

A Comprehensive Guide to Thermocouples

From affecting the activity of [benzoic acid](#) to impacting the [longevity of animals and humans](#), temperature plays a fascinating role in science in a variety of ways. As a result, in many contexts, it's vital that we have the capacity to quickly and accurately measure temperatures. One of the most helpful tools that we now have at our disposal to do exactly that is a thermocouple. However, if you're unfamiliar with this device, you might be wondering: [what is a thermocouple?](#)

This guide features all the key information you need to know about thermocouples: what they are, how they work, and the integral role they play in the science sector.

What Is a Thermocouple?

A [thermocouple](#) – also sometimes referred to as a thermal junction or a thermal – is an extremely popular form of temperature sensor, largely due to their low cost, versatility, and durability. It is an electrical device that connects two dissimilar electrical conductors, creating a temperature-reliant voltage due to the produced Seebeck effect. This reaction caused by the voltage can then be used to interpret temperature.

How Does a Thermocouple Work?

To put it simply, a thermocouple works on the basis of thermoelectrics. A thermocouple connects two wires made of two different metals that create two different junctions. One junction is known as the “hot” or measuring junction and is located at the point where an unknown temperature needs to be measured. The second junction is known as the “cold” or reference junction and it is connected to a known, stable temperature. By connecting these two junctions, the electrical voltage allows us to differentiate between the temperatures of the two points and discover the unknown temperature.

What is the Seebeck Effect?

[The Seebeck effect](#) refers to the production of an electromotive force (emf) and an electric current in a loop of two dissimilar conductors when two junctions are sustained at different temperatures. It is named after the German physicist Thomas Johann Seebeck, who discovered the effect in 1821. The Seebeck effect is widely used to measure temperature with incredible sensitivity and accuracy.

What Types of Thermocouples Are Available?

There is a wide variety of thermocouples available for purchase, including but not limited to:

Industrial thermocouples – These thermocouples are widely used in nearly all large-scale industrial markets, such as power generation, mining, oil or gas, biotech, and much more.

General purpose thermocouples – These thermocouples are often found in more practical, everyday items, such as stoves, furnaces, ovens, thermometers, and more.

Multipoint thermocouples – As the name suggests, multipoint thermocouples measure temperature at various spots across the length of the sensor. Multipoint thermocouples are typically available in the types K, J, E, T and N.

Having the capacity to accurately measure temperature is of utmost importance in a variety of contexts and industries. Whether it's setting your oven to the correct temperature to avoid burning your pizza, or assessing the temperature as an integral safety component in the mines, thermocouples serve a variety of purposes. Best of all, they perform the task of measuring temperature for a low cost and while never sacrificing on durability.