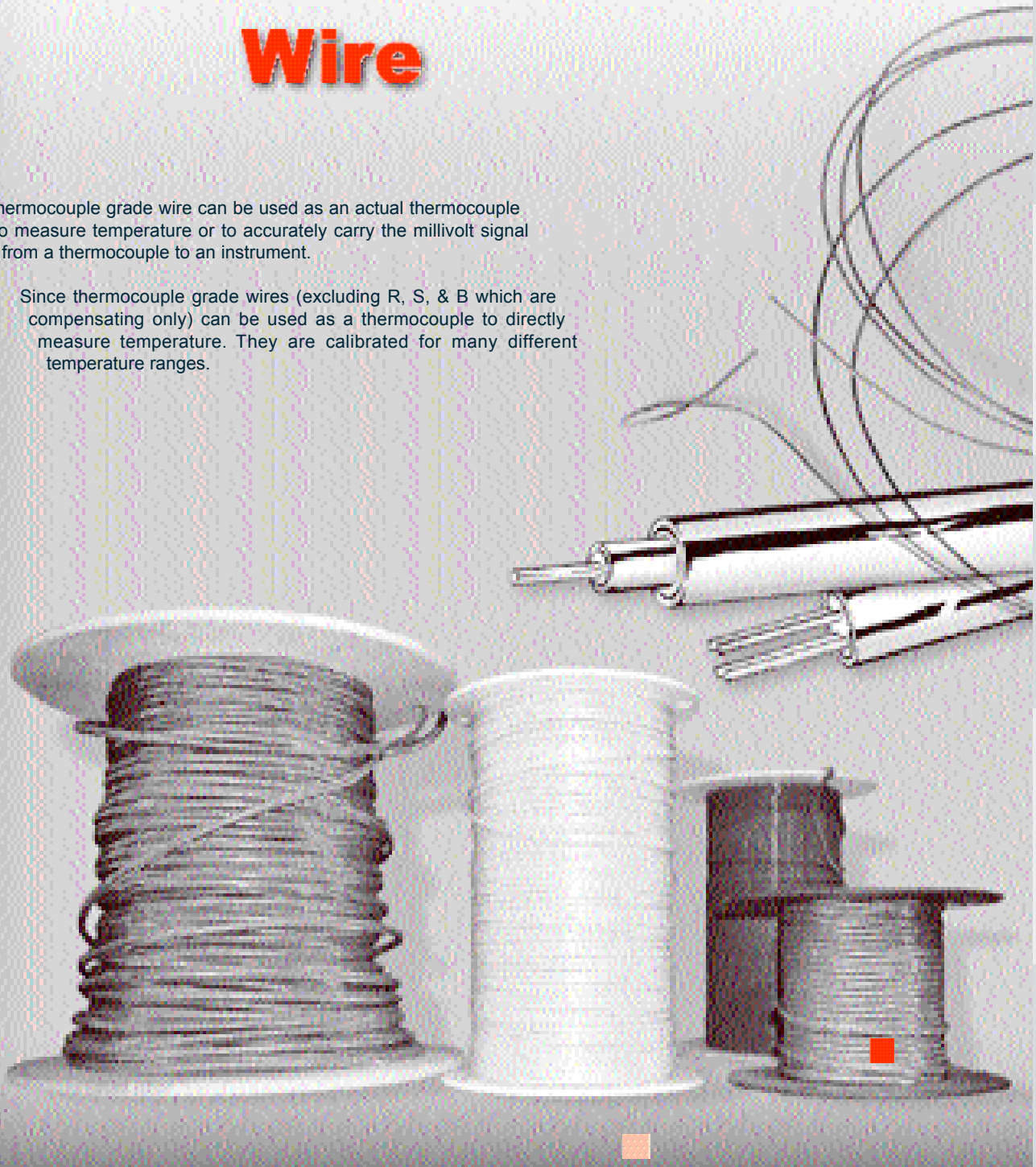
Wire

Thermocouple grade wire can be used as an actual thermocouple to measure temperature or to accurately carry the millivolt signal from a thermocouple to an instrument.

Since thermocouple grade wires (excluding R, S, & B which are compensating only) can be used as a thermocouple to directly measure temperature. They are calibrated for many different temperature ranges.



Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

THERMOCOUPLE AND EXTENSION GRADE COLOR CODES

See Pages 188 and 189 for a color version of the
Thermocouple and Extension Grade Wire Color Codes

Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

INTRODUCTION TO WIRE

In order to help you determine which thermocouple wire is best for your application, we have included the following brief explanation.

Thermocouple Wire
Thermocouple grade wire can be used as an actual thermocouple to measure temperature or to accurately carry the millivolt signal from a thermocouple to an instrument.

Since thermocouple grade wires (excluding R,S, & B which are compensating only) can be used as a thermocouple to directly measure temperature. They are calibrated for many different temperature ranges.

Extension Wire
Thermocouple extension grade wire is used only to carry the millivolt signal from the actual thermocouple to an instrument in place of more expensive thermocouple grade leadwire.

Thermocouple extension wire is not calibrated above 400˚F (204˚C).

Temperature Rating
Most constructions are rated for both continuous and single reading applications. The continuous use temperature is the highest temperature that a particular construction will operate at on a continuous basis. The single reading temperature is the highest temperature that a particular construction will operate at one time only without sustaining damage.

ANSI Color Code
Whenever possible, wire is colored to conform to the American National Standards Institute, specification No. MC 96.1. IEC standard available.

Physical Properties
Wire is rated based on the physical properties of the insulation to withstand abrasion, moisture and chemicals. Abrasion resistance is based on the thickness of the insulation and how well it withstands abrasion as compared to other insulation of similar thickness. The moisture resistance ratings are based on the ability of the insulation to withstand the ingress of moisture. Chemical resistance ratings are based on how well the insulation withstands exposure to the most common chemicals.

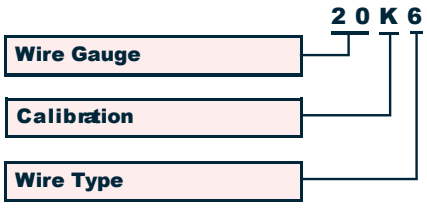
Recommended Upper Temperature Limit for Various Wire Sizes C˚/F˚

Thermocouple Type	No. 8 Gauge	No. 14 Gauge	No. 20 Gauge	No. 24 Gauge	No. 28 Gauge
E	870/1600	650/1200	540/1005	430/805	430/805
J	760/1400	590/1095	480/895	370/700	370/700
K & N	1260/2300	1090/1995	980/1795	870/1600	870/1600
T	—	370/700	260/500	200/395	200/395

Table courtesy of American National Standards Institute (ANSI) MC 96.1

How to Interpret TCP's Part Number

Typical Example:



Note:

"L" at the beginning of the part number indicates Extension Grade.

If "S" follows the calibration (ex. 20KS6) then wire is stranded, not solid.

If "SS" follows the Wire Type (ex. 20K6SS) then this wire has a Stainless Steel Overbraid.

If "P" follows the Wire Type (ex. 20K31P) then this wire is premium grade.

Other calibrations are available.

INTRODUCTION TO WIRE

Thermocouple Wire and Extension Wire

To permit convenient replacement of thermocouple wires, their E.M.F. characteristics must be reproduced year after year to required standards.

Thermo-Couple Products Company calibrates all thermocouple wires when received, and accepts only those which meet our exacting standards. Users are thereby assured of uniformity and reproducibility at all times.

Limits of Error

Unless otherwise specified, all thermocouple wire and extension wire are supplied to meet the Standard Limits of Error as set forth by the American National Standards Institute Specification MC 96.1. Special Limits of Error wires are also available at an extra cost per thousand feet.

Temperature Rating

Most constructions are rated for both continuous and single reading applications. The continuous use temperature is the highest temperature that a particular construction will operate at on a continuous basis. The single reading temperature is the highest temperature that a particular construction will operate, one time only without sustaining damage.

Limits of Error for Thermocouple Wire

ANSI Type	Type of Thermocouple	Temperature Ranges	Limits of Error	
			Standard	Special
J	Iron/ Constantan	32˚F to 530˚F 530˚F to 1400˚F	±4˚F ±.75%	±2˚F ±.4%
K	Chromel/ Alumel	32˚F to 530˚F 530˚F to 2300˚F	±4˚F ±.75%	±2˚F ±.4%
T	Copper/ Constantan	-328˚F to +32˚F 530˚F to 2300˚F 260˚F to 700˚F	±2˚F or ±1.5% ±2˚F or ±.75%	— ±1˚F or ±.4%
N	Nicrosil/ Nisil	32˚F to 530˚F 530˚F to 2300˚F	±4˚F ±.75%	±4˚F ±.75%
E	Chromel/ Constantan	-328˚F to +32˚F 32˚F to 500˚F 500˚F to 1600˚F	±3˚F or ±.1% ±3˚F ±.5%	— ±2˚F or ±.4%
R	Platinum 13% Rhodium/ Platinum	32˚F to 1100˚F 1100˚F to 2700˚F	±2.5˚F ±.25%	±1˚F ±.1%
S	Platinum 10% Rhodium/ Platinum	32˚F to 1100˚F 1100˚F to 2700˚F	±2.5˚F ±.25%	±1˚F ±.1%
B	Platinum 30% Rhodium/ Platinum 6% Rhodium	1500˚F to 3100˚F	±.5%	—

Chromel and Alumel are registered trade marks of Hoskins Mfg.Co.

Calibrating, Checking and Tagging

Thermocouple and extension wire are available calibrated, “CHECKED AND TAGGED” when so specified, at extra charge, Wires of this classification are within the Standard Limits of Error. But most important, their specific departure at given temperatures are known and can be taken into account. Each thermocouple coil, reel or spool of wire is checked and tagged to show the individual departure from the curve.

Temperature range for all checking and selecting is from +32˚F to +1900˚F, depending on type and gauge of wire. Below 32˚F, checking is also available.

Stranding Combinations

Type	Stranding	
	No. of Strands	Gauge
14	7	22
16	7	24
18	7	26
20	7	28
22	7	30
24	7	32

Solid and Stranded Conductors

Thermocouple and extension wire are usually solid conductors. When greater flexibility is required, either is available in stranded construction. Table shows stranding combinations used in all wire.

Color Coding

Standard ANSI color coding is used on all insulated thermocouple and extension wire where type of insulation permits. In color coding we reserve the right to include a tracer to distinguish calibration.

Shipping

All duplex insulated thermocouple and extension wires are normally packed in 1000-foot or 2000-foot reels, depending on gauge size and type of insulation. These lengths are plus or minus 5% for standard wires and plus or minus 10% for wires made to order. However, each reel and the container in which it is shipped is marked with the exact length. On an order for either standard or special wire, we reserve the right to ship plus or minus 10% of the total amount ordered.

Limits of Error of Extension Wires for Standard Wire Sizes

Type	Thermocouple	Temperature Ranges	I.S.A. Limits or Error	
			Standard	Special
EX	E	0 to + 400	±3˚F	—
JX	J	0 to + 400	±4˚F	±2˚F
KX	K	0 to + 400	±4˚F	±2˚F
RX, SX	R, S	+75 to + 400	±12˚F	—
TX	T	+75 to + 400	±1-1/2˚F	±3/4˚F

Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

INTRODUCTION TO WIRE

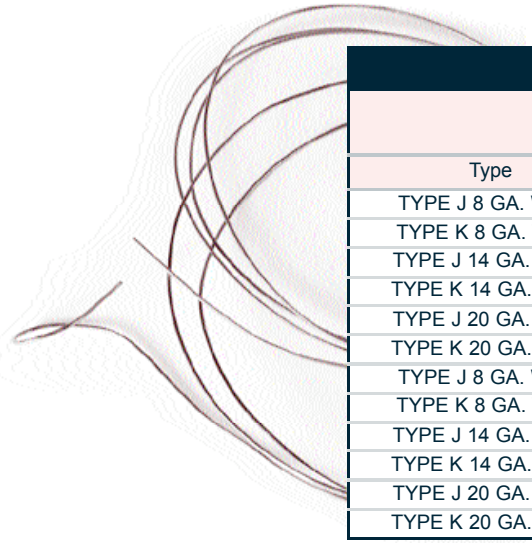
TCP supplies thermocouple wire based on ANSI (U.S.) standards unless specified otherwise.

Color Codes and Characteristics for Insulated Thermocouple Wires

Thermocouple Type		Color Coding					Means of Identification		
Symbol	Material	United States ANSI MC 96.1	United Kingdom BS 1843	West Germany DIN 43714	Japan JIS C1610-1981	France NF C42-323	Polarity	Magnetic Properties	Appearance
J	Iron/ Constantan	Black + White – Red	Black + Yellow – Blue	Blue + Red – Blue	Yellow + Red – White	Black + Yellow - Black	Pos. Neg	Mag. Non. Mag.	
K	Chromel/ Alumel	Yellow + Yellow – Red	Red + Brown – Blue	Green + Red – Green	Blue* + Red – White	Yellow + Yellow - Purple	Pos. Neg	Non Mag. Mag.	
T	Copper/ Constantan	Blue + Blue – Red	Blue + White – Blue	Brown + Red – Brown	Brown Red – White	Blue + Yellow - Blue	Pos. Neg	Non Mag. Non. Mag.	1 Copper Colored Wire
E	Chromel/ Constantan	Purple + Purple – Red	Brown + Brown – Blue	Black + Red – Black	Purple + Red – White	None	Pos. Neg	Non Mag. Non. Mag.	
S	Platinum 10% Rhodium/ Platinum (Compensating Wire)	Green + Black – Red	Green + White – Blue	White + Red - White	Black + Red - White	Green + Red – Green	Pos. Neg	Non Mag. Non. Mag.	2 Copper Colored Wires
R	Platinum 13% Rhodium/ Platinum (Compensating Wire)	Green + Black – Red	Green + White – Blue	None	Black + Red – White	None	Pos. Neg	Non Mag. Non. Mag.	2 Copper Colored Wires
B	Platinum 30% Rhodium/ Platinum 6% Rhodium (Compensating Wire)	Grey + Grey – Red	None	Grey + Red – Grey	Grey + Red – White	None	Pos. Neg	Non Mag. Non. Mag.	2 Copper Colored Wires

For a more detailed color version of this chart see page 188-189.

BARE WIRE



Bare Wire

Description				Feet per lb.	Catalog Number
Type	Polarity	Material	Gauge		
TYPE J 8 GA. WIRE	Positive	Iron	8	23'	561
TYPE K 8 GA. WIRE	Positive	Chromel	8	21'	475
TYPE J 14 GA. WIRE	Positive	Iron	14	91'	755A
TYPE K 14 GA. WIRE	Positive	Chromel	14	83'	L2250
TYPE J 20 GA. WIRE	Positive	Iron	20	365'	558
TYPE K 20 GA. WIRE	Positive	Chromel	20	313'	485
TYPE J 8 GA. WIRE	Negative	Constantan	8	20'	609
TYPE K 8 GA. WIRE	Negative	Alumel	8	21'	476
TYPE J 14 GA. WIRE	Negative	Constantan	14	80'	755B
TYPE K 14 GA. WIRE	Negative	Alumel	14	83'	L2551
TYPE J 20 GA. WIRE	Negative	Constantan	20	323'	559
TYPE K 20 GA. WIRE	Negative	Alumel	20	313'	486

INTRODUCTION TO WIRE

Thermocouple and Extension Wire Insulation Types and Characteristics

TCP Type Code	Single Conductor		Duplex Conductors		Temperature Rating		ANSI Color Coded	Physical Properties			Note	See Page
	Insulation	Impregnation	Insulation	Impregnation	Continuous Reading	Single Reading		Abrasion Resistance	Moisture Resistance	Chemical Resistance		
6	Vitreous Silica Fiber	None	Vitreous Silica Fiber	None	1800˚F 982˚C	2000˚F 1093˚C	No	Fair	Fair	Good		130
7	Glass Braid	Silicone Modified Resin	Glass Braid	Silicone Modified Resin	900˚F 482˚C	1000˚F 538˚C	Yes	Fair	Good	Good	Impregnation retained to 400˚F (204˚C)	130
8	Double Glass Wrap	Hi Temp Varnish	Glass Braid	Silicone Modified Resin	900˚F 482˚C	1000˚F 538˚C	Yes	Fair	Good	Good	Impregnation retained to 400˚F (204˚C)	130
10	Double Glass Braid	Silicon Modified Resin	Glass Braid	Silicone Modified Resin	900˚F 482˚C	1000˚F 538˚C	Yes	Good	Good	Good	Impregnation retained to 400˚F (204˚C)	131
14	Polyvinyl (PVC)	None	Ripcord	None	-20 to 221˚F -29 to 105˚C	—	Yes	Good	Excellent	Good		131
17	Polyvinyl (PVC)	None	Polyvinyl (PVC)	None	-20 to 221˚F -29 to 105˚C	—	Yes	Good	Excellent	Good		131
21	Extr, FEP Teflon	None	Extr. FEP Teflon	None	400˚F 204˚C	500˚F 260˚C	Yes	Excellent	Excellent	Excellent		132
23	Polyvinyl (PVC)	None	Polyvinyl (PVC) Twisted	None	-20 to 221˚F -29 to 105˚C	—	Yes	Good	Excellent	Good	Aluminum/Mylar* shield with drain wire	132
24	Fused Polyimide Tape	None	None Twisted	None	600˚F 316˚C	800˚F 427˚C	Both Legs have tracer	Excellent	Excellent	Excellent	FEP Teflon binder melts at approx. 500˚F (260˚C)	132
25	TFE Teflon Tape	None	TFE Teflon Tape Fused	None	500˚F 260˚C	600˚F 316˚C	Yes	Good	Excellent	Excellent		133
26	HighTemp. Glass Brand	None	High temp. Glass Brand	Light Lacquer Coating	1300˚F 704˚C	1600˚F 871˚C	No	Fair	Fair	Good	Coating retained to 300˚F (149˚C)	133
27	Extr. FEP Teflon	None	Extr. FEP Teflon Twisted	None	400˚F 204˚C	500˚F 260˚C	Yes	Excellent	Excellent	Excellent	Aluminum/Mylar* shield with drain wire	133
30	Ceramic Fiber	None	Ceramic Fiber	None	2200˚F 1204˚C	2600˚F 1427˚C	No	Good	Fair	Good		134
31	Fused Polyimide Tape	None	Fused Polyimide Tape	None	600˚F 316˚C	800˚F 427˚C	Yes	Excellent	Excellent	Excellent	FEP Teflon binder melts at approx. 500˚F (260˚C)	134
36	High Temp. Glass Braid	None	High Temp. Glass Braid	Silicone Modified Resin	1300˚F 74˚C	1600˚F 871˚C	Both Legs have tracer	Good	Fair	Good	Impregnation retained to 400˚F (204˚C)	134
42	Extr. FEP Teflon	None	Extr. FEP Teflon	None	400˚F 204˚C	500˚F 260˚C	Yes	Excellent	Excellent	Excellent		134

Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

TYPE 6

Single Conductor Insulation
- Braided Vitreous Silica Yarn;
- No Impregnation

Duplex Conductor Insulation
- Braided Vitreous Silica Yarn;
- No Impregnation

Temperature Rating
- Continuous: 1800˚F (982˚C)
- Single Reading 2000˚F (1093˚C)

ANSI Color-Coded
- No

Physical Properties
- Abrasion Resistance - Fair
- Moisture Resistance - Fair
- Chemical Resistance - Good

Note
- Because this insulation has no binders or impregnation, it may ”fray” when stripped.

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
6	20K6	20	.0320/.813	.590	.100 x .155/2.54 x 3.94	16	23.8

TYPE 7

Single Conductor Insulation
- Fiberglass Braid with Silicone
- Modified Resin Impregnation

Duplex Conductor Insulation
- Fiberglass Braid with Silicone
- Modified Resin Impregnation

Temperature Rating
- Continuous: 900˚F (482˚C)
- Single Reading 1000˚F (538˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Fair
- Moisture Resistance - Good
- Chemical Resistance - Good

Note
- Impregnation retained to 400˚F (204˚C)

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
7	20E7	20	.0320/.813	.704	.055 x .097/1.40 x 2.46	8	11.9
7	20J7	20	.0320/.813	.357	.055 x .097/1.40 x 2.46	8	11.9
7	24J7	24	.0201/.508	.877	.045 x .077/1.14 x 1.96	4	6.0
7	30J7	30	.0100/.254	3.520	.043 x .067/1.09 x 1.70	3	4.5
7	20K7	20	.0320/.813	.590	.055 x .097/1.40 x 2.46	8	11.9
7	24K7	24	.0201/.508	1.490	.045 x .077/1.14 x 1.96	4	6.0
7	28K7	28	.0126/.320	3.770	.043 x .067/1.09 x 1.70	3	4.5
7	20T7	20	.0320/.813	.298	.055 x .097/1.40 x 2.46	5	7.4
7	24T7	24	.0201/.508	.753	.045 x .077/1.14 x 1.96	4	6.0

Extension Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
7	L24R7	24	.0201/.508	.087	.045 x .077/1.14 x 1.96	8	11.9

TYPE 8

Single Conductor Insulation
- Double Fiberglass Wrap
- Varnish Impregnation

Duplex Conductor Insulation
- Fiberglass Braid with Silicone
- Modified Resin Impregnation

Temperature Rating
- Continuous: 900˚F (482˚C)
- Single Reading 1000˚F (538˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Fair
- Moisture Resistance - Good
- Chemical Resistance - Good

Note
- Impregnation retained to 400˚F (204˚C)

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
8	20J8	20	.0320/.813	.357	.052 x .092/1.32 x 2.34	8	11.9
8	24J8	24	.0201/.508	.877	.043 x .071/1.09 x 1.80	4	6.0
8	28J8	28	.0126/.320	2.216	.035 x .059/.89 x 1.50	11	16.4
8	30J8	30	.0100/.254	3.520	.035 x .053/.89 x 1.35	3	4.5
8	20K8	20	.0320/.813	.590	.052 x .092/1.32 x 2.34	8	11.9
8	24K8	24	.0201/.508	1.490	.043 x .071/1.09 x 1.80	4	6.0
8	28K8	28	.0126/.320	3.770	.035 x .059/.89 x 1.50	3	4.5
8	30K8	30	.0100/.254	5.980	.035 x .053/.89 x 1.35	2	3.0
8	24T8	24	.0201/.508	.753	.043 x .071/1.09 x 1.80	4	6.0
8	30T8	30	.0100/.254	3.025	.035 x .053/.89 x 1.35	2	3.0

TYPE 10

Single Conductor Insulation
- Double Fiberglass Braid with Silicone
- Modified Resin Impregnation

Duplex Conductor Insulation
- Fiberglass Braid with Silicone
- Modified Resin Impregnation

Temperature Rating
- Continuous: 900˚F (482˚C)
- Single Reading 1000˚F (538˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Good
- Chemical Resistance - Good

Note
- Impregnation retained to 400˚F (204˚C)

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight	
						(lb. /1000 ft)	(Kg\Km)
10	20JS10	20 Strnd.	.0390/1.000	.343	.070 x .122/1.78 x 3.10	9	13.4
10	20JS10SS	20 Strnd.	.0390/1.000	.343	.093 x .140/2.36 x 3.56	16	23.8
10	20KS10	20 Strnd.	.0390/1.000	.538	.070 x .122/1.78 x 3.10	9	13.4
10	20KS10SS	20 Strnd.	.0390/1.000	.538	.093 x .140/2.36 x 3.56	16	23.8

TYPE 14

Single Conductor Insulation
- Extruded Polyvinyl (PVC)

Duplex Conductor Insulation
- Single Fused (Ripcord)

Temperature Rating
- Continuous: -20 to +221˚F (-29 to 105˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Good

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight	
						(lb. /1000 ft)	(Kg\Km)
14	24J14	24	.0201/.508	.877	.046 x .086/1.17 x 2.18	4	6.0
14	24K14	24	.0201/.508	1.490	.046 x .086/1.17 x 2.18	4	6.0
14	24T14	24	.0201/.508	.753	.046 x .086/1.17 x 2.18	3	4.5

TYPE 17

Single Conductor Insulation
- Extruded Polyvinyl (PVC)

Duplex Conductor Insulation
- Extruded Polyvinyl (PVC)

Temperature Rating
- Continuous: -20 to +221˚F (-29 to 105˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Good

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight	
						(lb. /1000 ft)	(Kg\Km)
17	L20E17	20	.0320/.813	.704	.090 x .148/2.29 x3.76	15	22.3
17	L14J17	14	.0641/1.628	.086	.128 x .244/3.25 x 5.69	37	55.1
17	L16J17	16	.0508/1.290	.137	.111 x .190/2.82 x 4.83	27	40.2
17	L20J17	20	.0320/.813	.357	.090 x .148/2.29 x3.76	14	20.8
17	L14K17	14	.0641/1.628	.147	.128 x .244/3.25 x 5.69	38	56.5
17	L16K17	16	.0508/1.290	.233	.111 x .190/2.82 x 4.83	37	40.2
17	L20K17	20	.0320/.813	.590	.090 x .148/2.29 x3.76	14	20.8
17	L16T17	16	.0508/1.290	.118	.111 x .190/2.82 x 4.83	28	41.7
17	L20T17	20	.0320/.813	.298	.090 x .148/2.29 x3.76	15	22.3

Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

TYPE 21

Single Conductor Insulation
- Extruded FEP Teflon

Duplex Conductor Insulation
- Extruded FEP Teflon

Temperature Rating
- Continuous: 400˚F (204˚C)
- Single Reading: 500˚F (260˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Good

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
21	20J21	20	.0320/.813	.357	.070 x .122/1.78 x 3.10	11	16.4
21	20K21	20	.0320/.813	.590	.070 x .122/1.78 x 3.10	11	16.4
21	20T21	20	.0320/.813	.298	.070 x .122/1.78 x 3.10	11	16.4

TYPE 23

Single Conductor Insulation
- Extruded Polyvinyl (PVC)

Duplex Conductor Insulation
- Twisted; Extruded Polyvinyl (PCV) Overall

Temperature Rating
- Continuous: -20 to +221˚F (-29 to 105˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Good

Note
- Aluminum/Mylar® shield with drain wire.

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
23	L20E23	20	.0320/.813	.704	.170/4.32	20	29.8
23	L16J23	16	.0508/1.290	.137	.206/5.23	28	41.7
23	L20J23	20	.0320/.813	.357	.170/4.32	20	29.8
23	L16K23	16	.0508/1.290	.233	.206/5.23	28	41.7
23	L20K23	20	.0320/.813	.590	.170/4.32	20	29.8
23	L20T23	20	.0320/.813	.298	.170/4.32	20	29.8

® Mylar is a registered trademark of the E. I. Dupont de Nemours Co.

TYPE 24

Single Conductor Insulation
- Fused Polyimide Tape

Duplex Conductor Insulation
- None - Twisted

Temperature Rating
- Continuous: 600˚F (316˚C)
- Single Reading: 800˚F (427˚C)

ANSI Color-Coded
- Both legs have Color-Coded Tracers

Physical Properties
- Abrasion Resistance - Excellent
- Moisture Resistance - Excellent
- Chemical Resistance - Excellent

Note
- FEP Teflon laminate melts at approximately 500˚F (260˚C)

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
24	20J24	20	.0320/.813	.357	.084/2.13	8	11.9
24	24J24	24	.0201/.508	.877	.060/1.52	4	8.9
24	20K24	20	.0320/.813	.590	.084/2.13	8	11.9

TYPE 25

Single Conductor Insulation
- Fused TFE Teflon Tape

Duplex Conductor Insulation
- Fused TFE Teflon Tape

Temperature Rating
- Continuous: 500˚F (260˚C)
- Single Reading: 600˚F (316˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Excellent

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb./1000 ft)	Approx. Shipping Weight (Kg\Km)
25	20E25	20	.0320/.813	.704	.061 x .106/1.55 x 2.69	10	14.9
25	20J25	20	.0320/.813	.357	.061 x .106/1.55 x 2.69	10	14.9
25	24J25	24	.0201/.508	.877	.047 x .077/1.19 x 1.96	5	7.4
25	20K25	20	.0320/.813	.590	.061 x .106/1.55 x 2.69	10	14.9
25	24K25	24	.0201/.508	1.490	.047 x .077/1.19 x 1.96	5	7.4
25	20T25	20	.0320/.813	.298	.061 x .106/1.55 x 2.69	10	14.9
25	24T25	24	.0201/.508	.753	.047 x .077/1.19 x 1.96	5	7.4

TYPE 26

Single Conductor Insulation
- High temperature Fiber glass Braid; No Impregnation

Duplex Conductor Insulation
- High temperature Fiber glass Braid with Light Lacquer Coating

Temperature Rating
- Continuous: 1300˚F (704˚C)
- Single Reading: 1600˚F (871˚C)

Physical Properties
- Abrasion Resistance - Fair
- Moisture Resistance - Fair
- Chemical Resistance - Good

ANSI Color-Coded
- No

Note
- Coating retained to 300˚F (149˚C)

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
26	20K26	20	.0320/.813	.590	.100 x.150/2.54 x 3.81	16	23.8

TYPE 27

Single Conductor Insulation
- Extruded FEP Teflon

Duplex Conductor Insulation
- Twisted
- Extruded FEP Teflon
- Overall

Temperature Rating
- Continuous: 400˚F (204˚C)
- Single Reading: 500˚F (260˚C)

Physical Properties
- Abrasion Resistance - Excellent
- Moisture Resistance - Excellent
- Chemical Resistance - Excellent

ANSI Color-Coded
- Yes

Note
- Aluminum/Mylar® shield with drain wire.

Characteristics
- See page 129

Thermocouple Grade Wire							
Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
27	20J27	20	.0320/.813	.357	.131/3.33	16	23.8
27	20K27	20	.0320/.813	.590	.131/3.33	16	23.8

Thermo-Couple Products Co.
www.tcproducts.com
a division of Marsh Bellofram
www.marshbellofram.com
1-800-727-5646

TYPE 30

Single Conductor Insulation
- Ceramic Fiber Braid
- No Impregnation

Duplex Conductor Insulation
- Ceramic Fiber Braid
- No Impregnation

ANSI Color-Coded
- No

Temperature Rating
- Continuous: 2200˚F (1204˚C)
- Single Reading: 2600˚F (1427˚C)

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Fair
- Chemical Resistance - Good

Note
- Because this insulation has no binders or impregnation, it may ”fray” when stripped.

Thermocouple Grade Wire

Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
30	20K30	20	.0320/.813	.590	.110 x .150/2.79 x 3.81	16	23.8

TYPE 31

Single Conductor Insulation
- Fused Polyimide Tape - Colored Polyimide Enamel

Duplex Conductor Insulation
- Fused Polyimide Tape

Temperature Rating
- Continuous: 600˚F (316˚C)
- Single Reading: 800˚F (427˚C)

ANSI Color-Coded
- Yes (Singles)

Physical Properties
- Abrasion Resistance - Excellent
- Moisture Resistance - Excellent
- Chemical Resistance - Excellent

Note
- FEP Teflon laminate melts at approximately 500˚F (260˚C)

Characteristics
- See page 129

Thermocouple Grade Wire

Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
31	20J31P	20	.0320/.813	.357	.065 x .100/1.65 x 2.54	11	16.4
31	24J31P	24	.0201/.508	.877	.060 x .085/1.52 x 2.16	6	8.9
31	30J31P	30	.0100/.254	3.520	.048 x .058/1.22 x 1.47	4	6.0
31	20K31P	20	.0320/.813	.590	.065 x .100/1.65 x 2.54	11	16.4
31	24K31P	24	.0201/.508	1.490	.060 x .085/1.52 x 2.16	6	8.9
31	30K31P	30	.0100/.254	5.980	.048 x .058/1.22 x 1.47	4	6.0
31	20T31P	20	.0320/.813	.298	.065 x .100/1.65 x 2.54	11	16.4

TYPE 36

Single Conductor Insulation
- High Temperature Fiver Glass Braid; No impregnation

Duplex Conductor Insulation
- High Temperature Fiber Glass Braid with Silicone Modified Resin Impregnation

Temperature Rating
- Continuous: 1300˚F (704˚C)
- Single Reading: 1600˚F (871˚C)

ANSI Color-Coded
- Both Legs Have Tracers
- No Overall Color-Code

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Fair
- Chemical Resistance - Good

Note
- Impregnation retained to 400˚F (204˚C

Characteristics
- See page 129

Thermocouple Grade Wire

Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
36	14J36	14	.0641/.628	.086	.125 x .195/3.18x 4.95	36	53.6
36	14K36	14	.0641/.628	.147	.125 x .195/3.18x 4.95	39	58.0

TYPE 42

Single Conductor Insulation
- Extruded FEP Teflon

Duplex Conductor Insulation
- Extruded FEP Teflon

Temperature Rating
- Continuous: 400˚F (204˚C)
- Single Reading: 500˚F (260˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Excellent
- Moisture Resistance - Excellent
- Chemical Resistance - Excellent

Characteristics
- See page 129

Thermocouple Grade Wire

Type	Catalog Number	Wire Gauge	Conductor size (in/mm)	Ohms /Dbl. Ft.	Nominal Overall size (in/mm)	Approx. Shipping Weight (lb. /1000 ft)	Approx. Shipping Weight (Kg\Km)
42	30J42	30	.0100/.254	3.520	.030 x .050/.76 x 1.27	4	6.0
42	30K42	30	.0100/.254	5.980	.030 x .050/.76 x 1.27	4	6.0
42	30T42	30	.0100/.254	3.025	.030 x .050/.76 x 1.27	4	6.0

TYPE MT20

Single Conductor Insulation
- Extruded PVC

Duplex Conductor Insulation
- Extruded PVC

Temperature Rating
- Continuous: -20 to +221˚F (-29 to 105˚C)

ANSI Color-Coded
- Yes

Physical Properties
- Abrasion Resistance - Good
- Moisture Resistance - Excellent
- Chemical Resistance - Good

Standard Multipair T/C Extension Cable

Type MT is the designation for TCP's extensive family of multipair cables. The standard Series 900 cables are available from stock with PVC insulation. Several different pair counts, in most calibrations, can be shipped quickly from our warehouse.

Series 900 cable manufacturing includes the conductors first being insulated with 105˚C PVC. One single of each pair is then numbered for ease of installation. The numbered wire is then twisted with its corresponding thermoelement. These twisted pairs are then twisted or cabled together for added flexibility. During the cabling an additional insulated copper wire is included for use as a communication wire.

The cable is wrapped with a clear polyester tape to minimize the chance of short circuits to the shield of the cable. The shield itself consists of a spirally applied aluminized polyester tape. A copper drain wire and heavy ripcord are longitudinally applied under the final jacket which consists of a coating of flexible color-coded PVC.

For higher temperature versions of the above, please contact our factory. Multipair constructions using FEP, Tefzel®, Polyimide and fiber glass are frequently fabricated to customer specifications. TCP's low minimum order quantities make us the manufacturer of choice for highly specialized prototype constructions.

Where conditions call for other than these standard offerings, special constructions can be manufactured to meet specific requirements or specifications in quantities of not less than 1000 feet. complete information or specifications should accompany any request for quotation.

® Tefzel and Mylar are registered trademarks of the E.I. Dupont de Numours Co.

ANSI Type KX Pairs

ANSI Color-Code; Negative Wire, Red; Positive Wire, Yellow; Overall, Yellow

Catalog Number	No. of Pairs	B. & S. Gauge	Approx. O.D. (in/mm)	Approx. Shipping Weight	
				(lb./1000 ft)	(Kg\Km)
MT20K2	2-Twisted	20	.290 / 7.37	45	67.0
MT20K4	4-Twisted	20	.350 / 8.89	83	123.5
MT20K8*	8-Twisted	20	.420 / 10.67	131	194.9
MT20K12	12-Twisted	20	.495 / 12.57	198	294.9
MT20K16	16-Twisted	20	.550 / 13.97	245	364.6
MT20K20	20-Twisted	20	.620 / 15.75	285	424.1
MT20K24	24-Twisted	20	.665 / 16.89	338	503.0

*This item available i special limits also.

ANSI Type TX Pairs

ANSI Color-Code; Negative Wire, Red; Positive Wire, Blue; Overall, Blue

Catalog Number	No. of Pairs	B. & S. Gauge	Approx. O.D. (in/mm)	Approx. Shipping Weight	
				(lb./1000 ft)	(Kg\Km)
MT20T4	4-Twisted	20	.350 / 8.89	82	122.0
MT20T8	8-Twisted	20	.420 / 10.67	128	190.5
MT20T12	12-Twisted	20	.495 / 12.57	194	288.7
MT20T24	24-Twisted	20	.550 / 13.97	332	494.0

ANSI Type JX Pairs

ANSI Color-Code; Negative Wire, Red; Positive Wire, White; Overall, Black

Catalog Number	No. of Pairs	B. & S. Gauge	Approx. O.D. (in/mm)	Approx. Shipping Weight	
				(lb./1000 ft)	(Kg\Km)
MT20J2	2-Twisted	20	.290 / 7.37	45	67.0
MT20J4	4-Twisted	20	.350 / 8.89	83	123.5
MT20J8*	8-Twisted	20	.420 / 10.67	131	194.9
MT20J12	12-Twisted	20	.495 / 12.57	198	294.9
MT20J16	16-Twisted	20	.550 / 13.97	245	364.6
MT20J20	20-Twisted	20	.620 / 15.75	285	424.1
MT20J24	24-Twisted	20	.665 / 16.89	338	503.0

*This item available i special limits also.

THERMOCOUPLE AND EXTENSION GRADE WIRE COLOR CODES

ANSI Code	Alloy Combination		Maximum Useful Temperature Range ++	Maximum Thermocouple Grade Temperature Range	EMF (mV) Over Max. Temperature Range	Standard Limits of Error (above 0ºC)	Special Limits of Error (above 0ºC)
	+ Lead	– Lead					
J	IRON Fe (magnetic)	Constantan Copper-Nickel Cu-Ni	Thermocouple Grade 32 to 1382ºF 0 to 750ºC Extension Grade 32 to 392ºF 0 to 200ºC	-346 to 2193ºF -210 to 1200ºC	-8.095 to 69.553	greater of 2.2ºC or 0.75%	greater of 1.1ºC or 0.4%
K	Chromel Nickel–Chromium Ni-Cr	Alumel Nickel–Aluminum Ni-Al (magnetic)	Thermocouple Grade -328 to 2282ºF -200 to 1250ºC Extension Grade 32 to 392ºF 0 to 200ºC	-454 to 2501ºF -270 to 1372ºC	-6.458 to 54.886	greater of 2.2ºC or 0.75%	greater of 1.1ºC or 0.4%
V▼	Copper Cu	Constantan Copper-Nickel Cu-Ni	Extension Grade 32 to 176ºF 0 to 80ºC				
T	Copper Cu	Constantan Copper-Nickel Cu-Ni	Thermocouple Grade -328 to 662ºF -250 to 350ºC Extension Grade -76 to 212ºF -60 to 100ºC	-454 to 752ºF -270 to 400ºC	-6.528 to 20.872	greater of 1.0ºC or 0.75%	greater of 0.5ºC or 0.4%
E	Nickel–Chromium Ni-Cr	Constantan Copper-Nickel Cu-Ni	Thermocouple Grade -328 to 1652ºF -200 to 900ºC Extension Grade 32 to 392ºF 0 to 200ºC	-454 to 1832ºF -270 to 1000ºC	-9.835 to 76.373	greater of 1.7ºC or 0.5%	greater of 1.0ºC or 0.4%
N	Nicrosil Ni-Cr-Si	NISIL Ni-Si-Mg	Thermocouple Grade -450 to 2372ºF -270 to 1300ºC Extension Grade 32 to 392ºF 0 to 200ºC	-450 to 2372ºF -270 to 1300ºC	-4.345 to 47.513	greater of 2.2ºC or 0.75%	greater of 1.1ºC or 0.4%
R	Platinum- 13% Rhodium Pt-13% Rh	Platinum Pt	Thermocouple Grade 32 to 2642ºF 0 to 1450ºC Extension Grade 32 to 300ºF 0 to 150ºC	-58 to 3214ºF -50 to 1768ºC	-0.226 to 21.101	greater of 1.5ºC or 0.25%	greater of 0.6ºC or 0.1%
S	Platinum- 10% Rhodium Pt-10% Rh	Platinum Pt	Thermocouple Grade 32 to 2642ºF 0 to 1400ºC Extension Grade 32 to 300ºF 0 to 150ºC	-58 to 3214ºF -50 to 1768ºC	-0.236 to 18.693	greater of 1.5ºC or 0.25%	greater of 0.6ºC or 0.1%
U▼	Copper Cu	Copper-Low Nickel Cu-Ni	Extension Grade 32 to 122ºF 0 to 50ºC				
B	Platinum- 30% Rhodium Pt-30% Rh	Platinum 6% Rhodium Pt-6% Rh	Thermocouple Grade 32 to 3092ºF 0 to 1700ºC Extension Grade 32 to 212ºF 0 to 100ºC	32 to 3308ºF 0 to 1820ºC	0 to 13.820	0.5% over 800ºC	Not Established
G▼ **(W)**	Tungsten W	Tungsten- 26% Rhenium W-26% Re	Thermocouple Grade 32 to 4208ºF 0 to 2320ºC Extension Grade 32 to 500ºF 0 to 260ºC	32 to 4208ºF 0 to 2320ºC	0 to 38.564	greater of 4.5ºC or 1.0%	Not Established
C▼ **(W5)**	Tungsten- 5% Rhenium W-5% Re	Tungsten- 26% Rhenium W-26% Re	Thermocouple Grade 32 to 4208ºF 0 to 2320ºC Extension Grade 32 to 1600ºF 0 to 870ºC	32 to 4208ºF 0 to 2320ºC	0 to 37.066	greater of 4.5ºC or 1.0%	Not Established
D▼ **(W3)**	Tungsten- 3% Rhenium W-3% Re	Tungsten- 25% Rhenium W-25% Re	Thermocouple Grade 32 to 4208ºF 0 to 2320ºC Extension Grade 32 to 500ºF 0 to 260ºC	32 to 4208ºF 0 to 2320ºC	0 to 39.506	greater of 4.5ºC or 1.0%	Not Established

++Except as further restricted by temperature limits for T/C diameter and insulation tables that follow. ▼*Not official symbol or standard designation.*

Color Coding		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 NFE-18001	Comments Environment–Bare Wire	ANSI Code
Thermocouple Grade	Extension Grade								
+ –	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Reducing Vacuum, Inert. Limited Use in Oxidizing at High Temperatures. Not Recommended for Low Temperatures.	J
+ –	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Clean Oxidizing and Inert. Limited use in Vacuum or Reducing. Wide Temperature Range. Most Popular Calibration.	K
None Established	None Established	+ –	+ –	+ –		+ –	+ –	Alternative to KX Type Extension Wire for Low Temperature. Not Recommended for General Use.	V▼
+ –	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Mid Oxidizing, Reducing Vacuum or Insert. Good Where Moisture is Present. Low Temperature and Cryogenic Applications.	T
+ –	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Oxidizing or Inert. Limited Use in Vacuum or Reducing Highest EMF Change Per Degree	E
+ –	+ –	+ –	+ –	+ –	No Standard Use American Color Code			Alternative to Type K More Stable at High Temperature	N
None Established	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of contamination. High Temperature	R
None Established	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Oxidizing or Inert. Do No Insert in Metal Tubes. Beware of Contamination. High Temperature	S
None Established	+ –	+ –	+ –	+ –	+ –	+ –	+ –	Extension Guide Connecting Wire for R and S Thermocouples Also Known as RX and SX Extension Wire	U▼
None Established	+ –			No Color Standard	+ –	+ –	No Color Standard	Oxidizing or Inert. Do Not Insert in Metal Tubes. Beware of Contamination. High Temperature. Common Use in Glass Industry.	B
None Established	+ –			No Standard Use American Color Code				Vacuum, Inert, Hydrogen. Beware of Embittlement. Not Practical Below 399ºC (750ºF) Not for Oxidizing Atmosphere.	G▼ (W)
None Established	+ –			No Standard Use American Color Code				Vacuum, Inert, Hydrogen. Beware of Embittlement. Not Practical Below 399ºC (750ºF) Not for Oxidizing Atmosphere.	C▼ (W5)
None Established	+ –			No Standard Use American Color Code				Vacuum, Inert, Hydrogen. Beware of Embitterment. Not Practical Below 399ºC (750ºF)–Not for Oxidizing Atmosphere.	D▼ (W3)

++*Except as further restricted by temperature limits for T/C diameter and insulation tables that follow.* ▼*Not official symbol or standard designation.*