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Thermocouples Types · Conductor Combinations · Characteristics · National & International Standards

Thermocouple Type	Conductor Combinations (+) Positive	Conductor Combinations (-) Negative	National Standards	Initial Calibration Tolerances per ASTM E-230 Temperature Range °F	Temperature Range °C	Standard (whichever is greater)	Special (whichever is greater)	Approximate Change of emf per °C (Reference Junction at 0°C) µV/°C at 100°C	500°C	1000°C	Notes for Bare Wire Environment	Thermocouple Type
K	**Nickel - Chromium** Also known as: Chromel*, Thermokanthal KP*, NiCr, T1*, Tophel*	**Nickel - Aluminum** (Magnetic) Also known as: Ni-Al, Alumel*, Thermokanthal KN*, T2*, NiAl*	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 2300	0 to 1260	±2.2 or ±0.75%	±1.1 or ±0.4%	42	43	39	Most popular thermocouple type. Used in clean oxidizing and inert atmospheres.	K
T	**Copper**	**Copper - Nickel** Also known as: Constantan, Advance*, Cupron*	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 700	0 to 370	±1 or ±0.75%	±0.5 or ±0.4%	46	–	–	Excellent for cryogenic and low temperatures. Mild oxidizing, reducing vacuum or inert.	T
J	**Iron** (Magnetic) Also known as: Fe	**Copper - Nickel** Also known as: Nickel-Copper, Constantan, Advance*, Cupron*	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 1400	0 to 760	±2.2 or ±0.75%	±1.1 or ±0.4%	54	56	59	Not recommended for low temperatures. Used in reducing, vacuum or inert atmospheres.	J
N	**Nickel - Chromium - Silicon** Also known as: Nicrosil	**Nickel - Silicon - Magnesium** Also known as: Nisil	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 2300	0 to 1260	±2.2 or ±0.75%	±1.1 or ±0.4%	30	38	39	Used as an alternative to type K. Greater stability at higher temperatures.	N
E	**Nickel - Chromium** Also known as: Chromel*, Tophel*, Chromium, Nickel	**Copper - Nickel** Also known as: Nickel-Copper, Constantan, Advance*, Cupron*	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 1600	0 to 870	±1.7 or ±0.5%	±1 or ±0.4%	68	81	–	Has the highest EMF change per degree. Used in inert or oxidizing atmospheres.	E
S	**Platinum - 10% Rhodium**	**Platinum**	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 2700	0 to 1480	±1.5 or ±0.25%	±0.6 or ±0.1%	8	9	11	Used in high temperature applications in oxidizing or inert atmospheres.	S
R	**Platinum - 13% Rhodium**	**Platinum**	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	32 to 2700	0 to 1480	±1.5 or ±0.25%	±0.6 or ±0.1%	8	10	13	Used in high temperature applications in oxidizing or inert atmospheres.	R
B	**Platinum - 30% Rhodium**	**Platinum - 6% Rhodium**	NIST Monograph 175 BS EN 60584.1 DIN EN 60584.1 NF EN 60584.1 JISC 1602	1600 to 3100	870 to 1700	±0.5%	±0.25%	1	5	9	Commonly used in the glass industry. Used in high temperature applications in oxidizing or inert atmospheres.	B
G*	**Tungsten**	**Tungsten 26% Rhenium**	There are no officially recognized standards for Type G	32 to 4200	0 to 2315	Not Established	Not Established	5	16	21	Similar characteristics as Type C.	G*
C*	**Tungsten 5% Rhenium**	**Tungsten 26% Rhenium**	There are no officially recognized standards for Type C	32 to 4200	0 to 2315	±4.4 or ±1%	Not Established	15	18	18	High temperature applications. Used in a vacuum, inert or hydrogen atmosphere. Not recommended for temperatures below 800°F.	C*
D*	**Tungsten 3% Rhenium**	**Tungsten 25% Rhenium**	There are no officially recognized standards for Type D	32 to 4200	0 to 2315	Not Established	Not Established	13	20	20	Similar characteristics as Type C.	D*

*Types G, C and D are not officially recognized symbols.
* Equivalent Tradenames.
At a given temperature that is expressed in °C, the tolerance in °F is 1.8 times the tolerance in °C. Percentage based tolerances must be computed from the temperature in °C.
EMF versus temperature relationship may change with time during use. Tolerances in the above table are stated for new thermocouple wire and thermocouples.
Thermocouples are normally supplied to meet the tolerances for temperatures above 32°F. If materials are required to meet the tolerances below 32°F, it should be stated at the time of the order.
Standard tolerances for temperatures from -328 to 32°F are as follows (whichever is greater):
Type K ±2.2°C or ±2% , Type E ±1.7°C or ±1% , Type T ±1°C or ±1.5%. Type J is not recommended for temperatures below 32°F.