NOISE IN THERMOCOUPLE CIRCUITS

The reduction of electrical noise pickup by instrument circuits is an important consideration in temperature measurement. Noise obscures small changes in signal level. Electrical noise comes in the form of static, magnetic, common mode and crosstalk.

Static noise is capacitively coupled to the wires in an instrument circuit from power lines or other voltage sources. This type of noise can be reduced or eliminated by the use of a shield placed around the wires.

Magnetic noise occurs when a current goes through a conductor. This can occur around power lines, relays, motors, generators, etc. Twisting the extension wire can minimize this noise, by canceling out these magnetic currents.

Common Mode noise is dependent upon the electrical connections in the instrument circuit and occurs when different locations in a plant are at different ground potentials. This type of noise is especially detrimental to grounded thermocouples. If the thermocouple is electrically grounded at the measuring point and if the instrument is also grounded, a current will flow between the thermocouple and instrument, which are at different electrical potentials. To combat this problem many instrument manufacturers have neither of their input terminals grounded, incurring a high common mode rejection rating of the system. Another type of common mode noise is created through capacitance which exists between the thermocouple conductors and any metal object near it. The metal objects, being at a different potential than the thermocouple tip, allows currents to flow into the conductors causing a voltage drop along the conductors. This drop adds to the EMF signal and produces noise. The best way to combat this noise problem is to shield the extension wire from the thermocouple to the control instrumentation. The shield is at the same potential for this entire length. The only ground connection in the shield should be at the thermocouple.

Finally, cross talk noise occurs when signals in adjacent pairs of wires transfer to each other. The most common method to eliminate this noise problem in multipair cable is to individually shield each pair of wires and ground each shield individually.

JMS Southeast, Inc., can provide you with shielded and nonshielded thermocouple extension wire ranging from a single pair to 36 pair cable.

Please contact us for any thermocouple wire needs you may have.

Note: When using shielded wire with your sensor, we attach the shield to the tube or sheath with which the sensor is built. The drain wire is bare and left accessible to the end user. If you do not want the shield electrically connected to the sheath or tube, please specify a “Floating Shield” and we will accommodate you. (Normally the drain wire on grounded/shielded thermocouples is left unconnected at the instrument to avoid ground loops.)