THERMOCOUPLE vs THERMISTOR

What's The Difference

Although both components are temperature sensors, they operate on different physics principles. Thermistors made of semiconductor materials are ideal for applications demanding precise measurements within the temperature range of about -55C to 300C. Thermocouples are designed to measure a broader range of temperatures by generating a millivoltage relative to their body temperature.

With over 100 years of collective experience, the EI Sensor team provides customers with precision thermistors, technical expertise for resolving complex issues, and practical business strategies to help improve and streamline their operations. Call or email us today for more information about our services regarding your thermistor needs.

What is a Thermistor?

NTC Thermistors and thermistor probes detect temperature over their operational temperature range and provide a corresponding precise resistance to current flow corresponding to their body temperature.

(NTC) or Negative Temperature Coefficient thermistors decrease in electrical resistance when their body temperatures increase, while PTC thermistors increase their resistance when temperatures rise.

In common electrical circuits, a fixed resistor is placed in series with the thermistor, and a voltage source is applied, forming a voltage divider. When a thermistor's resistance detects a temperature change, the voltage across the thermistor measured by the circuit also changes. Voltage fluctuations signal to the control system that a temperature variation is occurring.

Applications of Thermistors

Digital Thermometers: The accuracy and rapid response characteristics of thermistors make them ideal for use in digital thermometers.

Household appliances: Refrigerators, toasters, ovens, and other appliances rely on thermistors to regulate internal temperature changes.

Vehicle applications: From monitoring coolant temperatures to adjusting interior climate controls, thermistors are essential for the optimal operation of multiple car systems.

Battery overheating prevention: Thermistors are found in all cell phones, laptops, and other digital battery packs to help reduce the risk of overheating. When, due to the charging current, a battery's temperature increases to an unsafe level, the thermistor's resistance triggers a circuit and either reduces the charging current to a safe level.

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EI Sensor's Selection of Thermistors

EI Sensor Technologies is a global leader in providing thermistors and thermistor probe assemblies with resistance values ranging from 100 ohms to 5M ohms and with temperature accuracies as precise as plus or minus 0.05C over a wide temperature range.

Glass Body Thermistors

We offer high-temperature glass body thermistors in both axial and radial-leaded designs. Reaching maximum operating temperatures of +300°C, they offer excellent stability and reliability in long-term challenging environments.

Surface Mount Thermistors

Our surface-mount thermistors include End-Banded Chip thermistors and the high-temperature MELF in various sizes. Ensuring reliable precision, rapid response times, and resilience in extreme conditions, EI Sensor's surface mount thermistors are ideal for measuring and controlling temperature changes within concentrated areas of electronic circuits.

Epoxy Coated Thermistors

EI Sensor's epoxy-coated thermistors are equipped with lead wires insulated with Teflon or Kynar and are also available with uninsulated lead wires. In addition, our interchangeable epoxy-coated thermistors assure precise accuracies over wide temperature ranges.

The epoxy coating we use on our thermistors provides numerous benefits, such as high thermal conductivity, protection against abrasion and mechanical damage as well as resistance to moisture contamination.

What is a Thermocouple?

Consisting of two different but specific metals corresponding to their desired properties, thermocouples provide temperature-sensing information by generating a millivoltage corresponding to the junction temperatures. When the junction is cooled or heated, the voltage changes corresponding to the appropriate temperature-voltage reference table.

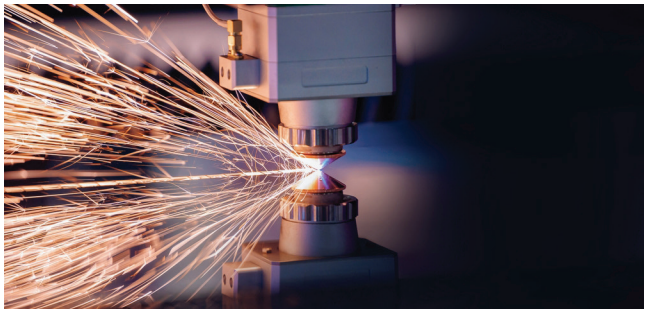
Applications of Thermocouples

Food processing: Thermocouples may be used for monitoring temperature during various phases of food processing.

Power generation: detects temperature changes within turbines, power plant exhaust systems, and industrial boilers.

Metal forging and melting: Thermocouples are used in metal-working due to their ability to withstand higher temperatures.

Auto engines: monitors engine torque and exhaust gas temperatures.



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Thermocouple vs Thermistor: Advantages and Disadvantages

Power Source for Thermocouples

When the junction of two different metals senses temperature fluctuations, the thermocouple generates a millivoltage sensed by a sophisticated data capture device or millivolt meter.

Power Source for Thermistors

Resistance changes are typically measured by applying an external voltage to a thermistor resistor series network and then measuring the voltage drop at the center point. Thermistors have a resistance versus temperature relationship that can be expressed by an equation or by a simple lookup table.

Accuracy of Thermocouples

Depending on the thermocouple type and operating conditions, thermocouples can attain an accuracy level of ± 1.8°F.

Accuracy of Thermistors

Thermistors can be provided with accuracies as accurate as plus or minus 0.05 degree Celsius making them more suitable when high precision is required by the application.

Thermocouple Stability

Thermocouples can drift over time due to wear and tear, high temperatures, and harsh environmental conditions. They are also susceptible to electromagnetic interference that can affect accuracy and premature stability.

Thermistor Stability

Consistently providing precise temperature measurements and long-term stability, thermistors are highly sensitive to temperature fluctuations. They can be produced to exhibit minimal drift over time. Thermistors are less impacted by electrical noise than thermocouples and deliver rapid responses to dynamic processes.

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