



AD-VANCE MAGNETICS, INC.

ISO 9001:2008 Certified Company

The Need For Magnetic Shielding

Without magnetic shielding, much of today's sophisticated electronic gear would be larger, less efficient and in some magnetic environments, impossible to function at all. As components are made more sensitive and packaging more dense, susceptibility to electromagnetic interaction increases dramatically, even in the best engineered layouts.

Electro-magnetic interference can originate from various sources. These could include permanent magnets or electromagnets, coil components such as transformers, solenoids and reactors, AC or DC motors and generators, and cables carrying large DC or AC current at power frequencies. In many cases, even the normal earth's magnetic field can affect proper functioning.

To assure optimum performance, stray magnetic fields must be directed around critical electronic components as a rock in a river diverts running water. This is accomplished by a magnetic shield of high permeability (indicative of the ability of a material to carry a flux) which provides a low reluctance path guiding the magnetic flux around the critical area. Field intensities encountered will usually be under 10 oersteds, and field frequencies from DC to 800 Hertz, although AD-MU alloys are effective at much higher frequencies.

Shielding is accomplished by placing a material with a permeability much greater than one between the field source and the sensitive components affected. Such material must be conductive to prevent passage of electric fields and highly permeable to prevent passage of magnetic fields. Shielding materials commonly used have permeabilities from 300 to over 500,000 depending on flux density.

Low frequency magnetic shield effectiveness is directly proportional to shield thickness because the shield's reluctance to magnetic flux is inversely proportional to its thickness. It is essential to minimize joints or air gaps which can reduce shielding effectiveness not only by enabling magnetic interference to leak through but significantly affecting the path's reluctance, resulting in a lower effective permeability. The degree of shielding achieved by a given total thickness of material can be increased by dividing it into two or more concentric shields separated by at least the thickness of the material. In such case, a medium permeability material should be used for one layer and a high permeability material for the other layer. The lower permeability material should be located closest to the field source. Thus the medium permeability laminae act as a buffer that sufficiently diverts the magnetic field to enable the lower reluctance (higher permeability) material to attain the required attenuation. When the external field is strong enough to cause the medium permeability material to approach saturation, an additional diverting shield of low permeability high flux carrying capability may be needed. At H.F., shielding by enhancing skin effect offers a much greater shielding from a thin layer.