Thermocouple Selection – Quick Tips

Thermocouples are temperature sensors. Different thermocouple types have different voltage output curves, so using the correct thermocouple type is essential to getting accurate measurements.

Thermocouple Selection

Factors to consider when selecting the appropriate thermocouple for your application include: the original equipment thermocouple type, the application temperature, required length of service, required degree of accuracy, proper selection of extension wire type, chemical resistance of the thermocouple and/or sheath material and cost.

Be aware that large errors in measurements can occur if the proper type of **extension wire** is not used. The extension wire is the wire that connects the thermocouple probe to the measuring element (meter, controller, receiver, recorder, etc.).

Thermocouples are identified by letter designation. Each letter type is designed for a specific temperature range and working environment. The most common types are J, K, T and E. Types R, S, C and GB are designed for high temperature applications. It is important to note that the working temperature range (and maximum temperature) can vary because it will depend on the diameter of the wire used in the probe, the material used for the probe and the probe coating material.

Thermocouple Probe Types

Penetration probes: Penetration probes feature a high-strength casing and a pointed tip. This probe type is designed to penetrate semi-solid and hard substances. Penetration probes come in a variety of probe diameters, lengths, materials and temperature ranges.

Air/gas probes: The construction of this type features a probe/sensor enclosed by a shield. The shield is perforated allowing gas/air to flow into the sensor. When using an air/gas probe, make sure the probe materials are compatible with the gases present in the atmosphere you will be measuring.

Surface probes: Used to measure the temperatures of surfaces. The junction of the surface probe is flat, ensuring that the whole measuring surface remains in

complete contact with the surface to be measured. These probes can be equipped with springs which will help the probe maintain constant contact with the surface or a sheath. There are a variety of surface probe types, some of which are: 90° angle, straight probes, flat-leaf probes and self-adhesive probes (for long-term measurements).

Flexible insulated-wire probes: Frequently used to measure the temperature of semi-solid materials or liquids. They come in a variety of sizes, materials and temperature ranges.

Many manufacturers offer specialty probes. These thermocouple probes are designed for specific industries or applications. Some examples are:

Food probes: Penetration probes specifically designed to be easy to clean. They come in a variety of lengths, probe diameters, materials and cable lengths.

HVAC probes: These are a variation of air/gas probes designed for HVAC applications. These probes include hook-n-loop attachments (for piping and tubing), magnetic attachments (for flat surfaces) and longer cable lengths.

Small-surface (electronics) probes: Smaller diameter probes specifically designed for smaller openings/spaces often found in electronic applications.

Scientific needle-tip probes: Small diameter, needle-tip/hypodermic-tip probes for scientific applications where a smaller-scale probe is required.

Typically, the probes listed above are available in J, K and T types. Again, the temperature for the probe types can vary by manufacturer as it depends upon the wire diameter, probe material and probe coating material.

Commonly Asked Questions

Q: What is the probe sheath?

A: A probe sheath is a tube that protects the thermocouple wires from chemical-rich atmospheres and high temperatures. A sheath is commonly found on thermocouple probes.

Q: Is there a distance limitation on how far a thermocouple measurement/signal can be transmitted?

A: The limit for an unamplified signal is about 200 ft. in an electrically clean (no interferences) environment. For transmitting over greater distances, use thermocouple extension wire.

Q: How can I measure objects or samples if contact is not permitted?

A: In these instances use of an infrared thermometer should be considered.

Source

The Cole Parmer website provides more information.

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