Ferrite transformers

Transformers with ferrite cores

Ferrites are ceramic materials which are used in the electronics industry for cores in inductances (reactors) and transformers for high frequencies. They have the appearance of compact, cast cores in a wide variety of different geometric shapes and are used where cores made of transformer laminations are not suitable. Generally speaking, the advantage of this material is that it can have very high permeability and low losses, and can work at high frequencies. The disadvantage is that it is easily saturated (its saturation flux density is typically < 0.5 T).

By making cores with different material blends it is possible to achieve desired properties, depen-ding on whether the cores are to be used for communication purposes, power supply, filter purposes, etc.

The big manufacturers of core materials and fittings supply their products in groups which differ from each other in physical appearance. The core in each group is usually supplied in several material qualities. The commonest core groups include group names such as E, ETD, RM, U, cup-type cores, toroidal cores, etc. Most of these core families represent relatively small components in terms of physical appearance.

The commonest users of ferrite cores are elec-tronics manufacturers in the fields of power supply (SMPS), telecommunications, instrumentation and the like.

Typical ferrite transformers

As the name indicates, ferromagnetic powder cores are not ferrites, but cores made up of oxidised ferromagnetic powder, moulded in a binding agent. The advantage of this material is that the core is not as easily saturated as in the case of ferrites. The saturation flux density is as high as approx. 1.5 T, making it possible to operate with high direct currents. Such cores also cope with high frequencies and are thermally stable.

The greatest disadvantage of ferromagnetic powder cores is that they have low permeability. This is due to the spacing between the iron particles, which adds up to a large air gap (known as a distributed air gap). Such cores are mainly used in reactors for energy storage and filtering at low frequencies. They are also used for HF impedance adjustment. Ferromagnetic powder cores are produced virtually exclusively in the form of toroidal cores.

Winding media

Class F (155°C) enamel-insulated wire is normally used. It can be soldered directly without re-moving the enamel, which melts during the soldering process. For units which are to work at high frequencies, high-frequency lace wire can be used. Lace covered with nylon or silk is usual. Silk has the advantage that less slag is formed during the soldering process. Copper foil is the usual winding medium in the case of power transformers.

Insulating materials

The windings are normally insulated internally and externally using insulating tape made of polyester film, e.g. Mylar (Du Pont). In the case of more stringent temperature/insulation require-ments Kapton or Nomex, for example, is used.

Standard pre-wound units

A selection of standard units is available in catalogue form from several of the large suppliers, particularly in the case of reactors.

Custom units

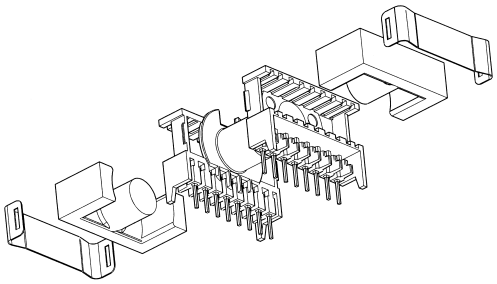
There are few manufacturers in the Nordic countries who can supply customer-specified reactors or transformers which the customer has designed himself.

Noratel can help, not only with the production of such units, but also with their design. The production of such units abroad usually requires very large volumes.

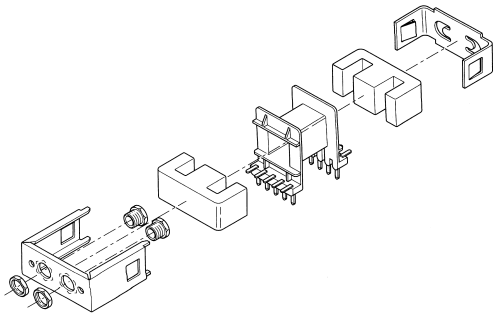
Typical core constructions

As in the case of conventional transformers, there are also different core constructions for ferrites, depending on the area of use and technical specifications.

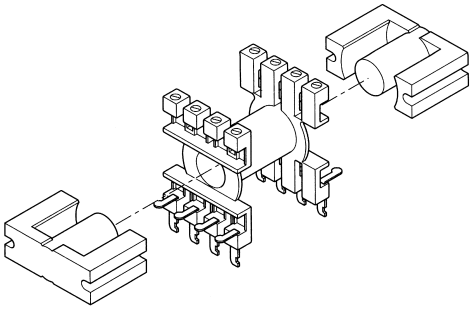
ETD-cores with fittings



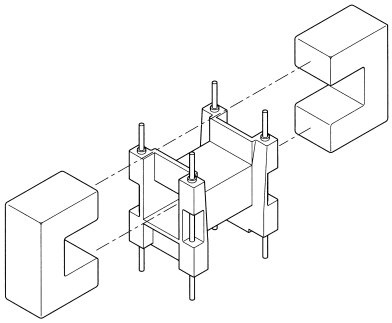
E-cores with fittings



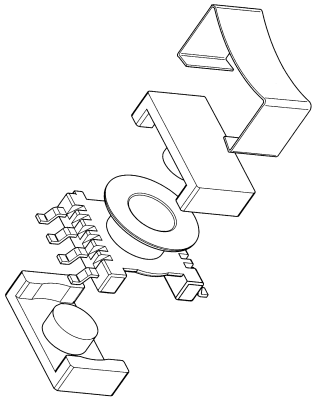
EC-cores with fittings



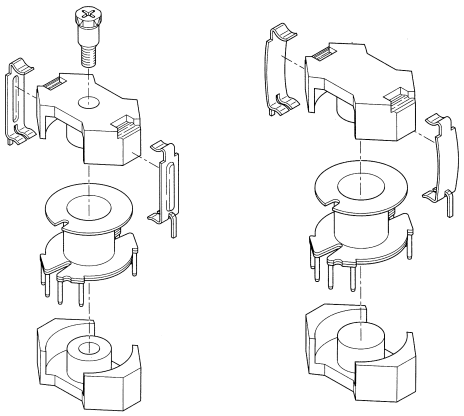
U, I-cores with fittings



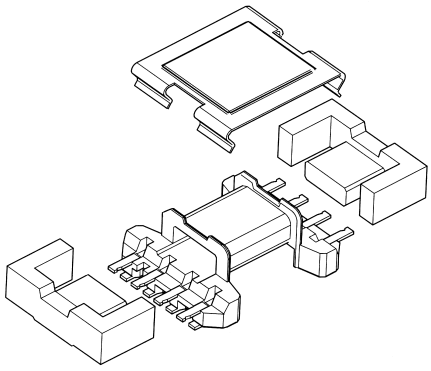
ER-cores with fittings



RM-cores with fittings



EFD-cores with fittings



Toroidal-cores with fittings