North American Sensors Corp.
Quality Pressure, Level, and Temperature Solutions

Thermocouples

T/C Series



The millivolt potential that is created in the thermocouple conductors differs depending on the materials used. Some materials make better thermocouples than others because the millivolt potentials created by these materials are more repeatable and well established. These thermocouples have been given specific type designations such as Type E, J, K, N, T, B, R and S. The type of T/C used also depends on temperature monitored and environment.

As a general rule, industrial thermocouples can be made to withstand higher temperatures and come in a wider variety of thermocouple types. MgO thermocouples are flexible and have a wider selection of measurement junction configurations.

An MgO thermocouple consists of a thermocouple element encased in a metal sheath and hard-packed with magnesium oxide mineral insulation. Thermocouple sheaths are fully annealed and can be formed into different configurations (minimum bend radius is twice the outer diameter of the sheath).

The measuring junction can also be sealed from the environment, reducing the potential for contamination issues.

How to Order (see order form on line, email or call for application assistance)

1) Type of thermocouple (J, K, T, etc.) and single or duplex element
2) Sheath diameter
3) Sheath material
4) Measuring junction (grounded, ungrounded, etc.)
5) Fittings/ no fittings/ sheath bends
6) Sheath terminations
7) Electrical transitions
8) Lead wire materials, transitions and length

Type	Application Information
E	Recommended for continuously oxidizing or inert atmospheres. Sub-zero limits of error not established. Highest thermoelectric output of the common thermocouple types.
J	Suitable for vacuum, reducing or inert atmospheres, oxidizing atmospheres with reduced life. Iron oxidizes rapidly above 1000°F so only heavy gauge wire is recommended for high temperature.
K	Recommended for continuous oxidizing or neutral atmospheres. Mostly used above 1000°F (538°C). Subject to failure if exposed to sulfur. Preferential oxidation of chromium in positive leg at certain low oxygen concentrations causes "green rot" and large negative calibration drifts most serious in the 1500 - 1900°F (816 1038°C) range.
N	Can be used in applications where Type K elements have shorter life and stability problems due to oxidation and the development of "green rot".
T	Usable in oxidizing, reducing, or inert atmospheres as well as vacuum. Not subject to corrosion in moist atmospheres.
R & S	Recommended for high temperature. Must be protected in a non-metallic protection tube and ceramic insulators. Type R is used in industry, Type S in the laboratory
B	Same as R & S but has a lower output. Also, has a higher maximum temperature and less susceptible to grain growth.

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Table 1: Thermocouple Types, Temperature Ranges, Limits of Error

	Standard			Special	
Type	Materials	Temperature Range	Limits Of Error	Temperature Range	Limits Of Error
J	Iron/Constantan				
		32 to 559F (0 to 293C)	4F (2.2C)	32 to 527F (0 to 275C)	2F (1.1C)
		550 to 1400F (293 to 760C)	0.75%	527 to 1400F (275 to 760C)	0.40%
		-328 to -166F (-200 to -110C)	2%		
K	Chromel/Alumel				
		-166 to 32F (-110 to 0C)	4F (2.2C)		
		32 to 559F (0 to 293C) 4F (2.2C)		32 to 527F (0 to 275C)	2F (1.1C)
		559 to 2282F (293 to 1250C)	0.75%	527 to 2282F (275 to 1250C)	0.40%
T	Copper/Constantan				
		-328 to -89F (-200 to -67C)	1.50%		
		-89 To 32F (-67 to 0C)	1.8F (1C)		
		32 to 271F (0 to 133C)	1.8F (1C)	32 to 257F (0 to 125C)	0.9F (.05C)
		271 to 662F (133 to 350C)	0.75%	257 to 662F (125 to 350C)	0.40%
E	Chromel/Constantan				
		-328 to -89F (-200 To -67C)	1%		
		-274 to 32F (-170 to 0C)	3.1F (1.7C)		
		32 to 644F (0 to 340C)	3.1F (1.7C)	32 to 482F (0 to 250C)	1.8F (1C)
		644 to 1652F (340 to 900C)	0.50%	482 to 1652F (250 to 900C)	0.40%
N	Nicrosil/Nisil				
		32 to 559F (0 to 293C)	4F (2.2C)		
		559 to 2300F (293 to 1260C)	0.75%		
R	Platinum/Platinum- 13% Rhodium				
		32 to 1112F (0 to 600C)	2.7F (1.5C)	32 to 1112F (0 to 600C)	1.1F (0.6C)
		1112F to 2642F (600 to 1450C)	0.25%	112F to 2642F (600 to 1450C)	0.10%
S	Platinum/Platinum-10% Rhodium				
		32 to 1112F (0 to 600C) 2.7F	(1.5C)	32 to 1112F (0 to 600C)	1.1F (0.6C)
		1112F to 2642F (600 to 1450C)	0.25%	112F to 2642F (600 to 1450C)	0.10%
B	Platinum/Platinum-30% Rhodium				
		1472 to 3092F (800 to 1700C)	0.50%	1472 to 3092F (800 to 1700C)	