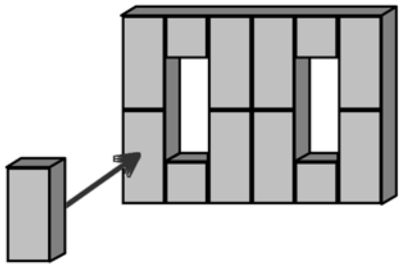
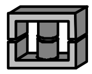
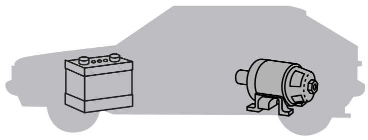
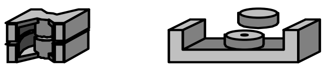
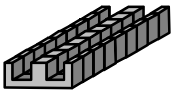
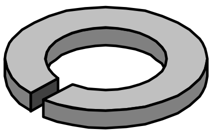
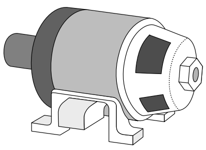
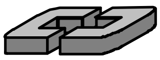
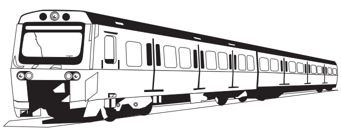
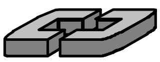
Large Size Ferrite Cores for High Power
Summary

Nowadays, more and more high-frequency circuits are being used in industrial equipment as well as consumer equipment. With the use of higher frequencies, silicon steel sheets have become unsuitable for magnetic material used in transformers. Ferrite, its substitute, delivers reduced core loss at high frequencies and is the optimum material for high-power requirements.
To meet these various demands, we at TDK have employed our ferrite development technologies accumulated over the years and advanced production technologies to offer large, high-quality cores for high-frequency, high-power power supplies.
In the following information, introduce ferrite cores that used PE22 and PC40 materials having superior magnetic characteristics.

APPLICATIONS

Transformer	High frequency inductive heater	EE320x250x20 
	Uninterruptible Power Supply System(UPS) CATV's power supply Photovoltaic power generation Power supply of communications station	EC70,90,120 
	Electrical vehicle 	PQ78,107 
	Automated warehouse, conveyor machine	
	Current sensor	
Reactor choke	General purpose inverter  • Air conditioner • Fun • Pump • Printing press • Packing machine • Machines for food industry • Drier • Compressor of freezer • Textile machine • Woodworking machine • Medical machine	UU79x129x31 
	Trains 	UU79x129x31 

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FEATURES

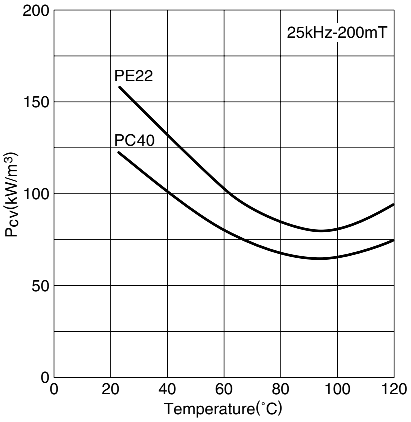
- Large size ferrite cores developed for reactors and transformers used in high power units.
- Please contact us for machinability of non-standard special forms.

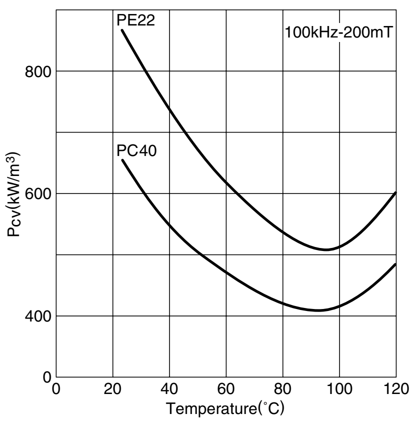
MATERIAL CHARACTERISTICS (Typical)

Material					PE22	PC40
Initial permeability		μ_i	[23°C]		1800	2300
Curie temperature		T_c		°C	>200	>200
Saturation magnetic flux density H=1194A/m		B_s	[23°C] [100°C]	mT	510 410	500 380
Remanent flux density		B_r	[23°C]	mT	140	125
Coercive force		H_c	[23°C]	A/m	16	15
Core loss	25kHz, 200mT 100kHz, 200mT	P_{cv}	[100°C]	kW/m³	80 520	70 420
Electrical resistivity		ρ		Ω • m	3	6.5
Approximate density		d_{app}		kg/m³	4.8×10^3	4.8×10^3
Thermal expansion coefficient		α		1/K	12×10^{-6}	12×10^{-6}
Thermal conductivity		κ		W/mK	5	5
Specific heat		C_p		J/kg • K	600	600
Bending strength		δ_{b3}		N/m²	9×10^7	9×10^7
Young's modulus		E		N/m²	1.2×10^{11}	1.2×10^{11}
Magnetostriction		λs			-0.6×10^{-6}	-0.6×10^{-6}

• 1(mT)=10(G),1(A/m)=0.012566(Oe)

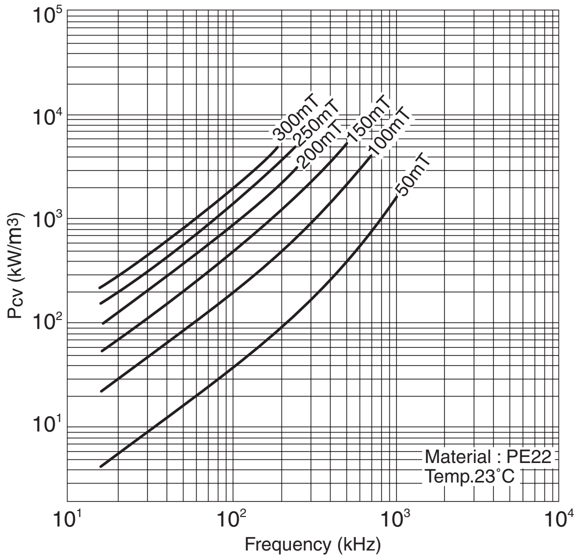
CORE LOSS vs. TEMPERATURE CHARACTERISTICS

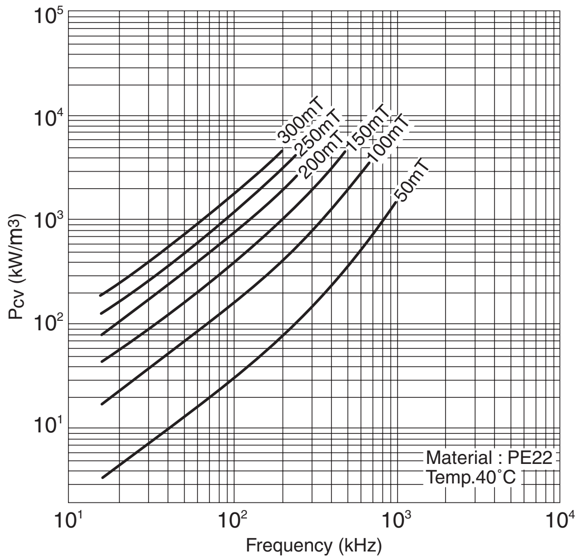


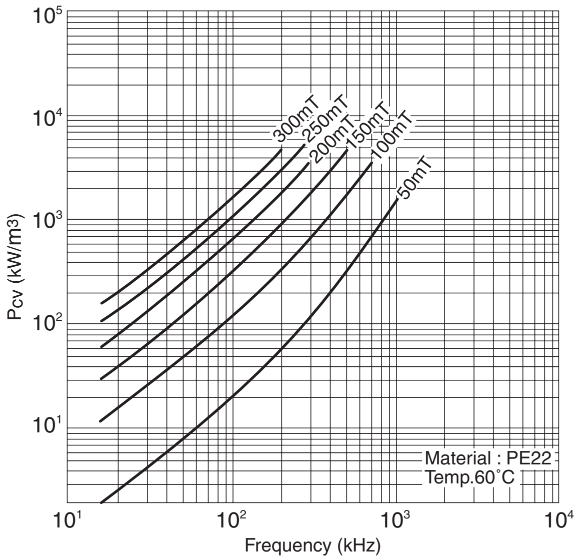


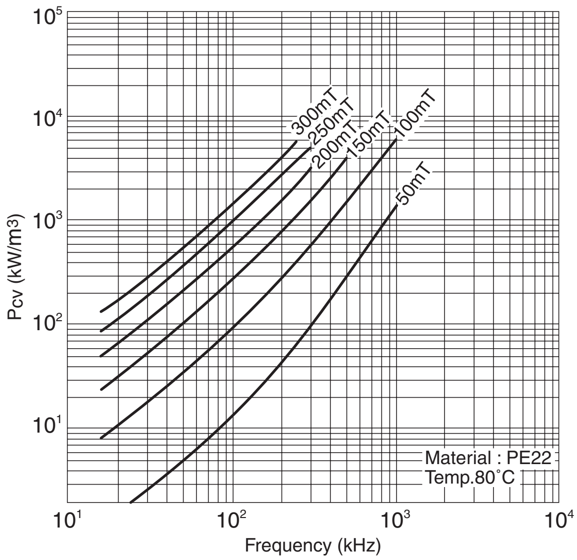
• All specifications are subject to change without notice.

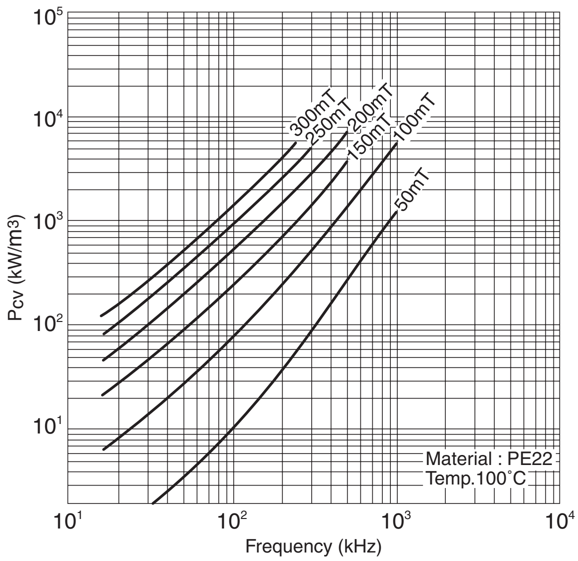
CORE LOSS vs. FREQUENCY CHARACTERISTICS
MATERIAL:PE22

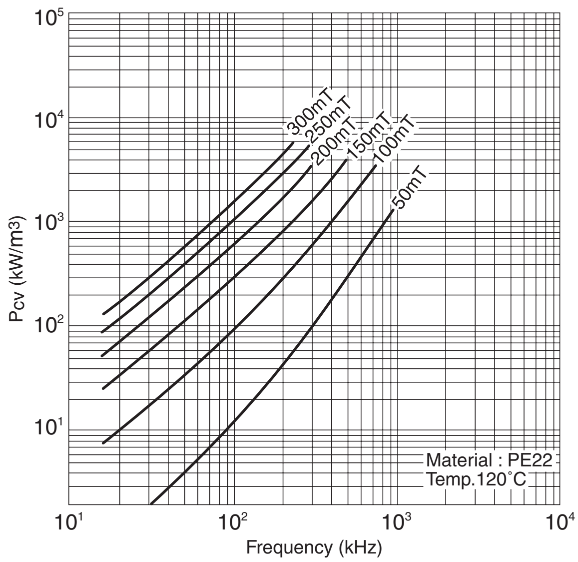












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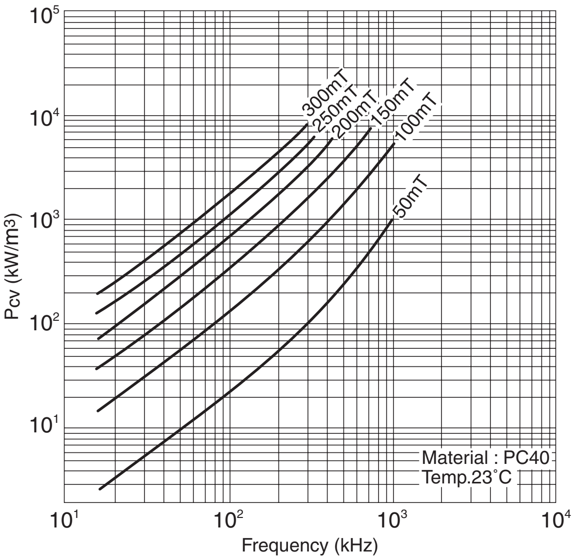
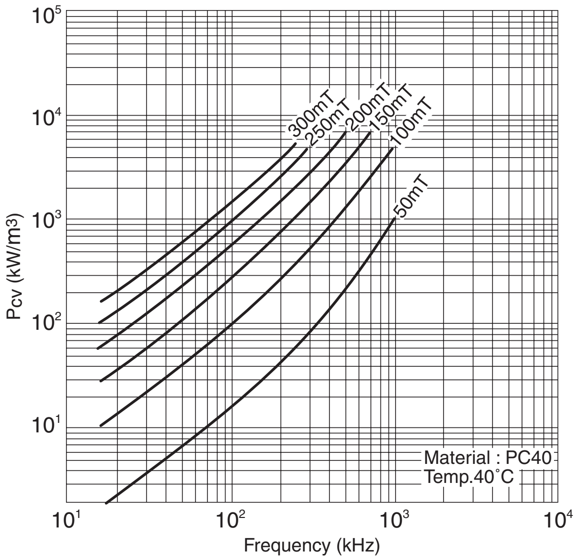
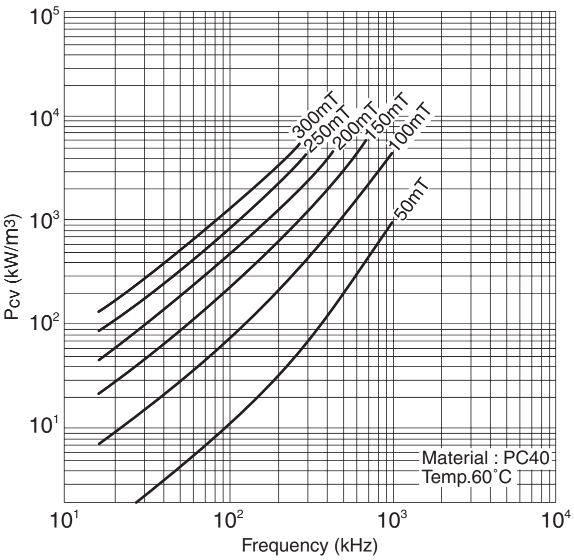
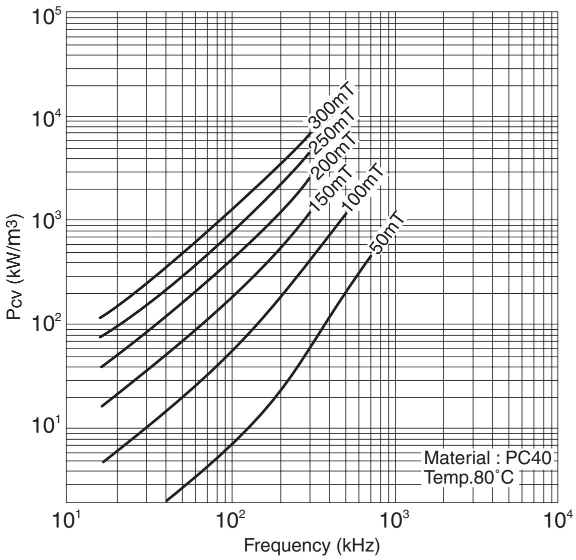
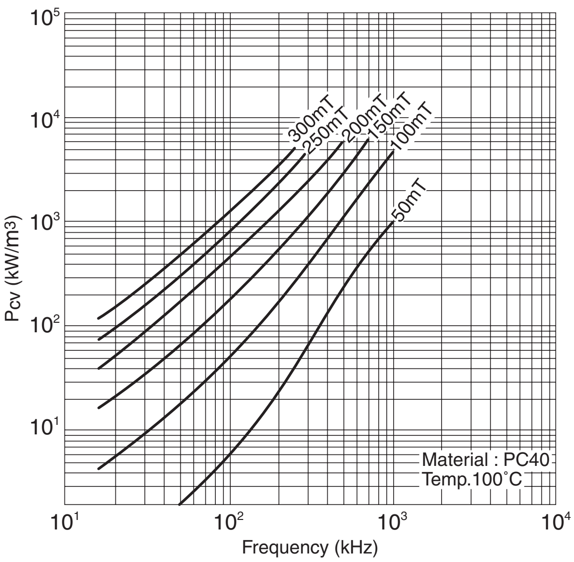
MATERIAL:PC40

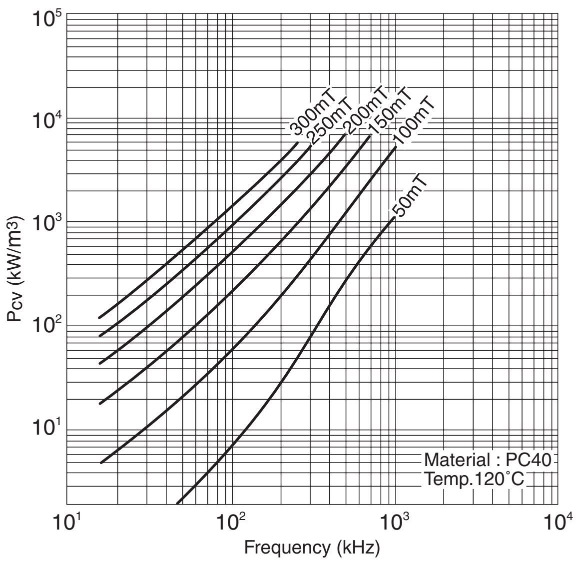












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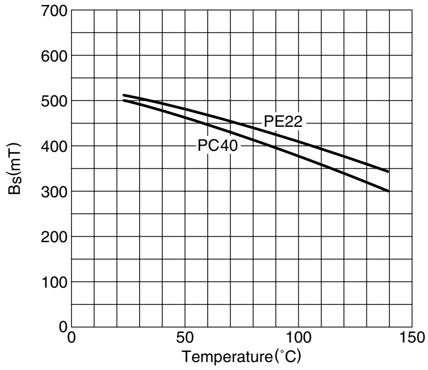
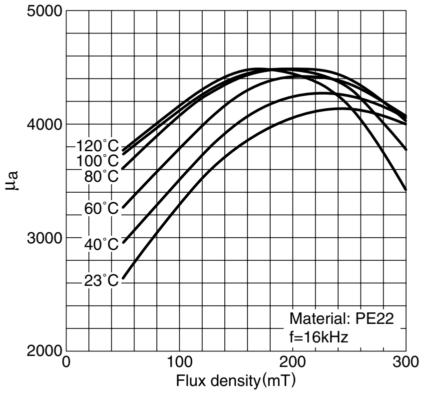
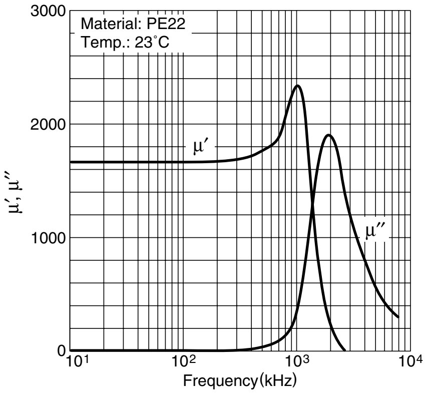
SATURATION MAGNETIC FLUX DENSITY vs. TEMPERATURE CHARACTERISTICS



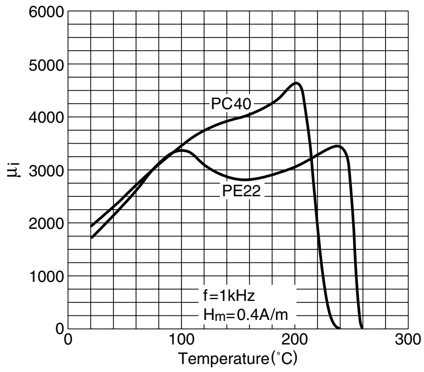
AMPLITUDE PERMEABILITY vs. SATURATION MAGNETIC FLUX DENSITY CHARACTERISTICS

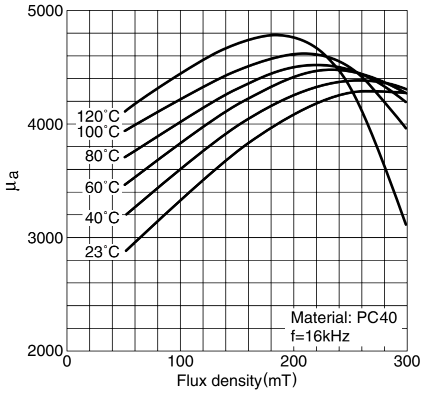


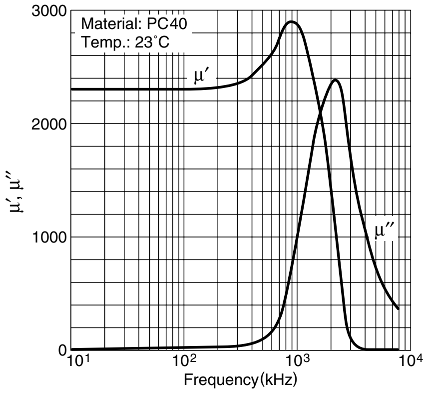
MAGNETIC PERMEABILITY vs. FREQUENCY CHARACTERISTICS



INITIAL MAGNETIC PERMEABILITY vs. TEMPERATURE CHARACTERISTICS







DIMENSIONAL RESONANCE

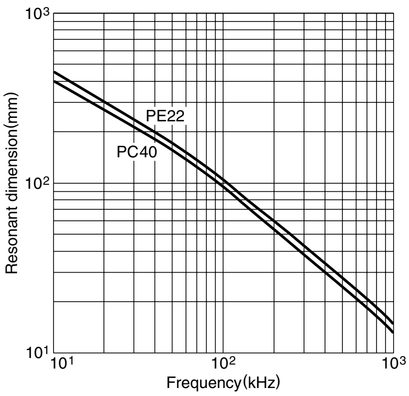
Dimensional resonance is a phenomenon which increases loss and decreases magnetic permeability by electromagnetic standing waves when the magnetic field of the core frequency is applied. The phenomenon appears when the maximum dimension of the cross section of the core perpendicular to the magnetic field is the integral multiple of about half of the electromagnetic wavelength λ.

$$\lambda = \frac{C}{f \times \sqrt{\mu_r \times \varepsilon_r}}$$

C: Electromagnetic wave speed in a vacuum(3.0×10^8m/s)
μ_r: Relative magnetic permeability
ε_r: Relative permissivity
f: Frequency of the applied magnetic field(electromagnetic wave)

As μ_e decreases by inserting into the gap, using the same core enables high frequency wave usage as indicated by the formula above.
As dimensional resonance quickly decreases magnetic permeability, design the actual frequency to avoid dimensional resonance.
In the case of possible dimensional resonance, it can be protected against by dividing the core in the magnetic circuit direction and bonding them.

RESONANCE DIMENSION vs. FREQUENCY CHARACTERISTICS



GENERAL PRECAUTIONS WHEN USING FERRITE CORE

- When selecting the material/form of the ferrite core, while considering the margins select from the range in the catalog (product manual) display where factors such as inductance value, maximum saturation flux density, core loss, temperature characteristics, frequency characteristics and Curie temperature are concerned.
- Select material that does not corrode or react in order to avoid insulation failure or a layer short, and also be careful to avoid loose winding of the core or causing damage to the wire.
- Be careful that the equipment and tools you use do not strike the core in order to avoid core cracks.
- Please consider using cases, bobbins or tape for insulation purposes.
- When using cases and bobbins, select those with a heat expansion coefficient as close to that of the ferrite as possible.
- When laying out the case, bobbin, coil and the ferrite core, create clearance between each part in order to prevent any core cracks and to assure insulation.
- Please handle with care, since a ferrite core is susceptible to shock.
- The outward appearance is determined according to the standard of our company.
- Do not place close to strong magnets.
- Be careful not to cause shock by the use of equipment and tools.
- Be careful not to expose to rapid change in temperature, since it is also susceptible to thermal shock.
- Careless handling may hurt your skin, since the corners of the polished surface of the ferrite are very sharp, and in some cases, burrs may have formed on the surface.
- Please be very careful when stacking and handling the containers, since some ferrite cores are heavy, and can cause injury, toppling or back pain.
- Where inner packaging is concerned, please be careful not to damage the core when taking it out from the container since the packing materials used in order to prevent damage during transportation may make it difficult to take out.
- Do not reprocess the ferrite core as it can cause problems, such as injury.