



Stoneridge, Inc., Control Devices Division

Temperature Sensors -40°C to $+300^{\circ}\text{C}$

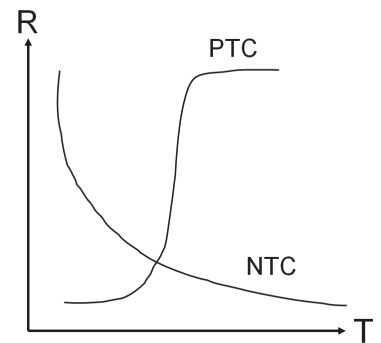
Stoneridge Advantage:

Stoneridge, Inc. is a publicly traded company (NYSE: SRI) which offers highly engineered sensors and controls for applications in the global transportation industry. SRI has global manufacturing operations in North America, Europe, South America, India and China. The Control Devices Division of SRI, with technical design centers located in Lexington, Ohio, Boston, Mass and Suzhou, China has been designing and manufacturing sensors and controls for applications such as speed sensing for various vehicle applications for over 40 years.



Sensing Technology:

SRI Temperature Sensors uses a thermistor sensing element which is a thermal resistor whose resistance changes significantly and predictably with temperature change. The device is made of a polycrystalline ceramic material which can produce either a negative temperature coefficient (NTC) or a positive temperature coefficient (PTC) resistance curve. The sensing device chosen for the temperature sensing applications is a NTC thermistor.



Features/Benefits:

- Full line of sensor designs to measure and/or control temperatures in typical applications such as engine oil, engine coolant, transmission fluid, inside/outside air, surface (i.e. battery), climate control and many others
- Sensors rated to measure temperatures from -40°C to $+300^{\circ}\text{C}$
- Vertically integrated thermistor design/manufacture and global purchasing capability to meet your programs' unique R/T curve requirements.

SRI Available Thermistor Curves					Additional Available Thermistor Curves					
Type	2.8K	10K	Special 10K	30K	Type	2.4K	5K	10K	30K	100K
T ($^{\circ}\text{C}$)	R (K Ω)	R (K Ω)	R (K Ω)	R (K Ω)	T ($^{\circ}\text{C}$)	R (K Ω)	R (K Ω)	R (K Ω)	R (K Ω)	R (K Ω)
0	9.423	32.654	33.650	95.851	0	6.88	13.968	32.65	94.691	329.4
25	2.795	10.000	10.000	30.000	25	2.400	5	10.000	29.069	98.63
90	0.2406	0.915	0.863	2.804	90	0.283	0.616	0.917	2.669	8.556

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Typical Operating Characteristics

Standard Thermistor Curves (@25°C)

- 2.6 K-ohms
- 10 K-ohms
- 30 K-ohms
- Customized options available

Operating Temperature

- -40°C to +300°C

Mounting options

- Pipe thread, straight thread, twist-lock, clip-in, and bracket mounted
- Customized options available

Connector Options

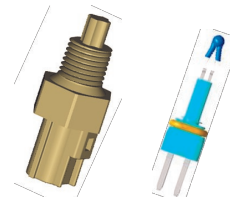
- Various direct connect or wire harness options available



Typical Application Construction:

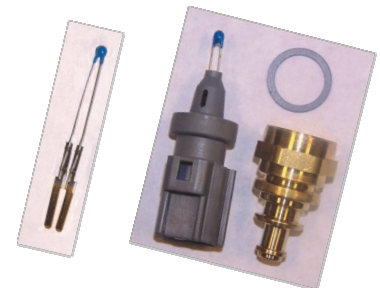
Patented Plastic Fluid Level Temperature Sensor

- One piece housing
- Glycol resistant
- Utilizes DTT thermistor sub-assembly



Brass Coolant Sensor

- Brass housing
- Plastic connector
- Gasket seal
- Thermistor assembly insert



Stoneridge is an independent designer and manufacturer of highly engineered electrical and electronic components, modules and systems principally for the automotive, light/medium/heavy-duty truck, agricultural and off-highway vehicle markets. Our products provide engineered solutions that improve the efficiency and performance of electric and electronic systems.

The **Control Devices Group** focuses on products that sense, switch and control a specific function. Our key technologies include:

- Electromechanical Actuators
- Customer Actuated Switches
- Connectors
- Solenoid Coil Valves
- Powertrain Switches and Sensors
- Pressure Switches and Sensors
- Speed Sensors
- Temperature Sensors
- Position Sensors
- Torque Sensors

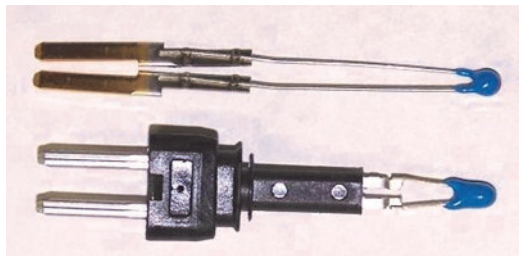
Thermistor Packaging Options

Terminal weld - Wire leaded thermistors are crimped and welded or directly welded to terminals

- This design offers a variety of packaging advantages, allowing customized integral connectors and off-set (i.e. 90°) sensor probes

DTT (Direct termination thermistor) - Thermistor is soldered directly to over-molded terminals

- This results in fewer connection points, eliminating several design failure modes over welded thermistors
- The DTT is inserted directly into the mating housing, eliminating the thermistor over-molding operation and reducing thermal shock.



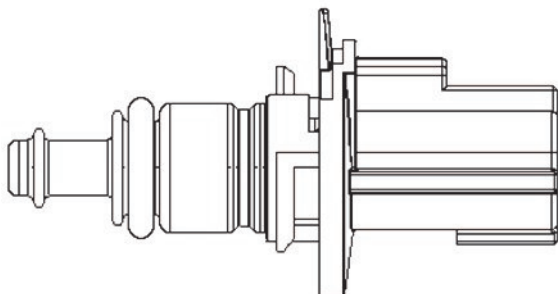
Leaded Thermistor Welded to Terminals



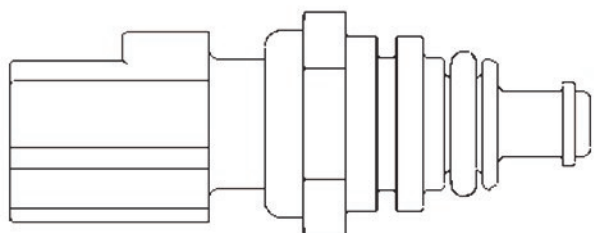
DTT Assembly

Application Interface Options

- Clip-in requires no assembly tooling; it uses a lock washer or rubber gasket mating component feature
- Twist-lock is used for molded mating parts; requires no assembly tooling; currently sourced on high volume coolant and intake air applications
- Straight thread with seal is widely used in sealed thread applications; no thread sealant is required
- Pipe-thread with sealant eliminates the need for an O-ring seal



Twist-lock Mounting Feature



Clip-in Mounting Feature

Thermistor Sensors

Thermistor Packaging Option Examples

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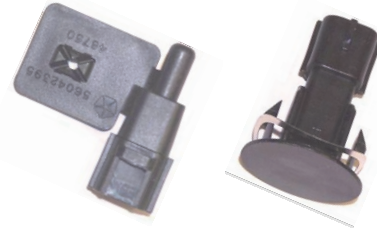
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Steel / stainless steel urea, Cylinder head and Gas Sensors



Plastic air, surface and fluid sensor



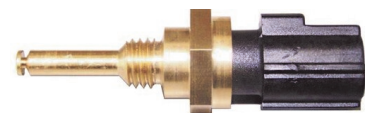
All plastic air and fluid sensor



Manifold air temperature and EGRT sensor



Brass coolant, oil, air and surface temperature sensors



Continuous contact disk-tip cylinder head sensor

Aluminum and improved plastic housing materials under development

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