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Thermocouple Types

Thermocouple Type	Useful/General Application Range	Notes
B	1370-1700°C (2500-3100°F)	Easily contaminated, require protection.
C*	1650-2315°C (3000-4200°F)	No oxidation resistance. Vacuum, hydrogen or inert atmospheres.
E**	95-900°C (200-1650°F)	Highest output of base metal thermocouples. Not subject to corrosion at cryogenic temperatures.
J	95-760°C (200-1400°F)	Reducing atmosphere recommended. Iron leg subject to oxidation at elevated temperatures—use larger gauge to compensate.
K**	95-1260°C (200-2300°F)	Well suited for oxidizing atmospheres.
N	650-1260°C (1200-2300°F)	For general use, better resistance to oxidation and sulfur than Type K.
R	870-1450°C (1600-2640°F)	Oxidizing atmosphere recommended. Easily contaminated, require protection.
S	980-1450°C (1800-2640°F)	Laboratory standard, highly reproducible. Easily contaminated, require protection.
T**	-200-350°C (-330-660°F)	Most stable at cryogenic temperatures ranges. Excellent in oxidizing and reducing atmospheres within temperature range.

Type E

The Type E thermocouple is suitable for use at temperatures up to 900°C (1650°F) in a vacuum, inert, mildly oxidizing or reducing atmosphere. At cryogenic temperatures, the thermocouple is not subject to corrosion. This thermocouple has the highest EMF output per degree of all the commonly used thermocouples.

Type J

The Type J may be used, exposed or unexposed, where there is a deficiency of free oxygen. For cleanliness and longer life, a protecting tube is recommended. Since JP (iron) wire will oxidize rapidly at temperatures over 540°C (1000°F), it is recommended that larger gauge wires be used to compensate. Maximum recommended operating temperature is 760°C (1400°F).

Type K

Due to its reliability and accuracy, Type K is used extensively at temperatures up to 1260°C (2300°F). It's good practice to protect this type of thermocouple with a suitable metal or ceramic protecting tube, especially in reducing atmospheres. In oxidizing atmospheres, such as electric furnaces, tube protection is not always necessary when other conditions are suitable; however, it is recommended for cleanliness and general mechanical protection. Type K will generally outlast Type J because the JP (iron) wire rapidly oxidizes, especially at higher temperatures.

Type N

This nickel-based thermocouple alloy is used primarily at high temperatures up to 1260°C (2300°F). While not a direct replacement for Type K, Type N provides better resistance to oxidation at high temperatures and longer life in applications where sulfur is present.

Type T

This thermocouple can be used in either oxidizing or reducing atmospheres, though for longer life a protecting tube is recommended. Because of its stability at lower temperatures, this is a superior thermocouple for a wide variety of applications in low and cryogenic temperatures. Its recommended operating range is— -200° to 350°C (-330° to 660°F), but it can be used to -269°C (-452°F) (boiling helium).

Types S, R and B

Maximum recommended operating temperature for Type S or R is 1450°C (2640°F); Type B is recommended for use at as high as 1700°C (3100°F). These thermocouples are easily contaminated. Reducing atmospheres are particularly damaging to the calibration. Noble metal thermocouples should always be protected with a gas-tight ceramic tube, a secondary tube of alumina and a silicon carbide or metal outer tube as conditions require.

W-5 Percent Re/W-26 Percent Re (Type C*)

This refractory metal thermocouple may be used at temperatures up to 2315°C (4200°F). Because it has no resistance to oxidation, its use is restricted to vacuum, hydrogen or inert atmospheres.

*an ANSI symbol

**Also suitable for cryogenic applications from -200 to 0°C (-328 to 32°F)