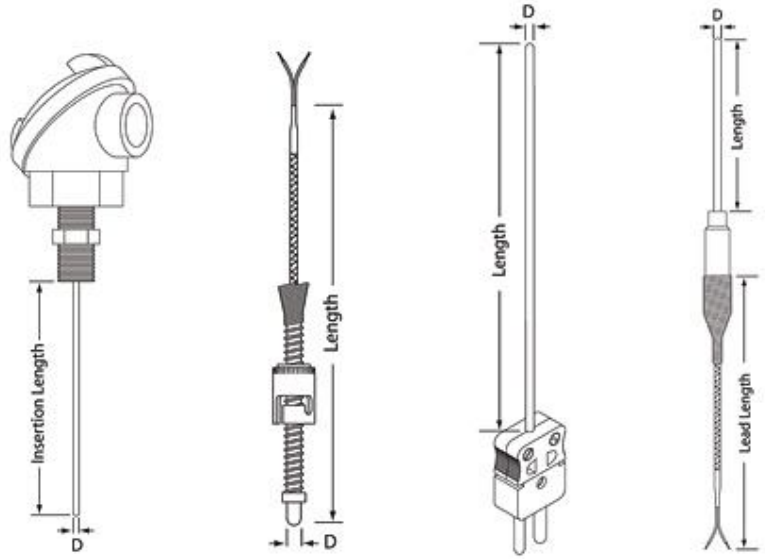
Thermocouple & RTD Sensors



THERMOCOUPLES

A thermocouple is a sensor for measuring temperature. It consists of two dissimilar metals,

joined together at one end. When the junction of the two metals is heated or cooled a voltage is produced that can interpreted by a temperature controller, high limit or display device. There are two common constructions for these: Tube and Wire and Mineral Insulated. The tube and wire uses an empty stainless tube with a wire inside which has a welded tip incorporating the wire junction. This construction is typically used to 900ºF. The Mineral Insulated construction uses a highly compacted stainless sheath with solid conductors encased in magnesium oxide insulation. This construction offers a

wider variety of diameters, allows for the sensors to be bent in the field and for temperatures to 2200ºF. These sensors are available is a huge range of physical packages with a variety of lead wire, housing, and mounting options.

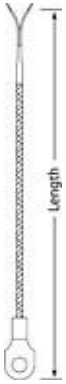
RTD’s (Resistance Temperature Detectors)

(RTDs) are temperature sensors that contain a resistor that changes resistance value as its temperature changes. RTDs are also available in a Tube and Wire and Mineral Insulated construction. They are more accurate than thermocouples and are typically used for temperature sensitive and laboratory applications. We offer these in a variety of constructions and physical packages but are constrained by the size of the resistor beads. There are restrictions to the diameter and lengths of the available constructions.

STANDARD CONSTRUCTIONS

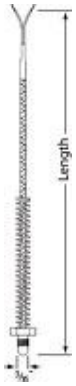
Adjustable Bayonet - Series 110

Adjustable Bayonet - Series 120

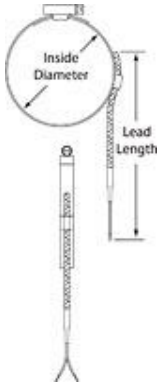


Ring Tongue - Series 130

Shimstock - Series 140

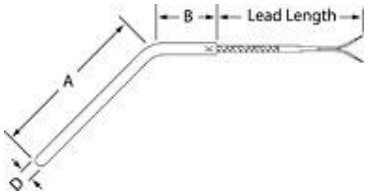


Nozzle - Series 145

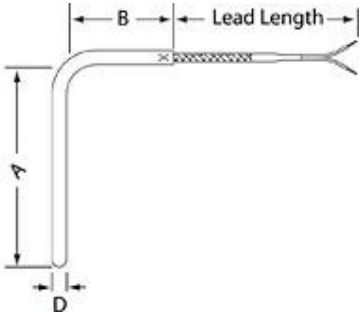


Pipe Clamp - Series 146

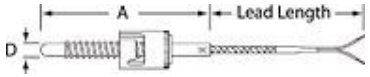
Tube and Wire - Series 150



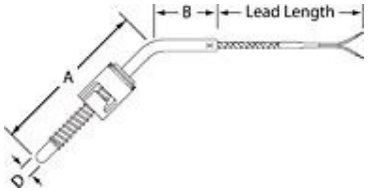
Tube and Wire - Series 151



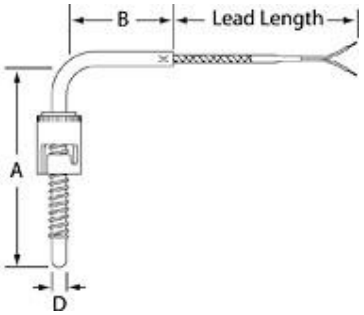
Tube and Wire - Series 152



Tube and Wire - Series 160

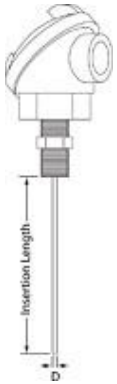


Tube and Wire - Series 161



Tube and Wire - Series 162

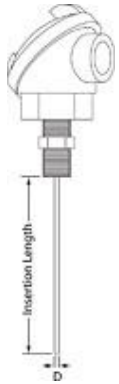
Mineral Insulated
- Series T1



Mineral Insulated
- Series T2

Mineral Insulated
- Series T3

RTD Mineral Insulated - Series R1

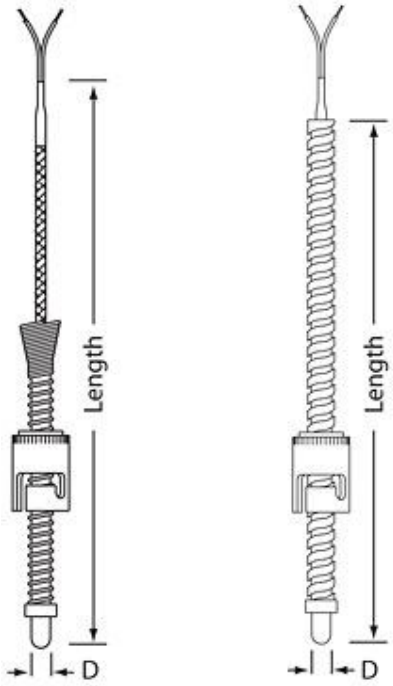


RTD Mineral Insulated - Series R2

RTD Mineral Insulated - Series R3

THERMOCOUPLES - ADJUSTABLE BAYONET

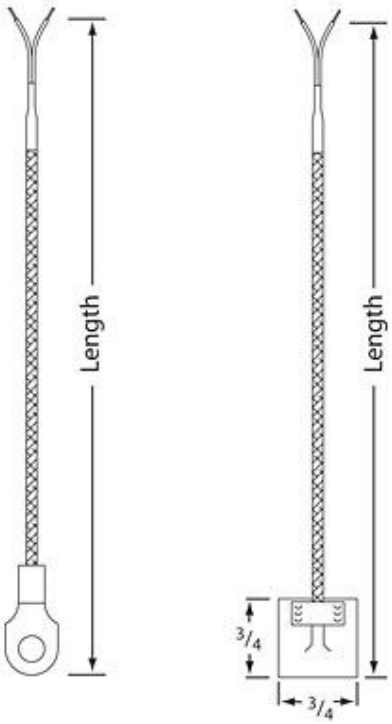
Series 110 **Series 120**



1) Series	110 120
2) Diameter (D)	B = 1/8", C = 3/16", D = 1/4"
3) Calibration	J, K, T, E, D = RTD 2 wire F = RTD 3 wire
4) Junction	G = Grounded, U = Ungrounded
5) Leads	G = Fiberglass 24 ga T = Fiberglass 24 ga stainless braid F = Fiberglass 20 ga S = Fiberglass 20 ga stainless braid I = Fiberglass 24 ga stainless hose H = Fiberglass 20 ga stainless hose A = Teflon 24 ga B = Teflon 20 ga C = PVC 24 ga D = PVC 20 ga
6) Lead length	In whole inches 006-999
7) Termination	Choose a terminal design from pg L8

THERMOCOUPLES - RING TONGUE AND SHIMSTOCK

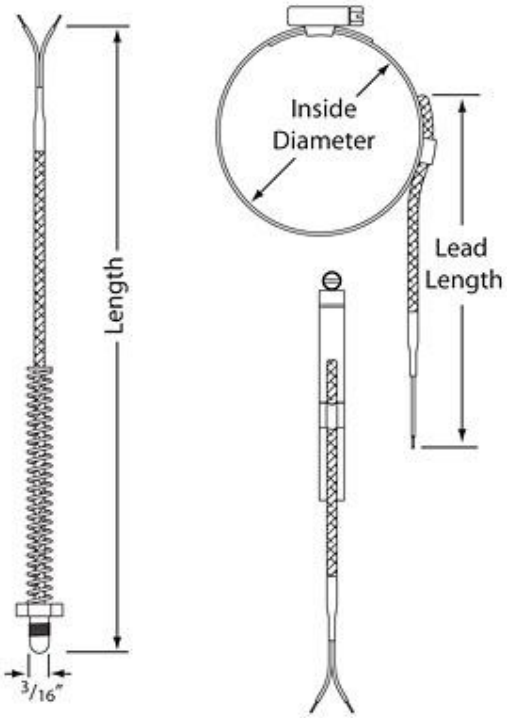
Series 130 **Series 140**



1) Series	130 140
2) Lug Sizes	Ring size A = #8, B = #10, C = 1/4" Shim size D = 3/4" by 3/4" Stainless steel
3) Calibration	J, K, T, E, D = RTD 2 wire F = RTD 3 wire
4) Junction	G = Grounded, U = Ungrounded
5) Leads	T = Fiberglass 24 ga stainless braid S = Fiberglass 20 ga stainless braid I = Fiberglass 24 ga stainless hose H = Fiberglass 20 ga stainless hose A = Teflon 24 ga B = Teflon 20 ga
6) Lead length	In whole inches 006-999
7) Termination	Choose a terminal design from pg L8
8) Special options	Enter 0 if none. Specify others at time of order

THERMOCOUPLES - NOZZLE AND PIPE CLAMP

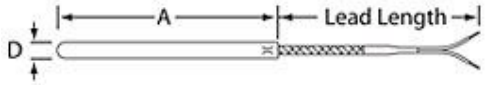
Series 145 **Series 146**



1) Series	145 146
2) Bolt Sizes	A = 1/4 x 28 UNF, B = 8-32, C = 10-32, D = M6 x 1
Band diameters	E = 11/16 -11/4, F = 11/4 -21/4, G = 21/4 -31/4, H = 31/4 -41/4, I = 4-5, J = 5-6, K = 6-7,
3) Calibration	J, K, T, E
4) Junction	G = Grounded, U = Ungrounded
5) Leads	T = Fiberglass 24 ga stainless braid S = Fiberglass 20 ga stainless braid I = Fiberglass 24 ga stainless hose H = Fiberglass 20 ga stainless hose A = Teflon 24 ga B = Teflon 20 ga
6) Lead length	In whole inches 006-999
7) Termination	Choose a terminal design from pg L8
8) Special options	Enter 0 if none. Specify others at time of order

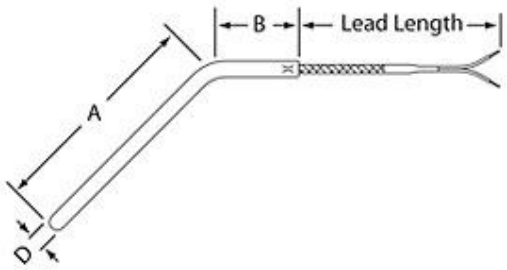
THERMOCOUPLES & RTD - TUBE AND WIRE

Series 150

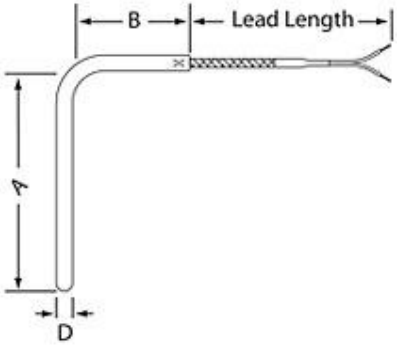


1) Series	150 151 152
2) Diameter (D)	B = 1/8", C = 3/16", D = 1/4",
3) Calibration	J, K, T, E, D = RTD 2 wire F = RTD 3 wire

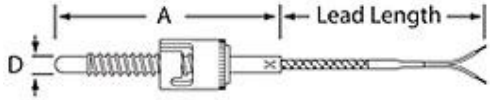
Series 151



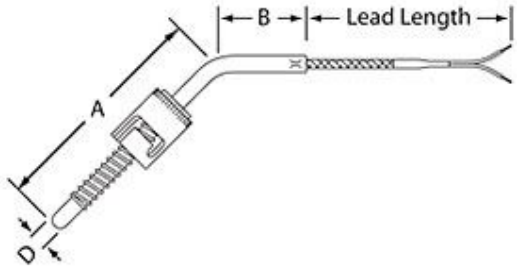
Series 152



Series 160

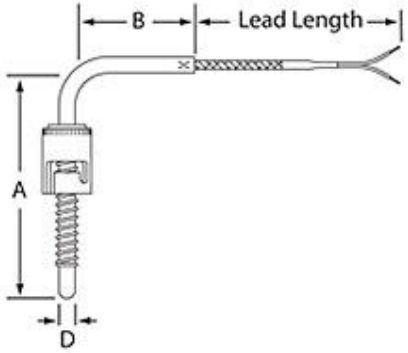


Series 161



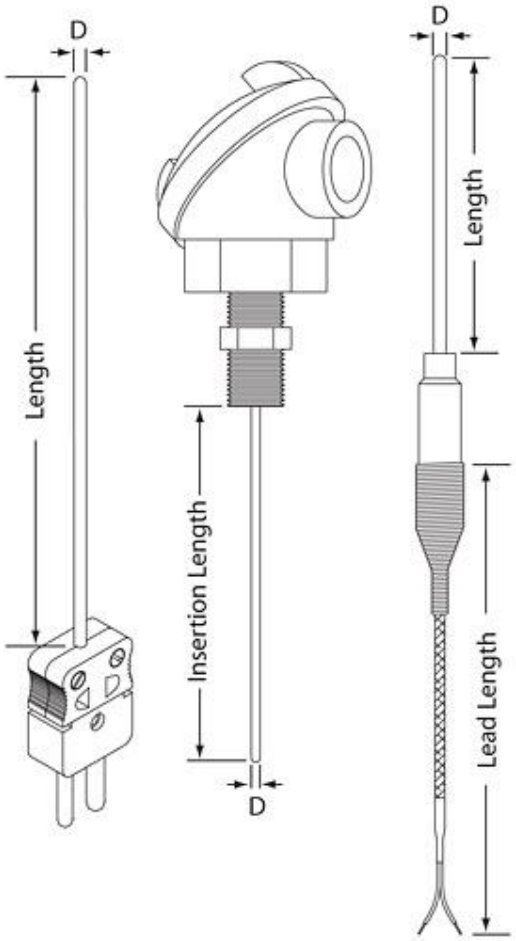
1) Series	160 161 162
2) Diameter (D)	B = 1/8", C = 3/16", D = 1/4",
3) Calibration	J, K, T, E, D = RTD 2 wire F = RTD 3 wire
4) Junction	G = Grounded, U = Ungrounded
5) A Dimension	A=1/2, B=1, C=1 1/2, D=2, E=2 1/2, F=3 G=3 1/2, H=4, I=4 1/2, J=5, K=5 1/2, L=6, M=6 1/2, N=7, O=7 1/2, P=8, Q=8 1/2, R=9 S=9 1/2, T=10, U=12, V=18, W=24, Y=36 Z=48, X=Special length
6) B Dimension	A=1/2, B=1, C=1 1/2, D=2, E=2 1/2, F=3

Series 162



THERMOCOUPLES - MINERAL INSULATED

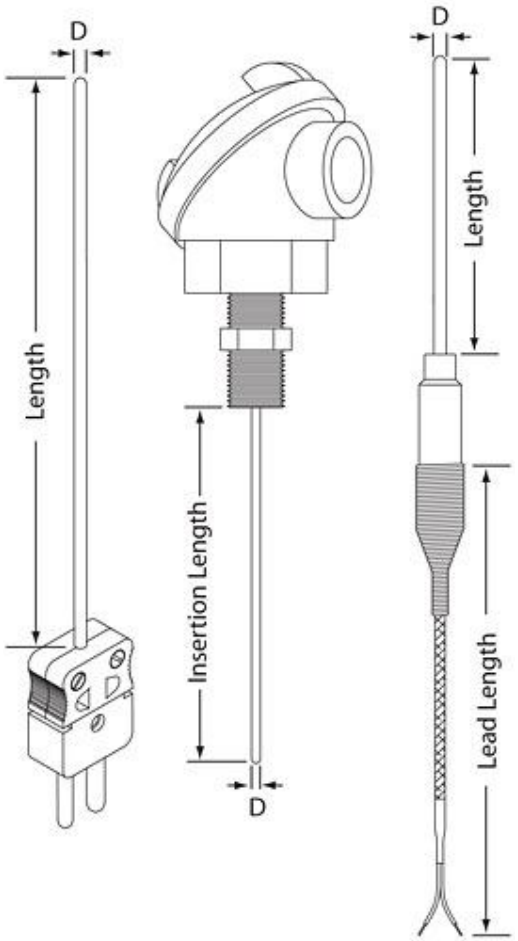
Series T3 **Series T2** **Series T1**



1) Series	T1 T2 T3
2) Diameter (D)	A = 1/16", B = 1/8", C = 3/16", D = 1/4",
3) Calibration	J, K, T, E, R, S
4) Junction	G = Grounded, U = Ungrounded E = Exposed
5) Sheath Material	A = 304SS, B = 316SS, C = Incoloy
6) L Dimension	In whole inches 00-99
7) L Dimension **Fractional inches**	A = 0, B = 1/8", D = 1/4", F = 3/8", H = 1/2", J = 5/8", L = 3/4", N = 7/8"
8) Leads	F = Fiberglass braid S = Fiberglass with stainless braid H = Fiberglass with stainless hose B = Teflon D= PVC K = Kapton
T2 terminations	A = Aluminium head 1/2 x 1/2 ss fitting L = Aluminium head 1/2 x 1/2 ss fitting spring loaded E = Expolsion proof 1/2 x 1/2 ss fitting I = Cast iron 1/2 x 1/2 ss fitting P = Polypropylene 1/2 x 1/2 ss fitting
9) Lead length	In whole inches 066-999
10 Termination	Choose a terminal design from pg L8
11) Special options	Fittings, flanges etc. Specify at time of order. Enter 0 if none

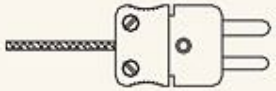
RTD - MINERAL INSULATED

Series R3 **Series R2** **Series R1**

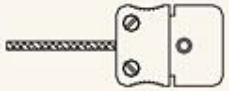


1) Series	R1 R2 R3
2) Diameter (D)	A = 1/16", B = 1/8", C = 3/16", D = 1/4",
3) Coefficient	D = Din 3850, J = JIS 3916 (100 ohm)
4) Lead Construction	D = 2 wire, T = 3 wire, F - 4 wire
5) Sheath Material	A = 304SS, B = 316SS, C = Incoloy
6) L Dimension	In whole inches 00-99
7) L Dimension	A = 0, B = 1/8", D = 1/4", F = 3/8",
Fractional inches	H = 1/2", J = 5/8", L = 3/4", N = 7/8"
8) Leads	F = Fiberglass braid S = Fiberglass with stainless braid H = Fiberglass with stainless hose B = Teflon D= PVC K = Kapton
T2 terminations	A = Aluminium head 1/2 x 1/2 ss fitting L = Aluminium head 1/2 x 1/2 ss fitting spring loaded E = Expolsion proof 1/2 x 1/2 ss fitting I = Cast iron 1/2 x 1/2 ss fitting P = Polypropylene 1/2 x 1/2 ss fitting
9) Lead length	In whole inches 066-999
10 Termination	Choose a terminal design from pg L8
11) Special options	Fittings, flanges etc. Specify at time of order. Enter 0 if none

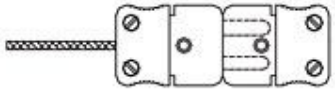
A - Standard Plug



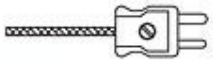
B - Standard Jack



C - Standard Plug / Mating Jack



D - Mini Plug



E - Mini Jack

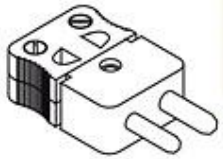
F - Mini Plug / Mating Jack

L - Split Leads

M - Leads with Spade Lugs

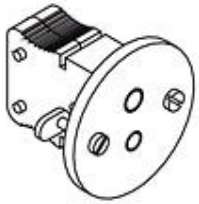
THERMOCOUPLES - PLUGS AND JACKS

Plug - Male



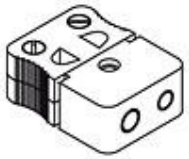
400°F Hollow pins
Part number _MP
Insert callibration J.K.T.R.U.E.N

Panel Jack



400°F Hollow pins
Part number _PMJ
Insert callibration J.K.T.R.U.E.N

Jack - Female



400°F Hollow pins
Part number _FP
Insert callibration J.K.T.R.U.E.N

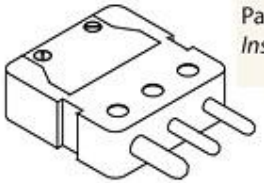
Mini Panel Jack

400°F Hollow pins
Part number _PMJ - mini
Insert callibration J.K.T.R.U.E.N

Mini Plug - Male

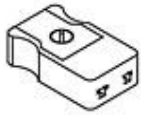
3 Pin Plug - Male

400°F Hollow pins
Part number _MP - mini
Insert callibration J.K.T.R.U.E.N



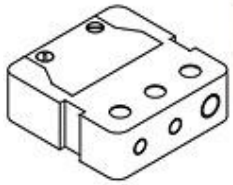
400°F Hollow pins
Part number _MP-3
Insert callibration J.K.T.R.U.E.N

Mini Jack - Female



400°F Hollow pins
Part number _FP - mini
Insert callibration J.K.T.R.U.E.N

3 Pin Jack - Female



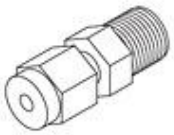
400°F Hollow pins
Part number _FP-3
Insert callibration J.K.T.R.U.E.N

THERMOCOUPLES - ACCESSORIES

Bayonet adaptors

Part No.	Length	Thread
BA1	$^{7}/_{8}$"	$^{1}/_{8}$" NPT
BA2	1 $^{1}/_{2}$"	$^{1}/_{8}$" NPT
BA3	2"	$^{1}/_{8}$" NPT
BA4	2 $^{1}/_{2}$"	$^{1}/_{8}$" NPT
BA5	3"	$^{1}/_{8}$" NPT

Compression Fittings



Part No.	Sheath O.D.	Material	Male NPT
CFB1/16ID	1/16"	Brass	1/8"
CFS1/16ID	1/16"	Stainless	1/8"
CFB1/8ID	1/8"	Brass	1/8"
CFS1/8ID	1/8"	Stainless	1/8"
CFB3/16ID	3/16"	Brass	1/8"
CFS3/16ID	3/16"	Stainless	1/8"
CFB1/4ID	1/4"	Brass	1/8"
CFS1/4ID	1/4"	Stainless	1/8"

Thermocouple wire

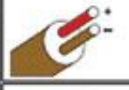
Construction	Overall jacket jacket	Single Conductors	Temperature ratings Continuous	Single reading
PVC Polyvinyl Chloride	PVC	PVC	-20 to +221°F -29 to +105°F	N/A
FEP Extruded Teflon	FEP Teflon	FEP Teflon	-90 to +400°F -67 to +204°C	500°F 260°C
Kapton	Kapton	Kapton	500°F 260°C	N/A
Fiberglass Braid	Silicone imp. glass braid	Silicone imp. glass braid	900°F 482°C	1000°F 538°C
Vitreous Silica Fiber	Vitreous Silica Fiber	Vitreous Silica Fiber	1600°F 871°C	2000°F 1093°C
Ceramic Fiber	Ceramic Fiber	Ceramic Fiber	2200°F 1204°C	2600°F 1204°C

THERMOCOUPLES - WIRE COLOUR CODES

North American Colour Codes

Code	Alloy Combination		Thermocouple Color Coding		Maximum Temperature Useful Range	EMF (mV) Over Max. Temperature Range	Limits of Error** (Whichever is Greater)	
	+Lead	-Lead	Thermocouple Grade	Extension Grade			Standard	Special
J	‡IRON Fe (magnetic)	CONSTANTAN COPPER-NICKEL Cu-Ni			**0 to 750°C** (32 to 1382°F) Therm. Grade **0 to 200°C** (32 to 392°F) Ext. Grade	-8.095 to 69.553	**0 to 750°C** (32 to 1382°F) 2.2°C or 0.75%	1.1°C or 0.4%
K	NICKEL-CHROMIUM Ni-Cr	NICKEL-ALUMINIUM Ni-Al (magnetic)			**-200 to 1250°C** (-328 to 2282°F) Therm. Grade **0 to 200°C** (32 to 392°F) Ext. Grade	-6.458 to 54.886	**-200 to 1250°C** (-328 to 2282°F) 2.2°C or 0.75% Above 0°C 2.2°C or 2.0% Below 0°C	1.1°C or 0.4%
T	COPPER Cu	CONSTANTAN COPPER-NICKEL Cu-Ni			**-200 to 350°C** (-328 to 662°F) Therm. Grade **-60 to 100°C** (-76 to 212°F) Ext. Grade	-6.528 to 20.872	**-200 to 350°C** (-328 to 662°F) 1.0°C or 0.75% Above 0°C 1.0°C or 1.5% Below 0°C	0.5°C or 0.4%
E	NICKEL-CHROMIUM Ni-Cr	CONSTANTAN COPPER-NICKEL Cu-Ni			**-200 to 900°C** (-328 to 1652°F) Therm. Grade **0 to 200°C** (32 to 392°F) Ext. Grade	-9.835 to 76.373	**-200 to 900°C** (-328 to 1652°F) 1.7°C or 0.5% Above 0°C 1.7°C or 1.0% Below 0°C	1.0°C or 0.4%
N	NICROSIL Ni-Cr-Si	NISIL Ni-Si-Mg			**-270 to 1300°C** (-450 to 2372°F) Therm. Grade **0 to 200°C** (32 to 392°F) Ext. Grade	-4.345 to 47.513	2.2°C or 0.75% Above 0°C 2.2°C or 2.0% Below 0°C	1.1°C or 0.4%
R	PLATINUM 13% RHODIUM Pt-13% Rh	PLATINUM PT	NONE ESTABLISHED		**0 to 1450°C** (32 to 2642°F) Therm. Grade **0 to 150°C** (32 to 300°F) Ext. Grade	-0.226 to 21.101	**0 to 1450°C** (32 to 2642°F) 1.5°C or 0.25%	0.6°C or 0.1%
S	PLATINUM 10% RHODIUM Pt-10% Rh	PLATINUM PT	NONE ESTABLISHED		**0 to 1450°C** (32 to 2642°F) Therm. Grade **0 to 150°C** (32 to 300°F) Ext. Grade	-0.236 to 18.693	**0 to 1450°C** (32 to 2642°F) 1.5°C or 0.25%	0.6°C or 0.1%

International Colour Codes

ANSI CODE	International IEC 584-3	International IEC 584-3 *Intrinsically Safe*	CZECH BRITISH to BS 1843	NETHERLANDS GERMAN to DIN 43710	JAPANESE to JIS C 1610-1981	FRENCH to NFC 42-324	Comments Environment - Bare Wire
J							Reducing, Vacuum, Inert. Limited Use in Oxidising at High Temperatures Not Recommended for Low Temperatures
K							Clean Oxidising and Inert. Limited Use in Vacuum or Reducing. Wide Temperature Range. Most Popular Calibration
T							Mild Oxidising, Reducing Vacuum or Inert. Good Where Moisture is Present, Low Temperature and Cryogenic Applications
E							Oxidising or Inert. Limited Use in Vacuum or Reducing. Highest EMF Change per Degree
N				No Standard Use American Color Codes			Alternative To Type K More Stable at High Temps
R							Oxidising or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature
S							Oxidising or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature