Group3 Hall Effect Digital Teslameters

Installation Techniques for Electrically Noisy Environments

The Group3 Digital Teslameter is a precision electronic measuring device. Because of the nature of the measurements it is asked to do it is frequently exposed to conditions that are considerably worse than is normally encountered by precision instruments.

Because of this due care has to be taken when installing it.

Requirements on any system:-

The Teslameter and its probe must be protected from any chance of a direct high voltage discharge. The probe cable should have been ordered as a shielded cable if the meter is to be used in an electrically noisy environment. This shield is an RFI shield, not a high current path, so if there is any possibility of an arcing discharge hitting the probe area then the entire probe and cable must be enclosed in a metal tube (non magnetic, of course), or shielded in some other way.

The probe cable should be routed away from any power, high current or high voltage wiring. It should be shielded from any capacitively coupled noise effects. If the cable runs close to any section of the apparatus that could be subjected to a very rapid change of potential on a spark discharge, then the probe cable must be shielded to prevent capacitive coupling of the noise.

The long jack screws designed to hold the probe connector onto the teslameter must be screwed up tight, as they form part of the electrical connection of the shield system. The woven braid of the probe cable is terminated to the probe connector case. The long jack screws then connect the probe connector case to the teslameter case.

The teslameter itself should be sited in a sheltered location, where it will not be exposed to spark discharges, radiated or capacitively coupled noise. The teslameter case is made of metal for shielding reasons. However, of necessity it is less than perfect, as apertures have to be left in the case for the display and various connectors etc.
The unit is a precision measuring device, and should be treated with care, not subjected to adverse environmental conditions.

The plugpacks supplied with each teslameter should be plugged in to a clean mains power supply. Noise on the mains will work its way through the transformers and disturb the teslameter. Simple mains filters are readily available if there is only one mains supply for the whole machine. Route the low voltage lead away from high current or high voltage wiring. Ideally cut the low voltage lead to the minimum length required for the installation, and re-connect the plug to it.

Grounding the teslameter case.

The probe shield is terminated to the probe connector case, which is then connected by the long jack screws to the teslameter chassis. At this point the entire shield system is floating. In some installations it is beneficial to have the system floating, but most frequently it is sensible to have the shields grounded.

If the case does need to be grounded then loosen one of the screws on the back panel and put a grounding lug under the head of the screw. It is most convenient to use a 1/4inch (6.35mm) quick connect tab. The grounding wire can then be easily disconnected if the teslameter has to be moved. Use a heavy gauge, short wire to ground the unit to a substantial grounding point nearby. If the teslameter is sitting on metalwork, then it should really be grounded to that metalwork so it is at the same potential.

Further Preventative Measures.

If problems are still encountered, despite following the precautions detailed above, then there are some further things to try.

Tests have shown that in an electrically noisy environment that the prime source of noise entry to the teslameter is through the low voltage power supply input.
This could be from mains borne transients working their way through the plugpack transformer, or from interference picked up on the low voltage lead itself.
The quickest and simplest fix for this problem is to wind the power lead several times through a ferrite core. Use a thick walled tube ferrite of substantial size - a simple small torroid is not nearly as effective. A suggested ferrite is the TDK part number HF70RH26x29x13. This is a tubular ferrite, 29 mm long, 26mm outside diameter, and 13mm inside diameter. Winding the power lead four times through this core, really close to the teslameter significantly reduces noise upsets.

If the analog outputs are wired up, then shielded twisted pair should be used for all wiring, routed away from any high current or high voltage cabling. In a really noisy environment it can be beneficial to put this analog cabling through a ferrite tube for a few turns to suppress induced noise.

The probe cable itself can be passed through a ferrite core. The internal diameter will need to be sufficient to pass the probe head through. An MPT (miniature) probe head is nearly the same size as shielded cable (6.5mm diameter), but an LPT probe head needs an internal ferrite diameter of 14mm or more.
Alternatively a split core ferrite variety can be used, such as TDK part HF70RU16x28x9.
The core should be placed either where the probe cable enters the probe connector, or alternatively where the cable shield layer ends, approximately 400mm back from the probe head.