

Temperature Sensors: Magnesium Oxide Insulated Sensors



Magnesium Oxide insulated thermocouples, commonly referred to as MgO thermocouples, are used in many process and laboratory applications. They are available in all thermocouple element types, a wide variety of sheath diameters and materials, they are rugged in nature and bendable, and their fairly high temperature ratings make MgO thermocouples a popular choice for a multitude of temperature measuring applications. The many desirable characteristics make them a good choice for general and special purpose applications.

MgO sensors are constructed by placing an element or elements into a sheath of a suitable material and size, insulating the elements from themselves and the sheath with loose filled or crushable Magnesium Oxide powder or insulators, and then swaging or drawing the filled sheath down to its final reduced size. The swaging process produces an element with highly compacted MgO insulation and provides a high dielectric strength insulation between the elements themselves and their sheath.

Helpful Hints

- Select an element type that has a temperature rating higher than the expected process temperature, one that will resist contamination by the process environment, and one that matches the measuring instruments' input.
- Do not use type J elements where they will be exposed to moisture, as moisture will contaminate the elements' iron leg. A type T element, if the temperature range is suitable, is a better choice.
- Select the sheath material based on the maximum expected process temperature, and select a material resistive to any corrosiveness of the process environment.
- Element response time and process temperature are the most important considerations. The smaller the diameter, less mass will be involved and the thermal response time will be faster, however, the smaller the sheath diameter the smaller the element wire gauge size and a reduced useful life would be expected.
- Do not exceed the recommended upper temperature limits for the element wire gauge size. This wire gauge size is determined by sheath diameter. You may refer to the recommended temperature limit tables for elements of various wire sizes.
- Standard purity MgO (96%) insulation is suitable for most process applications, however, where high temperatures are expected and it is desirable to use smaller sheath diameters, high purity MgO (99.6%) insulation is recommended. This is particularly true of type K and N thermocouple elements.
- Do not use exposed junctions in the presence of moisture or other process contaminants. Use only "U" ungrounded junctions with small diameter high temperature applications, and in conjunction with instrument manufacturer's measuring circuit recommendations.
- Do not place transitions or plug and jack connectors directly into the process environment. Select fittings and connectors with sufficient temperature ratings to withstand their ambient environment.
- Select leadwire insulation and conductor style suitable for the environment. Select fiberglass insulations for high temperature applications, teflons and PVC insulations for high moisture applications, metal overbraid for physical abuse applications, and stranded conductor for moving process applications.
- Minimum insertion length should be 10 times the OD of the sheath, nominal.