Magnesium Oxide Thermocouples

Magnesium Oxide (MgO) Insulated Thermocouples

- MgO thermocouples are versatile sensors for use in process temperatures up to 2400°F and are also recommended in high moisture, liquid, high pressure, and corrosive environments.
- Attributes are high dielectric strength, durability, malleability and quick response to temperature fluctuations.
- The uniform thickness of wires and magnesium oxide insulation provides mechanical strength, plus corrosion and moisture resistance.
- Densely-packed, high-purity MgO insulation is used in all calibrations and sheath materials.
- Minimum Bend Diameter is equal to two times the outside diameter.

Sheath Ratings

Continuous maximum temperature ratings of sheath in oxidizing atmospheres

- **304SS**: Up to 1650°F - good corrosion characteristics and resistance to oxidation, generally regarded as a standard sheath material.
- **Inconel 600**: Up to 2100°F - good high temperature resistance to corrosion, not suitable for use in presence of sulfur above 1000°F.
- **316SS**: Up to 1700°F - has excellent acid corrosion resistance; highly resistant to pitting type corrosion.
- **310SS**: Up to 2100°F - good resistance to oxidation and corrosion at high temperatures.

Time Constants

The time required for a thermocouple to indicate 63.2% of a step change in temperature in a surrounding media is the time constant. Several factors influence the measured time constant, such as the degree of insulation compaction, sheath wall thickness and distance of junction from the welded cap on the ungrounded style. These factors, as well as the velocity of liquid or mass past the thermocouple probe, affect the time constant.

Junction Construction

- **Grounded**: Thermocouple welded to the sheath. Fast response with thermocouple protected.
- **Ungrounded (Isolated)**: Thermocouple insulated from sheath with magnesium oxide. Stray EMF’s are prevented from affecting the reading. Response from rapid or frequent temperature cycling is slower than grounded style.
- **Exposed**: Thermocouple junction is not protected by welded cap. Used for quick response, but is susceptible to early corrosive failure.
- **Dual Element Common**: Two thermocouples with junctions welded together.
- **Dual Element Isolated (Standard)**: Two thermocouples electrically separate in the same sheath, provides isolation where instrumentation necessitates.

Sheath Ratings

Continuous maximum temperature ratings of sheath in oxidizing atmospheres

<table>
<thead>
<tr>
<th>SHEATH MATERIAL</th>
<th>EFFECTIVE LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGO</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**TIME CONSTANTS/SECOND**

<table>
<thead>
<tr>
<th>SHEATH DIAMETER (In inches)</th>
<th>GROUNDED JUNCTION</th>
<th>UNGROUNDED JUNCTION</th>
<th>EXPOSED JUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.040</td>
<td>0.2</td>
<td>0.7</td>
<td>0.1</td>
</tr>
<tr>
<td>0.063</td>
<td>0.1</td>
<td>0.8</td>
<td>0.2</td>
</tr>
<tr>
<td>0.125</td>
<td>0.5</td>
<td>1.3</td>
<td>0.3</td>
</tr>
<tr>
<td>0.188</td>
<td>1.0</td>
<td>2.5</td>
<td>0.5</td>
</tr>
<tr>
<td>0.250</td>
<td>2.3</td>
<td>4.3</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Junction Construction

- **Grounded**: Thermocouple welded to the sheath. Fast response with thermocouple protected.
- **Ungrounded (Isolated)**: Thermocouple insulated from sheath with magnesium oxide. Stray EMF’s are prevented from affecting the reading. Response from rapid or frequent temperature cycling is slower than grounded style.
- **Exposed**: Thermocouple junction is not protected by welded cap. Used for quick response, but is susceptible to early corrosive failure.
- **Dual Element Common**: Two thermocouples with junctions welded together.
- **Dual Element Isolated (Standard)**: Two thermocouples electrically separate in the same sheath, provides isolation where instrumentation necessitates.