

CHOOSING A BARRIER – FOR SENSORS

MTL700

ANALOGUE INPUTS, LOW LEVEL Thermocouples

The preferred barrier for thermocouples is the MTL760ac, whose 2-channel non-polarised design retains the 'earth-free' nature of the signal. Provided that the receiver's input circuit floats, the combination rejects common-mode ac and dc interference up to at least 6V and is unaffected by earth faults on the primary element. Even if the receiver's circuit is tied to its '0V' rail, the use of a 2-channel barrier takes the worry out of earthing. To eliminate errors due to thermal emfs, the compensating cable should be continued from the barrier to the receiver. For moving coil or other low resistance receivers, use the MTL751 (40Ω) or the MTL755ac (36Ω) if the resistance of the MTL760 (170Ω) is unacceptable.

USA regulations permit the thermocouple to be earthed on the assumption that the barrier will not conduct, but Europe and other 'IEC countries' assume that it may do so. In these countries either the thermocouple and its cables must be insulated to withstand 500V, Fig. 1; or the earth loop must be broken by an isolating transmitter, Fig. 2, or by one of the isolating interface devices in the MTL2000, 3000, 4000 or 5000 Series.

Photocells, ac sensors, flowmeters

Similar arguments apply, and the MTL760ac is recommended, Fig. 3. Any other 2-channel non-polarised barrier that will handle the voltage would be suitable. All MTL barriers of this type transmit signals up to a few kHz. At higher frequencies the self capacitance of the Zener diodes – around 100pF – may attenuate the signal. No certification is required for sensors generating less than 1.2V, 0.1A, 20μJ and 25mW. In practice this includes all photocells, but some ac sensors may have significant inductance and require to be designed and certified for use in hazardous areas.

Resistance temperature detectors

For 3-wire circuits with a floating bridge, the most economical solution is provided by the MTL755ac 2-channel barrier, Fig. 4. The two leads from the bridge arms are protected by the barrier, while the third (supply) lead is earthed at the busbar. The MTL755ac has a low end-to-end resistance of only 18.0Ω per channel to minimise span changes, and its channels track within 0.15Ω (from -20 to +60°C) to minimise zero shift with temperature. Close tolerancing of each channel to ±0.15Ω at 20°C facilitates barrier substitution.

If the bridge circuit is already earthed, a third barrier channel is needed; in practice this can be one half of another MTL755ac, Fig. 5. For extreme accuracy use three channels and an earth-free bridge, since the small errors due to barrier leakage tend to cancel.

4-wire constant-current circuits do not require matched barrier resistances, and can be protected more economically by two MTL761ac 2-channel barriers, Fig. 6. If the increase in loop resistance is too great, use two MTL755acs.

Choosing the right barrier is now even easier – just scan these four pages to find the answer. The majority of requirements are met by seven 'key' barriers, which are held in stock by MTL distributors all over the world and usually provide the most economical solutions. For quick identification we have picked them out in blue. Where alternatives exist, use a key barrier if possible. If you do not find what you require, please consult Application Note AN9007, available from MTL, or contact our experts at Luton.

Note: voltage figures shown on busbar are safety description values.

Hazardous area **Safe area**

