Madison
Sensing Solutions since 1959

Sensor Reference Information
Thermocouple Reference

Thermocouple Wire Color Codes

Color codes have been adopted by various national and international standard agencies for identification of thermocouple wire and thermocouple products. In the United States, thermocouple-grade wire normally has a brown overall jacket. For Types B, R and S, the color codes relate to the compensating cable normally used.

Type	United States ANSI 96.1	United Kingdom BS 1843	West Germany DIN 43714	France NF C42-323	Japan JIS C1610-1981
E	Purple + Purple – Red	Brown + Brown – Blue	Black + Red – Black	-	Purple + Red – White
J	Black + White – Red	Black + Yellow – Blue	Blue + Red – Blue	Black + Yellow – Black	Yellow + Red – White
K	Yellow + Yellow – Red	Red + Brown – Blue	Green + Red – Green	Yellow + Yellow – Purple	Blue + Red – White
N	Orange + Orange – Red	-	-	-	-
B	Grey + Grey – Red	-	Grey + Grey – Red	-	Grey + Red – White
R	Green + Black – Red	Green + White – Blue	-	-	Black + Red – White
S	Green + Black – Red	Green + White – Blue	White + Red – White	Green + Yellow – Green	Black + Red – White
T	Blue + Blue – Red	Blue + White – Blue	Brown + Red – Brown	Blue + Yellow – Blue	Brown + Red – White

Type	J	K	T
Material	Iron (+) vs. Constantan (-)	Nickel (10%) Chromium (+) vs. Nickel (5%) Aluminum Silicon (-)	Copper (+) vs. Constantan (-)
Temperature Range	0°C to 760°C	0°C to 1370°C	-160°C to 400°C

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Comparison of Temperature Transducers

Type	Thermocouple	RTD	Thermistor
Advantages	• Self-powered • Simple, rugged • Lower cost • Wide temperature range	• Most stable • Most accurate • Better linearity	• High output • Fast
Disadvantages	• Nonlinear • Low voltage • Least stable • Least sensitive • Reference required	• Expensive • Current source required • Small resistance change • Low absolute resistance • Self-heating	• Nonlinear • Limited temperature range • Fragile • Current source required • Self-heating

Time Contraints

The time constant of any sensor is defined as the time required for that sensor to respond to 63.2% of its total output signal when subjected to a step change. The step change can be either an increase or decrease in the parameter being measured. Five constants are required for a sensor to reach 99% of its total change. The graph to the right illustrates this relationship.

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