

Sensor Options Guide

Thermocouple and RTD Selection

Thermocouple Calibration	Sensor Metallurgy		Color Code		Temperature Range	Limits of Error (Accuracy)	
	Positive	Negative	Positive	Negative		Standard (whichever is greater)	Special (whichever is greater)
K	Chromel - NiCr	Alumel - NiAl	Yellow	Red	-328 to 32°F (-200 to 0°C)	±4.0°F (2.2°C) or ±.75%	N/A
					32 to 2300°F (0 to 1260°C)	±4.0°F (2.2°C) or ±.75%	±2.0°F (1.1°C) or ±.4%
J	Iron - Fe	Constantan - CuNi	White	Red	32 to 1400°F (0 to 760°C)	±4.0°F (2.2°C) or ±.75%	±2.0°F (1.1°C) or ±.4%
E	Chromel - NiCr	Constantan - CuNi	Purple	Red	-328 to 32°F (-200 to 0°C)	±3.1°F (1.7°C) or ±.1%	N/A
					32 to 1600°F (0 to 870°C)	±3.1°F (1.7°C) or ±.5%	±1.8°F (1.0°C) or ±.4%
T	Copper - Cu	Constantan - CuNi	Blue	Red	-328 to 32°F (-200 to 0°C)	±1.8°F (1.0°C) or ±1.5%	N/A
					32 to 700°F (0 to 370°C)	±1.8°F (1.0°C) or ±.75%	0.9°F (0.5°C) or ±.4%
S	Platinum - 10Rh	Platinum	Black	Red	32 to 2700°F (0 to 1480°C)	±2.7°F (1.5°C) or ±.25%	1.1°F (0.6°C) or ±.1%
R	Platinum - 13Rh	Platinum	Black	Red	32 to 2700°F (870 to 1480°C)	±2.7°F (1.5°C) or ±.25%	1.1°F (0.6°C) or ±.1%
B	Platinum - 30Rh	Platinum - 6Rh	Gray	Red	1600 to 3100°F (0 to 1700°C)	±.5%	±.25%
N	Nicrosil - Ni-Cr-Si	Nisil - Ni-Si-Mg	Orange	Red	32 to 2300°F (0 to 1260°C)	±4.0°F (2.2°C) or ±.75%	2.0°F (1.1°C) or ±.4%
RTD Calibration	Sensor Metallurgy	Number of Sensors	Color Code		Temperature Range	Tolerance Class Definitions	
			Positive	Negative		Class B (in °C)	Class A (in °C)
RTD - 100Ω PT, Alpha = 0.00385	Platinum	Single	White	Red	Low Temp -58 to 482°F (-50 to 250°C) High Temp -328 to 1221°F (-200 to 661°C)	±(0.3 + 0.005 t)	±(0.15 + 0.002 t)
		Dual	Yellow	Black			

Sensor Calibration Selection

Upper temperature limits for various types and wire sizes in a closed-end protecting tube.
This does not apply to compacted mineral-insulated, metal-sheathed thermocouples.

Thermocouple / RTD Type	Wire Gauge	Upper Temperature Limits	Conditions for Which Each is Best Suited
K	8 AWG	2300°F (1260°C)	The most common general purpose thermocouple. Suitable for use in oxidizing or neutral atmospheres. Recommended for use in temperature ranges of 1000°F to 2000°F. Accuracy below 900°F is greatly reduced after prolonged use above 1400°F. Should not be used in reducing atmospheres if unprotected.
	14 AWG	2000°F (1093°C)	
	20 AWG	1800°F (982°C)	
	24 AWG	1600°F (871°C)	
J	8 AWG	1400°F (760°C)	Has a more restricted range than Type K but a higher sensitivity. Suitable for use in reducing or neutral atmospheres. Because oxidation of the iron wire occurs rapidly at temperatures above 1000°F, the heavier gauge wires should be used at those temperatures. Iron wire may be attacked by ammonia, hydrogen, and nitrogen if not protected.
	14 AWG	1100°F (593°C)	
	20 AWG	900°F (482°C)	
	24 AWG	700°F (371°C)	
E	8 AWG	1600°F (871°C)	Has a high sensitivity and is well suited for cryogenic use. Recommended for use in oxidizing atmospheres. Exhibits good resistance to corrosion at low temperatures. Recommended for computer applications. Non-magnetic.
	14 AWG	1200°F (649°C)	
	20 AWG	1000°F (538°C)	
T	14 AWG	700°F (371°C)	Preferred type of thermocouple for cryogenic applications. Acceptable for mildly oxidizing or reducing atmospheres. High corrosive resistance to moisture and excellent for very low temperature applications.
	20 AWG	500°F (260°C)	
	24 AWG	400°F (204°C)	
S	24 AWG	2700°F (1482°C)	Type S is recommended only for higher temperature applications. Protection from all atmospheres must be provided, as they are subject to contamination and subsequent calibration drift. Commonly used for calibration.
R	24 AWG	2700°F (1482°C)	Type R is recommended only for higher temperature applications. Protection from all atmospheres must be provided, as they are subject to contamination and subsequent calibration drift. More sensitive and is used in industrial applications.
B	24 AWG	3100°F (1704°C)	Type B is recommended only for higher temperature applications. Protection from all atmospheres must be provided, as they are subject to contamination and subsequent calibration drift.
N	8 AWG	2300°F (1260°C)	Similar to Type K, but shows enhanced thermoelectric stability relative to Type K.
	14 AWG	2000°F (1093°C)	
	20 AWG	1800°F (982°C)	
	24 AWG	1600°F (871°C)	
RTD - 100Ω PT, ALPHA=0.00385	N/A	1221°F (660°C)	More accurate and stable than thermocouples but more fragile. Limited temperature range, sheath material, and size options.