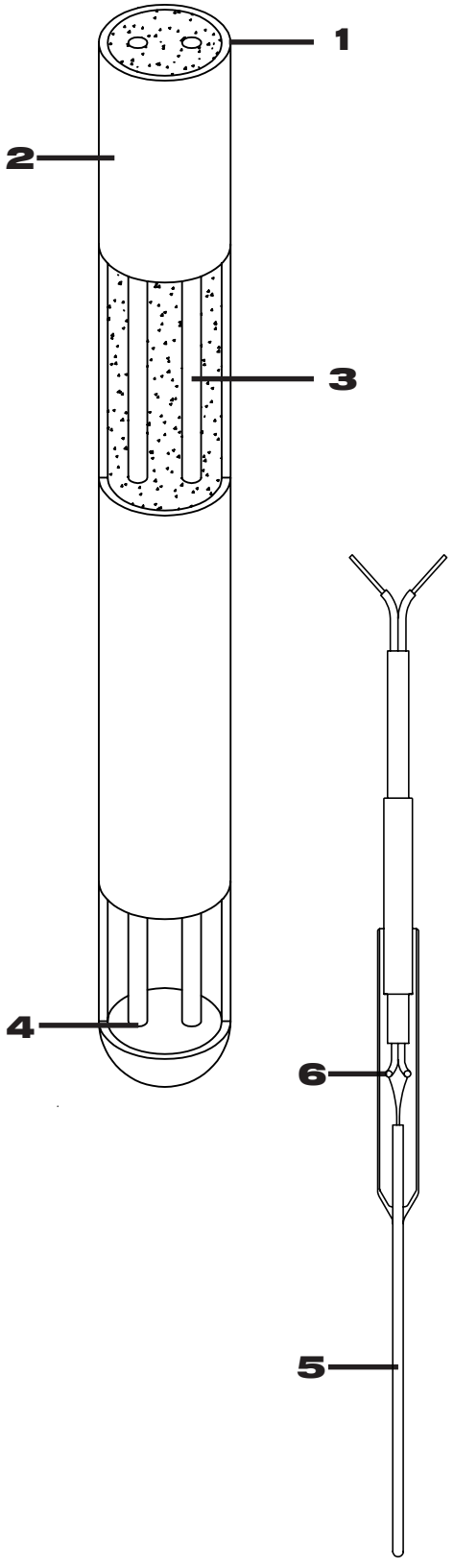
"TRUTEMP" Drawn Metal Sheathed Cable Sensors

The "TRUTEMP" drawn cable sensors feature durability, fast response and high temperature capabilities. Drawn cable sensor constructions combine precision fabrication techniques with premium quality mineral insulated cable and feature rugged construction in a particularly compact size.

The standard construction consists of an appropriate pair of elements embedded in compacted ceramic and encased in an appropriate tubular sheath. These elements are welded to form a thermocouple junction or attached to RTD sensor elements. A wide variety of standard and custom fittings can be added to the sensor to simplify installation and application. The lead end of the cable is typically equipped with connectors or leads to accommodate connection to control system wiring.



1

Durable Drawn Cable Construction. Ceramic insulated sensor elements are sheathed in high temperature alloy tubing and drawn to final dimensions. The resulting sheathed cable construction protects the internal elements from oxidation and corrosion as well as providing protection from mechanical abuse. The high strength cable construction can be readily formed into most desired configurations with no damage to the sheath or elements. The cable in its' standard, dead soft, bright annealed condition can be formed around a mandrel with a minimum diameter equal to two times the cable diameter.

2

Corrosion Resistant Alloy Sheath. Common sheath materials include 304, 310, 316 series stainless steels and Alloy 600. Other high temperature and corrosion resistant sheath materials are also available. The mineral insulated, cable style thermocouple can be manufactured with a sheath of virtually any malleable alloy.

3

High Quality Thermocouple Alloys. Available sensor calibrations include a full selection of common base metal alloys including type J, K, E and T. Noble metal sensor alloys such as type R and S are also available.

4

Precision Welded Sensor Junctions. Available junctions include grounded, ungrounded and exposed ungrounded styles. Special welding techniques allow precise control of welded tip dimension and allows subsequent shaping of the tip when required.

5

Compact Sensor Configuration. A wide range of cable sensor sizes with diameters of .020 to .250 inches permits simple installation into restricted access areas of an application. Single and multiple element thermocouple configurations are readily manufactured.

6

Superior Lead Systems. All lead style cable thermocouples feature precision welded element to lead connections. These connections are housed in a protective metal transition fitting filled with an electrical grade potting compound. A full selection of lead styles and lead restraints provide additional abuse resistance when required. A wide variety of connectors, spade lugs and other termination devices are also available.

Metal Sheathed Cable Sensor Specifications And Application Data

Cable Sheath Materials

Duratherm mineral insulated cable can be fabricated with a sheath consisting of virtually any malleable metal. All cable material is annealed in a protective atmosphere to provide a bright and ductile finished product. The table below outlines the most common cable sheath materials and their maximum recommended operating temperatures under continuous exposure to an oxidizing atmosphere.

Sheath Material	Maximum Temperature	Application Information
304 SS	1650 °F. 900 °C.	Most common low temperature sheath. Used in food processing, packaging, plastics processing and other industries where corrosion resistance is required.
316 SS	1650 °F. 900 °C.	Highest corrosion resistance of austenitic stainless steels. Used most frequently in food processing and chemical industries.
310 SS	2100 °F. 1150 °C.	Corrosion resistance slightly superior to 304 SS and substantially higher heat resistance. Less ductile material than 304 SS.
600 Alloy	2150 °F. 2110 °C.	Most common high temperaure sheath material. Very good high temperature strength and excellent high temperature oxidation resistance.

Cable Insulation Materials

Standard cable insulation consists of standard or high purity magnesium oxide powder. Other insulation materials can be supplied when required. Note that cable insulation materials are normally selected on the basis of high temperature insulation resistance. The ceramic insulation is compacted to near theoretical density during the manufacturing process, resulting in high heat transfer rates and rapid thermal response.

Calibration Tolerances

All mineral insulated cable sensor materials meet or exceed ANSI standards. "TRUTEMP" cable sensor assemblies meet or exceed the standard tolerances of ANSI Circular MC96.1-1982. Special tolerances meeting the standards of ANSI MC96.1-1982 can also be supplied when required.

Dimensional Tolerances

Standard Assembled Probe Length Tolerances		
Cable Diameter	Probe Lgth. <= 24 In.	Probe Lgth. > 24 In.
Less Than .039 .040 To .059 .060 And Greater	± 1/4 Inch ± 3/16 Inch ± 1/8 Inch	± 1% Of Length ± 3/4% Of Length ± 1/2% Of Length

Assembled Flexible Lead Tolerances	
Lead Length	Lead Length Tolerance
Less Than 10 Ft. 10 Ft. And Longer	+ 6 - 0 Inches + 5% - 0% Of Length

Cable Diameter Tolerance	
.010 - .057 .058 - .093 .094 - 188 .189 - 500	+.001 -.0005 ± .001 +.002 -.001 +.003 -.001

Custom Sheathed Cable Sensors

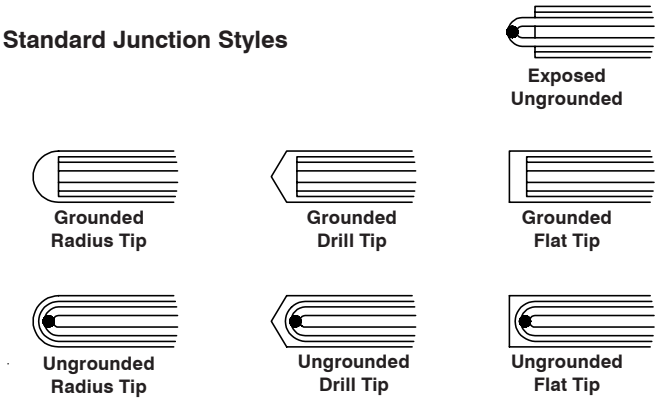
Custom sensors with virtually any desired combination of special design features can be readily manufactured. Our modern CNC equipped machine shop ensures in-house control of quality and delivery of component parts. Common design variations such as special fittings, flanges and connectors are supplied on a routine basis.

Duratherm has produced thousands of sophisticated, special purpose sensors and would welcome the opportunity to quote, design and manufacture any custom sensor your application requires.

Junction Configurations

Duratherm offers three basic thermocouple junctions. Exposed junctions have the best thermal response but bared junction is unprotected. Grounded junctions offer the next best thermal response and the junction is sealed. Ungrounded junctions feature slightly lower thermal response than the grounded type, but are sealed and electrically isolate the junction from the sensor sheath. Grounded and ungrounded junctions of cable sensors .040 and greater in diameter can be provided with shaped tip configurations to enhance response.

Standard Junction Styles



Forming Of Cable Material

The fully annealed, ductile cable portion of any assembly can be readily formed into any desired configuration. As a general rule, the cable can be formed around a mandrel equal to twice the sheath outside diameter. Note that repeated bending of mineral insulated cable will require additional annealing of the bend area.

Welding Attachment Procedures

The cable portion of a sensor assembly can be welded or brazed to the application provided that care is taken to avoid melting through the sheath. In cases where the cable is .040 or smaller in diameter we recommend the use of a weld sleeve. This sleeve can be factory installed and would consist of a .010 to .015 wall tube swaged into place on the cable.