Frequently Asked Questions

Q. How many feet of T/C wire can I run?

A. For a specific instrument, check its specifications to see if there are any limits to the input impedance. However as a rule of thumb, limit the resistance to 100 Ohms resistance maximum, and this depends on the gage of the wire; the larger the diameter, the less resistance/foot, the longer the run can be. However, if the environment is electrically noisy, then a transmitter may be required which transmits a 4-20 mA signal that can be run longer distances and is more resistant to noise.

Q. Should I use a grounded or ungrounded probe?

A. It depends on the instrumentation. If there is any chance that there may be a reference to ground (common in controllers with non-isolated inputs), then an ungrounded probe is required. If the instrument is a handheld meter, then a grounded probe can almost always be used.

Q. What size relay do I need to control my heaters?

A. This must be calculated from known parameters. Take the total wattage of heaters and divide this value in watts by the voltage rating of the heaters in volts. The answer will be in amperes, and solid state and mechanical relays are rated by “current rating” in amperes.

Q. Can I send my 4-20 mA control output to a chart recorder to monitor a process input?

A. No. A control output is designed to control a valve or some equivalent control device. If you need to send an analog signal to a recording device, then choose a controller that has a “retransmission or recorder output” option.

Q. Can I split my one T/C signal to two separate instruments?

A. No. The T/C signal is a very low-level millivolt signal, and should only be connected to one device. Splitting to two devices may result in bad readings or loss of signal. The solution is to use a “dual” T/C probe, or convert one T/C output to a 4-20 mA signal by using a transmitter or signal conditioner; then the new signal can be sent to more than one instrument.

Q. What are the accuracies and temperature ranges of the various thermocouples?

A. They are summarized in the tables on the first few pages of Section H. It is important to know that both accuracy and range depend on such things as the thermocouple alloys, the temperature being measured, the construction of the sensor, the material of the sheath, the media being measured, the state of the media (liquid, solid, or gas) and the diameter of either the thermocouple wire (if it is exposed) or the sheath diameter (if the thermocouple wire is not exposed but is sheathed).

Q. Why can't I use ANY multimeter for measuring temperature with thermocouples? What errors will result if I don't use a thermocouple temperature meter?

A. The magnitude of the thermoelectric voltage depends on the closed (sensing) end as well as the open (measuring) end of the particular thermocouple alloy leads. Temperature sensing instruments that use thermocouples take into account the temperature of the measuring end to determine the temperature at the sensing end. Most millivoltmeters do not have this capability, nor do they have the ability to do non-linear scaling to convert a millivoltage measurement to a temperature value. It is possible to use lookup tables to correct a particular millivoltage reading and calculate the temperature being sensed. However, the correction value needs to be continuously recalculated, as it is generally not constant over time. Small changes in temperature at the measuring instrument and the sensing end will change the correction value.

Q. How can I choose between thermocouples, resistance temperature detectors (RTD’s), thermistors and infrared devices when measuring temperature?

A. You have to consider the characteristics and costs of the various sensors as well as the available instrumentation. In addition: THERMOCOUPLES generally can measure temperatures over wide temperature ranges, inexpensively, and are very rugged, but they are not as accurate or stable as RTD’s and thermistors. RTD’s are stable and have a fairly wide temperature range, but are not as rugged and inexpensive as thermocouples. Since they require the use of electric current to make measurements, RTD’s are subject to inaccuracies from self-heating. THERMISTORS tend to be more accurate than RTD’s or thermocouples, but they have a much more limited temperature range. They are also subject to self-heating. INFRARED SENSORS can be used to measure temperatures higher than any of the other devices and do so without direct contact with the surfaces being measured. However, they are generally not as accurate and are sensitive to surface radiation efficiency (or more precisely, surface emissivity). Using fiber optic cables, they can measure surfaces that are not within a direct line of sight.

Q. What are the two most often overlooked considerations in selecting an infrared temperature measuring device?

A. The surface being measured must fill the field of view, and the surface emissivity must be taken into account.

Q. What are the best ways of overcoming electrical noise problems?

A. 1) Use low noise, shielded leads, connectors and probes. 2) Use instruments and connectors that suppress EMI and RF radiation. 3) Consider using analog signal transmitters, especially current transmitters. 4) Evaluate the possibility of using digitized signals.

Q. If a part is moving, can I still measure temperature?

A. Yes. Use infrared devices or direct contacting sensors plus a slip ring assembly.

Q. Can a two-color infrared system be used to measure low emissivity surfaces?

A. Only if at high temperature, say, above 700°C (1300°F).

Q. What error will result if the spot size of the infrared pyrometer is larger than the target size?

A. It would be indeterminate. The value would be a weighted average that wouldn’t necessarily be repeatable.

Q. What readout should be used with the OS36, OS37 and OS38 units?

A. Using the DP5000, BS6000, or the HH-200 would be best.