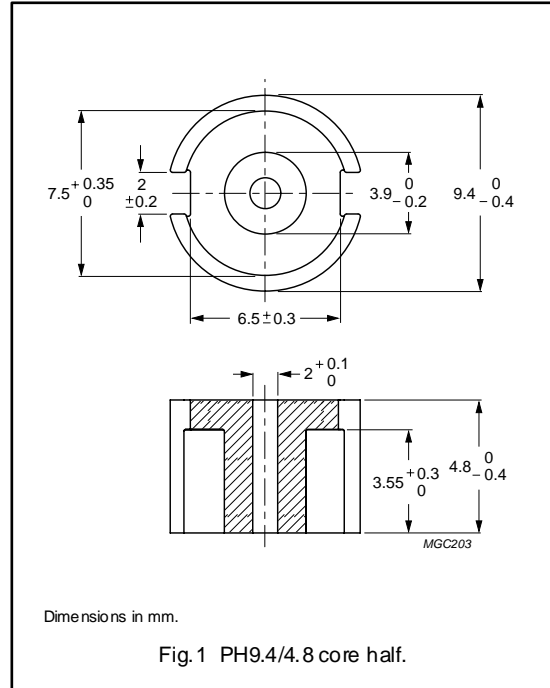


**CORE HALF**

**Ordering information**

GRADE	TYPE NUMBER
3D3	PH9.4/4.8-3D3

mass of core half  $\approx 0.7$  g

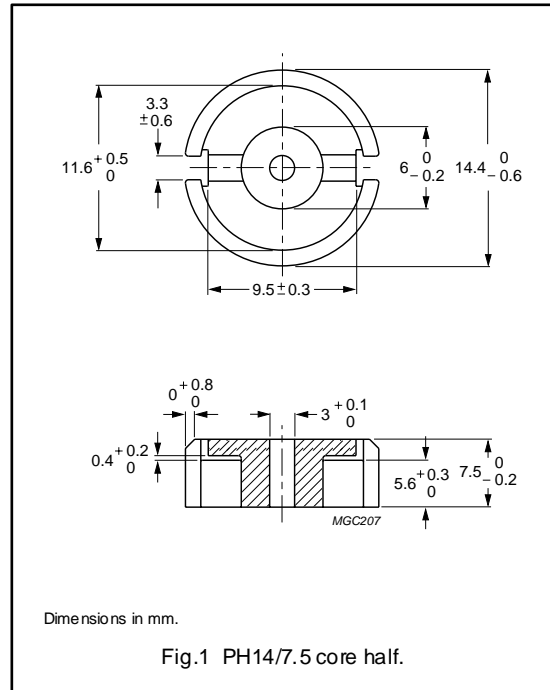


**CORE HALF**

**Ordering information**

GRADE	TYPE NUMBER
3D3	PH14/7.5-3D3

mass of core half  $\approx$  3 g



PH cores

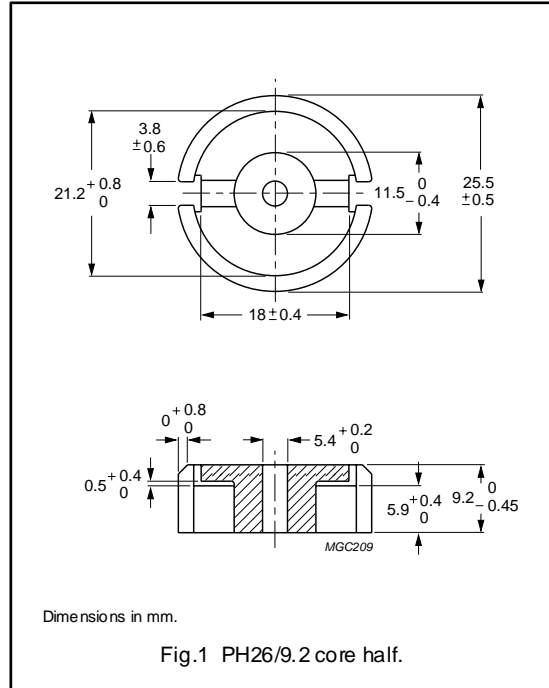
PH26/9.2

CORE HALF

Ordering information

GRADE	TYPE NUMBER
3D3	PH26/9.2-3D3

mass of core half ≈ 12 g









**Soft Ferrites**

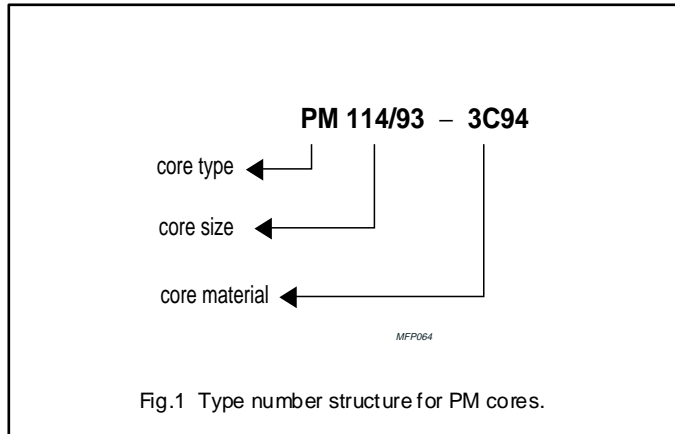
**PM cores**

**PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE**

**Product overview PM cores**

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
PM87/70	133000	910	770
PM114/93	344000	1720	1940

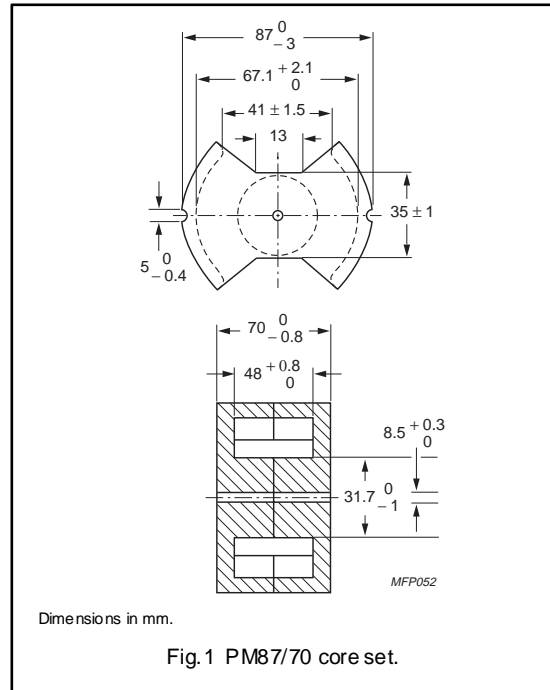
- In accordance with IEC 61247.



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.161	mm <sup>-1</sup>
$V_e$	effective volume	133000	mm <sup>3</sup>
$l_e$	effective length	146	mm
$A_e$	effective area	910	mm <sup>2</sup>
$A_{min}$	minimum area	700	mm <sup>2</sup>
$m$	mass of set	≈ 770	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 1250 ± 250 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	15000 ± 25 %	≈ 1770	≈ 0	PM87/70-3C90
3C94	15000 ± 25 %	≈ 1770	≈ 0	PM87/70-3C94

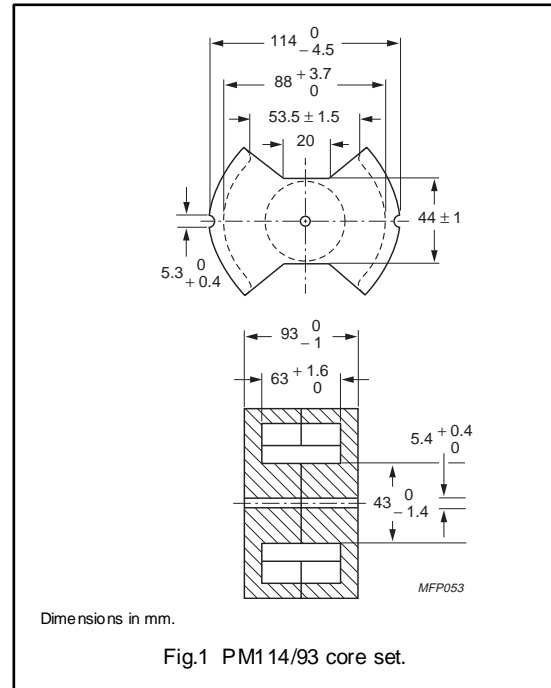
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 20
3C94	≥ 315	≤ 16

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.116	mm <sup>-1</sup>
$V_e$	effective volume	344000	mm <sup>3</sup>
$l_e$	effective length	200	mm
$A_e$	effective area	1720	mm <sup>2</sup>
$A_{min}$	minimum area	1380	mm <sup>2</sup>
$m$	mass of set	≈ 1940	g



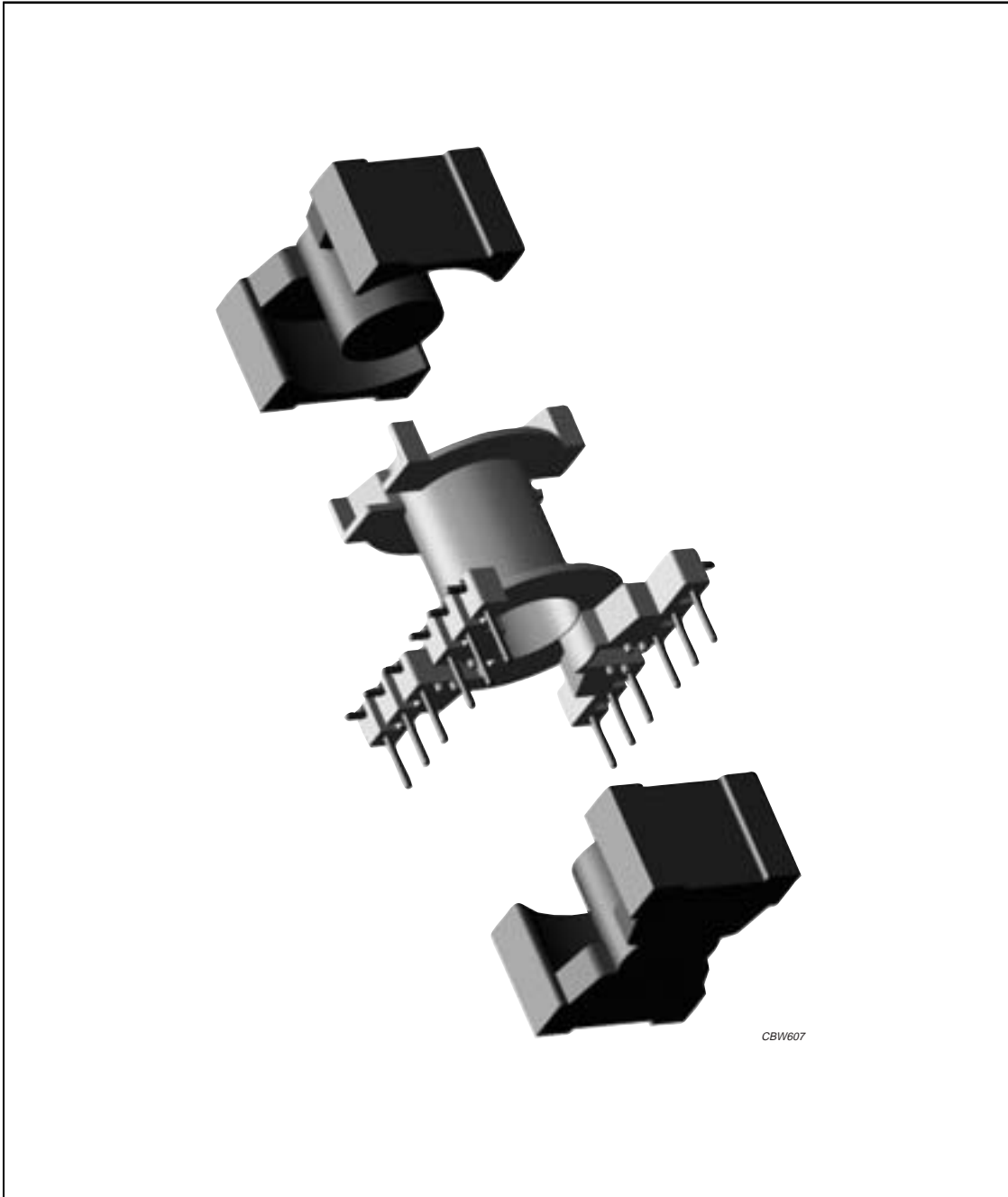
**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 2500 ± 500 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	20000 ± 25 %	≈ 1850	≈ 0	PM114/93-3C90
3C94	20000 ± 25 %	≈ 1850	≈ 0	PM114/93-3C94

**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; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 12
3C94	≥ 315	≤ 9



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Soft Ferrites

PQ cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview PQ cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
PQ20/16	2330	61.9	13
PQ20/20	2850	62.6	16
PQ26/20	5820	121	30
PQ26/25	6530	120	36
PQ32/20	9440	169	43
PQ32/30	12500	167	57
PQ35/35	16300	190	73
PQ40/40	20500	201	97
PQ50/50	37100	328	195

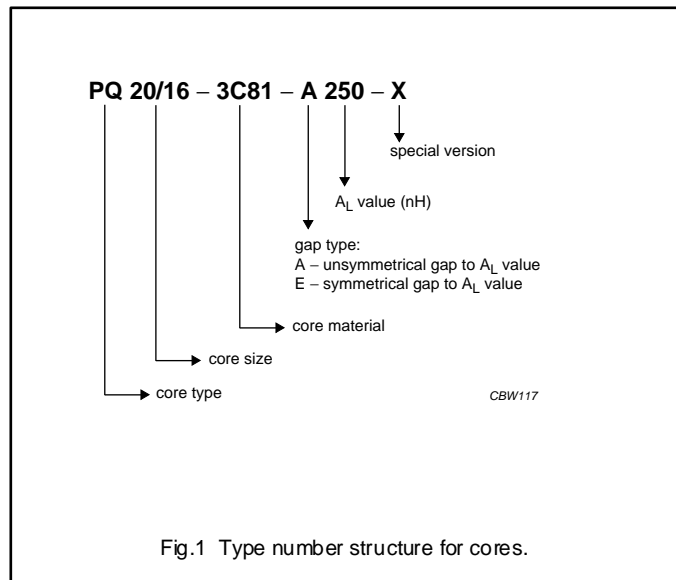


Fig.1 Type number structure for cores.

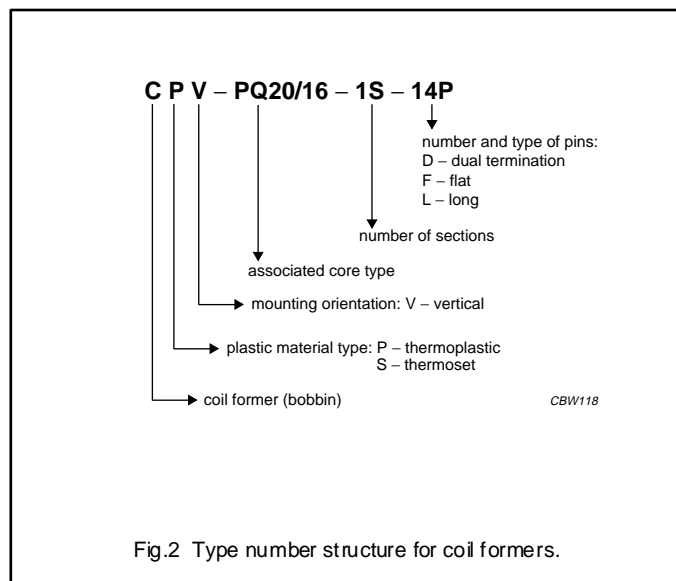
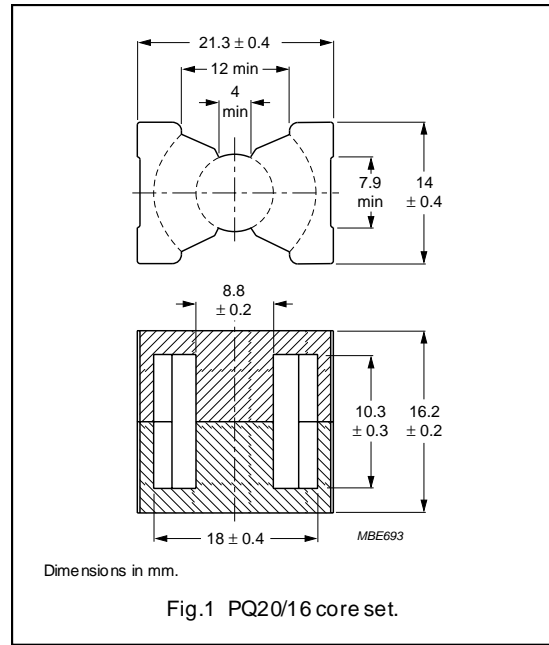


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.607	mm <sup>-1</sup>
$V_e$	effective volume	2330	mm <sup>3</sup>
$l_e$	effective length	37.6	mm
$A_e$	effective area	61.9	mm <sup>2</sup>
$A_{min}$	minimum area	59.1	mm <sup>2</sup>
$m$	mass of set	≈ 13	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	4080 ± 25%	≈ 1970	≈ 0	PQ20/16-3C91
3C94	3600 ± 25%	≈ 1740	≈ 0	PQ20/16-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	3250 ± 25%	≈ 1570	≈ 0	PQ20/16-3C96

## PQ cores and accessories

PQ20/16

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm$ 3%	$\approx 77$	$\approx 600$	PQ20/16-3F3-A160
	250 $\pm$ 3%	$\approx 121$	$\approx 350$	PQ20/16-3F3-A250
	315 $\pm$ 3%	$\approx 152$	$\approx 270$	PQ20/16-3F3-A315
	400 $\pm$ 3%	$\approx 193$	$\approx 200$	PQ20/16-3F3-A400
	630 $\pm$ 5%	$\approx 305$	$\approx 120$	PQ20/16-3F3-A630
	3080 $\pm$ 25%	$\approx 1490$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.54$	–	–	–
3C90	$\geq 320$	$\leq 0.28$	$\leq 0.3$	–	–
3C91	$\geq 320$	–	$\leq 0.16^{(1)}$	$\leq 1.1^{(1)}$	–
3C94	$\geq 320$	–	$\leq 0.22$	$\leq 1.4$	–
3C96	$\geq 340$	–	$\leq 0.16$	$\leq 1.1$	$\leq 0.43$
3F3	$\geq 320$	–	$\leq 0.26$	–	$\leq 0.44$

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq 320$	–	–	–	–
3C90	$\geq 320$	–	–	–	–
3C91	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 0.9$	–	–	–
3F3	$\geq 320$	–	–	–	–

## Note

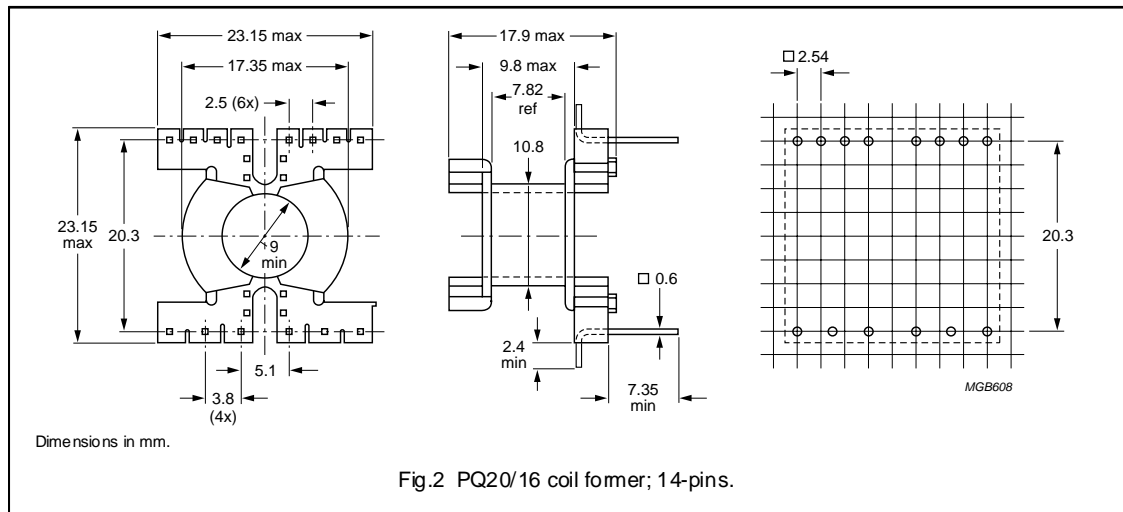
1. Measured at 60 °C.



**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, transition to lead-free (Sn) ongoing
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



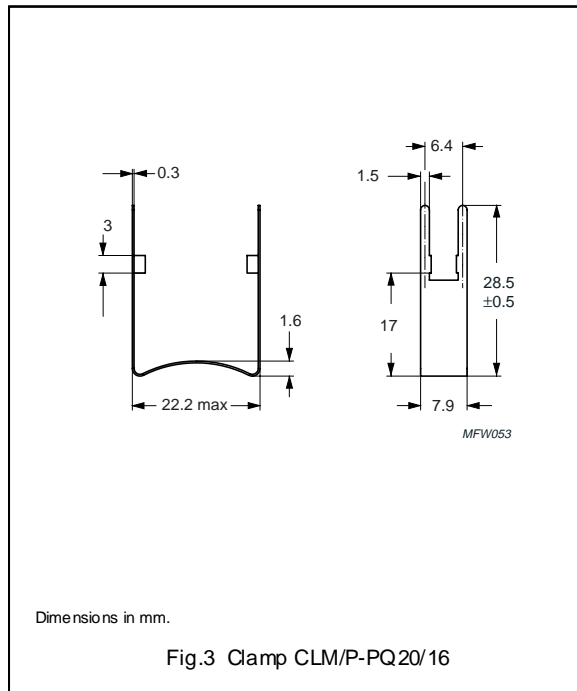
**Winding data for 14-pins PQ20/16 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

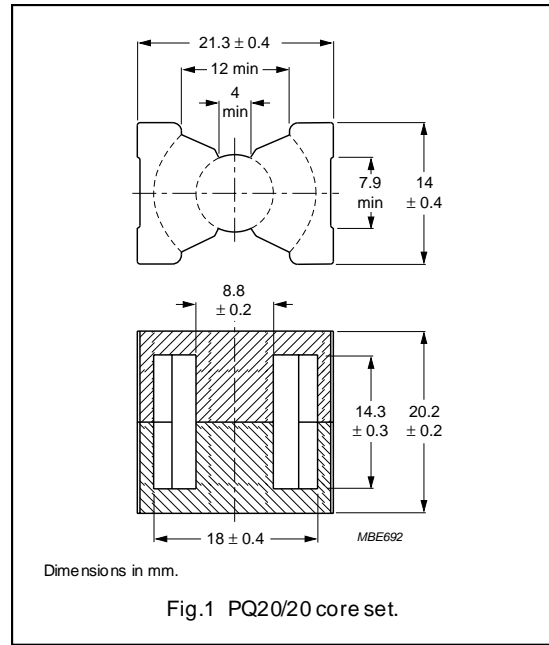
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ20/16



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.731	mm <sup>-1</sup>
$V_e$	effective volume	2850	mm <sup>3</sup>
$l_e$	effective length	45.7	mm
$A_e$	effective area	62.6	mm <sup>2</sup>
$A_{min}$	minimum area	59.1	mm <sup>2</sup>
$m$	mass of set	≈ 16	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	3580 ± 25%	≈ 2080	≈ 0	PQ20/20-3C91
3C94	3150 ± 25%	≈ 1830	≈ 0	PQ20/20-3C94
3C96 <small>des</small>	2820 ± 25%	≈ 1640	≈ 0	PQ20/20-3C96

## PQ cores and accessories

PQ20/20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm$ 3%	$\approx$ 93	$\approx$ 620	PQ20/20-3F3-A160
	250 $\pm$ 3%	$\approx$ 145	$\approx$ 360	PQ20/20-3F3-A250
	315 $\pm$ 3%	$\approx$ 183	$\approx$ 270	PQ20/20-3F3-A315
	400 $\pm$ 3%	$\approx$ 232	$\approx$ 200	PQ20/20-3F3-A400
	630 $\pm$ 5%	$\approx$ 366	$\approx$ 120	PQ20/20-3F3-A630
	2650 $\pm$ 25%	$\approx$ 1540	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 0.66	–	–	–	–
3C90	$\geq$ 320	$\leq$ 0.35	$\leq$ 0.37	–	–	–
3C91	$\geq$ 320	–	$\leq$ 0.2 <sup>(1)</sup>	$\leq$ 1.3 <sup>(1)</sup>	–	–
3C94	$\geq$ 320	–	$\leq$ 0.27	$\leq$ 1.7	–	–
3C96	$\geq$ 340	–	$\leq$ 0.2	$\leq$ 1.3	$\leq$ 0.53	$\leq$ 1.1
3F3	$\geq$ 320	–	$\leq$ 0.31	–	$\leq$ 0.54	–

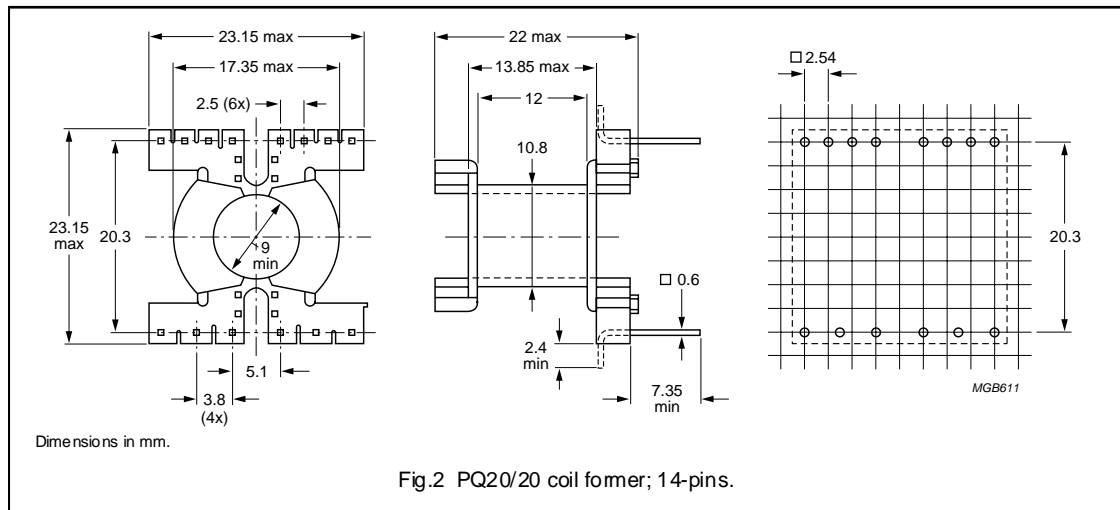
## Note

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, transition to lead-free (Sn) ongoing
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



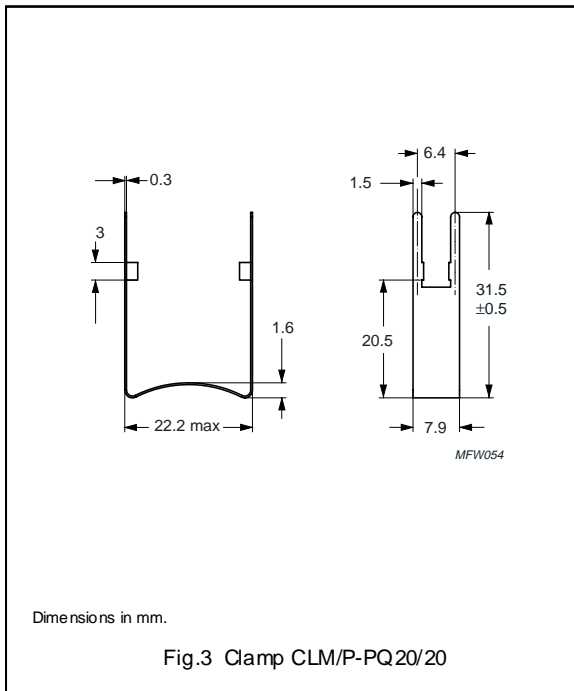
**Winding data for 14-pins PQ20/20 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

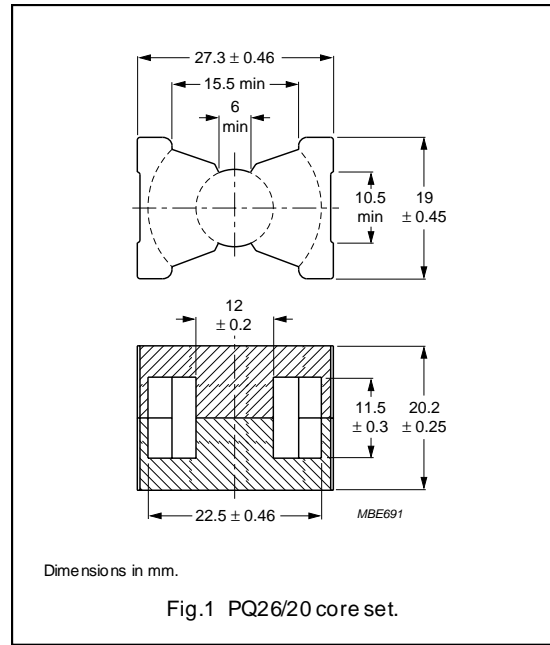
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ20/20



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.372	mm <sup>-1</sup>
$V_e$	effective volume	5470	mm <sup>3</sup>
$l_e$	effective length	45.0	mm
$A_e$	effective area	121	mm <sup>2</sup>
$A_{min}$	minimum area	109	mm <sup>2</sup>
$m$	mass of set	≈ 30	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 60 ± 15 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	7020 ± 25%	≈ 2080	≈ 0	PQ26/20-3C91
3C94	6200 ± 25%	≈ 1640	≈ 0	PQ26/20-3C94
3C96 <small>des</small>	5530 ± 25%	≈ 1640	≈ 0	PQ26/20-3C96

## PQ cores and accessories

PQ26/20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	250 $\pm 3\%$	$\approx 74$	$\approx 730$	PQ26/20-3F3-E250
	315 $\pm 3\%$	$\approx 93$	$\approx 550$	PQ26/20-3F3-A315
	400 $\pm 3\%$	$\approx 118$	$\approx 420$	PQ26/20-3F3-A400
	630 $\pm 3\%$	$\approx 186$	$\approx 250$	PQ26/20-3F3-A630
	1000 $\pm 5\%$	$\approx 296$	$\approx 140$	PQ26/20-3F3-A1000
	5200 $\pm 25\%$	$\approx 1540$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 1.3$	–	–	–
3C90	$\geq 320$	$\leq 0.66$	$\leq 0.7$	–	–
3C91	$\geq 320$	–	$\leq 0.42^{(1)}$	$\leq 2.5^{(1)}$	–
3C94	$\geq 320$	–	$\leq 0.52$	$\leq 3.3$	–
3C96	$\geq 340$	–	$\leq 0.42$	$\leq 2.5$	$\leq 1.0$
3F3	$\geq 320$	–	$\leq 0.64$	–	$\leq 1.1$

## 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq 320$	–	–	–	–
3C90	$\geq 320$	–	–	–	–
3C91	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 2.1$	–	–	–
3F3	$\geq 320$	–	–	–	–

## Note

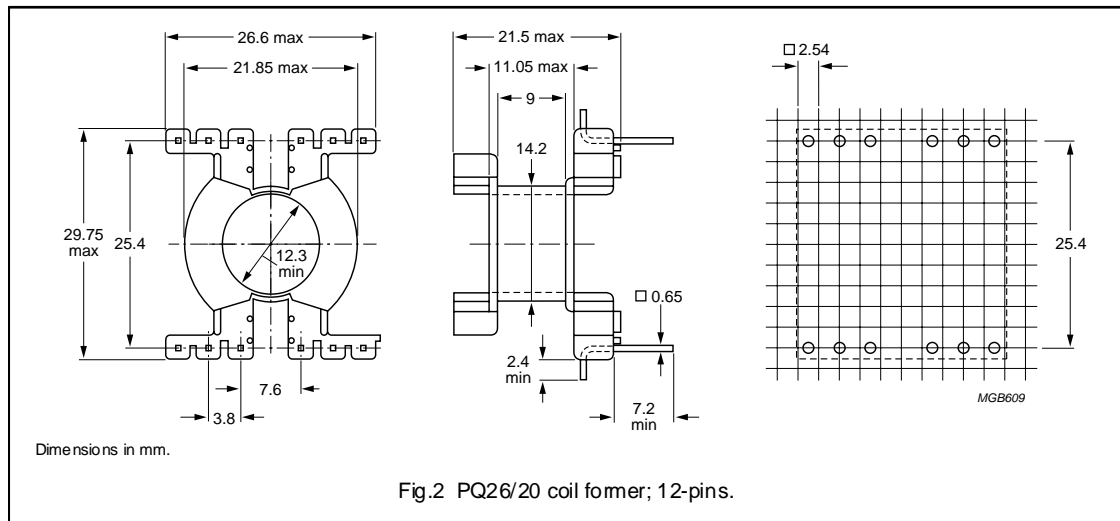
1. Measured at 60 °C.



**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, transition to lead-free (Sn) ongoing
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



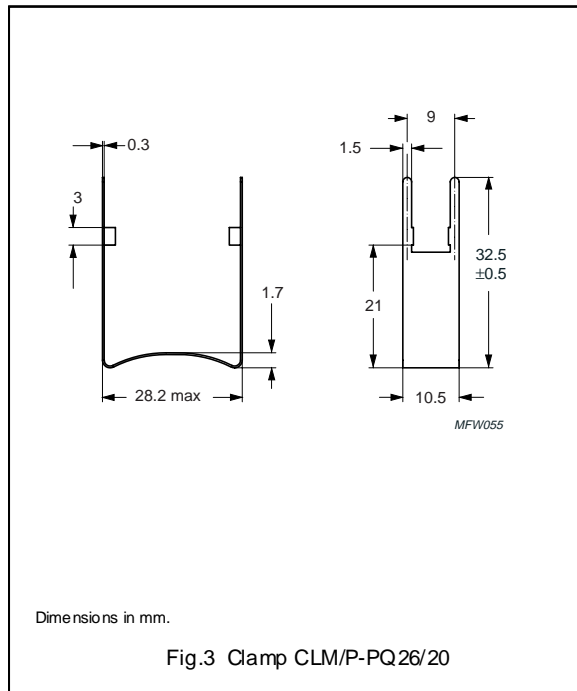
**Winding data for 12-pins PQ26/20 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

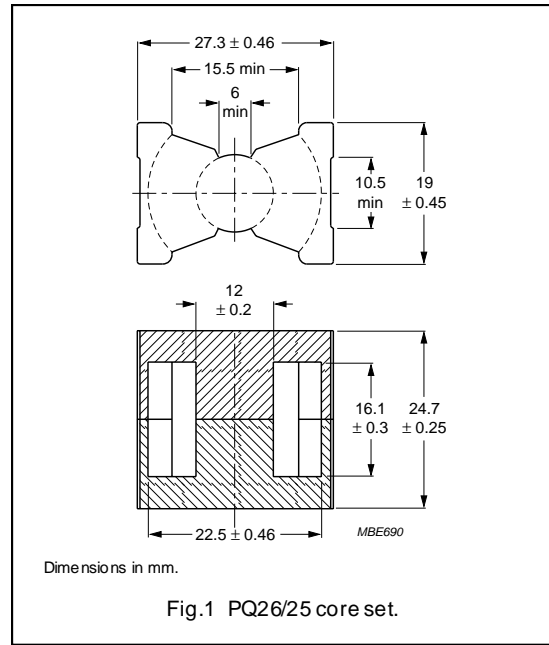
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ26/20



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.451	mm <sup>-1</sup>
$V_e$	effective volume	6530	mm <sup>3</sup>
$l_e$	effective length	54.3	mm
$A_e$	effective area	120	mm <sup>2</sup>
$A_{min}$	minimum area	108	mm <sup>2</sup>
$m$	mass of set	≈ 36	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 60 ± 15 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <small>des</small>	6010 ± 25%	≈ 2160	≈ 0	PQ26/25-3C91
3C94	5250 ± 25%	≈ 1890	≈ 0	PQ26/25-3C94
3C96 <small>des</small>	4700 ± 25%	≈ 1690	≈ 0	PQ26/25-3C96

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	250 $\pm$ 3%	$\approx$ 90	$\approx$ 730	PQ26/25-3F3-E250
	315 $\pm$ 3%	$\approx$ 113	$\approx$ 550	PQ26/25-3F3-A315
	400 $\pm$ 3%	$\approx$ 144	$\approx$ 420	PQ26/25-3F3-A400
	630 $\pm$ 3%	$\approx$ 227	$\approx$ 240	PQ26/25-3F3-A630
	1000 $\pm$ 5%	$\approx$ 360	$\approx$ 140	PQ26/25-3F3-A1000
	4390 $\pm$ 25%	$\approx$ 1574	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 1.5	–	–	–
3C90	$\geq$ 320	$\leq$ 0.79	$\leq$ 0.83	–	–
3C91	$\geq$ 320	–	$\leq$ 0.5 <sup>(1)</sup>	$\leq$ 3.2 <sup>(1)</sup>	–
3C94	$\geq$ 320	–	$\leq$ 0.62	$\leq$ 4.0	–
3C96	$\geq$ 340	–	$\leq$ 0.5	$\leq$ 3.2	$\leq$ 1.15
3F3	$\geq$ 320	–	$\leq$ 0.72	–	$\leq$ 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq$ 320	–	–	–	–
3C90	$\geq$ 320	–	–	–	–
3C91	$\geq$ 320	–	–	–	–
3C94	$\geq$ 320	–	–	–	–
3C96	$\geq$ 340	$\leq$ 2.5	–	–	–
3F3	$\geq$ 320	–	–	–	–

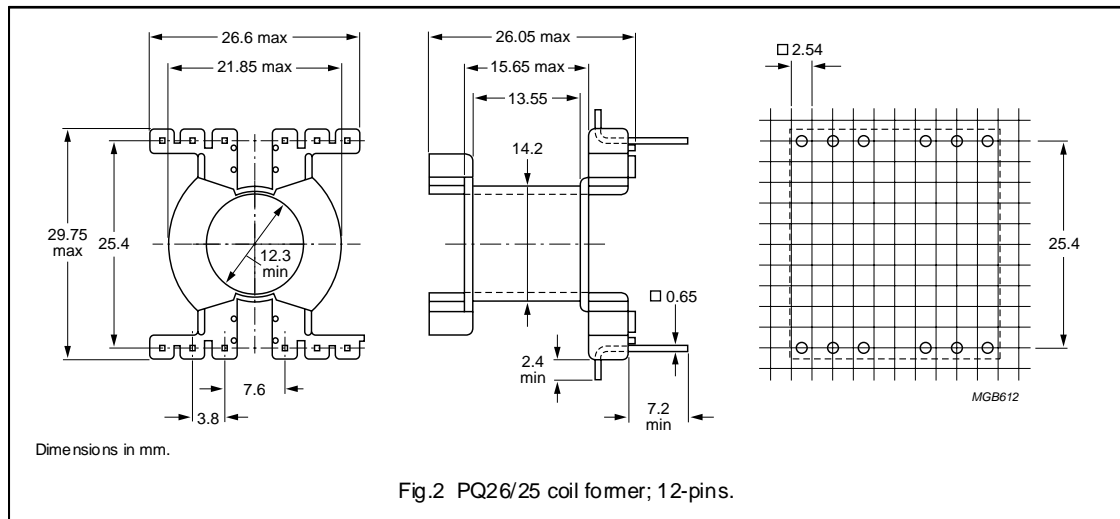
## Note

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, transition to lead-free (Sn) ongoing
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



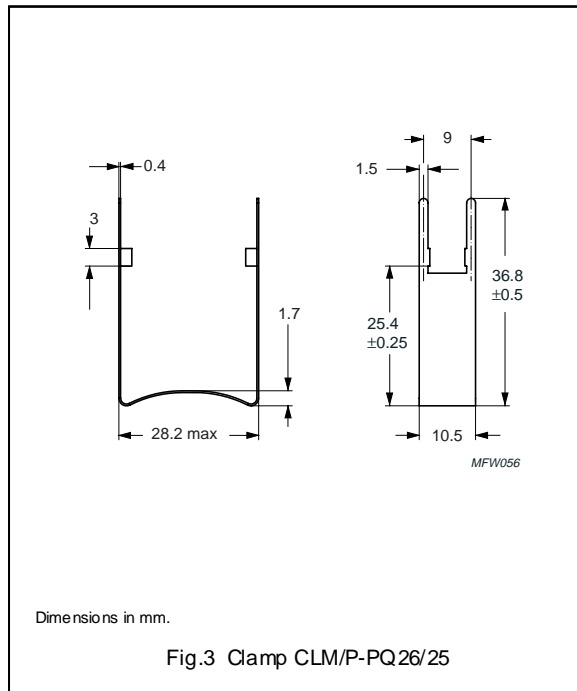
**Winding data for 12-pins PQ 26/25 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	NOMINAL WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	47.5	13.6	56.4	CPV-PQ 26/25-1 S-12P
1	47.5	13.6	56.4	CPV-PQ 26/25-1 S-12PD

**MOUNTING PARTS**

**General data**

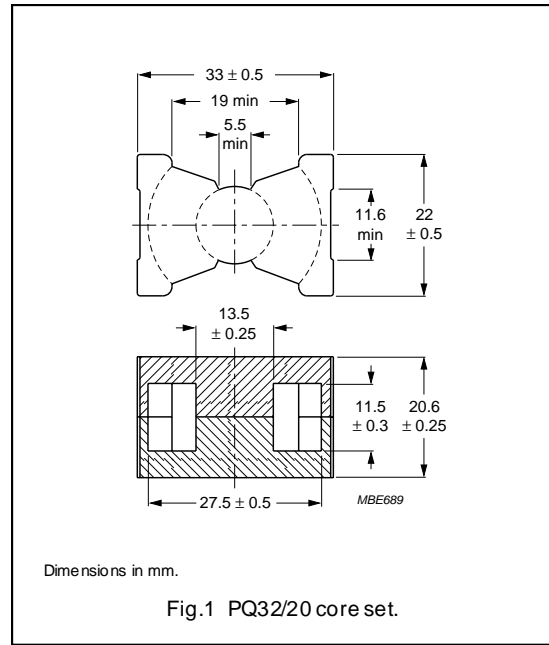
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ26/25



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.331	mm <sup>-1</sup>
$V_e$	effective volume	9440	mm <sup>3</sup>
$l_e$	effective length	55.9	mm
$A_e$	effective area	169	mm <sup>2</sup>
$A_{min}$	minimum area	142	mm <sup>2</sup>
$m$	mass of set	≈ 43	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	7560 ± 25%	≈ 1990	≈ 0	PQ32/20-3C91
3C94	6800 ± 25%	≈ 1790	≈ 0	PQ32/20-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6000 ± 25%	≈ 1580	≈ 0	PQ32/20-3C96

## PQ cores and accessories

PQ32/20

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	315 $\pm$ 3%	$\approx$ 83	$\approx$ 790	PQ32/20-3F3-E315
	400 $\pm$ 3%	$\approx$ 105	$\approx$ 600	PQ32/20-3F3-A400
	630 $\pm$ 3%	$\approx$ 166	$\approx$ 350	PQ32/20-3F3-A630
	1000 $\pm$ 3%	$\approx$ 263	$\approx$ 210	PQ32/20-3F3-A1000
	1600 $\pm$ 5%	$\approx$ 421	$\approx$ 120	PQ32/20-3F3-A1600
	6000 $\pm$ 25%	$\approx$ 1580	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 1.9	–	–	–
3C90	$\geq$ 320	$\leq$ 1.2	$\leq$ 1.3	–	–
3C91	$\geq$ 320	–	$\leq$ 0.7 <sup>(1)</sup>	$\leq$ 4.4 <sup>(1)</sup>	–
3C94	$\geq$ 320	–	$\leq$ 0.9	$\leq$ 5.5	–
3C96	$\geq$ 340	–	$\leq$ 0.7	$\leq$ 4.4	$\leq$ 1.7
3F3	$\geq$ 320	–	$\leq$ 1.0	–	$\leq$ 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq$ 320	–	–	–	–
3C90	$\geq$ 320	–	–	–	–
3C91	$\geq$ 320	–	–	–	–
3C94	$\geq$ 320	–	–	–	–
3C96	$\geq$ 340	$\leq$ 3.5	–	–	–
3F3	$\geq$ 320	–	–	–	–

## Note

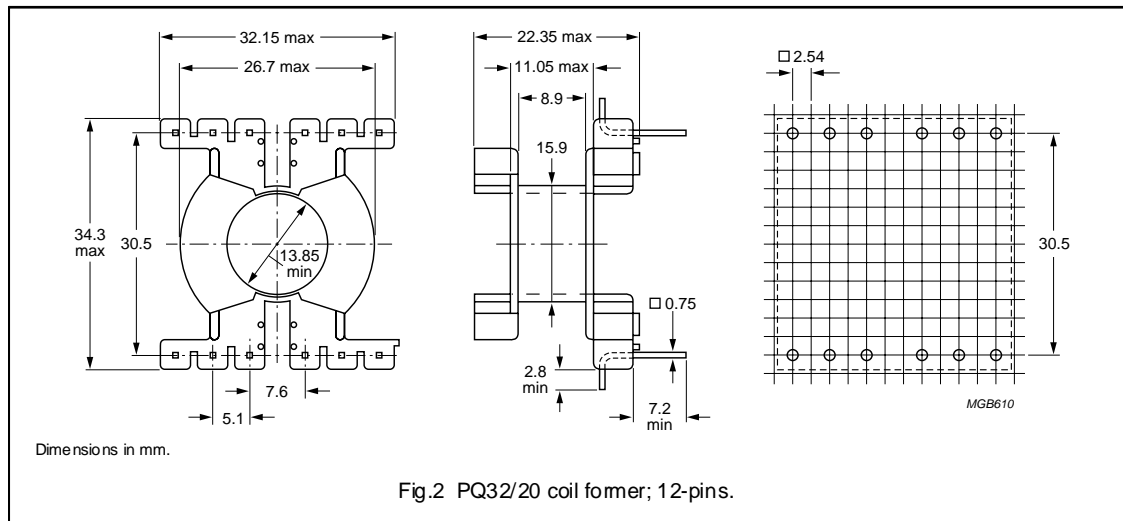
1. Measured at 60 °C.



**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, transition to lead-free (Sn) ongoing
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



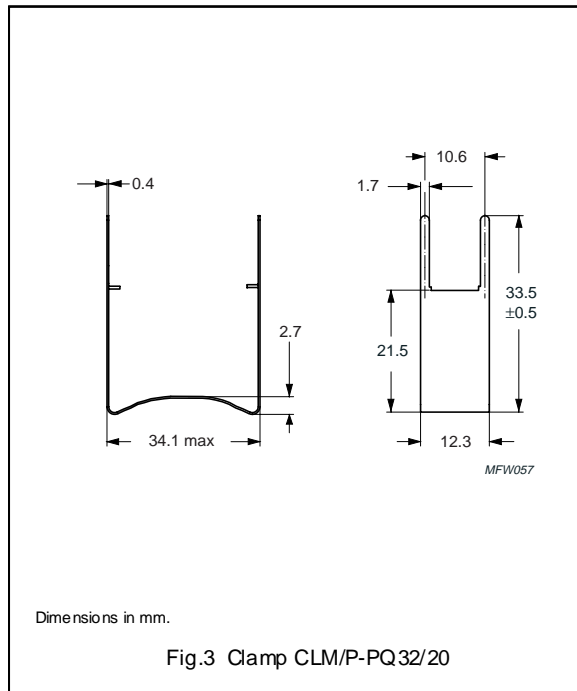
**Winding data for 12-pins PQ32/20 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

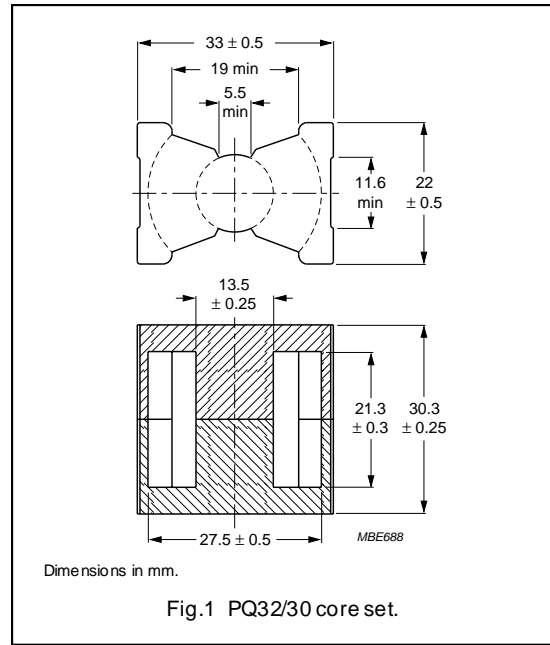
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ32/20



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.447	mm <sup>-1</sup>
$V_e$	effective volume	12500	mm <sup>3</sup>
$l_e$	effective length	74.7	mm
$A_e$	effective area	167	mm <sup>2</sup>
$A_{min}$	minimum area	142	mm <sup>2</sup>
$m$	mass of set	≈ 57	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	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 <small>des</small>	6570 ± 25%	≈ 2340	≈ 0	PQ32/30-3C91
3C94	5600 ± 25%	≈ 1990	≈ 0	PQ32/30-3C94
3C96 <small>des</small>	5040 ± 25%	≈ 1790	≈ 0	PQ32/30-3C96

## PQ cores and accessories

## PQ32/30

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	315 $\pm$ 3%	$\approx$ 112	$\approx$ 800	PQ32/30-3F3-E315
	400 $\pm$ 3%	$\approx$ 142	$\approx$ 600	PQ32/30-3F3-A400
	630 $\pm$ 3%	$\approx$ 224	$\approx$ 350	PQ32/30-3F3-A630
	1000 $\pm$ 3%	$\approx$ 356	$\approx$ 200	PQ32/30-3F3-A1000
	1600 $\pm$ 5%	$\approx$ 570	$\approx$ 110	PQ32/30-3F3-A1600
	4580 $\pm$ 25%	$\approx$ 1630	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 2.6	–	–	–
3C90	$\geq$ 320	$\leq$ 1.5	$\leq$ 1.6	–	–
3C91	$\geq$ 320	–	$\leq$ 0.9 <sup>(1)</sup>	$\leq$ 6.0 <sup>(1)</sup>	–
3C94	$\geq$ 320	–	$\leq$ 1.2	$\leq$ 7.5	–
3C96	$\geq$ 340	–	$\leq$ 0.9	$\leq$ 6.0	$\leq$ 2.3
3F3	$\geq$ 320	–	$\leq$ 1.4	–	$\leq$ 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq$ 320	–	–	–	–
3C90	$\geq$ 320	–	–	–	–
3C91	$\geq$ 320	–	–	–	–
3C94	$\geq$ 320	–	–	–	–
3C96	$\geq$ 340	$\leq$ 4.7	–	–	–
3F3	$\geq$ 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, transition to lead-free (Sn) ongoing
Maximum operating temperature	155 °C, "IEC 60085", class F
Resistance to soldering heat	"IEC 60068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1

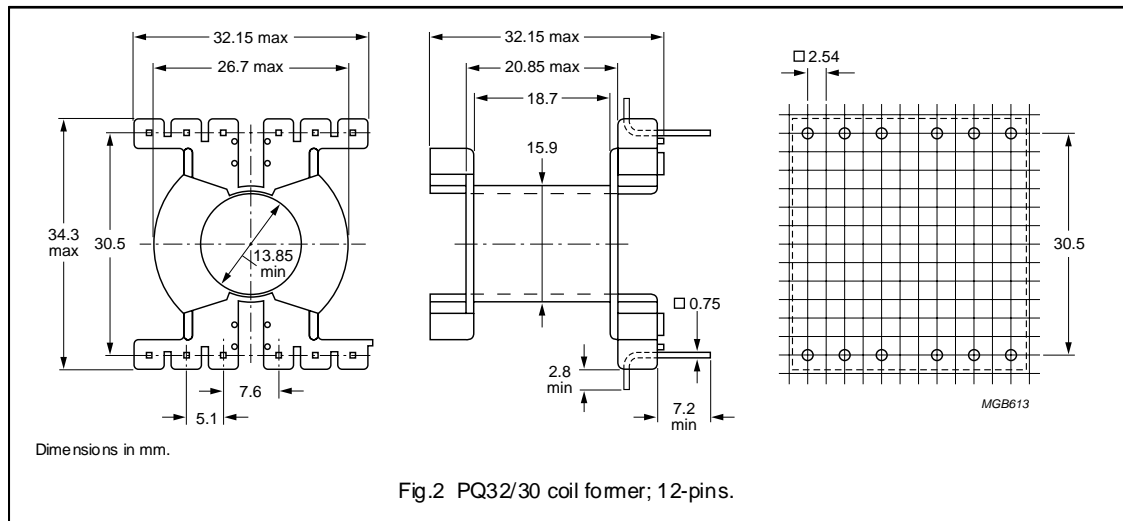


Fig.2 PQ32/30 coil former; 12-pins.

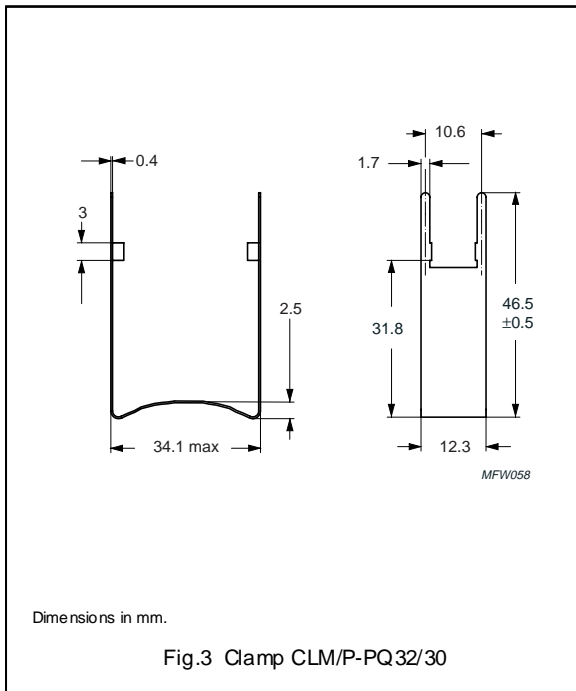
**Winding data for 12-pins PQ32/30 coil former**

NUMBER OF SECTIONS	MINIMUM WINDING AREA (mm <sup>2</sup> )	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**

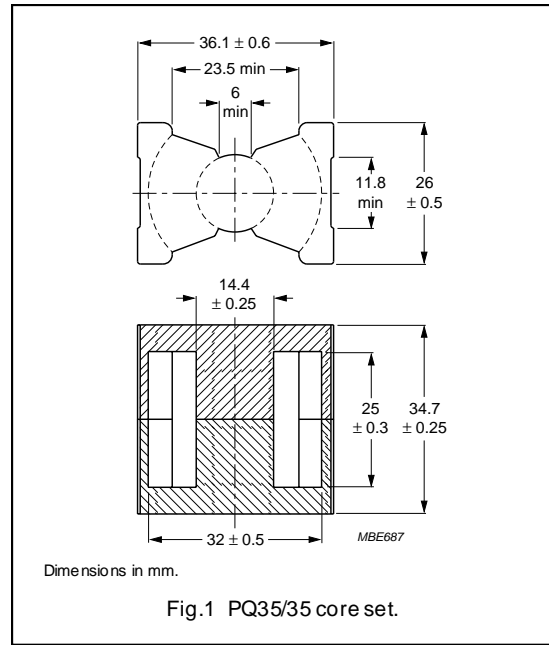
ITEM	REMARKS	TYPE NUMBER
Clamp	phosphorbronze, Sn plated, earth pins solderability acc. to "IEC 60068-2-20", Part 2, Test Ta, method 1: 235 °C, 2 s	CLM/P-PQ32/30



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.454	mm <sup>-1</sup>
$V_e$	effective volume	16300	mm <sup>3</sup>
$l_e$	effective length	86.1	mm
$A_e$	effective area	190	mm <sup>2</sup>
$A_{min}$	minimum area	162	mm <sup>2</sup>
$m$	mass of set	≈ 73	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6000 ± 25%	≈ 2160	≈ 0	PQ35/35-3C91
3C94	5200 ± 25%	≈ 1880	≈ 0	PQ35/35-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	4700 ± 25%	≈ 1700	≈ 0	PQ35/35-3C96

## PQ cores and accessories

PQ35/35

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	315 $\pm$ 3%	$\approx$ 114	$\approx$ 920	PQ35/35-3F3-E315
	400 $\pm$ 3%	$\approx$ 144	$\approx$ 690	PQ35/35-3F3-E400
	630 $\pm$ 3%	$\approx$ 227	$\approx$ 400	PQ35/35-3F3-A630
	1000 $\pm$ 3%	$\approx$ 361	$\approx$ 230	PQ35/35-3F3-A1000
	1600 $\pm$ 5%	$\approx$ 577	$\approx$ 120	PQ35/35-3F3-A1600
	4570 $\pm$ 25%	$\approx$ 1650	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq$ 320	$\leq$ 3.8	–	–	–
3C90	$\geq$ 320	$\leq$ 2.0	$\leq$ 2.1	–	–
3C91	$\geq$ 320	–	$\leq$ 1.2 <sup>(1)</sup>	$\leq$ 8.0 <sup>(1)</sup>	–
3C94	$\geq$ 320	–	$\leq$ 1.6	$\leq$ 10	–
3C96	$\geq$ 340	–	$\leq$ 1.2	$\leq$ 8.0	$\leq$ 3.0
3F3	$\geq$ 320	–	$\leq$ 1.8	–	$\leq$ 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq$ 320	–	–	–	–
3C90	$\geq$ 320	–	–	–	–
3C91	$\geq$ 320	–	–	–	–
3C94	$\geq$ 320	–	–	–	–
3C96	$\geq$ 340	$\leq$ 6.1	–	–	–
3F3	$\geq$ 320	–	–	–	–

## Note

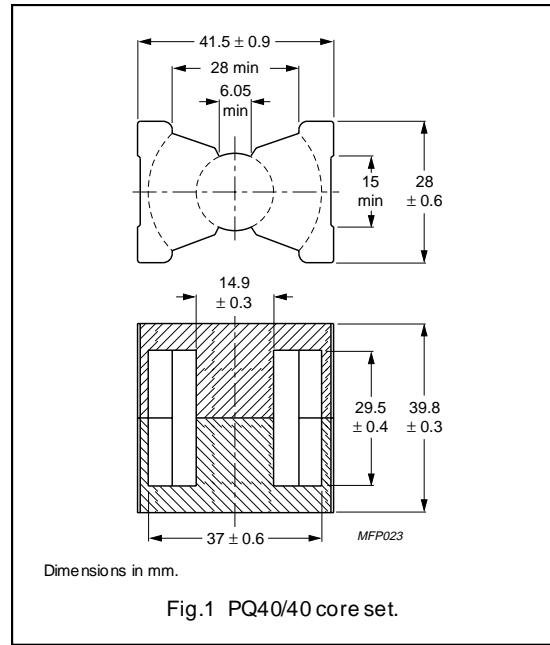
1. Measured at 60 °C.



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.507	mm <sup>-1</sup>
$V_e$	effective volume	20500	mm <sup>3</sup>
$l_e$	effective length	102	mm
$A_e$	effective area	201	mm <sup>2</sup>
$A_{min}$	minimum area	175	mm <sup>2</sup>
$m$	mass of set	≈ 97	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $80 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C91 <small>des</small>	$6100 \pm 25 \%$	≈ 2460	≈ 0	PQ40/40-3C91
3C94	$4900 \pm 25 \%$	≈ 1980	≈ 0	PQ40/40-3C94
3C96 <small>des</small>	$4200 \pm 25 \%$	≈ 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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C91	≥ 320	≤ 1.65 <sup>(1)</sup>	≤ 10 <sup>(1)</sup>	–
3C94	≥ 320	≤ 2.1	≤ 12.6	–
3C96	≥ 340	≤ 1.65	≤ 10	≤ 8.0

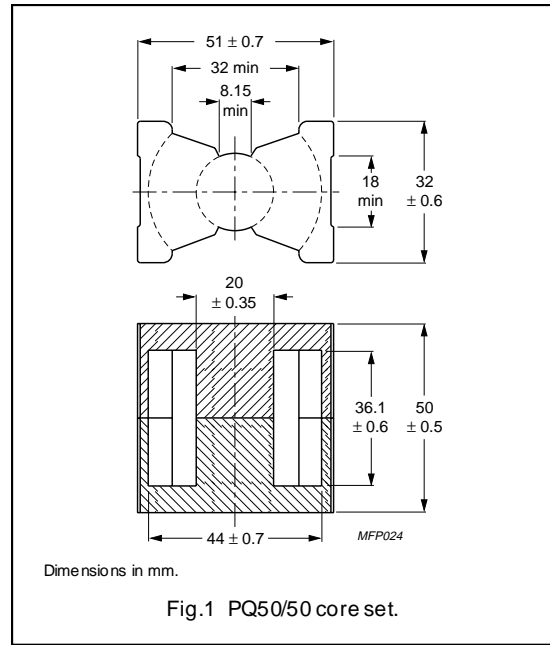
**Note**

1. Measured at 60 °C.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.345	mm <sup>-1</sup>
$V_e$	effective volume	371 00	mm <sup>3</sup>
$l_e$	effective length	113	mm
$A_e$	effective area	328	mm <sup>2</sup>
$A_{min}$	minimum area	314	mm <sup>2</sup>
$m$	mass of set	≈ 195	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $80 \pm 20$  N.

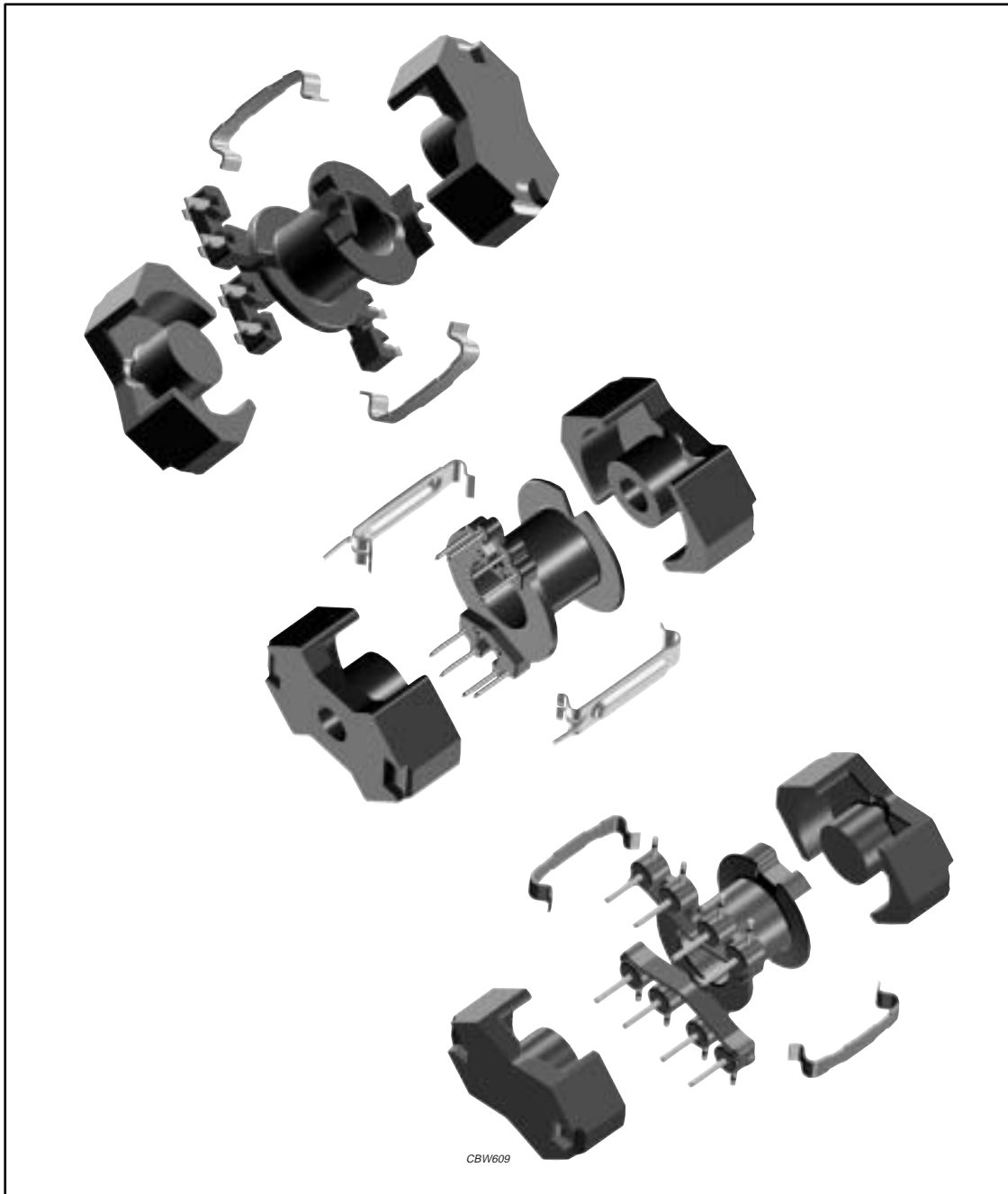
GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu m$ )	TYPE NUMBER
3C91 <small>des</small>	$9200 \pm 25 \%$	≈ 2530	≈ 0	PQ50/50-3C91
3C94	$7400 \pm 25 \%$	≈ 2030	≈ 0	PQ50/50-3C94
3C96 <small>des</small>	$6300 \pm 25 \%$	≈ 1730	≈ 0	PQ50/50-3C96

**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; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C
3C91	≥ 320	≤ 2.9 <sup>(1)</sup>	≤ 18 <sup>(1)</sup>	–
3C94	≥ 320	≤ 3.8	≤ 23	–
3C96	≥ 340	≤ 2.9	≤ 18	≤ 14

**Note**

1. Measured at 60 °C.



Soft Ferrites

RM, RM/I, RM/ILP  
cores and accessories

PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE

Product overview RM cores

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
RM4	230	11.0	1.5
RM4/I	322	13.8	1.7
RM4/ILP	251	14.5	1.3
RM5	450	21.2	3.1
RM5/I	574	24.8	3.2
RM5/ILP	430	24.5	2.6
RM6S	840	31.4	5.1
RM6S/I	1090	37.0	5.5
RM6S/ILP	820	37.5	4.4
RM6R	810	32.0	5.5
RM7/I	1325	44.1	7.5
RM7/ILP	1060	45.3	6.0
RM8	1850	52.0	11
RM8/I	2440	63.0	13
RM8/ILP	1860	64.9	10
RM10/I	4310	96.6	22
RM10/ILP	3360	99.1	17
RM12/I	8340	146	46
RM12/ILP	6195	148	35
RM14/I	13900	198	69
RM14/ILP	10230	201	55

• In accordance with IEC 60431.

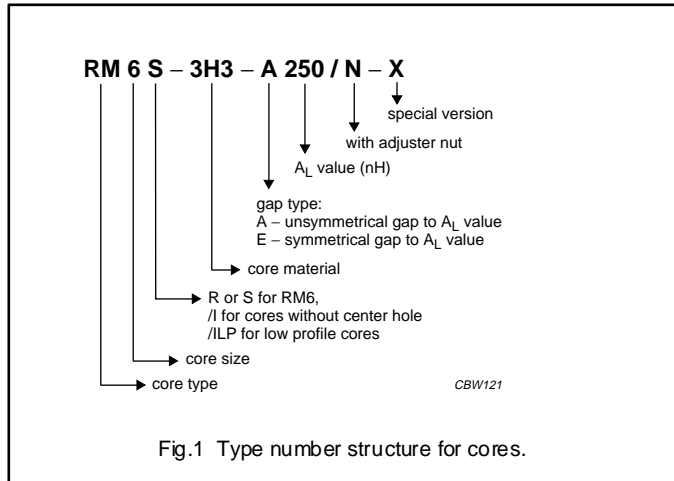


Fig.1 Type number structure for cores.

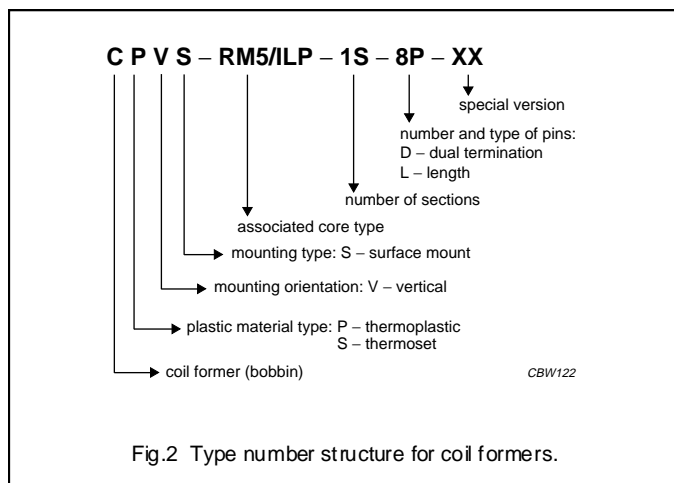
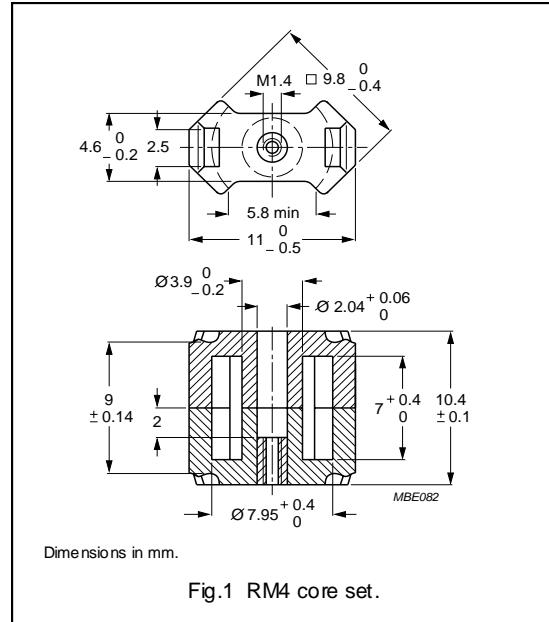


Fig.2 Type number structure for coil formers.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.94	mm <sup>-1</sup>
$V_e$	effective volume	230	mm <sup>3</sup>
$l_e$	effective length	21.3	mm
$A_e$	effective area	11.0	mm <sup>2</sup>
$A_{min}$	minimum area	8.1	mm <sup>2</sup>
$m$	mass of set	≈ 1.5	g



**Core sets for filter applications**

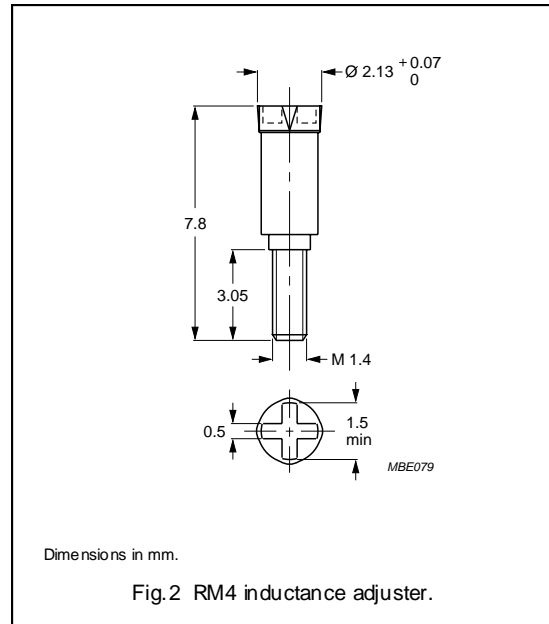
Clamping force for  $A_L$  measurements, 20 ±10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	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 <sup>sup</sup>	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



**Inductance adjuster selection chart (SUP) (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L % <sup>(1)</sup>
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

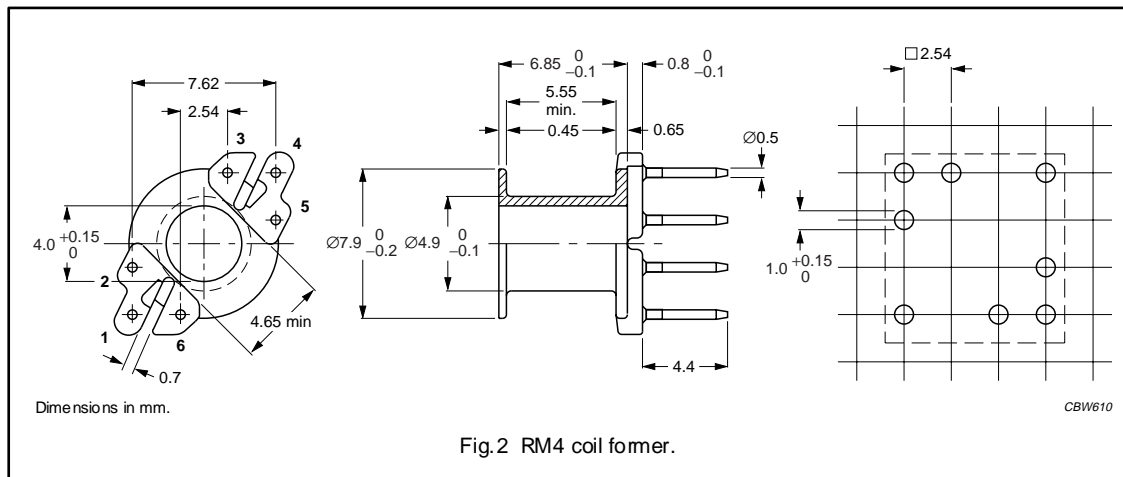
**Note**

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 (Sn) 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



**Winding data for RM4 coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	6	all	20	7.4	5.55	CSV-RM4-1S-6P <sup>(1)</sup>
1	5	1, 2, 3, 5, 6	20	7.4	5.55	CSV-RM4-1S-5P <sup>(1)</sup>

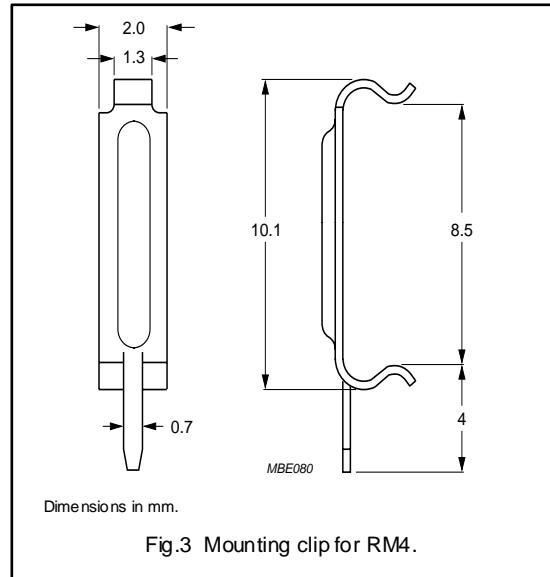
**Note**

- 1. Also available 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

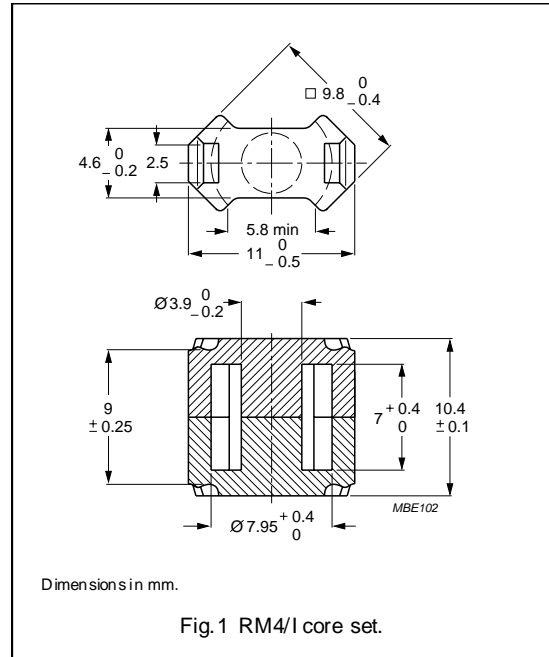




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.69	mm <sup>-1</sup>
$V_e$	effective volume	322	mm <sup>3</sup>
$l_e$	effective length	23.3	mm
$A_e$	effective area	13.8	mm <sup>2</sup>
$A_{min}$	minimum area	11.5	mm <sup>2</sup>
$m$	mass of set	≈ 1.7	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	1 125 ±25%	≈ 1510	≈ 0	RM4/I-3C90
3C94	1 125 ±25%	≈ 1510	≈ 0	RM4/I-3C94
3C96 <span style="border: 1px solid black; padding: 0 2px;">des</span>	1 000 ±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 <span style="border: 1px solid black; padding: 0 2px;">prot</span>	800 ±25%	≈ 1080	≈ 0	RM4/I-3F35
3F4 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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
3F45 <span style="border: 1px solid black; padding: 0 2px;">prot</span>	560 ±25%	≈ 750	≈ 0	RM4/I-3F45

## RM cores and accessories

RM4/I

**Core sets for filter applications**Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3B46 <small>des</small>	$1550 \pm 25 \%$	$\approx 2085$	$\approx 0$	RM4/I-3B46

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	$3500 +40/-30\%$	$\approx 4700$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.04$	$\leq 0.04$	–	–
3C94	$\geq 320$	–	$\leq 0.03$	$\leq 0.2$	–
3C96	$\geq 340$	–	$\leq 0.025$	$\leq 0.15$	$\leq 0.07$
3F3	$\geq 300$	–	$\leq 0.05$	–	$\leq 0.07$
3F35	$\geq 300$	–	–	–	$\leq 0.04$
3F4	$\geq 250$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–	–
3C94	$\geq 320$	–	–	–	–	–
3C96	$\geq 340$	$\leq 0.15$	–	–	–	–
3F3	$\geq 300$	–	–	–	–	–
3F35	$\geq 300$	$\leq 0.05$	$\leq 0.4$	–	–	–
3F4	$\geq 250$	–	–	$\leq 0.08$	–	$\leq 0.14$
3F45	$\geq 250$	–	–	$\leq 0.064$	$\leq 0.16$	$\leq 0.11$

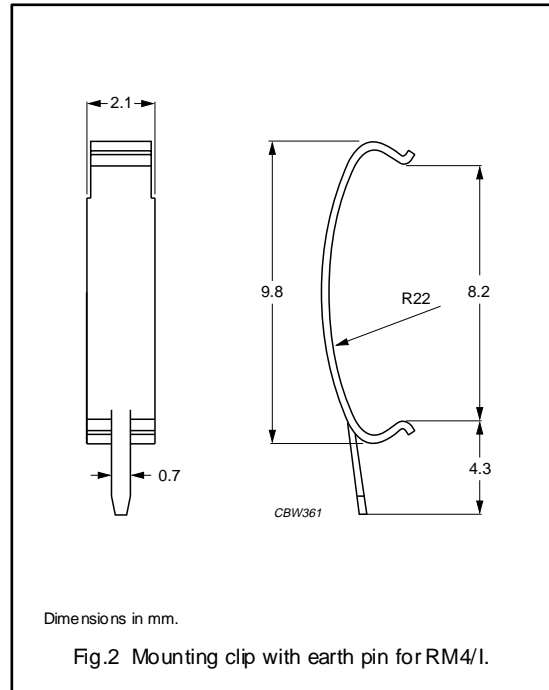
**COIL FORMERS**

For the information on coil formers suitable for RM4/I, see data sheet "RM4"

**MOUNTING PARTS**

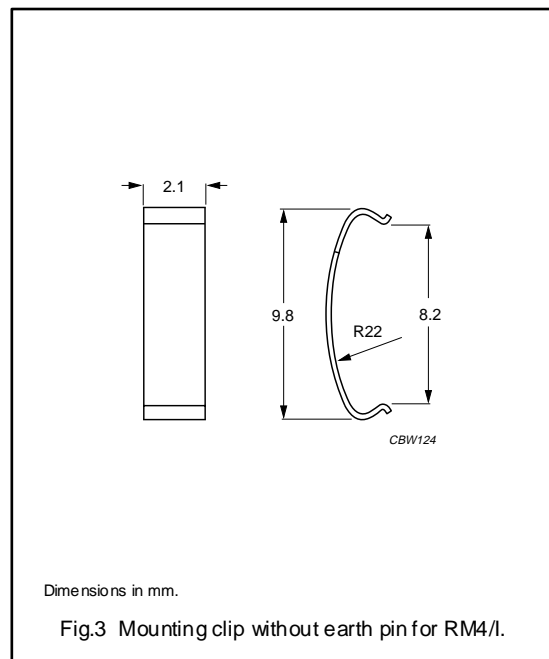
**General data mounting clip with earth pin**

ITEM	SPECIFICATION
Clamping force	≈ 5 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/I



**General data mounting clip without earth pin**

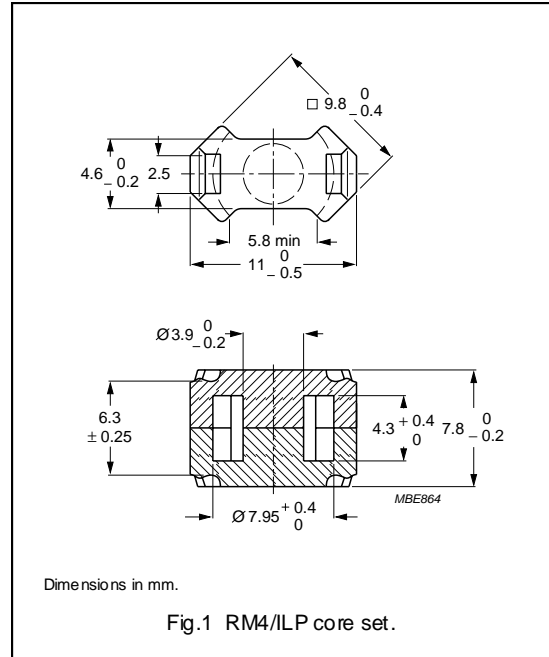
ITEM	SPECIFICATION
Clamping force	≈ 5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/I



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.19	mm <sup>-1</sup>
$V_e$	effective volume	251	mm <sup>3</sup>
$l_e$	effective length	17.3	mm
$A_e$	effective area	14.5	mm <sup>2</sup>
$A_{min}$	minimum area	11.3	mm <sup>2</sup>
$m$	mass of set	≈ 1.3	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	1400 ± 25%	≈ 1330	≈ 0	RM4/ILP-3C90
3C94	1400 ± 25%	≈ 1330	≈ 0	RM4/ILP-3C94
3C96 <small>des</small>	1250 ± 25%	≈ 1190	≈ 0	RM4/ILP-3C96
3F3	1200 ± 25%	≈ 1140	≈ 0	RM4/ILP-3F3
3F35 <small>prot</small>	1000 ± 25%	≈ 950	≈ 0	RM4/ILP-3F35
3F4 <small>des</small>	750 ± 25%	≈ 710	≈ 0	RM4/ILP-3F4
3F45 <small>prot</small>	750 ± 25%	≈ 710	≈ 0	RM4/ILP-3F45

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 10 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	1900 ± 25 %	≈ 1800	≈ 0	RM4/ILP-3B46

RM cores and accessories

RM4/ILP

**Core sets of high permeability grades**

Clamping force for  $A_L$  measurements,  $10 \pm 5$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	5000 +40/-30%	$\approx 4750$	$\approx 0$	RM4/ILP-3E5
3E6	6000 +40/-30%	$\approx 5700$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.04$	$\leq 0.04$	–	–
3C94	$\geq 320$	–	$\leq 0.024$	$\leq 0.13$	–
3C96	$\geq 340$	–	$\leq 0.018$	$\leq 0.1$	$\leq 0.06$
3F3	$\geq 300$	–	$\leq 0.04$	–	$\leq 0.06$
3F35	$\geq 300$	–	–	–	$\leq 0.03$
3F4	$\geq 250$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–	–
3C94	$\geq 320$	–	–	–	–	–
3C96	$\geq 340$	$\leq 0.1$	–	–	–	–
3F3	$\geq 300$	–	–	–	–	–
3F35	$\geq 300$	$\leq 0.04$	$\leq 0.3$	–	–	–
3F4	$\geq 250$	–	–	$\leq 0.08$	–	$\leq 0.12$
3F45	$\geq 250$	–	–	$\leq 0.05$	$\leq 0.13$	$\leq 0.09$

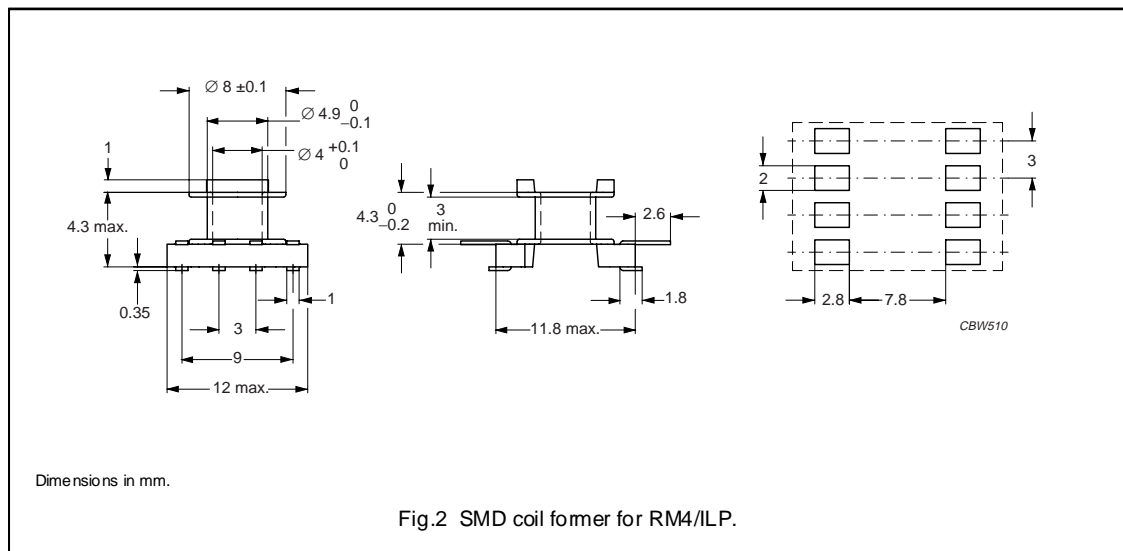
RM cores and accessories

RM4/ILP

**COIL FORMERS**

**General data SMD coil former**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E41429 (M)
Solder pad material	copper-clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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



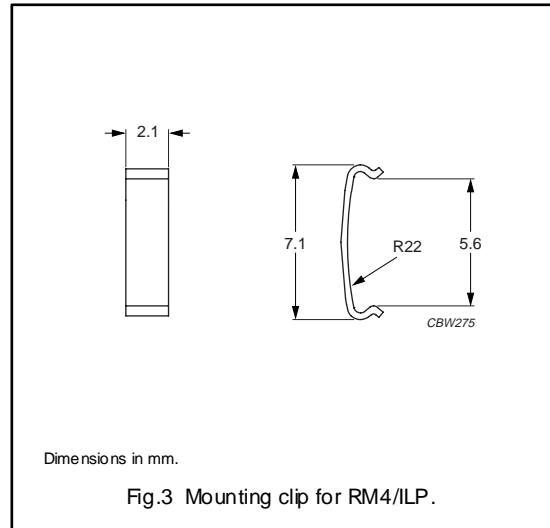
**Winding data for RM4/ILP coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	3.75	3.0	20.7	CSV5-RM4/LP-1S-8PL

**MOUNTING PARTS**

**General data**

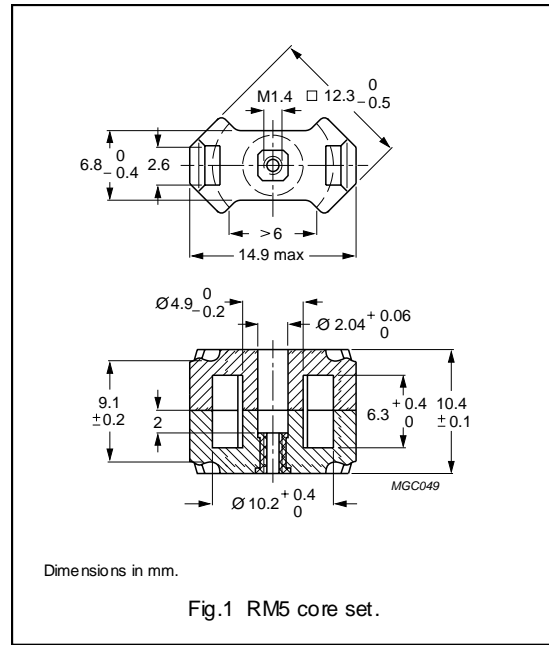
ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.01	mm <sup>-1</sup>
$V_e$	effective volume	450	mm <sup>3</sup>
$l_e$	effective length	21.4	mm
$A_e$	effective area	21.2	mm <sup>2</sup>
$A_{min}$	minimum area	14.8	mm <sup>2</sup>
$m$	mass of set	≈ 3.1	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 25 ± 10 N.

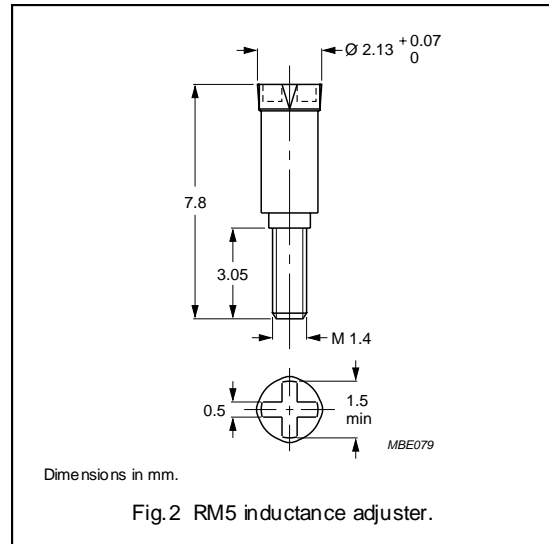
GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	40 ± 3%	≈ 32	≈ 990	RM5-3D3-E40/N	RM5-3D3-E40
	63 ± 3%	≈ 51	≈ 540	RM5-3D3-E63/N	RM5-3D3-E63
	100 ± 3%	≈ 80	≈ 300	RM5-3D3-E100/N	RM5-3D3-E100
	800 ± 25%	≈ 640	≈ 0	–	RM5-3D3
3H3 <sup>sup</sup>	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



**Inductance adjuster selection chart (SUP) (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L % <sup>(1)</sup>
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	–	–

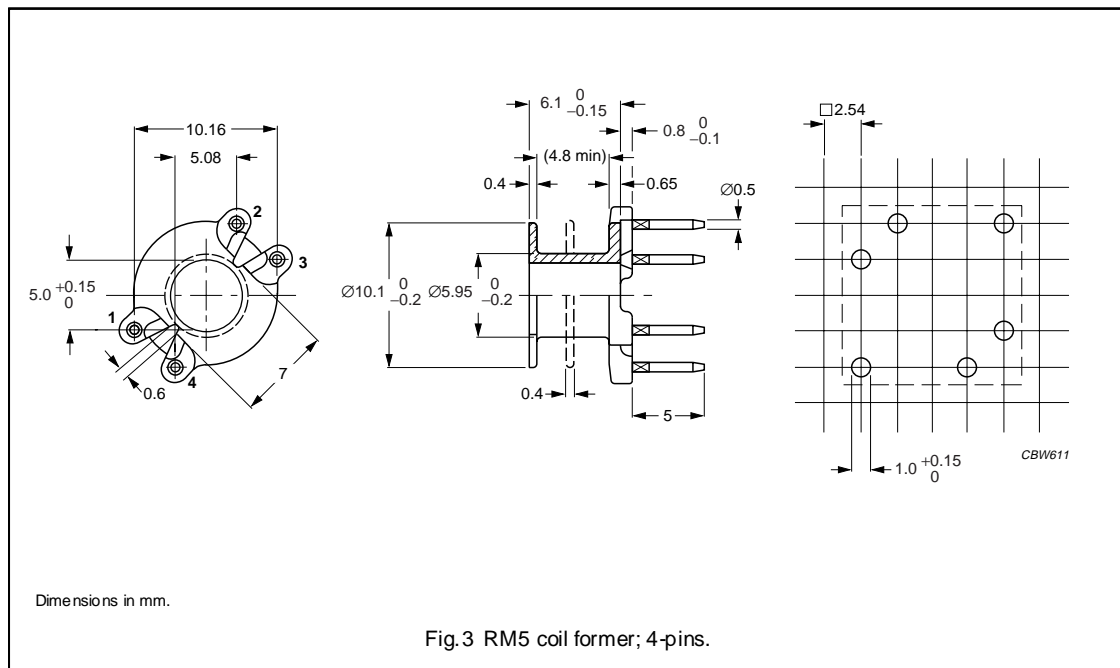
**Note**

1. Maximum adjustment range.

**COIL FORMER**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E 167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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

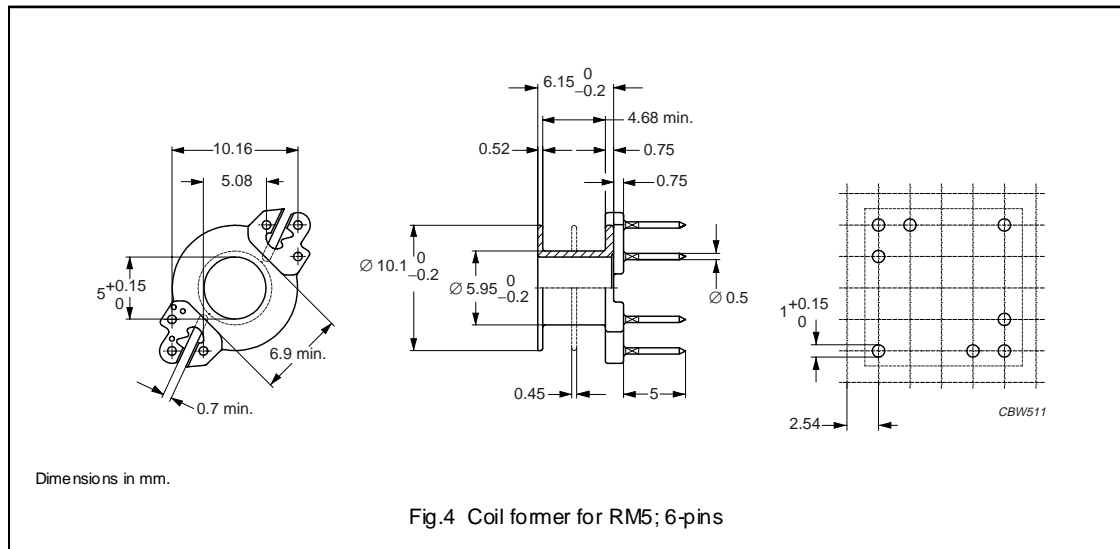


**Winding data for 4-pins RM5 coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm <sup>2</sup> )	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 (Sn) plated
Maximum operating temperature	180 °C, "IEC 60085", class H
Resistance to soldering heat	"IEC 60 068-2-20", Part 2, Test Tb, method 1B, 350 °C, 3.5 s
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1



Winding data for 6-pins RM5 coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	9.2	4.68	24.9	CSV-RM5-1S-6P-G <sup>(1)</sup>
1	5	1, 2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-5P-G <sup>(1)</sup>
1	4	2, 3, 5, 6	9.2	4.68	24.9	CSV-RM5-1S-4P-G <sup>(1)</sup>
2	6	all	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-6P-G <sup>(1)</sup>
2	5	1, 2, 3, 5, 6	2 × 4.15	2 × 2.06	24.9	CSV-RM5-2S-5P-G <sup>(1)</sup>

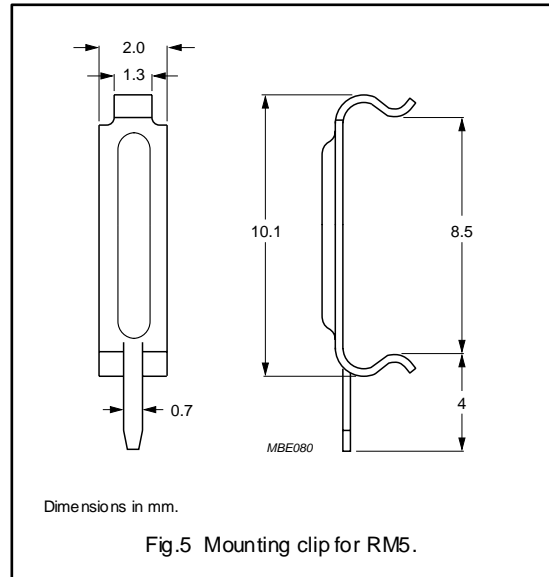
Note

1. Also available with post-inserted pins.

**MOUNTING PARTS**

**General data**

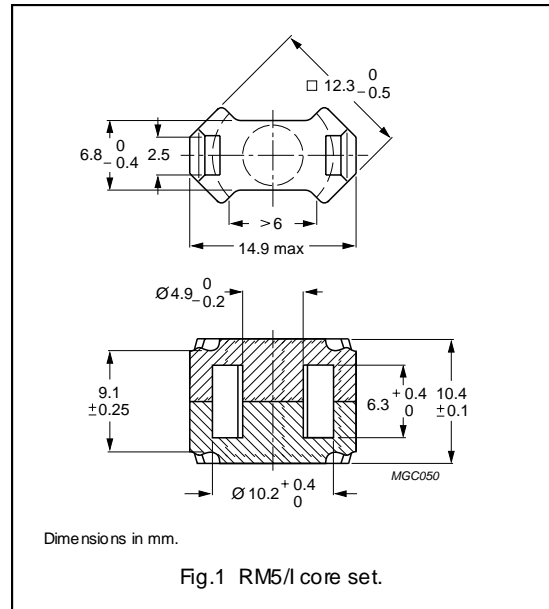
ITEM	SPECIFICATION
Clamping force	≈12 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CL/P-RM4/5



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.935	mm <sup>-1</sup>
$V_e$	effective volume	574	mm <sup>3</sup>
$l_e$	effective length	23.2	mm
$A_e$	effective area	24.8	mm <sup>2</sup>
$A_{min}$	minimum area	18.1	mm <sup>2</sup>
$m$	mass of set	≈ 3.2	g






**Core sets for general purpose**

Clamping force for  $A_L$  measurements, 12 ± 5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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	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 <small>des</small>	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


## RM cores and accessories

RM5/I

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F35 	1300 $\pm$ 25%	$\approx$ 970	$\approx$ 0	RM5/I-3F35
3F4 	100 $\pm$ 3%	$\approx$ 74	$\approx$ 360	RM5/I-3F4-A 100
	160 $\pm$ 3%	$\approx$ 119	$\approx$ 200	RM5/I-3F4-A 160
	250 $\pm$ 3%	$\approx$ 186	$\approx$ 110	RM5/I-3F4-A 250
	900 $\pm$ 25%	$\approx$ 670	$\approx$ 0	RM5/I-3F4
3F45 	900 $\pm$ 25%	$\approx$ 670	$\approx$ 0	RM5/I-3F45

## Core sets of filter and high permeability grades

Clamping force for  $A_L$  measurements, 12  $\pm$  5 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3B46 	2800 $\pm$ 25%	$\approx$ 2080	$\approx$ 0	RM5/I-3B46
3E27	4975 $\pm$ 25%	$\approx$ 3700	$\approx$ 0	RM5/I-3E27
3E5	6700 +40/-30%	$\approx$ 4990	$\approx$ 0	RM5/I-3E5
3E6	8500 +40/-30%	$\approx$ 6330	$\approx$ 0	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq$ 320	$\leq$ 0.07	$\leq$ 0.08	–	–
3C94	$\geq$ 320	–	$\leq$ 0.06	$\leq$ 0.32	–
3C96	$\geq$ 340	–	$\leq$ 0.04	$\leq$ 0.24	$\leq$ 0.11
3F3	$\geq$ 315	–	$\leq$ 0.08	–	$\leq$ 0.11
3F35	$\geq$ 300	–	–	–	$\leq$ 0.06
3F4	$\geq$ 250	–	–	–	–

## Properties of core sets under power conditions (continued)

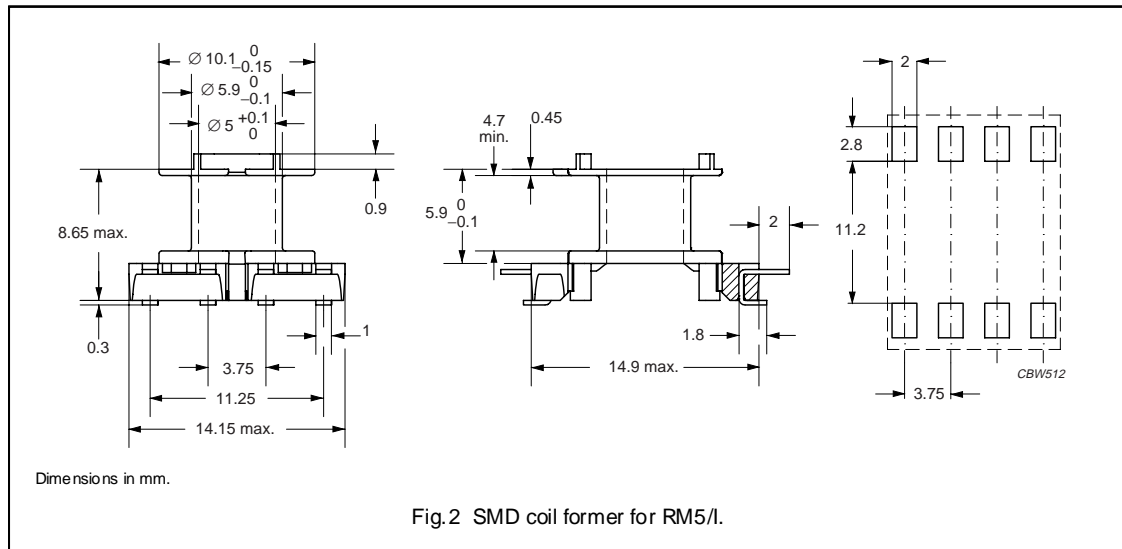
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq$ 320	–	–	–	–	–
3C94	$\geq$ 320	–	–	–	–	–
3C96	$\geq$ 340	$\leq$ 0.22	–	–	–	–
3F3	$\geq$ 315	–	–	–	–	–
3F35	$\geq$ 300	$\leq$ 0.08	$\leq$ 0.7	–	–	–
3F4	$\geq$ 250	–	–	$\leq$ 0.15	–	$\leq$ 0.25
3F45	$\geq$ 250	–	–	$\leq$ 0.12	$\leq$ 0.29	$\leq$ 0.2

**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, transition to lead-free (Sn) ongoing
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



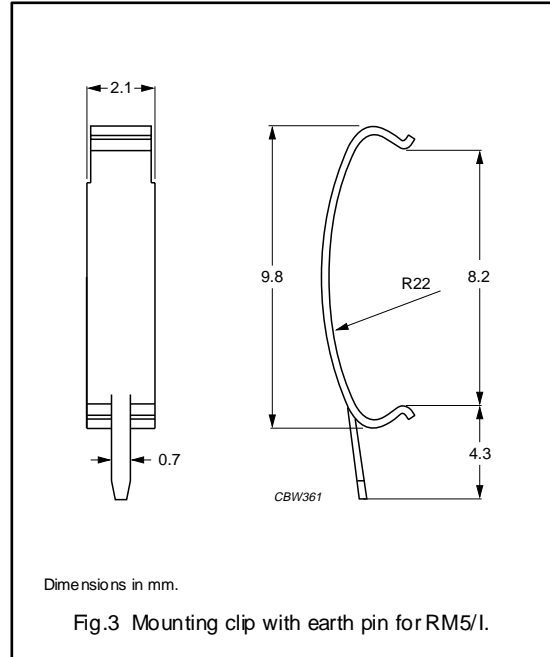
**Winding data for RM5/I coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	9.5	4.7	24.9	CSV5-RM5-1S-8P

**MOUNTING PARTS**

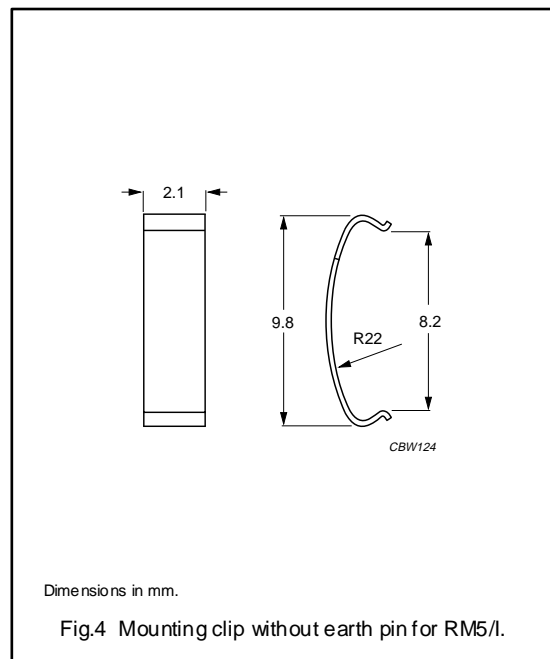
**General data mounting clip with earth pin**

ITEM	SPECIFICATION
Clamping force	≈6 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM4/5/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

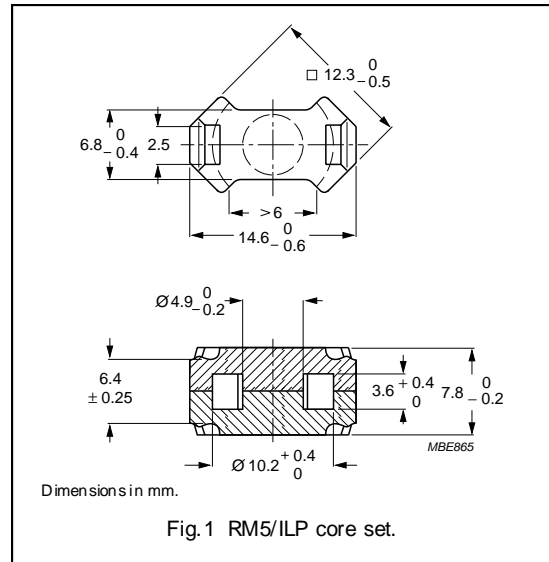




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.710	mm <sup>-1</sup>
$V_e$	effective volume	430	mm <sup>3</sup>
$l_e$	effective length	17.5	mm
$A_e$	effective area	24.5	mm <sup>2</sup>
$A_{min}$	minimum area	18.1	mm <sup>2</sup>
$m$	mass of set	≈ 2.6	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90	2350 ± 25%	≈ 1340	≈ 0	RM5/ILP-3C90
3C94	2350 ± 25%	≈ 1340	≈ 0	RM5/ILP-3C94
3C96 <small>des</small>	2100 ± 25%	≈ 1190	≈ 0	RM5/ILP-3C96
3F3	2000 ± 25%	≈ 1140	≈ 0	RM5/ILP-3F3
3F35 <small>prot</small>	1700 ± 25%	≈ 970	≈ 0	RM5/ILP-3F35
3F4 <small>des</small>	1250 ± 25%	≈ 710	≈ 0	RM5/ILP-3F4
3F45 <small>prot</small>	1250 ± 25%	≈ 710	≈ 0	RM5/ILP-3F45

**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3B46 <small>des</small>	3200 ± 25 %	≈ 1810	≈ 0	RM5/ILP-3B46

**Core sets of high permeability grades**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3E5	8500 +40/-30%	≈ 4830	≈ 0	RM5/ILP-3E5
3E6	10000 +40/-30%	≈ 5680	≈ 0	RM5/ILP-3E6

## RM cores and accessories

RM5/ILP

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; 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
3F45	≥250	–	–	≤0.086	≤0.22	≤0.15

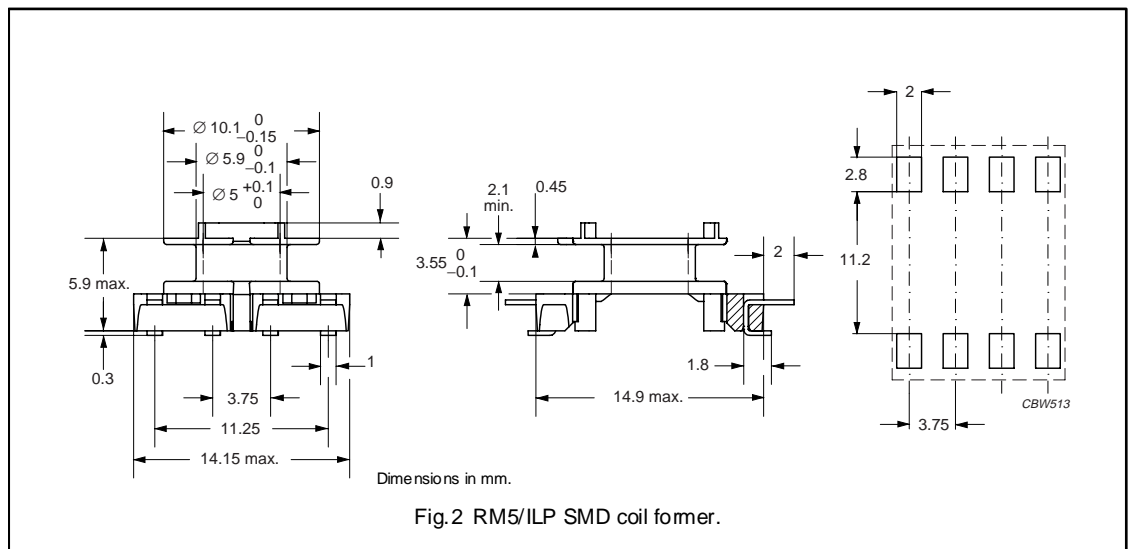
RM cores and accessories

RM5/ILP

COIL FORMERS

General data

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number: E41429 (M)
Pin material	copper-clad steel, tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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



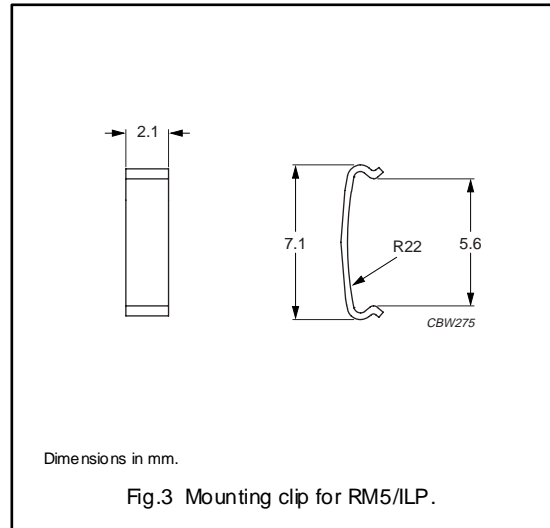
Winding data for 8-pads RM5/ILP SMD coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	4.6	2.1	24.9	CSV5-RM5/LP-1S-8P

**MOUNTING PARTS**

**General data**

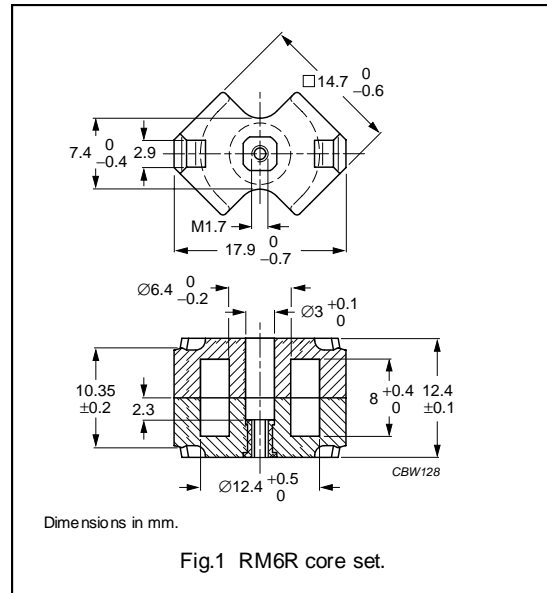
ITEM	SPECIFICATION
Clamping force	≈5 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM4/5/ILP



**CORE SETS**

**Effective core parameters**

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



**Core sets for filter applications**

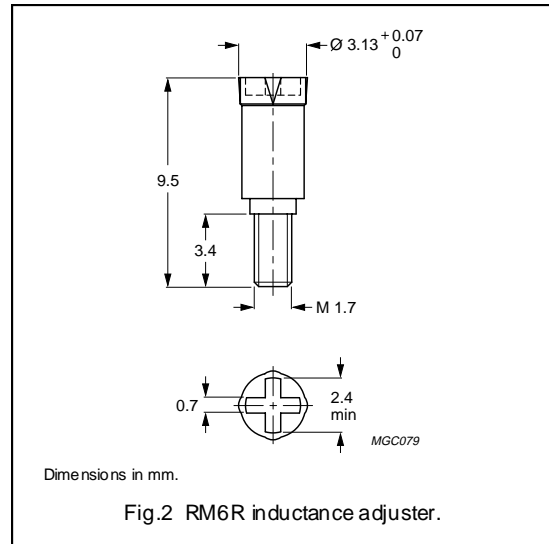
Clamping force for  $A_l$  measurements, 40±20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</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>sup</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



**Inductance adjuster selection chart (SUP) (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L <sup>(1)</sup> %	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L <sup>(1)</sup> %	TYPES FOR HIGH ADJUSTMENT	ΔL/L <sup>(1)</sup> %
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.

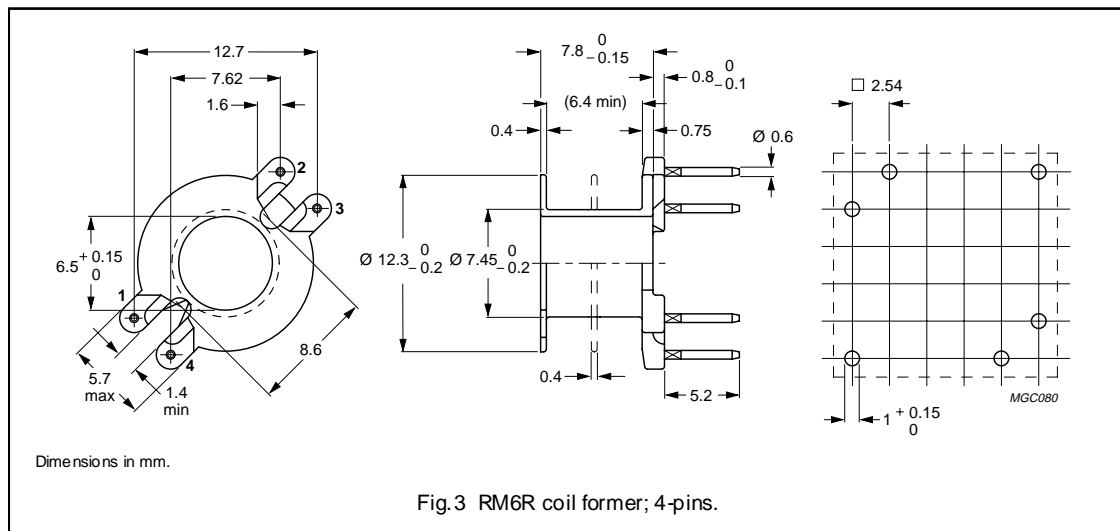
RM cores and accessories

RM6R

COIL FORMERS

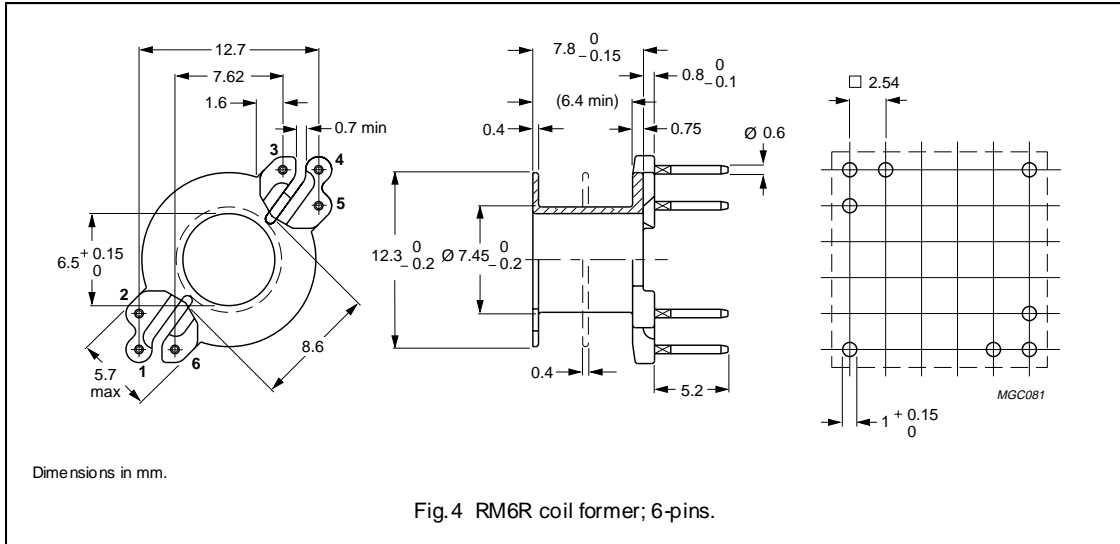
General data

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, transition to lead-free (Sn) ongoing
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



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 <sup>2</sup> )	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



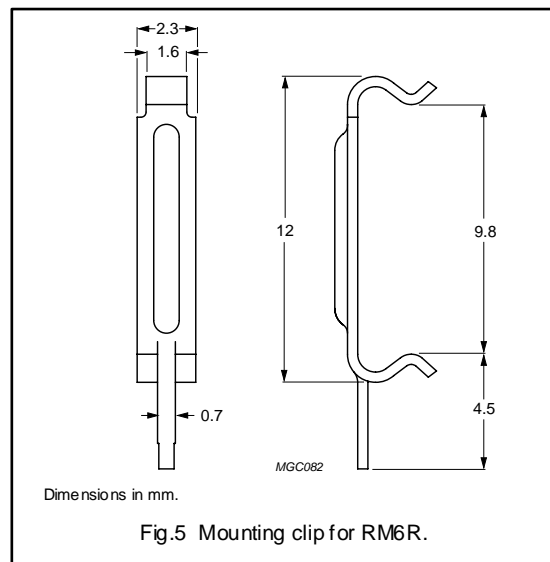
Winding data for 6-pins RM6R coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	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	CL/P-RM6

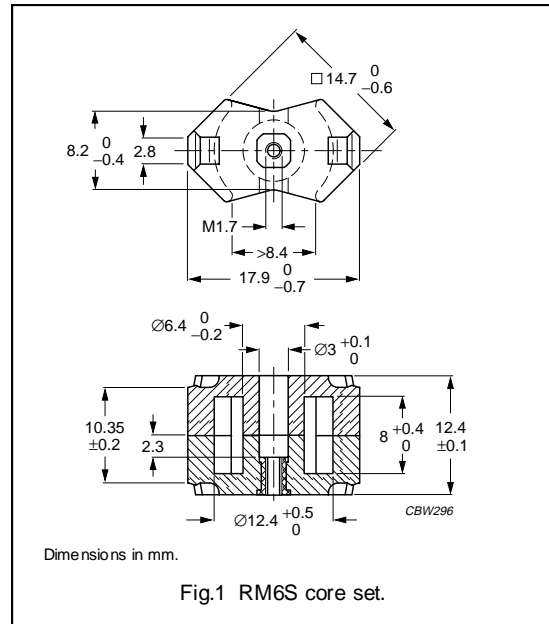




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.863	mm <sup>-1</sup>
$V_e$	effective volume	840	mm <sup>3</sup>
$l_e$	effective length	27.3	mm
$A_e$	effective area	31.0	mm <sup>2</sup>
$A_{min}$	minimum area	23.8	mm <sup>2</sup>
$m$	mass of set	≈ 5.1	g



**Core sets for filter applications**

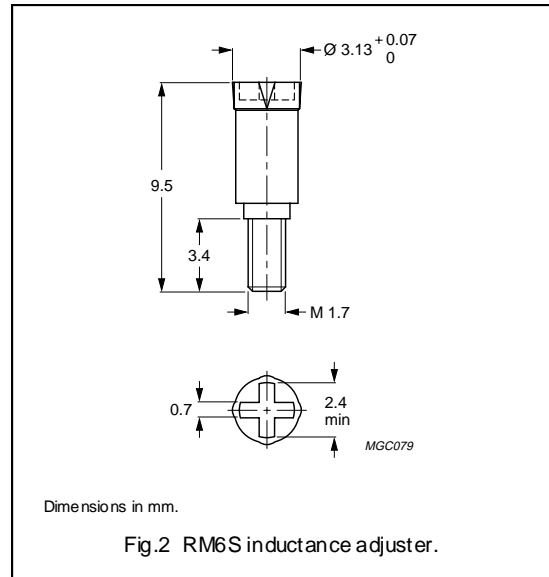
Clamping force for  $A_L$  measurements, 40 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	63 ± 3%	≈ 44	≈ 850	RM6S-3D3-E 63/N	RM6S-3D3-E63
	100 ± 3%	≈ 70	≈ 460	RM6S-3D3-E 100/N	RM6S-3D3-E100
	160 ± 3%	≈ 112	≈ 250	RM6S-3D3-A 160/N	RM6S-3D3-A160
	950 ± 25%	≈ 670	≈ 0	–	RM6S-3D3
3H3 <sup>sup</sup>	160 ± 3%	≈ 112	≈ 280	RM6S-3H3-A 160/N	RM6S-3H3-A160
	250 ± 3%	≈ 175	≈ 160	RM6S-3H3-A 250/N	RM6S-3H3-A250
	315 ± 3%	≈ 221	≈ 120	RM6S-3H3-A 315/N	RM6S-3H3-A315
	400 ± 3%	≈ 280	≈ 90	RM6S-3H3-A 400/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



**Inductance adjuster selection chart (SUP) (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L <sup>(1)</sup> %	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L <sup>(1)</sup> %	TYPES FOR HIGH ADJUSTMENT	ΔL/L <sup>(1)</sup> %
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	–	–
3D3	1250	–	–	ADJ-RM6-GREY	5	–	–
	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	–	–

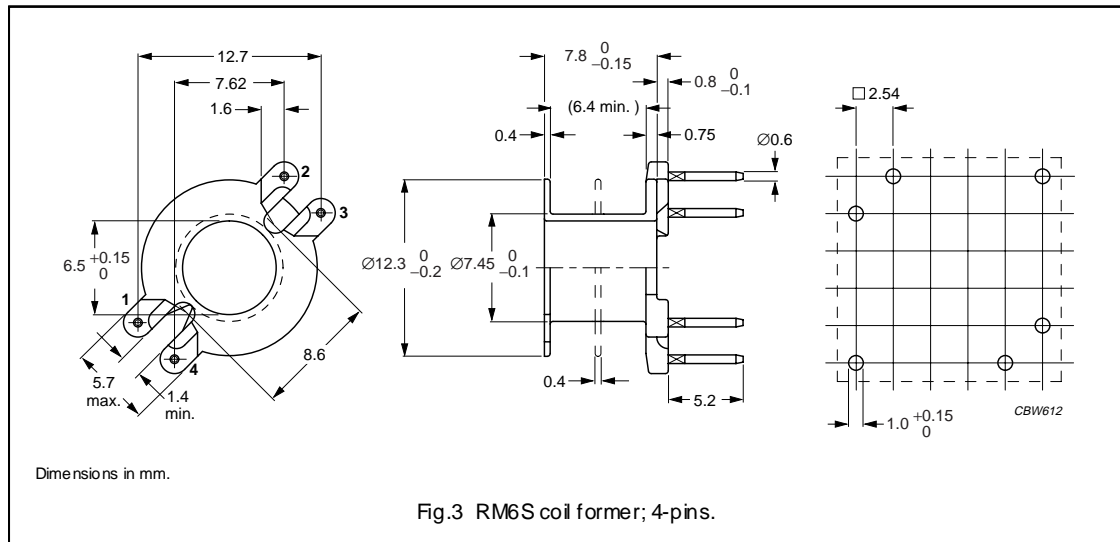
**Note**

1. Maximum adjustment range.

**COIL FORMERS**

**General data**

PARAMETER	SPECIFICATION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E 167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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

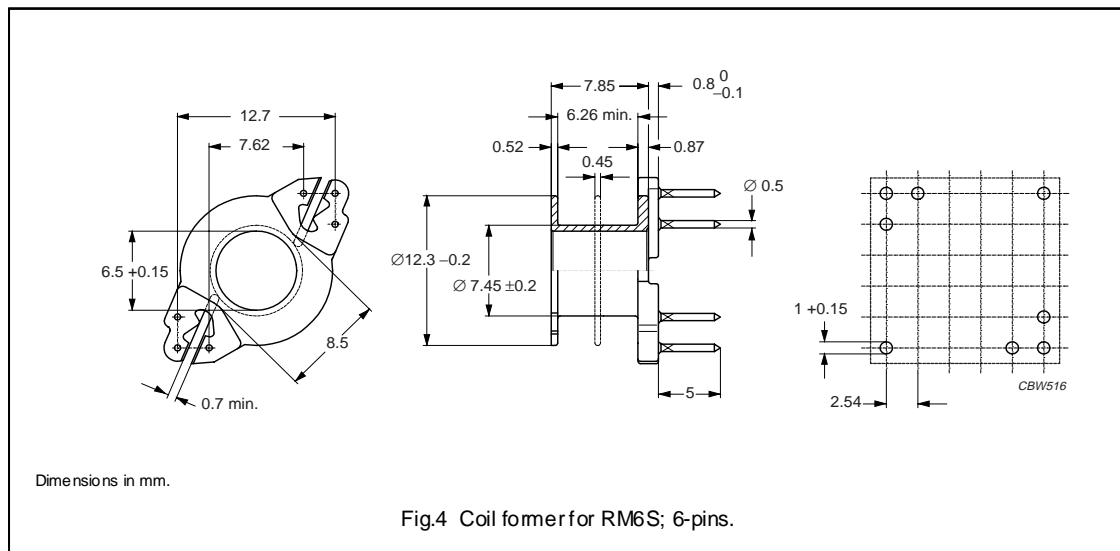


**Winding data for 4-pins RM6S coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



Winding data for RM6S coil former

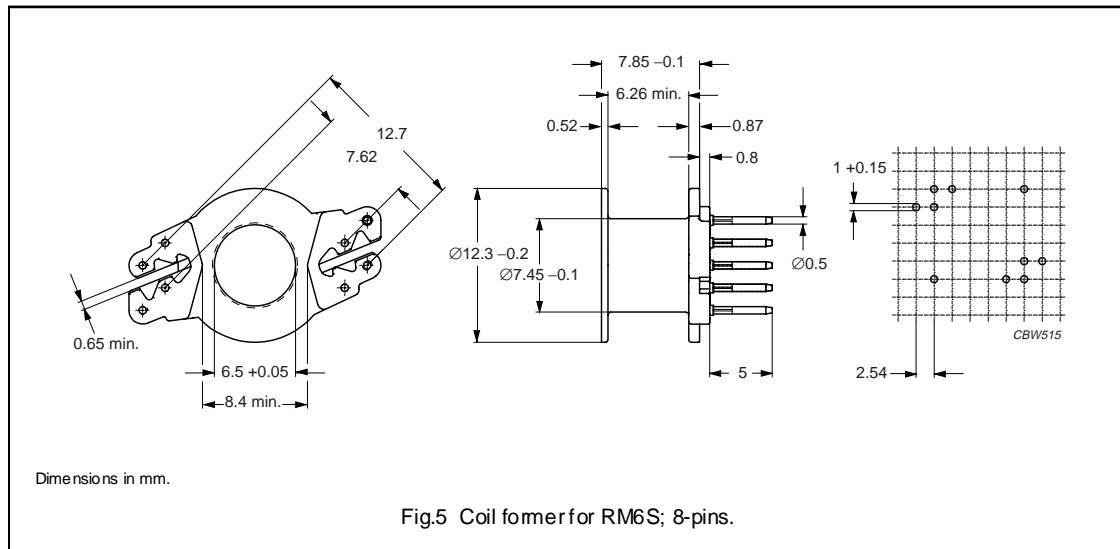
NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	6	all	15.0	6.3	30.0	CSV-RM6S-1S-6P-G <sup>(1)</sup>
1	5	1, 2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-5P-G <sup>(1)</sup>
1	4	2, 3, 5, 6	15.0	6.3	30.0	CSV-RM6S-1S-4P-G <sup>(1)</sup>
2	6	all	2 × 7	2 × 3	30.0	CSV-RM6S-2S-6P-G <sup>(1)</sup>

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 (Sn) 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



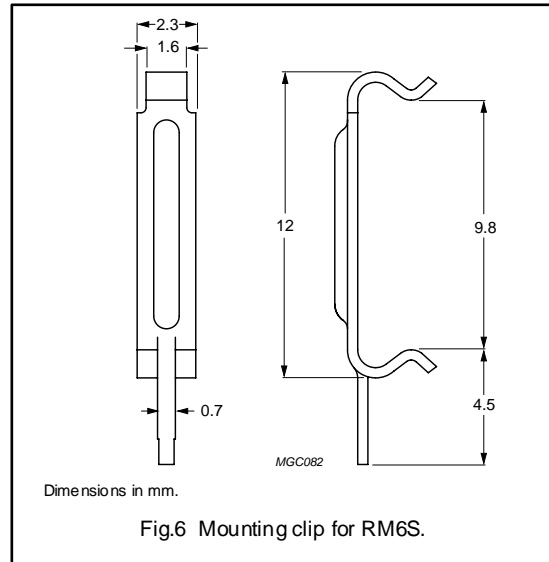
Winding data for RM6S coil former

NUMBER OF SECTIONS	NUMBER OF PINS	WINDING AREA (mm <sup>2</sup> )	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**

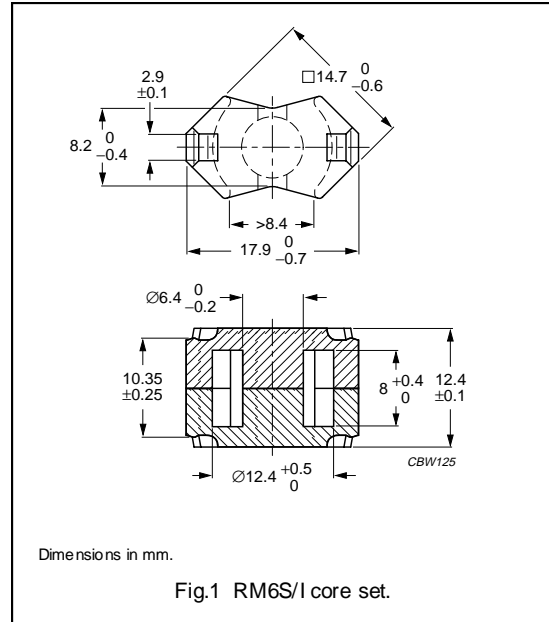
ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM6



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.784	mm <sup>-1</sup>
$V_e$	effective volume	1090	mm <sup>3</sup>
$l_e$	effective length	29.2	mm
$A_e$	effective area	37.0	mm <sup>2</sup>
$A_{min}$	minimum area	31.2	mm <sup>2</sup>
m	mass of set	≈ 5.5	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3B46 <small>des</small>	3650 ± 25 %	≈ 2280	≈ 0	RM6S/I-3B46
3D3	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	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)	$\mu_e$	AIR GAP ( $\mu$ m)	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

## RM cores and accessories

## RM6S/I

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	63 $\pm 3\%$	$\approx 40$	$\approx 1080$	RM6S/I-3C90-A63
	100 $\pm 3\%$	$\approx 63$	$\approx 600$	RM6S/I-3C90-A100
	160 $\pm 3\%$	$\approx 100$	$\approx 340$	RM6S/I-3C90-A160
	250 $\pm 3\%$	$\approx 157$	$\approx 200$	RM6S/I-3C90-A250
	315 $\pm 3\%$	$\approx 198$	$\approx 150$	RM6S/I-3C90-A315
	400 $\pm 3\%$	$\approx 251$	$\approx 110$	RM6S/I-3C90-A400
	630 $\pm 5\%$	$\approx 396$	$\approx 65$	RM6S/I-3C90-A630
	2600 $\pm 25\%$	$\approx 1630$	$\approx 0$	RM6S/I-3C90
3C91 <small>des</small>	3000 $\pm 25\%$	$\approx 1880$	$\approx 0$	RM6S/I-3C91
3C94	63 $\pm 3\%$	$\approx 40$	$\approx 1080$	RM6S/I-3C94-A63
	100 $\pm 3\%$	$\approx 63$	$\approx 600$	RM6S/I-3C94-A100
	160 $\pm 3\%$	$\approx 100$	$\approx 340$	RM6S/I-3C94-A160
	250 $\pm 3\%$	$\approx 157$	$\approx 200$	RM6S/I-3C94-A250
	315 $\pm 3\%$	$\approx 198$	$\approx 150$	RM6S/I-3C94-A315
	400 $\pm 3\%$	$\approx 251$	$\approx 110$	RM6S/I-3C94-A400
	630 $\pm 5\%$	$\approx 396$	$\approx 65$	RM6S/I-3C94-A630
	2600 $\pm 25\%$	$\approx 1630$	$\approx 0$	RM6S/I-3C94
3C96 <small>des</small>	2350 $\pm 25\%$	$\approx 1470$	$\approx 0$	RM6S/I-3C96
3F3	63 $\pm 3\%$	$\approx 40$	$\approx 1080$	RM6S/I-3F3-A63
	100 $\pm 3\%$	$\approx 63$	$\approx 600$	RM6S/I-3F3-A100
	160 $\pm 3\%$	$\approx 100$	$\approx 340$	RM6S/I-3F3-A160
	250 $\pm 3\%$	$\approx 157$	$\approx 200$	RM6S/I-3F3-A250
	315 $\pm 3\%$	$\approx 198$	$\approx 150$	RM6S/I-3F3-A315
	2150 $\pm 25\%$	$\approx 1350$	$\approx 0$	RM6S/I-3F3
3F35 <small>prot</small>	1750 $\pm 25\%$	$\approx 1100$	$\approx 0$	RM6S/I-3F35
3F4 <small>des</small>	63 $\pm 3\%$	$\approx 39$	$\approx 1040$	RM6S/I-3F4-A63
	100 $\pm 3\%$	$\approx 62$	$\approx 570$	RM6S/I-3F4-A100
	160 $\pm 3\%$	$\approx 100$	$\approx 310$	RM6S/I-3F4-A160
	250 $\pm 3\%$	$\approx 156$	$\approx 170$	RM6S/I-3F4-A250
	315 $\pm 3\%$	$\approx 197$	$\approx 130$	RM6S/I-3F4-A315
	1250 $\pm 25\%$	$\approx 780$	$\approx 0$	RM6S/I-3F4
3F45 <small>prot</small>	1250 $\pm 25\%$	$\approx 780$	$\approx 0$	RM6S/I-3F45



## RM cores and accessories

RM6S/I

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $20 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3E27	$6000 \pm 25\%$	$\approx 3770$	RM6S/I-3E27
3E5	$8600 +40/-30\%$	$\approx 5400$	RM6S/I-3E5
3E6	$11000 +40/-30\%$	$\approx 6910$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 320$	$\leq 0.25$	–	–	–
3C90	$\geq 320$	$\leq 0.13$	$\leq 0.14$	–	–
3C91	$\geq 315$	–	$\leq 0.08^{(1)}$	$\leq 0.4^{(1)}$	–
3C94	$\geq 320$	–	$\leq 0.11$	$\leq 0.6$	–
3C96	$\geq 340$	–	$\leq 0.08$	$\leq 0.4$	$\leq 0.2$
3F3	$\geq 315$	–	$\leq 0.14$	–	$\leq 0.2$
3F35	$\geq 315$	–	–	–	$\leq 0.12$
3F4	$\geq 250$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq 320$	–	–	–	–	–
3C90	$\geq 320$	–	–	–	–	–
3C91	$\geq 315$	–	–	–	–	–
3C94	$\geq 320$	–	–	–	–	–
3C96	$\geq 340$	$\leq 0.5$	–	–	–	–
3F3	$\geq 315$	–	–	–	–	–
3F35	$\geq 315$	$\leq 0.16$	$\leq 1.3$	–	–	–
3F4	$\geq 250$	–	–	$\leq 0.3$	–	$\leq 0.5$
3F45	$\geq 250$	–	–	$\leq 0.22$	$\leq 0.55$	$\leq 0.38$

**Note**

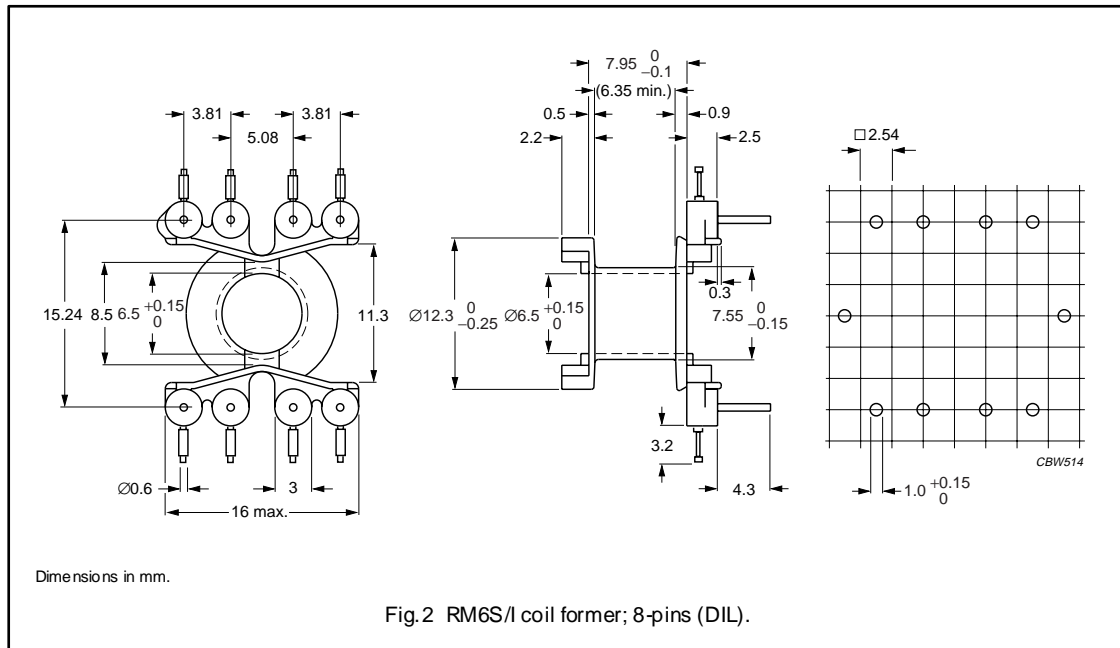
1. Measured at 60 °C.

**COIL FORMERS**

**General data**

For the information on other coil formers suitable for RM6S/I, see data sheet "RM6S".

PARAMETER	DESCRIPTION
Coil former material	polybutylene terephthalate (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, transition to lead-free (Sn) ongoing
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

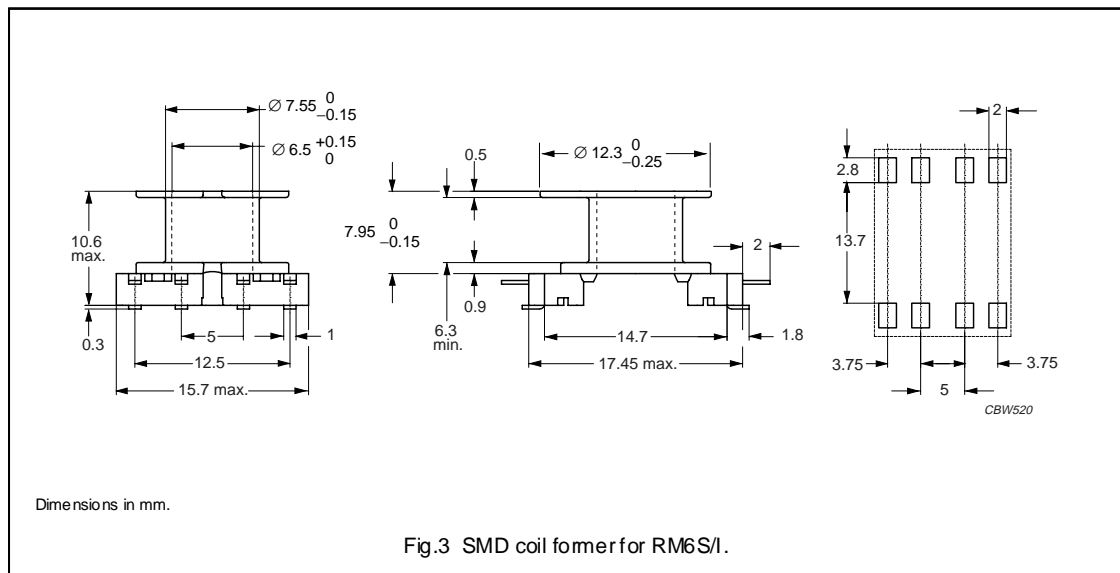


**Winding data for 8-pins RM6S/I coil former (DIL)**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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

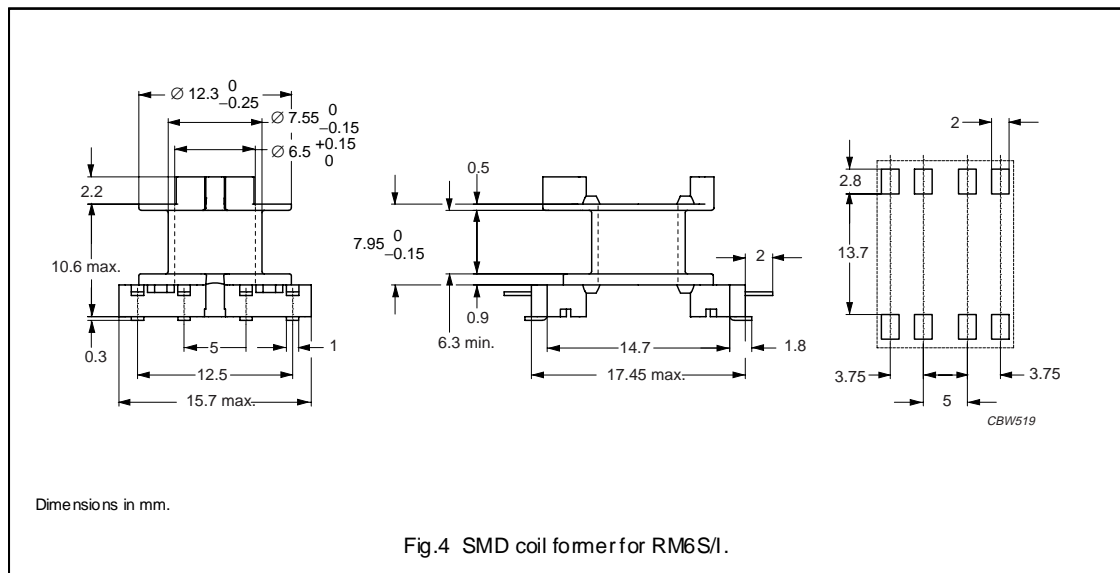


**Winding data for RM6S/I coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14	6.3	31	CSV5-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, transition to lead-free (Sn) ongoing
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



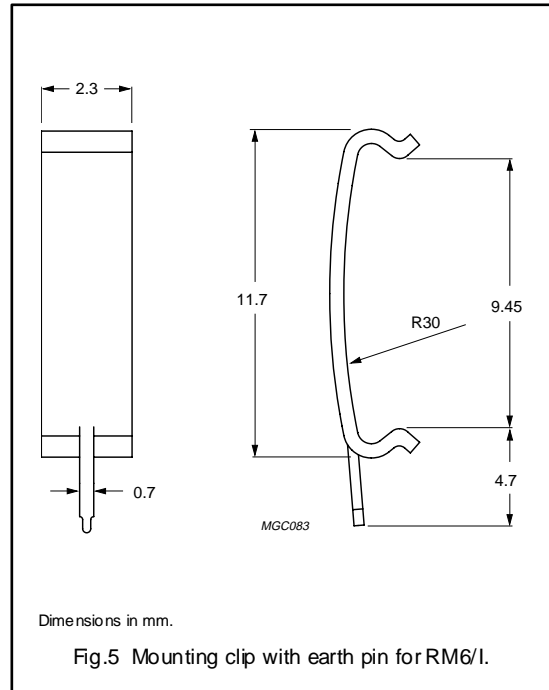
**Winding data for RM6S/I coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	14.2	6.3	31.4	CSV5-RM6S-1S-8P-B

**MOUNTING PARTS**

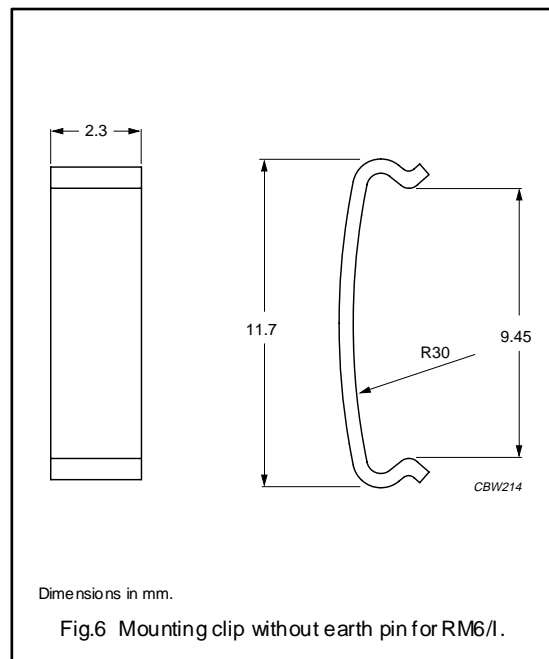
**General data**

ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM6/I



**General data mounting clip without earth pin**

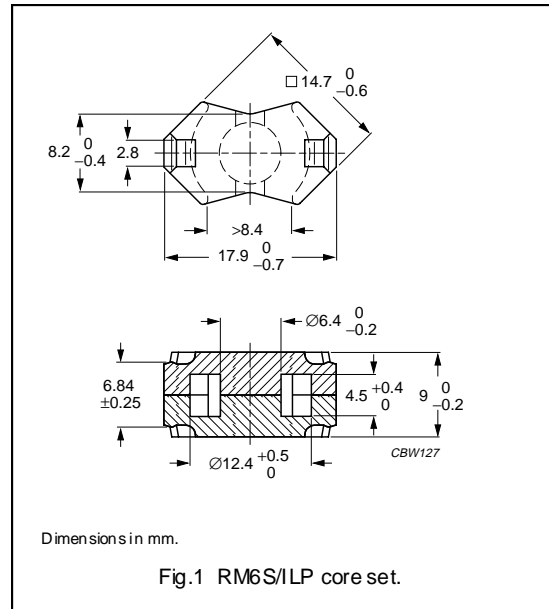
ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/I



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.580	mm <sup>-1</sup>
$V_e$	effective volume	820	mm <sup>3</sup>
$l_e$	effective length	21.8	mm
$A_e$	effective area	37.5	mm <sup>2</sup>
$A_{min}$	minimum area	31.2	mm <sup>2</sup>
m	mass of set	≈ 4.4	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 20 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3B46 <small>des</small>	4000 ± 25 %	≈ 1850	≈ 0	RM6S/ILP-3B46
3D3	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	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)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	3175 ± 25%	≈ 1470	≈ 0	RM6S/ILP-3C90
3C94	3175 ± 25%	≈ 1470	≈ 0	RM6S/ILP-3C94
3C96 <small>des</small>	2900 ± 25%	≈ 1340	≈ 0	RM6S/ILP-3C96
3F3	2700 ± 25%	≈ 1250	≈ 0	RM6S/ILP-3F3

RM cores and accessories

RM6S/ILP

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F35 <small>prot</small>	2200 $\pm$ 25%	$\approx$ 1020	$\approx$ 0	RM6S/ILP-3F35
3F4 <small>des</small>	1600 $\pm$ 25%	$\approx$ 740	$\approx$ 0	RM6S/ILP-3F4
3F45 <small>prot</small>	1600 $\pm$ 25%	$\approx$ 740	$\approx$ 0	RM6S/ILP-3F45

Core sets of high permeability grades

Clamping force for  $A_L$  measurements, 20  $\pm$ 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5	10500 +40/-30%	$\approx$ 4860	$\approx$ 0	RM6S/ILP-3E5
3E6	13000 +40/-30%	$\approx$ 6010	$\approx$ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq$ 320	$\leq$ 0.10	$\leq$ 0.11	–	–
3C94	$\geq$ 320	–	$\leq$ 0.08	$\leq$ 0.45	–
3C96	$\geq$ 340	–	$\leq$ 0.06	$\leq$ 0.35	$\leq$ 0.15
3F3	$\geq$ 300	–	$\leq$ 0.10	–	$\leq$ 0.15
3F35	$\geq$ 300	–	–	–	$\leq$ 0.08
3F4	$\geq$ 250	–	–	–	–

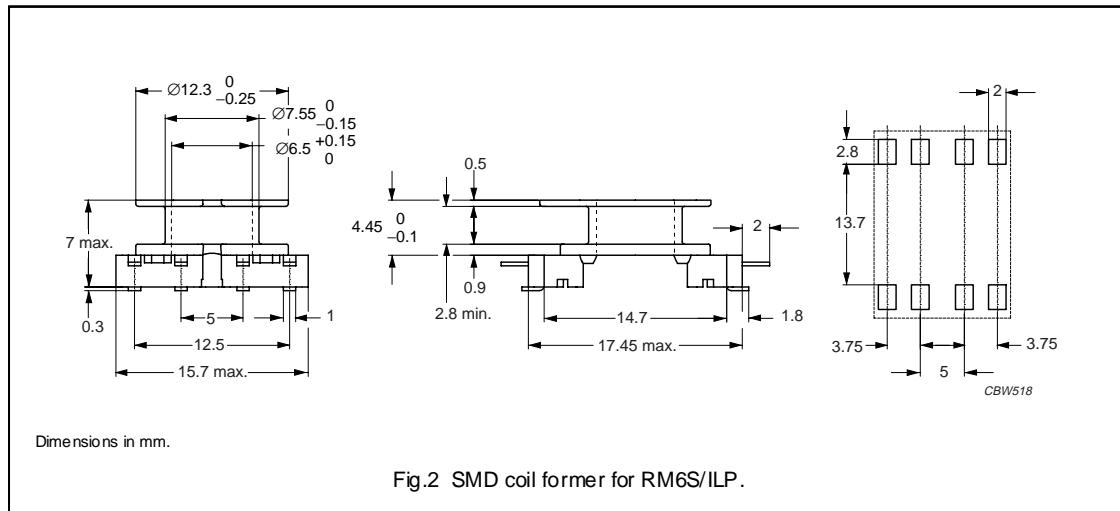
Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq$ 320	–	–	–	–	–
3C94	$\geq$ 320	–	–	–	–	–
3C96	$\geq$ 340	$\leq$ 0.3	–	–	–	–
3F3	$\geq$ 300	–	–	–	–	–
3F35	$\geq$ 300	$\leq$ 0.15	$\leq$ 1.0	–	–	–
3F4	$\geq$ 250	–	–	$\leq$ 0.25	–	$\leq$ 0.4
3F45	$\geq$ 250	–	–	$\leq$ 0.17	$\leq$ 0.4	$\leq$ 0.3

**COIL FORMERS**

**General data**

PARAMETER	DESCRIPTION
Coil former material	phenolformaldehyde (PF), glass-reinforced, flame retardant in accordance with "UL 94 V-0"; UL file number E41429 (M)
Solder pad material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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



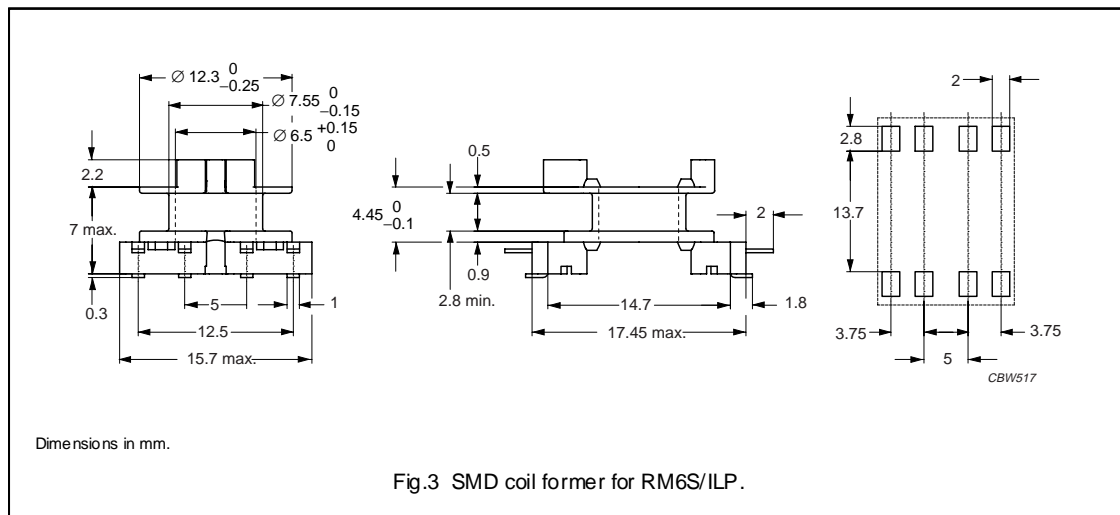
**Winding data for RM6S/ILP coil former (SMD)**

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (m <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



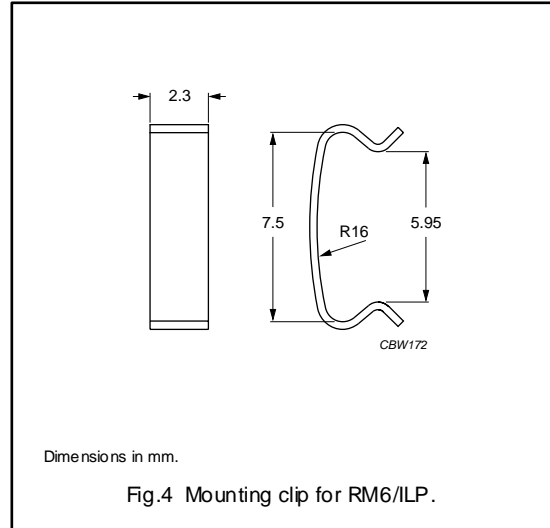
Winding data for RM6S/ILP coil former (SMD)

NUMBER OF SECTIONS	NUMBER OF SOLDER PADS	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	8	6.4	2.85	31.4	CSV5-RM6S/LP-1S-8P-B

**MOUNTING PARTS**

**General data**

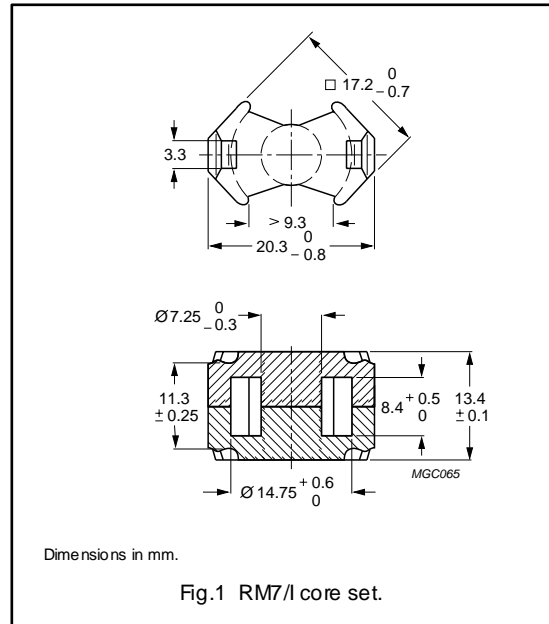
ITEM	SPECIFICATION
Clamping force	≈10 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM6/ILP



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.680	mm <sup>-1</sup>
$V_e$	effective volume	1325	mm <sup>3</sup>
$l_e$	effective length	30.0	mm
$A_e$	effective area	44.1	mm <sup>2</sup>
$A_{min}$	minimum area	39.6	mm <sup>2</sup>
$m$	mass of set	≈ 7.5	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements 40 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3C90 <sup>sup</sup>	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 <sup>sup</sup>	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

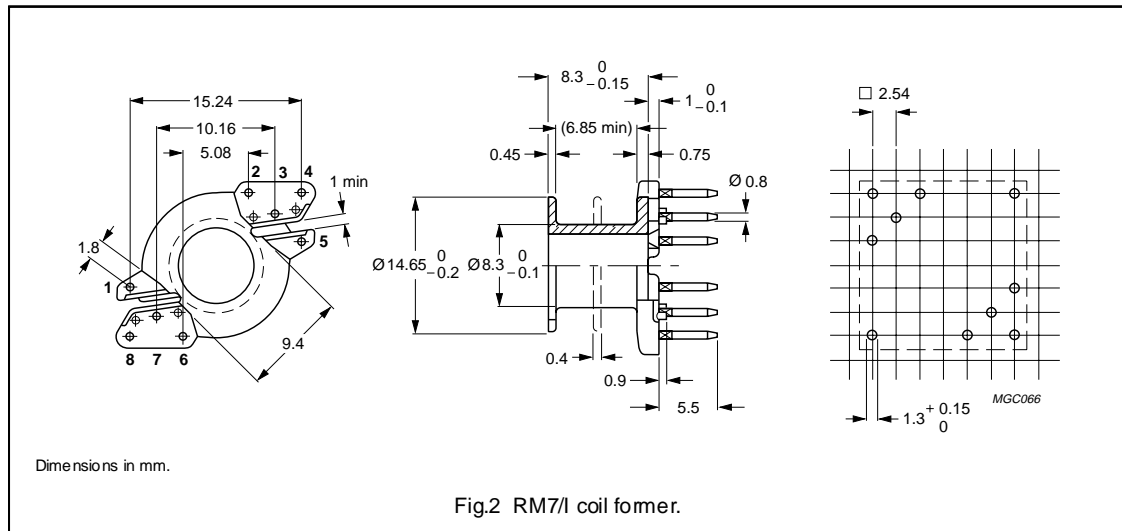
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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 E 167521(M)
Pin material	copper-tin alloy (CuSn), tin-lead alloy (SnPb) plated, transition to lead-free (Sn) ongoing
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



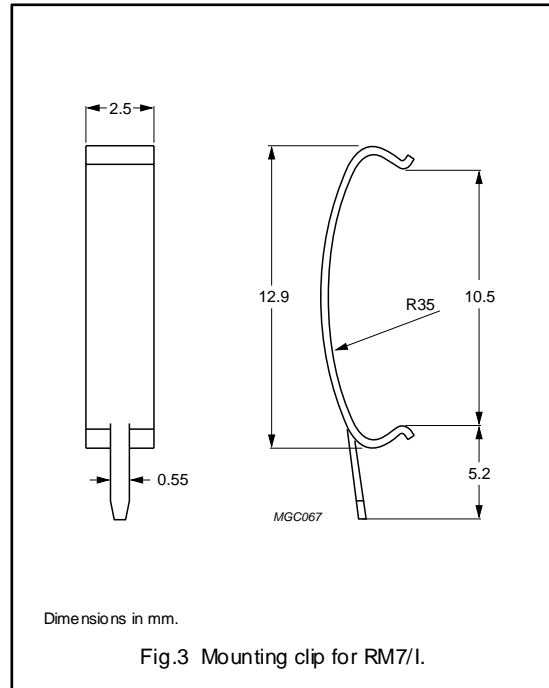
**Winding data for RM7/I coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	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**

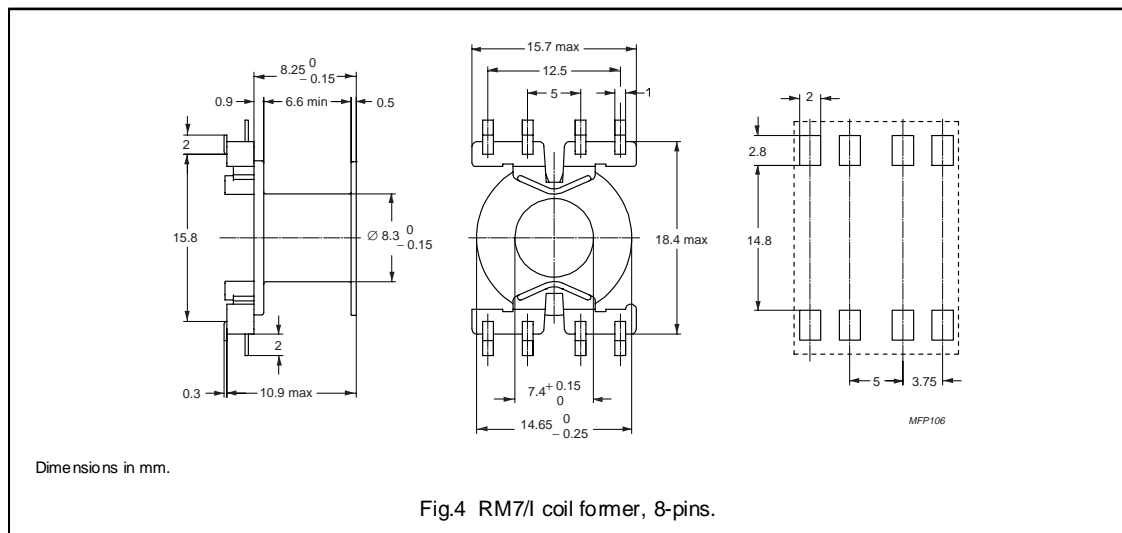
ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	steel
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM7



**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-tin alloy (CuSn), tin (Sn) 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



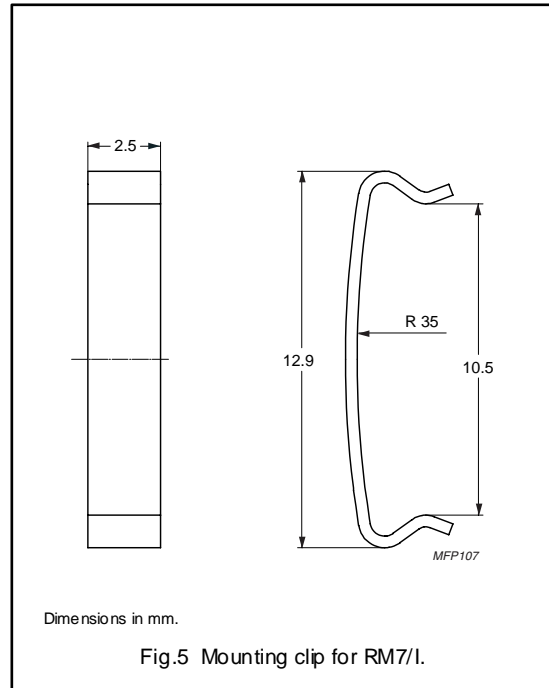
**Winding data for RM7/I coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	8	all	35	20	6.6	CSVS-RM7-1S-8P-Z

**MOUNTING PARTS**

**General data**

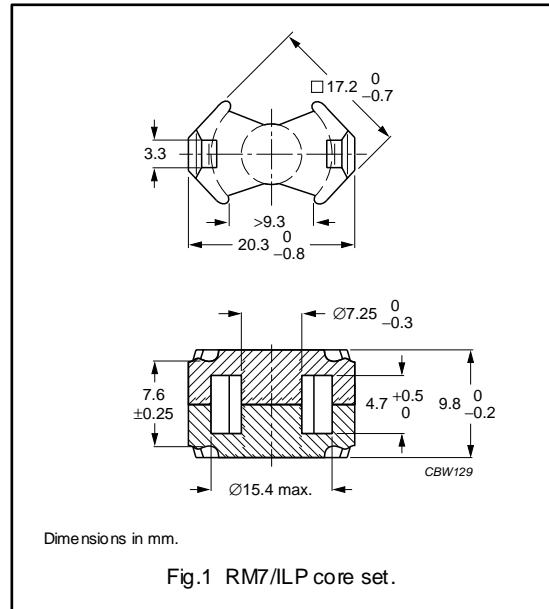
ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM7



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.520	mm <sup>-1</sup>
$V_e$	effective volume	1 060	mm <sup>3</sup>
$l_e$	effective length	23.5	mm
$A_e$	effective area	45.3	mm <sup>2</sup>
$A_{min}$	minimum area	39.6	mm <sup>2</sup>
m	mass of set	≈ 6.0	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements 40 ±20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90 <sup>sup</sup>	3650 ±25%	≈ 1510	≈ 0	RM7/ILP-3C90
3F3 <sup>sup</sup>	3100 ±25%	≈ 1280	≈ 0	RM7/ILP-3F3
3F4 <sup>sup</sup>	1800 ±25%	≈ 740	≈ 0	RM7/ILP-3F4

**Properties of core sets under power conditions**

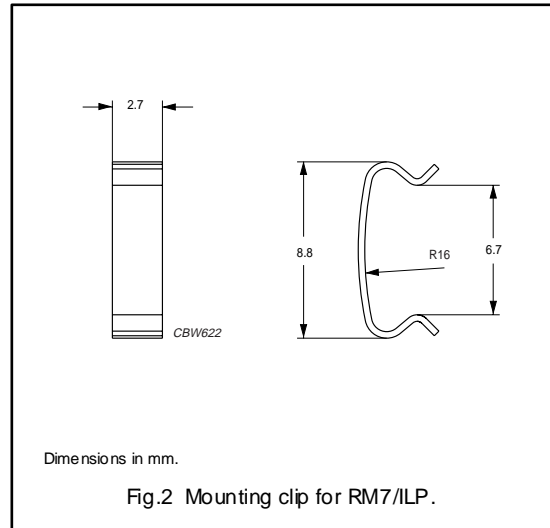
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	≥320	≤ 0.13	≤ 0.14	–	–	–
3F3	≥300	–	≤ 0.12	≤ 0.20	–	–
3F4	≥250	–	–	–	≤ 0.3	≤ 0.5



**MOUNTING PARTS**

**General data**

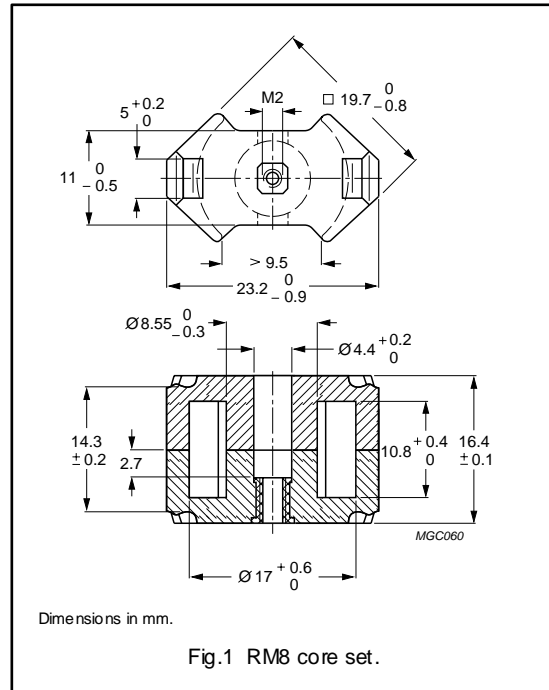
ITEM	SPECIFICATION
Clamping force	≈20 N
Clip material	stainless steel (CrNi)
Type number	CLI-RM7/ILP



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.683	mm <sup>-1</sup>
$V_e$	effective volume	1850	mm <sup>3</sup>
$l_e$	effective length	35.5	mm
$A_e$	effective area	52.0	mm <sup>2</sup>
$A_{min}$	minimum area	39.5	mm <sup>2</sup>
$m$	mass of set	≈ 11	g



**Core sets for filter applications**

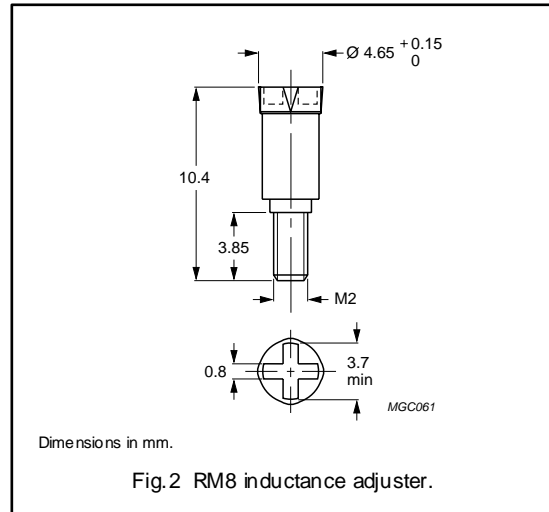
Clamping force for  $A_L$  measurements, 60±30 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER (WITH NUT)	TYPE NUMBER (WITHOUT NUT)
3D3 <sup>sup</sup>	100 ±3%	≈ 54	≈ 840	RM8-3D3-E100/N	RM8-3D3-E100
	160 ±3%	≈ 87	≈ 450	RM8-3D3-E160/N	RM8-3D3-E160
	1 240 ±25%	≈ 675	≈ 0	–	RM8-3D3
3H3 <sup>sup</sup>	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



**Inductance adjuster selection chart (SUP) (applies to all types)**

GRADE	A <sub>L</sub> (nH)	TYPES FOR LOW ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR MEDIUM ADJUSTMENT	ΔL/L % <sup>(1)</sup>	TYPES FOR HIGH ADJUSTMENT	ΔL/L % <sup>(1)</sup>
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

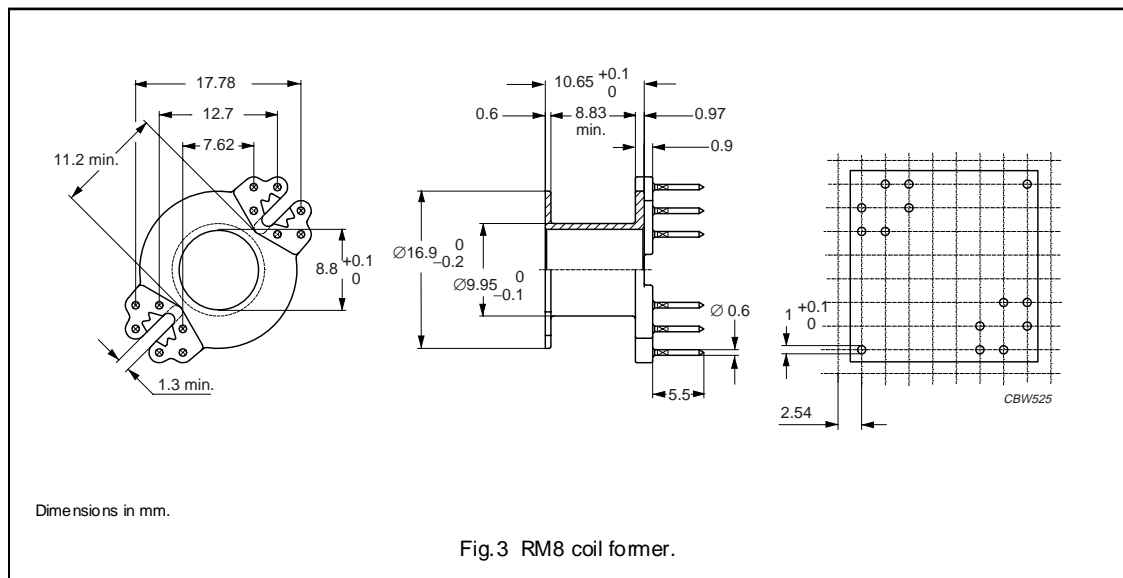
**Note**

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 (Sn) 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



**Winding data for RM8 coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	8	1, 2, 5, 6, 7, 8, 11, 12	42	30	9.1	CSV-RM8-1S-8P-G <sup>(1)</sup>
1	12	all	42	30	9.1	CSV-RM8-1S-12P-G <sup>(1)</sup>
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

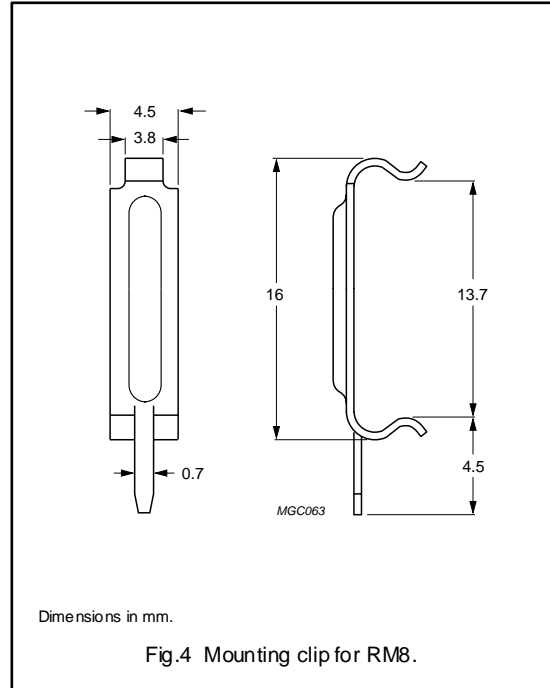
**Note**

1. Also available with post-inserted pins.

**MOUNTING PARTS**

**General data**

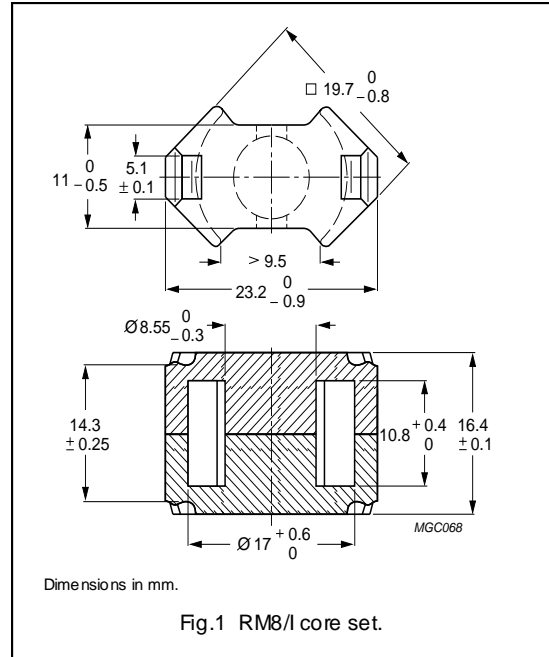
ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	steel
Clip plating	silver (Ag)
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM8



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.604	mm <sup>-1</sup>
$V_e$	effective volume	2440	mm <sup>3</sup>
$l_e$	effective length	38.4	mm
$A_e$	effective area	63.0	mm <sup>2</sup>
$A_{min}$	minimum area	55.4	mm <sup>2</sup>
$m$	mass of set	≈ 13	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 30 ± 10 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3B46 <small>des</small>	5200 ± 25 %	≈ 2500	≈ 0	RM8/I-3B46
3D3	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	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

## RM cores and accessories

RM8/I

## Core sets for general purpose transformers and power applications

Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C81	$100 \pm 3\%$	$\approx 49$	$\approx 1100$	RM8/I-3C81-E100
	$160 \pm 3\%$	$\approx 78$	$\approx 610$	RM8/I-3C81-A160
	$250 \pm 3\%$	$\approx 121$	$\approx 360$	RM8/I-3C81-A250
	$315 \pm 3\%$	$\approx 153$	$\approx 270$	RM8/I-3C81-A315
	$400 \pm 3\%$	$\approx 194$	$\approx 200$	RM8/I-3C81-A400
	$4100 \pm 25\%$	$\approx 1990$	$\approx 0$	RM8/I-3C81
3C90	$100 \pm 3\%$	$\approx 49$	$\approx 1100$	RM8/I-3C90-A100
	$160 \pm 3\%$	$\approx 78$	$\approx 610$	RM8/I-3C90-A160
	$250 \pm 3\%$	$\approx 121$	$\approx 360$	RM8/I-3C90-A250
	$315 \pm 3\%$	$\approx 153$	$\approx 270$	RM8/I-3C90-A315
	$400 \pm 3\%$	$\approx 194$	$\approx 200$	RM8/I-3C90-A400
	$3300 \pm 25\%$	$\approx 1600$	$\approx 0$	RM8/I-3C90
3C91 <small>des</small>	$4100 \pm 25\%$	$\approx 1990$	$\approx 0$	RM8/I-3C91
3C94	$100 \pm 3\%$	$\approx 49$	$\approx 1100$	RM8/I-3C94-A100
	$160 \pm 3\%$	$\approx 78$	$\approx 610$	RM8/I-3C94-A160
	$250 \pm 3\%$	$\approx 121$	$\approx 360$	RM8/I-3C94-A250
	$315 \pm 3\%$	$\approx 153$	$\approx 270$	RM8/I-3C94-A315
	$400 \pm 3\%$	$\approx 194$	$\approx 200$	RM8/I-3C94-A400
	$3300 \pm 25\%$	$\approx 1600$	$\approx 0$	RM8/I-3C94
3C96 <small>des</small>	$3000 \pm 25\%$	$\approx 1440$	$\approx 0$	RM8/I-3C96
3F3	$100 \pm 3\%$	$\approx 49$	$\approx 1100$	RM8/I-3F3-A100
	$160 \pm 3\%$	$\approx 78$	$\approx 610$	RM8/I-3F3-A160
	$250 \pm 3\%$	$\approx 121$	$\approx 360$	RM8/I-3F3-A250
	$315 \pm 3\%$	$\approx 153$	$\approx 270$	RM8/I-3F3-A315
	$400 \pm 3\%$	$\approx 194$	$\approx 200$	RM8/I-3F3-A400
	$3000 \pm 25\%$	$\approx 1440$	$\approx 0$	RM8/I-3F3
3F35 <small>prot</small>	$2400 \pm 25\%$	$\approx 1150$	$\approx 0$	RM8/I-3F35
3F4 <small>des</small>	$100 \pm 3\%$	$\approx 49$	$\approx 1100$	RM8/I-3F4-A100
	$160 \pm 3\%$	$\approx 78$	$\approx 610$	RM8/I-3F4-A160
	$250 \pm 3\%$	$\approx 121$	$\approx 360$	RM8/I-3F4-A250
	$315 \pm 3\%$	$\approx 153$	$\approx 270$	RM8/I-3F4-A315
	$400 \pm 3\%$	$\approx 194$	$\approx 200$	RM8/I-3F4-A400
	$1700 \pm 25\%$	$\approx 820$	$\approx 0$	RM8/I-3F4
3F45 <small>prot</small>	$1700 \pm 25\%$	$\approx 820$	$\approx 0$	RM8/I-3F45

## RM cores and accessories

RM8/I

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3E27	$8000 \pm 25\%$	$\approx 3880$	RM8/I-3E27
3E5	$12500 +40/-30\%$	$\approx 6060$	RM8/I-3E5
3E6	$15500 +40/-30\%$	$\approx 7520$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	$\geq 315$	$\leq 0.56$	–	–	–
3C90	$\geq 320$	$\leq 0.30$	$\leq 0.31$	–	–
3C91	$\geq 315$	–	$\leq 0.17^{(1)}$	$\leq 1.0^{(1)}$	–
3C94	$\geq 320$	–	$\leq 0.23$	$\leq 1.2$	–
3C96	$\geq 340$	–	$\leq 0.17$	$\leq 1.0$	$\leq 0.43$
3F3	$\geq 315$	–	$\leq 0.27$	–	$\leq 0.47$
3F35	$\geq 315$	–	–	–	$\leq 0.25$
3F4	$\geq 250$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C81	$\geq 315$	–	–	–	–	–
3C90	$\geq 320$	–	–	–	–	–
3C91	$\geq 315$	–	–	–	–	–
3C94	$\geq 320$	–	–	–	–	–
3C96	$\geq 340$	$\leq 0.9$	–	–	–	–
3F3	$\geq 315$	–	–	–	–	–
3F35	$\geq 315$	$\leq 0.37$	$\leq 2.6$	–	–	–
3F4	$\geq 250$	–	–	$\leq 0.7$	–	$\leq 1.1$
3F45	$\geq 250$	–	–	$\leq 0.5$	$\leq 1.2$	$\leq 0.86$

**Note**

1. Measured at 60 °C.

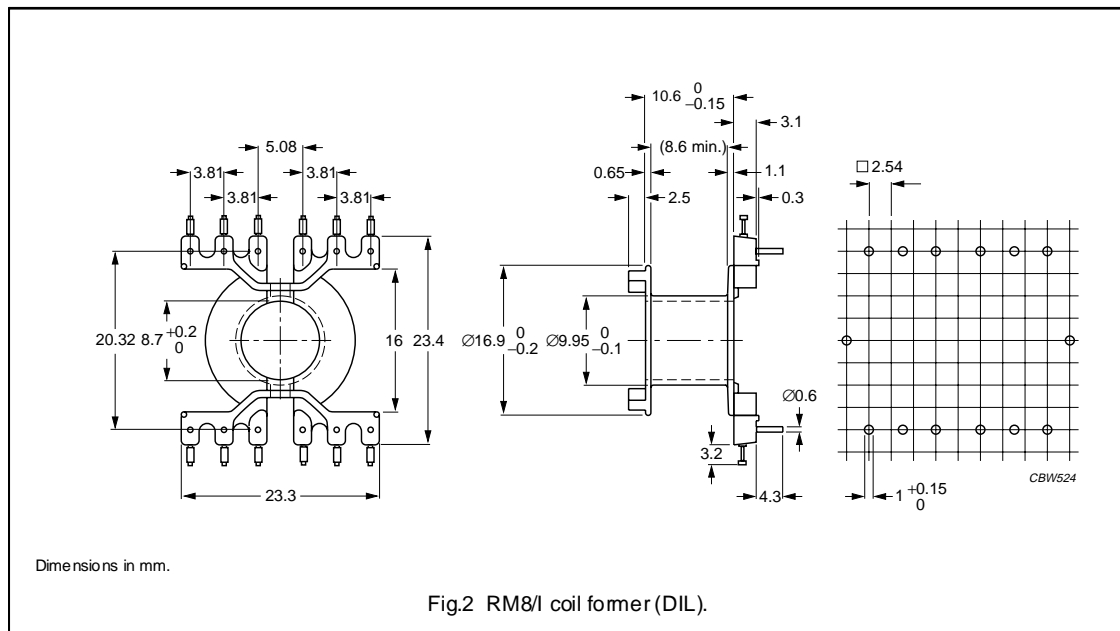


**COIL FORMER**

**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, transition to lead-free (Sn) ongoing
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



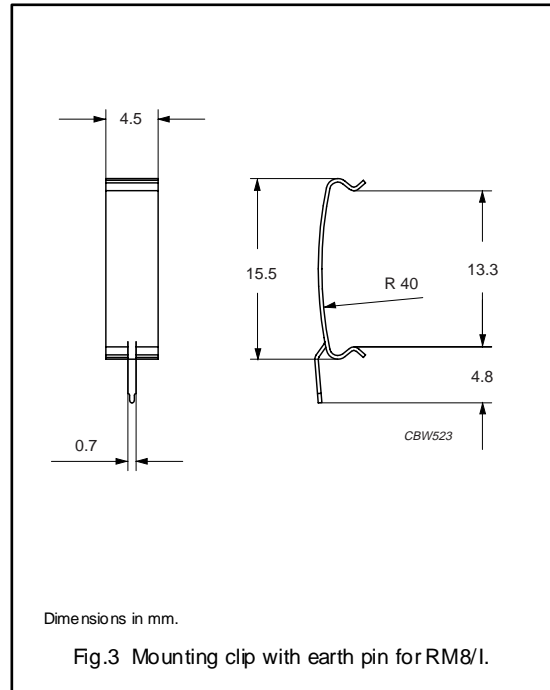
**Winding data for RM8/I coil former (DIL)**

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	42	30.9	8.6	CPV-RM8/I-1S-12PD

**MOUNTING PARTS**

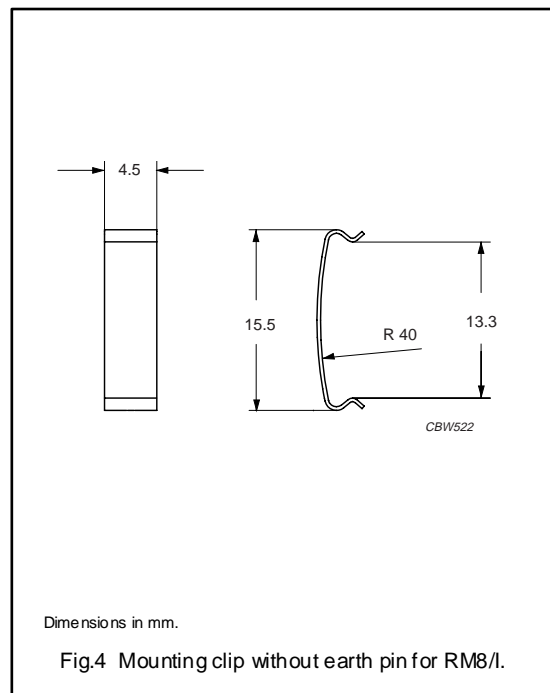
**General data**

ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM8/I



**General data**

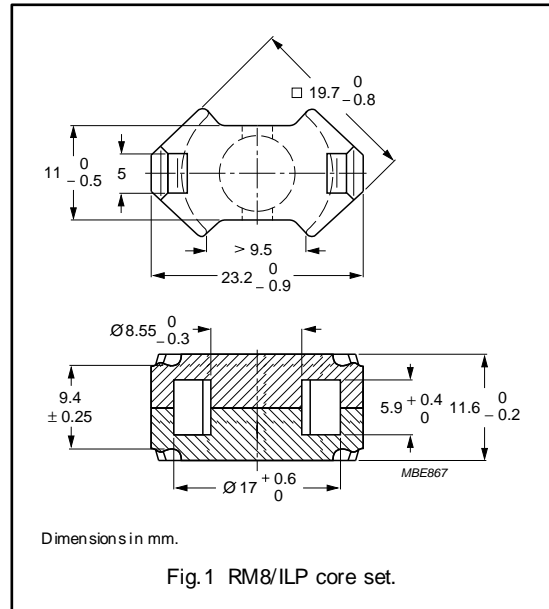
ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel
Type number	CLI-RM8/I



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.440	mm <sup>-1</sup>
$V_e$	effective volume	1860	mm <sup>3</sup>
$l_e$	effective length	28.7	mm
$A_e$	effective area	64.9	mm <sup>2</sup>
$A_{min}$	minimum area	55.4	mm <sup>2</sup>
$m$	mass of set	≈ 10	g



**Core sets for filter applications**





Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3B46 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	$6500 \pm 25\%$	≈ 2280	≈ 0	RM8/ILP-3B46
3D3	$250 \pm 3\%$	≈ 88	≈ 330	RM8/ILP-3D3-A250
	$315 \pm 3\%$	≈ 111	≈ 250	RM8/ILP-3D3-A315
	$400 \pm 5\%$	≈ 141	≈ 180	RM8/ILP-3D3-A400
	$1850 \pm 25\%$	≈ 650	≈ 0	RM8/ILP-3D3
3H3	$400 \pm 3\%$	≈ 141	≈ 210	RM8/ILP-3H3-A400
	$630 \pm 5\%$	≈ 222	≈ 120	RM8/ILP-3H3-A630
	$1000 \pm 8\%$	≈ 352	≈ 70	RM8/ILP-3H3-A1000
	$4100 \pm 25\%$	≈ 1440	≈ 0	RM8/ILP-3H3



## RM cores and accessories

RM8/ILP

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$4100 \pm 25\%$	$\approx 1440$	$\approx 0$	RM8/ILP-3C90
3C94	$4100 \pm 25\%$	$\approx 1440$	$\approx 0$	RM8/ILP-3C94
3C96 	$3800 \pm 25\%$	$\approx 1330$	$\approx 0$	RM8/ILP-3C96
3F3	$3800 \pm 25\%$	$\approx 1330$	$\approx 0$	RM8/ILP-3F3
3F35 	$3100 \pm 25\%$	$\approx 1090$	$\approx 0$	RM8/ILP-3F35
3F4 	$2200 \pm 25\%$	$\approx 770$	$\approx 0$	RM8/ILP-3F4
3F45 	$2200 \pm 25\%$	$\approx 770$	$\approx 0$	RM8/ILP-3F45

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $30 \pm 10$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5 	$16000 +40/-30\%$	$\approx 5600$	$\approx 0$	RM8/ILP-3E5
3E6 	$19500 +40/-30\%$	$\approx 6800$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.23$	$\leq 0.24$	–	–
3C94	$\geq 320$	–	$\leq 0.18$	$\leq 0.92$	–
3C96	$\geq 340$	–	$\leq 0.14$	$\leq 0.73$	$\leq 0.32$
3F3	$\geq 315$	–	$\leq 0.21$	–	$\leq 0.36$
3F35	$\geq 300$	–	–	–	$\leq 0.2$
3F4	$\geq 250$	–	–	–	–

**Properties of core sets under power conditions (continued)**

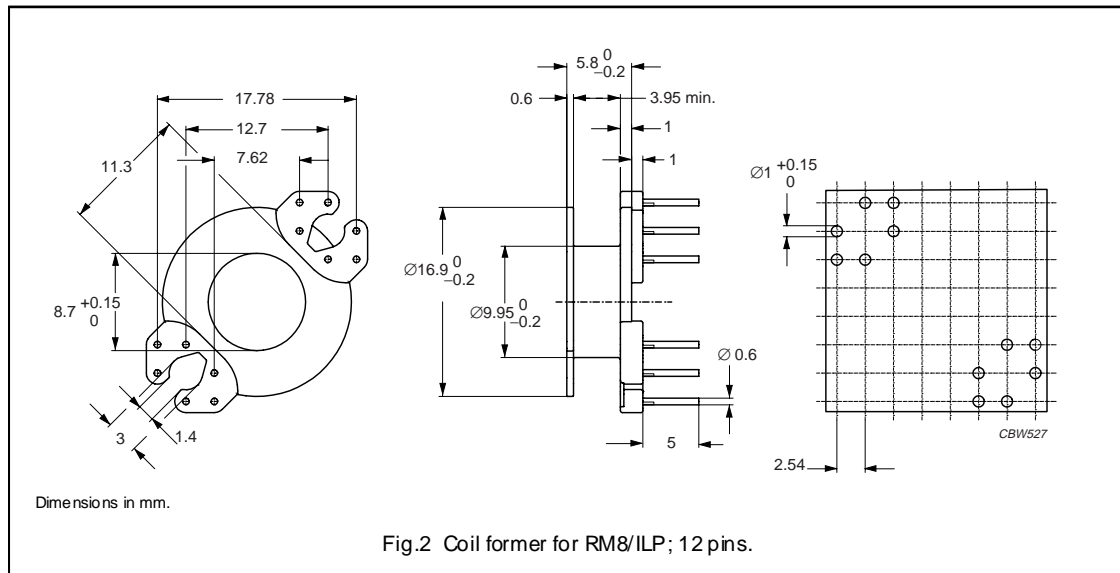
GRADE	B (mT) at	CORE LOSS (W) at				
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 1 MHz; B = 50 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–	–
3C94	$\geq 320$	–	–	–	–	–
3C96	$\geq 340$	$\leq 0.7$	–	–	–	–
3F3	$\geq 315$	–	–	–	–	–
3F35	$\geq 300$	$\leq 0.3$	$\leq 2.2$	–	–	–
3F4	$\geq 250$	–	–	$\leq 0.55$	–	$\leq 0.9$
3F45	$\geq 250$	–	–	$\leq 0.37$	$\leq 0.93$	$\leq 0.65$

RM cores and accessories

RM8/ILP

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 (Sn) 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



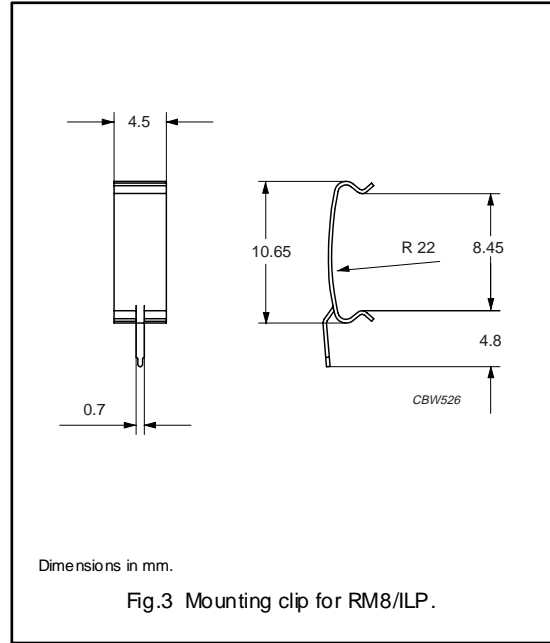
Winding data for RM8/ILP coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	12	all	13.3	3.95	41.8	CSV-RM8/ILP-1S-12P-Z
1	10	1, 2, 3, 4, 6, 7, 9, 10, 11, 12	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P-Z
1	10	1, 2, 3, 4, 6, 8, 9, 10, 11, 12	13.3	3.95	41.8	CSV-RM8/ILP-1S-10P-ZA

**MOUNTING PARTS**

**General data**

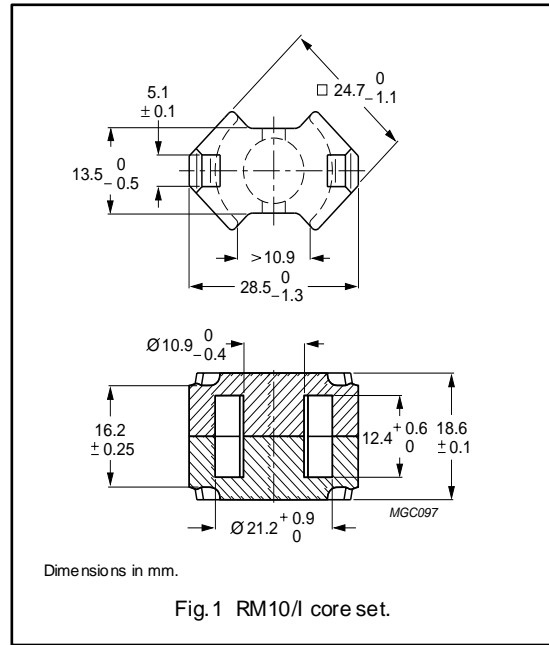
ITEM	SPECIFICATION
Clamping force	≈15 N
Clip material	stainless steel (CrNi)
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CL/P-RM8/ILP



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.462	mm <sup>-1</sup>
$V_e$	effective volume	4310	mm <sup>3</sup>
$l_e$	effective length	44.6	mm
$A_e$	effective area	96.6	mm <sup>2</sup>
$A_{min}$	minimum area	89.1	mm <sup>2</sup>
m	mass of set	≈ 22	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 60 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP (μm)	TYPE NUMBER
3D3	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	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)	$\mu_e$	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

## RM cores and accessories

RM10/I

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	160 $\pm 3\%$	$\approx 59$	$\approx 980$	RM10/I-3C90-A160
	250 $\pm 3\%$	$\approx 92$	$\approx 570$	RM10/I-3C90-A250
	315 $\pm 3\%$	$\approx 116$	$\approx 430$	RM10/I-3C90-A315
	400 $\pm 3\%$	$\approx 147$	$\approx 330$	RM10/I-3C90-A400
	630 $\pm 3\%$	$\approx 232$	$\approx 190$	RM10/I-3C90-A630
	4500 $\pm 25\%$	$\approx 1650$	$\approx 0$	RM10/I-3C90
3C91 <small>des</small>	5500 $\pm 25\%$	$\approx 2020$	$\approx 0$	RM10/I-3C91
3C94	160 $\pm 3\%$	$\approx 59$	$\approx 980$	RM10/I-3C94-A160
	250 $\pm 3\%$	$\approx 92$	$\approx 570$	RM10/I-3C94-A250
	315 $\pm 3\%$	$\approx 116$	$\approx 430$	RM10/I-3C94-A315
	400 $\pm 3\%$	$\approx 147$	$\approx 330$	RM10/I-3C94-A400
	630 $\pm 3\%$	$\approx 232$	$\approx 190$	RM10/I-3C94-A630
	4500 $\pm 25\%$	$\approx 1650$	$\approx 0$	RM10/I-3C94
3C96 <small>des</small>	4050 $\pm 25\%$	$\approx 1680$	$\approx 0$	RM10/I-3C96
3F3	160 $\pm 3\%$	$\approx 59$	$\approx 980$	RM10/I-3F3-A160
	250 $\pm 3\%$	$\approx 92$	$\approx 570$	RM10/I-3F3-A250
	315 $\pm 3\%$	$\approx 116$	$\approx 430$	RM10/I-3F3-A315
	400 $\pm 3\%$	$\approx 147$	$\approx 330$	RM10/I-3F3-A400
	630 $\pm 3\%$	$\approx 232$	$\approx 190$	RM10/I-3F3-A630
	4050 $\pm 25\%$	$\approx 1490$	$\approx 0$	RM10/I-3F3
3F35 <small>prot</small>	3100 $\pm 25\%$	$\approx 1190$	$\approx 0$	RM10/I-3F35

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements, 60  $\pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3E27	10700 $\pm 25\%$	$\approx 3930$	RM10/I-3E27
3E5	16 000 +40/-30%	$\approx 5880$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥315	≤ 1.0	–	–	–
3C90	≥320	≤ 0.52	≤ 0.55	–	–
3C91	≥315	–	≤ 0.3 <sup>(1)</sup>	≤ 1.8 <sup>(1)</sup>	–
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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; 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	–	–

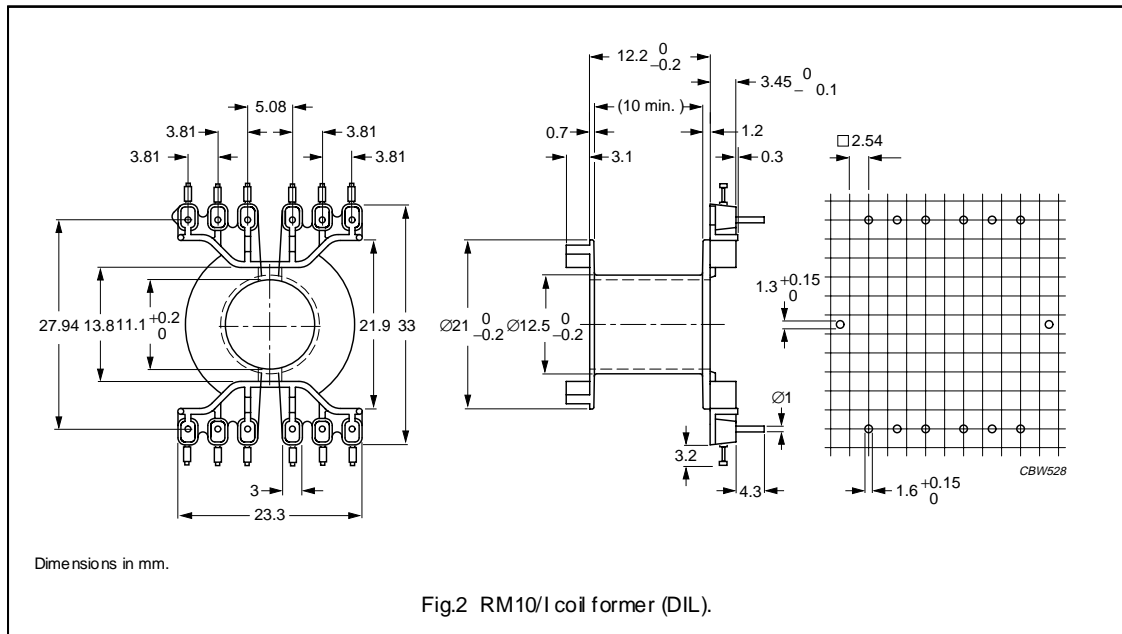
## Note

1. Measured at 60 °C.

**COIL FORMER**

**General data**

PARAMETER	SPECIFICATION
Coil former material	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, transition to lead-free (Sn) ongoing
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



**Winding data for RM10 coil former (DIL)**

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	52	44.2	10.0	CPV-RM10-1S-12PD

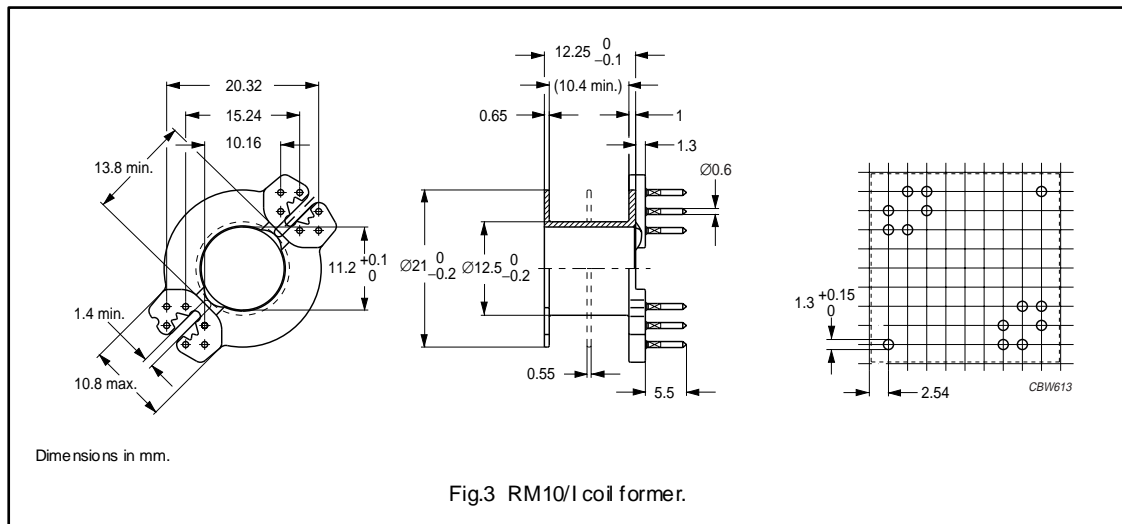
RM cores and accessories

RM10/I

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 (Sn) 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



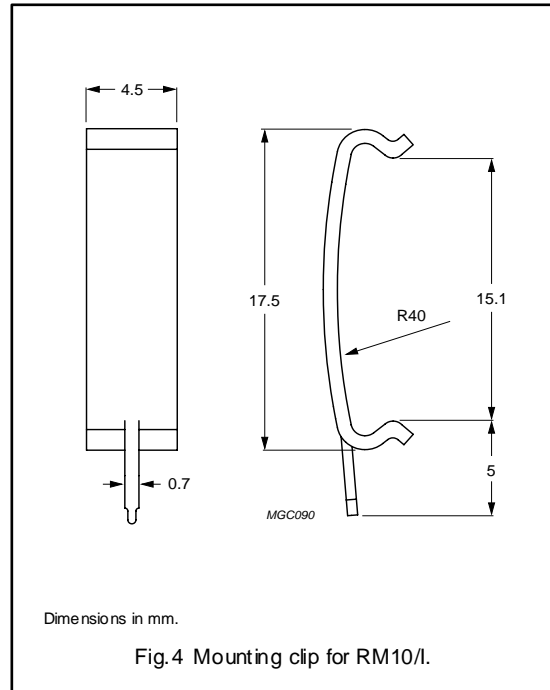
Winding data for RM10/I coil former

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	12	all	52.3	42.7	10.3	CSV-RM10-1S-12P

**MOUNTING PARTS**

**General data**

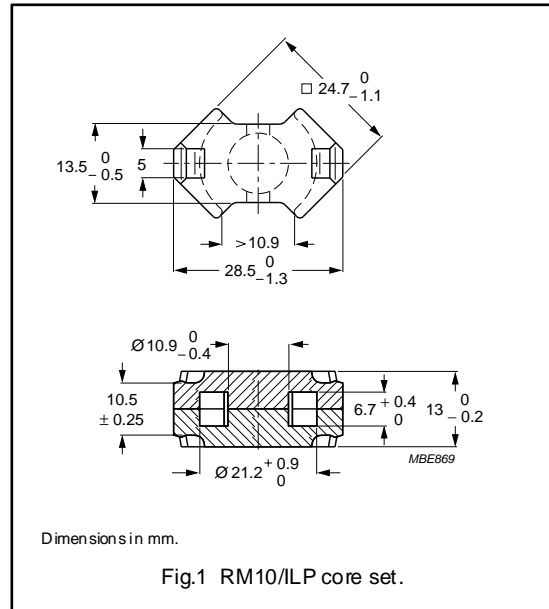
ITEM	SPECIFICATION
Clamping force	≈30 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM10/I



**CORE SETS**

**Effective core parameters RM10/ILP**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.340	mm <sup>-1</sup>
$V_e$	effective volume	3360	mm <sup>3</sup>
$l_e$	effective length	33.9	mm
$A_e$	effective area	99.1	mm <sup>2</sup>
$A_{min}$	minimum area	89.1	mm <sup>2</sup>
$m$	mass of set	≈ 17	g



**Core sets for filter applications**

Clamping force for  $A_L$  measurements, 60 ± 20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3D3	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	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

## RM cores and accessories

RM10/ILP

**Core sets for general purpose transformers and power applications**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3C90	$5600 \pm 25\%$	$\approx 1510$	$\approx 0$	RM10/ILP-3C90
3C94	$5600 \pm 25\%$	$\approx 1510$	$\approx 0$	RM10/ILP-3C94
3C96 <small>des</small>	$5200 \pm 25\%$	$\approx 1400$	$\approx 0$	RM10/ILP-3C96
3F3	$5200 \pm 25\%$	$\approx 1410$	$\approx 0$	RM10/ILP-3F3
3F35 <small>prot</small>	$4000 \pm 25\%$	$\approx 1080$	$\approx 0$	RM10/ILP-3F35
3F4 <small>des</small>	$3000 \pm 25\%$	$\approx 810$	$\approx 0$	RM10/ILP-3F4

**Core sets of high permeability grades**Clamping force for  $A_L$  measurements,  $60 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3E5 <small>des</small>	$22000 +40/-30\%$	$\approx 5950$	$\approx 0$	RM10/ILP-3E5
3E6 <small>des</small>	$27000 +40/-30\%$	$\approx 7300$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 320$	$\leq 0.41$	$\leq 0.43$	–	–
3C94	$\geq 320$	–	$\leq 0.32$	$\leq 1.7$	–
3C96	$\geq 340$	–	$\leq 0.24$	$\leq 1.4$	$\leq 0.6$
3F3	$\geq 300$	–	$\leq 0.37$	–	$\leq 0.64$
3F35	$\geq 300$	–	–	–	–
3F4	$\geq 250$	–	–	–	–

**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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 1.2$	–	–	–
3F3	$\geq 300$	–	–	–	–
3F35	$\geq 300$	$\leq 0.45$	$\leq 3.5$	–	–
3F4	$\geq 250$	–	–	$\leq 1.0$	$\leq 1.6$

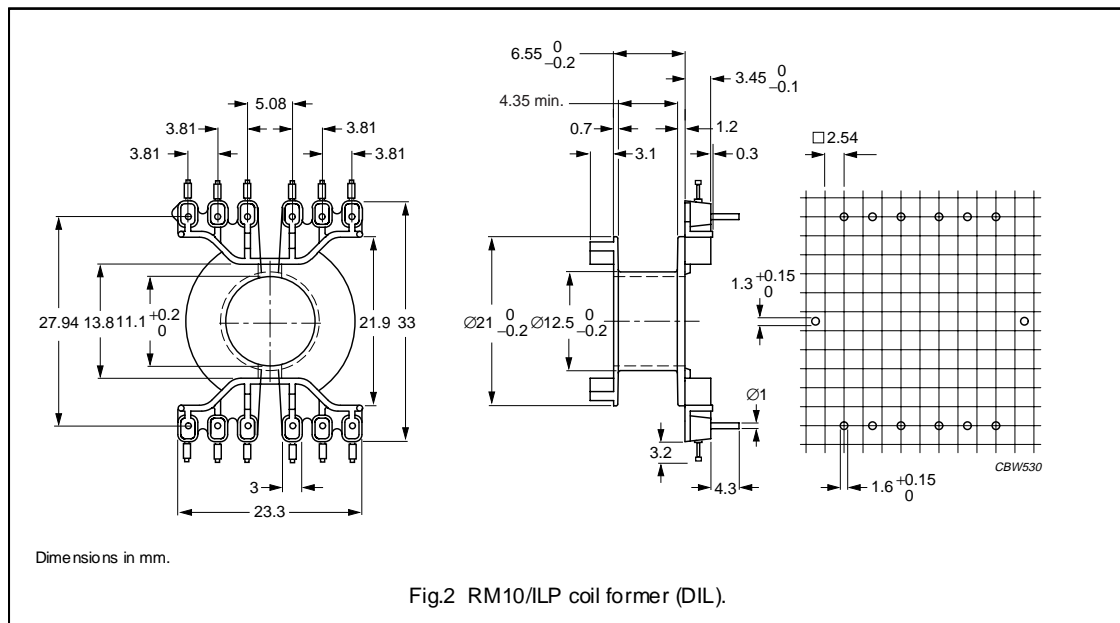
RM cores and accessories

RM10/ILP

COIL FORMER

General data

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, transition to lead-free (Sn) ongoing
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



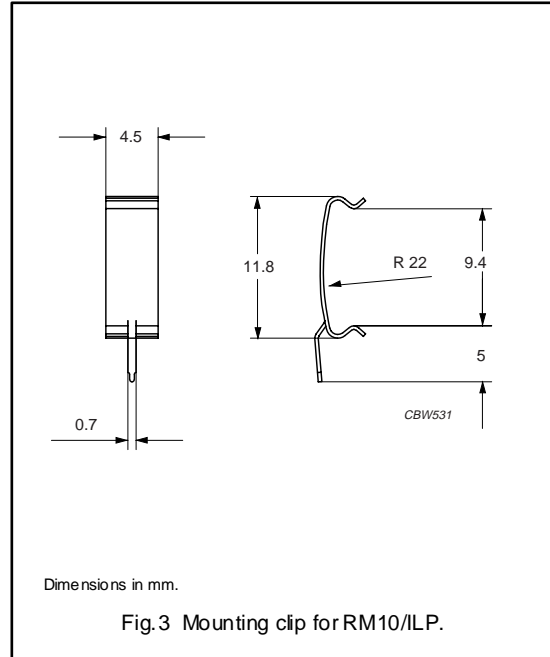
Winding data for RM10/ coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	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), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CL/P-RM10/ILP

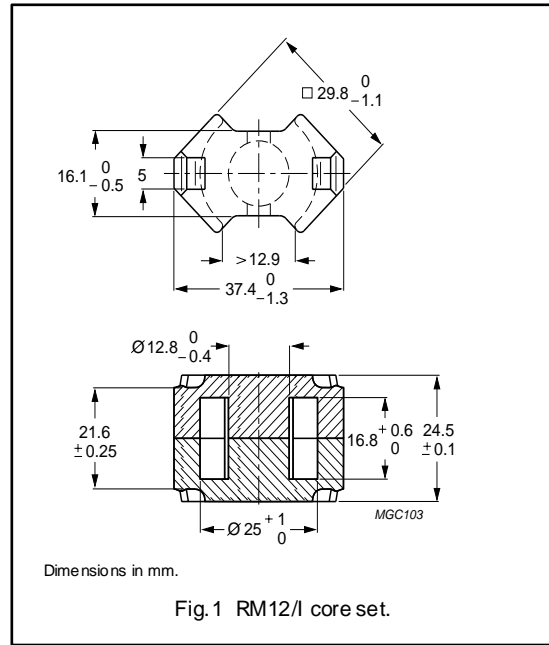




**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.388	mm <sup>-1</sup>
$V_e$	effective volume	8340	mm <sup>3</sup>
$l_e$	effective length	56.6	mm
$A_e$	effective area	146	mm <sup>2</sup>
$A_{min}$	minimum area	125	mm <sup>2</sup>
$m$	mass of set	≈ 46	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements,  $70 \pm 20$  N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	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	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 <small>des</small>	5050 ±25%	≈ 1560	≈ 0	RM12/I-3C96

## RM cores and accessories

RM12/I

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu\text{m}$ )	TYPE NUMBER
3F3	160 $\pm 3\%$	$\approx 49$	$\approx 1570$	RM12/I-3F3-A160
	250 $\pm 3\%$	$\approx 77$	$\approx 900$	RM12/I-3F3-A250
	315 $\pm 5\%$	$\approx 97$	$\approx 680$	RM12/I-3F3-A315
	400 $\pm 5\%$	$\approx 123$	$\approx 510$	RM12/I-3F3-A400
	630 $\pm 5\%$	$\approx 194$	$\approx 300$	RM12/I-3F3-A630
	5050 $\pm 25\%$	$\approx 1560$	$\approx 0$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	$\geq 315$	$\leq 1.0$	$\leq 1.1$	–	–
3C94	$\geq 315$	–	$\leq 0.8$	$\leq 4.5$	–
3C96	$\geq 340$	–	$\leq 0.6$	$\leq 3.6$	$\leq 1.5$
3F3	$\geq 315$	–	$\leq 0.92$	–	$\leq 1.6$

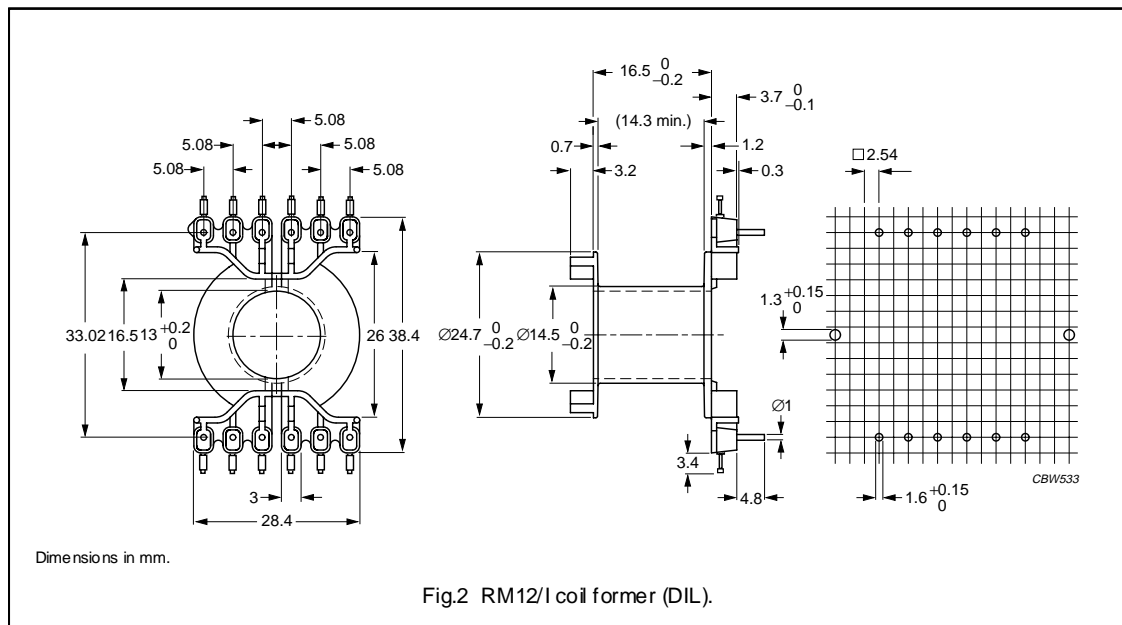
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; B = 10 mT; T = 100 °C
3C90	$\geq 320$	–	–	–	–
3C94	$\geq 320$	–	–	–	–
3C96	$\geq 340$	$\leq 3.0$	–	–	–
3F3	$\geq 315$	–	–	–	–

**COIL FORMER**

**General data**

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, transition to lead-free (Sn) ongoing
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



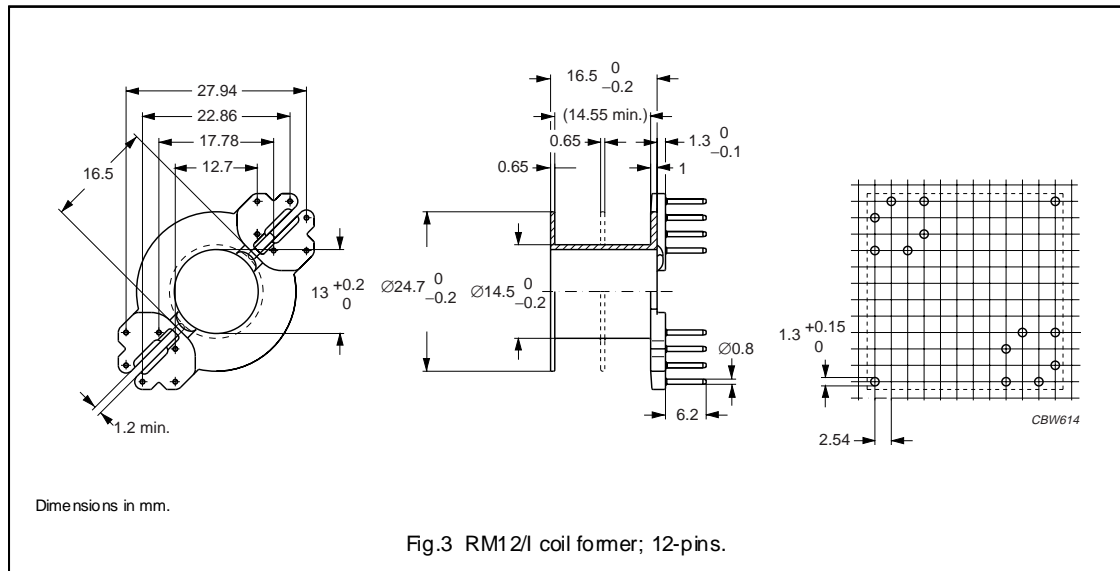
**Winding data for RM12/I coil former (DIL)**

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	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, transition to lead-free (Sn) ongoing
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



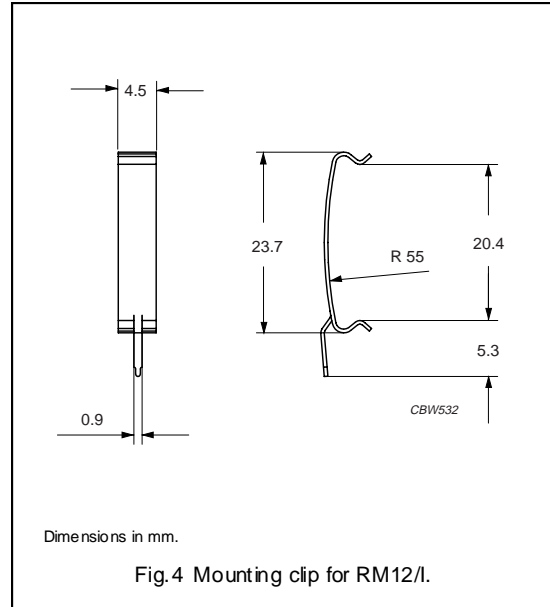
**Winding data for RM12/I coil former with 12-pins**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	72	14.4	61	CSV-RM12-1S-12P

**MOUNTING PARTS**

**General data**

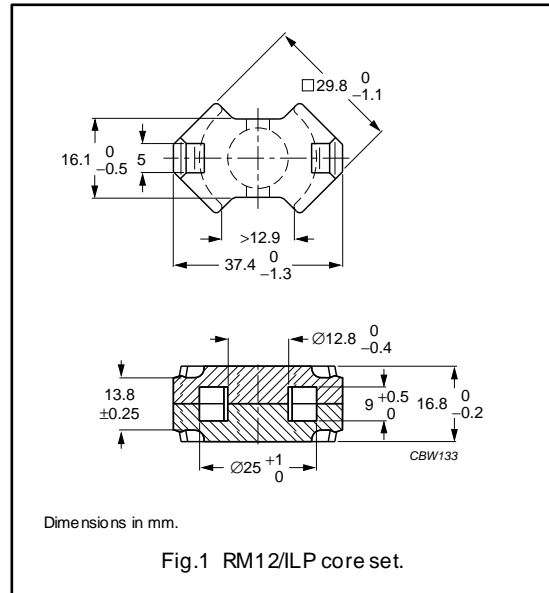
ITEM	SPECIFICATION
Clamping force	≈ 35 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM12/I



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.280	mm <sup>-1</sup>
$V_e$	effective volume	6200	mm <sup>3</sup>
$l_e$	effective length	42	mm
$A_e$	effective area	148	mm <sup>2</sup>
$A_{min}$	minimum area	125	mm <sup>2</sup>
$m$	mass of set	≈ 35	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 70±20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	7100 ±25%	≈ 1600	≈ 0	RM12/ILP-3C90
3C94	7100 ±25%	≈ 1600	≈ 0	RM12/ILP-3C94
3C96 <small>des</small>	6700 ±25%	≈ 1510	≈ 0	RM12/ILP-3C96
3F3	6700 ±25%	≈ 1510	≈ 0	RM12/ILP-3F3
3F35 <small>prot</small>	5000 ±25%	≈ 1110	≈ 0	RM12/ILP-3F35
3F4 <small>des</small>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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	–	–	–	–

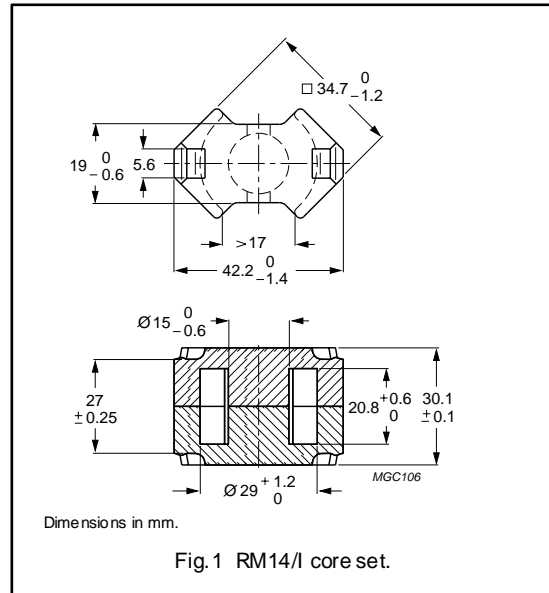
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; 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
$\Sigma(l/A)$	core factor (C1)	0.353	mm <sup>-1</sup>
$V_e$	effective volume	13900	mm <sup>3</sup>
$l_e$	effective length	70.0	mm
$A_e$	effective area	198	mm <sup>2</sup>
$A_{min}$	minimum area	168	mm <sup>2</sup>
$m$	mass of set	≈ 69	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80±20 N.

GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	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	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 <small>des</small>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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

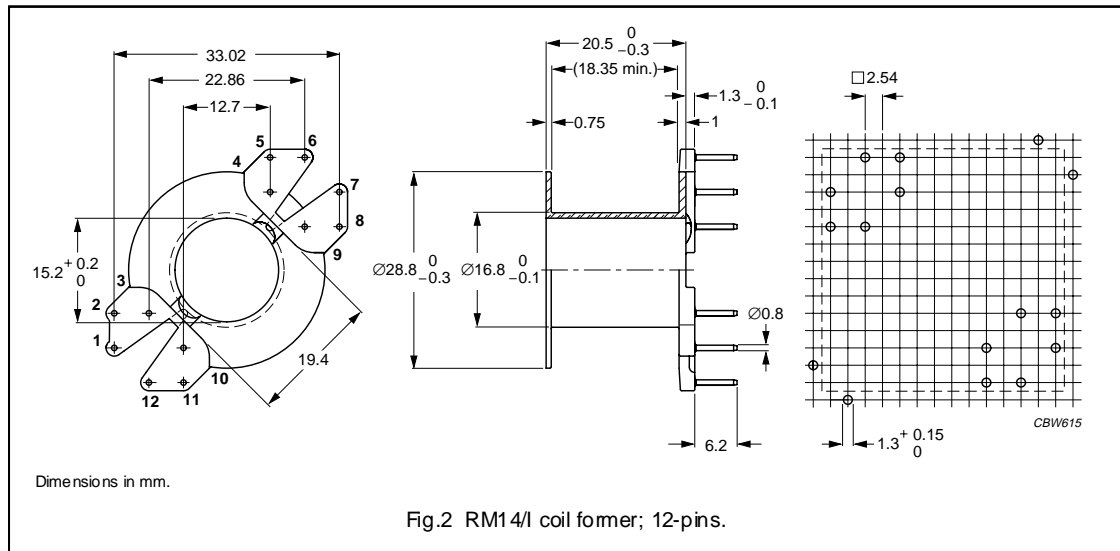
## Properties of core sets under power conditions (continued)

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 500 kHz; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; 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, transition to lead-free (Sn) ongoing
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

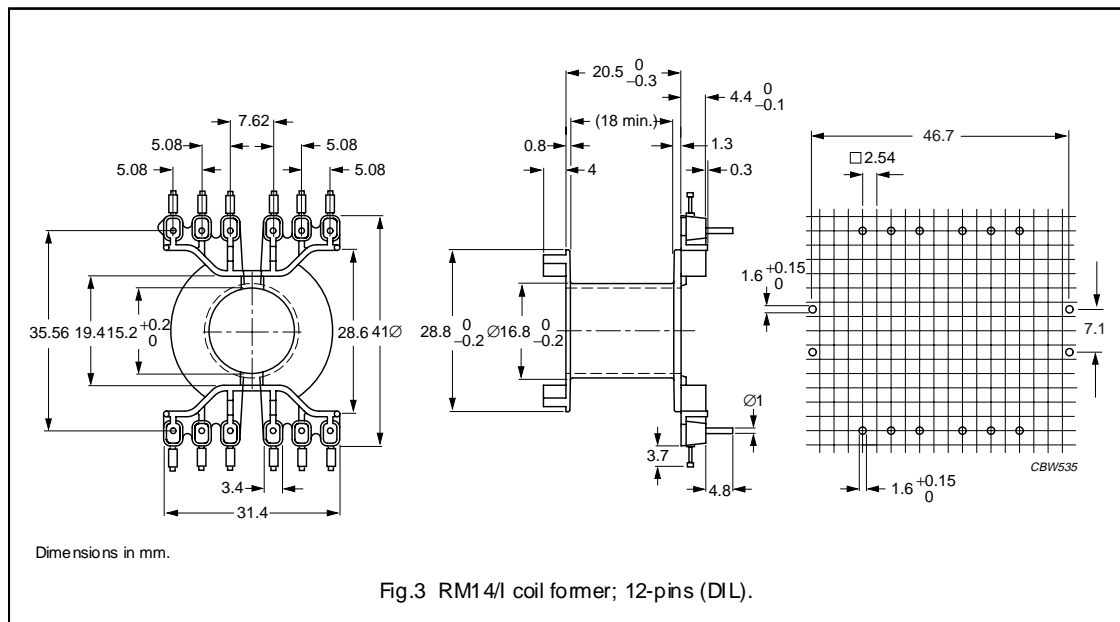


**Winding data for 12-pins RM14/I coil former**

NUMBER OF SECTIONS	NUMBER OF PINS	PIN POSITIONS USED	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	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	polybutyleneterephthalate (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, transition to lead-free (Sn) ongoing
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



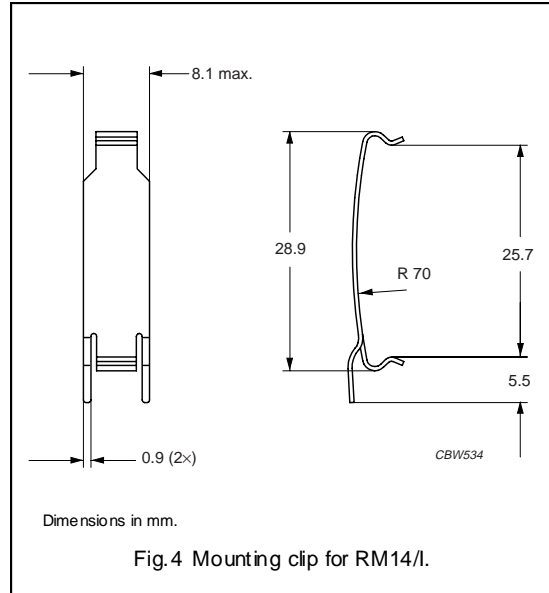
Winding data for 12-pins RM14/I coil former (DIL)

NUMBER OF SECTIONS	AVERAGE LENGTH OF TURN (mm)	WINDING AREA (mm <sup>2</sup> )	WINDING WIDTH (mm)	TYPE NUMBER
1	71	111	18.0	CPV-RM14/I-1S-12PD

**MOUNTING PARTS**

**General data mounting clip with earth pin**

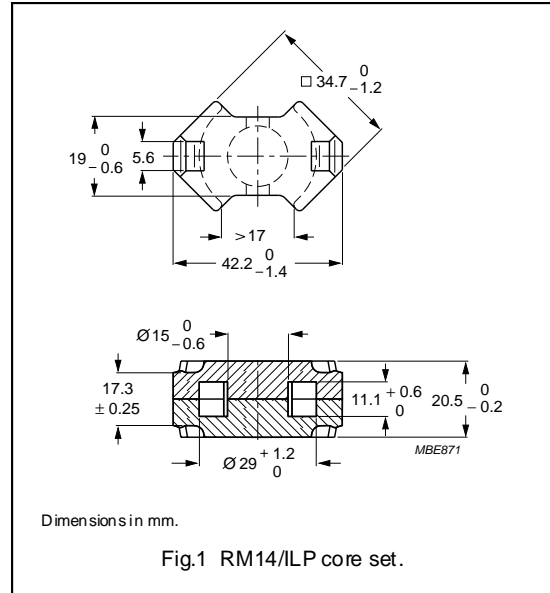
ITEM	SPECIFICATION
Clamping force	≈40 N
Clip material	stainless steel
Clip plating	tin-lead alloy (SnPb), transition to lead-free (Sn) ongoing
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1
Type number	CLI/P-RM14/I



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.250	mm <sup>-1</sup>
$V_e$	effective volume	10230	mm <sup>3</sup>
$l_e$	effective length	50.9	mm
$A_e$	effective area	201	mm <sup>2</sup>
$A_{min}$	minimum area	168	mm <sup>2</sup>
$m$	mass of set	≈ 55	g



**Core sets for general purpose transformers and power applications**

Clamping force for  $A_L$  measurements, 80±20 N.

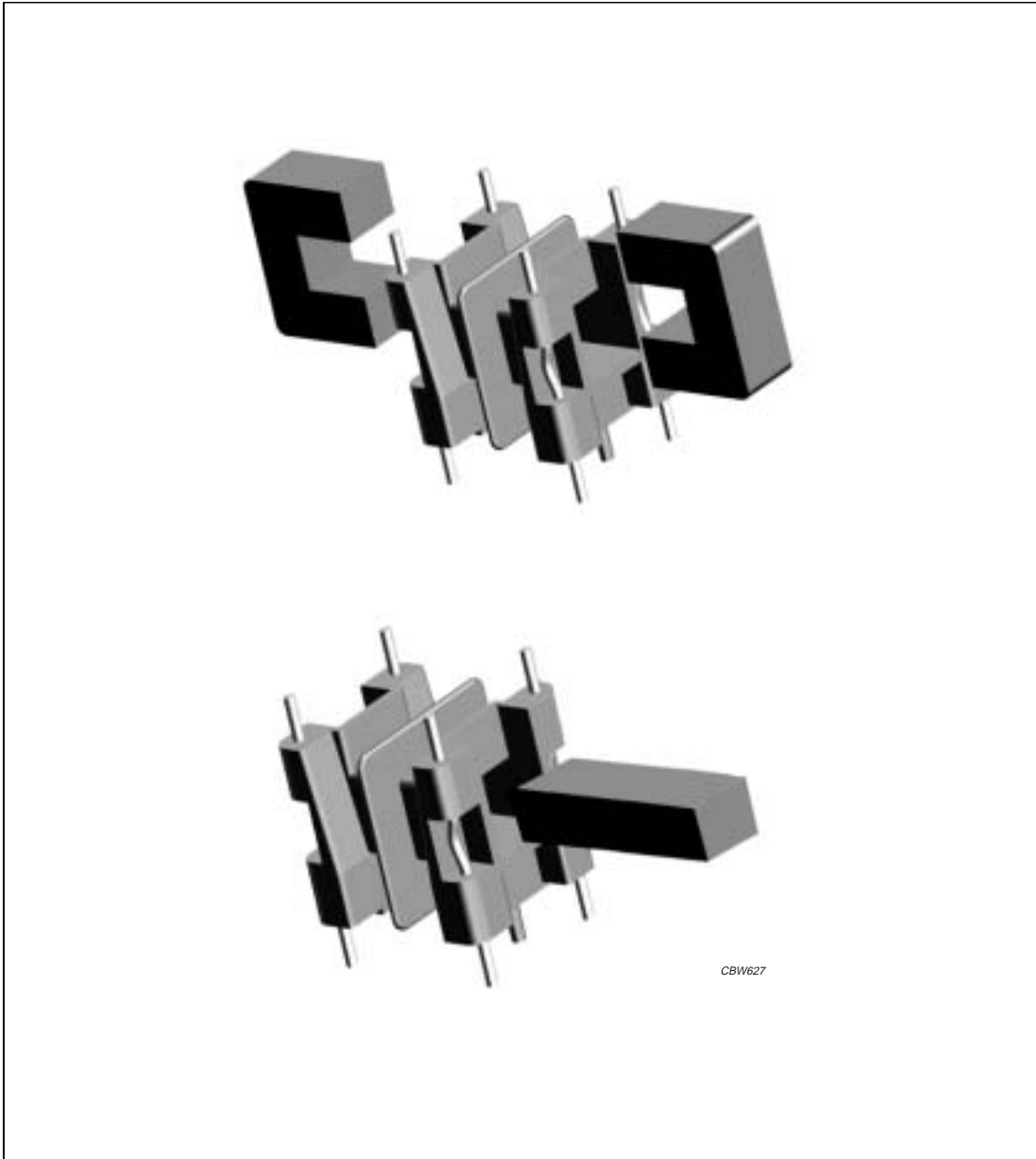
GRADE	$A_L$ (nH)	$\mu_e$	AIR GAP ( $\mu$ m)	TYPE NUMBER
3C90	8400 ±25%	≈ 1690	≈ 0	RM14/ILP-3C90
3C94	8400 ±25%	≈ 1690	≈ 0	RM14/ILP-3C94
3C96 <small>des</small>	7700 ±25%	≈ 1550	≈ 0	RM14/ILP-3C96
3F3	7700 ±25%	≈ 1550	≈ 0	RM14/ILP-3F3
3F35 <small>prot</small>	5800 ±25%	≈ 1150	≈ 0	RM14/ILP-3F35
3F4 <small>des</small>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; 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; B = 50 mT; T = 100 °C	f = 500 kHz; B = 100 mT; T = 100 °C	f = 1 MHz; B = 30 mT; T = 100 °C	f = 3 MHz; 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



CBW627

Soft Ferrites

U, I cores and accessories

PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

Product overview U, I cores

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
U10/8/3	309	8.07	0.9
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
U93/52/30	217000	840	560
U93/76/16	159000	448	400
I93/28/16	115000	447	200
U93/76/30	297000	840	760
I93/28/30	175000	836	370
U100/57/25	199000	645	500
I100/25/25	158000	645	300
U126/91/20	268800	560	680

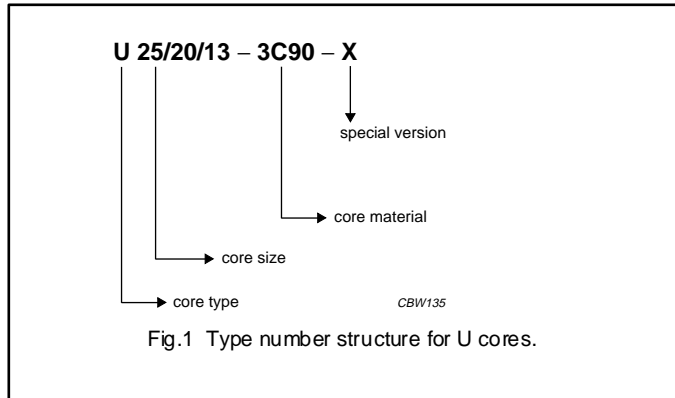


Fig.1 Type number structure for U cores.

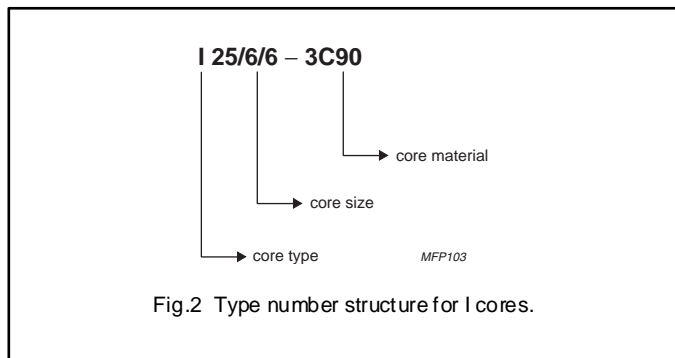


Fig.2 Type number structure for I cores.

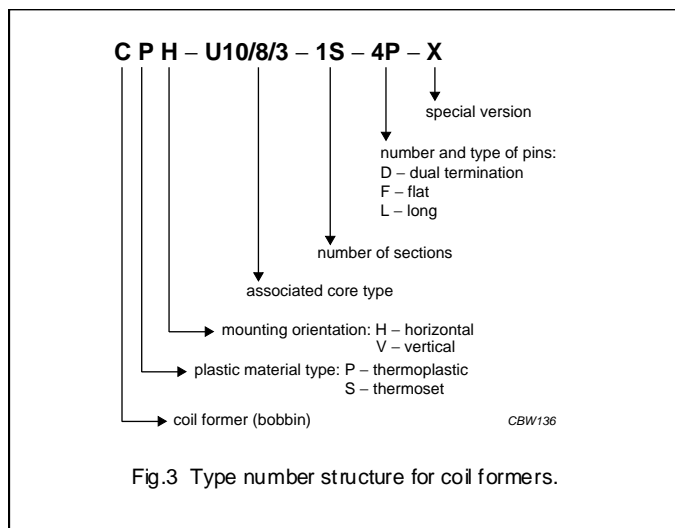


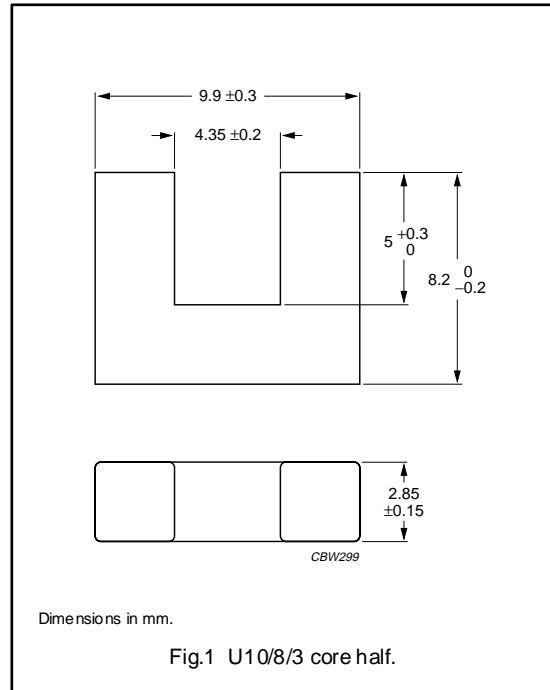
Fig.3 Type number structure for coil formers.



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.74	mm <sup>-1</sup>
$V_e$	effective volume	309	mm <sup>3</sup>
$l_e$	effective length	38.3	mm
$A_e$	effective area	8.07	mm <sup>2</sup>
$A_{min}$	minimum area	7.91	mm <sup>2</sup>
$m$	mass of core half	≈ 0.9	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	420 ±25%	≈ 1590	U10/8/3-3C90
3C94	470 ±25%	≈ 1770	U10/8/3-3C94

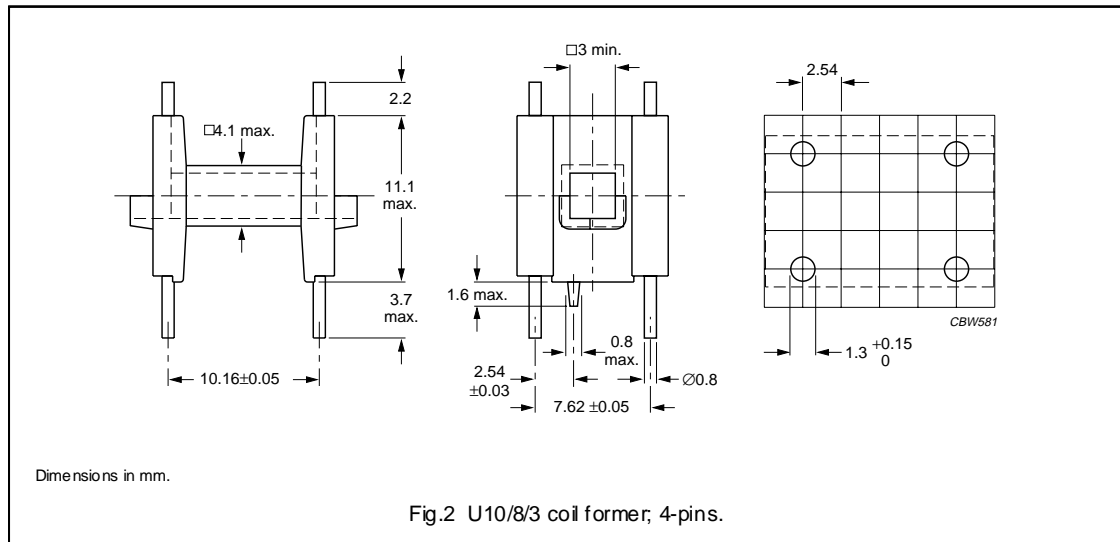
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; 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	polybuteneterephthalate (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, transition to lead-free (Sn) ongoing
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



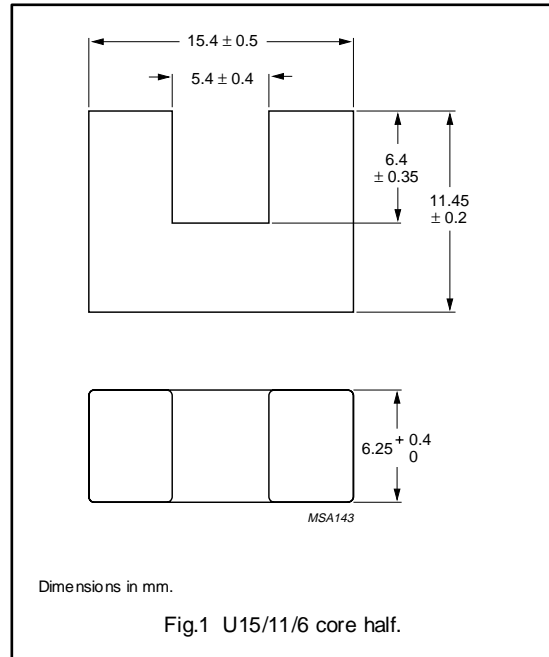
**Winding data for 4-pins U10/8/3 coil former**

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	MINIMUM WINDING WIDTH (mm)	AVERAGE LENGTH OF TURN (mm)	TYPE NUMBER
1	28	8	30	CPH-U10/8/3-1S-4P

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.60	mm <sup>-1</sup>
$V_e$	effective volume	1680	mm <sup>3</sup>
$l_e$	effective length	52	mm
$A_e$	effective area	32.3	mm <sup>2</sup>
m	mass of core half	≈ 4	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	1400 ± 25%	≈ 1900	U15/11/6-3C90
3C94	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 0.2	≤ 0.22	–
3C94	≥ 320	–	≤ 0.17	≤ 1.0

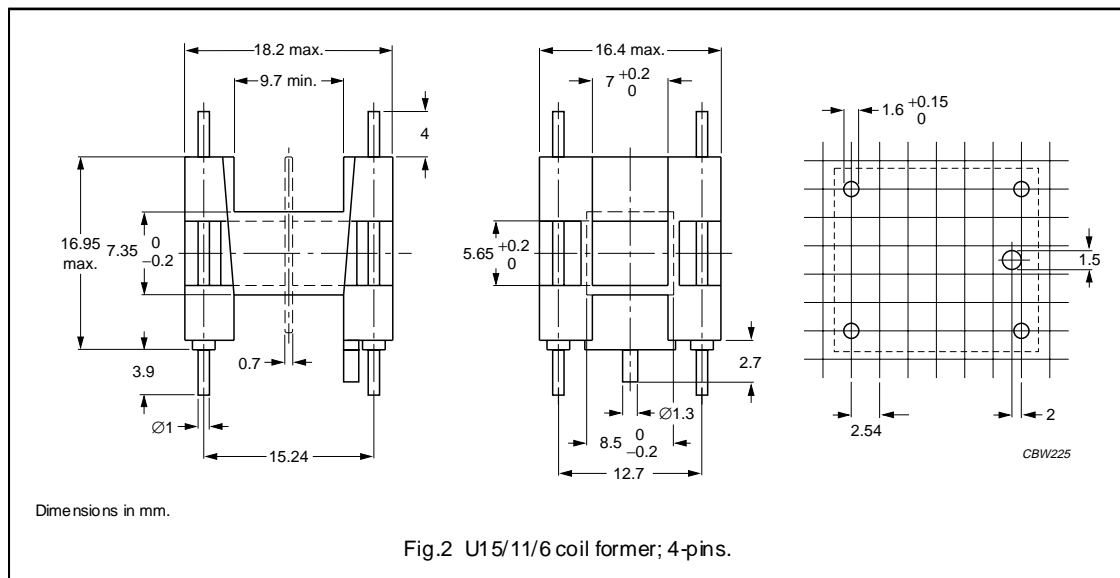
U cores and accessories

U15/11/6

COIL FORMERS

General data 4-pins U15/11/6 coil former

PARAMETER	SPECIFICATION
Coil former material	polyethylenerephthalate (PET), glass-reinforced, flame retardant in accordance with "UL 94V-0"; UL file number E69578 (M)
Pin material	copper-tin alloy (CuSn), tin (Sn) 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



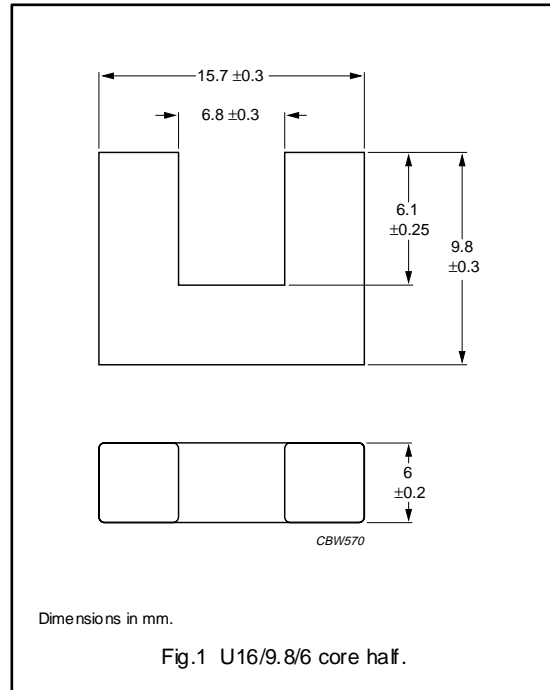
Winding data for 4-pins U15/11/6 coil former

NUMBER OF SECTIONS	WINDING AREA (mm <sup>2</sup> )	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

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.07	mm <sup>-1</sup>
$V_e$	effective volume	1255	mm <sup>3</sup>
$l_e$	effective length	51	mm
$A_e$	effective area	24.6	mm <sup>2</sup>
$A_{min}$	minimum area	22.2	mm <sup>2</sup>
$m$	mass of core half	≈ 3.6	g



**Core halves**

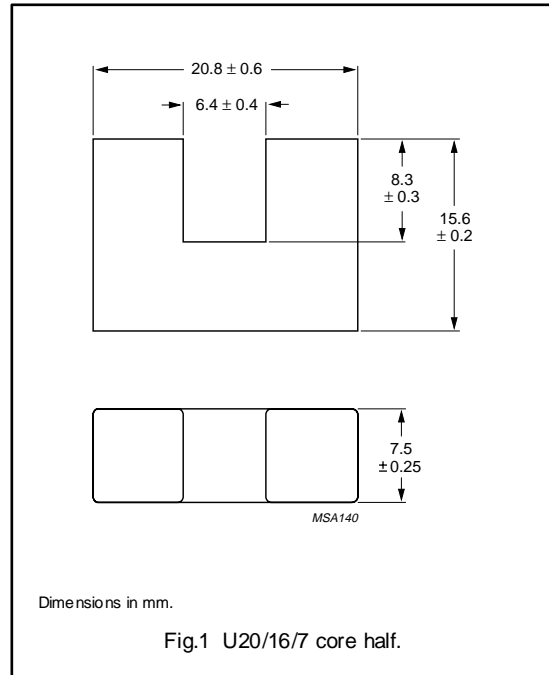
$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3E26	3860 ± 25%	≈ 6370	U16/9.8/6-3E26

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.21	mm <sup>-1</sup>
$V_e$	effective volume	3800	mm <sup>3</sup>
$l_e$	effective length	68	mm
$A_e$	effective area	56	mm <sup>2</sup>
$m$	mass of core half	≈ 9	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	1900 ± 25%	≈ 1950	U20/16/7-3C90
3C94	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**

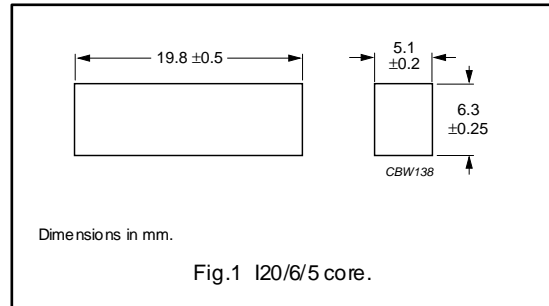
GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 0.46	≤ 0.48	–
3C94	≥ 320	–	≤ 0.36	≤ 2.3

**CORE**

**Ordering information**

GRADE	TYPE NUMBER
3C90	I20/6/5-3C90

Remark: To be used as bar core (without counter part).



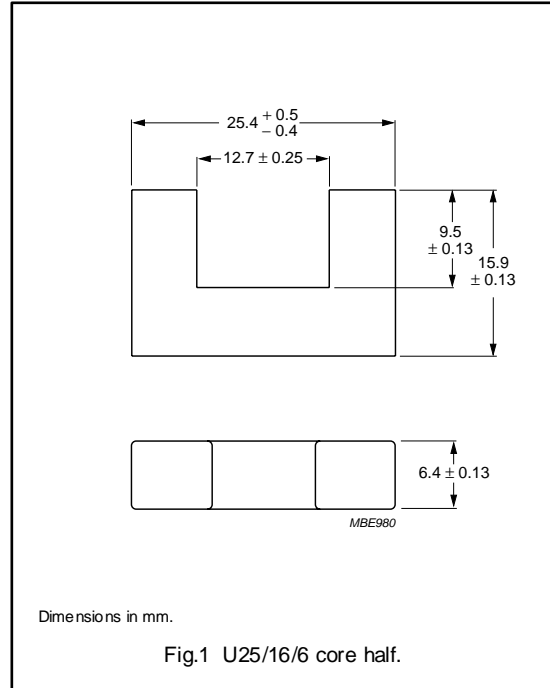
**COIL FORMER**

For coil former data, see data sheet, "U15/11/6".

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.07	mm <sup>-1</sup>
$V_e$	effective volume	3380	mm <sup>3</sup>
$l_e$	effective length	83.6	mm
$A_e$	effective area	40.3	mm <sup>2</sup>
$m$	mass of core half	≈ 8.0	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C81	1400 ±25%	≈ 2300	U25/16/6-3C81
3C90	1200 ±25%	≈ 2300	U25/16/6-3C90
3C91 <small>des</small>	1400 ±25%	≈ 2300	U25/16/6-3C91
3C94	1200 ±25%	≈ 2300	U25/16/6-3C94
3C11	2050 ±25%	≈ 3380	U25/16/6-3C11
3E27	2500 ±25%	≈ 4130	U25/16/6-3E27



## U cores and accessories

U25/16/6  
(376U250)

## Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at			
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.78	–	–	–
3C90	≥320	≤ 0.4	≤ 0.4	–	–
3C91	≥320	–	≤ 0.23 <sup>(1)</sup>	≤ 1.6 <sup>(1)</sup>	–
3C94	≥320	–	≤ 0.3	≤ 2.0	–

**Note**

1. Measured at 60 °C.

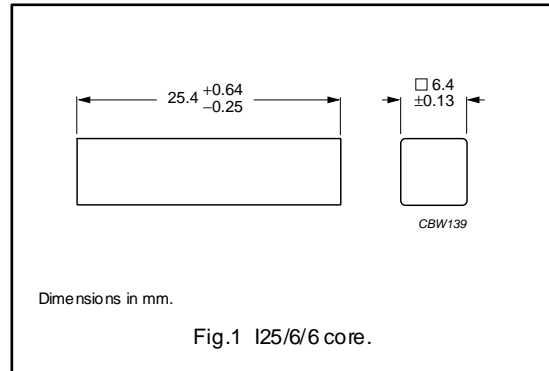
I cores and accessories

I25/6/6  
(376B250)

CORE SETS

Effective core parameters measured in combination with U25/16/6

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.59	mm <sup>-1</sup>
$V_e$	effective volume	2590	mm <sup>3</sup>
$l_e$	effective length	64.3	mm
$A_e$	effective area	40.3	mm <sup>2</sup>
m	mass of I core	≈ 4.5	g



Core halves

$A_L$  measured in combination with "U25/16/6".

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C81	1750 ±25%	≈ 2210	I25/6/6-3C81
3C90	1500 ±25%	≈ 1900	I25/6/6-3C90
3C91 <small>des</small>	1750 ±25%	≈ 2210	I25/6/6-3C91
3C94	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C81	≥320	≤ 0.6	–	–
3C90	≥320	≤ 0.3	≤ 0.3	–
3C91	≥320	–	≤ 0.18 <sup>(1)</sup>	≤ 1.2 <sup>(1)</sup>
3C94	≥320	–	≤ 0.23	≤ 1.6

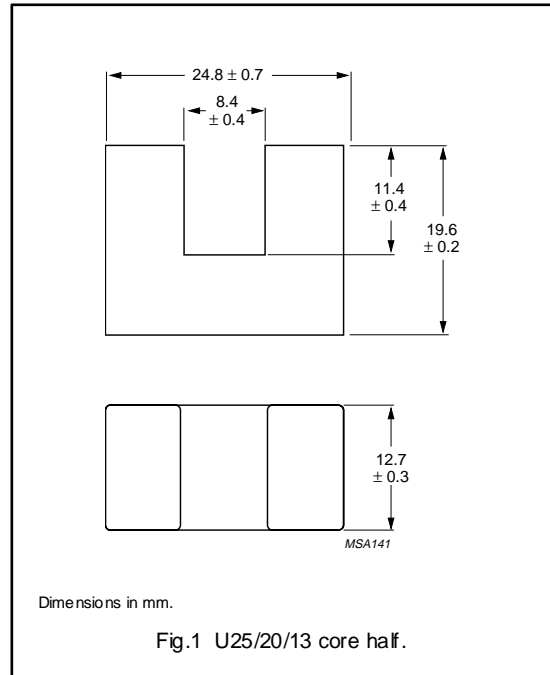
Note

1. Measured at 60 °C.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.85	mm <sup>-1</sup>
$V_e$	effective volume	9180	mm <sup>3</sup>
$l_e$	effective length	88.2	mm
$A_e$	effective area	104	mm <sup>2</sup>
$m$	mass of core half	≈ 23.5	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	2900 ±25%	≈ 2000	U25/20/13-3C90
3C94	2900 ±25%	≈ 2000	U25/20/13-3C94
3C11	5000 ±25%	≈ 3400	U25/20/13-3C11
3E27	6300 ±25%	≈ 4300	U25/20/13-3E27

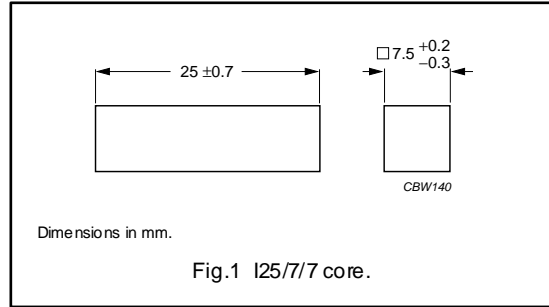
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥320	≤ 1.1	≤ 1.2	–
3C94	≥320	–	≤ 0.9	≤ 5.5

**CORE**

**Ordering information**

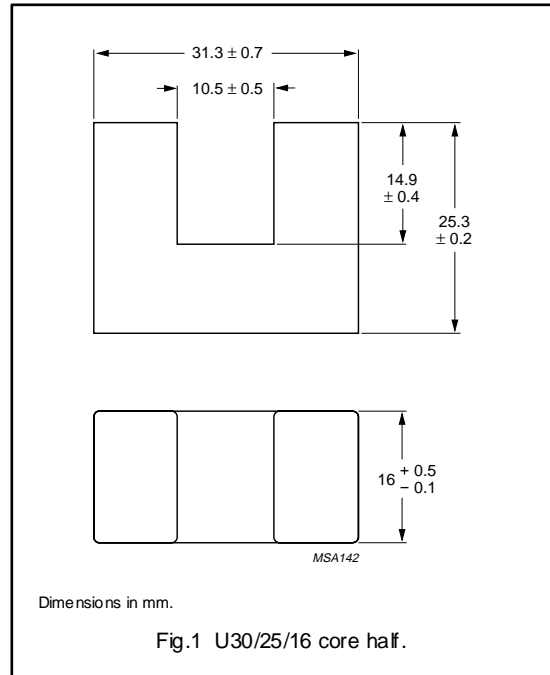
GRADE	TYPE NUMBER
3C90	I25/7/7-3C90



**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.690	mm <sup>-1</sup>
$V_e$	effective volume	17900	mm <sup>3</sup>
$l_e$	effective length	111	mm
$A_e$	effective area	161	mm <sup>2</sup>
m	mass of core half	≈ 43	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	3700 ±25%	≈ 2030	U30/25/16-3C90
3C94	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C90	≥ 320	≤ 2.2	≤ 2.3	–
3C94	≥ 320	–	≤ 1.8	≤ 11

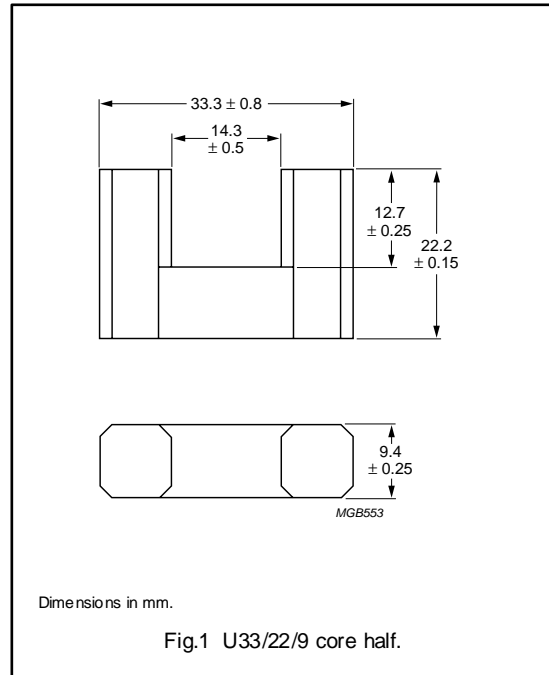
U cores and accessories

U33/22/9  
(1F30)

CORE SETS

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.27	mm <sup>-1</sup>
$V_e$	effective volume	9490	mm <sup>3</sup>
$l_e$	effective length	110	mm
$A_e$	effective area	86.5	mm <sup>2</sup>
m	mass of core half	≈ 24	g



Core halves

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C81	2300 ±25%	≈ 2320	U33/22/9-3C81
3C91 <small>des</small>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C81	≥320	≤ 2.2	–	–
3C91	≥320	–	≤ 0.57 <sup>(1)</sup>	≤ 4.3 <sup>(1)</sup>

Note

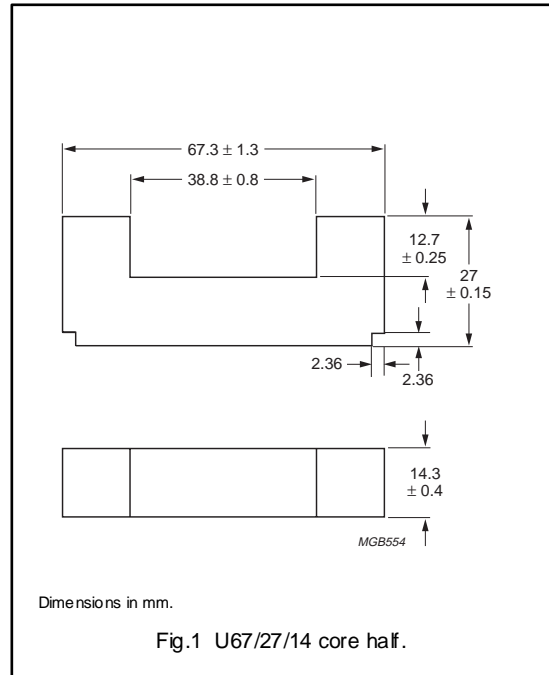
Note

1. Measured at 60 °C.

**CORE SETS**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.850	mm <sup>-1</sup>
$V_e$	effective volume	35200	mm <sup>3</sup>
$l_e$	effective length	173	mm
$A_e$	effective area	204	mm <sup>2</sup>
$m$	mass of core half	≈ 85	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C81	3800 ±25%	≈ 2570	U67/27/14-3C81
3C91 <small>des</small>	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C81	≥320	≤ 8.1	–	–
3C91	≥320	–	≤ 2.1 <sup>(1)</sup>	≤ 16 <sup>(1)</sup>

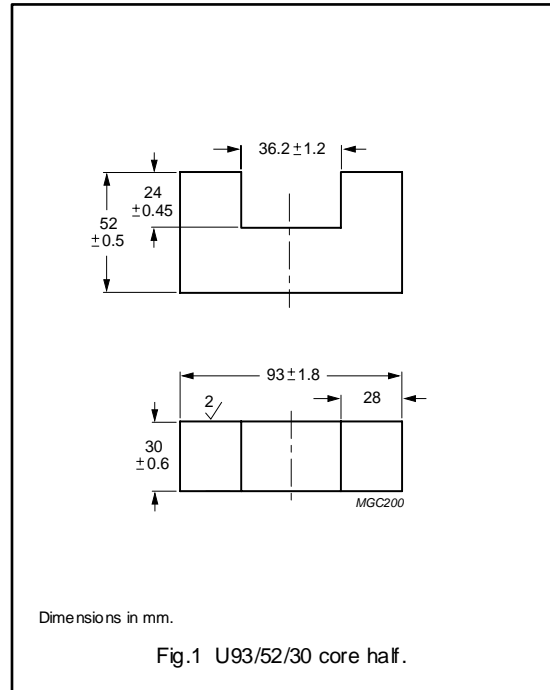
**Note**

1. Measured at 60 °C.

**U CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.307	mm <sup>-1</sup>
$V_e$	effective volume	217 000	mm <sup>3</sup>
$l_e$	effective length	258	mm
$A_e$	effective area	840	mm <sup>2</sup>
$m$	mass of core half	≈ 560	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	8700 ±25%	≈ 2100	U93/52/30-3C90
3C94	8700 ±25%	≈ 2100	U93/52/30-3C94

**Properties of core sets under power conditions**

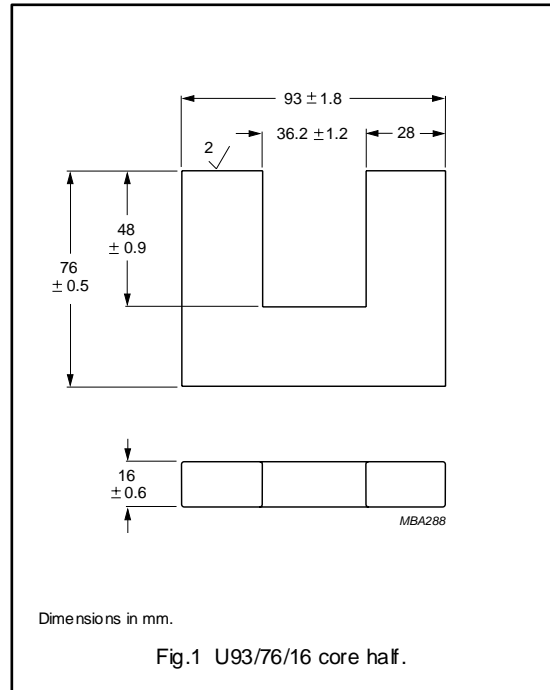
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 28	≤ 38
3C94	≥ 320	–	≤ 30



**U CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.790	mm <sup>-1</sup>
$V_e$	effective volume	159 000	mm <sup>3</sup>
$l_e$	effective length	354	mm
$A_e$	effective area	448	mm <sup>2</sup>
$m$	mass of core half	≈ 400	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	3400 ±25%	≈ 2200	U93/76/16-3C90
3C94	3400 ±25%	≈ 2200	U93/76/16-3C94

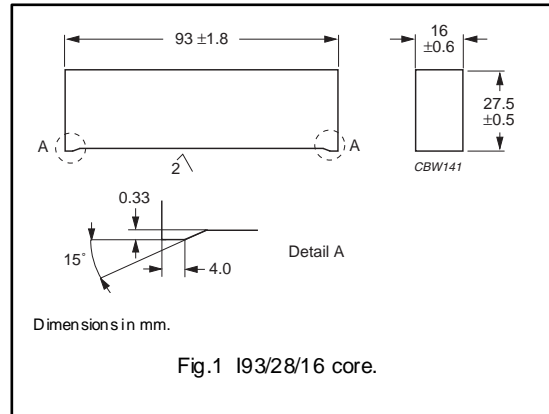
**Properties of core sets under power conditions**

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 20	≤ 23
3C94	≥ 320	–	≤ 18

**CORE SETS**

Effective core parameters in combination with U93/76/16

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.576	mm <sup>-1</sup>
$V_e$	effective volume	115000	mm <sup>3</sup>
$l_e$	effective length	258	mm
$A_e$	effective area	447	mm <sup>2</sup>
m	mass of core	≈ 200	g



**Core data**

$A_L$  measured in combination with "U93/76/16".

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	4600 ±25%	≈ 2100	I93/28/16-3C90
3C94	4600 ±25%	≈ 2100	I93/28/16-3C94

**Properties of core sets under power conditions**

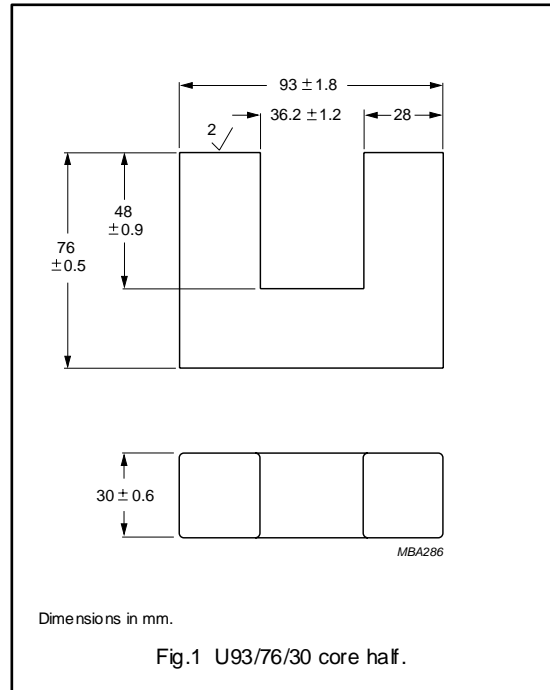
Measured in combination with "U93/76/16".

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥320	≤ 15	≤ 16
3C94	≥320	–	≤ 13

**U CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.421	mm <sup>-1</sup>
$V_e$	effective volume	297 000	mm <sup>3</sup>
$l_e$	effective length	354	mm
$A_e$	effective area	840	mm <sup>2</sup>
$m$	mass of core half	≈ 760	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	6400 ±25%	≈ 2200	U93/76/30-3C90
3C94	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 40	≤ 52
3C94	≥ 320	–	≤ 39

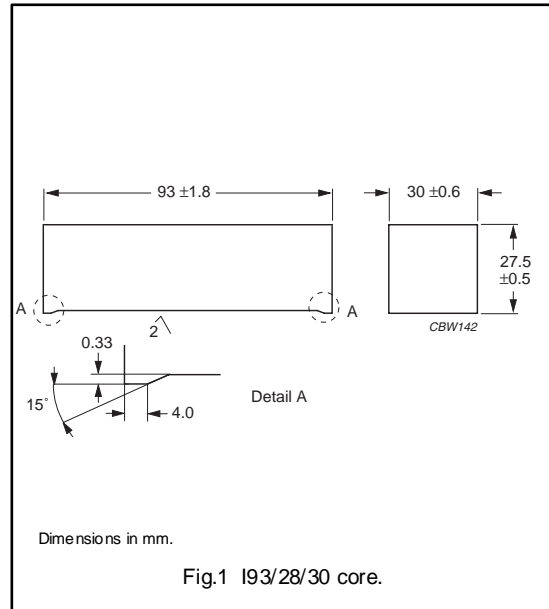
**CORE SETS**

Effective core parameters in combination with U93/52/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.251	mm <sup>-1</sup>
$V_e$	effective volume	175000	mm <sup>3</sup>
$l_e$	effective length	210	mm
$A_e$	effective area	836	mm <sup>2</sup>
m	mass of core	≈ 370	g

Effective core parameters in combination with U93/76/30

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.307	mm <sup>-1</sup>
$V_e$	effective volume	217000	mm <sup>3</sup>
$l_e$	effective length	258	mm
$A_e$	effective area	840	mm <sup>2</sup>
m	mass of core	≈ 370	g



**Core data**

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	10700 ± 25% <sup>(1)</sup>	≈ 2150	I93/28/30-3C90
	8700 ± 25% <sup>(2)</sup>	≈ 2150	
3C94	10700 ± 25% <sup>(1)</sup>	≈ 2150	I93/28/30-3C94
	8700 ± 25% <sup>(2)</sup>	≈ 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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 330	≤ 24 <sup>(1)</sup>	≤ 31 <sup>(1)</sup>
	≥ 330	≤ 28 <sup>(2)</sup>	≤ 38 <sup>(2)</sup>
3C94	≥ 330	–	≤ 24 <sup>(1)</sup>
	≥ 330	–	≤ 30 <sup>(2)</sup>

**Notes**

1. Measured in combination with "U93/52/30".
2. Measured in combination with "U93/76/30".

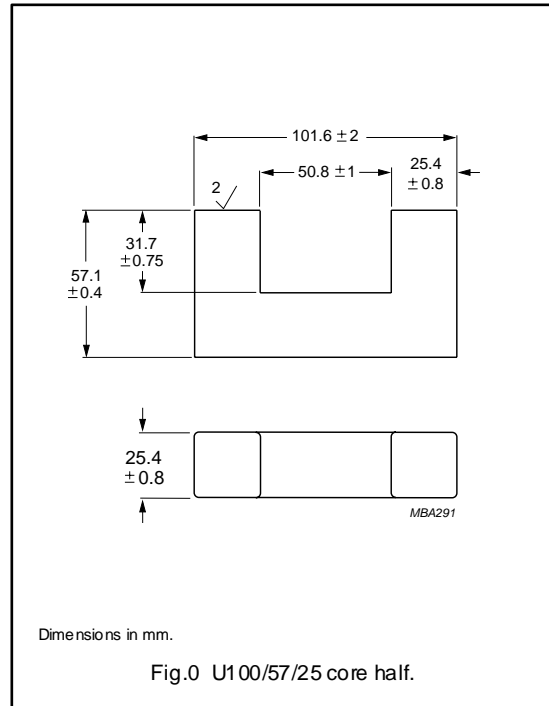
U cores and accessories

U100/57/25

U CORES

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.478	mm <sup>-1</sup>
$V_e$	effective volume	199 000	mm <sup>3</sup>
$l_e$	effective length	308	mm
$A_e$	effective area	645	mm <sup>2</sup>
m	mass of core half	≈ 500	g



Core halves

$A_L$  measured on a combination of 2 U cores.

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	5500 ± 25%	≈ 2200	U100/57/25-3C90
3C94	5500 ± 25%	≈ 2200	U100/57/25-3C94

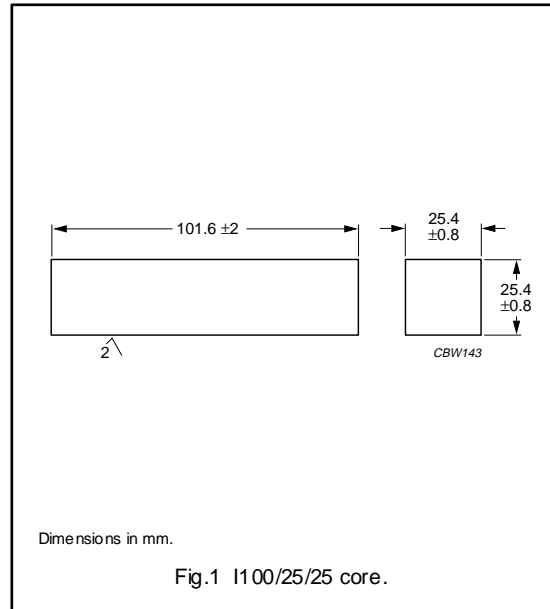
Properties of core sets under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 26	≤ 32
3C94	≥ 320	–	≤ 26

**CORE SETS**

Effective core parameters in combination with U100/57/25

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.379	mm <sup>-1</sup>
$V_e$	effective volume	158000	mm <sup>3</sup>
$l_e$	effective length	245	mm
$A_e$	effective area	645	mm <sup>2</sup>
m	mass of core	≈ 300	g



**Core data**

$A_L$  measured in combination with "U100/57/25".

GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	6700 ±25%	≈ 2150	I100/25/25-3C90
3C94	6700 ±25%	≈ 2150	I100/25/25-3C94

**Properties of core sets under power conditions**

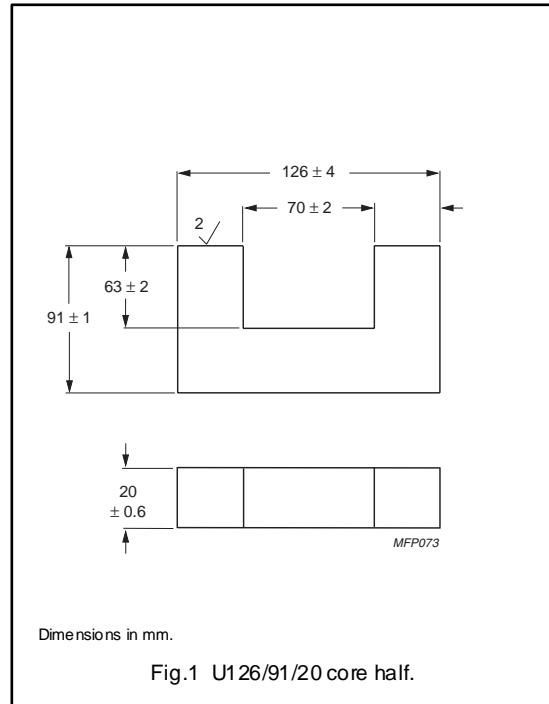
Core loss measured in combination with "U100/57/25".

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 330	≤ 21	≤ 25
3C94	≥ 330	–	≤ 21

**U CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.857	mm <sup>-1</sup>
$V_e$	effective volume	268 800	mm <sup>3</sup>
$l_e$	effective length	480	mm
$A_e$	effective area	560	mm <sup>2</sup>
$A_{min}$	minimum area	560	mm <sup>2</sup>
$m$	mass of core half	≈ 680	g



**Core halves**

$A_L$  measured on a combination of 2 U cores.

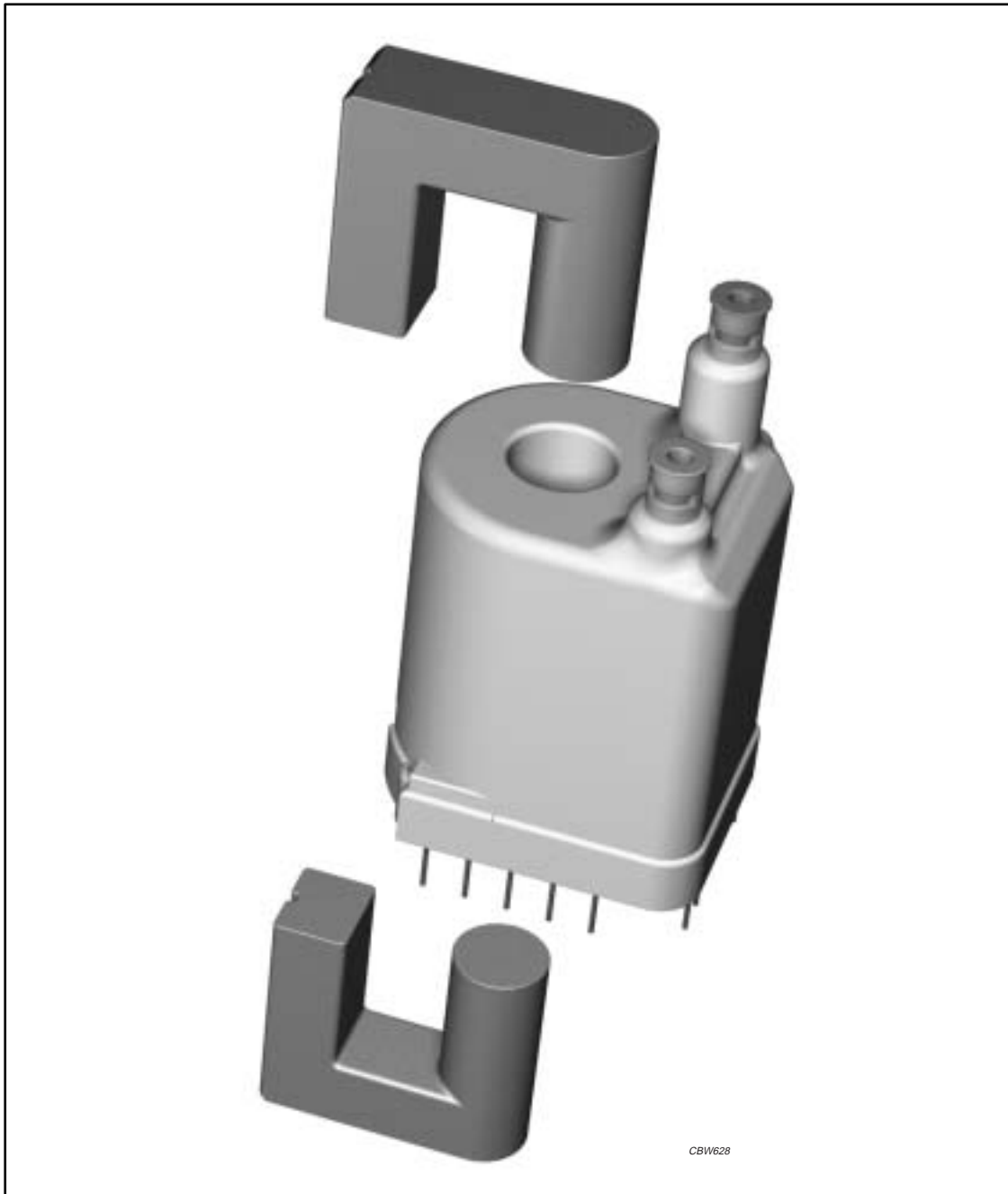
GRADE	$A_L$ (nH)	$\mu_e$	TYPE NUMBER
3C90	3000 ± 25 %	≈ 2050	U126/91/20-3C90
3C94	3000 ± 25 %	≈ 2050	U126/91/20-3C94

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 35	≤ 40
3C94	≥ 320	–	≤ 32





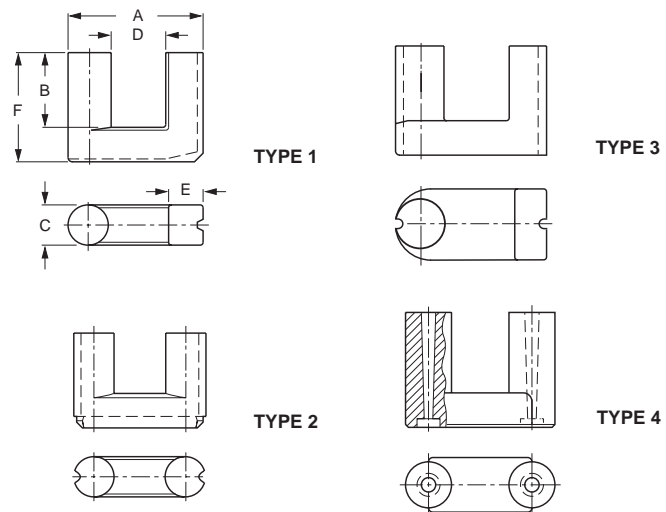


**UR cores**

**UR cores**

**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.



MEA765

For dimensions see Table 1.

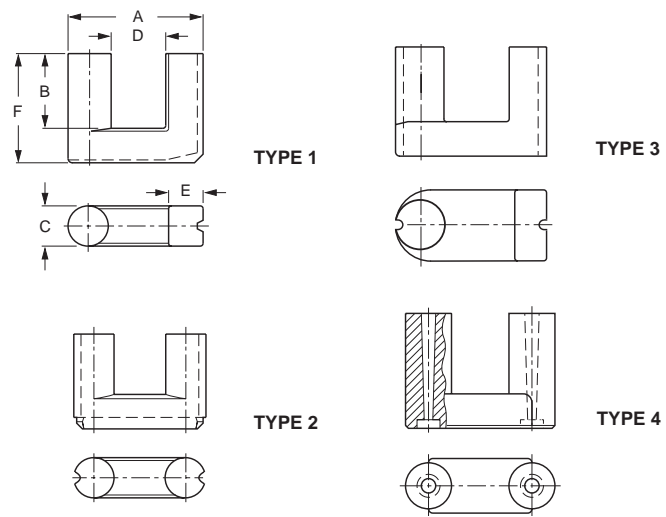
Fig.1 UR cores for line output and welding transformers.

UR cores

UR cores

Table 1 Mechanical data

DESCRIPTION	SHAPE	DIMENSIONS (mm)						EFFECTIVE CORE PARAMETERS				
		A	B	C	D <sub>min</sub>	E	F	C1 (mm <sup>-1</sup> )	V <sub>e</sub> (mm <sup>3</sup> )	l <sub>e</sub> (mm)	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
UR32/28/11	1	32.5	19.5	11.0	12.2	9.0	28.5	1.41	12550	133	94.5	31
UR35/27.5/13	1	35.4	17.5	13.0	12.0	10.0	27.5	1.00	16640	129	129	41
UR38/32/13	1	38.0	22.0	13.0	14.0	10.6	32.5	1.15	20100	152	132	49
UR40/30/14	1	40.0	18.4	14.0	14.1	11.5	30.2	0.957	24310	153	159	58
UR42/34/15	1	42.35	22.6	15.0	14.5	12.0	34.6	0.923	28250	162	175	70
UR44/38/16	1	43.65	25.7	15.9	15.25	12.5	38.1	0.881	34530	174	198	86
UR46/21/11	2	46.2	11.85	11.15	24.4	11.15	21.25	1.47	11600	129	88	29
UR48/39/17	1	48.0	26.9	17.0	17.4	13.0	39.4	0.865	39990	186	215	100
UR55/38/36	3	54.9	25.5	23.5	19.6	12.0	37.5	0.450	78570	188	418	198
UR57/28/16	2	57.65	16.0	15.5	26.9	15.9	28.4	0.953	27900	163	171	70
UR59/36/17	2	59.34	21.9	17.0	25.5	17.0	35.8	0.900	39700	189	210	99
UR64/29/14	2	64.0	18.1	13.8	36.1	13.8	29.5	1.26	27040	185	147	71
UR64/40/20	4	64.0	26.5	20.0	23.2	20.0	40.5	0.724	61000	210	290	160
UR70/33/17	2	68.37	19.05	17.25	35.0	17.25	33.35	0.921	43800	197	214	103



MEA765

For type numbers see Table 2.

Fig.2 UR cores for line output and welding transformers.

UR cores

UR cores

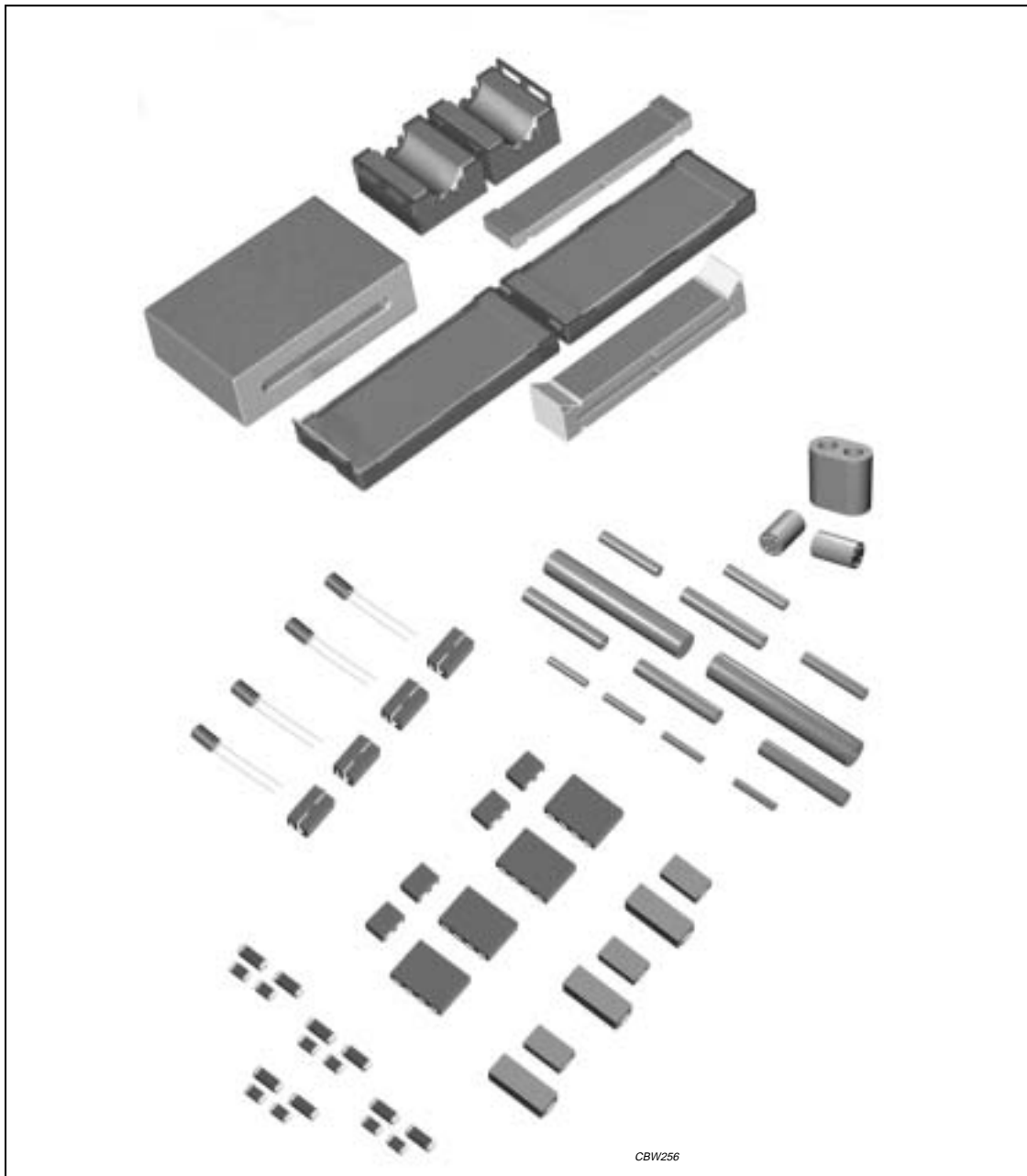
**Table 2** Type numbers

SHAPE	MATERIAL GRADE		
	3C81	3C30	3C90
1		UR32/28/11-3C30	
1		UR35/27.5/13-3C30	
1		UR38/32/13-3C30	
1		UR40/30/14-3C30	
1		UR42/34/15-3C30	
1		UR44/38/16-3C30	
2	UR46/21/11-3C81	UR46/21/11-3C30	UR46/21/11-3C90
1		UR48/39/17-3C30	
3			UR55/38/36-3C90
2	UR57/28/16-3C81	UR57/28/16-3C30	UR57/28/16-3C90
2	UR59/36/17-3C81	UR59/36/17-3C30	UR59/36/17-3C90
2	UR64/29/14-3C81	UR64/29/14-3C30	UR64/29/14-3C90
4			UR64/40/20-3C90
2	UR70/33/17-3C81	UR70/33/17-3C30	UR70/33/17-3C90



Soft Ferrites

EMI-suppression products



CBW256

## Soft Ferrites

## EMI-suppression products

### PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

#### Product overview EMI-suppression products

CORE TYPE	DESCRIPTION
BC	bobbin core
BD	bead
BDS	bead SMD
BDW	bead on wire
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
CSF	cable shield flat
CST	cable shield tubular
CSU	cable shield U-shape
CSU-EN	cable shield U-shape encapsulated
D	miniature drum core
MHB	multihole core binocular (incl miniature balun core)
MHC	multihole core circular
MHR	multihole core rectangular
MLI, MLH	multilayer inductor
MLS, MLP, MLN	multilayer suppressor
ROD	rod
TUB	tube
WBC	wideband choke
WBS	wideband choke SMD
WBSM	wideband choke SMD metallized
T	toroid (ring core)
TC	toroid coated with parylene C
TL	toroid coated with lacquer (converted to epoxy)
TN	toroid coated with nylon
TX	toroid coated with epoxy



EMI-suppression products

Bobbin cores

**BOBBIN CORES**

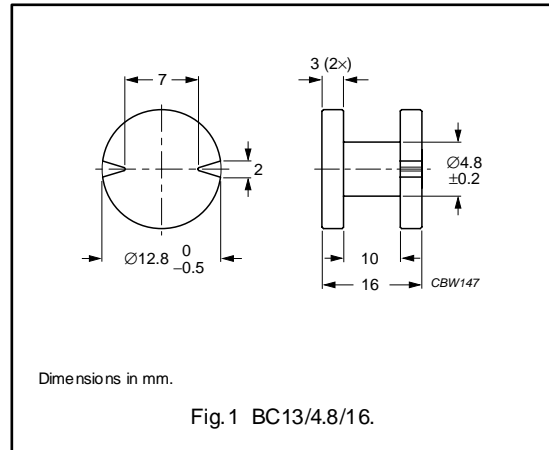
**Type BC13/4.8/16**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	50	BC13/4.8/16-3C90 <sup>sup</sup>

**Winding data for BC13/4.8/16**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
38.8	27.3



Dimensions in mm.

Fig.1 BC13/4.8/16.

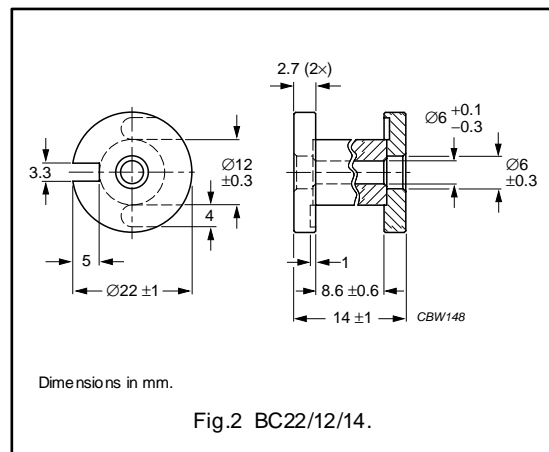
**Type BC22/12/14**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	86	BC22/12/14-3C90 <sup>sup</sup>

**Winding data for BC22/12/14**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
43.0	53.4



Dimensions in mm.

Fig.2 BC22/12/14.

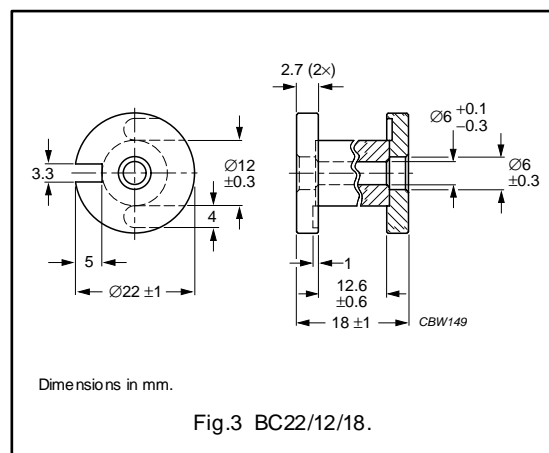
**Type BC22/12/18**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	85	BC22/12/18-3C90 <sup>sup</sup>

**Winding data for BC22/12/18**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
63.0	53.4



Dimensions in mm.

Fig.3 BC22/12/18.

EMI-suppression products

Bobbin cores

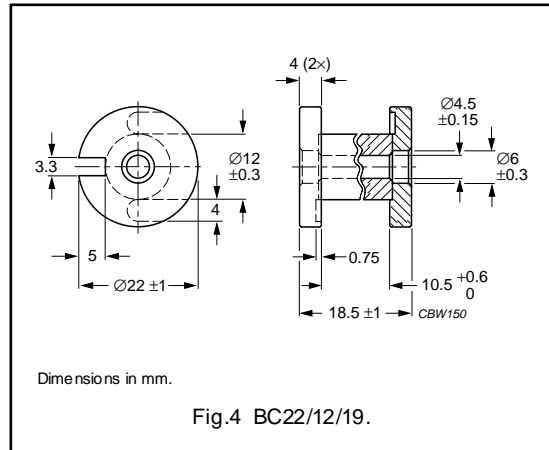
**Type BC22/12/19**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	94	BC22/12/19-3C90 <sup>sup</sup>

**Winding data for BC22/12/19**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
52.5	53.4



Dimensions in mm.

Fig.4 BC22/12/19.

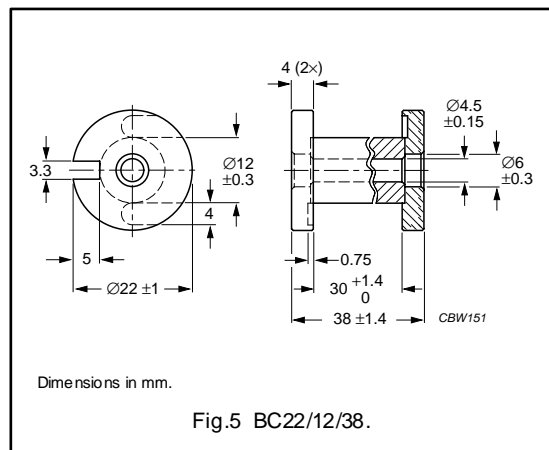
**Type BC22/12/38**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	74	BC22/12/38-3C90 <sup>sup</sup>

**Winding data for BC22/12/38**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
150	53.4



Dimensions in mm.

Fig.5 BC22/12/38.

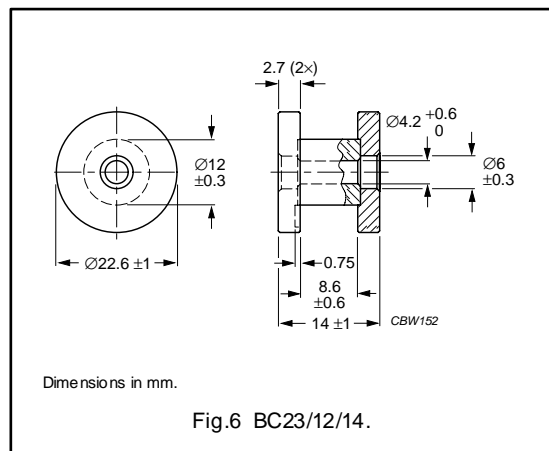
**Type BC23/12/14**

$A_L$  measured with fully wound bobbin.

GRADE	$A_L$ (nH)	TYPE NUMBER
3C90	92	BC23/12/14-3C90 <sup>sup</sup>

**Winding data for BC23/12/14**

WINDING AREA (mm <sup>2</sup> )	AVERAGE LENGTH OF TURN (mm)
45.6	54.3

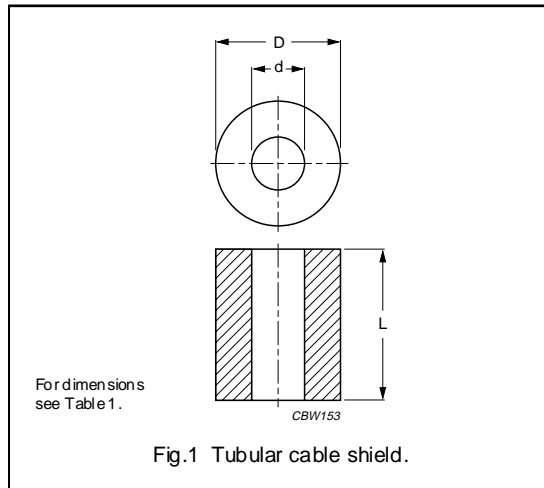


Dimensions in mm.

Fig.6 BC23/12/14.

**CABLE SHIELDS FOR EMI-SUPPRESSION**

**Tubular cable shields**












**Table 1** Type numbers, dimensions and parameters; see Fig. 1

TYPE NUMBER	DIMENSIONS			Z <sub>typ</sub> <sup>(1)</sup> (Ω) at	
	D	d	L	25 MHz	100 MHz
CST7.8/5.3/9.8-3S4 <small>des</small>	7.8±0.2	5.3+0.3	9.8±0.2	33	50
CST8/5.3/10-3S4 <small>des</small>	8-0.4	5.3+0.3	10-0.4	36 <sup>(2)</sup>	50
CST8.3/3.5/10-3S4 <small>des</small>	8.3-0.4	3.5+0.3	10-0.6	70	96
CST9.5/4.8/4.8-4S2 <small>des</small>	9.5±0.25	4.75±0.25	4.8±0.2	18	35
CST9.5/4.8/6.4-4S2 <small>des</small>	9.5±0.25	4.75±0.25	6.35±0.35	23	50
CST9.5/4.8/9.5-4S2 <small>des</small>	9.5±0.25	4.75±0.15	9.5±0.3	40	70
CST9.5/4.8/10-4S2 <small>des</small>	9.5±0.25	4.75±0.15	10.4±0.25	53	80
CST9.5/4.8/13-4S2 <small>des</small>	9.5±0.25	4.75±0.15	12.7±0.5	60	95
CST9.5/4.8/19-4S2 <small>des</small>	9.5±0.25	4.75±0.15	19.05±0.7	100	145
CST9.5/5.1/15-3S4 <small>des</small>	9.5±0.3	5.1±0.15	14.5±0.45	66	110
CST9.5/5.1/15-4S2 <small>des</small>	9.5±0.3	5.1±0.15	14.5±0.45	66	110
CST9.7/5/5.1-4S2 <small>des</small>	9.65±0.25	5±0.2	5.05-0.45	26	43
CST14/6.4/5.3-4S2 <small>des</small>	14.3±0.45	6.35±0.25	5.3-0.45	35	60
CST14/6.4/10-4S2 <small>des</small>	14.3±0.45	6.35±0.25	10.1±0.4	70	105
CST14/6.4/14-4S2 <small>des</small>	14.3±0.45	6.35±0.25	13.8±0.4	90	150
CST14/6.4/15-4S2 <small>des</small>	14.3±0.45	6.35±0.25	15±0.45	100	170
CST14/6.4/29-4S2 <small>des</small>	14.3±0.45	6.35±0.25	28.6±0.75	170	250
CST14/7.3/29-4S2 <small>des</small>	14.3±0.45	7.25±0.15	28.6±0.75	143	215
CST16/7.9/14-4S2 <small>des</small>	16.25-0.75	7.9±0.25	14.3±0.35	70	113
CST16/7.9/29-4S2 <small>des</small>	16.25-0.75	7.9±0.25	28.6±0.75	130	213
CST17/9.5/13-3S4 <small>des</small>	17.45±0.35	9.53±0.25	12.7±0.5	55	90
CST17/9.5/13-4S2 <small>des</small>	17.45±0.4	9.5±0.25	12.7±0.5	55	88

## EMI-suppression products

## Cable shields

TYPE NUMBER	DIMENSIONS			Z <sub>typ</sub> <sup>(1)</sup> (Ω) at	
	D	d	L	25 MHz	100 MHz
CST17/9.5/29-3S4 	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	200
CST17/9.5/29-4S2 	17.45 ±0.35	9.53 ±0.25	28.55 ±0.75	125	250
CST17/11/60-3S4 	17.2 -1.2	11 ±0.5	60 -2.5	200	320
CST19/10/15-4S2 	19 -0.65	10.15 ±0.25	14.65 -0.75	70	110
CST19/10/29-4S2 	19 -0.65	10.15 ±0.25	28.6 ±0.75	128	196
CST19/11/12-3S4 	19 ±0.4	10.6 ±0.3	11.5 ±0.4	50	75
CST26/13/21-4S2 	25.9 ±0.75	12.8 ±0.25	21.3 ±0.5	110	180
CST26/13/29-4S2 	25.9 ±0.75	12.8 ±0.25	28.6 ±0.8	145	225
CST29/19/7.5-4S2 	29 ±0.75	19 ±0.5	7.5 ±0.25	28	47

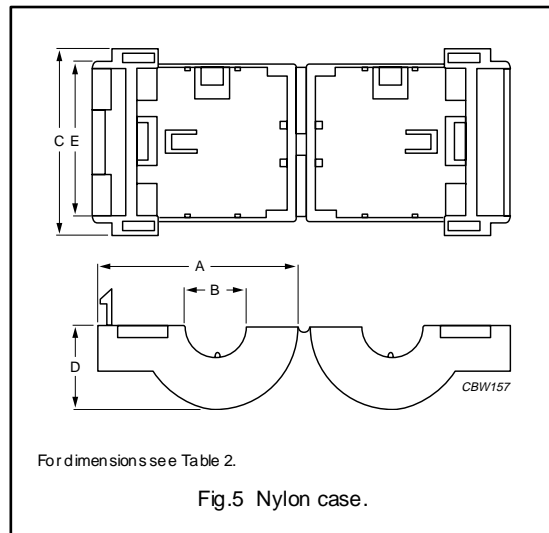
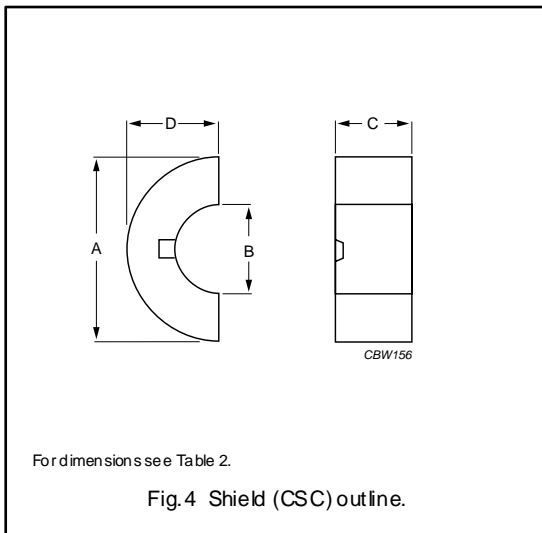
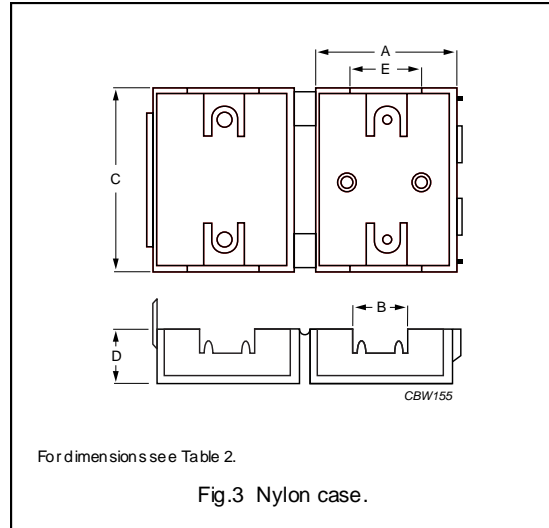
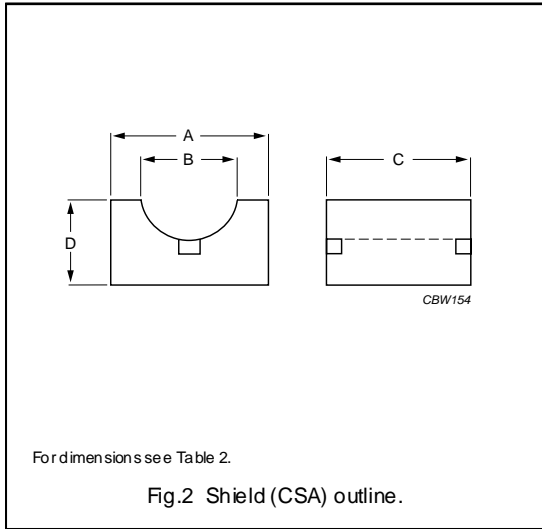
**Note**

1. Minimum guaranteed impedance is |Z|<sub>typ</sub> -20%.
2. At 30 MHz.

EMI-suppression products

Cable shields

Round cable shields (split)



## EMI-suppression products

## Cable shields

## General data

ITEM	SPECIFICATION
Case material	polyamide (PA66), glass reinforced, flame retardant in accordance with "UL94V-0", grade A82, colour black

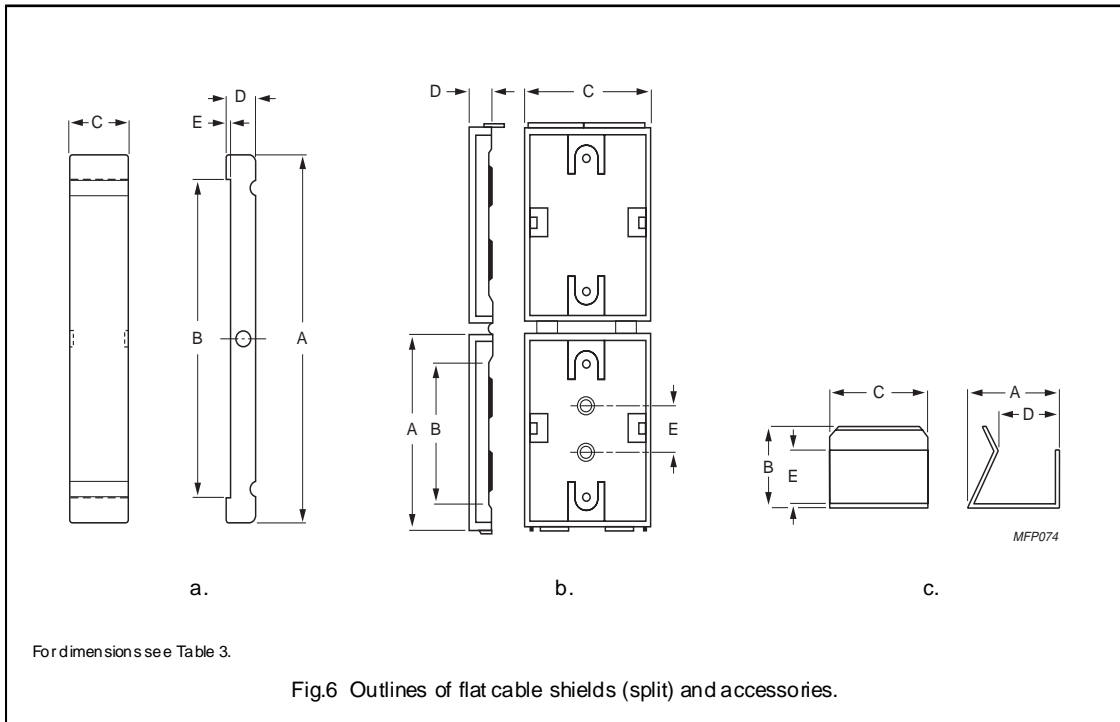
Table 2 Type numbers, dimensions and parameters; see Figs 2 to 5

TYPE NUMBER	FIG.	DIMENSIONS					Z <sub>typ</sub>   <sup>(1)</sup> (Ω) at		
		A	B	C	D	E	25 MHz	100 MHz	
<b>Round cable shields</b>									
CSA15/7.5/29-4S2 <small>des</small>	2	15 ±0.25	6.6 ±0.3	28.6 ±0.8	7.5 ±0.15	–	165	275	
CSA19/9.4/29-4S2 <small>des</small>	2	18.65 ±0.4	10.15 ±0.3	28.6 ±0.8	9.4 ±0.15	–	140	225	
CSA26/13/29-4S2 <small>des</small>	2	25.9 ±0.5	13.05 ±0.3	28.6 ±0.8	12.8 ±0.25	–	155	250	
CSC16/7.9/14-4S2 <small>des</small>	4	15.9 ±0.4	7.9 ±0.3	14.3 ±0.4	7.95 ±0.2	–	50	113	
<b>Round cable shields in matching nylon cases</b>									
CSA15/7.5/29-4S2-EN <small>des</small>	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 <small>des</small>	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 <small>des</small>	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 <small>des</small>	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 |Z|<sub>typ</sub> – 20%.

Flat cable shields (split)



## EMI-suppression products

## Cable shields

## 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

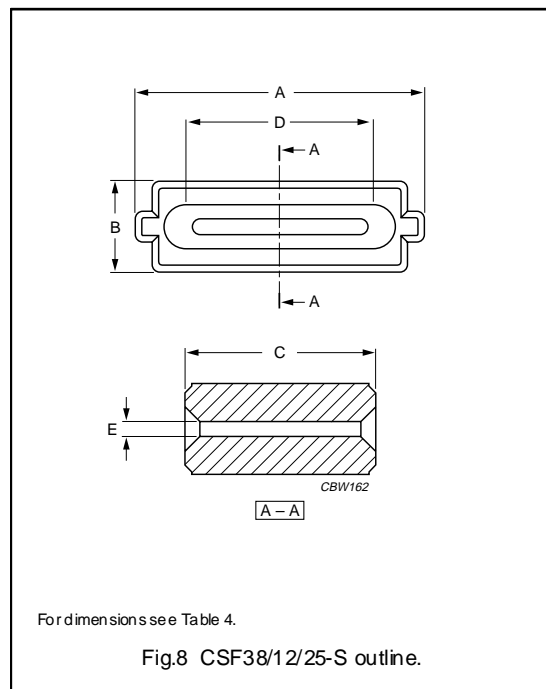
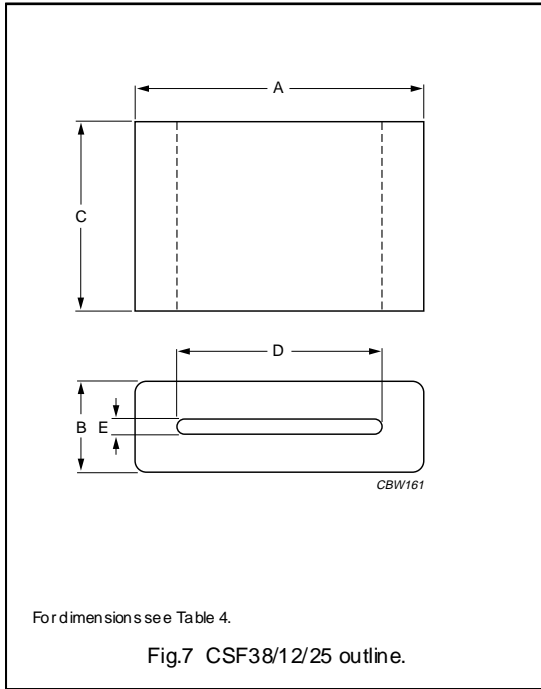
TYPE NUMBER	FIG.	DIMENSIONS					Z <sub>typ</sub> <sup>(1)</sup> (Ω) at		
		A	B	C	D	E	25 MHz	100 MHz	
<b>Flat cable shields (split)</b>									
CSU45/6.4/29-4S2 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6a	45.1 ±0.75	34.4 ±0.7	28.6 ±0.7	6.35 ±0.25	0.85 ±0.2	96	225	
CSU76/6.4/13-3S4 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6c	16.1	11.0	12.7	11.4	8.0	–	–	
<b>Flat cable shields in matching nylon cases</b>									
CSU45/6.4/29-4S2-EN <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	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 |Z|<sub>typ</sub> – 20%.



Flat cable shields



**Table 4** Type numbers, dimensions and parameters; see Figs 7 and 8

TYPE NUMBER	FIG.	DIMENSIONS					Z <sub>typ</sub> <sup>(1)</sup> (Ω) at		
		A	B	C	D	E	25 MHz	100 MHz	
<b>Flat cable shields</b>									
CSF38/12/25-3S4	 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	 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 |Z|<sub>typ</sub> - 20%.

EMI-suppression products

EMI-suppression beads

EMI-SUPPRESSION BEADS

Colour marking: 4S2 has a flash of yellow paint.

Note

1. Typical values at 100 MHz,  $|Z|_{\min}$  is -20%.

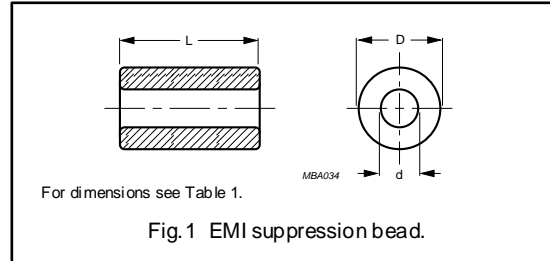


Table 1 Grades, parameters and type numbers; see Fig. 1

GRADE	$ Z_{typ}  (\Omega)^{(1)}$							DIMENSIONS (mm)			TYPE NUMBER
	at frequency (MHz)							D	d	L	
	1	3	10	25	30	100	300				
3S1	24	48	49	-	39	33	29	3 ±0.1	0.7 +0.1	4 ±0.2	BD3/0.7/4-3S1 <sup>sup</sup>
	41	90	91	-	74	63	55	3 ±0.1	1 +0.1/-0.05	10 ±0.3	BD3/1/10-3S1 <sup>sup</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>sup</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>sup</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>sup</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>sup</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>sup</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>sup</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**

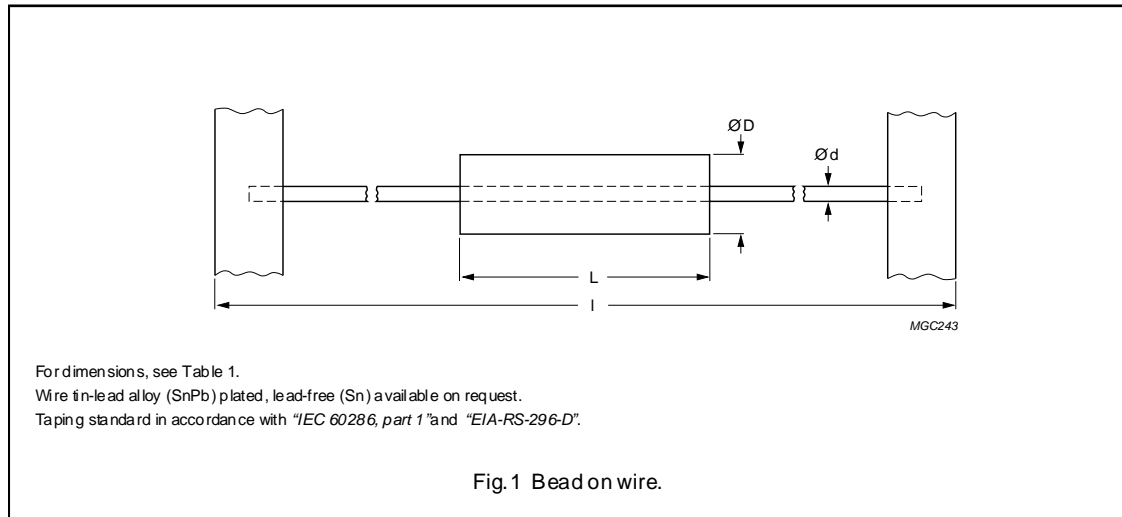


Fig. 1 Bead on wire.

**Table 1** Grades, parameters and type numbers; see Fig. 1

GRADE	$ Z_{typ}  (\Omega)^{(1)}$							DIMENSIONS (mm)				TYPE NUMBER
	at frequency (MHz)							$\varnothing D$	L	l	$\varnothing d$	
	1	3	10	25	30	100	300					
4S2	4	13	24	-	36	58	65	$3.5 \pm 0.2$	$3.5 - 0.5$	64.4	0.64	BDW3.5/3.5-4S2
	5	16	33	-	49	75	88	$3.5 \pm 0.2$	$4.7 - 0.5$	64.4	0.64	BDW3.5/4.7-4S2
	-	-	-	54	-	82	-	$3.5 \pm 0.25$	$5.25 \pm 0.25$	64.4	0.64	BDW3.5/5.3-4S2
	6	21	44	-	66	100	119	$3.5 \pm 0.2$	$6.0 \pm 0.25$	64.4	0.64	BDW3.5/6-4S2
	8	25	49	-	74	110	131	$3.5 \pm 0.2$	$6.7 \pm 0.25$	64.4	0.64	BDW3.5/6.7-4S2
	9	28	55	-	84	131	150	$3.5 \pm 0.2$	$7.6 \pm 0.35$	64.4	0.64	BDW3.5/7.6-4S2
	10	33	65	-	98	146	175	$3.5 \pm 0.2$	$8.9 \pm 0.35$	64.4	0.64	BDW3.5/8.9-4S2
	-	-	-	96	-	150	-	$3.5 \pm 0.25$	$9.5 \pm 0.3$	64.4	0.64	BDW3.5/9.5-4S2
	-	-	-	117	-	180	-	$3.5 \pm 0.25$	$11.4 \pm 0.4$	64.4	0.64	BDW3.5/11-4S2
	-	-	-	143	-	220	-	$3.5 \pm 0.25$	$13.8 \pm 0.5$	64.4	0.64	BDW3.5/14-4S2

**Note**

1. Typical values at 25 and 100 MHz,  $|Z|_{min}$  is -20%. Other impedance values are for reference only.

MINIATURE BALUN CORES

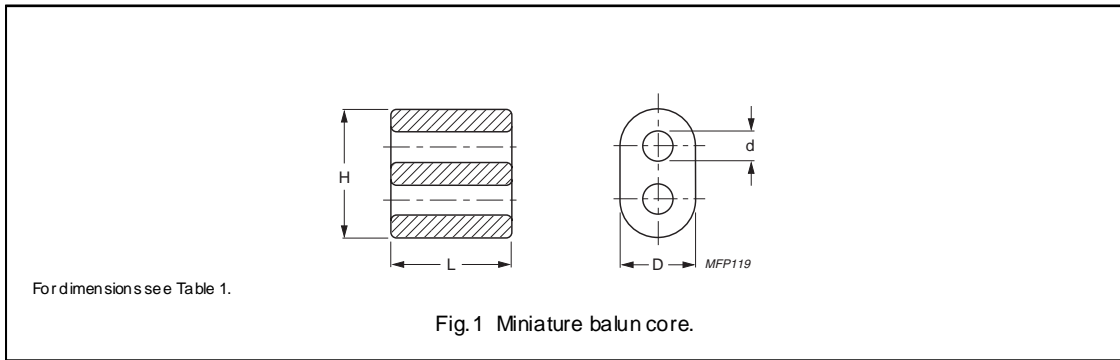


Table 1 Grades, parameters and type numbers, **des** ( applies to all types), see fig. 1

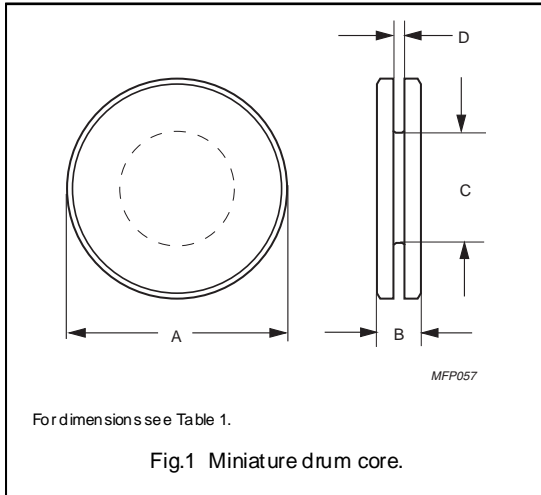
DIMENSIONS (mm)				GRADE	TYPE NUMBER
H	D	L	d		
3.6 - 0.3	2.1 - 0.3	1.4 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/1.4-3C11
				4A11	MHB2-3.6/2.1/1.4-4A11
				4B1	MHB2-3.6/2.1/1.4-4B1
3.6 - 0.3	2.1 - 0.3	1.8 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/1.8-3C11
				4A11	MHB2-3.6/2.1/1.8-4A11
				4B1	MHB2-3.6/2.1/1.8-4B1
3.6 - 0.3	2.1 - 0.3	2 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/2-3C11
				3C90	MHB2-3.6/2.1/2-3C90
				3E25	MHB2-3.6/2.1/2-3E25
				3E7	MHB2-3.6/2.1/2-3E7
				4A11	MHB2-3.6/2.1/2-4A11
				4B1	MHB2-3.6/2.1/2-4B1
				4C65	MHB2-3.6/2.1/2-4C65
3.6 - 0.3	2.1 - 0.3	2.5 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/2.5-3C11
				3C90	MHB2-3.6/2.1/2.5-3C90
				4A11	MHB2-3.6/2.1/2.5-4A11
				4B1	MHB2-3.6/2.1/2.5-4B1
3.6 - 0.3	2.1 - 0.3	3 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/3-3C11
				3C90	MHB2-3.6/2.1/3-3C90
				3E25	MHB2-3.6/2.1/3-3E25
				4A11	MHB2-3.6/2.1/3-4A11
				4B1	MHB2-3.6/2.1/3-4B1
3.6 - 0.3	2.1 - 0.3	3.5 ± 0.2	0.8 + 0.15	3C11	MHB2-3.6/2.1/3.5-3C11
				4A11	MHB2-3.6/2.1/3.5-4A11
				4B1	MHB2-3.6/2.1/3.5-4B1

## EMI-suppression products

## Miniature balun cores

DIMENSIONS (mm)				GRADE	TYPE NUMBER
H	D	L	d		
5.1 ± 0.3	3 ± 0.2	2 ± 0.2	1.2 ± 0.1	3C90	MHB2-5/3/2-3C90
				4A 11	MHB2-5/3/2-4A 11
				4B 1	MHB2-5/3/2-4B 1
5.1 ± 0.3	3 ± 0.2	3 ± 0.2	1.2 ± 0.1	3C90	MHB2-5/3/3-3C90
				4A 11	MHB2-5/3/3-4A 11
				4B 1	MHB2-5/3/3-4B 1
5.1 ± 0.3	3 ± 0.2	4 ± 0.2	1.2 ± 0.1	3C90	MHB2-5/3/4-3C90
				4A 11	MHB2-5/3/4-4A 11
				4B 1	MHB2-5/3/4-4B 1
7 ± 0.4	4 ± 0.2	4 ± 0.2	1.8 ± 0.1	3C90	MHB2-7/4/4-3C90
				4A 11	MHB2-7/4/4-4A 11
				4B 1	MHB2-7/4/4-4B 1
7 ± 0.4	4 ± 0.2	5 ± 0.2	1.8 ± 0.1	3C90	MHB2-7/4/5-3C90
				4A 11	MHB2-7/4/5-4A 11
				4B 1	MHB2-7/4/5-4B 1
7 ± 0.4	4 ± 0.2	6 ± 0.2	1.8 ± 0.1	3C90	MHB2-7/4/6-3C90
				4A 11	MHB2-7/4/6-4A 11
				4B 1	MHB2-7/4/6-4B 1
7 ± 0.4	4 ± 0.2	7 ± 0.2	1.8 ± 0.1	4B 1	MHB2-7/4/7-4B 1

**MINIATURE DRUM CORES**



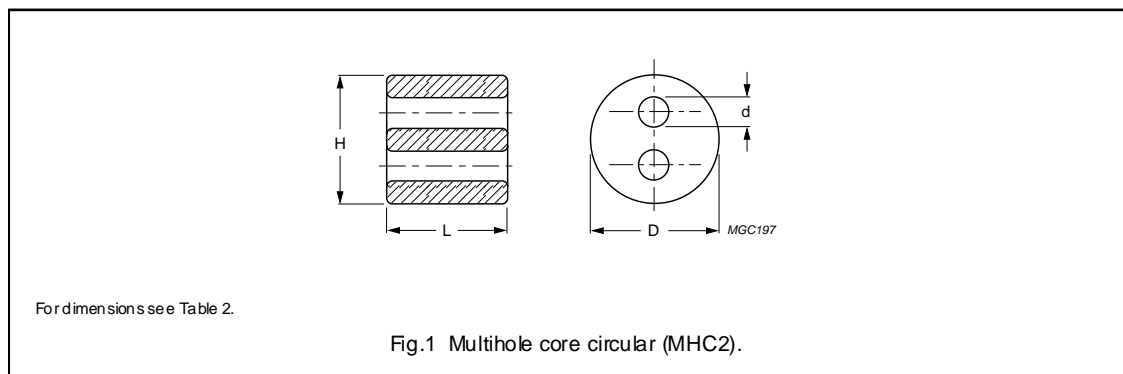
**Table 1** Grades, parameters and type numbers; see Fig. 1

DIMENSIONS (mm)				TYPE NUMBER		
A	B	C	D	3C92	4A11	4B1
3.8 ± 0.15	2.0 ± 0.1	1.5 ± 0.1	1.2 ± 0.1	D381520 12-3C92	-	-
4.1 ± 0.15	0.8 ± 0.1	1.5 ± 0.1	0.3 ± 0.1	D411508 03-3C92	D41150803-4A11	D41150803-4B1
4.11 ± 0.15	1.27 ± 0.1	1.45 ± 0.1	0.64 ± 0.1	-	D41151306-4A11	-
4.1 ± 0.15	1.4 ± 0.1	1.5 ± 0.1	0.7 ± 0.1	D411514 07-3C92	D41151407-4A11	D41151407-4B1
4.1 ± 0.15	1.8 ± 0.1	1.5 ± 0.1	1.1 ± 0.1	D411518 11-3C92	-	-
4.1 ± 0.15	1.0 ± 0.1	1.6 ± 0.1	0.35 ± 0.1	D411610 04-3C92	-	-
4.1 ± 0.15	1.6 ± 0.1	1.6 ± 0.1	0.9 ± 0.1	-	-	D41161609-4B1
4.2 ± 0.15	0.9 ± 0.1	1.8 ± 0.1	0.28 ± 0.1	D421809 03-3C92	-	-
4.2 ± 0.15	2.0 ± 0.1	1.8 ± 0.1	1.2 ± 0.1	D421820 12-3C92	-	-
4.2 ± 0.15	0.9 ± 0.1	2.0 ± 0.1	0.3 ± 0.1	-	-	D42200903-4B1
4.2 ± 0.15	1.1 ± 0.1	2.0 ± 0.1	0.5 ± 0.1	D422011 05-3C92	-	-
5.8 ± 0.15	0.8 ± 0.1	1.5 ± 0.1	0.3 ± 0.1	D581508 03-3C92	-	-

**MULTIHOLE CORES**

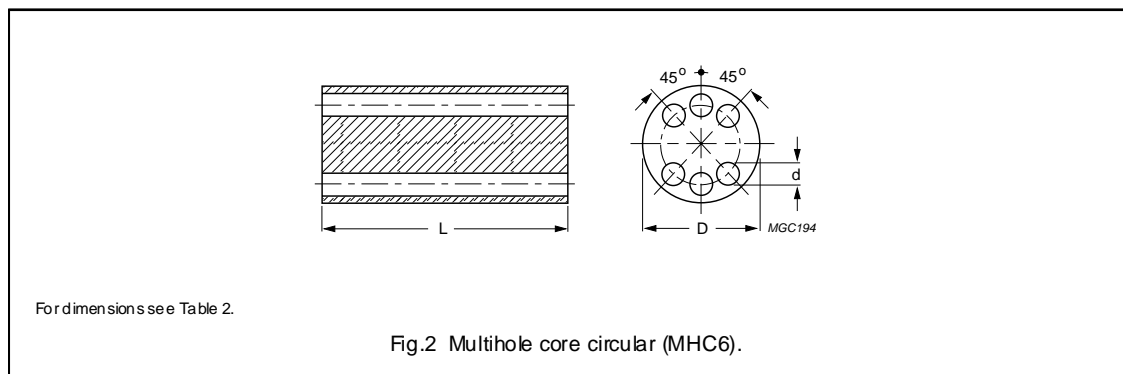
**Table 1** MHC2 grades, parameters and type numbers

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



**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>sup</sup>
	6 ±0.3	0.7 +0.2	5 -0.2	MHC6-6/5-4B1



EMI-suppression products

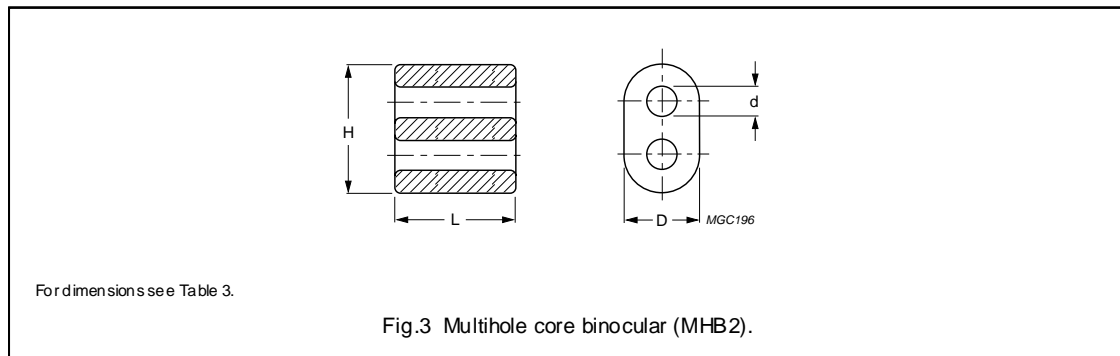
Multihole cores

**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>sup</sup>
	8.5 - 0.5	3.5 + 0.5	14 ± 0.4	14 ± 0.5	MHB2-14/8.5/14-4B1 <sup>sup</sup>
	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	MHB2-13/8/6-4B1 <sup>(1)</sup>
3C90	8.0 ± 0.3	3 ± 0.3	6 ± 0.3	13 ± 0.3	MHB2-13/8/6-3C90 <sup>(1)</sup>

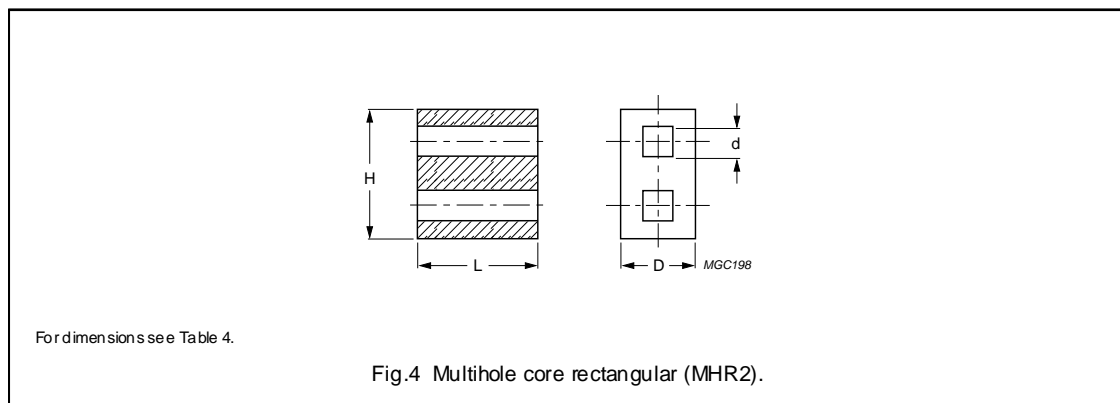
**Note**

1. Chamfered holes and sides.



**Table 4** MHR2 grades, parameters and type numbers

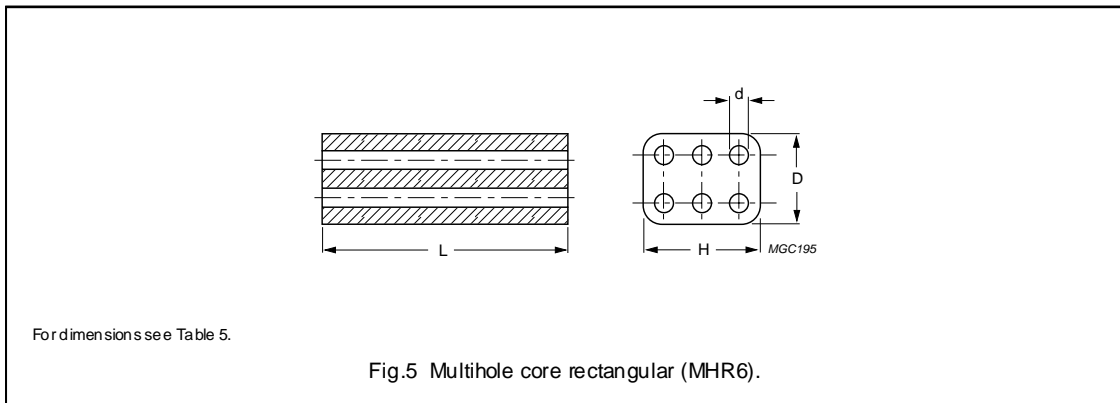
GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
4A11	5.4 ± 0.3	2.0 ± 0.3	10.9 ± 0.4	10.8 ± 0.3	MHR2-11/5.4/11-4A11
3C90	5.4 ± 0.3	2.0 ± 0.3	10.9 ± 0.4	10.8 ± 0.3	MHR2-11/5.4/11-3C90





**Table 5** MHR6 grades, parameters and type numbers

GRADE	DIMENSIONS (mm)				TYPE NUMBER
	D	d	L	H	
3B1	$4 \pm 0.2$	$0.7 \pm 0.3$	$10 \pm 0.5$	$6.1 \pm 0.3$	MHR6-6.1/4/10-3B1



## Soft Ferrites

## Multilayer inductors

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### 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.
- Plating material lead-free
- Wide range of inductance values.
- Superior physical properties.
- Available in standard EIA and EIAJ tape-and-reel.
- Operating temperature -40°C to +125°C.
- 100% sorting out on inductance. Product construction

## Soft Ferrites

## Multilayer inductors

**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  $\mu$ H

Different ways to indicate the values are used.

**EXAMPLES**

4N7: 4.7 nH

82N: 82 nH

R10: 0.1  $\mu$ H

1R8: 1.8  $\mu$ H

820: 82  $\mu$ H

151: 150  $\mu$ H

**Tolerance**

The last 2 digits represent the tolerance:

05%, 10% or 20%

In MLH '03' the tolerance has the absolute value of  $\pm 0.3$  nH.

**Multilayer Inductor MLI 0805-R68-10**

TYPE	SIZE	INDUCTANCE	TOLERANCE
MLI	0805	0.68 $\mu$ H	$\pm 10\%$

**Multilayer Inductor High frequency MLH 0402-4N7-03**

TYPE	SIZE	INDUCTANCE	TOLERANCE
MLH	0402	4.7 nH	$\pm 0.3$ nH

**MULTILAYER INDUCTORS**

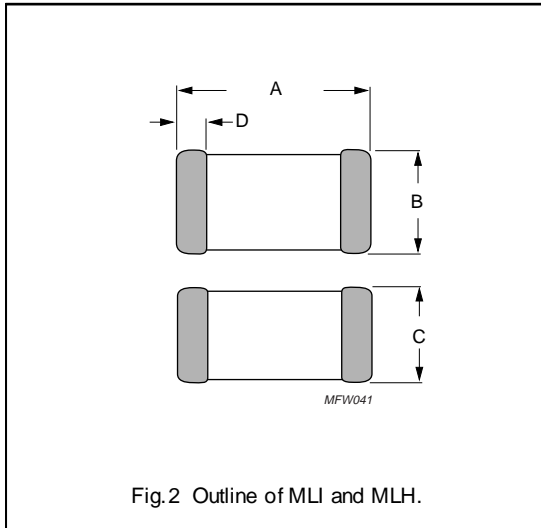


Fig.2 Outline of MLI and MLH.

**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 ± 0.15	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 <sup>(1)</sup>	0.5 ± 0.30	≈ 11

Note: <sup>(1)</sup>  
 1.2 ± 0.3 for types with L ≥ 180 nH

## Soft Ferrites

## Multilayer inductors

## Product specifications Multilayer Inductors MLI

SIZE	L ( $\mu$ H)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R <sub>DC</sub> max. ( $\Omega$ )	I max. (mA)	TYPE NUMBER
0603	0.047	$\pm 20\%$	20	50	260	0.3	50	MLI0603-47N-20 <a href="#">des</a>
	0.068	$\pm 20\%$	20	50	250	0.3	50	MLI0603-68N-20 <a href="#">des</a>
	0.082	$\pm 20\%$	20	50	245	0.3	50	MLI0603-82N-20 <a href="#">des</a>
	0.1	$\pm 10\%$	30	25	240	0.3	50	MLI0603-R10-10 <a href="#">des</a>
	0.12	$\pm 10\%$	30	25	205	0.5	50	MLI0603-R12-10 <a href="#">des</a>
	0.15	$\pm 10\%$	30	25	180	0.6	50	MLI0603-R15-10 <a href="#">des</a>
	0.18	$\pm 10\%$	30	25	165	0.6	50	MLI0603-R18-10 <a href="#">des</a>
	0.22	$\pm 10\%$	30	25	150	0.8	50	MLI0603-R22-10 <a href="#">des</a>
	0.27	$\pm 10\%$	30	25	136	0.8	50	MLI0603-R27-10 <a href="#">des</a>
	0.33	$\pm 10\%$	30	25	125	0.85	35	MLI0603-R33-10 <a href="#">des</a>
	0.39	$\pm 10\%$	30	25	110	1	35	MLI0603-R39-10 <a href="#">des</a>
	0.47	$\pm 10\%$	30	25	105	1.35	35	MLI0603-R47-10 <a href="#">des</a>
	0.56	$\pm 10\%$	30	25	95	1.55	35	MLI0603-R56-10 <a href="#">des</a>
	0.68	$\pm 10\%$	30	25	85	1.7	35	MLI0603-R68-10 <a href="#">des</a>
	0.82	$\pm 10\%$	30	25	75	2.1	35	MLI0603-R82-10 <a href="#">des</a>
	1.0	$\pm 10\%$	35	10	65	0.6	25	MLI0603-1R0-10 <a href="#">des</a>
	1.2	$\pm 10\%$	35	10	60	0.8	25	MLI0603-1R2-10 <a href="#">des</a>
	1.5	$\pm 10\%$	35	10	55	0.8	25	MLI0603-1R5-10 <a href="#">des</a>
	1.8	$\pm 10\%$	35	10	50	0.95	25	MLI0603-1R8-10 <a href="#">des</a>
	2.2	$\pm 10\%$	35	10	50	1.15	15	MLI0603-2R2-10 <a href="#">des</a>
	2.7	$\pm 10\%$	35	10	40	1.35	15	MLI0603-2R7-10 <a href="#">des</a>
	3.3	$\pm 10\%$	35	10	38	1.55	15	MLI0603-3R3-10 <a href="#">des</a>
	3.9	$\pm 10\%$	35	10	35	1.7	15	MLI0603-3R9-10 <a href="#">des</a>
	4.7	$\pm 10\%$	35	10	33	2.1	15	MLI0603-4R7-10 <a href="#">des</a>
5.6	$\pm 10\%$	35	4	22	1.55	5	MLI0603-5R6-10 <a href="#">des</a>	
6.8	$\pm 10\%$	35	4	20	1.7	5	MLI0603-6R8-10 <a href="#">des</a>	
8.2	$\pm 10\%$	30	4	18	2.1	15	MLI0603-8R2-10 <a href="#">des</a>	
10	$\pm 10\%$	20	2	17	2.55	15	MLI0603-100-10 <a href="#">des</a>	
0805	0.047	$\pm 20\%$	25	50	320	0.2	300	MLI0805-47N-20 <a href="#">des</a>
	0.068	$\pm 20\%$	25	50	280	0.2	300	MLI0805-68N-20 <a href="#">des</a>
	0.082	$\pm 20\%$	25	50	255	0.2	300	MLI0805-82N-20 <a href="#">des</a>
	0.1	$\pm 10\%$	30	25	235	0.3	250	MLI0805-R10-10 <a href="#">des</a>
	0.12	$\pm 10\%$	30	25	220	0.3	250	MLI0805-R12-10 <a href="#">des</a>
	0.15	$\pm 10\%$	30	25	200	0.4	250	MLI0805-R15-10 <a href="#">des</a>
	0.18	$\pm 10\%$	30	25	185	0.4	250	MLI0805-R18-10 <a href="#">des</a>
	0.22	$\pm 10\%$	30	25	170	0.5	250	MLI0805-R22-10 <a href="#">des</a>
	0.27	$\pm 10\%$	30	25	150	0.5	250	MLI0805-R27-10 <a href="#">des</a>
	0.33	$\pm 10\%$	30	25	145	0.55	250	MLI0805-R33-10 <a href="#">des</a>
	0.39	$\pm 10\%$	30	25	135	0.65	250	MLI0805-R39-10 <a href="#">des</a>

## Soft Ferrites

## Multilayer inductors

SIZE	L ( $\mu$ H)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R <sub>DC</sub> max. ( $\Omega$ )	I max. (mA)	TYPE NUMBER	
0805	0.47	$\pm 10\%$	30	25	125	0.65	250	MLI0805-R47-10	<a href="#">des</a>
	0.56	$\pm 10\%$	30	25	115	0.75	150	MLI0805-R56-10	<a href="#">des</a>
	0.68	$\pm 10\%$	30	25	105	0.8	150	MLI0805-R68-10	<a href="#">des</a>
	0.82	$\pm 10\%$	30	25	100	1	150	MLI0805-R82-10	<a href="#">des</a>
	1.0	$\pm 10\%$	45	10	75	0.45	50	MLI0805-1R0-10	<a href="#">des</a>
	1.2	$\pm 10\%$	45	10	65	0.5	50	MLI0805-1R2-10	<a href="#">des</a>
	1.5	$\pm 10\%$	45	10	60	0.5	50	MLI0805-1R5-10	<a href="#">des</a>
	1.8	$\pm 10\%$	45	10	55	0.6	50	MLI0805-1R8-10	<a href="#">des</a>
080505	2.2	$\pm 10\%$	45	10	50	0.65	30	MLI0805-2R2-10	<a href="#">des</a>
	2.7	$\pm 10\%$	45	10	45	0.75	30	MLI080505-2R7-10	<a href="#">des</a>
	3.3	$\pm 10\%$	45	10	41	0.8	30	MLI080505-3R3-10	<a href="#">des</a>
	3.9	$\pm 10\%$	45	10	38	0.9	30	MLI080505-3R9-10	<a href="#">des</a>
	4.7	$\pm 10\%$	45	10	35	1	30	MLI080505-4R7-10	<a href="#">des</a>
	5.6	$\pm 10\%$	45	4	32	0.9	15	MLI080505-5R6-10	<a href="#">des</a>
	6.8	$\pm 10\%$	45	4	29	1	15	MLI080505-6R8-10	<a href="#">des</a>
	8.2	$\pm 10\%$	45	4	26	1.1	15	MLI080505-8R2-10	<a href="#">des</a>
	10	$\pm 10\%$	45	2	24	1.15	15	MLI080505-100-10	<a href="#">des</a>
	12	$\pm 10\%$	45	2	22	1.25	15	MLI080505-120-10	<a href="#">des</a>
	15	$\pm 10\%$	30	1	19	0.8	5	MLI080505-150-10	<a href="#">des</a>
1206	18	$\pm 10\%$	30	1	18	0.9	5	MLI080505-180-10	<a href="#">des</a>
	0.047	$\pm 20\%$	30	50	320	0.15	300	MLI1206-47N-20	<a href="#">des</a>
	0.068	$\pm 20\%$	25	50	280	0.25	300	MLI1206-68N-20	<a href="#">des</a>
	0.1	$\pm 10\%$	30	25	235	0.25	250	MLI1206-R10-10	<a href="#">des</a>
	0.12	$\pm 10\%$	30	25	220	0.3	250	MLI1206-R12-10	<a href="#">des</a>
	0.15	$\pm 10\%$	30	25	200	0.3	250	MLI1206-R15-10	<a href="#">des</a>
	0.18	$\pm 10\%$	30	25	185	0.4	250	MLI1206-R18-10	<a href="#">des</a>
	0.22	$\pm 10\%$	30	25	170	0.4	250	MLI1206-R22-10	<a href="#">des</a>
	0.27	$\pm 10\%$	30	25	150	0.5	250	MLI1206-R27-10	<a href="#">des</a>
	0.33	$\pm 10\%$	30	25	145	0.6	250	MLI1206-R33-10	<a href="#">des</a>
	0.39	$\pm 10\%$	30	25	135	0.5	200	MLI1206-R39-10	<a href="#">des</a>
	0.47	$\pm 10\%$	30	25	125	0.6	200	MLI1206-R47-10	<a href="#">des</a>
	0.56	$\pm 10\%$	30	25	115	0.7	150	MLI1206-R56-10	<a href="#">des</a>
	0.68	$\pm 10\%$	30	25	105	0.8	150	MLI1206-R68-10	<a href="#">des</a>
	0.82	$\pm 10\%$	30	25	100	0.9	150	MLI1206-R82-10	<a href="#">des</a>
	1.0	$\pm 10\%$	45	10	75	0.4	100	MLI1206-1R0-10	<a href="#">des</a>
	1.2	$\pm 10\%$	45	10	65	0.5	100	MLI1206-1R2-10	<a href="#">des</a>
	1.5	$\pm 10\%$	45	10	60	0.5	80	MLI1206-1R5-10	<a href="#">des</a>
1.8	$\pm 10\%$	45	10	55	0.5	70	MLI1206-1R8-10	<a href="#">des</a>	
2.2	$\pm 10\%$	45	10	50	0.6	60	MLI1206-2R2-10	<a href="#">des</a>	

## Soft Ferrites

## Multilayer inductors

SIZE	L ( $\mu$ H)	L tol.	Q min.	L, Q test f (MHz).	SRF min. (MHz).	R <sub>DC</sub> max. ( $\Omega$ )	I max. (mA)	TYPE NUMBER
1206	2.7	$\pm 10\%$	45	10	45	0.6	60	MLI1206-2R7-10 <a href="#">des</a>
	3.3	$\pm 10\%$	45	10	41	0.7	60	MLI1206-3R3-10 <a href="#">des</a>
	3.9	$\pm 10\%$	45	10	38	0.8	50	MLI1206-3R9-10 <a href="#">des</a>
	4.7	$\pm 10\%$	45	10	35	0.9	50	MLI1206-4R7-10 <a href="#">des</a>
	5.6	$\pm 10\%$	45	4	32	0.7	25	MLI1206-5R6-10 <a href="#">des</a>
	6.8	$\pm 10\%$	45	4	29	0.8	25	MLI1206-6R8-10 <a href="#">des</a>
	8.2	$\pm 10\%$	45	4	26	0.9	25	MLI1206-8R2-10 <a href="#">des</a>
	10	$\pm 10\%$	45	2	24	1	25	MLI1206-100-10 <a href="#">des</a>
	12	$\pm 10\%$	45	2	22	1.05	15	MLI1206-120-10 <a href="#">des</a>
	15	$\pm 10\%$	35	1	19	0.7	5	MLI1206-150-10 <a href="#">des</a>
	18	$\pm 10\%$	35	1	18	0.7	5	MLI1206-180-10 <a href="#">des</a>

- 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.

## Soft Ferrites

## Multilayer inductors

## 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 <sub>DC</sub> 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	100	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	







## Soft Ferrites

## Multilayer inductors

SIZE	L (nH) 100 (MHz)	L tol.	Q min 100 (MHz)	Q typ 100 (MHz)	Q typ 800 (MHz)	SRF min. (MHz)	R <sub>DC</sub> 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 <sup>(1)</sup>	1400	0.60	300	MLH0603-39N-5	des
	47.0	± 5%	15	18	35 <sup>(1)</sup>	1200	0.70	300	MLH0603-47N-5	des
	56.0	± 5%	15	18	32 <sup>(1)</sup>	1100	0.75	300	MLH0603-56N-5	des
	68.0	± 5%	15	18	34 <sup>(1)</sup>	1050	0.85	300	MLH0603-68N-5	des
	82.0	± 5%	15	18	32 <sup>(1)</sup>	900	1.0	300	MLH0603-82N-5	des
	100	± 5%	15	18	20 <sup>(1)</sup>	850	1.2	300	MLH0603-R10-5	des
	120	± 5%	8 <sup>(3)</sup>	16 <sup>(3)</sup>	23 <sup>(2)</sup>	680	1.6	250	MLH0603-R12-5	des
	150	± 5%	8 <sup>(3)</sup>	14 <sup>(3)</sup>	23 <sup>(2)</sup>	620	2.0	250	MLH0603-R15-5	des
	180	± 5%	8 <sup>(3)</sup>	14 <sup>(3)</sup>	21 <sup>(2)</sup>	570	2.4	250	MLH0603-R18-5	des
220	± 5%	8 <sup>(3)</sup>	13 <sup>(3)</sup>	20 <sup>(2)</sup>	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%	18	23	-	730	1.0	300	MLH0805-R10-5	des
120 <sup>(3)</sup>	± 5%	13 <sup>(3)</sup>	22	-	650	1.2	300	MLH0805-R12-5	des	
150 <sup>(1)</sup>	± 5%	13 <sup>(3)</sup>	22	-	550	1.4	300	MLH0805-R15-5	des	
180 <sup>(1)</sup>	± 5%	13 <sup>(3)</sup>	23	-	500	1.8	300	MLH0805-R18-5	des	
220 <sup>(1)</sup>	± 5%	12 <sup>(1)</sup>	20	-	450	1.8	300	MLH0805-R22-5	des	

## Soft Ferrites

## Multilayer inductors

SIZE	L (nH) 100 (MHz)	L tol.	Q min 100 (MHz)	Q typ 100 (MHz)	Q typ 800 (MHz)	SRF min. (MHz)	R <sub>DC</sub> max. (Ω)	I max. (mA)	TYPE NUMBER
0805	270 <sup>(1)</sup>	± 5%	12 <sup>(1)</sup>	20	-	400	2.5	200	MLH0805-R27-5 
	330 <sup>(1)</sup>	± 5%	12 <sup>(1)</sup>	22	-	380	3.0	200	MLH0805-R33-5 
	390 <sup>(1)</sup>	± 5%	10 <sup>(1)</sup>	17	-	330	3.5	200	MLH0805-R39-5 
	470 <sup>(1)</sup>	± 5%	10 <sup>(1)</sup>	17	-	300	4.0	200	MLH0805-R47-5 

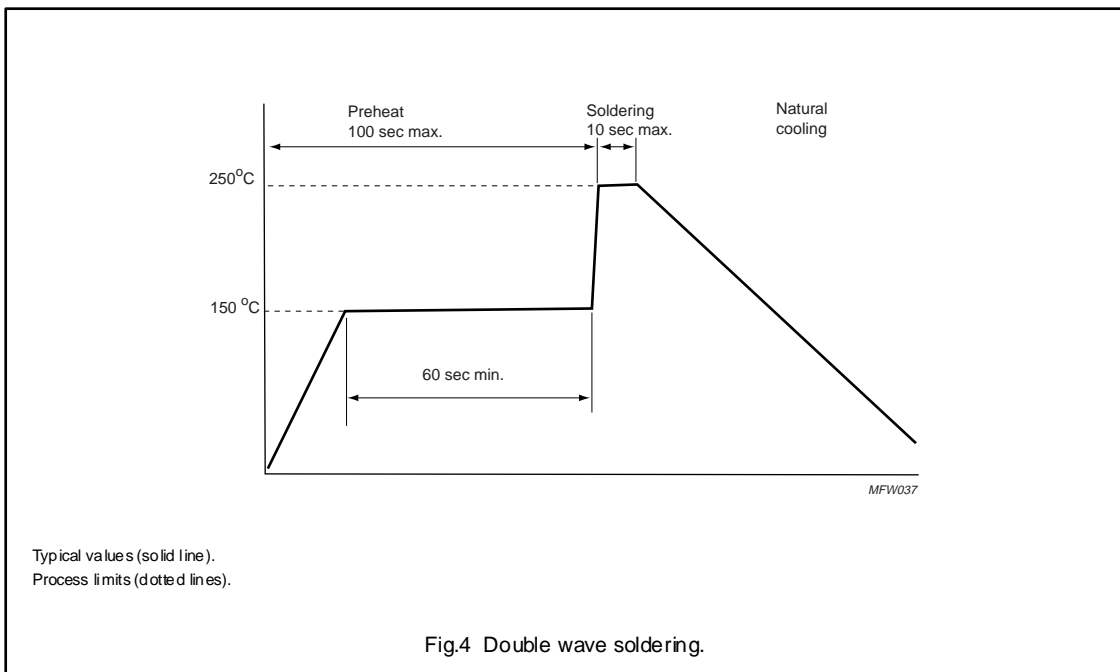
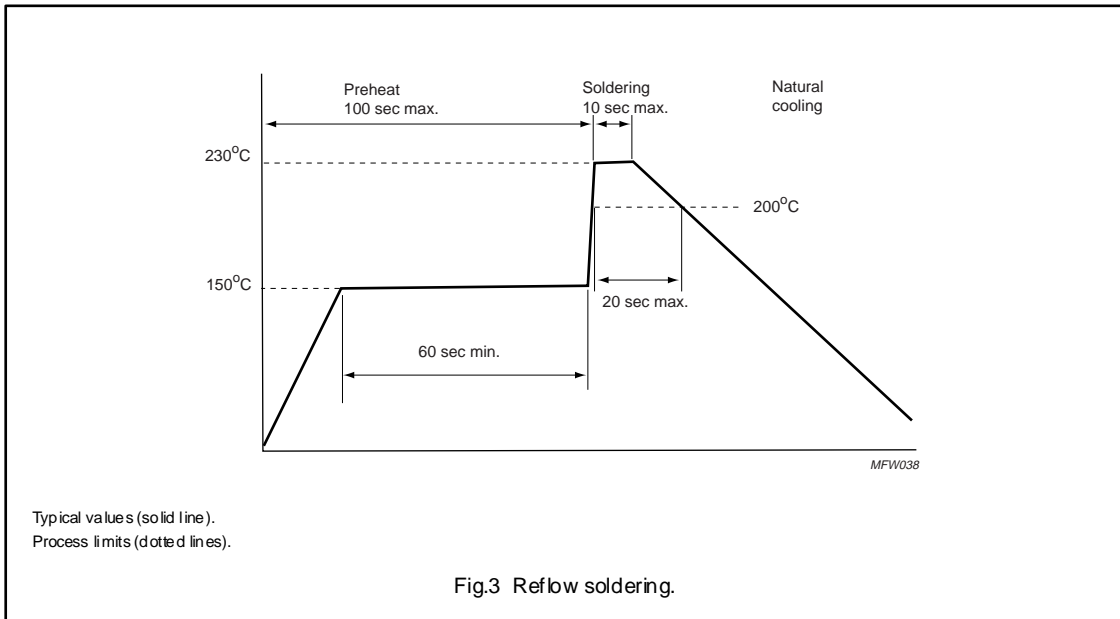
**Note**

1. at 500 MHz
2. at 300 MHz
3. at 50 MHz

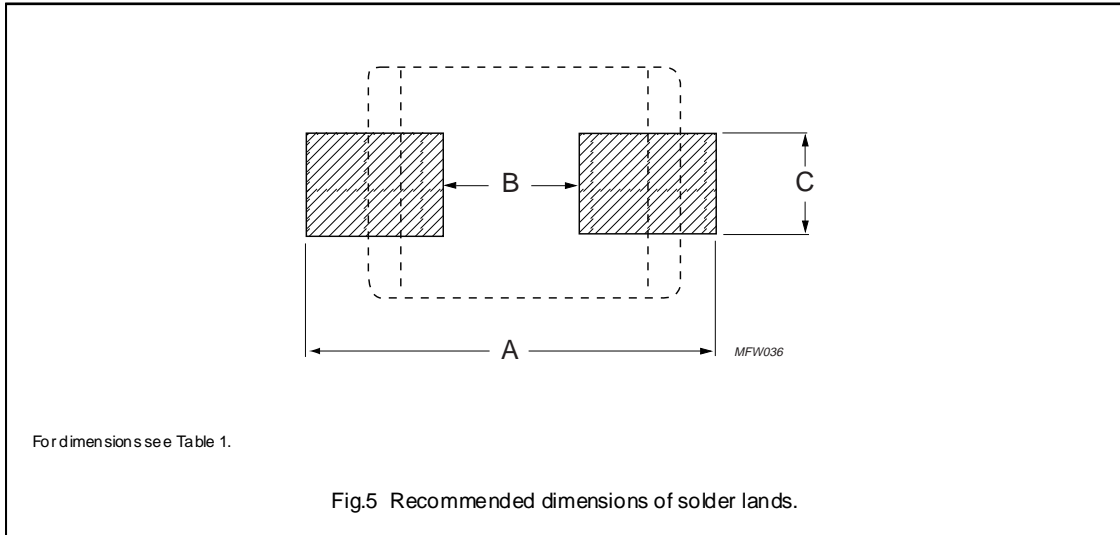
- RDC: Resistance of component for DC current.
- Maximum rated current: measure of current capacity of the component. When the maximum rated current is applied, temperature rise shall not exceed 20°C.
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

**MOUNTING**

**Soldering profiles**



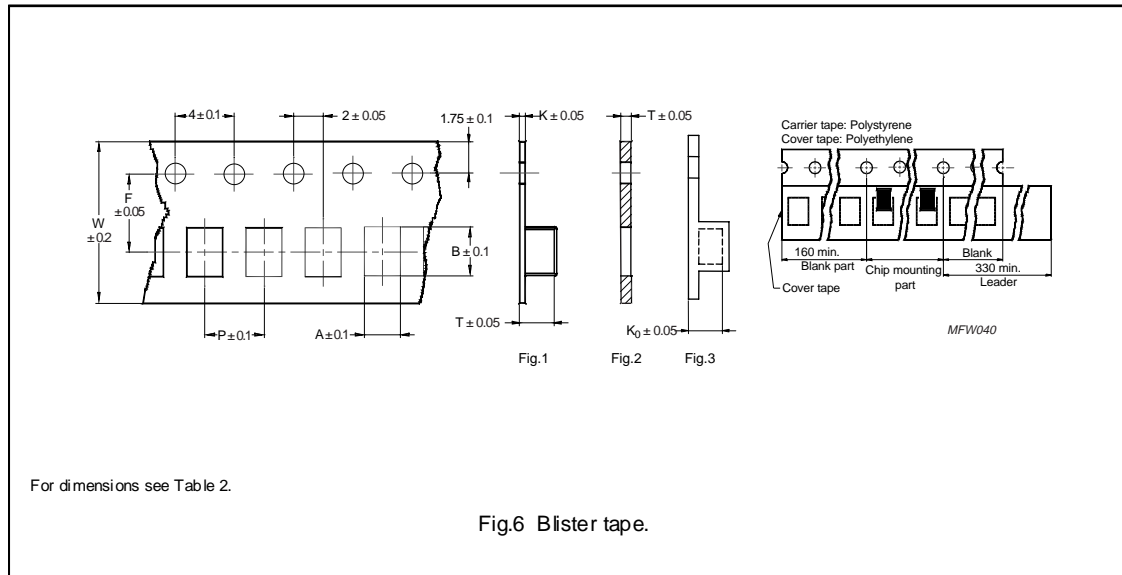
**Dimensions of solderlands**



**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**



**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 <sub>0</sub>	0.6	–	0.95	0.2	0.22	0.2	0.2
Tape fig.	3	2	3	1	3	1	1

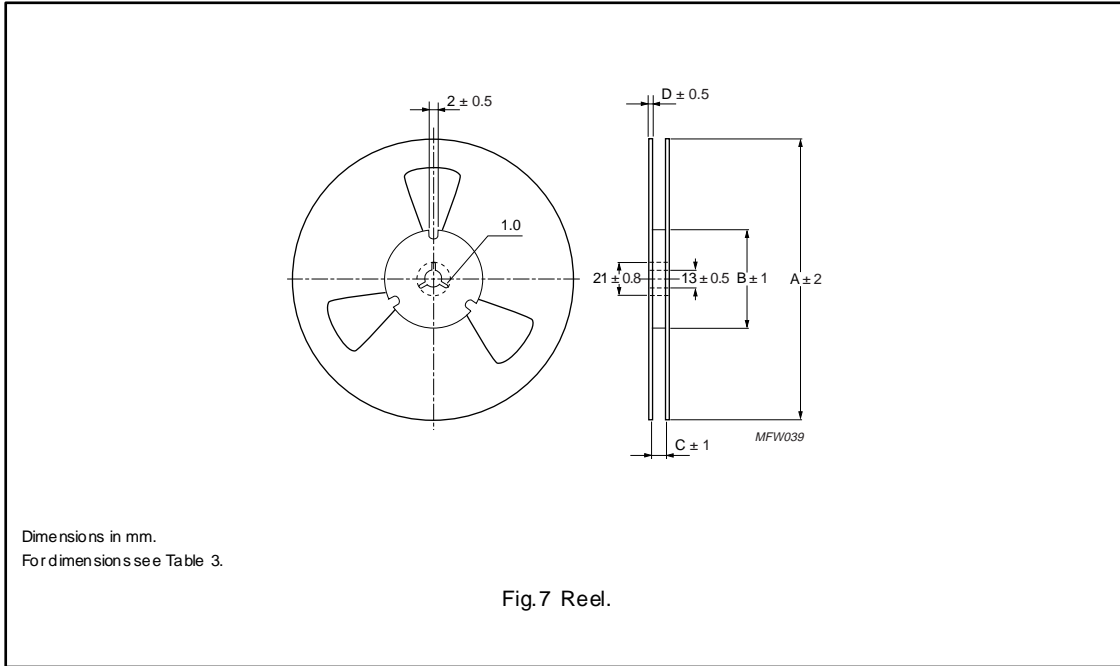
**Note 1):**  
 K<sub>0</sub> = 1.04 for L < 180 nH  
 K<sub>0</sub> = 1.4 for L ≥ 180 nH

**MATERIAL BLISTER TAPE:**

- Sizes 0402 and 0603: paper
- Other sizes: Polystyrene

**MATERIAL COVER FILM:**

- Polyethylene



**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

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## EMI-suppression products

## Multilayer suppressors

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### 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  $\Omega$  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 high reliability
- 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
- Plating material lead-free
- 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

## EMI-suppression products

## Multilayer suppressors

**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 ( $\Omega$ )

First two digits are significant figures

Last digit is the number of zeros to follow.

**EXAMPLES**

600: 60  $\Omega$

101: 100  $\Omega$

121: 120  $\Omega$

151: 150  $\Omega$

301: 300  $\Omega$

102: 1000  $\Omega$

**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

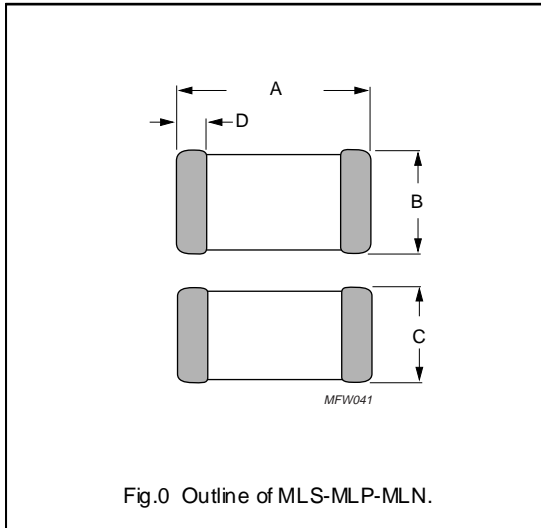
**Multilayer Narrow Band MLN0603-601**

TYPE	SIZE	IMPEDANCE
MLN	0603	600

Standard products are delivered taped on reel and have a tolerance on impedance of 25%.



**MULTILAYER SUPPRESSORS**



**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	0.3 ± 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

## EMI-suppression products

## Multilayer suppressors

## Product specifications Multilayer Suppressors MLS

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0402	$6 \pm 25\%$	0.05	500	MLS0402-4S4-060	des
	$10 \pm 25\%$	0.05	500	MLS0402-4S4-100	des
	$40 \pm 25\%$	0.3	300	MLS0402-4S4-400	des
	$80 \pm 25\%$	0.4	200	MLS0402-4S4-800	des
	$120 \pm 25\%$	0.5	200	MLS0402-4S4-121	des
	$240 \pm 25\%$	0.5	200	MLS0402-4S4-241	des
	$480 \pm 25\%$	0.8	100	MLS0402-4S4-481	des
0603	$11 \pm 25\%$	0.05	500	MLS0603-4S4-110	des
	$19 \pm 25\%$	0.08	500	MLS0603-4S4-190	des
	$30 \pm 25\%$	0.1	400	MLS0603-4S7-300	des
	$40 \pm 25\%$	0.1	400	MLS0603-4S7-400	des
	$60 \pm 25\%$	0.1	300	MLS0603-4S7-600	des
	$80 \pm 25\%$	0.15	300	MLS0603-4S7-800	des
	$100 \pm 25\%$	0.25	300	MLS0603-4S7-101	des
	$120 \pm 25\%$	0.25	300	MLS0603-4S7-121	des
	$150 \pm 25\%$	0.3	200	MLS0603-4S7-151	des
	$220 \pm 25\%$	0.3	200	MLS0603-4S7-221	des
	$300 \pm 25\%$	0.4	200	MLS0603-4S7-301	des
	$450 \pm 25\%$	0.5	200	MLS0603-4S7-451	des
	$600 \pm 25\%$	0.5	200	MLS0603-4S7-601	des
	$750 \pm 25\%$	0.7	200	MLS0603-4S7-751	des
$1000 \pm 25\%$	0.7	200	MLS0603-4S7-102	des	
$1500 \pm 25\%$	1	50	MLS0603-4S4-152	des	
0805	$7 \pm 25\%$	0.1	600	MLS0805-4S4-070	des
	$9 \pm 25\%$	0.1	600	MLS0805-4S4-090	des
	$11 \pm 25\%$	0.1	600	MLS0805-4S4-110	des
	$17 \pm 25\%$	0.1	600	MLS0805-4S4-170	des
	$30 \pm 25\%$	0.1	600	MLS0805-4S4-300	des
	$60 \pm 25\%$	0.15	500	MLS0805-4S4-600	des
	$70 \pm 25\%$	0.15	500	MLS0805-4S7-700	des
	$80 \pm 25\%$	0.15	500	MLS0805-4S7-800	des
	$120 \pm 25\%$	0.25	300	MLS0805-4S7-121	des
	$150 \pm 25\%$	0.25	300	MLS0805-4S7-151	des
	$220 \pm 25\%$	0.3	300	MLS0805-4S7-221	des
	$300 \pm 25\%$	0.3	300	MLS0805-4S7-301	des
	$400 \pm 25\%$	0.3	300	MLS0805-4S7-401	des
	$500 \pm 25\%$	0.4	300	MLS0805-4S7-501	des
	$600 \pm 25\%$	0.4	300	MLS0805-4S7-601	des
$750 \pm 25\%$	0.5	200	MLS0805-4S4-751	des	

## EMI-suppression products

## Multilayer suppressors

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0805	$1000 \pm 25\%$	0.5	200	MLS0805-4S7-102	des
	$1500^{(1)} \pm 25\%$	0.6	200	MLS0805-4S7-152	des
	$2000 \pm 25\%$	0.8	100	MLS0805-4S4-202	des
1206	$19 \pm 25\%$	0.05	600	MLS1206-4S4-190	des
	$26 \pm 25\%$	0.05	600	MLS1206-4S4-260	des
	$30 \pm 25\%$	0.05	600	MLS1206-4S4-300	des
	$50 \pm 25\%$	0.1	500	MLS1206-4S4-500	des
	$60 \pm 25\%$	0.1	500	MLS1206-4S4-600	des
	$70 \pm 25\%$	0.1	500	MLS1206-4S4-700	des
	$90 \pm 25\%$	0.15	500	MLS1206-4S4-900	des
	$120 \pm 25\%$	0.15	500	MLS1206-4S4-121	des
	$150 \pm 25\%$	0.15	500	MLS1206-4S4-151	des
	$200 \pm 25\%$	0.2	400	MLS1206-4S4-201	des
	$400 \pm 25\%$	0.2	400	MLS1206-4S4-401	des
	$500 \pm 25\%$	0.2	400	MLS1206-4S4-501	des
	$600 \pm 25\%$	0.3	400	MLS1206-4S4-601	des
	$1000^{(1)} \pm 25\%$	0.4	200	MLS1206-4S7-102	des
$1200^{(1)} \pm 25\%$	0.4	200	MLS1206-4S7-122	des	
$2000^{(2)} \pm 25\%$	0.6	200	MLS1206-4S7-202	des	
1210	$32 \pm 25\%$	0.2	500	MLS1210-4S4-320	des
	$60 \pm 25\%$	0.2	500	MLS1210-4S4-600	des
	$90 \pm 25\%$	0.2	500	MLS1210-4S4-900	des
1806	$50 \pm 25\%$	0.2	600	MLS1806-4S4-500	des
	$60 \pm 25\%$	0.2	600	MLS1806-4S4-600	des
	$80 \pm 25\%$	0.2	600	MLS1806-4S4-800	des
	$100 \pm 25\%$	0.3	500	MLS1806-4S4-101	des
	$150 \pm 25\%$	0.3	500	MLS1806-4S4-151	des
	$170 \pm 25\%$	0.3	500	MLS1806-4S4-171	des
1812	$70 \pm 25\%$	0.3	500	MLS1812-4S4-700	des
	$120 \pm 25\%$	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  $\pm 25\%$ .
- Other tolerances can be provided upon request.
- Operating temperature: -40°C to +125°C.

## EMI-suppression products

## Multilayer suppressors

## Product specifications Multilayer Power Beads MLP

SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0603	11 $\pm$ 25%	0.02	4000	MLP0603-110	<a href="#">des</a>
	25 $\pm$ 25%	0.03	3000	MLP0603-250	<a href="#">des</a>
	40 $\pm$ 25%	0.035	3000	MLP0603-400	<a href="#">des</a>
	60 $\pm$ 25%	0.04	3000	MLP0603-600	<a href="#">des</a>
	120 $\pm$ 25%	0.07	1800	MLP0603-121	<a href="#">des</a>
	300 $\pm$ 25%	0.14	1500	MLP0603-301	<a href="#">des</a>
	500 $\pm$ 25%	0.18	1500	MLP0603-501	<a href="#">des</a>
	600 $\pm$ 25%	0.2	1000	MLP0603-601	<a href="#">des</a>
	1000 $\pm$ 25%	0.25	800	MLP0603-102	<a href="#">des</a>
0805	11 $\pm$ 25%	0.01	6000	MLP0805-110	<a href="#">des</a>
	17 $\pm$ 25%	0.02	5000	MLP0805-170	<a href="#">des</a>
	30 $\pm$ 25%	0.02	4000	MLP0805-300	<a href="#">des</a>
	60 $\pm$ 25%	0.03	3000	MLP0805-600	<a href="#">des</a>
	80 $\pm$ 25%	0.04	3000	MLP0805-800	<a href="#">des</a>
	120 $\pm$ 25%	0.04	3000	MLP0805-121	<a href="#">des</a>
	200 $\pm$ 25%	0.05	2500	MLP0805-201	<a href="#">des</a>
	300 $\pm$ 25%	0.08	2000	MLP0805-301	<a href="#">des</a>
	600 $\pm$ 25%	0.1	2000	MLP0805-601	<a href="#">des</a>
	1000 $\pm$ 25%	0.12	1500	MLP0805-102	<a href="#">des</a>
1206	19 $\pm$ 25%	0.015	7000	MLP1206-190	<a href="#">des</a>
	32 $\pm$ 25%	0.015	4000	MLP1206-320	<a href="#">des</a>
	50 $\pm$ 25%	0.02	4000	MLP1206-500	<a href="#">des</a>
	70 $\pm$ 25%	0.025	3000	MLP1206-700	<a href="#">des</a>
	80 $\pm$ 25%	0.025	3000	MLP1206-800	<a href="#">des</a>
	100 $\pm$ 25%	0.03	2500	MLP1206-101	<a href="#">des</a>
	300 $\pm$ 25%	0.06	2000	MLP1206-301	<a href="#">des</a>
	600 $\pm$ 25%	0.1	1800	MLP1206-601	<a href="#">des</a>
	1000 <sup>(1)</sup> $\pm$ 25%	0.15	1200	MLP1206-102	<a href="#">des</a>
	1200 <sup>(1)</sup> $\pm$ 25%	0.18	1000	MLP1206-122	<a href="#">des</a>
1500 <sup>(1)</sup> $\pm$ 25%	0.2	800	MLP1206-152	<a href="#">des</a>	
1210	60 $\pm$ 25%	0.025	4000	MLP1210-600	<a href="#">des</a>
	90 $\pm$ 25%	0.025	3000	MLP1210-900	<a href="#">des</a>
1806	50 $\pm$ 25%	0.02	6000	MLP1806-500	<a href="#">des</a>
	60 $\pm$ 25%	0.02	5000	MLP1806-600	<a href="#">des</a>
	80 $\pm$ 25%	0.025	4000	MLP1806-800	<a href="#">des</a>
	150 $\pm$ 25%	0.1	2000	MLP1806-151	<a href="#">des</a>
1812	70 $\pm$ 25%	0.03	6000	MLP1812-700	<a href="#">des</a>
	120 $\pm$ 25%	0.03	4000	MLP1812-121	<a href="#">des</a>

## EMI-suppression products

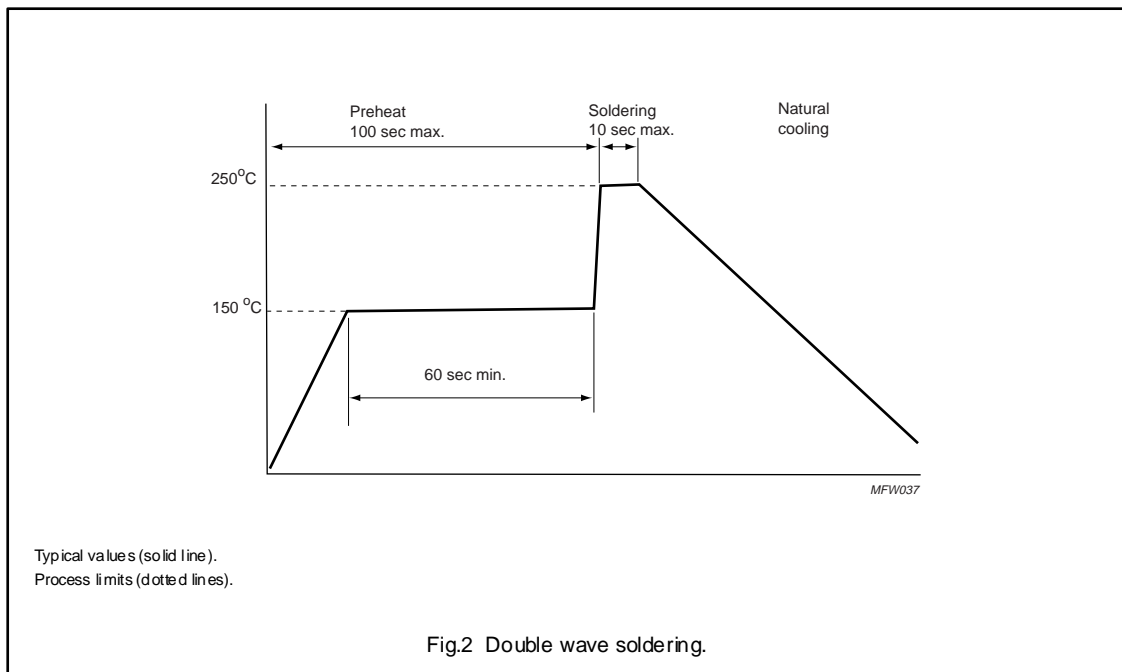
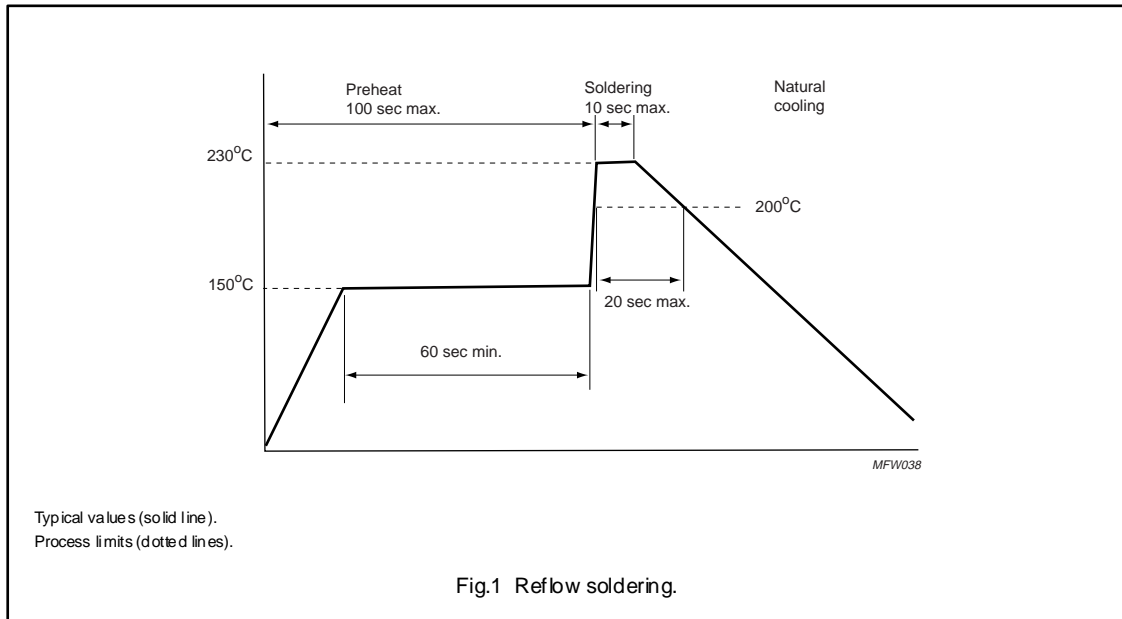
## Multilayer suppressors

## Product specifications Multilayer Narrow Band MLN

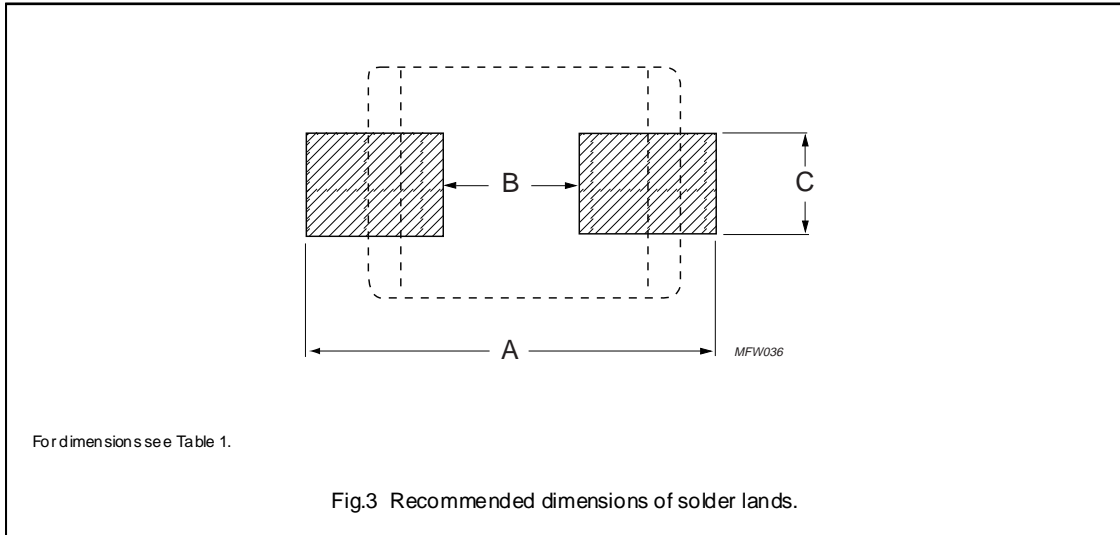
SIZE	$ Z_{typ} $ at 100 MHz ( $\Omega$ )	$R_{DC}$ MAX. ( $\Omega$ )	I MAX. (mA)	TYPE NUMBER	
0603	6 $\pm$ 25%	0.05	500	MLN0603-060	<a href="#">des</a>
	10 $\pm$ 25%	0.07	400	MLN0603-100	<a href="#">des</a>
	40 $\pm$ 25%	0.30	300	MLN0603-400	<a href="#">des</a>
	80 $\pm$ 25%	0.50	300	MLN0603-800	<a href="#">des</a>
	120 $\pm$ 25%	0.40	300	MLN0603-121	<a href="#">des</a>
	240 $\pm$ 25%	0.60	200	MLN0603-241	<a href="#">des</a>
	300 $\pm$ 25%	0.60	200	MLN0603-301	<a href="#">des</a>
	480 $\pm$ 25%	0.70	150	MLN0603-481	<a href="#">des</a>
	600 $\pm$ 25%	0.60	100	MLN0603-601	<a href="#">des</a>
0805	6 $\pm$ 25%	0.07	800	MLN0805-060	<a href="#">des</a>
	11 $\pm$ 25%	0.10	700	MLN0805-110	<a href="#">des</a>
	26 $\pm$ 25%	0.20	600	MLN0805-260	<a href="#">des</a>
	32 $\pm$ 25%	0.20	600	MLN0805-320	<a href="#">des</a>
	60 $\pm$ 25%	0.30	500	MLN0805-600	<a href="#">des</a>
	75 $\pm$ 25%	0.30	500	MLN0805-750	<a href="#">des</a>
	90 $\pm$ 25%	0.30	500	MLN0805-900	<a href="#">des</a>
	120 $\pm$ 25%	0.40	400	MLN0805-121	<a href="#">des</a>
	150 $\pm$ 25%	0.40	400	MLN0805-151	<a href="#">des</a>
	170 $\pm$ 25%	0.50	400	MLN0805-171	<a href="#">des</a>
	220 $\pm$ 25%	0.50	300	MLN0805-221	<a href="#">des</a>
	300 $\pm$ 25%	0.50	300	MLN0805-301	<a href="#">des</a>
	400 $\pm$ 25%	0.60	300	MLN0805-401	<a href="#">des</a>
	500 $\pm$ 25%	0.70	200	MLN0805-501	<a href="#">des</a>
	600 $\pm$ 25%	0.50	200	MLN0805-601	<a href="#">des</a>
1000 $\pm$ 25%	1.0	100	MLN0805-102	<a href="#">des</a>	
1200 $\pm$ 25%	0.70	100	MLN0805-122	<a href="#">des</a>	
1500 $\pm$ 25%	0.70	100	MLN0805-152	<a href="#">des</a>	
1206	32 $\pm$ 25%	0.20	600	MLN1206-320	<a href="#">des</a>
	60 $\pm$ 25%	0.30	500	MLN1206-600	<a href="#">des</a>
	80 $\pm$ 25%	0.30	500	MLN1206-800	<a href="#">des</a>
	90 $\pm$ 25%	0.30	500	MLN1206-900	<a href="#">des</a>
	120 $\pm$ 25%	0.40	400	MLN1206-121	<a href="#">des</a>
	150 $\pm$ 25%	0.40	400	MLN1206-151	<a href="#">des</a>
	200 $\pm$ 25%	0.50	300	MLN1206-201	<a href="#">des</a>
	220 $\pm$ 25%	0.50	300	MLN1206-221	<a href="#">des</a>
	350 $\pm$ 25%	0.60	300	MLN1206-351	<a href="#">des</a>
	400 $\pm$ 25%	0.60	300	MLN1206-401	<a href="#">des</a>
	600 $\pm$ 25%	0.80	300	MLN1206-601	<a href="#">des</a>
	1200 $\pm$ 25%	1.00	200	MLN1206-122	<a href="#">des</a>

**MOUNTING**

**Soldering profiles**



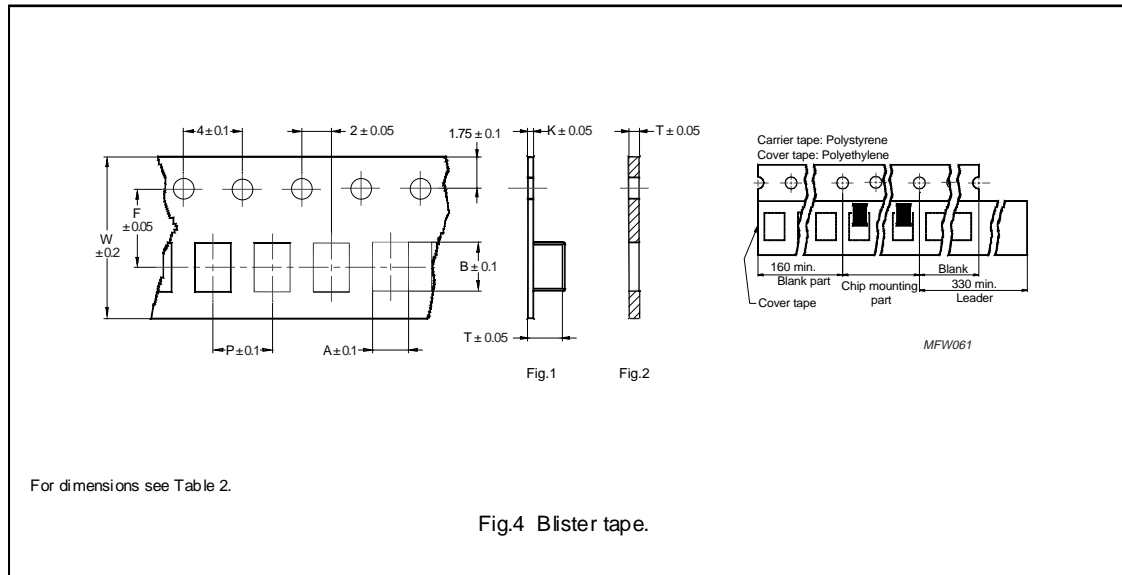
**Dimensions of solderlands**



**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**



**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:**

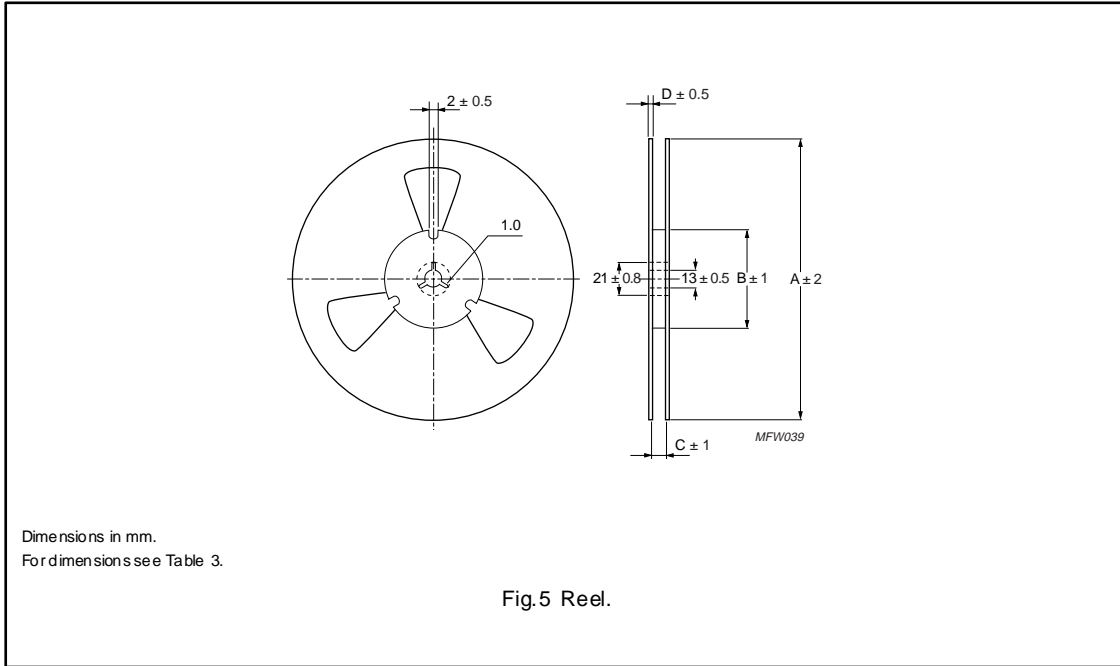
- Sizes 0402 and 0603: paper
- Other sizes: Polystyrene

**MATERIAL COVER FILM:**

- Polyethylene



EMI-suppression products



**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

## RODS

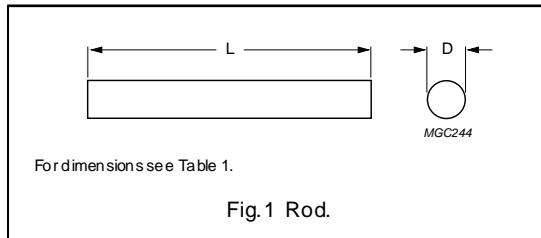


Table 1 Grades, parameters and type numbers; see Fig. 1

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

EMI-suppression products

SMD beads

SMD BEADS FOR EMI SUPPRESSION

General data

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-58", Part 2, Test Ta, method 1
Taping method	"IEC 60 286-3", "EIA 481-1" and "EIA 481-2"

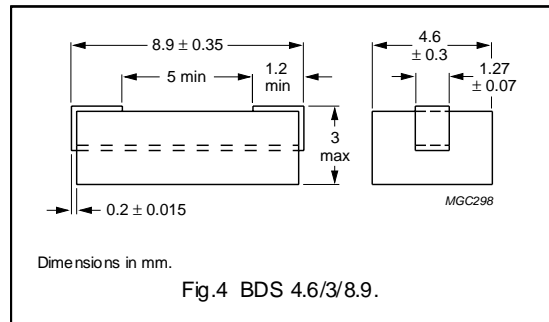
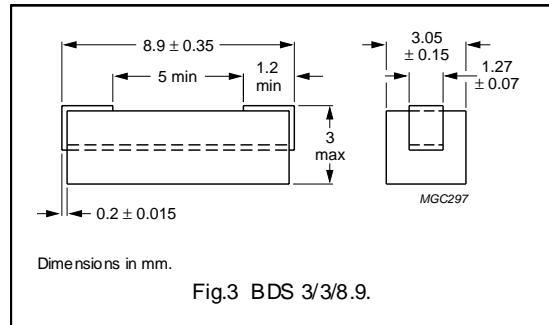
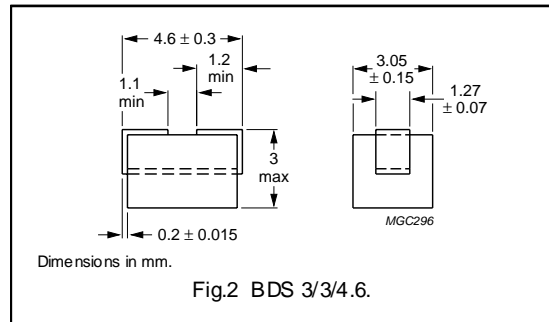
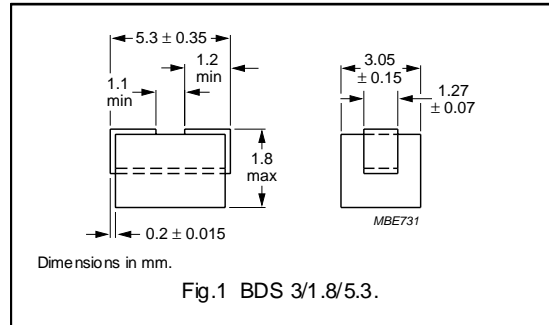
Grades, parameters and type numbers

GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	at f (MHz)	TYPE NUMBER
<b>BDS 3/1.8/5.3; mass <math>\approx</math> 0.1 g<sup>(2)</sup></b>			
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	
<b>BDS 3/3/4.6; mass <math>\approx</math> 0.15 g<sup>(2)</sup></b>			
3S1	25	3	BDS 3/3/4.6-3S1
	45	10	
	35	25	
4S2	30	25	BDS 3/3/4.6-4S2
	50	100	
	55	300	
<b>BDS 3/3/8.9; mass <math>\approx</math> 0.3 g<sup>(3)</sup></b>			
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	
<b>BDS 4.6/3/8.9; mass <math>\approx</math> 0.5 g<sup>(3)</sup></b>			
4S2	65	25	BDS 4.6/3/8.9-4S2
	100	100	
	110	300	

Note

1. Typical values,  $|Z|_{min}$  is  $-20\%$ .
2. DC resistance  $< 0.6 m\Omega$ .
3. DC resistance  $< 1.0 m\Omega$ .

Mechanical data



EMI-suppression products

SMD beads

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

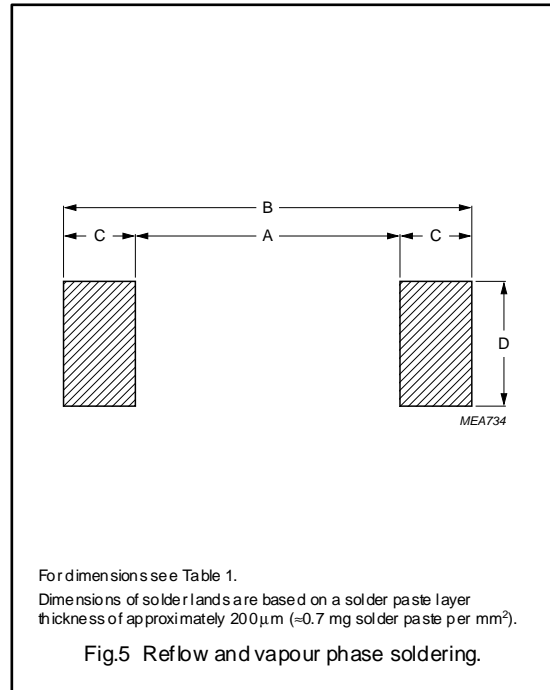
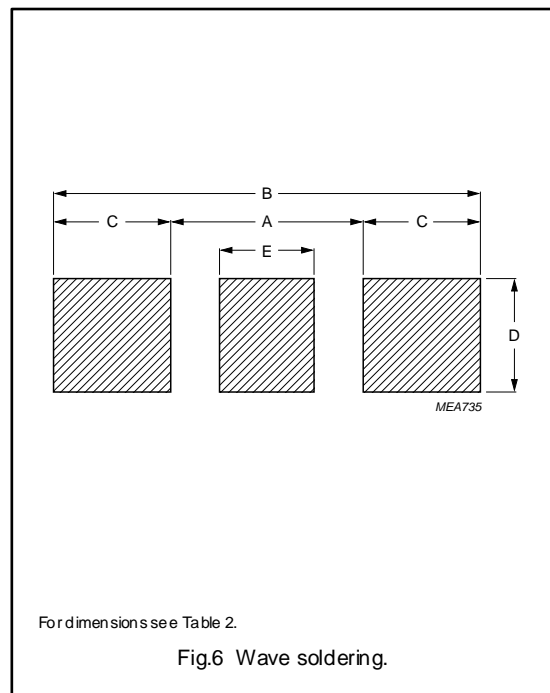
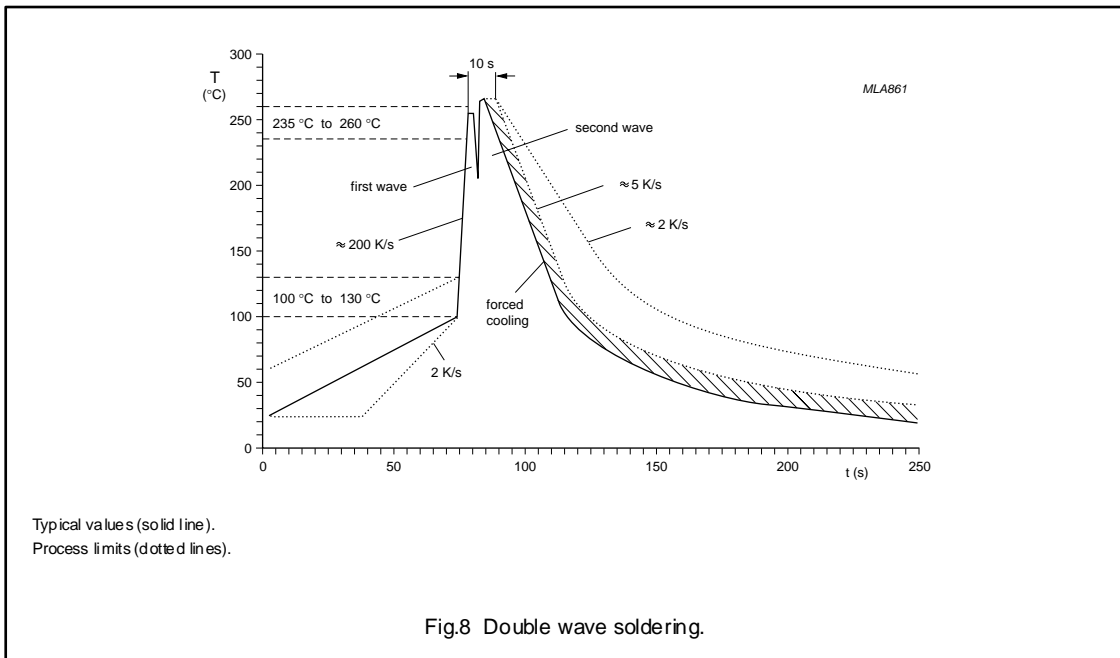
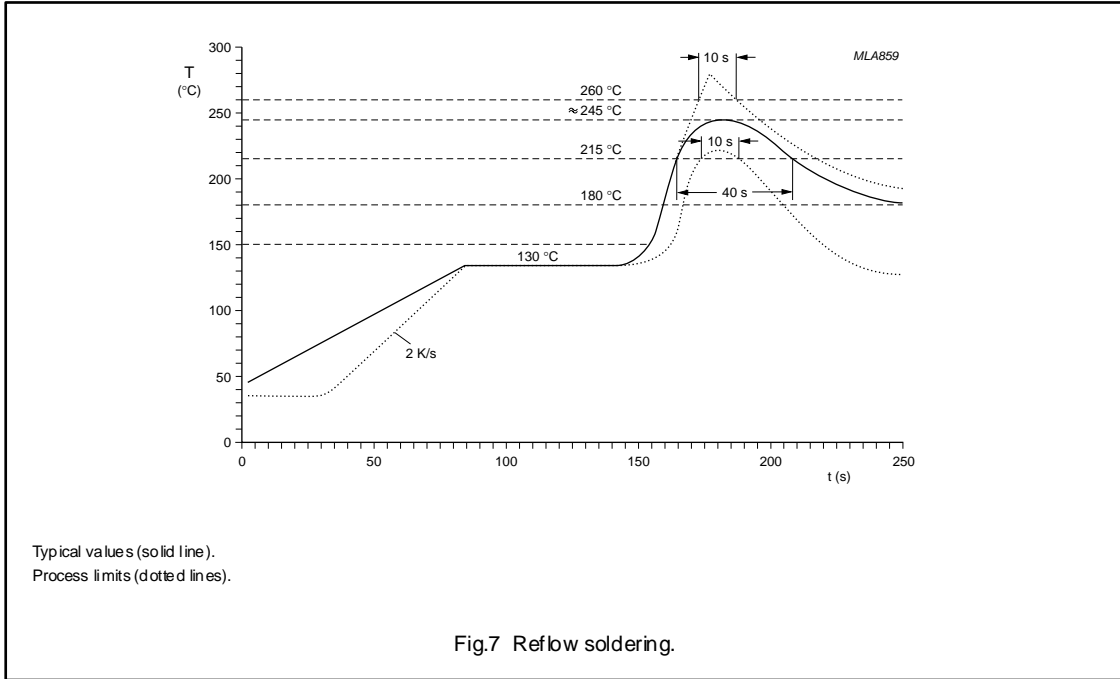


Table 2 Wave soldering

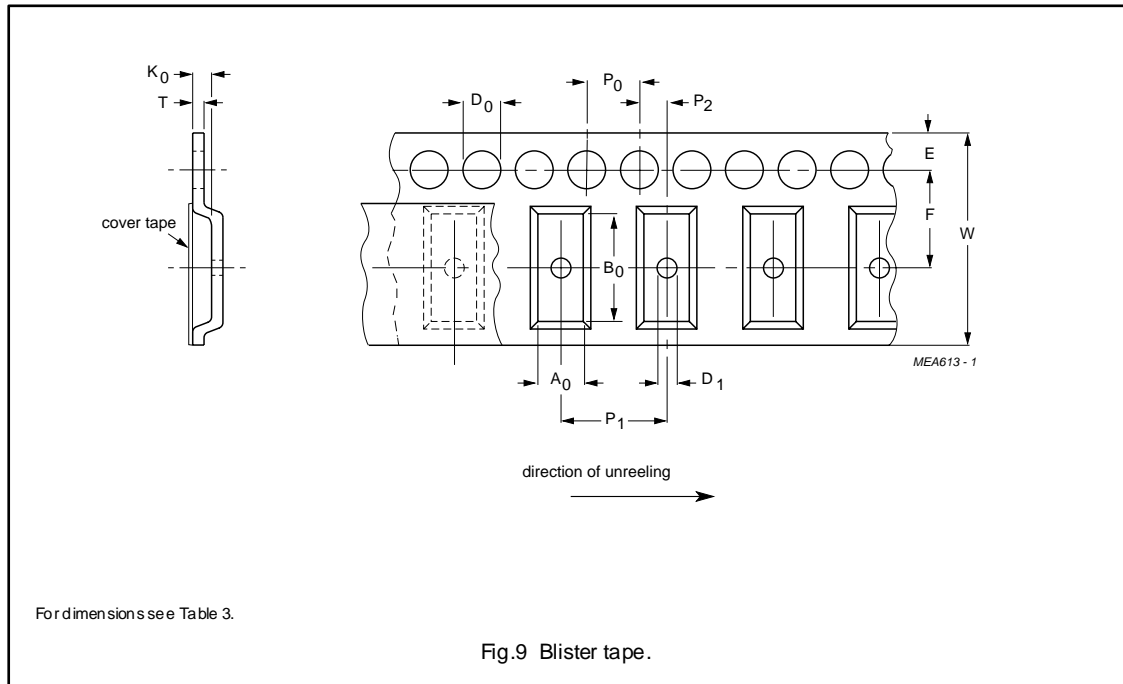
SIZE	DIMENSIONS (mm)				
	A	B	C	D	E
BDS 3/1.8/5.3	2.0	7.2	2.6	3.0	0.8
BDS 3/3/4.6	2.0	6.4	2.2	3.0	0.8
BDS 3/3/8.9	6.0	12.2	3.1	3.0	2.5
BDS 4.6/3/8.9	6.0	12.2	3.1	3.0	2.5



Soldering profiles

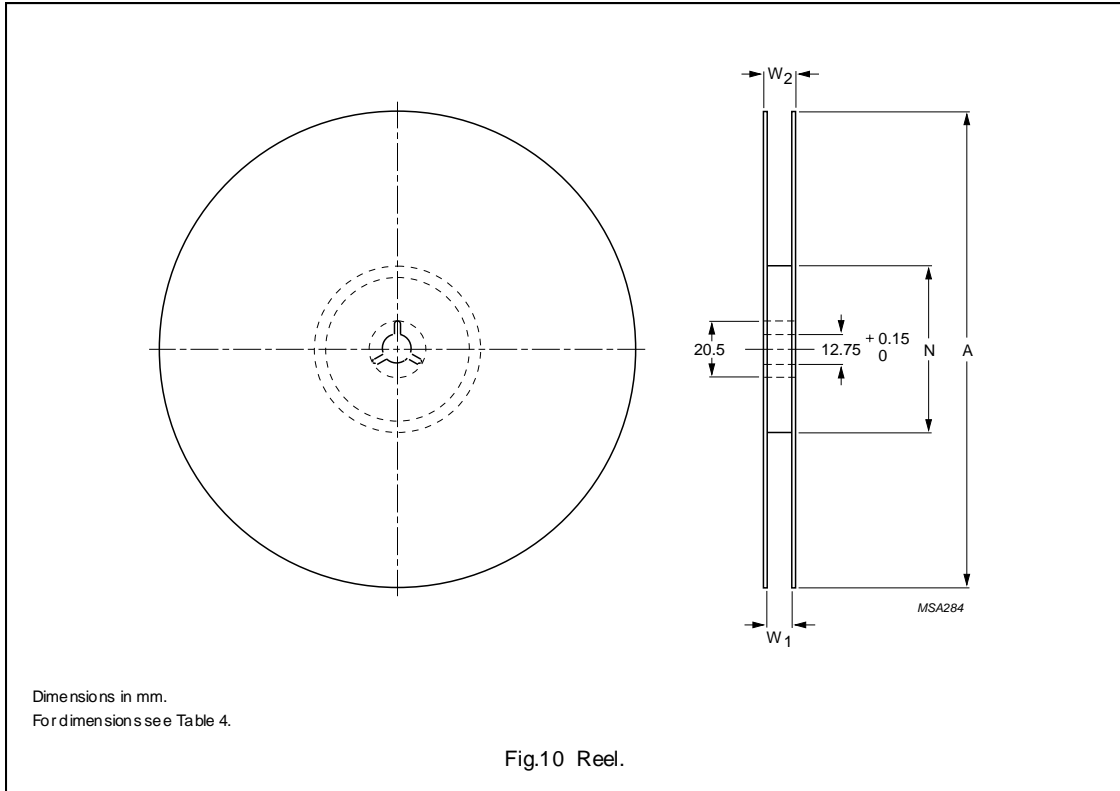


**BLISTER TAPE AND REEL DIMENSIONS**



**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
$A_0$	$3.25 \pm 0.1$	$3.45 \pm 0.1$	$3.45 \pm 0.1$	$5.1 \pm 0.1$
$B_0$	$5.85 \pm 0.1$	$5.1 \pm 0.1$	$9.4 \pm 0.1$	$9.4 \pm 0.1$
$K_0$	$2.0 \pm 0.1$	$3.1 \pm 0.1$	$3.1 \pm 0.1$	$3.1 \pm 0.1$
$T$	$0.3 \pm 0.05$	$0.25 \pm 10\%$	$0.35 \pm 0.05$	$0.3 \pm 0.05$
$W$	$12.0 \pm 0.3$	$12.0 \pm 0.3$	$16.0 \pm 0.3$	$16.0 \pm 0.3$
$E$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$	$1.75 \pm 0.1$
$F$	$5.5 \pm 0.05$	$5.5 \pm 0.05$	$7.5 \pm 0.1$	$7.5 \pm 0.1$
$D_0$	$1.5 \pm 0.1$	$1.5 \pm 0.1$	$1.5 \pm 0.1$	$1.5 \pm 0.1$
$D_1$	$\geq 1.5$	$\geq 1.5$	$\geq 1.5$	$\geq 1.5$
$P_0$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$4.0 \pm 0.1$	$4.0 \pm 0.1$
$P_1$	$8.0 \pm 0.1$	$8.0 \pm 0.1$	$8.0 \pm 0.1$	$8.0 \pm 0.1$
$P_2$	$2.0 \pm 0.1$	$2.0 \pm 0.05$	$2.0 \pm 0.1$	$2.0 \pm 0.1$



**Table 4** Reel dimensions; see Fig.10

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4

EMI-suppression products

SMD common mode chokes

**SMD COMMON MODE CHOKES FOR EMI-SUPPRESSION**

**General data**

ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-58", Part 2, Test Ta, method 1
Taping method	"IEC 60 286-3", "EIA 481-1-A" and "EIA 481-2"

**Grades, parameters and type numbers**

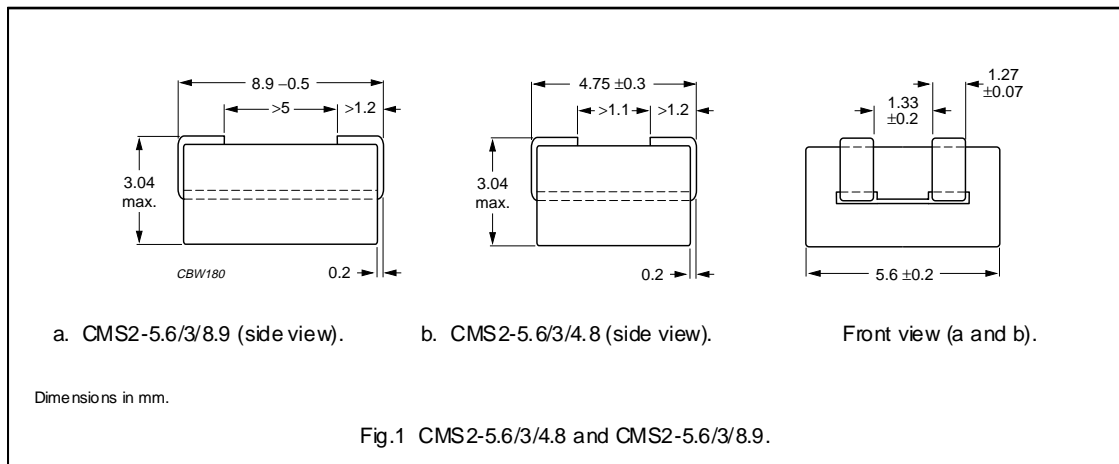
GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	at f (MHz)	TYPE NUMBER
<b>CMS2-5.6/3/4.8; mass <math>\approx</math>0.3 g</b>			
4S2	21	25	CMS2-5.6/3/4.8-4S2
	35	100	
	50	300	
<b>CMS2-5.6/3/8.9; mass <math>\approx</math>0.6 g</b>			
4S2	38	25	CMS2-5.6/3/8.9-4S2
	60	100	

GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	at f (MHz)	TYPE NUMBER
<b>CMS4-11/3/4.8; mass <math>\approx</math>0.6 g</b>			
4S2 inner channel	12	25	CMS4-11/3/4.8-4S2
	23	100	
	42	300	
4S2 outer channel	15	25	
	30	100	
	50	300	
<b>CMS4-11/3/8.9; mass <math>\approx</math>1.1 g</b>			
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,  $|Z|_{min}$  is -20%.  
DC resistance <0.6 m $\Omega$ .

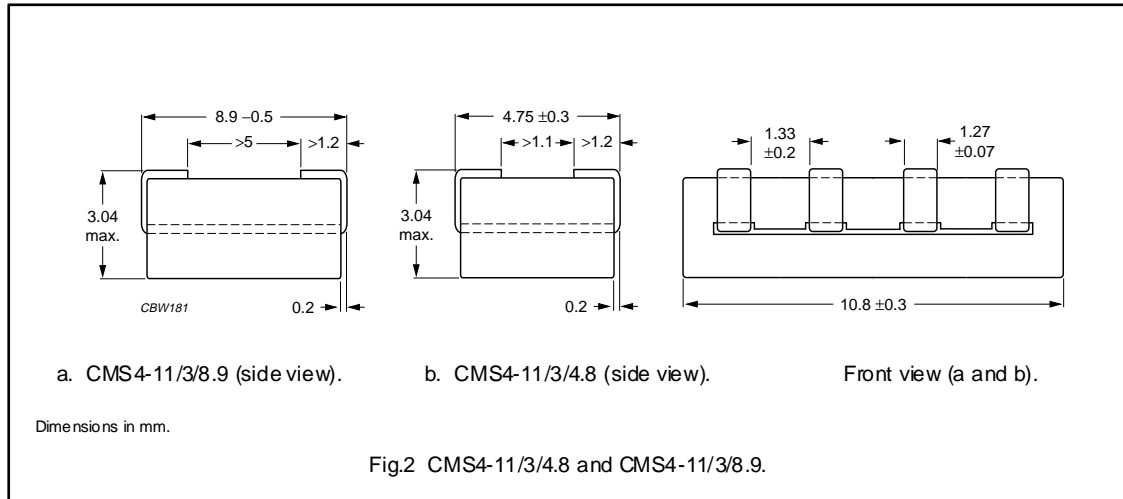
**Mechanical data**



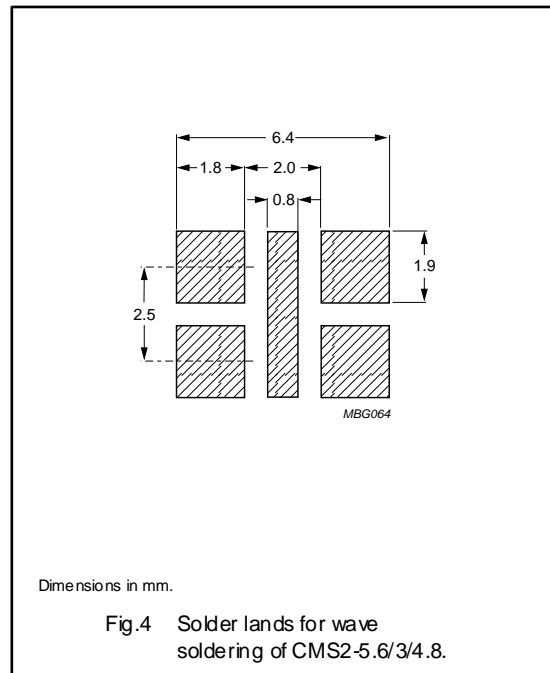
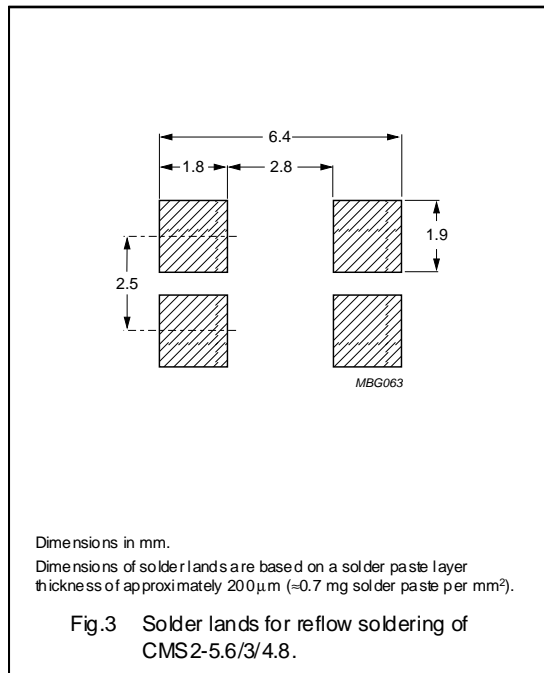


EMI-suppression products

SMD common mode chokes

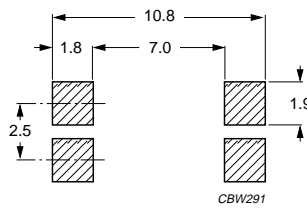


Recommended dimensions of solder lands



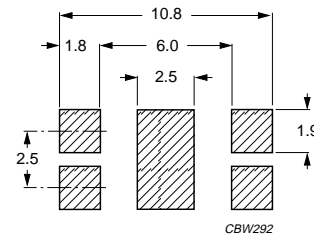
EMI-suppression products

SMD common mode chokes



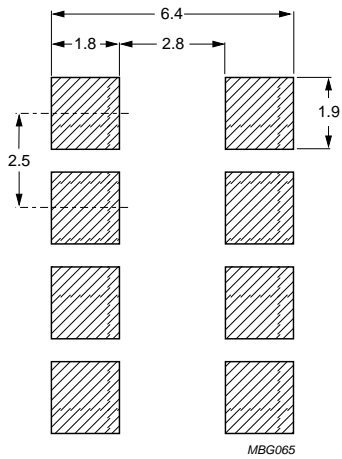
Dimensions in mm.  
 Dimensions of solder lands are based on a solder paste layer thickness of approximately 200 μm (=0.7 mg solder paste per mm<sup>2</sup>).

Fig.5 Solder lands for reflow soldering of CMS2-5.6/3/8.9.



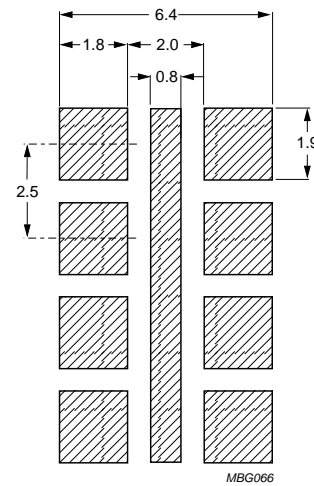
Dimensions in mm.

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<sup>2</sup>).

Fig.7 Solder lands for reflow soldering of CMS4-11/3/4.8.

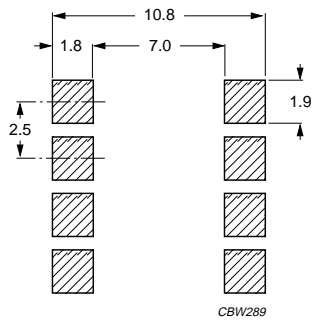


Dimensions in mm.

Fig.8 Solder lands for wave soldering of CMS4-11/3/4.8.

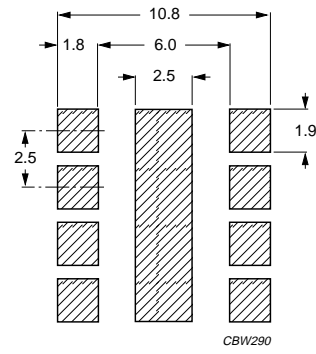
EMI-suppression products

SMD common mode chokes



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<sup>2</sup>).

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

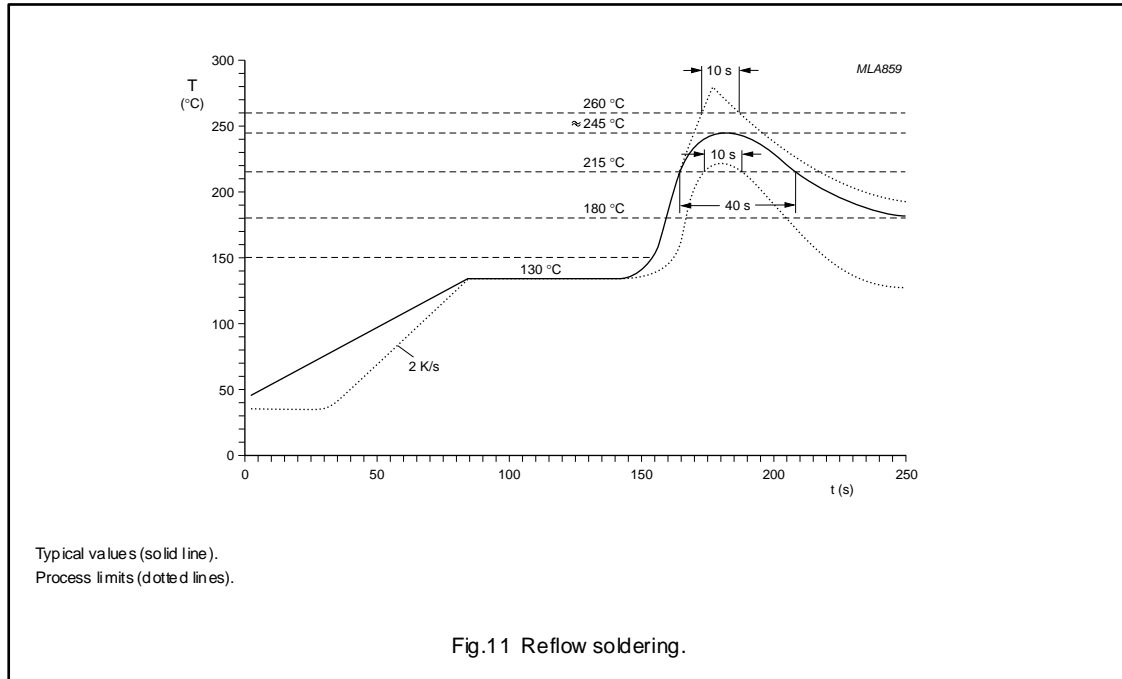


Fig.11 Reflow soldering.

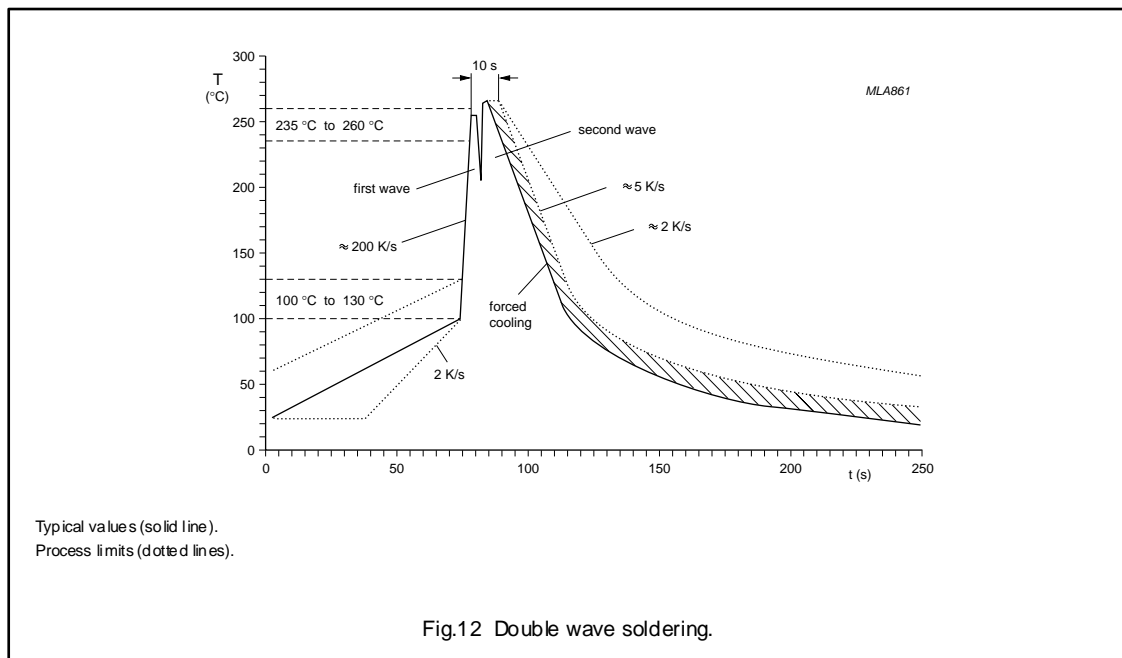
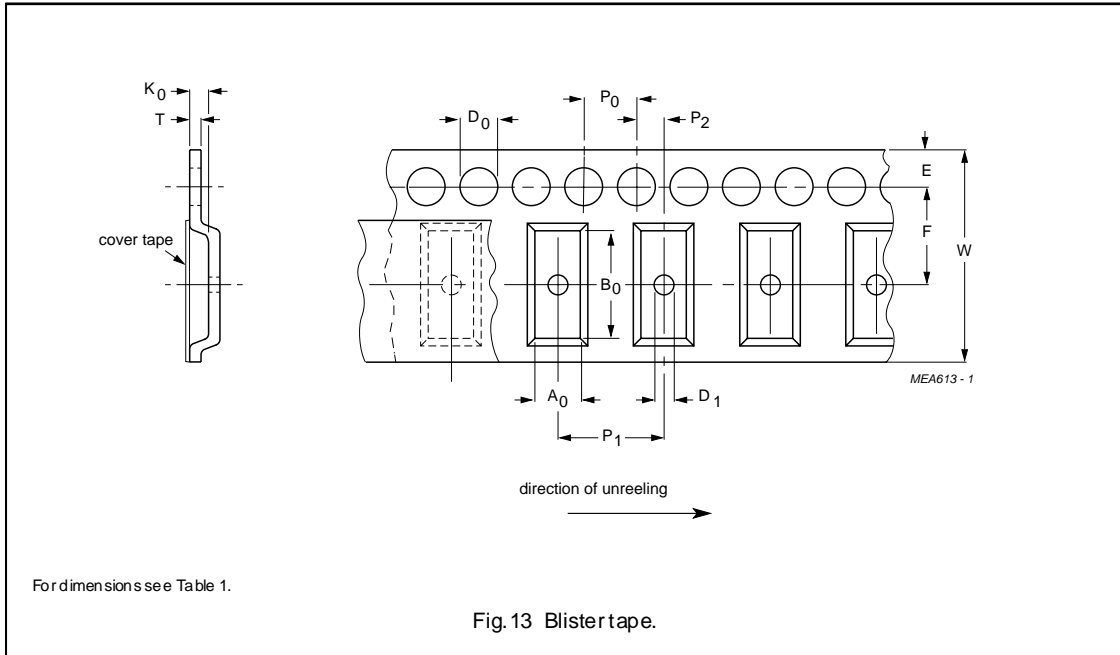


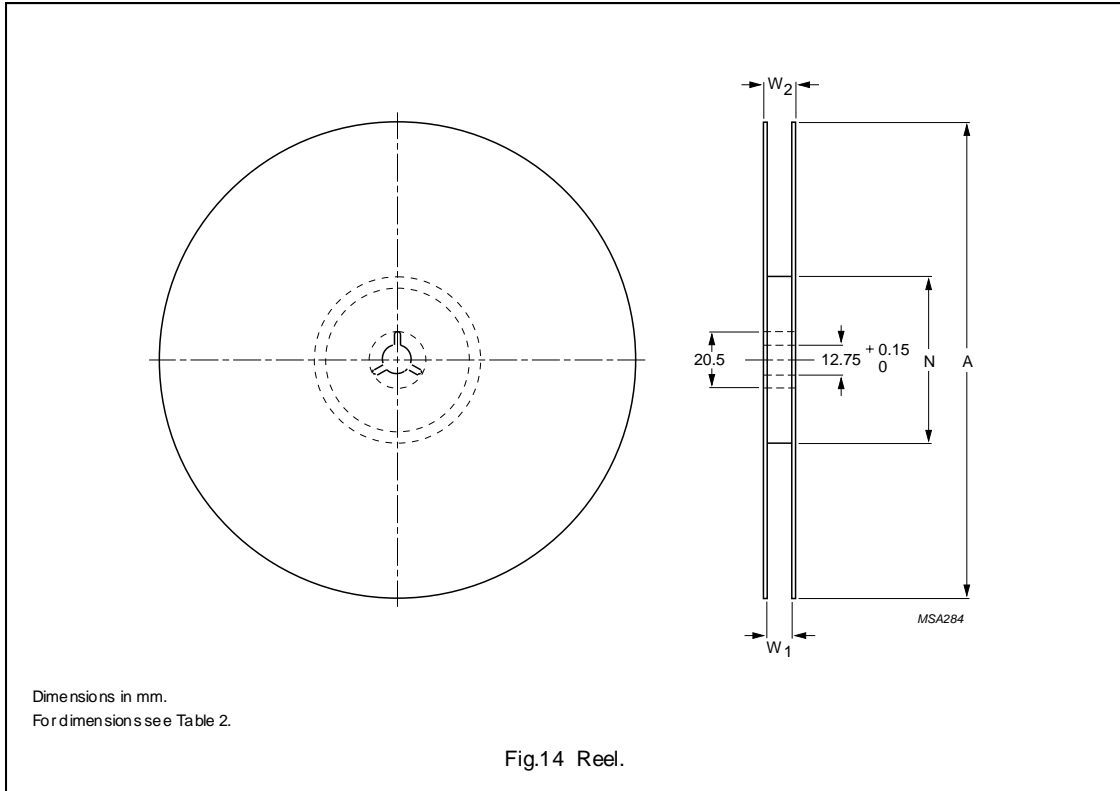
Fig.12 Double wave soldering.

**BLISTER TAPE AND REEL DIMENSIONS**



**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
$D_1$	$\geq 1.5$	$\geq 1.5$	$\geq 1.5$	$\geq 1.5$
$P_0$	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



**Table 2** Reel dimensions; see Fig.14

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
12	330	100 ±5	12.4	≤16.4
16	330	100 ±5	16.4	≤20.4
24	330	100 ±5	24.4	≤28.4

EMI-suppression products

SMD wideband chokes

SMD WIDEBAND CHOKES

SMD wideband choke WBS1.5-5/4.8/10

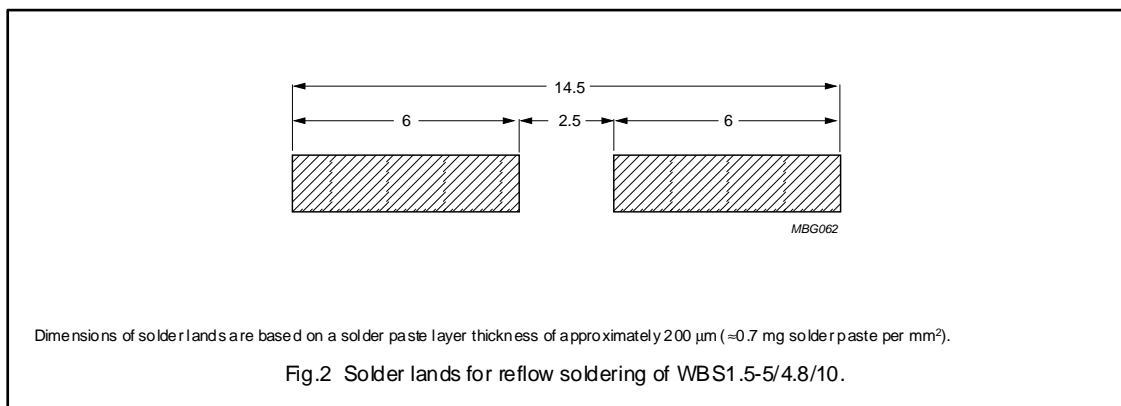
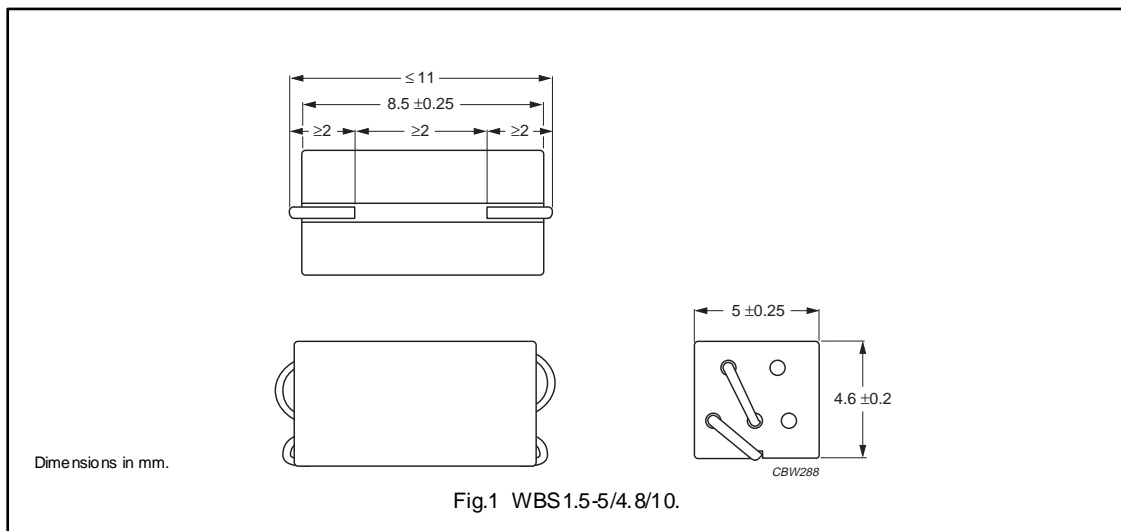
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-58", Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	"IEC 60 286-3" and "EIA 481-2"

Grades, parameters and type numbers; see Fig.1

GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	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,  $|Z|_{min}$  is -20%.



EMI-suppression products

SMD wideband chokes

SMD wideband choke WBS2.5-5/4.8/10

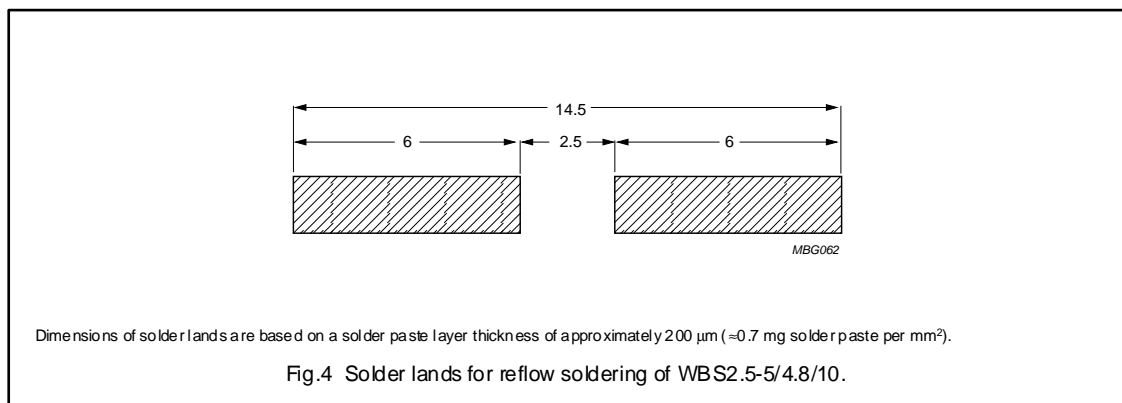
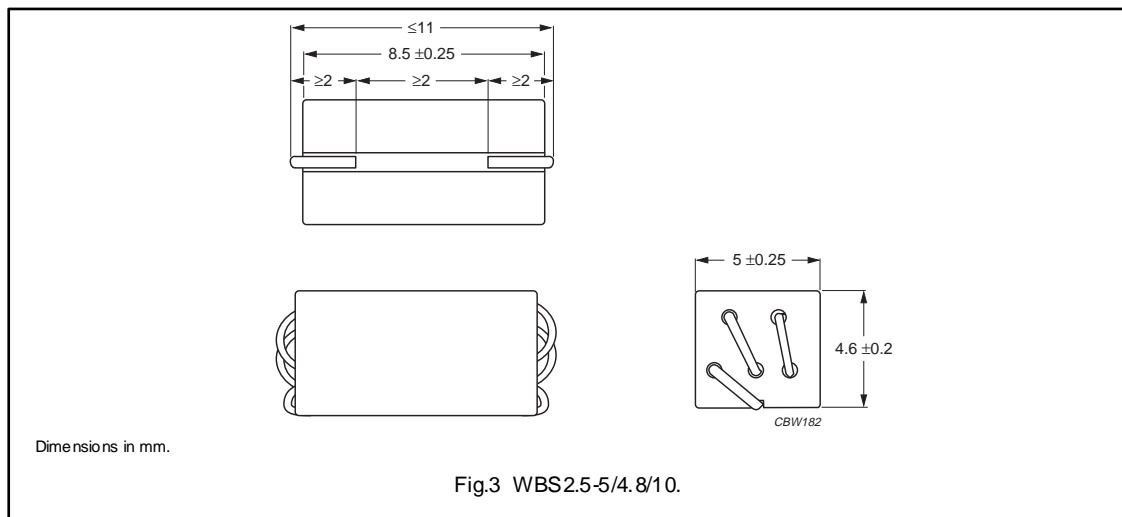
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-58"; Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	"IEC 60 286-3" and "EIA 481-2"

Grades, parameters and type numbers; see Fig.3

GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	at f (MHz)	TYPE NUMBER
3S4	300	10	WBS2.5-5/4.8/10-3S4
	625	50	
	600	100	
4B1	485	25	WBS2.5-5/4.8/10-4B1
	850	100	
	350	300	

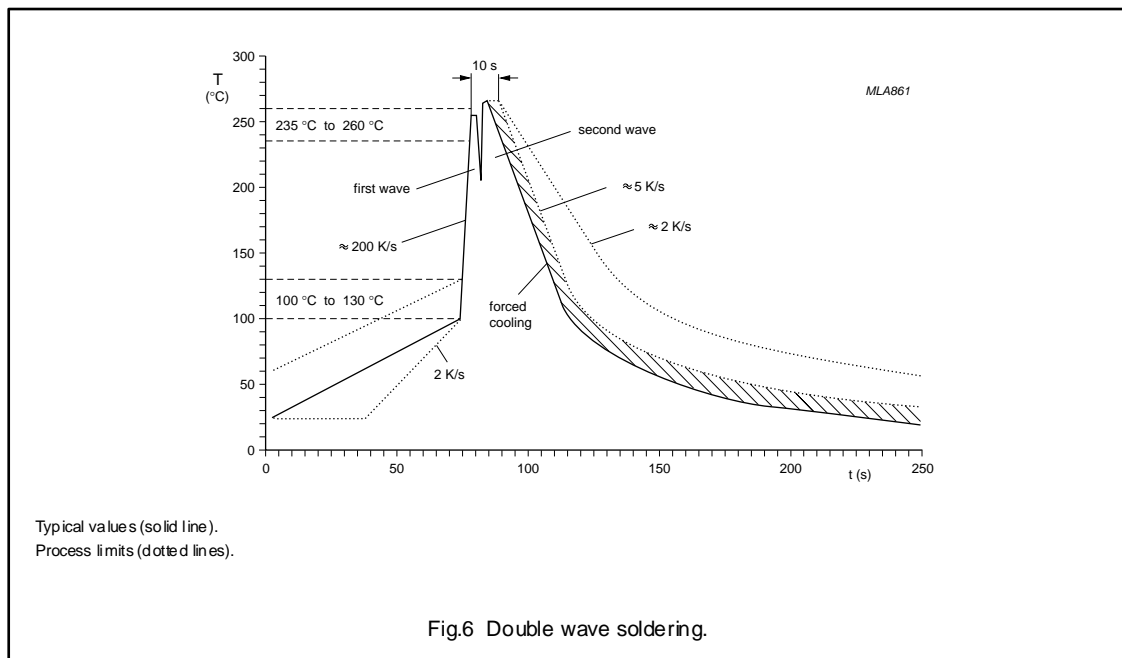
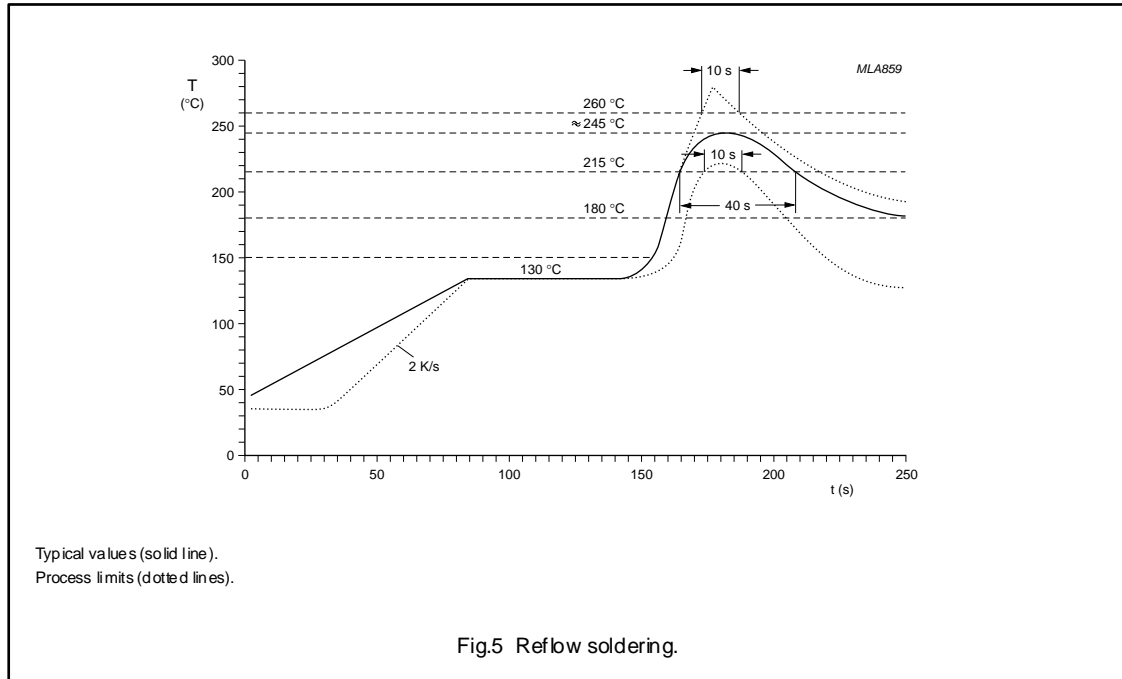
Note

1. Typical values,  $|Z|_{min}$  is -20%.

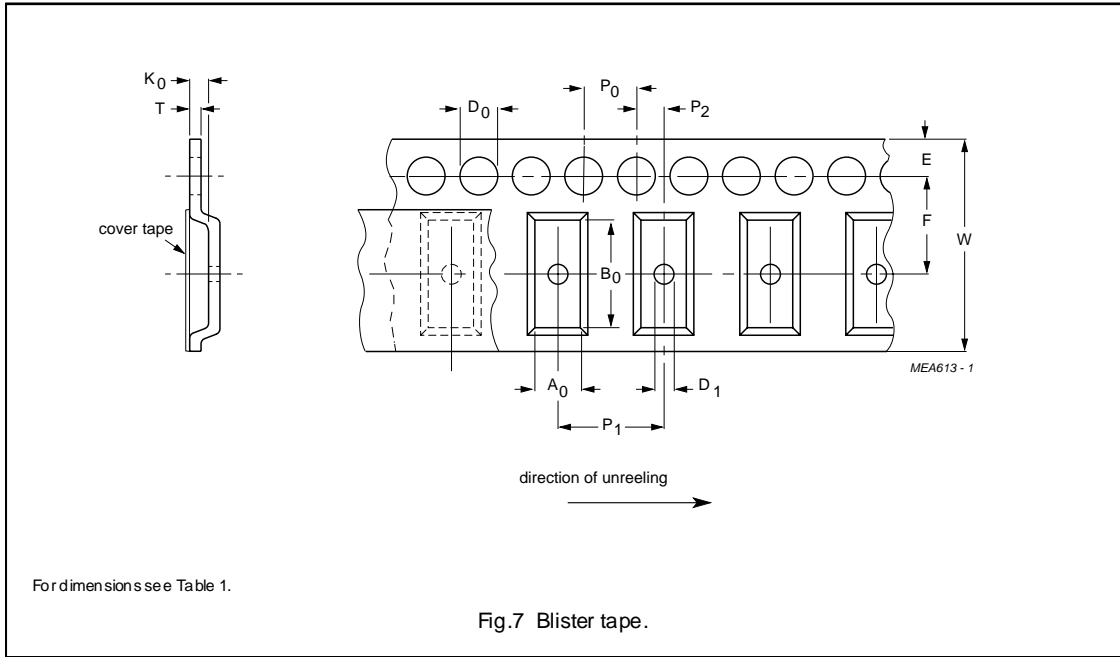




Soldering profiles

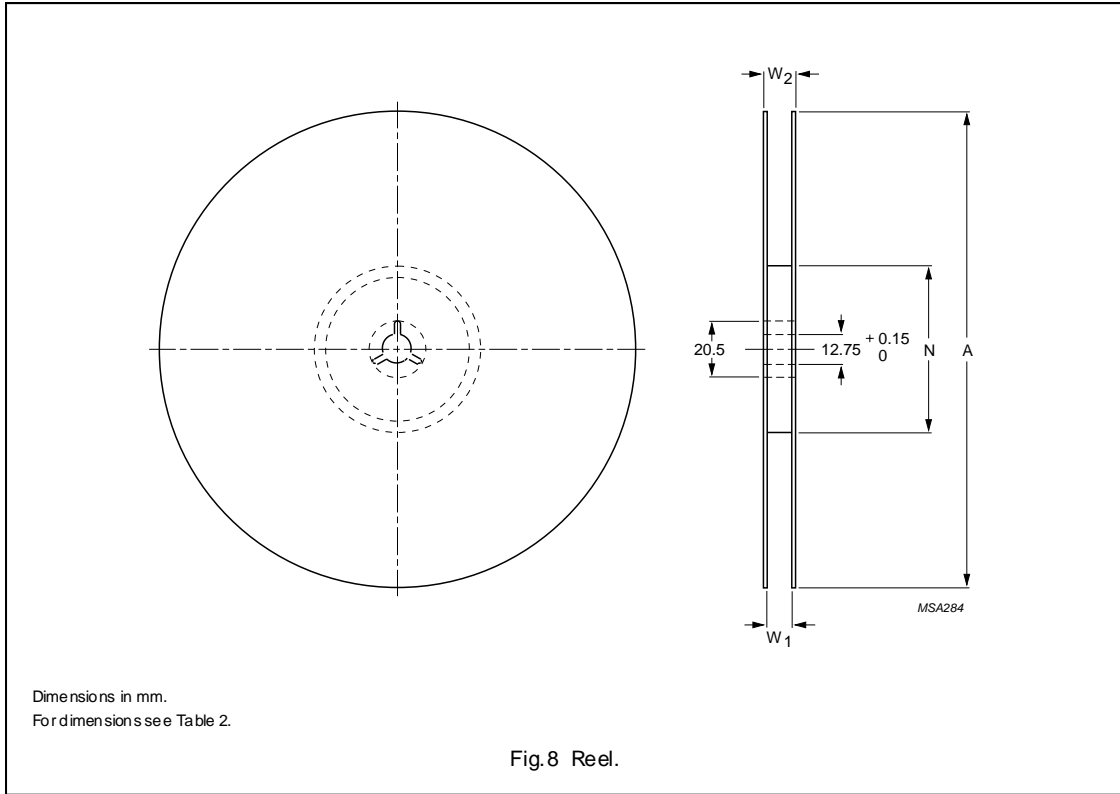


**BLISTER TAPE AND REEL DIMENSIONS**



**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
$D_1$	$\geq 1.5$	$\geq 1.5$
$P_0$	4.0	4.0
$P_1$	8.0	8.0
$P_2$	2.0	2.0



**Table 2** Reel dimensions; see Fig.8

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
24	330	100 ±5	24.4	≤28.4

EMI-suppression products

SMD wideband chokes metallized

SMD wideband choke metallized WBSM2.5-5/4.8/10

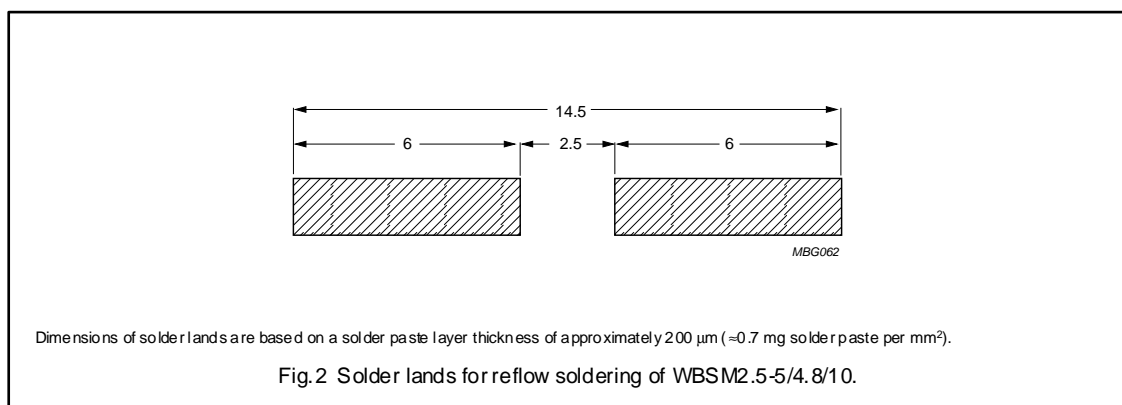
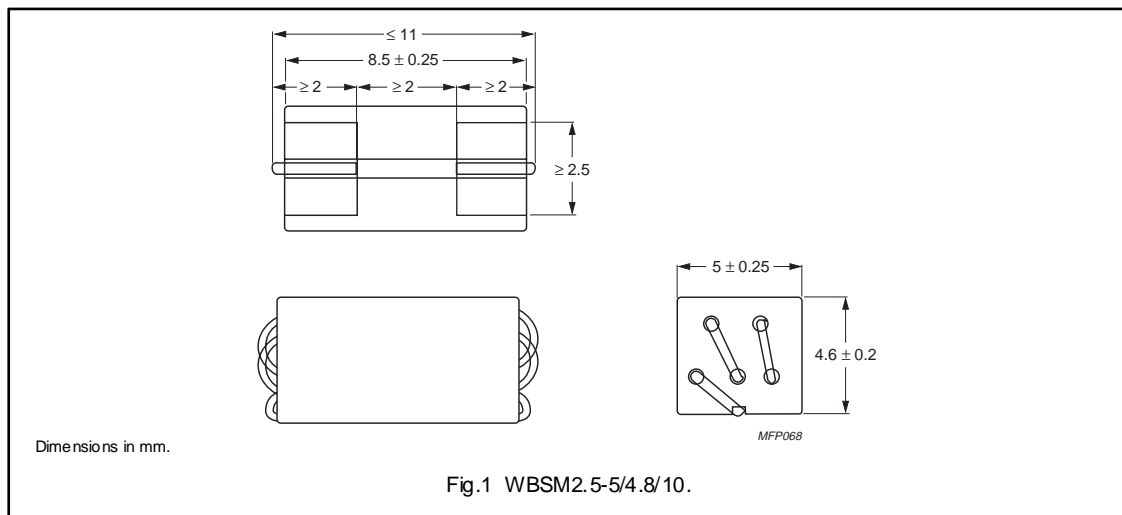
ITEM	SPECIFICATION
Strip material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Metallization	copper-tin (CuSn)
Solderability	"IEC 60 068-2-58"; Part 2, Test Ta, method 1
Mass	≈0.9 g
Taping method	"IEC 60 286-3" and "EIA 481-2"

Grades, parameters and type numbers; see Fig. 1

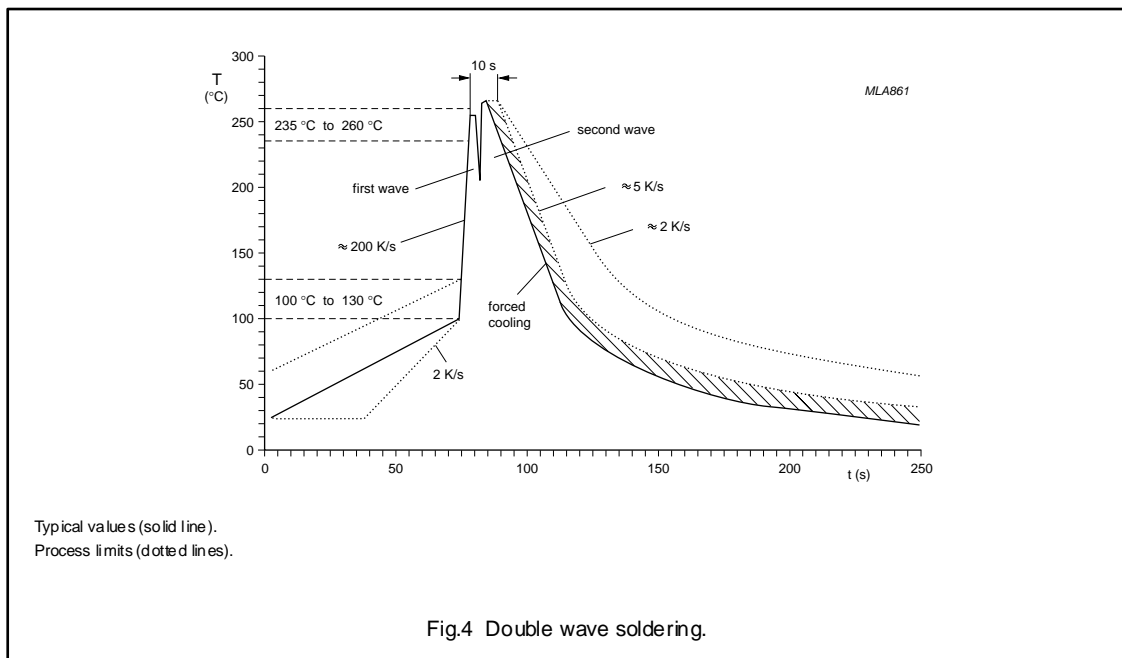
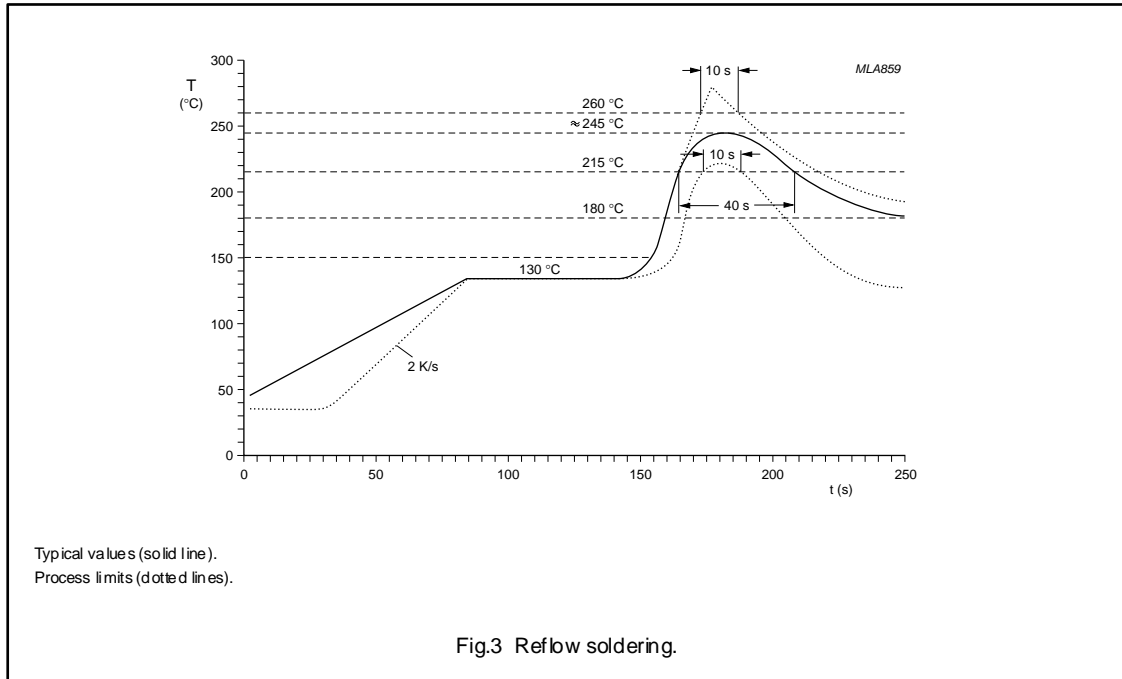
GRADE	$ Z_{typ} ^{(1)}$ ( $\Omega$ )	at f (MHz)	TYPE NUMBER
4B1	485	25	WBSM2.5-5/4.8/10-4B1
	850	100	
	350	300	

Note

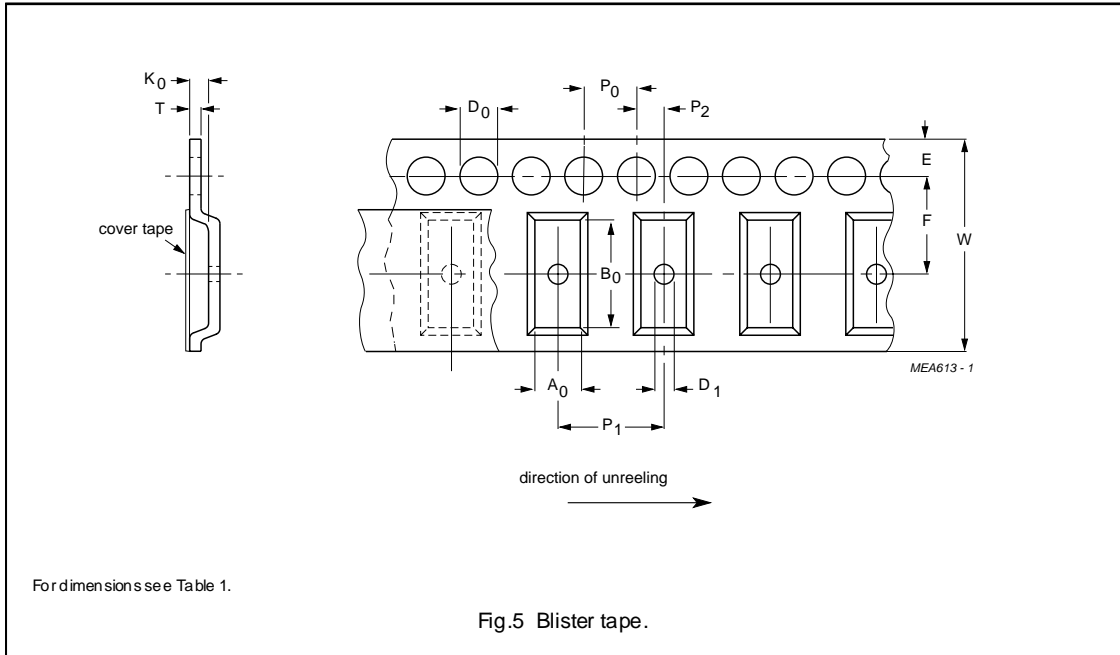
1. Typical values,  $|Z|_{min}$  is -20%.



Soldering profiles

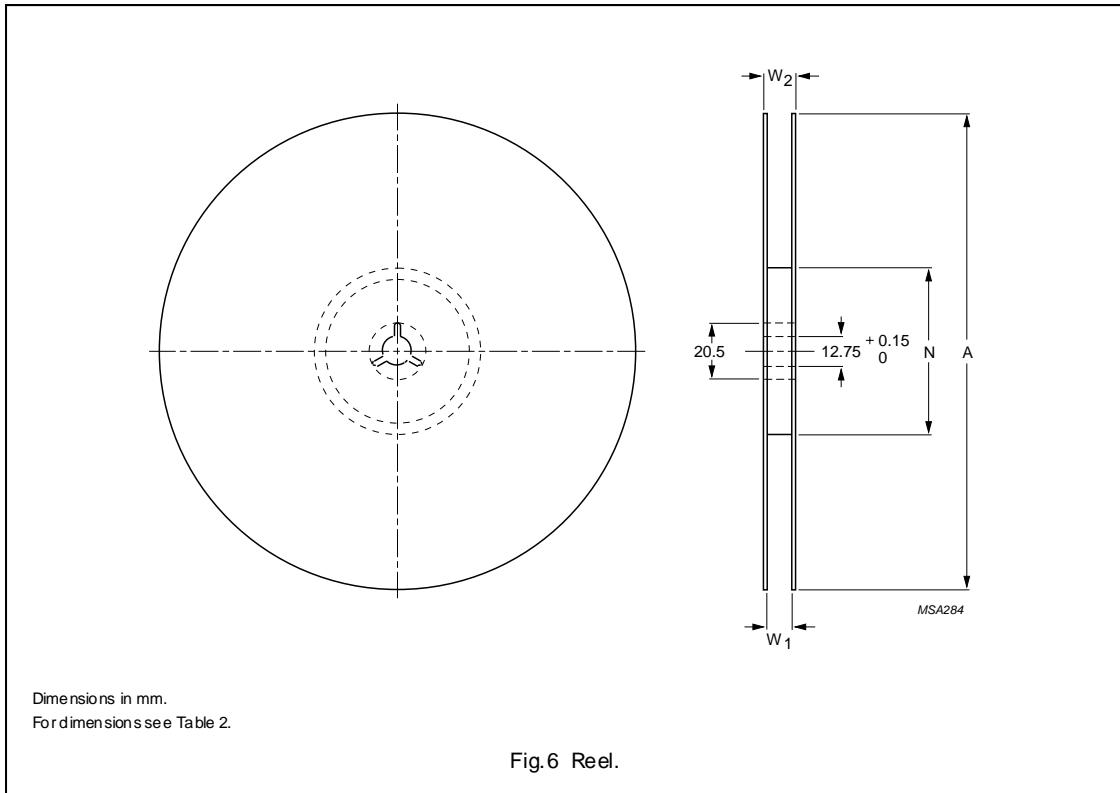


**BLISTER TAPE AND REEL DIMENSIONS**



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

SIZE	DIMENSIONS (mm)
	WBSM2.5-5/4.8/10
$A_0$	5.51
$B_0$	11
$K_0$	5.03
$T$	0.36
$W$	24
$E$	1.75
$F$	11.5
$D_0$	1.5
$D_1$	$\geq 1.5$
$P_0$	4.0
$P_1$	8.0
$P_2$	2.0



**Table 2** Reel dimensions; see Fig.6

SIZE	DIMENSIONS ( mm )			
	A	N	W <sub>1</sub>	W <sub>2</sub>
24	330	100 ±5	24.4	≤28.4

## EMI-suppression products

## Tubes

## TUBES

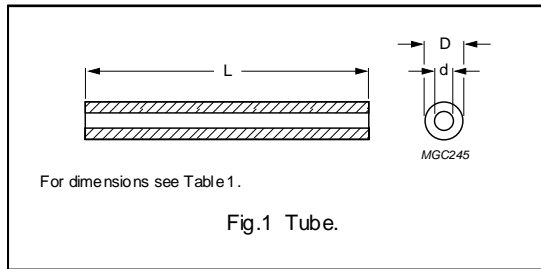


Table 1 Grades, parameters and type numbers; see Fig. 1

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



EMI-suppression products

Wideband chokes

WIDEBAND CHOKES FOR EMI-SUPPRESSION

General data WBC1.5/A

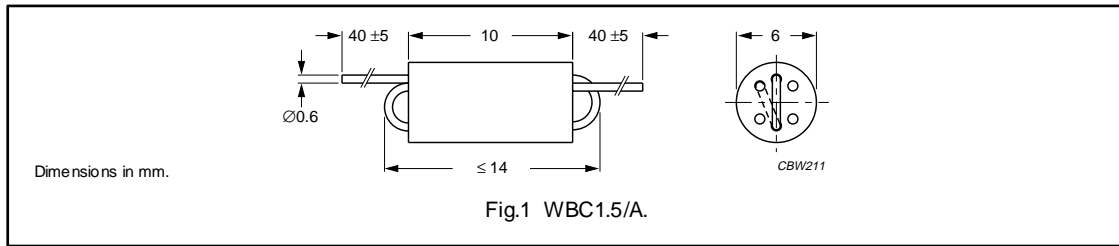
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.1

GRADE	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	1.5	≥300	120	WBC1.5/A-3S4
4B1	1.5	≥350	250	WBC1.5/A-4B1
4S2	1.5	213 <sup>(1)</sup>	10	WBC1.5/A-4S2
		400 <sup>(1)</sup>	50	
		470 <sup>(1)</sup>	100	

Note

1. Minimum guaranteed impedance is |Z<sub>typ</sub>|-20%.
2. Also available with insulated



General data WBC1.5/1.5/A

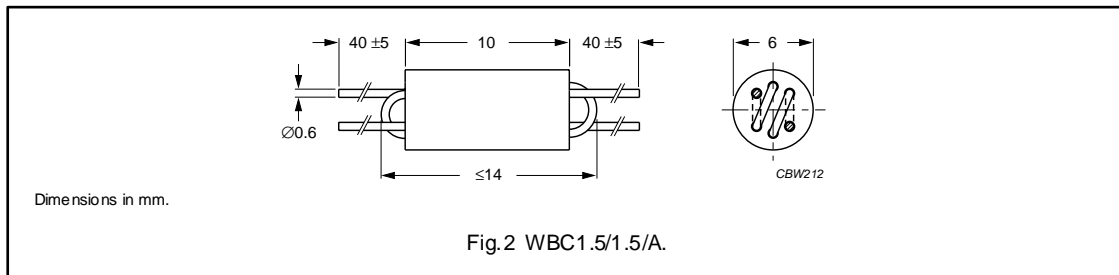
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.2

GRADE	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2 × 1.5	≥700 <sup>(1)</sup>	50	WBC1.5/1.5/A-3S4
4B1	2 × 1.5	≥800 <sup>(1)</sup>	110	WBC1.5/1.5/A-4B1
4S2	2 × 1.5	213 <sup>(2)</sup>	10	WBC1.5/1.5/A-4S2
		400 <sup>(2)</sup>	50	
		470 <sup>(2)</sup>	100	
4A15	2 × 1.5	1000	50	WBC1.5/1.5/A-4A15
		1000	180	

Notes

1. |Z| measured with both windings connected in series.
2. Minimum guaranteed impedance is |Z<sub>typ</sub>|-20%; measured with one winding



EMI-suppression products

Wideband chokes

General data WBC2/R

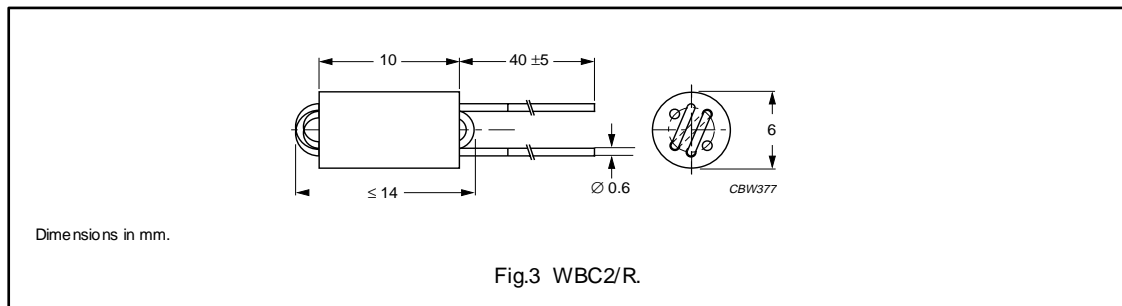
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.3

GRADE	No. OF TURNS	Z <sub>typ</sub>   <sup>(1)</sup> at f		TYPE NUMBER
		(Ω)	(MHz)	
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<sub>typ</sub>|-20%.



General data WBC2.5/A

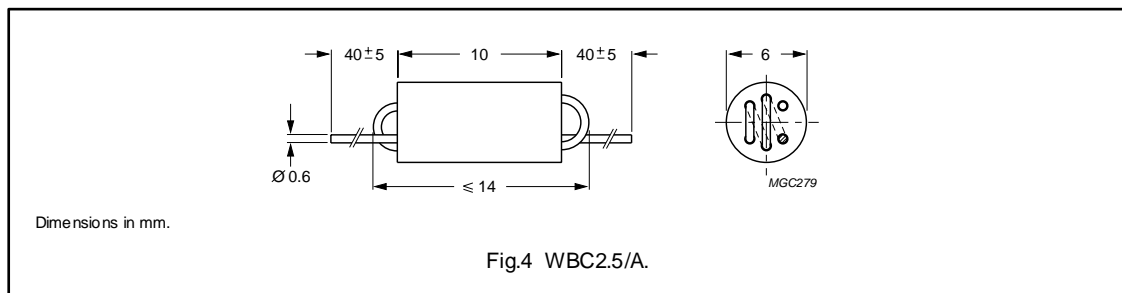
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.4

GRADE	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/A-3S4 <sup>(2)</sup>
4B1	2.5	≥700	180	WBC2.5/A-4B1 <sup>(2)</sup>
4S2	2.5	400 <sup>(1)</sup>	10	WBC2.5/A-4S2
		850 <sup>(1)</sup>	50	
		725 <sup>(1)</sup>	100	
4A15	2.5	800	50	WBC2.5/A-4A15
		820	180	

Note

1. Minimum guaranteed impedance is |Z<sub>typ</sub>|-20%.
2. Also available with insulated wires, sleeves, encapsulated and taped and reeled.



EMI-suppression products

Wideband chokes

General data WBC2.5/R

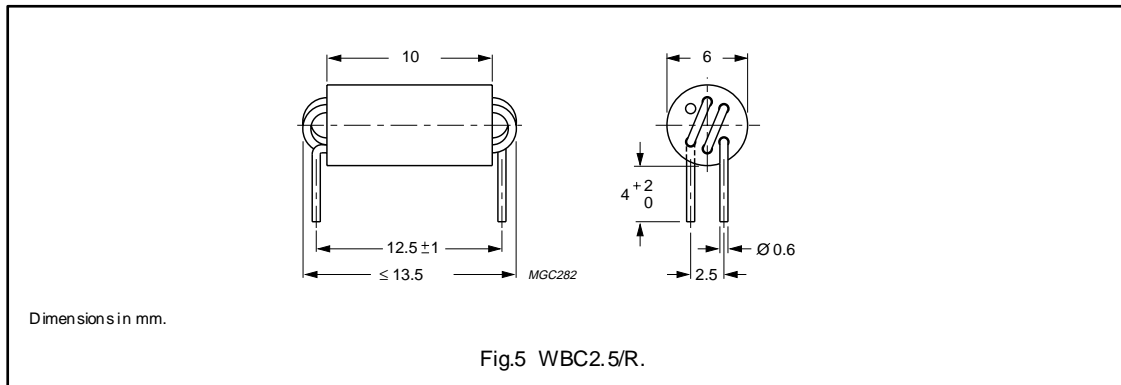
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.5

GRADE	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/R-3S4 <sup>(1)</sup> <sup>sup</sup>
4B1	2.5	≥700	75	WBC2.5/R-4B1 <sup>(2)</sup> <sup>sup</sup>
4S2	2.5	400	10	WBC2.5/R-4S2 <sup>sup</sup>
		850	50	
		725	100	

Note

1. Also available with insulated wires, sleeves and moulded.
2. Also available with insulated wires, sleeves.



General data WBC2.5/SP

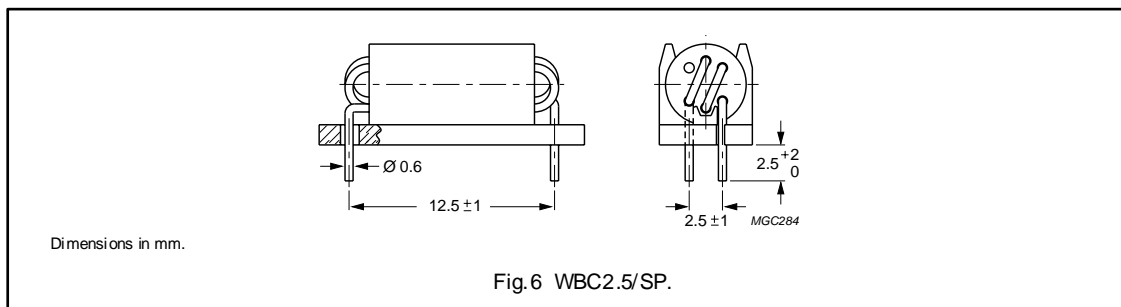
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Support	polyamide (PA6.6) plate to allow mounting across circuit tracks; flame retardant in accordance with UL 94V-0
Solderability	"IEC 60068-2-20", Part 2, Test Ta, method 1

Grades, parameters and type numbers; see Fig.6

GRADE note 1	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	2.5	≥600	50	WBC2.5/SP-3S4 <sup>sup</sup>
4B1	2.5	≥700	75	WBC2.5/SP-4B1 <sup>sup</sup>

Note

1. Colour code 3S4 = blue, 4B1 = green.



EMI-suppression products

Wideband chokes

General data WBC3/R

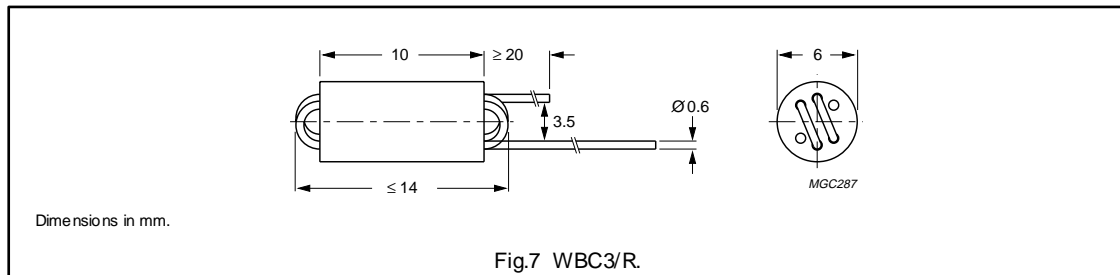
ITEM	SPECIFICATION
Wire material	copper (Cu), tin-lead (SnPb) plated, lead-free (Sn) available on request.
Solderability	"IEC 60 068-2-20", Part 2, Test Ta, method 1

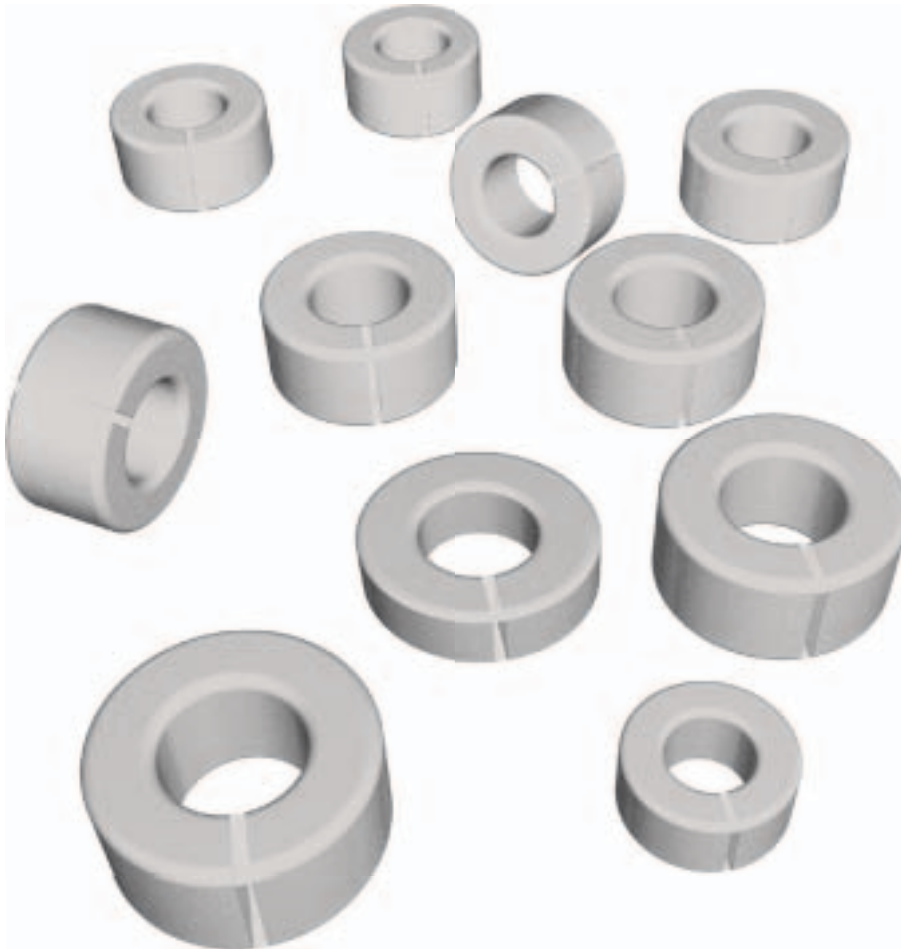
Grades, parameters and type numbers; see Fig.7

GRADE	No. OF TURNS	Z <sub>typ</sub>   at f		TYPE NUMBER
		(Ω)	(MHz)	
3S4	3	≥650	63	WBC3/R-3S4 <sup>(2)</sup>
4B1	3	≥800	110	WBC3/R-4B1 <sup>(2)</sup>
4S2	3	500 <sup>(1)</sup>	10	WBC3/R-4S2
		1 000 <sup>(1)</sup>	50	
		688 <sup>(1)</sup>	100	
4A15	3	≥1000	50	WBC3/R-4A15
		≥1000	180	

Note

1. Minimum guaranteed impedance is |Z<sub>typ</sub>|-20%.
2. Also available with encapsulation and/or taped and reeled.





MFP061

**Soft Ferrites**

**Gapped ferrite toroids**

**PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE**

**Product overview gapped ferrite toroids**

CORE TYPE	$V_e$ (mm <sup>3</sup> )	$A_e$ (mm <sup>2</sup> )	MASS (g)
TN13/7.5/5	368	12.2	1.8
TN17/11/6.4	787	18.7	3.7
TN20/10/6.4	1330	30.5	6.9
TN23/14/7.5	1845	33.1	9.0
TN26/15/11	3700	61.5	19

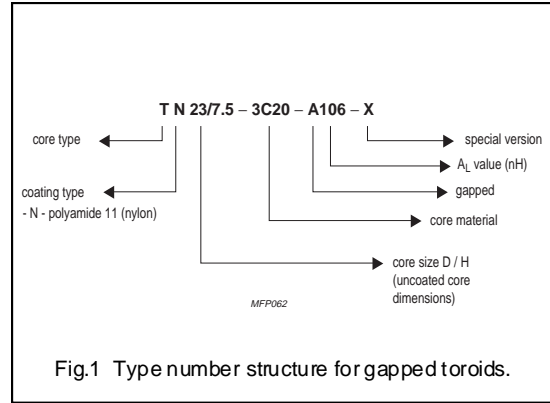


Fig.1 Type number structure for gapped toroids.

Gapped ferrite toroids

TN13/7.5/5

RING CORES (TOROIDS)

Effective core parameters

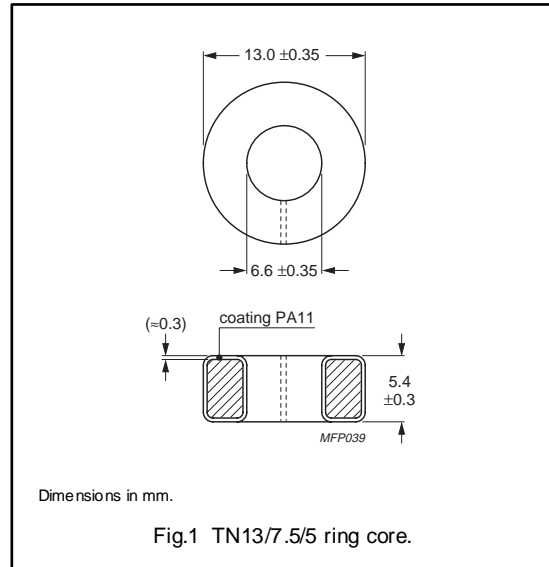
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.46	mm <sup>-1</sup>
$V_e$	effective volume	368	mm <sup>3</sup>
$l_e$	effective length	30.1	mm
$A_e$	effective area	12.2	mm <sup>2</sup>
m	mass of core	≈ 1.8	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M). The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C20	40 ± 15%	≈ 90	TN13/5-3C20-A40
	56 ± 15%	≈ 125	TN13/5-3C20-A56
	67 ± 15%	≈ 147	TN13/5-3C20-A67
	72 ± 15%	≈ 160	TN13/5-3C20-A72
	79 ± 15%	≈ 173	TN13/5-3C20-A79

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 1200 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C20	~ 400	≤ 0.033	≤ 0.22

Gapped ferrite toroids

TN17/11/6.4

RING CORES (TOROIDS)

Effective core parameters

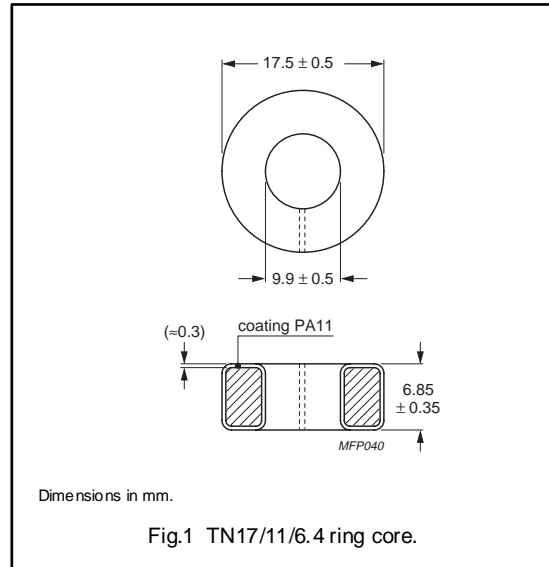
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	2.24	mm <sup>-1</sup>
$V_e$	effective volume	787	mm <sup>3</sup>
$l_e$	effective length	42.0	mm
$A_e$	effective area	18.7	mm <sup>2</sup>
m	mass of core	≈ 3.7	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).  
The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C20	52 ± 15%	≈ 90	TN17/6.4-3C20-A52
	72 ± 15%	≈ 125	TN17/6.4-3C20-A72
	88 ± 15%	≈ 147	TN17/6.4-3C20-A88
	92 ± 15%	≈ 160	TN17/6.4-3C20-A92
	104 ± 15%	≈ 173	TN17/6.4-3C20-A104

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 1200 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C20	~ 400	≤ 0.070	≤ 0.47



Gapped ferrite toroids

TN20/10/6.4

RING CORES (TOROIDS)

Effective core parameters

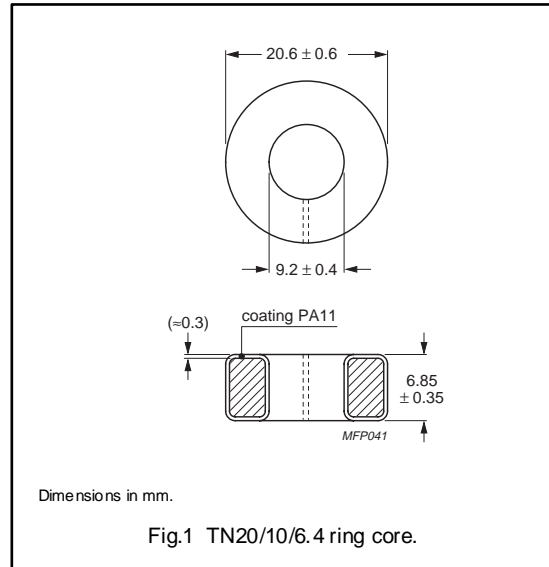
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.43	mm <sup>-1</sup>
$V_e$	effective volume	1330	mm <sup>3</sup>
$l_e$	effective length	43.6	mm
$A_e$	effective area	30.5	mm <sup>2</sup>
m	mass of core	≈ 6.9	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).  
The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C20	68 ± 15%	≈ 125	TN20/10/6.4-3C20-A68
	81 ± 15%	≈ 147	TN20/10/6.4-3C20-A81
	87 ± 15%	≈ 160	TN20/10/6.4-3C20-A87
	96 ± 15%	≈ 173	TN20/10/6.4-3C20-A96
	109 ± 15%	≈ 200	TN20/10/6.4-3C20-A109

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 1200 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C20	~ 400	≤ 0.12	≤ 0.80

Gapped ferrite toroids

TN23/14/7.5

RING CORES (TOROIDS)

Effective core parameters

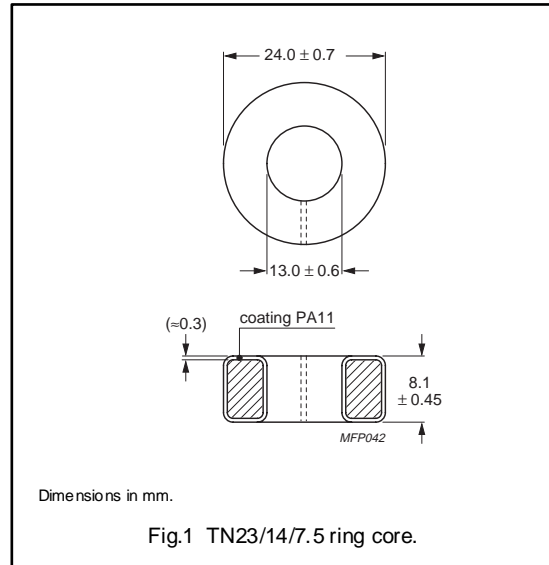
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.69	mm <sup>-1</sup>
$V_e$	effective volume	1845	mm <sup>3</sup>
$l_e$	effective length	55.8	mm
$A_e$	effective area	33.1	mm <sup>2</sup>
m	mass of core	≈ 9.0	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).  
The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C20	65 ± 15%	≈ 90	TN23/14/7.5-3C20-A65
	90 ± 15%	≈ 125	TN23/14/7.5-3C20-A90
	106 ± 15%	≈ 147	TN23/14/7.5-3C20-A106
	115 ± 15%	≈ 160	TN23/14/7.5-3C20-A115
	124 ± 15%	≈ 173	TN23/14/7.5-3C20-A124

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 1200 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C20	~ 400	≤ 0.16	≤ 1.1

Gapped ferrite toroids

TN26/15/11

RING CORES (TOROIDS)

Effective core parameters

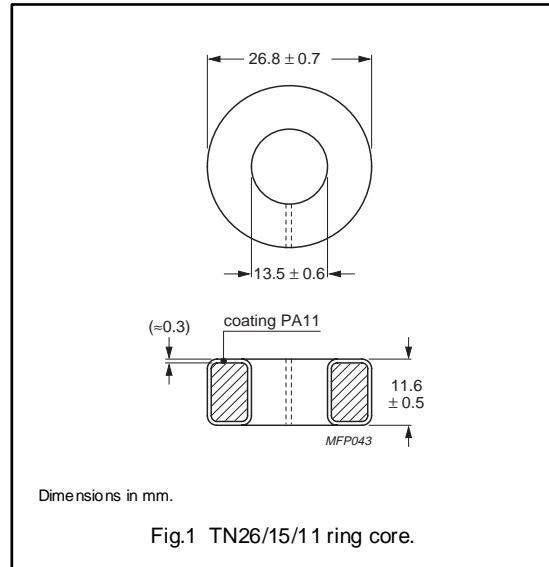
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	0.982	mm <sup>-1</sup>
$V_e$	effective volume	3700	mm <sup>3</sup>
$l_e$	effective length	60.1	mm
$A_e$	effective area	61.5	mm <sup>2</sup>
m	mass of core	≈ 19	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).  
The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C20	113 ± 15%	≈ 90	TN26/15/11-3C20-A113
	157 ± 15%	≈ 125	TN26/15/11-3C20-A157
	185 ± 15%	≈ 147	TN26/15/11-3C20-A185
	201 ± 15%	≈ 160	TN26/15/11-3C20-A201
	217 ± 15%	≈ 173	TN26/15/11-3C20-A217

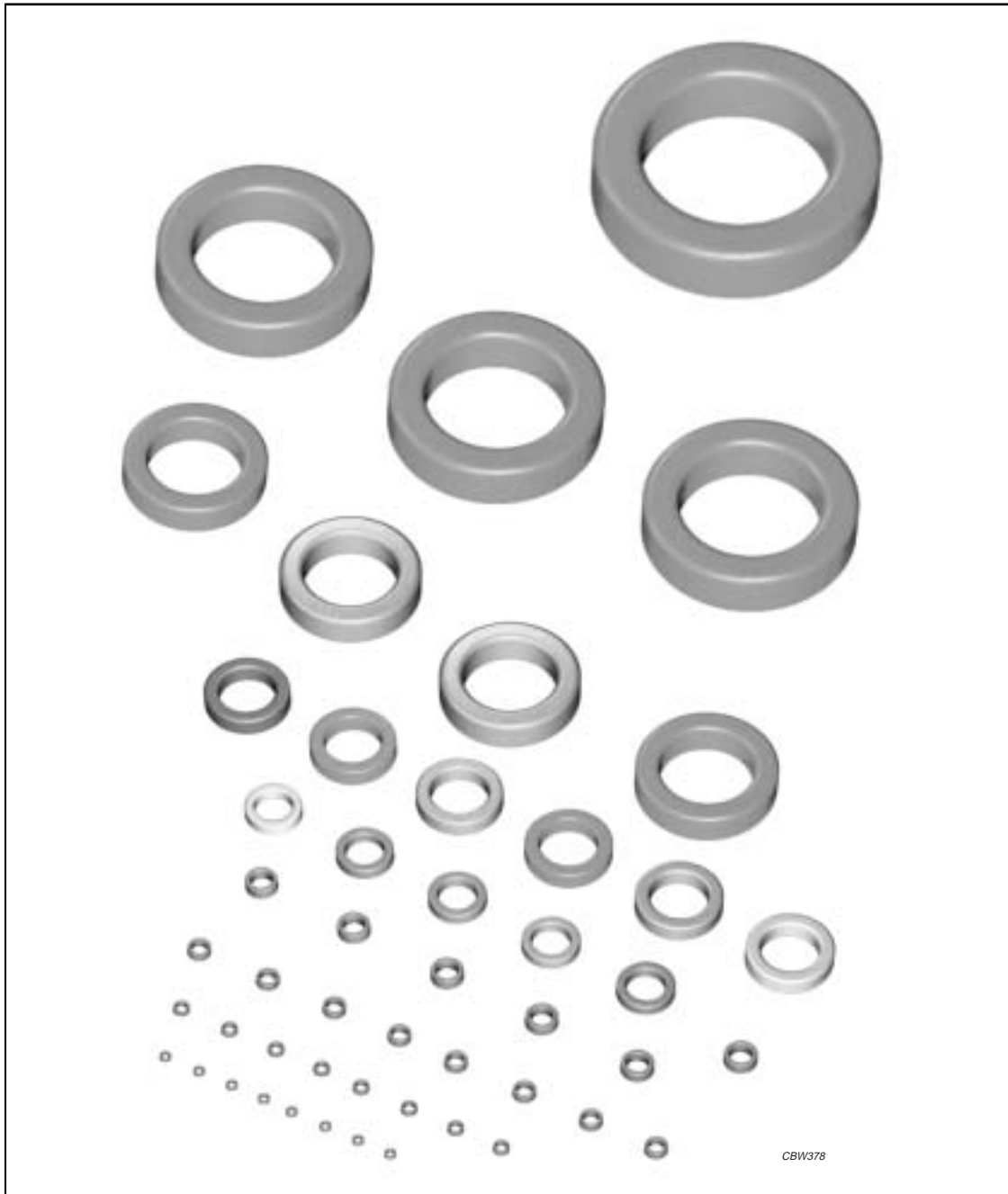
Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at	
	H = 1200 A/m; f = 10 kHz; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 100 kHz; B = 200 mT; T = 100 °C
3C20	~ 400	≤ 0.33	≤ 2.2



Soft Ferrites

Ferrite toroids



CBW378

## Soft Ferrites

## Ferrite toroids

## PRODUCT OVERVIEW AND TYPE NUMBER STRUCTURE

## Product overview Ferrite ring cores (toroids)

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)	CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
TC2.5/1.3/0.8	2.7	0.49	0.012	TC9.5/4.8/3.2	148	7.16	0.70
TC2.5/1.3/1.3	4.29	0.76	0.022	TN10/6/4	188	7.8	0.95
TC2.5/1.3/2.5	8.57	1.55	0.044	TX10/6/4	188	7.8	0.95
TC2.5/1.5/0.8	2.21	0.37	0.012	TX13/7.1/4.8	361	12.3	1.8
TC2.5/1.5/1	2.94	0.49	0.015	TN13/7.5/5	368	12.2	1.8
TC3.1/1.3/1.3	6.35	1.06	0.033	TX13/7.5/5	368	12.2	1.8
TC3.1/1.8/2	9.10	1.26	0.05	TX13/7.9/6.4	442	14.1	2.2
TC3.4/1.8/1.3	7.3	0.96	0.035	TN14/9/5	430	12.3	2.1
TC3.4/1.8/2	11.6	1.54	0.06	TX14/9/5	430	12.3	2.1
TC3.4/1.8/2.1	11.5	1.52	0.06	TN14/9/9	774	22.1	3.8
TC3.4/1.8/2.3	14.0	1.83	0.068	TX14/9/9	774	22.1	3.8
TC3.5/1.6/1.3	8.3	1.15	0.043	TX16/9.1/4.7	548	14.7	2.7
TC3.5/1.8/1.3	7.87	1.03	0.04	TN16/9.6/6.3	760	19.7	3.8
TC3.5/1.8/1.8	11.0	1.44	0.06	TX16/9.6/6.3	760	19.7	3.8
TC3.5/1.8/2	12.4	1.62	0.05	TN19/11/10	1795	40.8	9.2
TC3.9/1.8/1.8	14.8	1.83	0.09	TN19/11/15	2692	61.2	13.8
TC3.9/1.8/2.5	21.1	2.6	0.12	TN20/10/7	1465	33.6	7.7
TC3.9/2.2/1.3	9.2	1.0	0.045	TX20/10/7	1465	33.6	7.7
TC4/1.8/0.8	6.43	0.79	0.035	TX22/14/6.4	1340	24.8	6.5
TC4/2/2	16.7	1.92	0.095	TX22/14/13	2750	50.9	14
TC4/2.2/1.1	8.8	0.96	0.04	TN23/14/7	1722	30.9	8.4
TC4/2.2/1.3	9.8	1.07	0.05	TN25/15/10	2944	48.9	15
TC4/2.2/1.6	12.9	1.40	0.06	TX25/15/10	2944	48.9	15
TC4/2.2/1.8	14.4	1.56	0.07	TN26/15/10	3360	55.9	17
TC4/2.2/2	16.1	1.75	0.08	TX26/15/10	3360	55.9	17
TC4.8/2.3/1.3	15.5	1.52	0.09	TN26/15/20	6720	112	34
TC5.8/3.1/0.8	13.2	1.01	0.07	TN29/11/6	2680	50.8	14
TC5.8/3.1/1.5	26.1	2.00	0.13	TN29/19/7.5	2700	36.9	13.5
TC5.8/3.1/3.2	55.8	4.28	0.31	TX29/19/7.5	2700	36.9	13.5
TC5.9/3.1/3.1	53.8	4.12	0.14	TX29/19/7.6	2600	35.5	13
TC6/4/2	30.2	1.97	0.15	TN29/19/15	5410	73.9	28
TC6/4/3	45.2	2.96	0.23	TX29/19/15	5410	73.9	28
TC6.3/3.8/2.5	46.5	3.06	0.23	TN32/19/13	5820	76.5	29
TC7.6/3.2/4.8	148	9.92	0.70	TX32/19/13	5820	76.5	29
TC7.6/3.2/5.2	160	10.6	0.75	TX36/23/10	5820	64.9	28
TC8.2/3.7/4	144	8.50	0.70	TX36/23/15	8740	97.5	40
TC9/6/3	102	4.44	0.50	TX39/20/13	9513	112	45
TN9/6/3	102	4.44	0.50	TX42/26/13	9860	95.8	53
TX9/6/3	102	4.44	0.50	TX42/26/18	13810	134	55

**Soft Ferrites**

**Ferrite toroids**

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	MASS (g)
TX50/30/19	2 2378	186	100
TX51/32/19	21 500	172	100
TX55/32/18	26 580	202	100
TX58/41/18	23 200	152	110
TX63/38/25	46 500	306	220
TX74/39/13	34 300	208	170
TX80/40/15	50 200	288	240
TX87/54/14	46 400	217	220
T87/56/13	42 133	194	200
TX102/66/15	68 200	267	325
T107/65/18	96 000	370	456
TX107/65/18	96 000	370	456
T107/65/25	133 000	514	680
T140/106/25	161 100	422	800
TX140/106/25	161 100	422	800

• In accordance with IEC 61604.

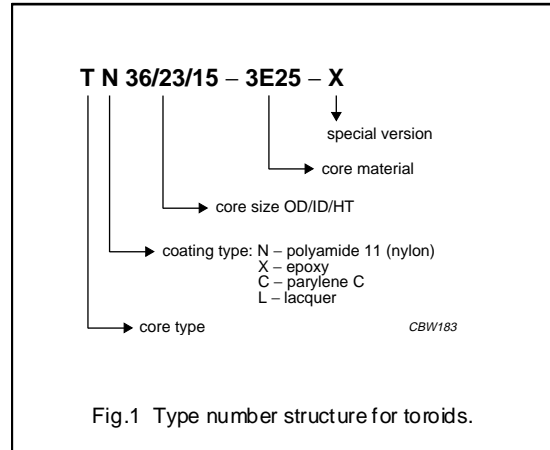


Fig.1 Type number structure for toroids.

Ferrite toroids

TC2.5/1.3/0.8

RING CORES (TOROIDS)

Effective core parameters

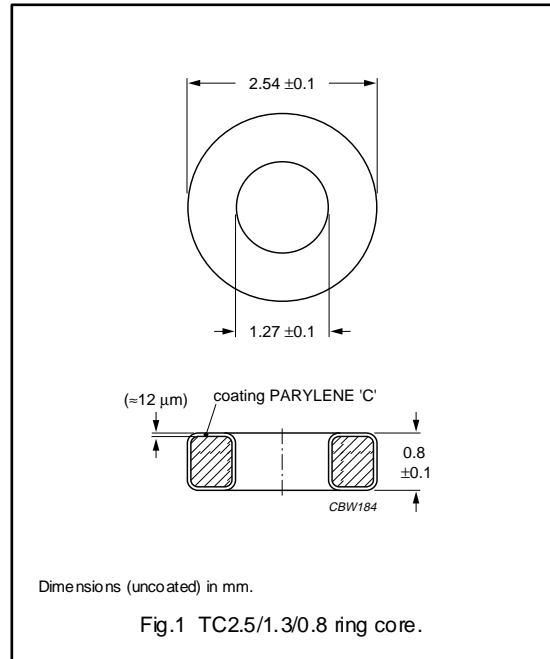
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	11.3	mm <sup>-1</sup>
$V_e$	effective volume	2.7	mm <sup>3</sup>
$l_e$	effective length	5.53	mm
$A_e$	effective area	0.49	mm <sup>2</sup>
m	mass of core	≈0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	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

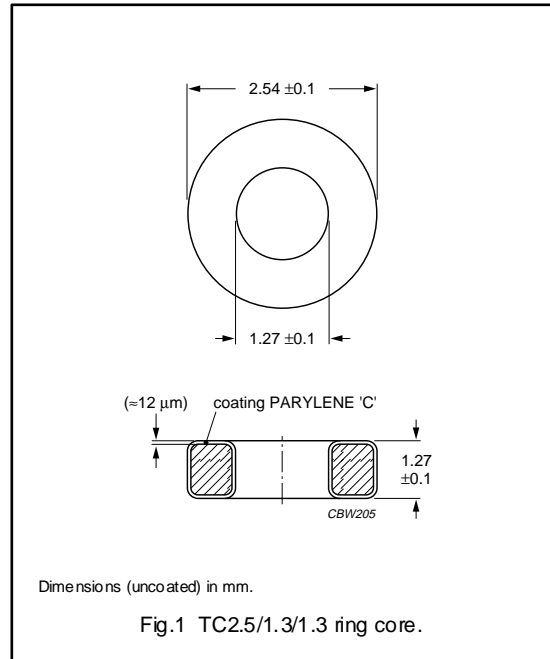
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.14	mm <sup>-1</sup>
$V_e$	effective volume	4.29	mm <sup>3</sup>
$l_e$	effective length	5.53	mm
$A_e$	effective area	0.76	mm <sup>2</sup>
m	mass of core	≈ 0.022	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11 <small>des</small>	150 ± 25%	≈ 850	TC2.5/1.3/1.3-4A11
3S4 <small>des</small>	300 ± 25%	≈ 1700	TC2.5/1.3/1.3-3S4
3E25 <small>des</small>	970 ± 30%	≈ 5500	TC2.5/1.3/1.3-3E25
3E6 <small>des</small>	1835 ± 30%	≈ 10000	TC2.5/1.3/1.3-3E6 <sup>(1)</sup>

Note

1. Maximum tolerances on mechanical dimensions are ± 0.13 mm.

Ferrite toroids

TC2.5/1.3/2.5

RING CORES (TOROIDS)

Effective core parameters

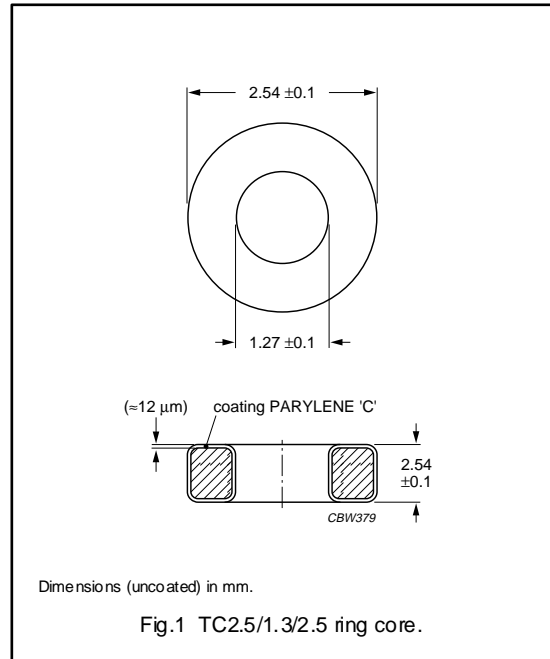
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.57	mm <sup>-1</sup>
$V_e$	effective volume	8.57	mm <sup>3</sup>
$l_e$	effective length	5.53	mm
$A_e$	effective area	1.55	mm <sup>2</sup>
m	mass of core	≈0.044	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	1400 ± 25%	≈4000	TC2.5/1.3/2.5-3E28

Ferrite toroids

TC2.5/1.5/0.8

RING CORES (TOROIDS)

Effective core parameters

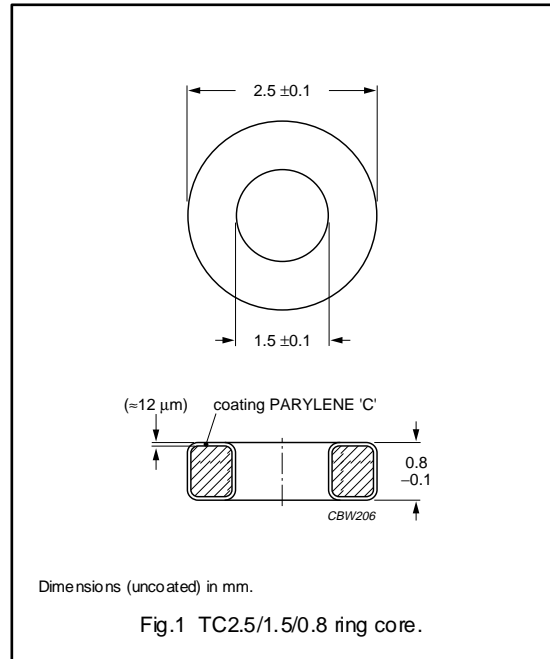
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	16.4	mm <sup>-1</sup>
$V_e$	effective volume	2.21	mm <sup>3</sup>
$l_e$	effective length	6.02	mm
$A_e$	effective area	0.37	mm <sup>2</sup>
m	mass of core	≈ 0.012	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E6 <small>des</small>	765 ± 30%	≈ 10000	TC2.5/1.5/0.8-3E6

Ferrite toroids

TC2.5/1.5/1

RING CORES (TOROIDS)

Effective core parameters

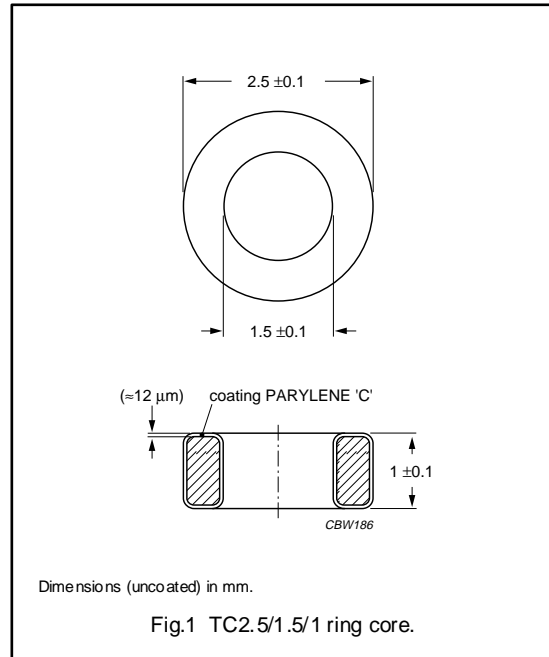
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	12.3	mm <sup>-1</sup>
$V_e$	effective volume	2.94	mm <sup>3</sup>
$l_e$	effective length	6.02	mm
$A_e$	effective area	0.489	mm <sup>2</sup>
m	mass of core	≈0.015	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11 <small>des</small>	87 ± 25%	≈ 700 <sup>(1)</sup>	TC2.5/1.5/1-4A11
3E28 <small>des</small>	410 ± 25%	≈ 4000	TC2.5/1.5/1-3E28
3E27 <small>des</small>	513 ± 20%	≈ 5500	TC2.5/1.5/1-3E27
3E5 <small>des</small>	920 ± 30%	≈ 9000	TC2.5/1.5/1-3E5
3E6 <small>des</small>	1020 ± 30%	≈ 10000	TC2.5/1.5/1-3E6

1. Old permeability specification maintained.

Ferrite toroids

TC3.1/1.3/1.3

RING CORES (TOROIDS)

Effective core parameters

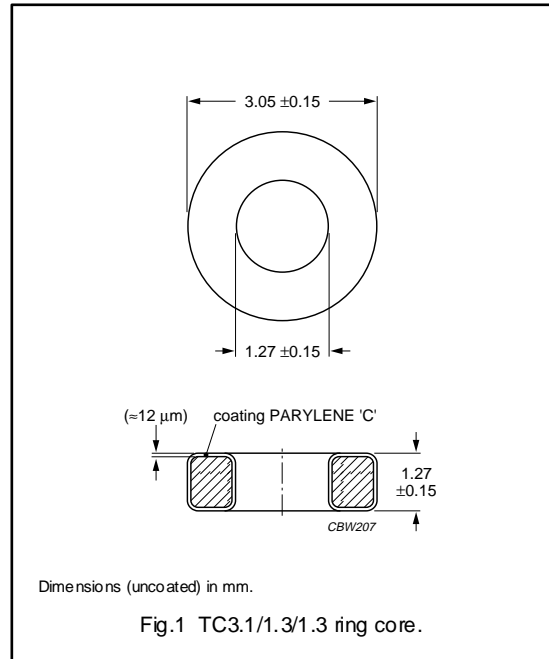
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.65	mm <sup>-1</sup>
$V_e$	effective volume	6.35	mm <sup>3</sup>
$l_e$	effective length	5.99	mm
$A_e$	effective area	1.06	mm <sup>2</sup>
m	mass of core	≈ 0.033	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11 <small>des</small>	190 ± 20%	≈ 850	TC3.1/1.3/1.3-4A11
3E25 <small>des</small>	1225 ± 25%	≈ 5500	TC3.1/1.3/1.3-3E25
3E6 <small>des</small>	2225 ± 30%	≈ 10000	TC3.1/1.3/1.3-3E6

Ferrite toroids

TC3.1/1.8/2

RING CORES (TOROIDS)

Effective core parameters

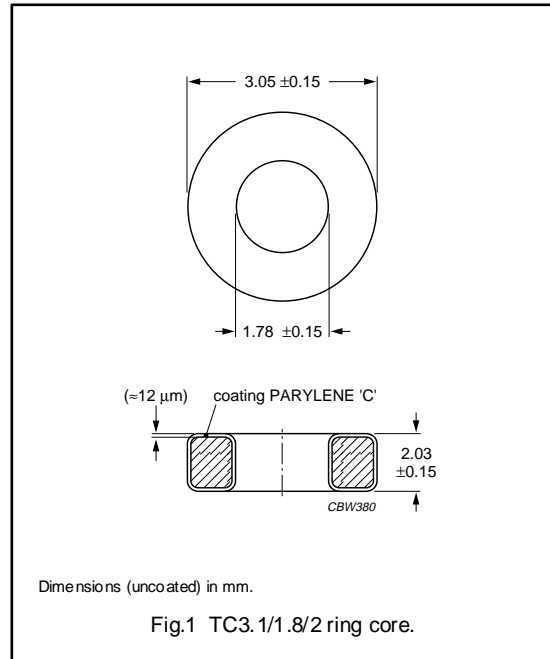
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.75	mm <sup>-1</sup>
$V_e$	effective volume	9.10	mm <sup>3</sup>
$l_e$	effective length	7.23	mm
$A_e$	effective area	1.26	mm <sup>2</sup>
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	1100 ± 25%	≈ 5000	TC3.1/1.8/2-3E28

Ferrite toroids

TC3.4/1.8/1.3

RING CORES (TOROIDS)

Effective core parameters

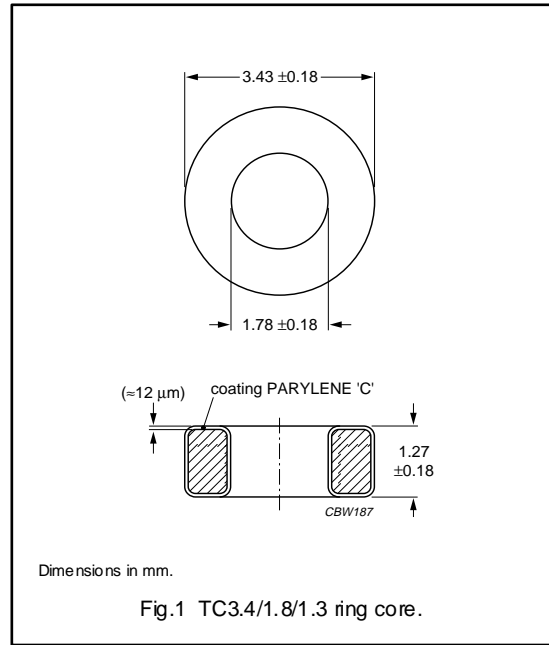
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.93	mm <sup>-1</sup>
$V_e$	effective volume	7.3	mm <sup>3</sup>
$l_e$	effective length	7.62	mm
$A_e$	effective area	0.96	mm <sup>2</sup>
m	mass of core	≈ 0.035	g

Coating

The cores are coated with parylene C; flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3D3 <sup>sup</sup>	110 ± 20%	≈ 750	TC3.4/1.8/1.3-3D3
3B7 <sup>sup</sup>	375 ± 20%	≈ 2300	TC3.4/1.8/1.3-3B7
3E27	660 ± 20%	≈ 4200	TC3.4/1.8/1.3-3E27
3E6 <sup>des</sup>	1580 ± 30%	≈ 10000	TC3.4/1.8/1.3-3E6

Ferrite toroids

TC3.4/1.8/2

RING CORES (TOROIDS)

Effective core parameters

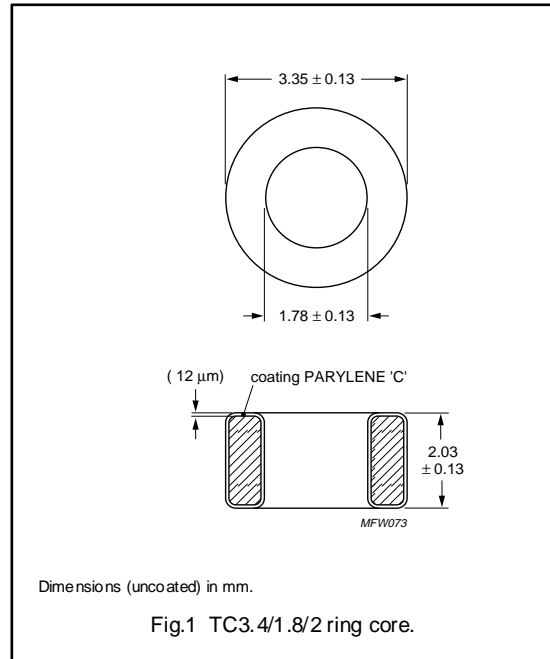
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.9	mm <sup>-1</sup>
$V_e$	effective volume	11.6	mm <sup>3</sup>
$l_e$	effective length	7.54	mm
$A_e$	effective area	1.54	mm <sup>2</sup>
m	mass of core	≈ 0.059	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E25 <small>des</small>	1420 ± 25%	≈ 5500	TC3.4/1.8/2-3E25
3E7 <small>des</small>	3080 ± 30%	≈ 12000	TC3.4/1.8/2-3E7



Ferrite toroids

TC3.4/1.8/2.1

RING CORES (TOROIDS)

Effective core parameters

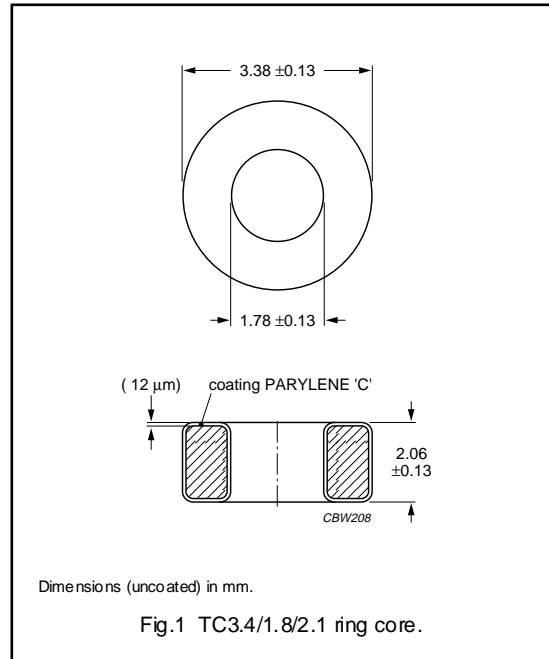
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.97	mm <sup>-1</sup>
$V_e$	effective volume	11.5	mm <sup>3</sup>
$l_e$	effective length	7.54	mm
$A_e$	effective area	1.52	mm <sup>2</sup>
m	mass of core	≈ 0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E25 <small>des</small>	1420 ± 25%	≈ 5600	TC3.4/1.8/2.1-3E25
3E28 <small>des</small>	1045 ± 25%	≈ 4000	TC3.4/1.8/2.1-3E28

Ferrite toroids

TC3.4/1.8/2.3

RING CORES (TOROIDS)

Effective core parameters

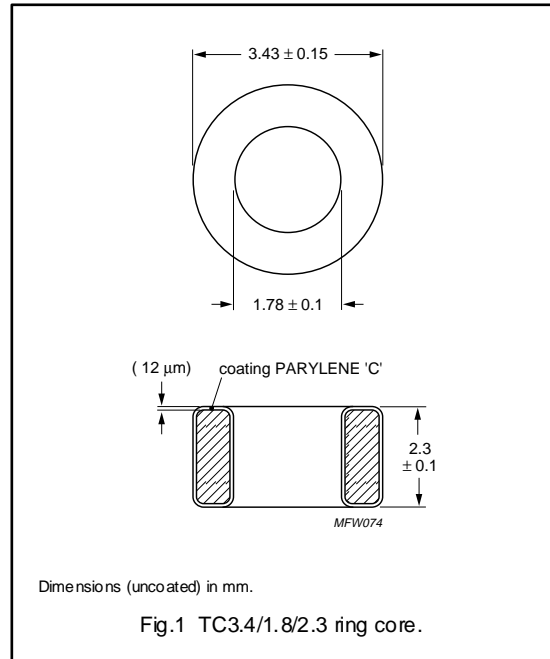
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.16	mm <sup>-1</sup>
$V_e$	effective volume	14.0	mm <sup>3</sup>
$l_e$	effective length	7.63	mm
$A_e$	effective area	1.83	mm <sup>2</sup>
m	mass of core	≈ 0.068	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	1207 ± 25%	≈ 4000	TC3.4/1.8/2.3-3E28

Ferrite toroids

TC3.5/1.6/1.3

RING CORES (TOROIDS)

Effective core parameters

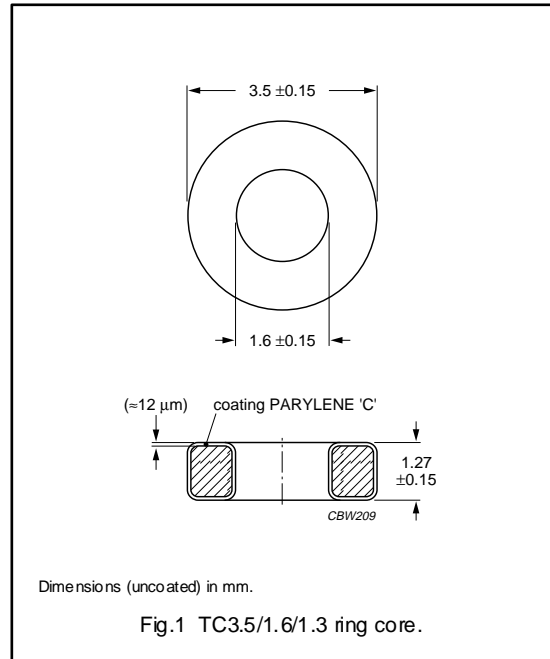
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.32	mm <sup>-1</sup>
$V_e$	effective volume	8.3	mm <sup>3</sup>
$l_e$	effective length	7.25	mm
$A_e$	effective area	1.15	mm <sup>2</sup>
m	mass of core	≈ 0.043	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	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

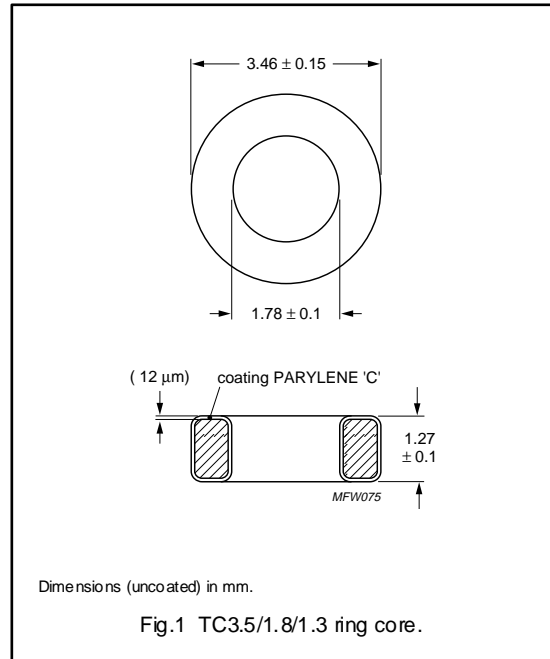
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.44	mm <sup>-1</sup>
$V_e$	effective volume	7.87	mm <sup>3</sup>
$l_e$	effective length	7.65	mm
$A_e$	effective area	1.03	mm <sup>2</sup>
m	mass of core	≈ 0.04	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11 <small>des</small>	144 ± 25%	≈ 850	TC3.5/1.8/1.3-4A11
3E27 <small>des</small>	930 ± 25%	≈ 5500	TC3.5/1.8/1.3-3E27

Ferrite toroids

TC3.5/1.8/1.8

RING CORES (TOROIDS)

Effective core parameters

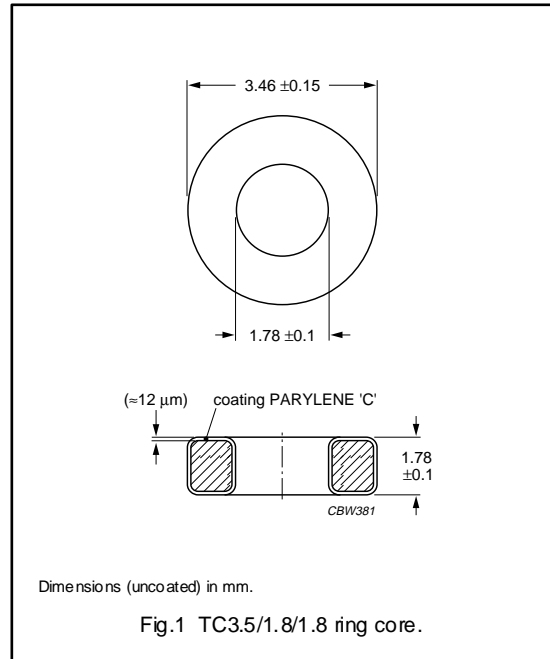
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.31	mm <sup>-1</sup>
$V_e$	effective volume	11.0	mm <sup>3</sup>
$l_e$	effective length	7.65	mm
$A_e$	effective area	1.44	mm <sup>2</sup>
m	mass of core	≈ 0.06	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	950 ± 25%	≈ 4000	TC3.5/1.8/1.8-3E28

Ferrite toroids

TC3.5/1.8/2

RING CORES (TOROIDS)

Effective core parameters

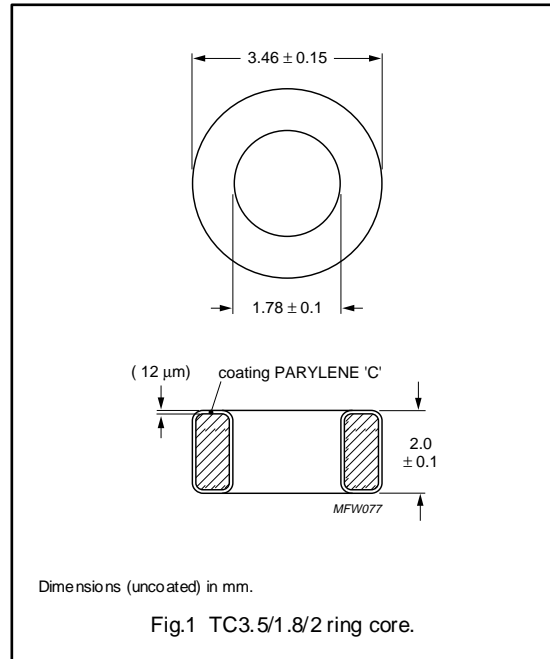
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.73	mm <sup>-1</sup>
$V_e$	effective volume	12.4	mm <sup>3</sup>
$l_e$	effective length	7.6	mm
$A_e$	effective area	1.62	mm <sup>2</sup>
m	mass of core	≈ 0.05	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	1060 ± 25%	≈ 4000	TC3.5/1.8/2-3E28

Ferrite toroids

TC3.9/1.8/1.8

RING CORES (TOROIDS)

Effective core parameters

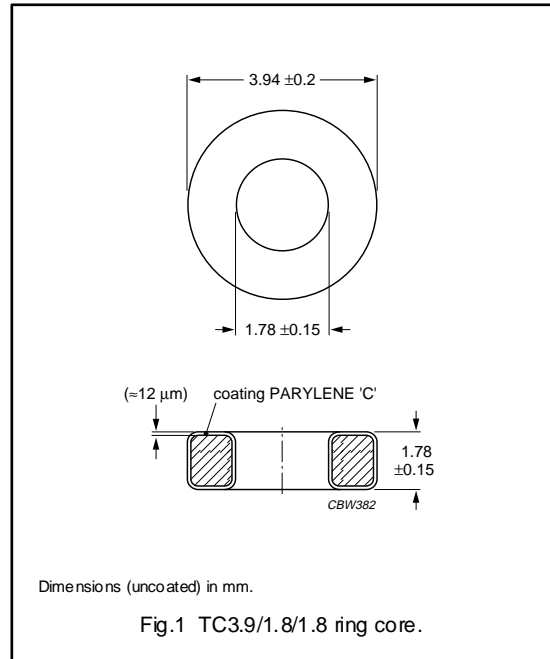
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.44	mm <sup>-1</sup>
$V_e$	effective volume	14.8	mm <sup>3</sup>
$l_e$	effective length	8.1	mm
$A_e$	effective area	1.83	mm <sup>2</sup>
m	mass of core	≈ 0.086	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	1400 ± 30%	≈ 5000	TC3.9/1.8/1.8-3E28

Ferrite toroids

TC3.9/1.8/2.5

RING CORES (TOROIDS)

Effective core parameters

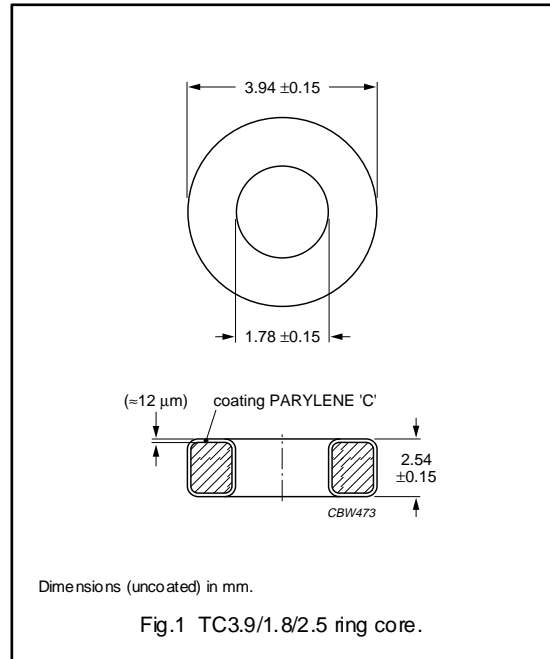
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.11	mm <sup>-1</sup>
$V_e$	effective volume	21.1	mm <sup>3</sup>
$l_e$	effective length	8.1	mm
$A_e$	effective area	2.6	mm <sup>2</sup>
m	mass of core	≈ 0.12	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	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

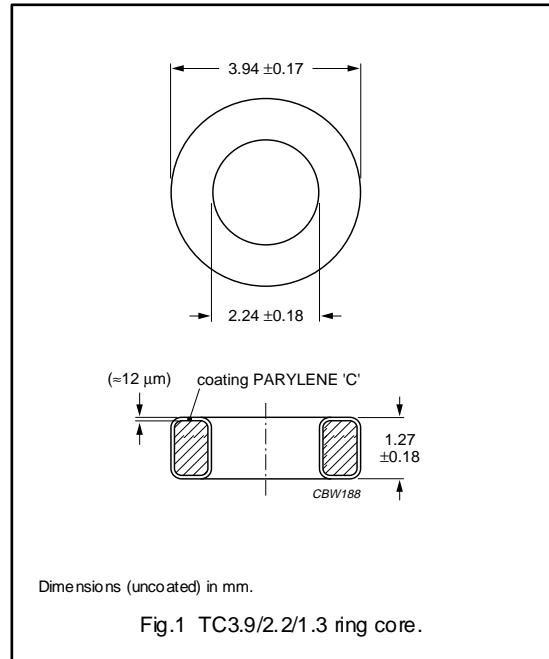
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.20	mm <sup>-1</sup>
$V_e$	effective volume	9.20	mm <sup>3</sup>
$l_e$	effective length	9.20	mm
$A_e$	effective area	1.00	mm <sup>2</sup>
m	mass of core	≈ 0.045	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3D3 <sup>sup</sup>	97 ± 20%	≈ 750	TC3.9/2.2/1.3-3D3
3B7 <sup>sup</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

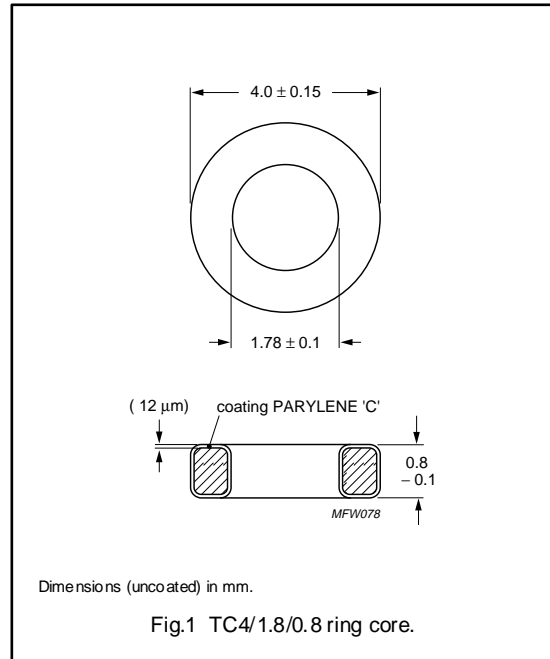
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	10.3	mm <sup>-1</sup>
$V_e$	effective volume	6.43	mm <sup>3</sup>
$l_e$	effective length	8.16	mm
$A_e$	effective area	0.79	mm <sup>2</sup>
m	mass of core	≈ 0.035	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	486 ± 25%	≈ 4000	TC4/1.8/0.8-3E28

Ferrite toroids

TC4/2/2

RING CORES (TOROIDS)

Effective core parameters

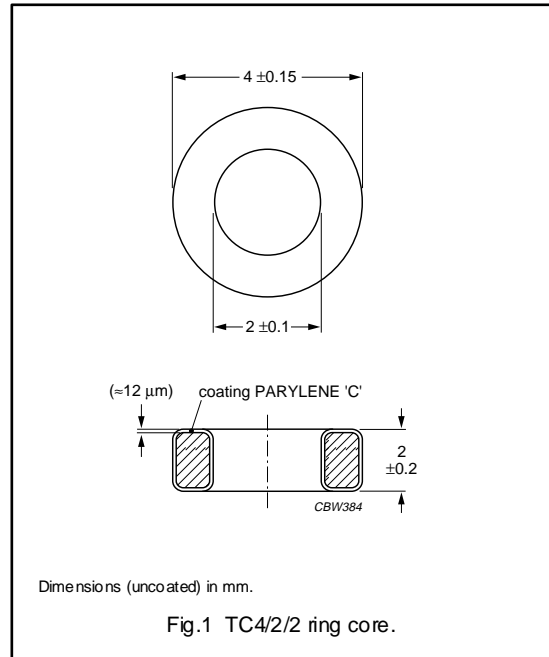
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.54	mm <sup>-1</sup>
$V_e$	effective volume	16.7	mm <sup>3</sup>
$l_e$	effective length	8.71	mm
$A_e$	effective area	1.92	mm <sup>2</sup>
m	mass of core	≈ 0.095	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3C11	1 190 ± 25%	≈ 4300	TC4/2/2-3C11
3E28 <small>des</small>	1 110 ± 25%	≈ 4000	TC4/2/2-3E28
3E27 <small>des</small>	1623 ± 20%	≈ 5500	TC4/2/2-3E27

Ferrite toroids

TC4/2.2/1.1

RING CORES (TOROIDS)

Effective core parameters

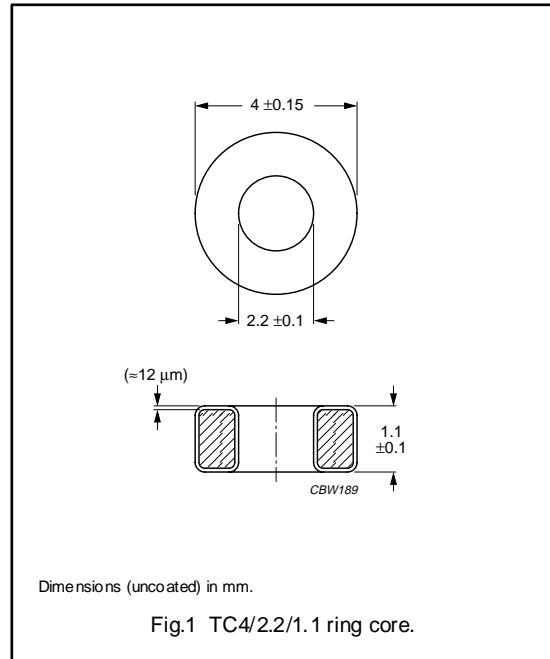
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	9.55	mm <sup>-1</sup>
$V_e$	effective volume	8.82	mm <sup>3</sup>
$l_e$	effective length	9.18	mm
$A_e$	effective area	0.961	mm <sup>2</sup>
m	mass of core	≈ 0.04	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4C65	16 ± 25%	≈ 125	TC4/2.2/1.1-4C65
4A11	92 ± 25%	≈ 700 <sup>(1)</sup>	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 <small>des</small>	1315 ± 30%	≈ 10 000	TC4/2.2/1.1-3E6

1. Old permeability specification maintained.

Ferrite toroids

TC4/2.2/1.3

**RING CORES (TOROIDS)**

**Effective core parameters**

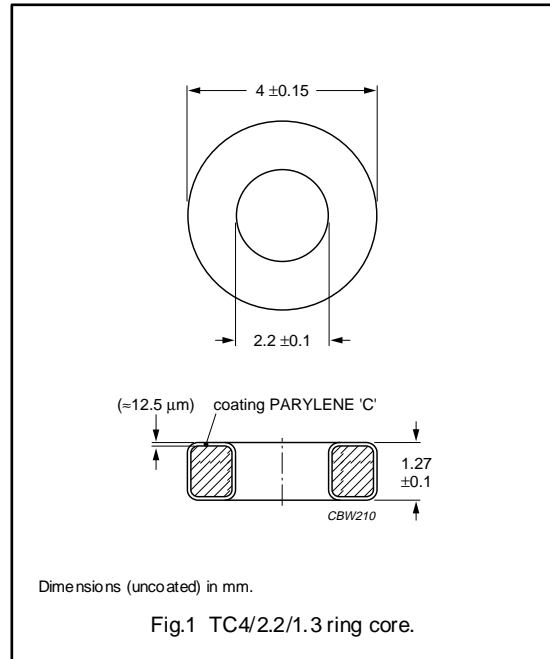
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	8.28	mm <sup>-1</sup>
$V_e$	effective volume	10.2	mm <sup>3</sup>
$l_e$	effective length	9.18	mm
$A_e$	effective area	1.11	mm <sup>2</sup>
m	mass of core	≈ 0.05	g

**Coating**

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

**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)	$\mu_i$	TYPE NUMBER
4A11	122 ± 20%	≈ 800	TC4/2.2/1.3-4A11
3E25	720 ± 25%	≈ 5500	TC4/2.2/1.3-3E25

**RING CORES (TOROIDS)**

**Effective core parameters**

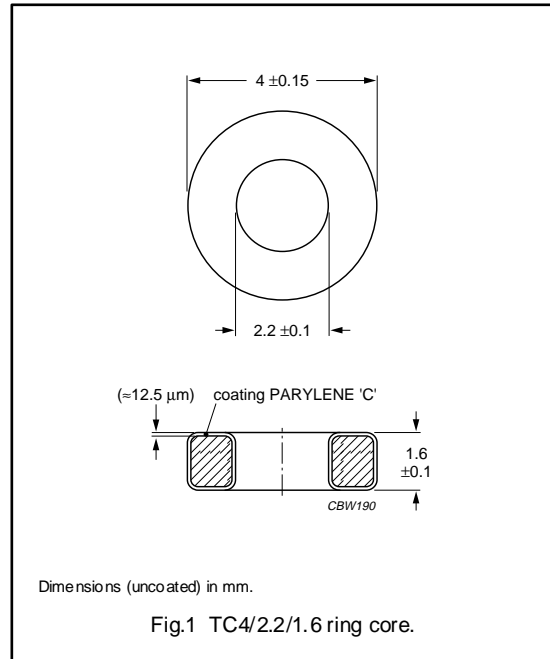
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.56	mm <sup>-1</sup>
$V_e$	effective volume	12.9	mm <sup>3</sup>
$l_e$	effective length	9.18	mm
$A_e$	effective area	1.4	mm <sup>2</sup>
m	mass of core	≈ 0.06	g

**Coating**

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

**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)	$\mu_i$	TYPE NUMBER
4C65	24 ± 25%	≈ 125	TC4/2.2/1.6-4C65
4A11	134 ± 25%	≈ 700 <sup>(1)</sup>	TC4/2.2/1.6-4A11
3S4 <small>des</small>	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 <small>des</small>	1915 ± 30%	≈ 10000	TC4/2.2/1.6-3E6

1. Old permeability specification maintained.

**RING CORES (TOROIDS)**

**Effective core parameters**

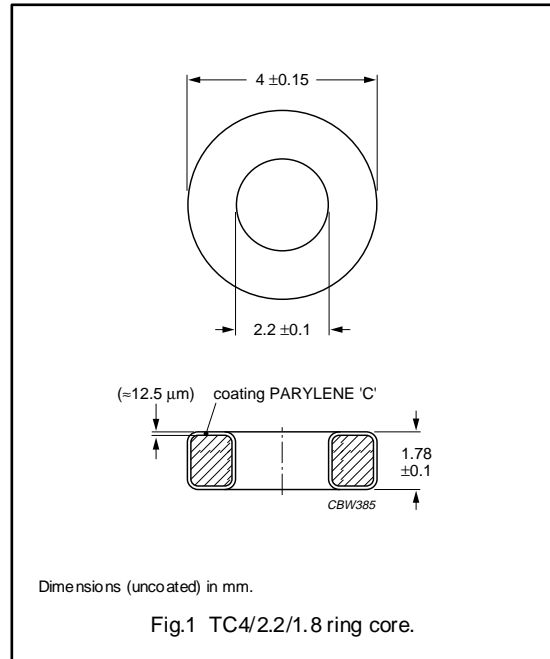
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.89	mm <sup>-1</sup>
$V_e$	effective volume	14.4	mm <sup>3</sup>
$l_e$	effective length	9.18	mm
$A_e$	effective area	1.56	mm <sup>2</sup>
m	mass of core	≈ 0.07	g

**Coating**

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

**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)	$\mu_i$	TYPE NUMBER
3E6 <small>des</small>	2130 ± 30%	≈ 10000	TC4/2.2/1.8-3E6

Ferrite toroids

TC4/2.2/2

RING CORES (TOROIDS)

Effective core parameters

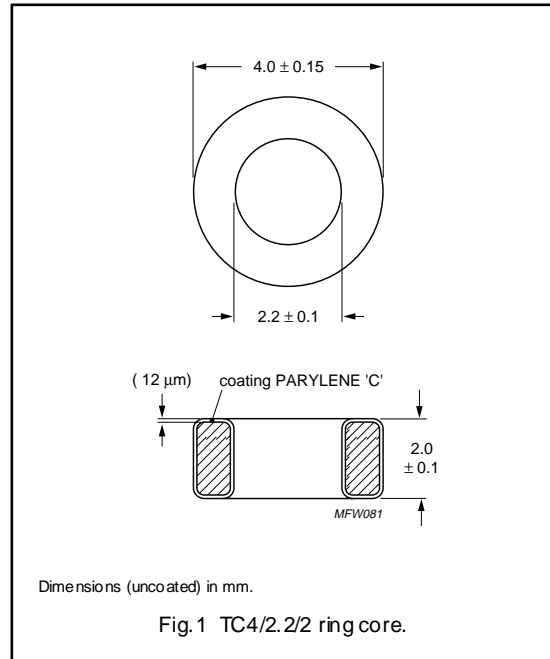
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.26	mm <sup>-1</sup>
$V_e$	effective volume	16.1	mm <sup>3</sup>
$l_e$	effective length	9.18	mm
$A_e$	effective area	1.75	mm <sup>2</sup>
m	mass of core	≈ 0.08	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E25 <small>des</small>	1315 ± 30%	≈ 5500	TC4/2.2/2-3E25
3E8 <small>prot</small>	3590 ± 30%	≈ 15000	TC4/2.2/2-3E8



Ferrite toroids

TC4.8/2.3/1.3

RING CORES (TOROIDS)

Effective core parameters

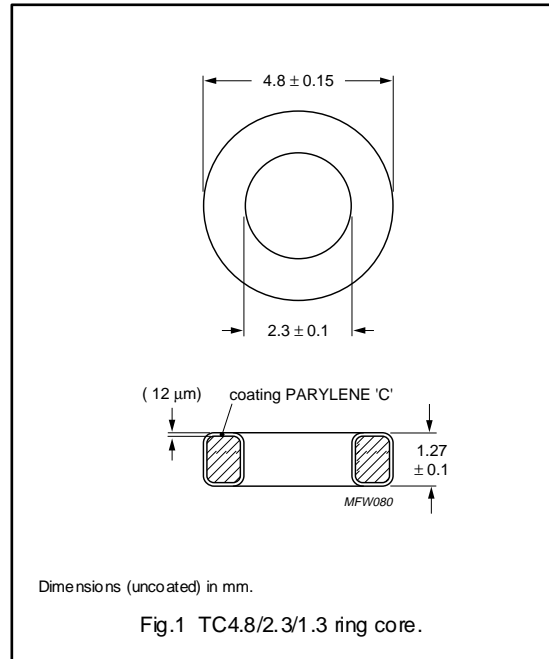
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.73	mm <sup>-1</sup>
$V_e$	effective volume	15.5	mm <sup>3</sup>
$l_e$	effective length	10.2	mm
$A_e$	effective area	1.52	mm <sup>2</sup>
m	mass of core	≈ 0.09	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E27 <small>des</small>	1030 ± 25%	≈ 5500	TC4.8/2.3/1.3-3E27
3B7 <small>sup</small>	430 ± 20%	≈ 2300	TC4.8/2.3/1.3-3B7

Ferrite toroids

TC5.8/3.1/0.8

RING CORES (TOROIDS)

Effective core parameters

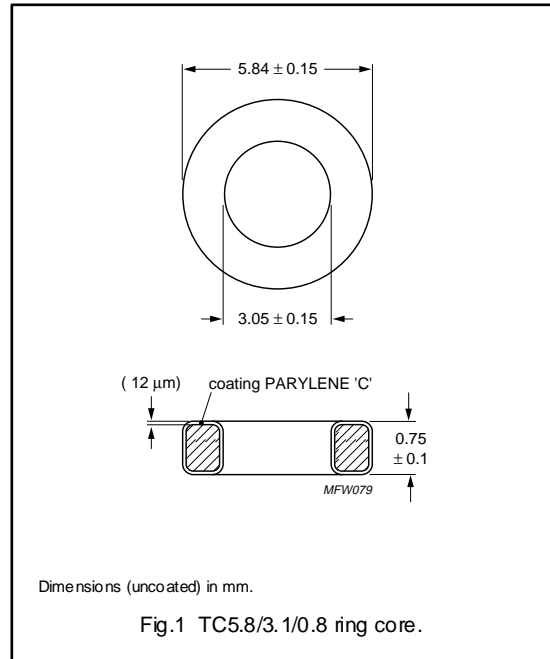
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	12.9	mm <sup>-1</sup>
$V_e$	effective volume	13.2	mm <sup>3</sup>
$l_e$	effective length	13.0	mm
$A_e$	effective area	1.01	mm <sup>2</sup>
m	mass of core	≈ 0.07	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	390 ± 25%	≈ 4000	TC5.8/3.1/0.8-3E28

Ferrite toroids

TC5.8/3.1/1.5

RING CORES (TOROIDS)

Effective core parameters

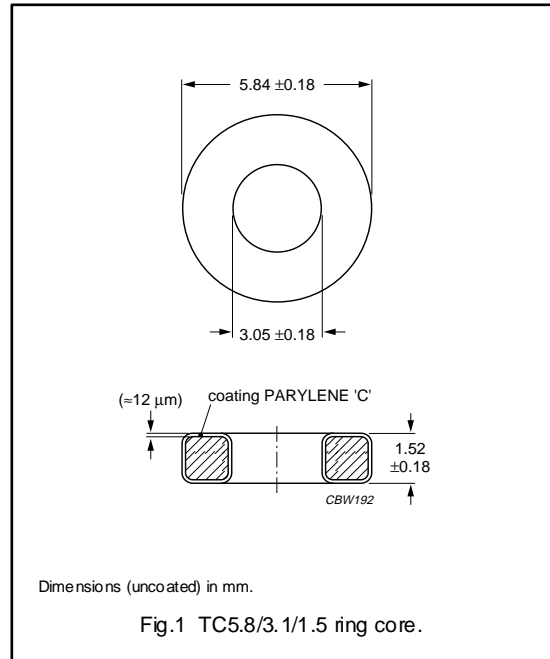
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	6.52	mm <sup>-1</sup>
$V_e$	effective volume	26.1	mm <sup>3</sup>
$l_e$	effective length	13.0	mm
$A_e$	effective area	2.00	mm <sup>2</sup>
m	mass of core	≈ 0.13	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4C65	25 ± 25%	≈ 125	TC5.8/3.1/1.5-4C65
4B1 <small>des</small>	50 ± 25%	≈ 250	TC5.8/3.1/1.5-4B1
3B7 <small>sup</small>	450 ± 20%	≈ 2300	TC5.8/3.1/1.5-3B7 <sup>(1)</sup>
3E27	890 ± 20%	≈ 4600	TC5.8/3.1/1.5-3E27
3E6	1960 ± 30%	≈ 9925	TC5.8/3.1/1.5-3E6
3E8 <small>prot</small>	2940 ± 30%	≈ 15000	TC5.8/3.1/1.5-3E8

Note

1. OD = 6 ± 0.18

Ferrite toroids

TC5.8/3.1/3.2

RING CORES (TOROIDS)

Effective core parameters

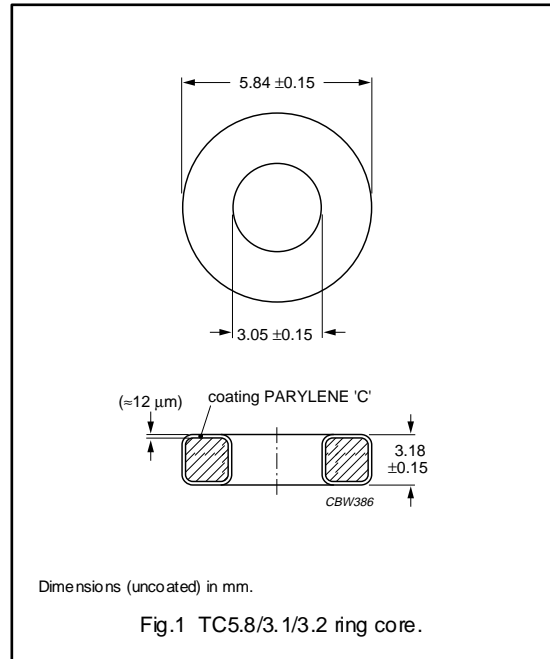
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.04	mm <sup>-1</sup>
$V_e$	effective volume	55.8	mm <sup>3</sup>
$l_e$	effective length	13.0	mm
$A_e$	effective area	4.28	mm <sup>2</sup>
m	mass of core	≈ 0.31	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3D3 <span style="border: 1px solid black; padding: 0 2px;">des</span>	310 ± 20%	≈ 750	TC5.8/3.1/3.2-3D3
3B7 <span style="border: 1px solid black; padding: 0 2px;">sup</span>	940 ± 25%	≈ 2300	TC5.8/3.1/3.2-3B7 <sup>(1)</sup>
3E28 <span style="border: 1px solid black; padding: 0 2px;">des</span>	1650 ± 25%	≈ 4000	TC5.8/3.1/3.2-3E28
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	4130 ± 30%	≈ 10000	TC5.8/3.1/3.2-3E6

Note

1. Dimensions with coating.

Ferrite toroids

TC5.9/3.1/3.1

RING CORES (TOROIDS)

Effective core parameters

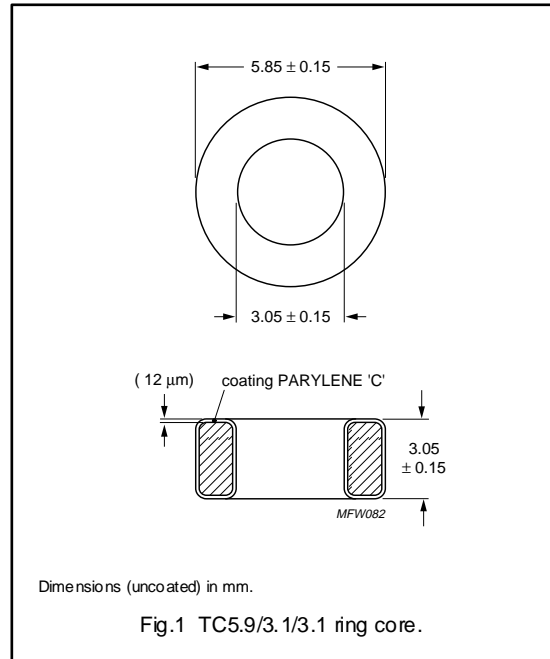
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.16	mm <sup>-1</sup>
$V_e$	effective volume	53.8	mm <sup>3</sup>
$l_e$	effective length	13.0	mm
$A_e$	effective area	4.12	mm <sup>2</sup>
m	mass of core	≈ 0.14	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E6 <small>des</small>	3960 ± 30%	≈ 10000	TC5.9/3.1/3.1-3E6

**RING CORES (TOROIDS)**

**Effective core parameters**

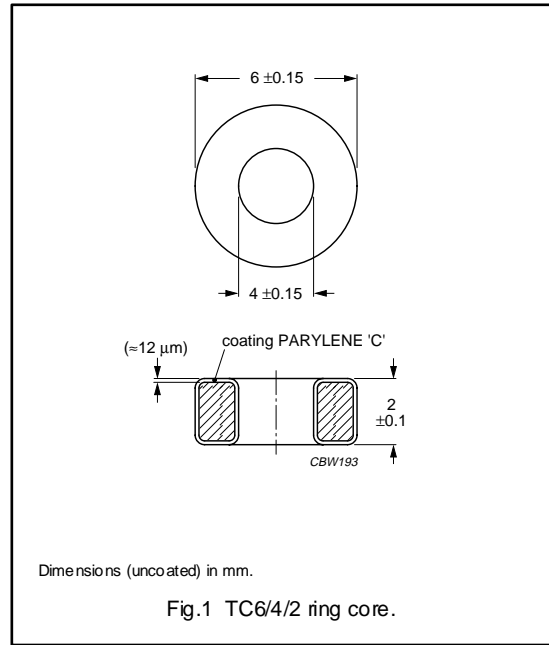
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	7.75	mm <sup>-1</sup>
$V_e$	effective volume	30.2	mm <sup>3</sup>
$l_e$	effective length	15.3	mm
$A_e$	effective area	1.97	mm <sup>2</sup>
m	mass of core	≈ 0.15	g

**Coating**

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

**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)	$\mu_i$	TYPE NUMBER
4C65	20 ± 25%	≈ 125	TC6/4/2-4C65
4A11	114 ± 25%	≈ 700 <sup>(1)</sup>	TC6/4/2-4A11
3S4 <small>des</small>	275 ± 25%	≈ 1 700	TC6/4/2-3S4
3F3	325 ± 25%	≈ 2 000	TC6/4/2-3F3
3E25	890 ± 30%	≈ 5 500	TC6/4/2-3E25
3E5	1380 ± 30%	≈ 8 500	TC6/4/2-3E5
3E6 <small>des</small>	1620 ± 30%	≈ 10 000	TC6/4/2-3E6

1. Old permeability specification maintained.

Ferrite toroids

TC6/4/3

RING CORES (TOROIDS)

Effective core parameters

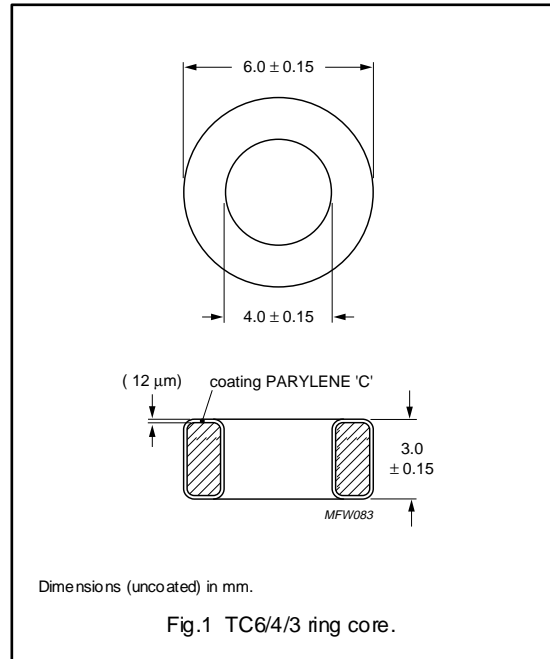
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.17	mm <sup>-1</sup>
$V_e$	effective volume	45.2	mm <sup>3</sup>
$l_e$	effective length	15.3	mm
$A_e$	effective area	2.96	mm <sup>2</sup>
m	mass of core	≈ 0.23	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E6 <small>des</small>	2430 ± 30%	≈ 10000	TC6/4/3-3E6

Ferrite toroids

TC6.3/3.8/2.5

RING CORES (TOROIDS)

Effective core parameters

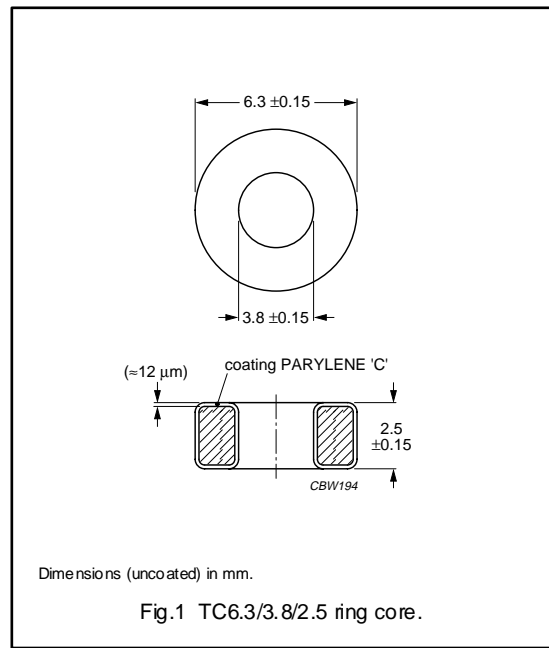
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	4.97	mm <sup>-1</sup>
$V_e$	effective volume	46.5	mm <sup>3</sup>
$l_e$	effective length	15.2	mm
$A_e$	effective area	3.06	mm <sup>2</sup>
m	mass of core	≈ 0.23	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11	177 ± 25%	≈ 700 <sup>(1)</sup>	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 <span style="border: 1px solid black; padding: 0 2px;">des</span>	2530 ± 30%	≈ 10000	TC6.3/3.8/2.5-3E6
3E7 <span style="border: 1px solid black; padding: 0 2px;">des</span>	3600 + 30/- 40%	≈ 12000	TC6.3/3.8/2.5-3E7

1. Old permeability specification maintained.



Ferrite toroids

TC7.6/3.2/4.8

RING CORES (TOROIDS)

Effective core parameters

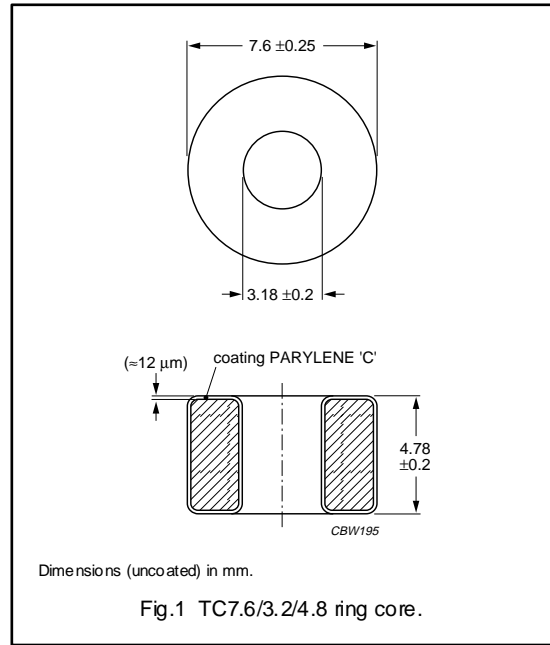
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.51	mm <sup>-1</sup>
$V_e$	effective volume	148	mm <sup>3</sup>
$l_e$	effective length	15.0	mm
$A_e$	effective area	9.92	mm <sup>2</sup>
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3C90	1915 ±25%	≈ 2300	TC7.6/3.2/4.8-3C90
3E28 <small>des</small>	3800 ±30%	≈ 4000	TC7.6/3.2/4.8-3E28
3E6 <small>des</small>	8360 ±30%	≈ 10000	TC7.6/3.2/4.8-3E6
3E8 <small>prot</small>	12500 ±30%	≈ 15000	TC7.6/3.2/4.8-3E8

Ferrite toroids

TC7.6/3.2/5.2

RING CORES (TOROIDS)

Effective core parameters

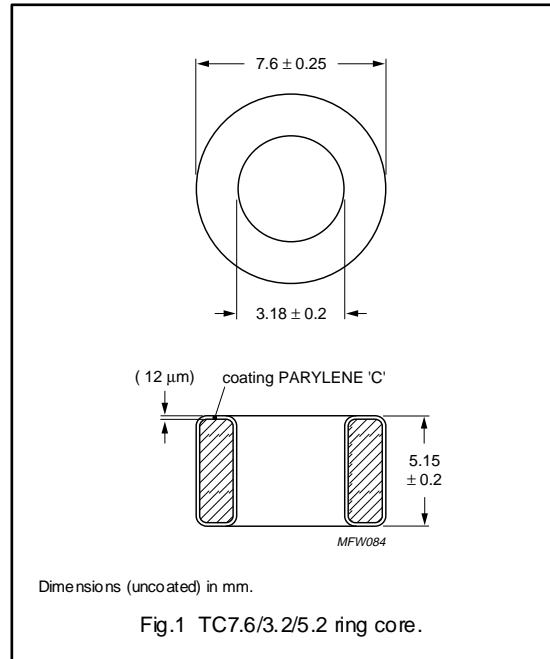
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.41	mm <sup>-1</sup>
$V_e$	effective volume	160	mm <sup>3</sup>
$l_e$	effective length	15.0	mm
$A_e$	effective area	10.6	mm <sup>2</sup>
m	mass of core	≈ 0.75	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E28 <small>des</small>	3580 ± 25%	≈ 4000	TC7.6/3.2/5.2-3E28

Ferrite toroids

TC8.2/3.7/4

RING CORES (TOROIDS)

Effective core parameters

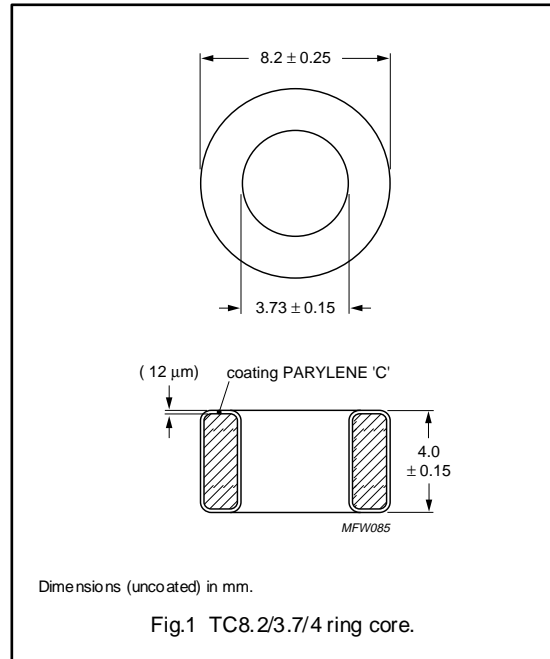
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.99	mm <sup>-1</sup>
$V_e$	effective volume	144	mm <sup>3</sup>
$l_e$	effective length	16.9	mm
$A_e$	effective area	8.5	mm <sup>2</sup>
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
4A11 <small>des</small>	440 ± 25%	≈ 700 <sup>(1)</sup>	TC8.2/3.7/4-4A11
3E7 <small>des</small>	7560 ± 30%	≈ 12000	TC8.2/3.7/4-3E7

1. Old permeability specification maintained.

Ferrite toroids

TC9/6/3

RING CORES (TOROIDS)

Effective core parameters

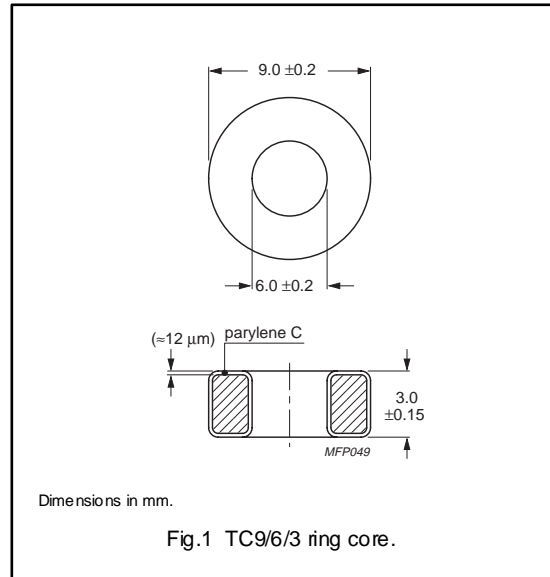
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.17	mm <sup>-1</sup>
$V_e$	effective volume	102	mm <sup>3</sup>
$l_e$	effective length	22.9	mm
$A_e$	effective area	4.44	mm <sup>2</sup>
m	mass of core	≈ 0.5	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3E5	2070 ± 30%	≈ 8500	TC9/6/3-3E5
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	2435 ± 30%	≈ 10000	TC9/6/3-3E6

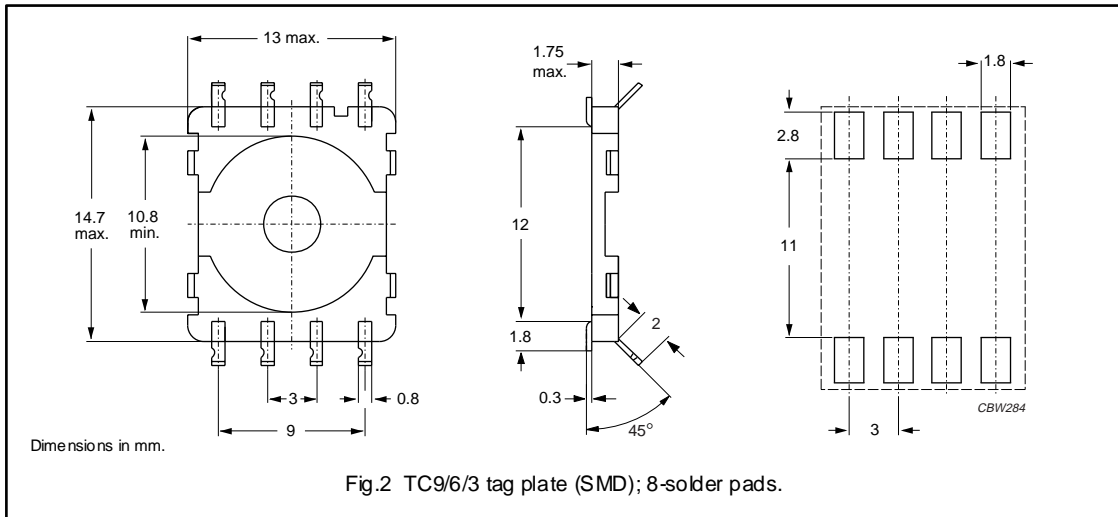
Ferrite toroids

TC9/6/3

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 (Sn) 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

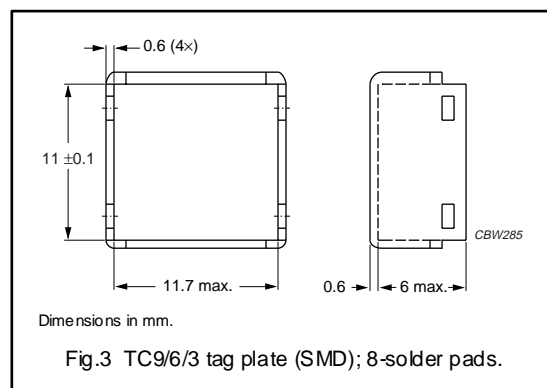


Type number information for TC9/6/3 tag plate (SMD) with 8 solder pads

NUMBER OF SOLDER PADS	TYPE NUMBER
8	TGPS-9-8P-Z

Cover data

PARAMETER	SPECIFICATION
Cover material	polyamide (PA4.6) glass reinforced, flame retardant in accordance with "UL 94V-0"
Maximum operating temperature	130 °C, "IEC 60085" class B
Type number	COV-9



**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.17	mm <sup>-1</sup>
$V_e$	effective volume	102	mm <sup>3</sup>
$l_e$	effective length	22.9	mm
$A_e$	effective area	4.44	mm <sup>2</sup>
m	mass of core	≈ 0.5	g

**Coating**

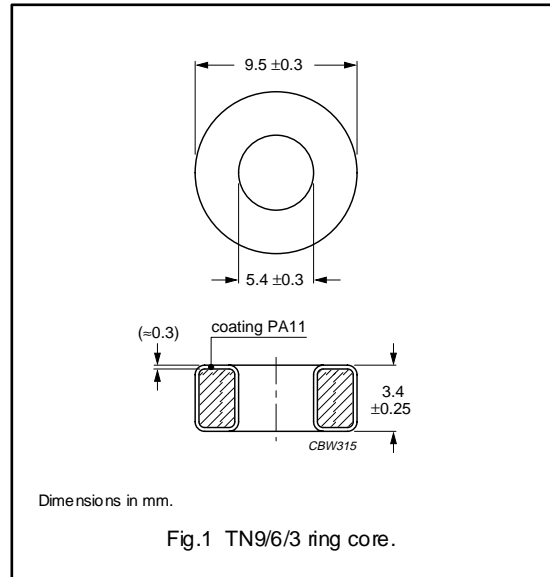
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
4C65	30 ± 25%	≈ 125	TN9/6/3-4C65
4A11	170 ± 25%	≈ 700 <sup>(1)</sup>	TN9/6/3-4A11
3R1 <sup>(2)</sup>	–	≈ 800	TN9/6/3-3R1
3F3	440 ± 25%	≈ 1800	TN9/6/3-3F3
3C90	560 ± 25%	≈ 2300	TN9/6/3-3C90
3E25	1340 ± 30%	≈ 5500	TN9/6/3-3E25

1. Old permeability specification maintained.
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.

<b>WARNING</b>
Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to "3R1" material specification in this data handbook.

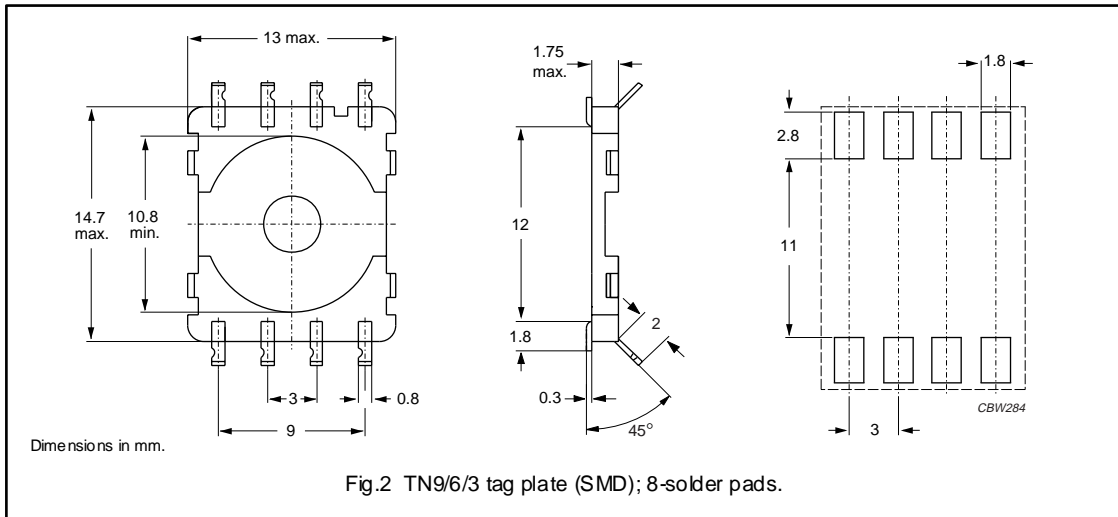
Ferrite toroids

TN9/6/3

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 (Sn) 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

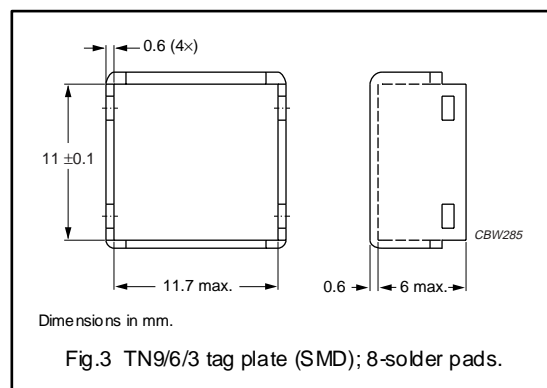


Type number information for TN9/6/3 tag plate (SMD) with 8 solder pads

NUMBER OF SOLDER PADS	TYPE NUMBER
8	TGPS-9-8P-Z

Cover data

PARAMETER	SPECIFICATION
Cover material	polyamide (PA4.6) glass reinforced, flame retardant in accordance with "UL 94V-0"
Maximum operating temperature	130 °C, "IEC 60085" class B
Type number	COV-9



**RING CORES (TOROIDS)**

**Effective core parameters**

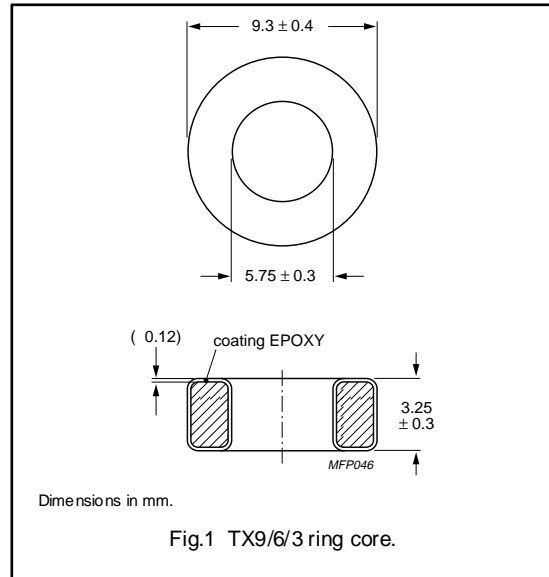
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	5.17	mm <sup>-1</sup>
$V_e$	effective volume	102	mm <sup>3</sup>
$l_e$	effective length	22.9	mm
$A_e$	effective area	4.44	mm <sup>2</sup>
m	mass of core	≈ 0.5	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3E25	1340 ± 30%	≈ 5500	TX9/6/3-3E25
3E5	2070 ± 30%	≈ 8500	TX9/6/3-3E5



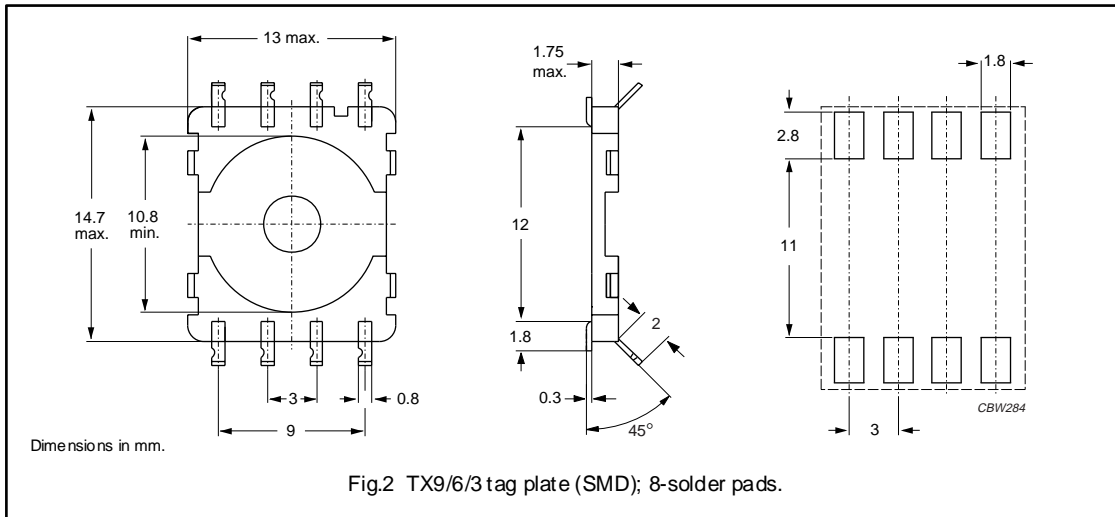
Ferrite toroids

TX9/6/3

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 (Sn) 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

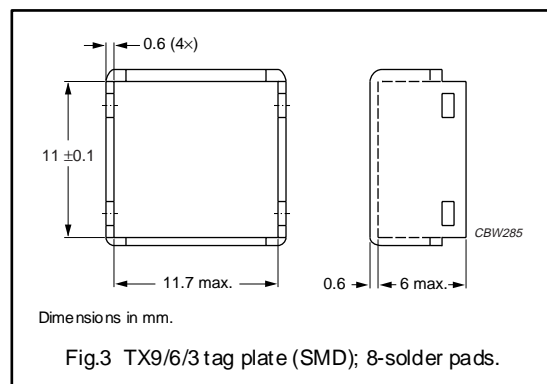


Type number information for TX9/6/3 tag plate (SMD) with 8 solder pads

NUMBER OF SOLDER PADS	TYPE NUMBER
8	TGPS-9-8P-Z

Cover data

PARAMETER	SPECIFICATION
Cover material	polyamide (PA4.6) glass reinforced, flame retardant in accordance with "UL 94V-0"
Maximum operating temperature	130 °C, "IEC 60085" class B
Type number	COV-9



Ferrite toroids

TC9.5/4.8/3.2

RING CORES (TOROIDS)

Effective core parameters

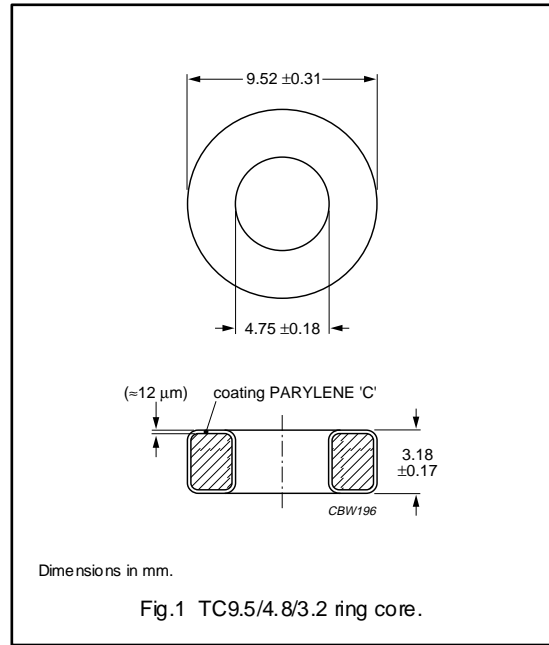
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.98	mm <sup>-1</sup>
$V_e$	effective volume	144	mm <sup>3</sup>
$l_e$	effective length	20.7	mm
$A_e$	effective area	6.95	mm <sup>2</sup>
m	mass of core	≈ 0.7	g

Coating

The cores are coated with parylene C, flame retardant in accordance with "UL 94V-2"; UL file number E 194397. The coating is transparent.

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)	$\mu_i$	TYPE NUMBER
3D3 <sup>sup</sup>	330 ± 20%	≈ 750	TC9.5/4.8/3.2-3D3
3F3	890 ± 25%	≈ 2000	TC9.5/4.8/3.2-3F3 <sup>(1)</sup>
3B7 <sup>sup</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 <sup>des</sup>	4390 ± 30%	≈ 10100	TC9.5/4.8/3.2-3E6 <sup>(1)</sup>
3E7 <sup>des</sup>	5323 ± 30%	≈ 12000	TC9.5/4.8/3.2-3E7 <sup>(1)</sup>
3E8 <sup>prot</sup>	6590 ± 30%	≈ 15000	TC9.5/4.8/3.2-3E8 <sup>(1)</sup>

Note

1. Dimensions with coating.

Ferrite toroids

TN10/6/4

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(I/A)$	core factor (C1)	3.07	mm <sup>-1</sup>
$V_e$	effective volume	188	mm <sup>3</sup>
$l_e$	effective length	24.1	mm
$A_e$	effective area	7.8	mm <sup>2</sup>
m	mass of core	≈ 0.95	g

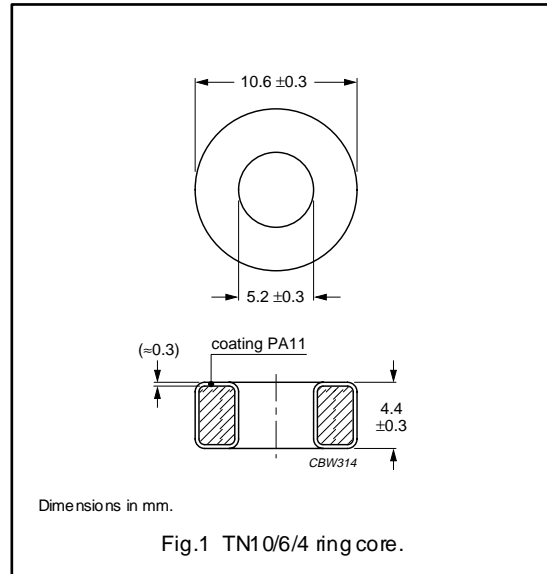
Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M). The colour is white.

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)	$\mu_i$	TYPE NUMBER
4C65	52 ± 25%	≈ 125	TN10/6/4-4C65
4A11	286 ± 25%	≈ 700 <sup>(1)</sup>	TN10/6/4-4A11
3D3	306 ± 25%	≈ 750	TN10/6/4-3D3
3R1 <sup>(2)</sup>	-	≈ 800	TN10/6/4-3R1
3F3	740 ± 25%	≈ 1800	TN10/6/4-3F3
3C90	940 ± 25%	≈ 2300	TN10/6/4-3C90
3C11	1750 ± 25%	≈ 4300	TN10/6/4-3C11
3E25	2250 ± 30%	≈ 5500	TN10/6/4-3E25

1. Old permeability specification maintained.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no  $A_L$  value is specified. For the application in magnetic amplifiers  $A_L$  is not a critical parameter.

**WARNING**

Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to "3R1" material specification in this data handbook.

## Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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

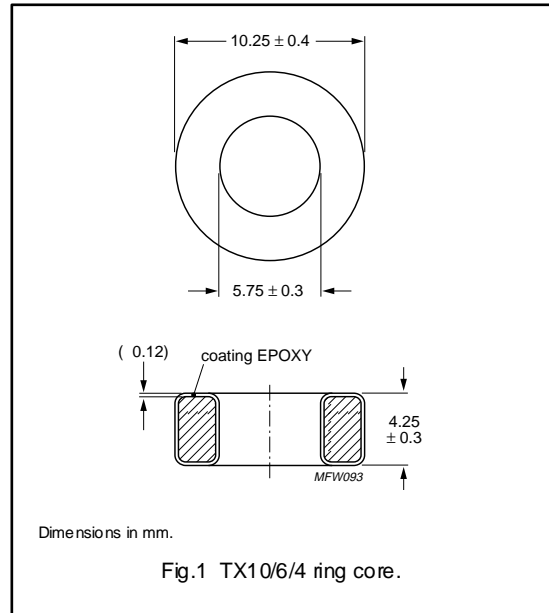
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.07	mm <sup>-1</sup>
$V_e$	effective volume	188	mm <sup>3</sup>
$l_e$	effective length	24.1	mm
$A_e$	effective area	7.8	mm <sup>2</sup>
m	mass of core	≈ 0.95	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	3 470 ± 30%	≈ 8500	TX 10/6/4-3E5
3E6 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	4 085 ± 30%	≈ 10000	TX 10/6/4-3E6

Ferrite toroids

TX13/7.1/4.8

RING CORES (TOROIDS)

Effective core parameters

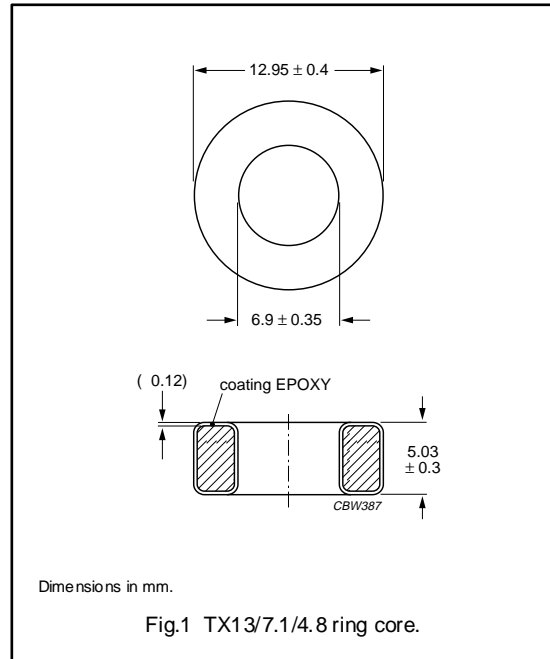
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.40	mm <sup>-1</sup>
$V_e$	effective volume	361	mm <sup>3</sup>
$l_e$	effective length	29.5	mm
$A_e$	effective area	12.3	mm <sup>2</sup>
m	mass of core	≈ 1.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3D3 <sup>sup</sup>	415 ± 20%	≈ 750	TX13/7.1/4.8-3D3
3F3	990 ± 20%	≈ 1800	TX13/7.1/4.8-3F3
3C90	1260 ± 20%	≈ 2300	TX13/7.1/4.8-3C90
3C81	1475 ± 20%	≈ 2700	TX13/7.1/4.8-3C81
3E27	2750 ± 20%	≈ 5000	TX13/7.1/4.8-3E27
3E6 <sup>des</sup>	5400 ± 30%	≈ 10400	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.08	–	–
3C90	≥320	≤ 0.036	≤ 0.036	–
3F3	≥320	–	≤ 0.04	≤ 0.07

Ferrite toroids

TN13/7.5/5

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.46	mm <sup>-1</sup>
$V_e$	effective volume	368	mm <sup>3</sup>
$l_e$	effective length	30.1	mm
$A_e$	effective area	12.2	mm <sup>2</sup>
m	mass of core	≈ 1.8	g

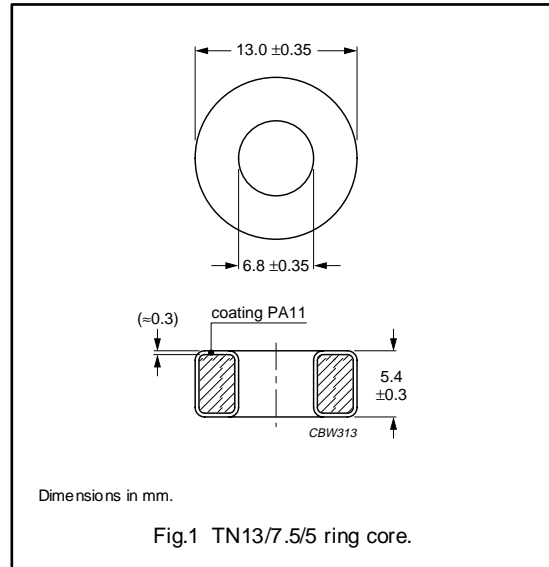
Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M). The colour is white.

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)	$\mu_i$	TYPE NUMBER
4C65	64 ± 25%	≈ 125	TN13/7.5/5-4C65
4A11	358 ± 25%	≈ 700 <sup>(1)</sup>	TN13/7.5/5-4A11
3F4	460 ± 25%	≈ 900	TN13/7.5/5-3F4
4A15	610 ± 25%	≈ 1200	TN13/7.5/5-4A15
3F3	900 ± 25%	≈ 1800	TN13/7.5/5-3F3
3C90	1170 ± 25%	≈ 2300	TN13/7.5/5-3C90
3C11	2200 ± 25%	≈ 4300	TN13/7.5/5-3C11
3E25	2810 ± 30%	≈ 5500	TN13/7.5/5-3E25
3R1 <sup>(2)</sup>	–	–	TN13/7.5/5-3R1

1. Old permeability specification maintained.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no  $A_L$  value is specified. For the application in magnetic amplifiers  $A_L$  is not a critical parameter.

WARNING

Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to "3R1" material specification in this data handbook.

## Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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

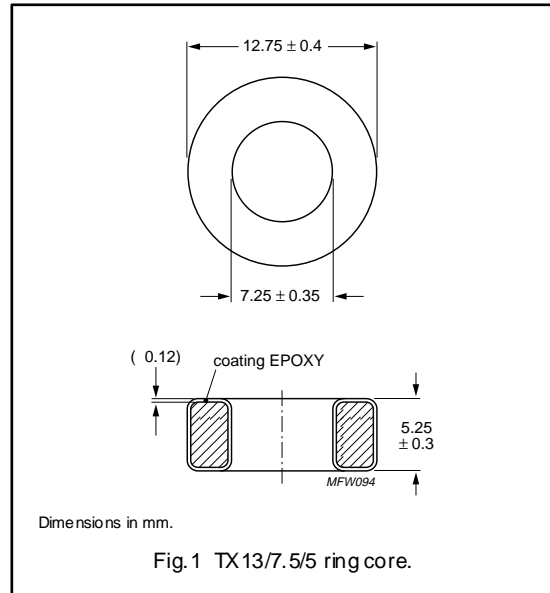
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.46	mm <sup>-1</sup>
$V_e$	effective volume	368	mm <sup>3</sup>
$l_e$	effective length	30.1	mm
$A_e$	effective area	12.2	mm <sup>2</sup>
m	mass of core	≈ 1.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	4340 ± 30%	≈ 8500	TX13/7.5/5-3E5
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	5095 ± 30%	≈ 10000	TX13/7.5/5-3E6

Ferrite toroids

TX13/7.9/6.4

RING CORES (TOROIDS)

Effective core parameters

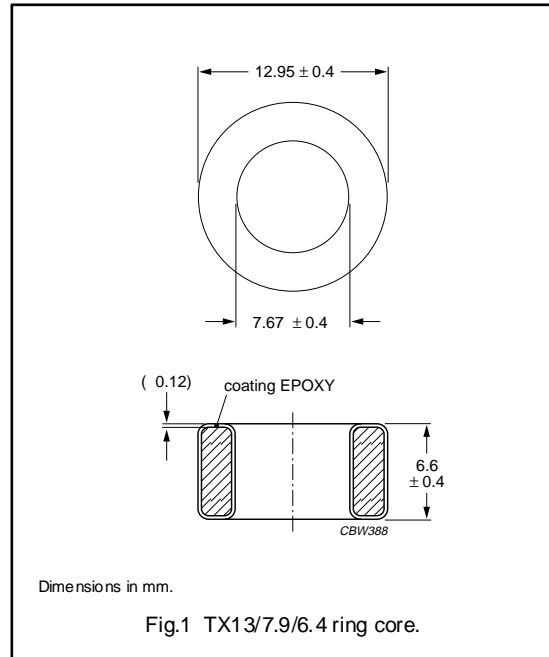
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.21	mm <sup>-1</sup>
$V_e$	effective volume	442	mm <sup>3</sup>
$l_e$	effective length	31.2	mm
$A_e$	effective area	14.1	mm <sup>2</sup>
m	mass of core	≈ 2.2	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
4C65	75 ± 25%	≈ 125	TX13/7.9/6.4-4C65
3F3	1100 ± 20%	≈ 1800	TX13/7.9/6.4-3F3
3C90	1380 ± 20%	≈ 2300	TX13/7.9/6.4-3C90
3C81	1620 ± 20%	≈ 2700	TX13/7.9/6.4-3C81
3E27	3000 ± 20%	≈ 5000	TX13/7.9/6.4-3E27
3E25 <small>des</small>	3000 ± 20%	≈ 5000	TX13/7.9/6.4-3E25
3E6	5900 ± 30%	≈ 10600	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤ 0.10	–	–
3C90	≥320	≤ 0.044	≤ 0.044	–
3F3	≥320	–	≤ 0.05	≤ 0.09

Ferrite toroids

TN14/9/5

RING CORES (TOROIDS)

Effective core parameters

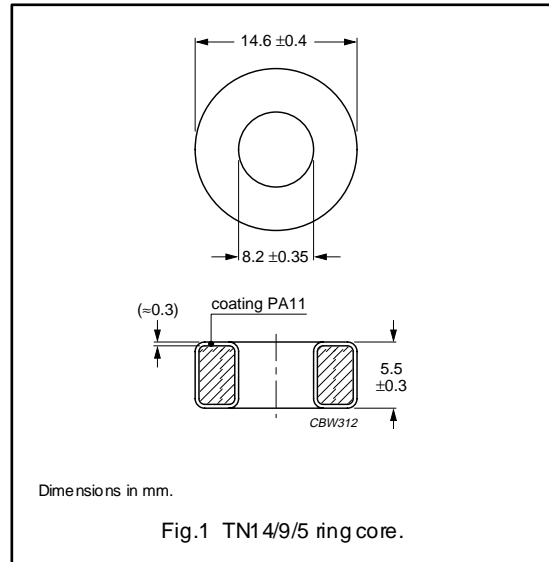
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.84	mm <sup>-1</sup>
$V_e$	effective volume	430	mm <sup>3</sup>
$l_e$	effective length	35	mm
$A_e$	effective area	12.3	mm <sup>2</sup>
m	mass of core	≈ 2.1	g

Coating

The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M). The colour is white.

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)	$\mu_i$	TYPE NUMBER
4C65	55 ± 25%	≈ 125	TN14/9/5-4C65
4A11	310 ± 25%	≈ 700 <sup>(1)</sup>	TN14/9/5-4A11
3R1 <sup>(2)</sup>	–	≈ 800	TN14/9/5-3R1
3F3	790 ± 25%	≈ 1800	TN14/9/5-3F3
3C90	1015 ± 25%	≈ 2300	TN14/9/5-3C90
3C11	1900 ± 25%	≈ 4300	TN14/9/5-3C11
3E25	2430 ± 30%	≈ 5500	TN14/9/5-3E25

1. Old permeability specification maintained.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no  $A_L$  value is specified. For the application in magnetic amplifiers  $A_L$  is not a critical parameter.

**WARNING**

Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to "3R1" material specification in this data handbook.

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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

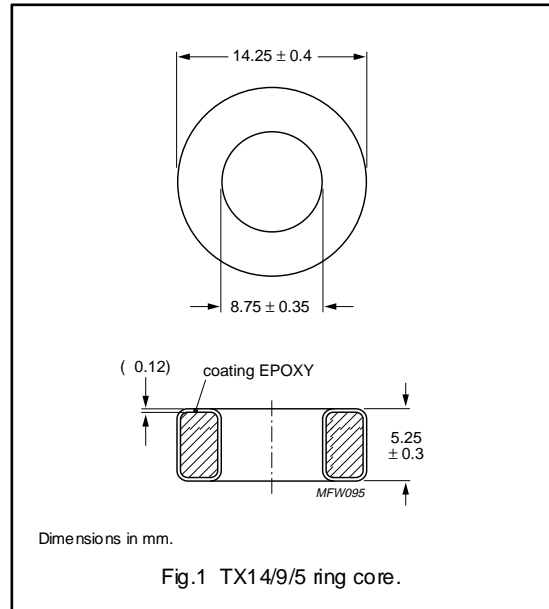
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.84	mm <sup>-1</sup>
$V_e$	effective volume	430	mm <sup>3</sup>
$l_e$	effective length	35	mm
$A_e$	effective area	12.3	mm <sup>2</sup>
m	mass of core	≈ 2.1	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	3760 ± 30%	≈ 8500	TX14/9/5-3E5
3E6 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	4415 ± 30%	≈ 10000	TX14/9/5-3E6

Ferrite toroids

TN14/9/9

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.58	mm <sup>-1</sup>
$V_e$	effective volume	774	mm <sup>3</sup>
$l_e$	effective length	35	mm
$A_e$	effective area	22.1	mm <sup>2</sup>
m	mass of core	≈ 3.8	g

Coating

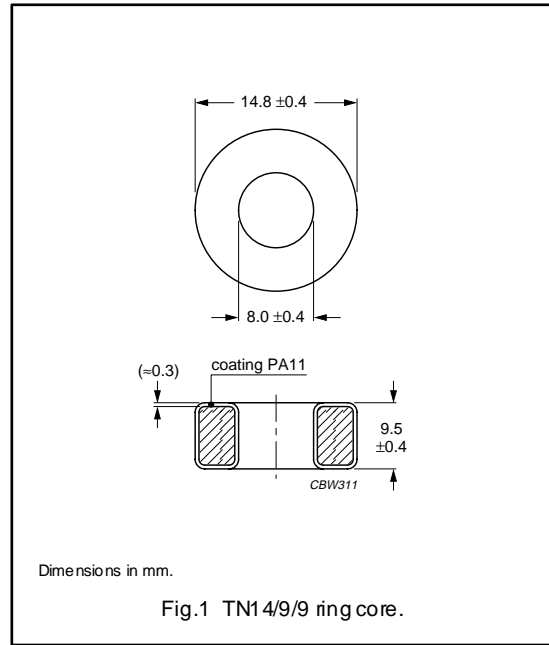
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
4A11	557 ± 25%	≈ 700 <sup>(1)</sup>	TN14/9/9-4A11
3F3	1430 ± 25%	≈ 1800	TN14/9/9-3F3
3C90	1825 ± 25%	≈ 2300	TN14/9/9-3C90
3C11	3400 ± 25%	≈ 4300	TN14/9/9-3C11
3E25	4370 ± 30%	≈ 5500	TN14/9/9-3E25

1. Old permeability specification maintained.

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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥320	≤ 0.087	≤ 0.087	–
3F3	≥320	–	≤ 0.09	≤ 0.15

**RING CORES (TOROIDS)**

**Effective core parameters**

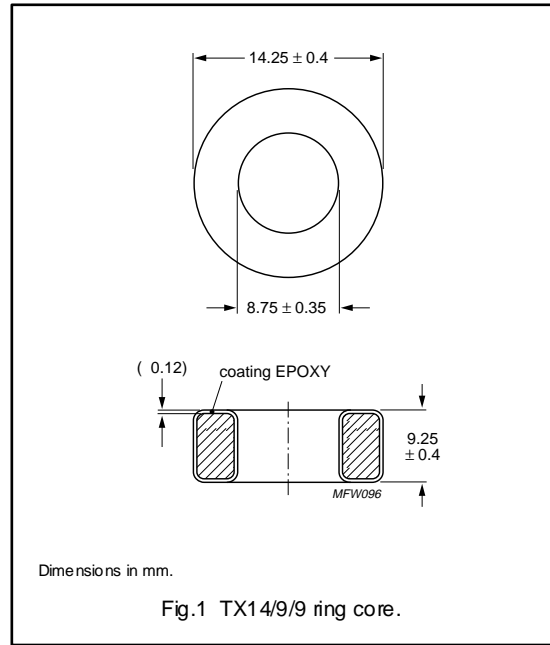
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.58	mm <sup>-1</sup>
$V_e$	effective volume	774	mm <sup>3</sup>
$l_e$	effective length	35	mm
$A_e$	effective area	22.1	mm <sup>2</sup>
m	mass of core	≈ 3.8	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3E5	6760 ± 30%	≈ 8500	TX 14/9/9-3E5
3E6 <small>des</small>	7955 ± 30%	≈ 10000	TX 14/9/9-3E6

Ferrite toroids

TX16/9.1/4.7

RING CORES (TOROIDS)

Effective core parameters

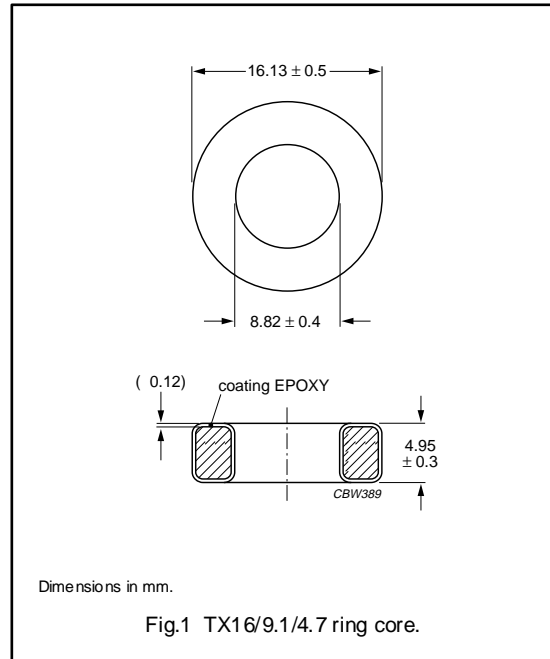
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.53	mm <sup>-1</sup>
$V_e$	effective volume	548	mm <sup>3</sup>
$l_e$	effective length	37.2	mm
$A_e$	effective area	14.7	mm <sup>2</sup>
m	mass of core	≈ 2.7	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	1215 ± 20%	≈ 2300	TX16/9.1/4.7-3C90
3C81	1400 ± 20%	≈ 2700	TX16/9.1/4.7-3C81
3E27	2600 ± 20%	≈ 5000	TX16/9.1/4.7-3E27
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	5200 ± 30%	≈ 10500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C81	≥320	≤0.11	—
3C90	≥320	≤0.055	≤0.055

Ferrite toroids

TN16/9.6/6.3

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.95	mm <sup>-1</sup>
$V_e$	effective volume	760	mm <sup>3</sup>
$l_e$	effective length	38.5	mm
$A_e$	effective area	19.7	mm <sup>2</sup>
m	mass of core	≈ 3.8	g

Coating

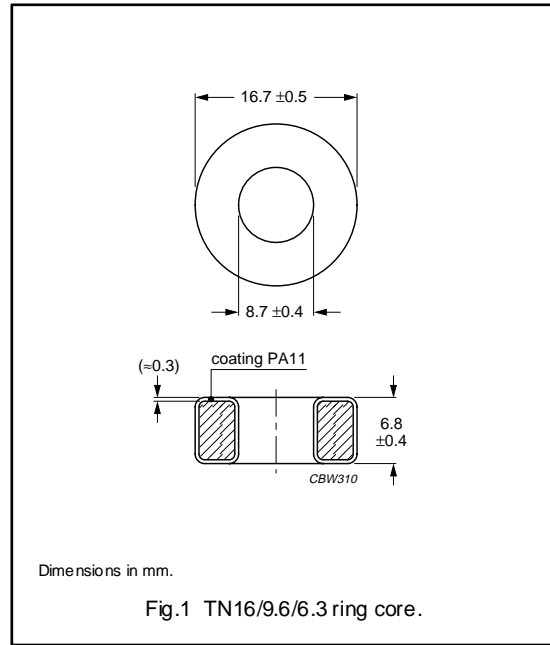
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
4A11	450 ± 25%	≈ 700 <sup>(1)</sup>	TN16/9.6/6.3-4A11
3F3	1160 ± 25%	≈ 1800	TN16/9.6/6.3-3F3
3C90	1480 ± 25%	≈ 2300	TN16/9.6/6.3-3C90
3C11	2700 ± 25%	≈ 4300	TN16/9.6/6.3-3C11
3E25	3540 ± 30%	≈ 5500	TN16/9.6/6.3-3E25

1. Old permeability specification maintained.

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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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

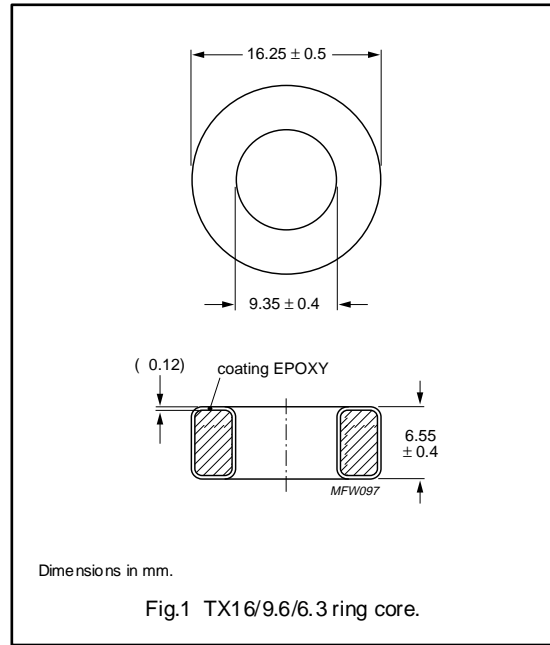
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.95	mm <sup>-1</sup>
$V_e$	effective volume	760	mm <sup>3</sup>
$l_e$	effective length	38.5	mm
$A_e$	effective area	19.7	mm <sup>2</sup>
m	mass of core	≈ 3.8	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	5470 ± 30%	≈ 8500	TX 16/9.6/6.3-3E5
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	6430 ± 30%	≈ 10000	TX 16/9.6/6.3-3E6

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm <sup>-1</sup>
$V_e$	effective volume	1795	mm <sup>3</sup>
$l_e$	effective length	44.0	mm
$A_e$	effective area	40.8	mm <sup>2</sup>
m	mass of core	≈ 9.2	g

**Coating**

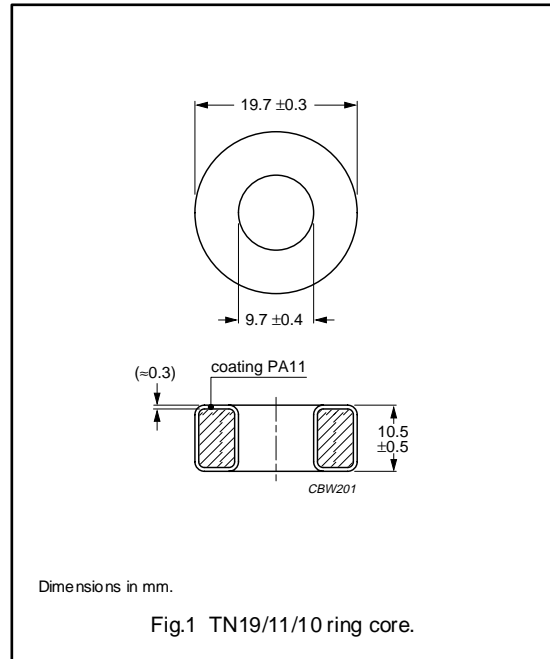
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3C90 <small>des</small>	2680 ± 25%	≈ 2300	TN19/11/10-3C90
3C11	5000 ± 25%	≈ 4300	TN19/11/10-3C11
3E25	6420 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.20	≤ 0.20

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.718	mm <sup>-1</sup>
$V_e$	effective volume	2692	mm <sup>3</sup>
$l_e$	effective length	44.0	mm
$A_e$	effective area	61.2	mm <sup>2</sup>
m	mass of core	≈ 13.8	g

**Coating**

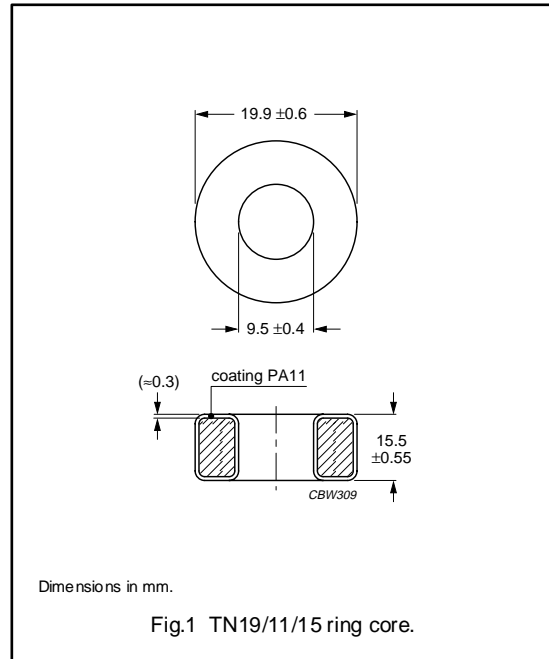
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3C90 <small>des</small>	4020 ± 25%	≈ 2300	TN19/11/15-3C90
3C11	7500 ± 25%	≈ 4300	TN19/11/15-3C11
3E25	9630 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.30	≤ 0.30

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.30	mm <sup>-1</sup>
$V_e$	effective volume	1465	mm <sup>3</sup>
$l_e$	effective length	43.6	mm
$A_e$	effective area	33.6	mm <sup>2</sup>
m	mass of core	≈ 7.7	g

**Coating**

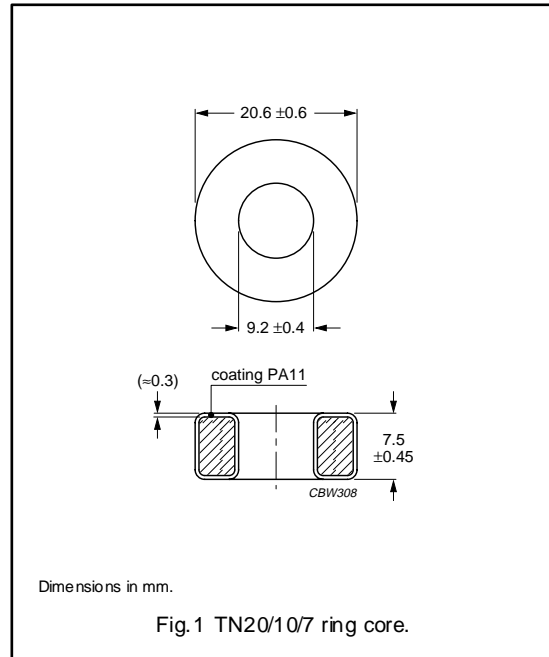
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
4C65	121 ± 25%	≈ 125	TN20/10/7-4C65
3C90	2230 ± 25%	≈ 2300	TN20/10/7-3C90
3C11	4150 ± 25%	≈ 4300	TN20/10/7-3C11
3E25	5340 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.15	≤ 0.16

Ferrite toroids

TX20/10/7

RING CORES (TOROIDS)

Effective core parameters

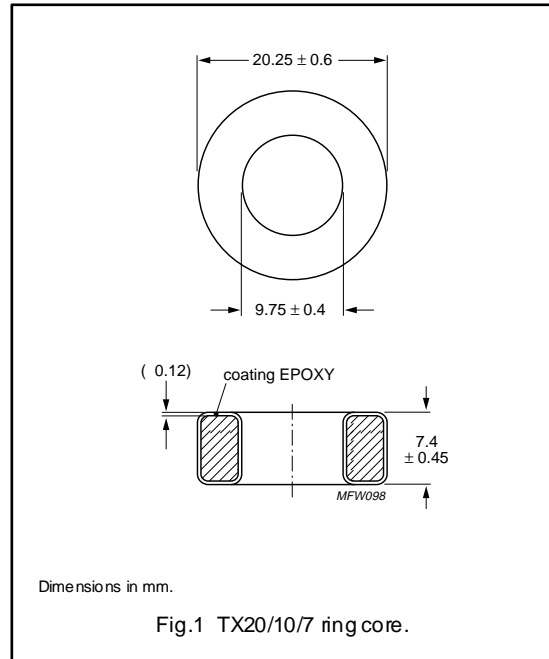
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.30	mm <sup>-1</sup>
$V_e$	effective volume	1465	mm <sup>3</sup>
$l_e$	effective length	43.6	mm
$A_e$	effective area	33.6	mm <sup>2</sup>
m	mass of core	≈ 7.7	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	8250 ± 30%	≈ 8 500	TX20/10/7-3E5
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	9685 ± 30%	≈ 10000	TX20/10/7-3E6

Ferrite toroids

TX22/14/6.4

RING CORES (TOROIDS)

Effective core parameters

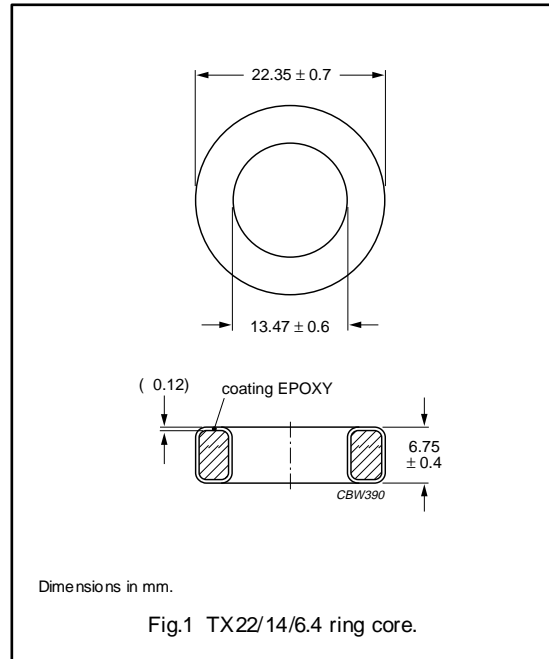
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.20	mm <sup>-1</sup>
$V_e$	effective volume	1340	mm <sup>3</sup>
$l_e$	effective length	54.2	mm
$A_e$	effective area	24.8	mm <sup>2</sup>
m	mass of core	≈ 6.5	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
4C65	75 ± 25%	≈ 125	TX22/14/6.4-4C65
3D3	454 ± 20%	≈ 750	TX22/14/6.4-3D3
3C90	1400 ± 20%	≈ 2300	TX22/14/6.4-3C90
3C81	1650 ± 20%	≈ 2700	TX22/14/6.4-3C81
3E27 <small>des</small>	3055 ± 20%	≈ 5300	TX22/14/6.4-3E27
3E6	6000 ± 30%	≈ 10500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C81	≥320	≤0.21	–
3C90	≥320	≤0.13	≤0.13

Ferrite toroids

TX22/14/13

RING CORES (TOROIDS)

Effective core parameters

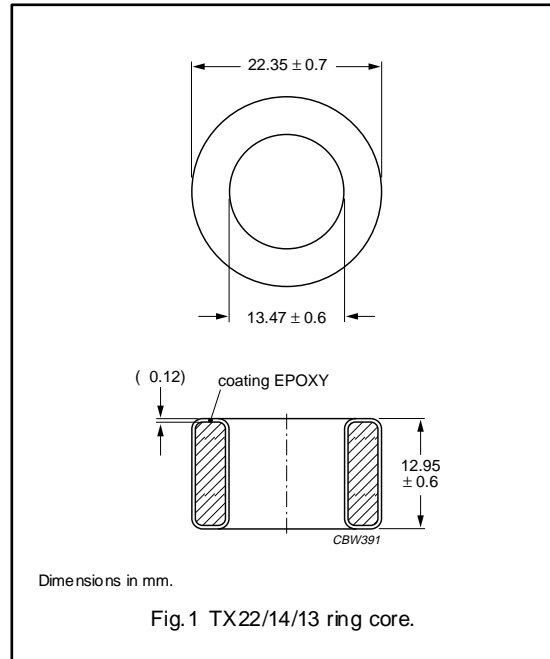
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.07	mm <sup>-1</sup>
$V_e$	effective volume	2750	mm <sup>3</sup>
$l_e$	effective length	54.2	mm
$A_e$	effective area	50.9	mm <sup>2</sup>
m	mass of core	≈ 14	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	2200 ± 20%	≈ 1800	TX22/14/13-3F3
3C90	2795 ± 20%	≈ 2300	TX22/14/13-3C90
3E27 <small>des</small>	6110 ± 20%	≈ 5000	TX22/14/13-3E27
3E6	12080 ± 30%	≈ 10300	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; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3F3	≥ 320	≤ 0.30	≤ 0.52

Ferrite toroids

TN23/14/7

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.81	mm <sup>-1</sup>
$V_e$	effective volume	1722	mm <sup>3</sup>
$l_e$	effective length	55.8	mm
$A_e$	effective area	30.9	mm <sup>2</sup>
m	mass of core	≈ 8.4	g

Coating

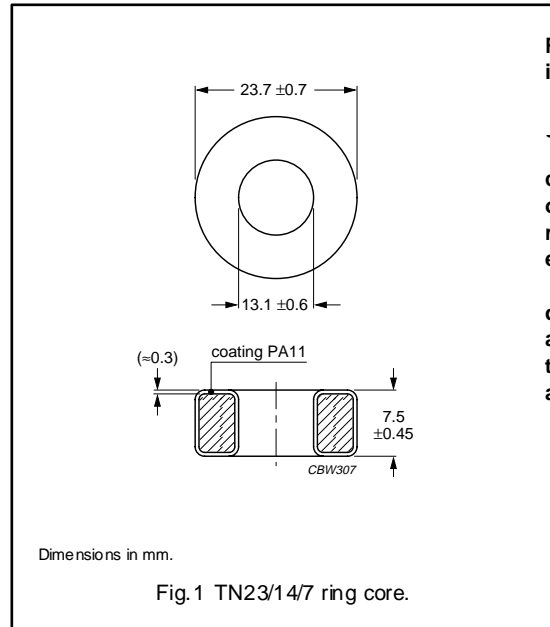
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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.



GRADE	$A_L$ (nH)	$\mu_i$	TYPE NUMBER
4C65	87 ± 25%	≈ 125	TN23/14/7-4C65
4A11	486 ± 25%	≈ 700 <sup>(1)</sup>	TN23/14/7-4A11
3R1 <sup>(2)</sup>	—	≈ 800	TN23/14/7-3R1
3F3	1250 ± 25%	≈ 1800	TN23/14/7-3F3
3C90	1600 ± 25%	≈ 2300	TN23/14/7-3C90
3C11 <small>des</small>	3000 ± 25%	≈ 4300	TN23/14/7-3C11
3E25	3820 ± 25%	≈ 5500	TN23/14/7-3E25

1. Old permeability specification maintained.
2. Due to the rectangular BH-loop of 3R1, inductance values strongly depend on the magnetic state of the ring core and measuring conditions. Therefore no  $A_L$  value is specified. For the application in magnetic amplifiers  $A_L$  is not a critical parameter.

**WARNING**

Do not use 3R1 cores close to their mechanical resonant frequency. For more information refer to "3R1" material specification in this data handbook.



## Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥320	≤ 0.19	≤ 0.19	
3F3	≥320		≤ 0.19	≤ 0.33

Ferrite toroids

TN25/15/10

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm <sup>-1</sup>
$V_e$	effective volume	2944	mm <sup>3</sup>
$l_e$	effective length	60.2	mm
$A_e$	effective area	48.9	mm <sup>2</sup>
m	mass of core	≈ 15	g

Coating

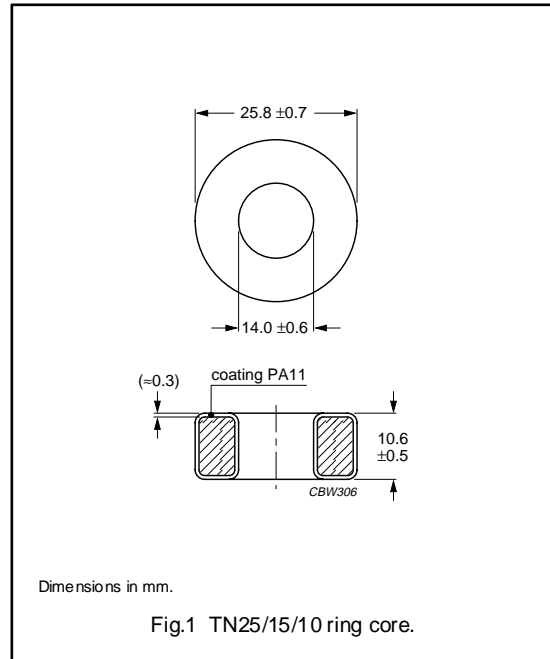
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	1840 ± 25%	≈ 1800	TN25/15/10-3F3
3C90	2350 ± 25%	≈ 2300	TN25/15/10-3C90
3C11	4400 ± 25%	≈ 4300	TN25/15/10-3C11
3E25	5620 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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

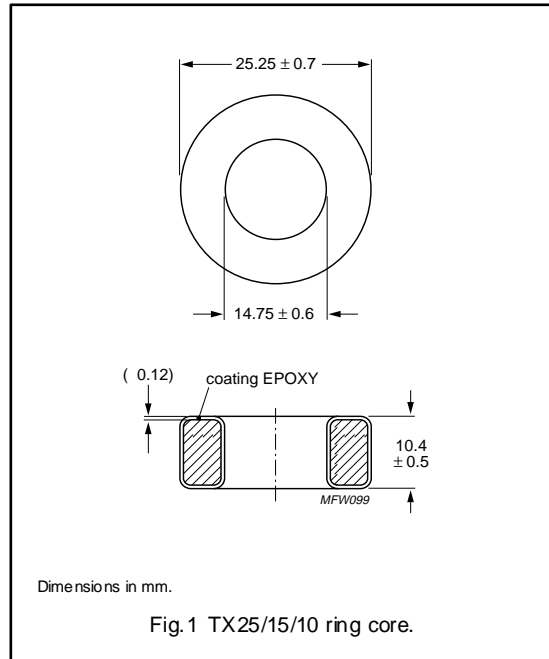
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm <sup>-1</sup>
$V_e$	effective volume	2944	mm <sup>3</sup>
$l_e$	effective length	60.2	mm
$A_e$	effective area	48.9	mm <sup>2</sup>
m	mass of core	≈ 15	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	8680 ± 30%	≈ 8500	TX25/15/10-3E5
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	10200 ± 30%	≈ 10000	TX25/15/10-3E6

Ferrite toroids

TN26/15/10

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm <sup>-1</sup>
$V_e$	effective volume	3360	mm <sup>3</sup>
$l_e$	effective length	60.1	mm
$A_e$	effective area	55.9	mm <sup>2</sup>
m	mass of core	≈ 17	g

Coating

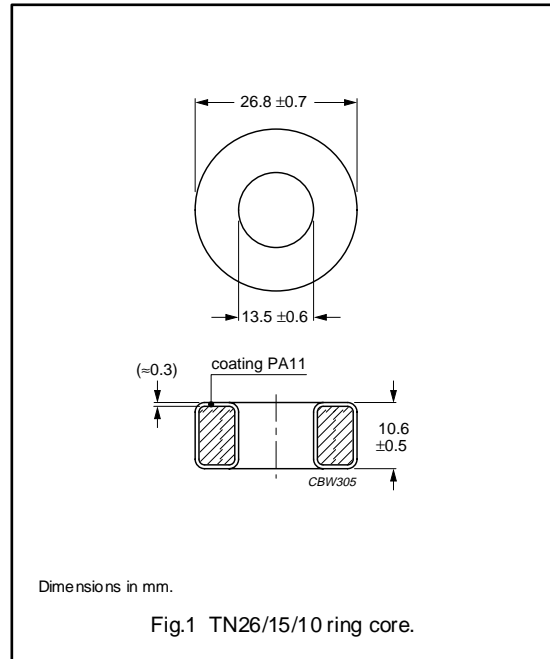
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
4A11	817 ± 25%	≈ 700 <sup>(1)</sup>	TN26/15/10-4A11
3C90	2645 ± 25%	≈ 2300	TN26/15/10-3C90
3C11	5000 ± 25%	≈ 4300	TN26/15/10-3C11
3E25	6420 ± 25%	≈ 5500	TN26/15/10-3E25

1. Old permeability specification maintained.

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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.38	≤ 0.38

Ferrite toroids

TX26/15/10

RING CORES (TOROIDS)

Effective core parameters

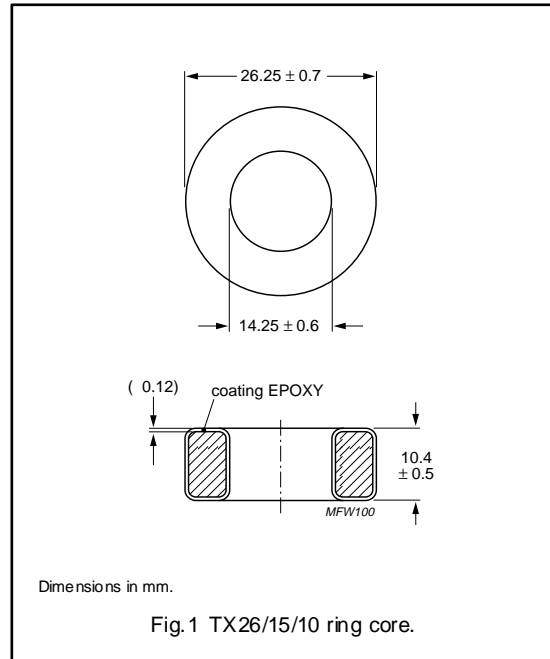
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.08	mm <sup>-1</sup>
$V_e$	effective volume	3360	mm <sup>3</sup>
$l_e$	effective length	60.1	mm
$A_e$	effective area	55.9	mm <sup>2</sup>
m	mass of core	≈ 17	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	10000 ± 30%	≈ 8 500	TX26/15/10-3E5

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.538	mm <sup>-1</sup>
$V_e$	effective volume	6720	mm <sup>3</sup>
$l_e$	effective length	60.1	mm
$A_e$	effective area	112	mm <sup>2</sup>
m	mass of set	≈ 34	g

**Coating**

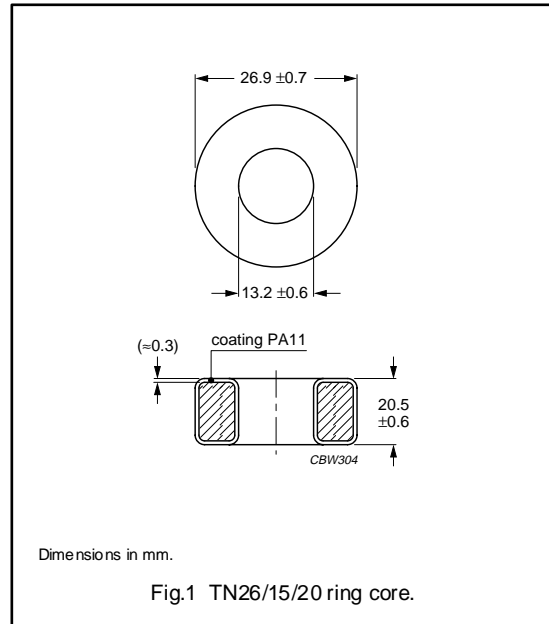
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3C90 <small>des</small>	5400 ± 25%	≈ 2300	TN26/15/20-3C90
3C11	10000 ± 25%	≈ 4300	TN26/15/20-3C11
3E25	12800 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; 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
$\Sigma(l/A)$	core factor (C1)	1.04	mm <sup>-1</sup>
$V_e$	effective volume	2680	mm <sup>3</sup>
$l_e$	effective length	52.9	mm
$A_e$	effective area	50.8	mm <sup>2</sup>
m	mass of core	≈ 14	g

Coating

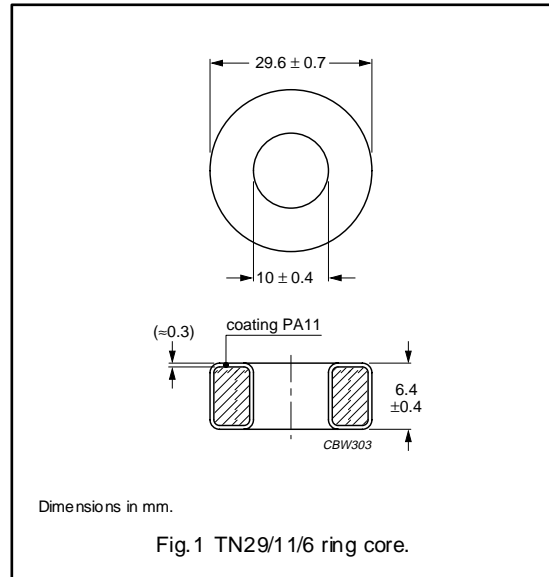
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	2780 ± 20%	≈ 2 300	TN29/11/6-3C90
3C11	5100 ± 25%	≈ 4 300	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; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C
3C90	≥320	≤ 0.3	≤ 0.3

Ferrite toroids

TN29/19/7.5

RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.98	mm <sup>-1</sup>
$V_e$	effective volume	2700	mm <sup>3</sup>
$l_e$	effective length	73.2	mm
$A_e$	effective area	36.9	mm <sup>2</sup>
m	mass of core	≈ 13.5	g

Coating

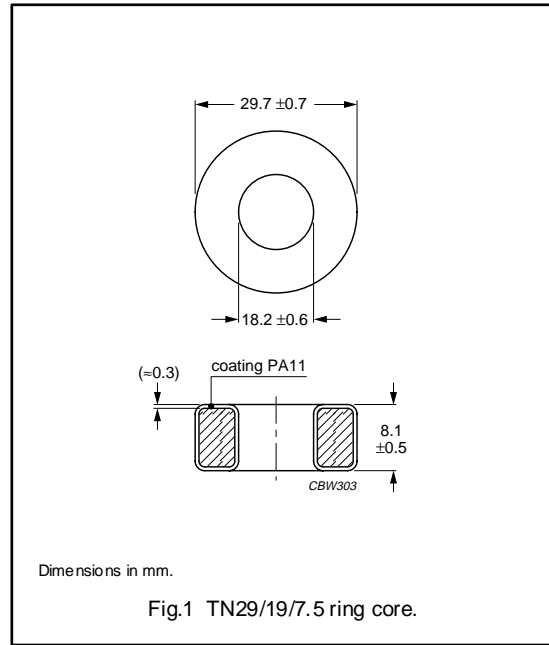
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	1460 ± 25%	≈ 2300	TN29/19/7.5-3C90
3C11	2700 ± 25%	≈ 4300	TN29/19/7.5-3C11
3E25	3550 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.30	≤ 0.30



Ferrite toroids

TX29/19/7.5

RING CORES (TOROIDS)

Effective core parameters

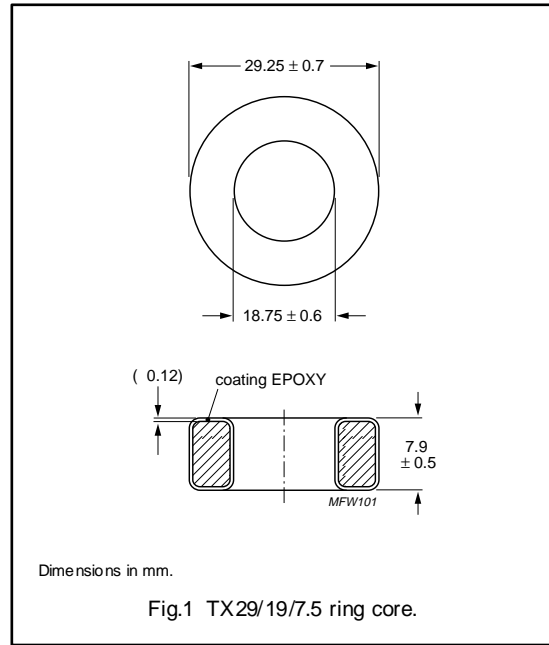
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.98	mm <sup>-1</sup>
$V_e$	effective volume	2700	mm <sup>3</sup>
$l_e$	effective length	73.2	mm
$A_e$	effective area	36.9	mm <sup>2</sup>
m	mass of core	≈ 13.5	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E6 <small>des</small>	6340 ± 30%	≈ 10000	TX29/19/7.5-3E6

Ferrite toroids

TX29/19/7.6

RING CORES (TOROIDS)

Effective core parameters

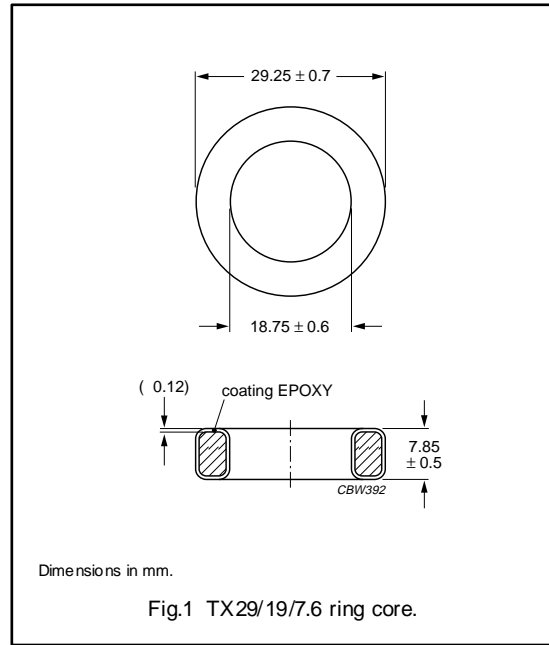
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.06	mm <sup>-1</sup>
$V_e$	effective volume	2600	mm <sup>3</sup>
$l_e$	effective length	73.2	mm
$A_e$	effective area	35.5	mm <sup>2</sup>
m	mass of core	≈ 13	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C81	1740 ± 20%	≈ 2 800	TX29/19/7.6-3C81
3E27	3225 ± 20%	≈ 5 300	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; 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 <sup>-1</sup>
$V_e$	effective volume	5410	mm <sup>3</sup>
$l_e$	effective length	73.2	mm
$A_e$	effective area	73.9	mm <sup>2</sup>
m	mass of core	≈ 28	g

Coating

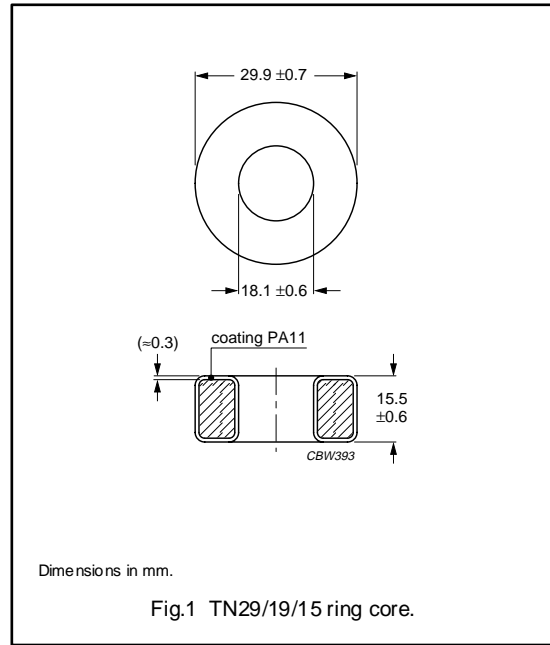
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	2960 ± 20%	≈ 2300	TN29/19/15-3C90
3E25	7000 ± 25%	≈ 5500	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 0.61	≤ 0.61

Ferrite toroids

TX29/19/15

RING CORES (TOROIDS)

Effective core parameters

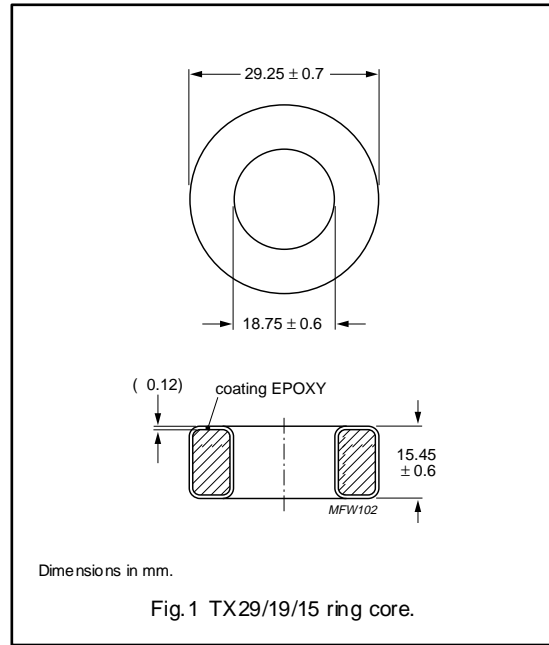
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.98	mm <sup>-1</sup>
$V_e$	effective volume	5410	mm <sup>3</sup>
$l_e$	effective length	73.2	mm
$A_e$	effective area	73.9	mm <sup>2</sup>
m	mass of core	≈ 28	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	10780 ± 30%	≈ 8500	TX29/19/15-3E5
3E6 <small>des</small>	12850 ± 30%	≈ 10000	TX29/19/15-3E6

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.99	mm <sup>-1</sup>
$V_e$	effective volume	5820	mm <sup>3</sup>
$l_e$	effective length	76	mm
$A_e$	effective area	76.5	mm <sup>2</sup>
m	mass of core	≈29	g

**Coating**

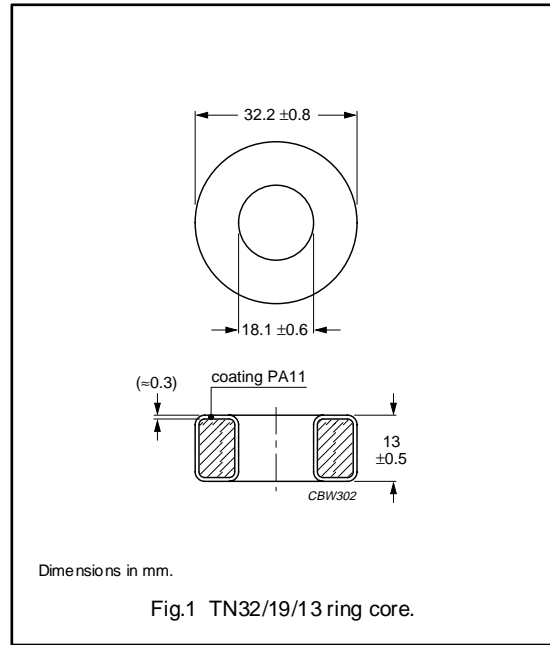
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
4A11	885 ± 25%	≈ 700 <sup>(1)</sup>	TN32/19/13-4A11
3F3	2270 ± 25%	≈ 1800	TN32/19/13-3F3
3C90	2910 ± 25%	≈ 2300	TN32/19/13-3C90
3C11	5450 ± 25%	≈ 4300	TN32/19/13-3C11
3E25	6950 ± 25%	≈ 5500	TN32/19/13-3E25

1. Old permeability specification maintained.

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C90	≥320	≤ 0.65	≤ 0.65	–
3F3	≥320	–	≤ 0.64	≤ 1.1

Ferrite toroids

TX32/19/13

RING CORES (TOROIDS)

Effective core parameters

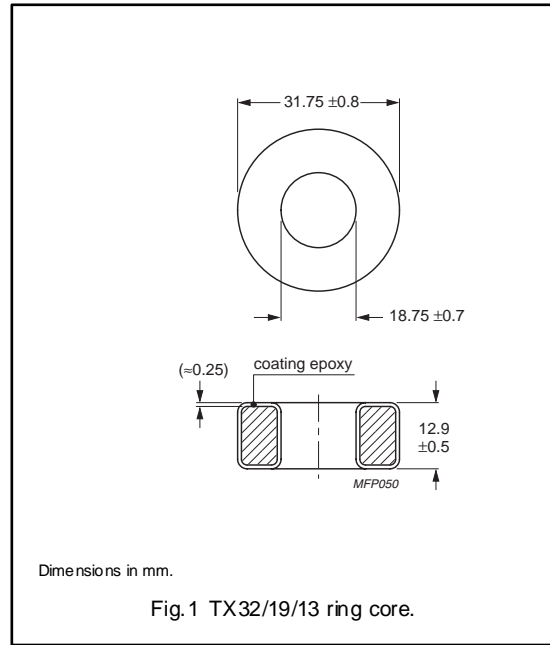
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.99	mm <sup>-1</sup>
$V_e$	effective volume	5820	mm <sup>3</sup>
$l_e$	effective length	76	mm
$A_e$	effective area	76.5	mm <sup>2</sup>
m	mass of core	≈29	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3E5	10700 ± 30%	≈ 8500	TX32/19/13-3E5

**RING CORES (TOROIDS)**

**Effective core parameters**

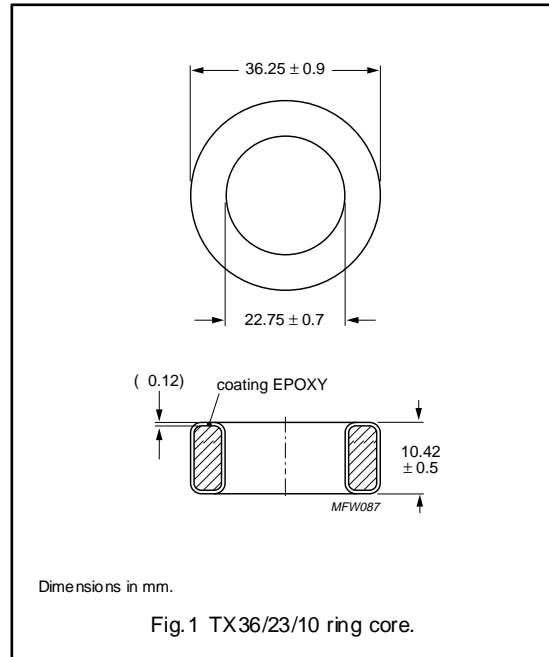
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.38	mm <sup>-1</sup>
$V_e$	effective volume	5820	mm <sup>3</sup>
$l_e$	effective length	89.7	mm
$A_e$	effective area	64.9	mm <sup>2</sup>
m	mass of core	≈ 27	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
4C65	112 ± 25%	≈ 125	TX36/23/10-4C65
3C90 <small>des</small>	2060 ± 25%	≈ 2300	TX36/23/10-3C90
3C81	2455 ± 20%	≈ 2700	TX36/23/10-3C81
3C11	3900 ± 25%	≈ 4300	TX36/23/10-3C11
3E27	4545 ± 20%	≈ 5000	TX36/23/10-3E27
3E6 <small>des</small>	9090 ± 30%	≈ 10000	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥320	≤ 0.64	≤ 0.64
3C81	≥320	≤ 1.1	-

**RING CORES (TOROIDS)****Effective core parameters**

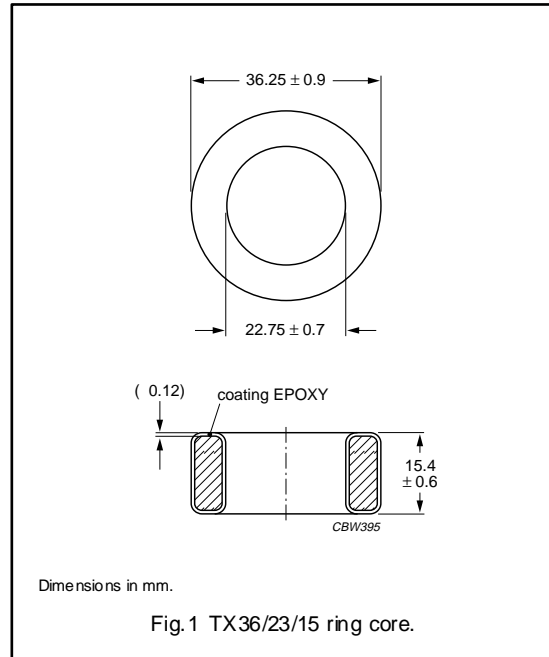
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.919	mm <sup>-1</sup>
$V_e$	effective volume	8740	mm <sup>3</sup>
$l_e$	effective length	89.7	mm
$A_e$	effective area	97.5	mm <sup>2</sup>
m	mass of core	≈ 40	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu$	TYPE NUMBER
4C65	170 ± 25%	≈ 125	TX36/23/15-4C65
4A11	940 ± 25%	≈ 700 <sup>(1)</sup>	TX36/23/15-4A11
3R1 <sup>(2)</sup>	–	≈ 800	TX36/23/15-3R1
3S4 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	2285 ± 25%	≈ 1700	TX36/23/15-3S4
3F3	2420 ± 25%	≈ 1800	TX36/23/15-3F3
3C90	3090 ± 20%	≈ 2300	TX36/23/15-3C90
3C81	3670 ± 20%	≈ 2700	TX36/23/15-3C81
3C11	5800 ± 25%	≈ 4300	TX36/23/15-3C11
3E25	7390 ± 25%	≈ 5500	TX36/23/15-3E25
3E27 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	6800 ± 20%	≈ 5000	TX36/23/15-3E27
3E5	11400 ± 30%	≈ 8500	TX36/23/15-3E5
3E6	13600 ± 30%	≈ 10400	TX36/23/15-3E6

1. Old permeability specification maintained.
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.



## Ferrite toroids

TX36/23/15

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥320	≤1.7	–	–
3C90	≥320	≤0.96	≤0.96	–
3F3	≥320	–	≤0.95	≤1.7

Ferrite toroids

TX39/20/13

RING CORES (TOROIDS)

Effective core parameters

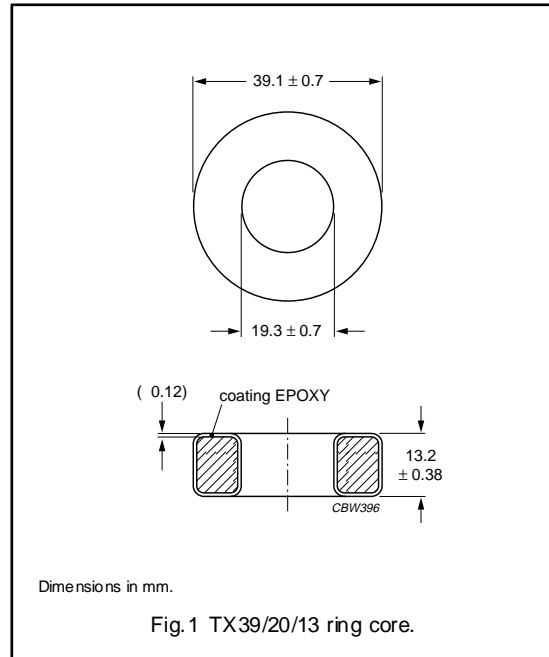
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.76	mm <sup>-1</sup>
$V_e$	effective volume	9513	mm <sup>3</sup>
$l_e$	effective length	84.9	mm
$A_e$	effective area	112	mm <sup>2</sup>
m	mass of core	≈ 45	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	3150 ± 20%	≈ 1800	TX39/20/13-3F3
3C90	3800 ± 20%	≈ 2 300	TX39/20/13-3C90
3C81	4700 ± 20%	≈ 2 700	TX39/20/13-3C81
3E27	8720 ± 20%	≈ 5 000	TX39/20/13-3E27
3E6 <small>des</small>	16700 ± 30%	≈ 9600	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; 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**

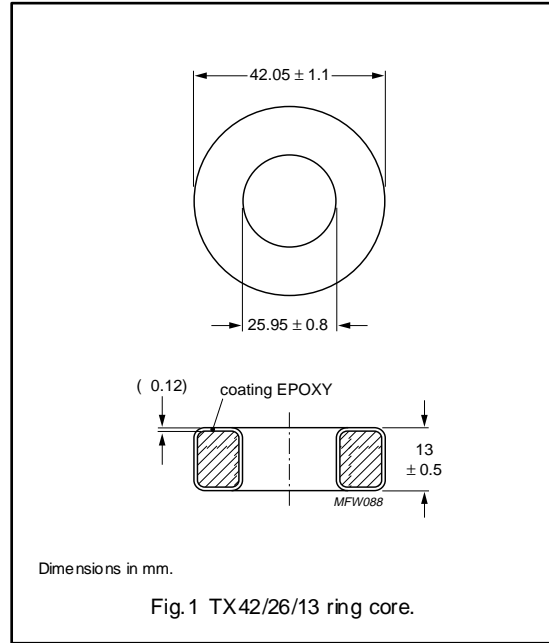
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.076	mm <sup>-1</sup>
$V_e$	effective volume	9860	mm <sup>3</sup>
$l_e$	effective length	103	mm
$A_e$	effective area	95.8	mm <sup>2</sup>
m	mass of core	≈ 53	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3C90	2 690 ± 25%	≈ 2300	TX42/26/13-3C90
3C11	5 000 ± 25%	≈ 4300	TX42/26/13-3C11
3E25	6 425 ± 25%	≈ 5500	TX42/26/13-3E25
3E27	6 425 ± 25%	≈ 5500	TX42/26/13-3E27
4A11	820 ± 25%	≈ 700 <sup>(1)</sup>	TX42/26/13-4A11

1. Old permeability specification maintained.

**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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 1.1	≤ 1.1

**RING CORES (TOROIDS)**

**Effective core parameters**

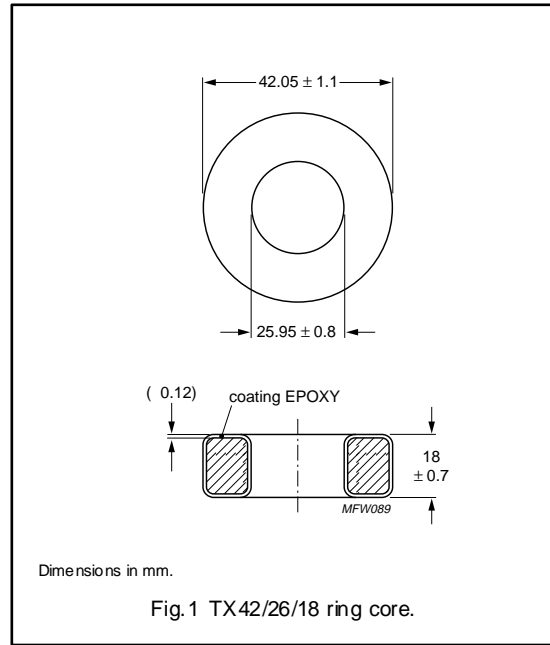
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.769	mm <sup>-1</sup>
$V_e$	effective volume	13810	mm <sup>3</sup>
$l_e$	effective length	103	mm
$A_e$	effective area	134	mm <sup>2</sup>
m	mass of core	≈ 55	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3E5	12900 ± 30%	≈ 8500	TX42/26/18-3E5

**RING CORES (TOROIDS)**

**Effective core parameters**

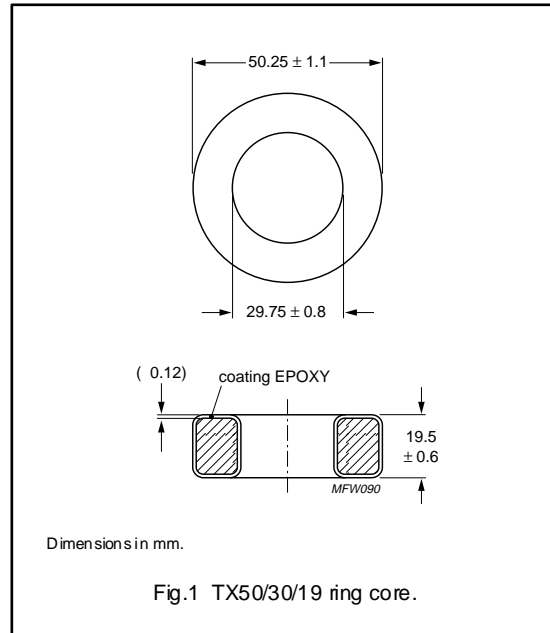
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.65	mm <sup>-1</sup>
$V_e$	effective volume	22 378	mm <sup>3</sup>
$l_e$	effective length	120.4	mm
$A_e$	effective area	186	mm <sup>2</sup>
m	mass of core	≈ 100	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	19400 ± 30%	≈ 10 000	TX50/30/19-3E6

Ferrite toroids

TX51/32/19

RING CORES (TOROIDS)

Effective core parameters

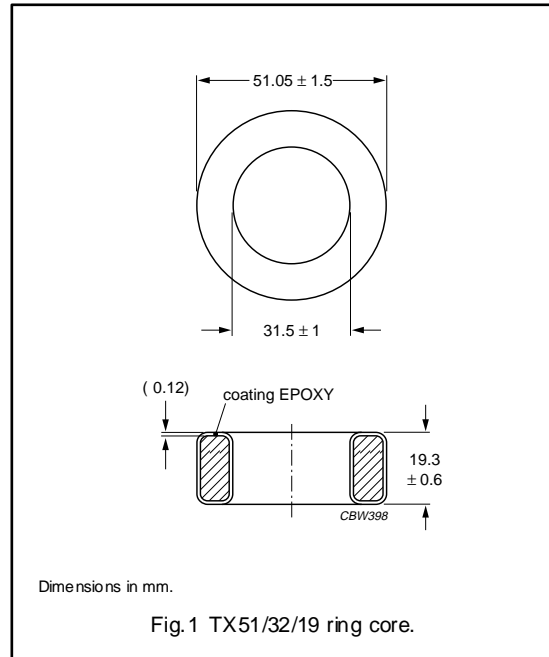
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.73	mm <sup>-1</sup>
$V_e$	effective volume	21500	mm <sup>3</sup>
$l_e$	effective length	125	mm
$A_e$	effective area	172	mm <sup>2</sup>
m	mass of core	≈ 100	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3 <small>des</small>	3200 ± 20%	≈ 1800	TX51/32/19-3F3
3C90	3980 ± 20%	≈ 2300	TX51/32/19-3C90
3C81	4800 ± 20%	≈ 2700	TX51/32/19-3C81
3E25	8890 ± 20%	≈ 5000	TX51/32/19-3E25
3E27 <small>des</small>	8890 ± 20%	≈ 5000	TX51/32/19-3E27
3E6	17300 ± 30%	≈ 10000	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥ 320	≤ 4.4	–	–
3C90	≥ 320	≤ 2.4	≤ 2.4	–
3F3	≥ 320	–	≤ 2.4	≤ 4.1

## Ferrite toroids

TX55/32/18

## RING CORES (TOROIDS)

## Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.651	mm <sup>-1</sup>
$V_e$	effective volume	26580	mm <sup>3</sup>
$l_e$	effective length	132	mm
$A_e$	effective area	202	mm <sup>2</sup>
m	mass of core	≈ 134	g

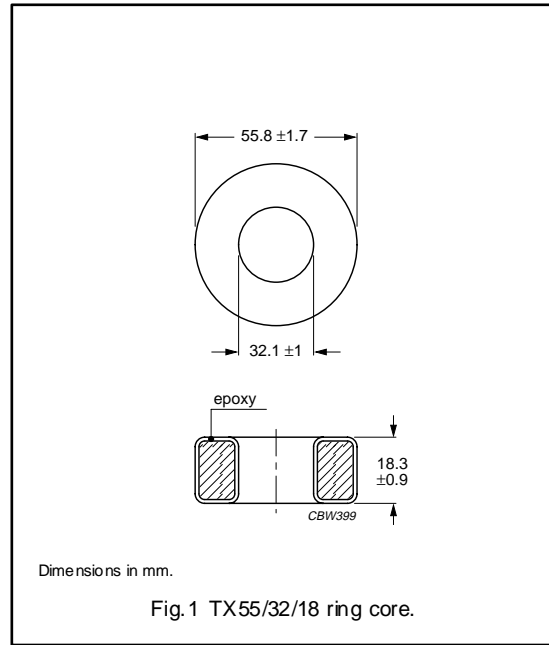
## Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

## 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)	$\mu_i$	TYPE NUMBER
4A11	1350 ± 25%	≈ 700 <sup>(1)</sup>	TX55/32/18-4A11
3C11	8300 ± 25%	≈ 4300	TX55/32/18-3C11
3E25	10620 ± 25%	≈ 5500	TX55/32/18-3E25
3E27	10620 ± 25%	≈ 5500	TX55/32/18-3E27

1. Old permeability specification maintained.

Ferrite toroids

TX58/41/18

RING CORES (TOROIDS)

Effective core parameters

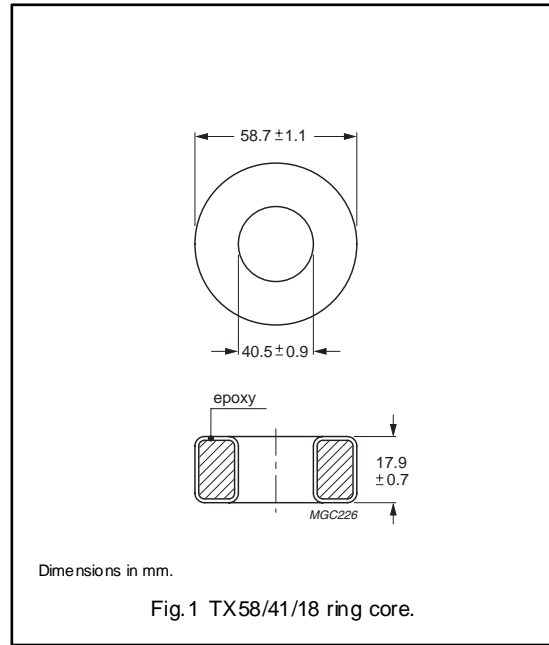
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.0	mm <sup>-1</sup>
$V_e$	effective volume	23200	mm <sup>3</sup>
$l_e$	effective length	152	mm
$A_e$	effective area	152	mm <sup>2</sup>
m	mass of core	≈ 110	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90 des	2890 ± 25%	≈ 2300	TX58/41/18-3C90
3C11	5400 ± 25%	≈ 4300	TX58/41/18-3C11
3E25	6900 ± 25%	≈ 5500	TX58/41/18-3E25

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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥320	≤2.6	≤2.6



Ferrite toroids

TX63/38/25

RING CORES (TOROIDS)

Effective core parameters

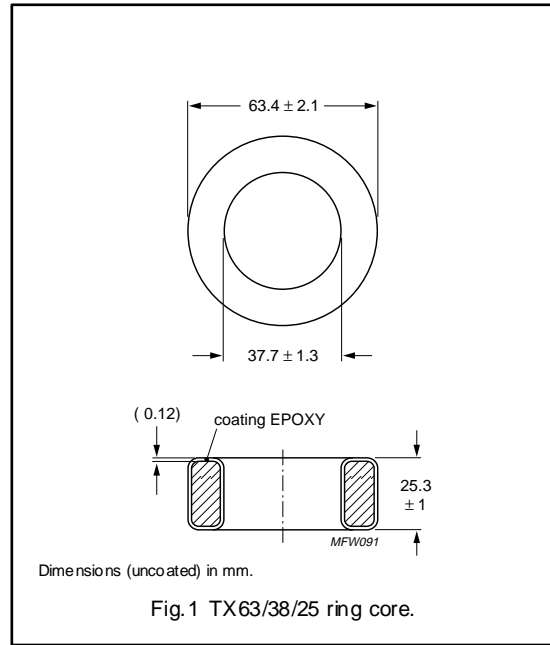
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.497	mm <sup>-1</sup>
$V_e$	effective volume	46500	mm <sup>3</sup>
$l_e$	effective length	152	mm
$A_e$	effective area	306	mm <sup>2</sup>
m	mass of core	≈ 220	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	4550 ± 25 %	≈ 1800	TX63/38/25-3F3
3E25	13900 ± 25 %	≈ 5500	TX63/38/25-3E25
3E6 <span style="border: 1px solid black; padding: 0 2px;">des</span>	25280 ± 30 %	≈ 10000	TX63/38/25-3E6

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; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3F3	≥ 320	≤ 5.1	≤ 8.8

Ferrite toroids

TX74/39/13

RING CORES (TOROIDS)

Effective core parameters

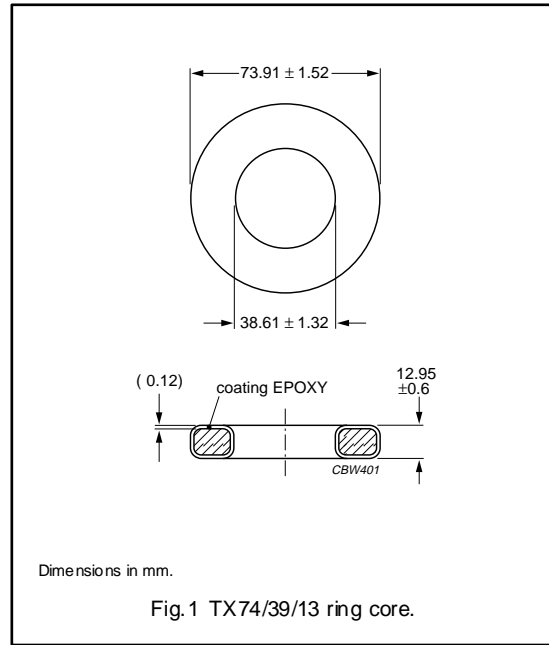
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.80	mm <sup>-1</sup>
$V_e$	effective volume	34300	mm <sup>3</sup>
$l_e$	effective length	165	mm
$A_e$	effective area	208	mm <sup>2</sup>
m	mass of core	≈ 170	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	2900 ± 20%	≈ 1800	TX74/39/13-3F3
3C90 des	3620 ± 20%	≈ 2300	TX74/39/13-3C90
3C81	4350 ± 20%	≈ 2700	TX74/39/13-3C81
3E25	8060 ± 20%	≈ 5000	TX74/39/13-3E25
3E6 des	15776 ± 30%	≈ 10000	TX74/39/13-3E6

Properties of cores under power conditions

GRADE	B (mT) at	CORE LOSS (W) at		
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3C81	≥ 320	≤ 7.0	–	–
3C90	≥ 320	≤ 4.0	≤ 4.0	–
3F3	≥ 320	–	≤ 3.8	≤ 8.1

Ferrite toroids

TX80/40/15

RING CORES (TOROIDS)

Effective core parameters

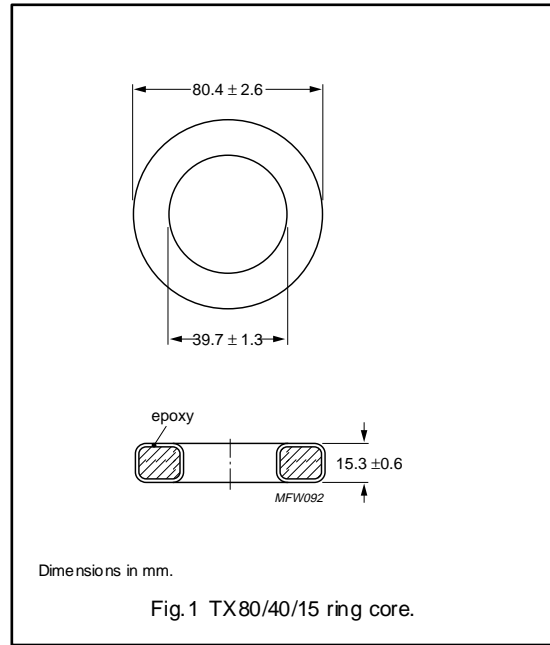
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.604	mm <sup>-1</sup>
$V_e$	effective volume	50200	mm <sup>3</sup>
$l_e$	effective length	174	mm
$A_e$	effective area	288	mm <sup>2</sup>
m	mass of core	≈ 240	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	4780 ± 25%	≈ 2300	TX80/40/15-3C90

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; B̂ = 200 mT; T = 100 °C	f = 100 kHz; B̂ = 100 mT; T = 100 °C
3C90	≥ 320	≤ 6.0	≤ 6.0

Ferrite toroids

TX87/54/14

RING CORES (TOROIDS)

Effective core parameters

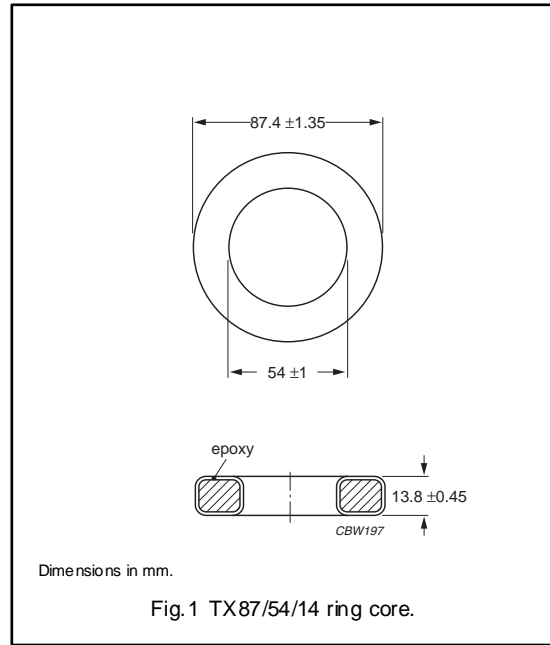
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.987	mm <sup>-1</sup>
$V_e$	effective volume	46400	mm <sup>3</sup>
$l_e$	effective length	214	mm
$A_e$	effective area	217	mm <sup>2</sup>
m	mass of core	≈ 220	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90 <small>des</small>	2930 ± 25%	≈ 2300	TX87/54/14-3C90
3C11 <small>des</small>	5470 ± 25%	≈ 4300	TX87/54/14-3C11

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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 5.5	≤ 5.5

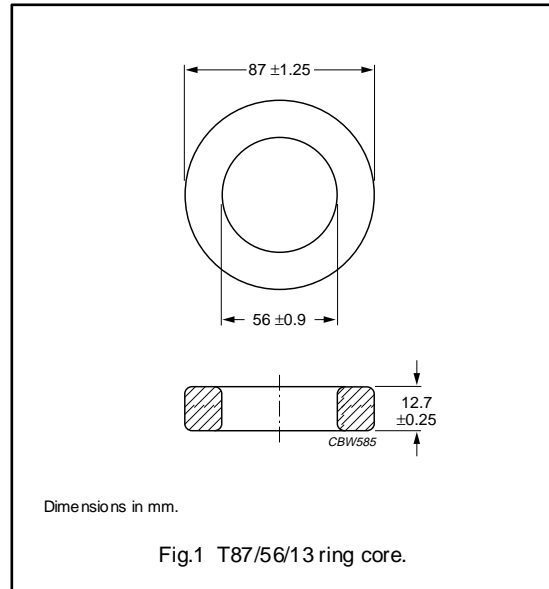
**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.123	mm <sup>-1</sup>
$V_e$	effective volume	42 133	mm <sup>3</sup>
$l_e$	effective length	217.5	mm
$A_e$	effective area	194	mm <sup>2</sup>
$m$	mass of core	≈ 200	g

**Coating**

Coated cores are available on request.



**Ring core data**

GRADE	$A_L$ (nH)	$\mu_i$	TYPE NUMBER
3E6 <span style="background-color: black; color: white; padding: 0 2px;">des</span>	11190 ± 30%	≈ 10 000	T87/56/13-3E6

Ferrite toroids

TX102/66/15

**RING CORES (TOROIDS)**

**Effective core parameters**

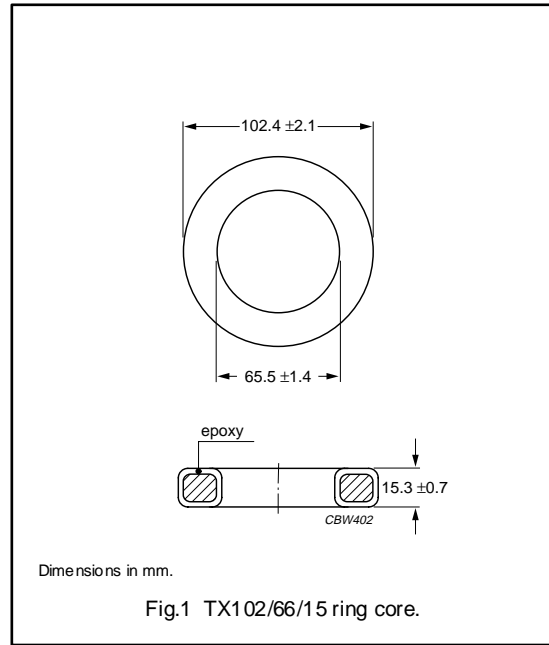
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.956	mm <sup>-1</sup>
$V_e$	effective volume	68200	mm <sup>3</sup>
$l_e$	effective length	255	mm
$A_e$	effective area	267	mm <sup>2</sup>
m	mass of core	≈ 325	g

**Coating**

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

**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)	$\mu_i$	TYPE NUMBER
4C65 des	165 ± 25%	≈ 125	TX102/66/15-4C65
3C11 des	5300 ± 25%	≈ 4300	TX102/66/15-3C11
3E25 des	7900 ± 25%	≈ 5500	TX102/66/15-3E25

Ferrite toroids

T107/65/18

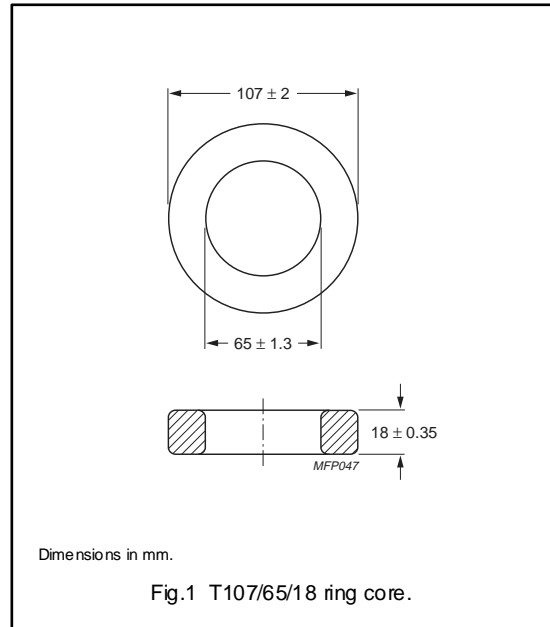
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.700	mm <sup>-1</sup>
$V_e$	effective volume	96000	mm <sup>3</sup>
$l_e$	effective length	259	mm
$A_e$	effective area	370	mm <sup>2</sup>
m	mass of core	≈ 456	g

Coating

Coated cores are available on request.



Ring core data

GRADE	$A_L$ (nH)	$\mu_i$	TYPE NUMBER
3F4 <small>des</small>	1354 ± 25%	≈ 750	T107/65/18-3F4

Ferrite toroids

TX107/65/18

RING CORES (TOROIDS)

Effective core parameters

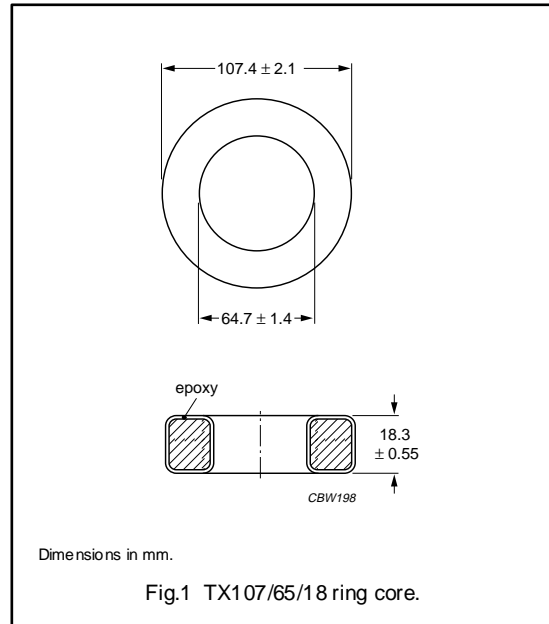
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.700	mm <sup>-1</sup>
$V_e$	effective volume	96000	mm <sup>3</sup>
$l_e$	effective length	259	mm
$A_e$	effective area	370	mm <sup>2</sup>
m	mass of core	≈ 456	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3F3	3230 ± 25%	≈ 1800	TX107/65/18-3F3
3E25	9900 ± 25%	≈ 5 500	TX107/65/18-3E25

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 = 100 kHz; B = 100 mT; T = 100 °C	f = 400 kHz; B = 50 mT; T = 100 °C
3F3	≥ 320	≤ 10.6	≤ 18.2



Ferrite toroids

T107/65/25

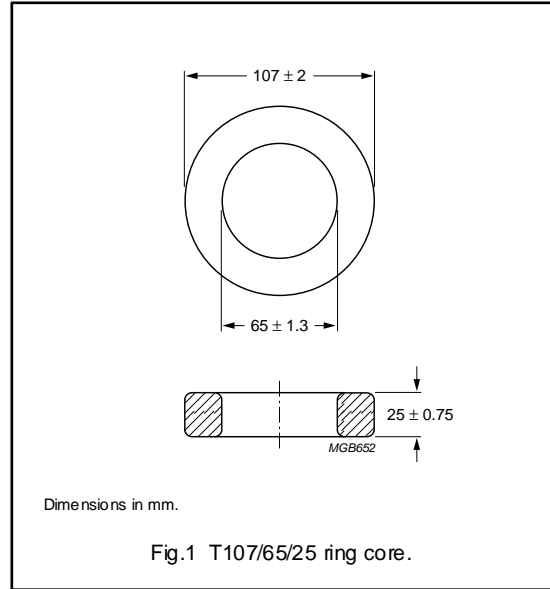
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.504	mm <sup>-1</sup>
$V_e$	effective volume	133 000	mm <sup>3</sup>
$l_e$	effective length	259	mm
$A_e$	effective area	514	mm <sup>2</sup>
$m$	mass of core	≈ 680	g

Coating

Coated cores are available on request.



Ring core data

GRADE	$A_L$ (nH)	$\mu_i$	TYPE NUMBER
3F4 <small>des</small>	1870 ± 25%	≈ 750	T107/65/25-3F4
3F3 <small>des</small>	4485 ± 25%	≈ 1800	T107/65/25-3F3

Ferrite toroids

T140/106/25

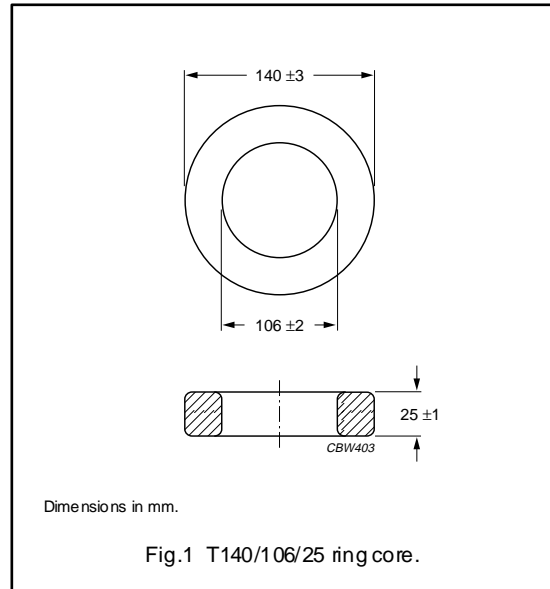
RING CORES (TOROIDS)

Effective core parameters

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.903	mm <sup>-1</sup>
$V_e$	effective volume	161 100	mm <sup>3</sup>
$l_e$	effective length	382	mm
$A_e$	effective area	422	mm <sup>2</sup>
m	mass of core	≈ 800	g

Coating

Coated cores are available on request.



Ring core data

GRADE	$A_L$ (nH)	$\mu_i$	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; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 22.7	≤ 22.7

Ferrite toroids

TX140/106/25

RING CORES (TOROIDS)

Effective core parameters

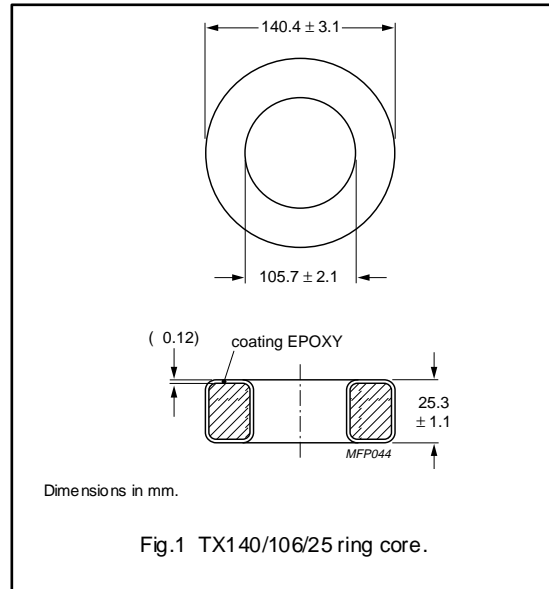
SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	0.903	mm <sup>-1</sup>
$V_e$	effective volume	161 100	mm <sup>3</sup>
$l_e$	effective length	382	mm
$A_e$	effective area	422	mm <sup>2</sup>
m	mass of core	≈ 800	g

Coating

The cores are coated with epoxy, flame retardant in accordance with "UL 94V-0"; UL file number E 228348. The colour is white.

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)	$\mu_i$	TYPE NUMBER
3C90	3200 ± 20%	≈ 2300	TX140/106/25-3C90
3E25	7700 ± 30%	≈ 5500	TX140/106/25-3E25

Properties of cores under power conditions

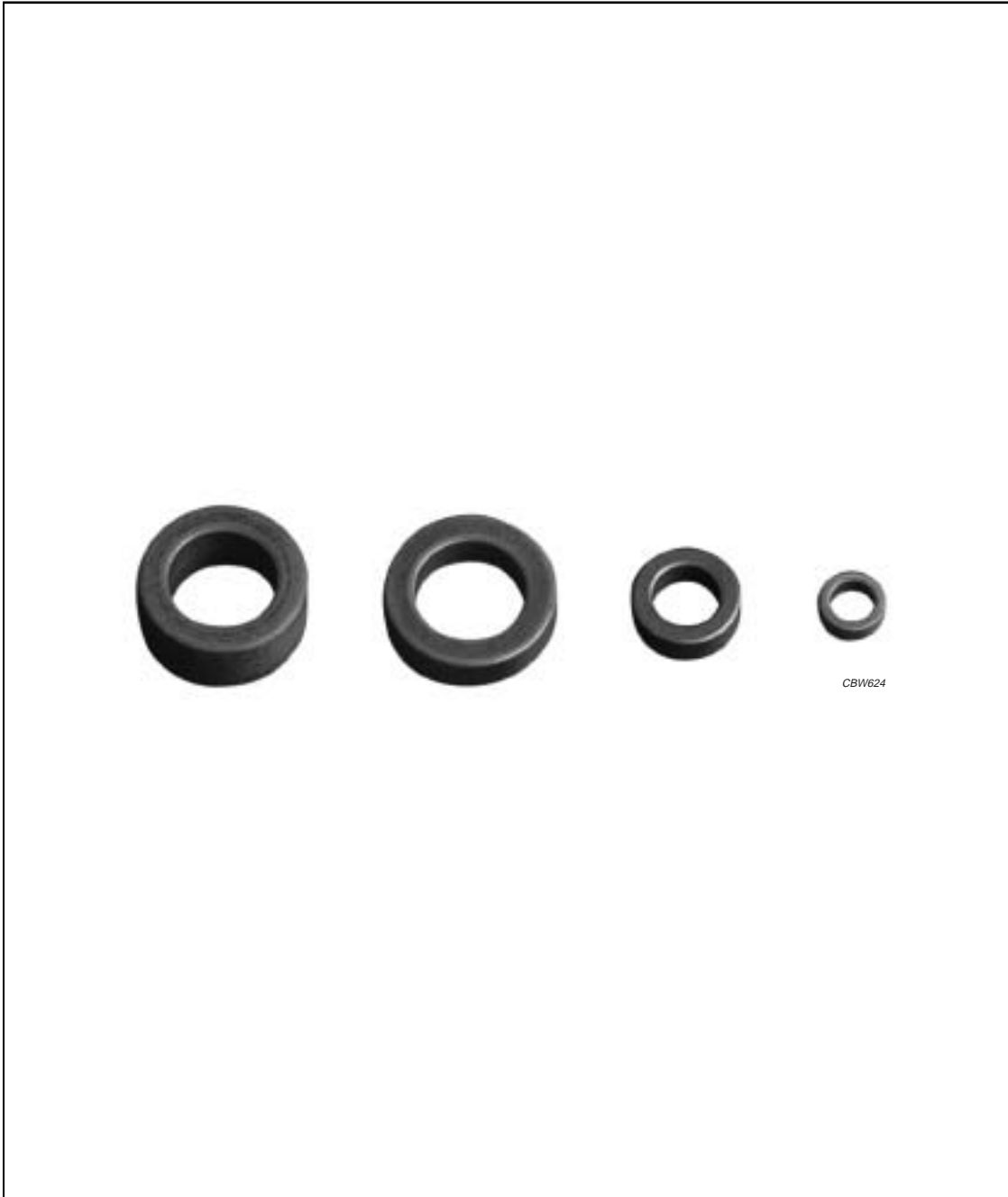
GRADE	B (mT) at	CORE LOSS (W) at	
	H = 250 A/m; f = 25 kHz; T = 100 °C	f = 25 kHz; B = 200 mT; T = 100 °C	f = 100 kHz; B = 100 mT; T = 100 °C
3C90	≥ 320	≤ 22.7	≤ 22.7



**Soft Ferrites**

**Iron powder toroids**

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**Soft Ferrites**

**Iron powder toroids**

**PRODUCT OVERVIEW AND  
TYPE NUMBER STRUCTURE**

**Product overview iron powder ring cores (toroids)**

CORE TYPE	V <sub>e</sub> (mm <sup>3</sup> )	A <sub>e</sub> (mm <sup>2</sup> )	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

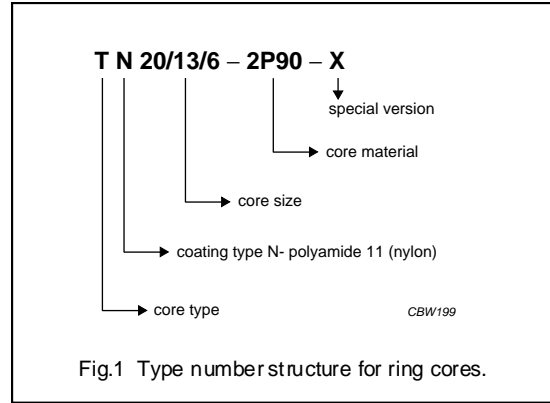


Fig.1 Type number structure for ring cores.

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.58	mm <sup>-1</sup>
$V_e$	effective volume	83	mm <sup>3</sup>
$l_e$	effective length	17.3	mm
$A_e$	effective area	4.81	mm <sup>2</sup>
m	mass of core	≈0.6	g

**Coating**

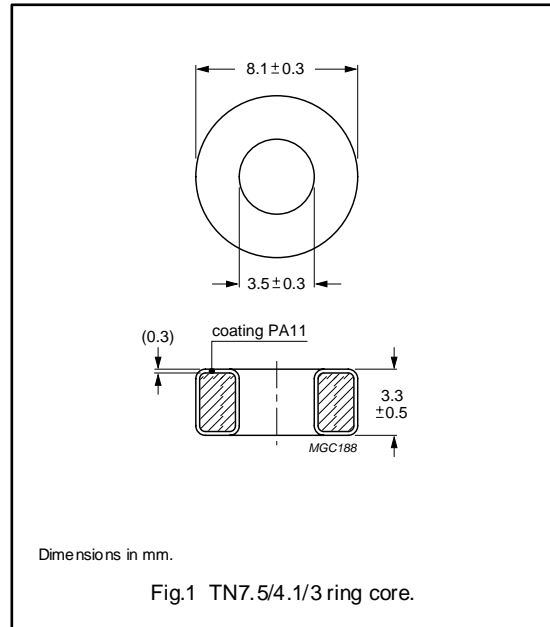
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	$14 \pm 10\%$	≈40	TN7.5/4.1/3-2P40
2P50 <sup>sup</sup>	$18 \pm 10\%$	≈50	TN7.5/4.1/3-2P50
2P65 <sup>sup</sup>	$23 \pm 10\%$	≈65	TN7.5/4.1/3-2P65
2P80 <sup>sup</sup>	$28 \pm 10\%$	≈80	TN7.5/4.1/3-2P80
2P90 <sup>sup</sup>	$30 +10/-15\%$	≈90	TN7.5/4.1/3-2P90

Iron powder toroids

TN12/8/4.4

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	3.30	mm <sup>-1</sup>
$V_e$	effective volume	290	mm <sup>3</sup>
$l_e$	effective length	30.9	mm
$A_e$	effective area	9.37	mm <sup>2</sup>
m	mass of core	≈2	g

**Coating**

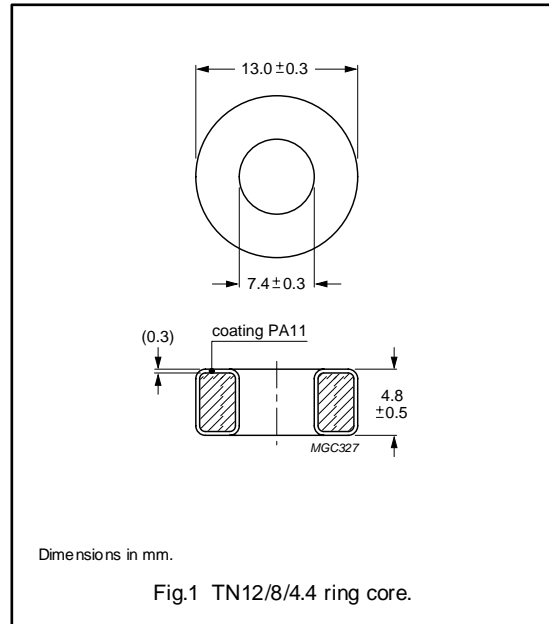
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	15 ± 10%	≈40	TN12/8/4.4-2P40
2P50 <sup>sup</sup>	19 ± 10%	≈50	TN12/8/4.4-2P50
2P65 <sup>sup</sup>	25 ± 10%	≈65	TN12/8/4.4-2P65
2P80 <sup>sup</sup>	31 ± 10%	≈80	TN12/8/4.4-2P80
2P90 <sup>sup</sup>	33 +10/- 15%	≈90	TN12/8/4.4-2P90



Iron powder toroids

TN17/9.8/4.4

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.55	mm <sup>-1</sup>
$V_e$	effective volume	635	mm <sup>3</sup>
$l_e$	effective length	40.2	mm
$A_e$	effective area	15.8	mm <sup>2</sup>
m	mass of core	≈5	g

**Coating**

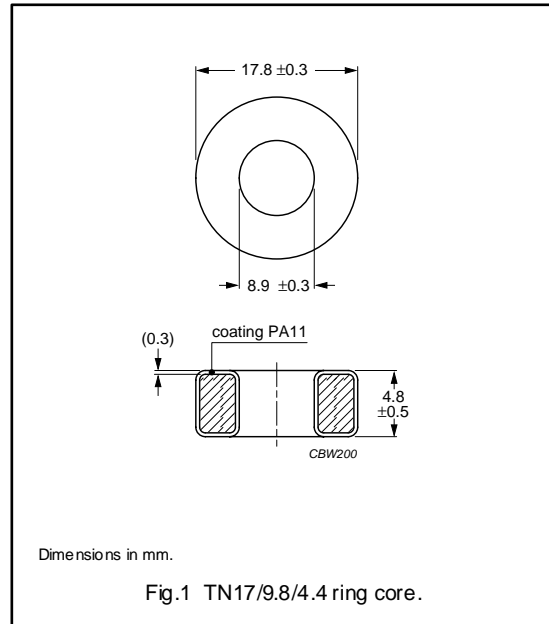
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	20 ± 10%	≈40	TN17/9.8/4.4-2P40
2P50 <sup>sup</sup>	25 ± 10%	≈50	TN17/9.8/4.4-2P50
2P65 <sup>sup</sup>	32 ± 10%	≈65	TN17/9.8/4.4-2P65
2P80 <sup>sup</sup>	40 ± 10%	≈80	TN17/9.8/4.4-2P80
2P90 <sup>sup</sup>	42 +10/- 15%	≈90	TN17/9.8/4.4-2P90

**RING CORES (TOROIDS)****Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	2.44	mm <sup>-1</sup>
$V_e$	effective volume	1 020	mm <sup>3</sup>
$l_e$	effective length	49.9	mm
$A_e$	effective area	20.4	mm <sup>2</sup>
m	mass of core	≈7.5	g

**Coating**

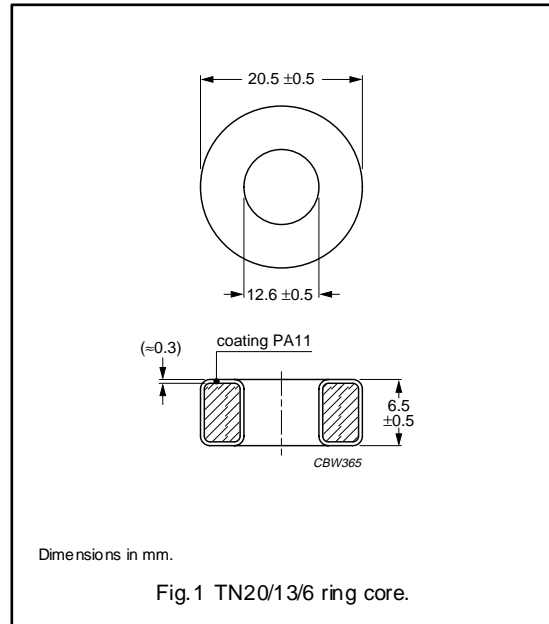
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	21 ± 10%	≈40	TN20/13/6-2P40
2P50 <sup>sup</sup>	26 ± 10%	≈50	TN20/13/6-2P50
2P65 <sup>sup</sup>	34 ± 10%	≈65	TN20/13/6-2P65
2P80 <sup>sup</sup>	41 ± 10%	≈80	TN20/13/6-2P80
2P90 <sup>sup</sup>	44 +10/-15%	≈90	TN20/13/6-2P90

Iron powder toroids

TN24/15/7.5

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.76	mm <sup>-1</sup>
$V_e$	effective volume	1 895	mm <sup>3</sup>
$l_e$	effective length	57.8	mm
$A_e$	effective area	32.8	mm <sup>2</sup>
m	mass of core	≈13	g

**Coating**

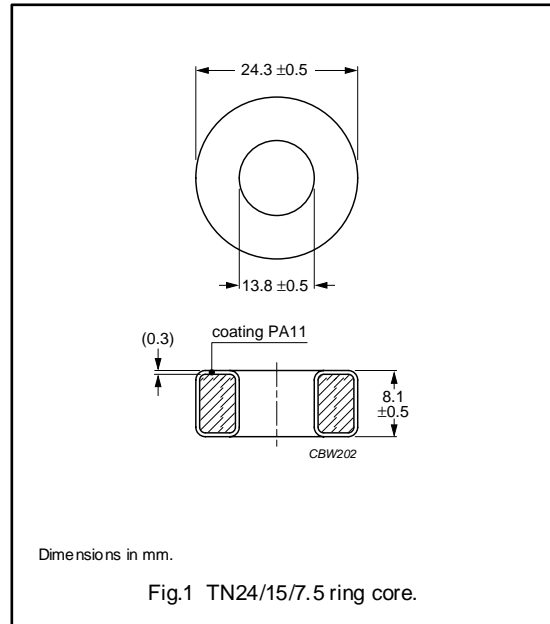
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	29 ±10%	≈40	TN24/15/7.5-2P40
2P50 <sup>sup</sup>	36 ±10%	≈50	TN24/15/7.5-2P50
2P65 <sup>sup</sup>	47 ±10%	≈65	TN24/15/7.5-2P65
2P80 <sup>sup</sup>	57 ±10%	≈80	TN24/15/7.5-2P80
2P90 <sup>sup</sup>	61 +10/-15%	≈90	TN24/15/7.5-2P90

Iron powder toroids

TN27/15/11

**RING CORES (TOROIDS)**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.02	mm <sup>-1</sup>
$V_e$	effective volume	3 720	mm <sup>3</sup>
$l_e$	effective length	61.6	mm
$A_e$	effective area	60.4	mm <sup>2</sup>
m	mass of core	≈25	g

**Coating**

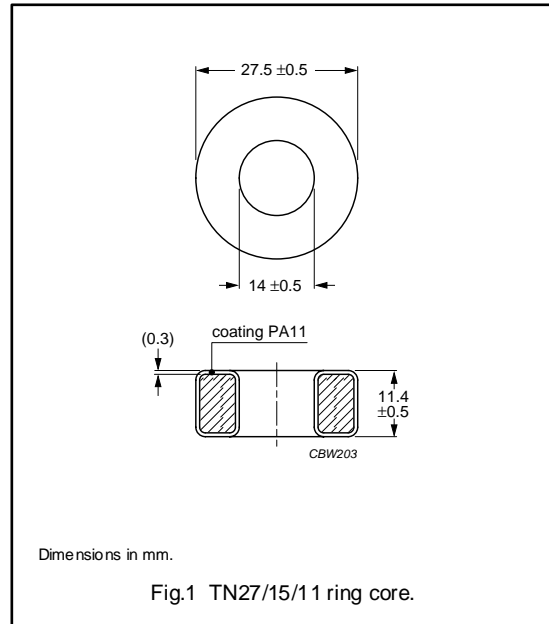
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	49 ±10%	≈40	TN27/15/11-2P40
2P50 <sup>sup</sup>	62 ±10%	≈50	TN27/15/11-2P50
2P65 <sup>sup</sup>	80 ±10%	≈65	TN27/15/11-2P65
2P80 <sup>sup</sup>	94 ±10%	≈80	TN27/15/11-2P80
2P90 <sup>sup</sup>	105 +10/-15%	≈90	TN27/15/11-2P90

Iron powder toroids

TN33/20/11

**RING CORES**

**Effective core parameters**

SYMBOL	PARAMETER	VALUE	UNIT
$\Sigma(l/A)$	core factor (C1)	1.23	mm <sup>-1</sup>
$V_e$	effective volume	5 200	mm <sup>3</sup>
$l_e$	effective length	80.0	mm
$A_e$	effective area	65.0	mm <sup>2</sup>
m	mass of core	≈35	g

**Coating**

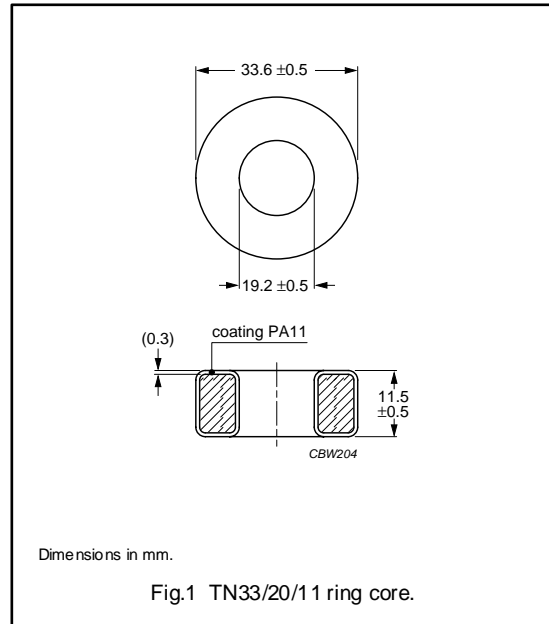
The cores are coated with polyamide 11 (PA11), flame retardant in accordance with "UL 94V-2"; UL file number E 45228 (M).

The colour is white.

**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)	$\mu_i$	TYPE NUMBER
2P40 <sup>sup</sup>	41 ±10%	≈40	TN33/20/11-2P40
2P50 <sup>sup</sup>	51 ±10%	≈50	TN33/20/11-2P50
2P65 <sup>sup</sup>	67 ±10%	≈65	TN33/20/11-2P65
2P80 <sup>sup</sup>	82 ±10%	≈80	TN33/20/11-2P80
2P90 <sup>sup</sup>	87 +10/-15%	≈90	TN33/20/11-2P90

