ULTRA

ANSI CODED MATERIAL SPECIFICATIONS

TYPE CODE	POSITIVE LEG	NEGATIVE LEG	RECOMMENDED TEMP RANGE F(C) OF PROT. TC	APPLICATION INFORMATION
J	Iron ThermoKanthal JP	Constantan Cupron Advance ThermoKanthal JN	32 to 1400° F (0 to 760° C)	Suitable for vacuum, reducing or insert atmospheres, oxidizing, atmosphere with reduced life. Iron oxidizes rapidly above 1000°F (538°C) so only heavy gauge wire is recommended for high temperature. Bare elements should not be exposed to sulphurous atmospheres above 1000°F (538°C)
K	Chromel Tophel T1 ThermoKanthal KP	Alumel Nial T2 ThermoKanthal KN	32 to 2300° F (0 to 1260° C)	Recommended for continuous oxidizing or neutral atmospheres. Mostly used above 1000°F (538°C). Subject to failure if exposed to sulphur. 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°C-1038°C) range. Ventilation or inert sealing of the protection tube can prevent this.
N	Nicrosil 14.5% Chromium 1.4% Silicon 0.1% Magnesium Balance Nickel	Nisil 4.2% Silicon 0.1% Magnesium Balance Nickel	32 to 2300° F (0 to 1260° C)	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	Copper	Constantan Cupron Advance ThermoKanthal JN	-300 to 700 °F (-184 to 371° C)	Useable in oxidizing, reducing or inert atmospheres. Sub-zero limits of error not established. Highest thermoelectric output of common calibrations.
E	Chromel Tophel T1 ThermoKanthal KP	Constantan Cupron Advance ThermoKanthal JN	32 to 1600° F (0 to 871° C)	Recommended for continuously oxidizing or inert atmospheres. Sub-zero limits of error not established. Highest thermoelectric output of common calibrations.
R	Platinum- 13% Rhodium	Platinum	1000 to 2700° F (538 to 1482° C)	Recommended for high temperature. Must be protected with non-metallic protection tube and ceramic insulators. Continued high temperature usages causes grain growth which can lead to mechanical failure. Negative calibration drift caused by Rhodium diffusion to pure leg as well as from Rhodium volatilization. Type R is used in industry; Type S in the laboratory.
S	Platinum- 10% Rhodium			
B	Platinum- 30% Rhodium	Platinum- 6% Rhodium	1600 to 3100° F (871 to 1705° C)	Same as R & S but output is lower. Also less susceptible to grain growth and drift.

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C	Tungsten-5% Rhenium (W-5% Re)	Tungsten-26% Rhenium (W-26% Re)	32 to 4200° F (0 to 2315° C)	Very high temperature applications in inert or vacuum. Preferred over Tungsten/Tungsten-26% Rhenium because it is less brittle at low temperatures.
D	Tungsten-3% Rhenium (W-3% Re)	Tungsten-26% (W-26% Re)	32 to 4200° F (0 to 2315° C)	The ductility of the W3Re leg is superior to pure Tungsten, but not as good as W5Re. This combination has highest output of the 3 common Tungsten Rhenium calibrations from 1860-4200° F.
G	Tungsten (W)	Tungsten-26% Rhenium (W-26% Re)	32 to 4200° F (0 to 2315° C)	Very high temperature application in inert or vacuum. Heating to above 2192°F creates a loss of ductility at room temperature. This embrittlement creates mechanical weakness.
M	Nickel-18% Molybdenum (Ni-18% Mo)	Nickel (Ni-0.8% Co)	-58 to 2570°F (-50 to 1410 °C)	High temperature applications in inert or vacuum atmosphere. Useful in many hydrogen applications. Continuous cycling causes excessive grain growth.
P	Platinel 5355	Platinel 7674	32 to 2543° F 0 to 1395° C)	Nobel metal combination which approximates Type K curve but has much improved oxidation resistance. Should be treated as any noble metal calibration.

* The upper and lower range limits of any particular type of thermocouple will depend on such factors as wire size, temperature, time of exposure, and environment. Thermocouples should only be used within the ranges listed in ASTM MNL 12 Table 3.1 (Recommended Upper Temperature Limits for Protected Thermocouples) or 3.5 (Recommended Upper Temperature Limits for Protected Thermoelements), ASTM E 230 Table 6 (Suggested Upper Temperature Limits for Protected Thermocouples), ASTM E 608 Table 1 (Suggested Upper Temperature Limits for Sheathed Thermocouples). The temperature limits given in these tables are intended only as a guide to the user and should not be taken as absolute values nor as guarantees of satisfactory life or performance. These types and sizes are sometimes used at temperatures above the given limits, but usually at the expense of stability or life or both.