

## Thermocouple Wire

This section has been developed to serve as a guide in the selection of wires to accomplish most all temperature measuring requirements. Featured is a large selection of thermoelements, insulation materials and constructions. Should you need assistance, Thermo Sensors' sales personnel are anxious to help you in selecting the wire to give optimum performance in your application.



Thermo Sensors' thermocouple and extension wires are known for their quality performance and reliability. Careful attention is given to the proper selection and matching of conductors to ensure conformance to standard limits of error as defined in ANSI C96.1. Unless otherwise specified, all wire will be furnished to standard limits of error. Many of the wires are available with special limits of error and must be specified when ordering.

### Technical Data

#### Limits of Error

##### ANSI Limits of Error

Thermo Sensors' thermocouple and extension wires are known for their quality performance and reliability. Careful attention is given to the proper selection and matching of conductors to ensure conformance to standard limits of error as defined in ANSI C96.1\*. Tables on this page show the limits of error for both thermocouple and extension grade wires. Unless otherwise specified, all wire will be furnished to standard limits of error. Many of the wires are available with special limits of error and must be specified when ordering.

Thermo Sensors provides a calibration service for customers who require known deviations from specified temperature points. Each coil or spool of wire so certified is marked and a "Certificate of Calibration" is furnished. Certification temperatures available are -320°F, -110°F, 32°F, and 2000°F and must be specified by the customer. All equipment used in the certification is traceable to the National Bureau of Standards.

\*The American National Standards Institute (ANSI) designations have replaced the previous Instrument Society of America (ISA) designations for thermocouple materials. ANSI Standard C96.1-1975, or latest version, is the applicable standard for wires listed in this catalog unless otherwise noted.

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**Limits of Error for Thermocouple Wire**  
 Reference Junction at 32°F

Type	Temperature Range	Limits of Error			
		Standard (whichever is greater)		Special (whichever is greater)	
T	0 to 350°C 32 to 662°F	± 1°C ± 2°F	or ± .75%	± .5°C ± 1°F	or ± .4%
J	0 to 750°C 32 to 1382°F	± 2.2°C ± 4°F	or ± .75%	± 1.1°C ± 2°F	or ± .4%
E	0 to 900°C 32 to 1652°F	± 1.7°C ± 3°F	or ± .5%	± 1°C ± 2°F	or ± .4%
K	0 to 1250°C 32 to 2202°F	± 2.2°C ± 4°F	or ± .75%	± 1.1°C ± 2°F	or ± .4%
R, S	0 to 1450°C 32 to 2642°F	± 1.5°C ± 3°F	or ± .25%	± .6°C ± .1°F	or ± .1%
B	800 to 1700°C 1472 to 3092°F	± .5°			

**Sub-Zero Limits of Error**

Thermocouple materials are normally supplied to meet the limits of error specified in the table for temperatures above 0°C. These materials, however, may not fall within the sub-zero limits of error given in the following table. If materials are required to meet the sub-zero limits, the purchase order must so state. Special pricing for selection of materials will be required.

<b>T</b>	-200 to 0°C -328 to 32°F	± 1°C ± 2°F	or ± 1.5%	_____
<b>E</b>	-200 to 0°C -328 to 32°F	± 1.7°C ± 3°F	or ± 1%	_____
<b>K</b>	-200 to 0°C -328 to 32°F	± 2.2°C ± 4°F	or ± 2%	_____

Little information is available to justify establishing special limits of error for sub-zero temperatures. Limited experience suggests the following limits for types E and T thermocouples.

<b>E</b>	-200 to 0°C -328 to 32°F	± 1°C ± 2°F	or ± .5%	_____
<b>T</b>	-200 to 0°C -328 to 32°F	± .5°C ± 1°F	or ± .8%	_____

These limits are given only as a guide. Due to the characteristics of the materials, sub-zero limits of error for Type J thermocouples and special sub-zero limits for Type K thermocouples are not listed.

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### Limits of Error for Extension Wire

Reference Junction at 32°F

Type	Temperature Range	Limits of Error	
		Standard	Special
KX	0 to 200°C 32 to 392°F	± 2.2°C ± 4°F	
JX	0 to 200°C 32 to 392°F	± 2.2°C ± 4°F	± 1.1°C ± 2°F
EX	0 to 200°C 32 to 392°F	± 1.7°C ± 3°F	
TX	-60 to 100°C -76 to 212°F	± 1°C ± 2°F	± .5°C ± 1°F

### Limits of Error for Thermocouple Compensating Extension Wire

Reference Junction at 32°F

Compensating Type	Thermocouple Type	Temperature Range	Limits of Error
RSX	R, S	0 to 200°C 32 to 382°F	± 5°C ± 9°F
BX	B	0 to 100°C 32 to 212°F	± 0°C -3.7°C* ± 0°F -6.7°F*

\*Due to the non-linearity of the types of R, S, and B temperature - EMF curves, the error introduced into a thermocouple system by the compensating wire will be variable when expressed in degrees. The limits of error given in the table above are based on the following measuring junction temperatures:

Type Wire	Measuring Junction Temperature
RSX	Greater Than 870°C (1596°F)
BX	Greater Than 1000°C (1832°F)

## Noise Shielding

### Wire for Electromagnetic and Electrostatic Noise Shielding

**Electromagnetic Noise** is produced due to capacitive coupling of an electric field within the plant to the instrument circuit. The source of these electric fields may be power lines or other voltage sources mentioned below. The most effective means of isolating static noise is to have the instrument circuit enclosed within a 100% coverage shield such as an aluminum backed mylar tape. A drain wire in contact with the aluminum foil carries the interference to the ground.

**Magnetic Noise** is generated anytime a loop of instrument wires pass through a magnetic field. As the wires come in the stray magnetic field of an electric motor, generator, power line, relay or similar source, a current is produced in the

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instrument circuit to oppose the magnetic field. That current super-imposed on the sensor signal results in an erroneous and usually unstable signal input at the instrument.

Electrostatic and magnetic noise sources include but are not limited to the following conditions:  
 Circuits near:

- Power lines
- Medium sized (SHP) and larger motors
- Control relays
- Transformers
- electrolytic processes
- Induction heating equipment

To minimize the effects of electrostatic and magnetic noise, the use of Thermo Sensors' type PPZS extension wire is suggested. It incorporates both twisting, 100% shielding with an Aluminum/Mylar tape and drain wire. These wires are listed in the appropriate extension wire table.

## ANSI Designations

### ANSI Letter Designations

The tables listed below are provided to the user for a ready reference of ANSI designations as compared to the generic and trade names for the most common thermocouple materials. The letter "P" in the designation indicates the positive (+) leg of the calibration while the letter "N" designates the negative (-). Color coding and other means of conductor identification are also provided.

### Thermocouple Grade Wire

ANSI Type	Grade or Generic Trade Names*	Single Conductors	Magnetic	Conductor Color Code	Overall Color Code**
E	Chromel Constantan	EP EN	No No	Purple Red	Brown w/ Purple Tracer
J	Iron Constantan	JP JN	Yes No	White Red	Brown w/ White Tracer
K	Chromel Alumel	KP KN	No Yes	Yellow Red	Brown w/ Yellow Tracer
T	Copper Constantan	TP TN	No No	Blue Red	Brown w/ Blue Tracer

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### Extension Grade Wire

ANSI Type	Grade or Generic Trade Names*	Single Conductors	Magnetic	Conductor Color Code	Overall Color Code**
EX	Chromel Constantan	EPX ENX	No No	Purple Red	Purple
JX	Iron Constantan	JPX JNX	Yes No	White Red	Black
KX	Chromel Alumel	KPX KNX	No Yes	Yellow Red	Yellow
TX	Copper Constantan	TPX TNX	No No	Blue Red	Blue
RX	Copper Alloy #11	RPX RNX	No No	Black Red	Green
SX	Copper Alloy #11	SPX SNX	No No	Black Red	Green
BX	Copper Copper	BPX BNX	No No	Gray Red	Gray
W325X***	Alloy 203 Alloy 225	W3FX W25NX	No Yes	Orange Red	Orange w/ Black Tracer
WS26X	Alloy 405 Alloy 426	WSPX W26NX	Yes Yes	Orange Red	Orange

\*Trade names: Chromel, Alumel, Constantan - Hoekins Mfg. Co.

\*\*Color Coding: Capton insulations will have a color fiber tracer under the Kapton singles. Overall insulations of Katpon and Teflon are not color coded.

Some high temperature fibrous insulations are not color coded; others will have a colored tracer. The color pigment burns off at 300°F.

\*\*\*Not ANSI Designations

### Stranded Wire

Thermocouple and extension wires are usually solid conductors. When greater flexibility is needed, stranded wire is used. Both constructions are listed in the wire tables. The stranding combination used is given in the wire size column of the tables.

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## Overbraids

### Overbraids

Any insulated wire in this bulletin can be furnished with a metal overbraid to give added protection from abrasion and mechanical damage.

Stranded Overbraids:

- Stainless Steel
- Tinned Copper

Available as special order:

- Flat Stainless Ribbon Braid
- Flat Stainless Steel Spiral Wrap

To specify an overbraid, see "How To Order."

By using the information from the tables on the following pages, a wire can be selected to meet the installation conditions of most common industrial requirements. However, special constructions and insulations are available. Request a quotation to your specifications.

### How To Order:

#### Standard Limits of Error Wire:

Specify footage required and the appropriate catalog number from the following tables.

Example: 3000 ft PP16KX

#### Special Limits of Error Wire:

Same as standard wire except add suffix "-PG" catalog number.

Example: 3000 ft GG20K-PG

#### Metal Overbraid Wire:

Same as for standard or special wires and add suffix:

"-SS" for stainless steel wire overbraid

"-CU" for tinned copper wire overbraid

Example: 3000 ft GG20K-SS

## Thermocouple Wire Types, Construction and Characteristics

Type	Single Conductor		Overall		Temperature Rating		ANSI Color Coded	Insulation Properties		Remarks
	Insulation	Impregnation	Insulation	Impregnation	Continuous	Single Reading		Abrasion Resistance	Moisture Resistance	
HtHt	Vitreous Silica Fiber .020"	-	Vitreous Silica Fiber .020"	-	871°C 1600°F	1093°C 2000°F	No	Fair	Fair	
GgG	Double	Modified	Glass	Modified	482°C	538°C	Yes	Good	Good	Impregnati

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	Glass Braid .012" Wall	Silicone	Braid .006"	Silicone	900°F	1000°F				on retained to 204°C (400°F)
GG	Glass Braid .006"	Modified Silicone	Glass Braid .006"	Modified Silicone	482°C 900°F	538°C 1000°F	Yes	Fair	Good	Impregnation retained to 204°C (400°F)
GwG	Double Glass Wrap .005"	Modified Silicone	Glass Braid .006"	Modified Silicone	482°C 900°F	538°C 1000°F	Yes	Fair	Good	Impregnation retained to 204°C (400°F)
GnGn	Glass Braid .006"	-	Glass Braid .006"	-	482°C 900°F	538°C 1000°F	No	Fair	Fair	Heat treat to minimize traying & remove binders.
TtGt	Teflon (TFE) Tape (not fused) .004", (TFE) Coated Glass .006"	-	Teflon (TFE) Coated Glass Braid	-	482°C 900°F	538°C 1000°F	Yes	Good	Excellent	Teflon good to 260°C (500°F)
TtGt	Fused Teflon Tape (TFE) .004"	-	Teflon (TFE) Coated Glass Braid .006"	-	260°C 500°F	316°C 600°F	Yes	Fair	Very Good	
HgHg	High Temp Glass Braid .012"	-	High Temp Glass Braid .012"	Light Lacquer Coating	704°C 1300°F	871°C 1600°F	No	Fair	Fair	Coating is retained to 149°C (300°F)
CtCt	Ceramic Fiber .015"	-	Ceramic Fiber .020"	-	1430°C 2600°F	1430°C 2600°F	No	Good	Fair	
NN	Nylon .010"	-	Nylon .008"-.010"	-	177°C 350°F	-	Yes	Excellent	Fair	Overall jacket is clear

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P	Polyvinyl .012"- .014"	-	Rip Cord constructi on	-	-29 to +105°C -20 to +221°F	-	Yes	Good	Excellent	
TxTx	Teflon (FEP) Extr. .008"	-	Teflon (FEP) Extr. .010"	-	204°C 400°F	316°C 600°F	Yes	Very Good	Excellent	
TfTf	Teflon (TFE) Tape Fused .008"	-	Teflon (FEP) Tape Fused .008"	-	260°C 500°F	316°C 600°F	Yes	Good	Excellent	
TxTxZ S	Teflon (FEP) Extr. .009"	-	Teflon (FEP) Extruded .010" Twisted; Alum.- Mylar Shield w/ Drain Wire	-	204°C 400°F	316°C 600°F	Yes	Very Good	Excellent	
KZ	Fused Kapton Tape .004"	-	None Twisted	-	316°C 600°F	427°C 800°F	Yes (Tracer s)	Excellent	Excellent	FEP binder melts at approx. 260°C (500°F)
KK	Fused Kapton .006" on 24 ga. .004" on 20 ga.	-	Fused Kapton .006" on 24 ga. .004" on 20 ga.	-	316°C 600°F	427°C 800°F	Yes (Tracer s)	Excellent	Excellent	FEP binder melts at approx. 260°C (500°F)

\*Mylar, Teflon, Kapton - Trade names of E. I. du Pont de Nemours & Co.



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## Insulated Thermocouple Wire

**Thermocouple Wire  
 Duplex - ANSI Type K**

\*\*Color Code: Positive Wire (+) - Yellow  
 Negative Wire (-) - Red  
 Overall Jacket - Brown with Yellow Tracer

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
HtHt20K	20	.032	Solid	.590	Vitreous Silica Fiber Braid	Vitreous Silica Fiber Braid	.104 x .176	16
GG20K	20	.032	Solid	.590	Glass Braid	Glass Braid	.055 x .100	8
GwG20K	20	.032	Solid	.590	Glass Wrap	Glass Braid	.054 x .095	8
GnGn20K	20	.032	Solid	.590	Nonimpregnated Glass Braid	Nonimpregnated Glass Braid	.057 x .102	9
TtGGt20K	20	.032	Solid	.590	Teflon (TFE) Tape, Teflon (TFE) Impregnated Glass Braid	Teflon (TFE) Impregnated Glass Braid	.075 x .137	11
HgHg20K	20	.032	Solid	.590	High Temp. Glass Braid	High Temp. Glass Braid	.100 x .150	16
CtCt20K	20	.032	Solid	.590	Ceramic Fiber	Ceramic Fiber	.104 x .176	16
TxTx20K	20	.032	Solid	.590	Teflon (FEP) Extruded	Teflon (FEP) Extruded	.072 x .124	11
TfTf20K	20	.032	Solid	.590	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.060 x .10	11
TxTxZS20K	20	.032	Solid	.590	Teflon (FEP) Extruded	Twisted, Alum.-Mylar & Drain Wire: Teflon (FEP) Extruded	.132	16
KZ20K	20	.032	Solid	.590	Fused Kapton Tape	Twisted	.087	8
KK20K	20	.032	Solid	.590	Fused Kapton Tape	Fused Kapton Tape	.052 x .096	11
GgG20FK	20	7/28	Stranded	.538	Double Glass Braid	Glass Braid	.075 x .137	9
GG24K	24	.020	Solid	1.490	Glass Braid	Glass Braid	.047 x .081	4

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GwG24K	24	.020	Solid	1.490	Glass Wrap	Glass Braid	.042 x .072	4
P24K	24	.020	Solid	1.490	Polyvinyl	Non-Rip Cord	.048 x .096	4
TfTf24K	24	.020	Solid	1.490	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.055 x .085	5
KK24K	24	.020	Solid	1.490	Fused Kapton Tape	Fused Kapton Tape	.050 x .080	6
GwG26K	26	.016	Solid	2.370	Glass Wrap	Glass Braid	.040 x .085	3
GwG28K	28	.013	Solid	3.770	Glass Wrap	Glass Braid	.036 x .057	3
GwG30K	30	.010	Solid	5.980	Glass Wrap	Glass Braid	.033 x .052	2

**Duplex - ANSI Type T**

\*\*Color Code: Positive Wire (+) - Blue  
 Negative Wire (-) - Red  
 Overall Jacket - Brown with Blue Tracer

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
GG20T	20	.032	Solid	.296	Glass Braid	Glass Braid	.055 x .100	5
GwG20T	20	.032	Solid	.296	Glass Wrap	Glass Braid	.054 x .095	8
TfGGt20T	20	.032	Solid	.296	Teflon (TFE) Tape, Teflon (TFE) Impregnated Glass Braid	Teflon (TFE) Impregnated Glass Braid	.075 x .137	12
TxTx20T	20	.032	Solid	.296	Teflon (FEP) Extruded	Teflon (FEP) Extruded	.072 x .124	11
TfTf20T	20	.032	Solid	.296	Fused Teflon (FEP) Tape	Fused Teflon (FEP) Tape	.080 x .130	11
TxTxZS20T	20	.032	Solid	.296	Teflon (FEP) Extruded	Twisted, Alum.-Mylar & Drain Wire; Teflon (FEP) Extruded	.132	16
KK20T	20	.032	Solid	.296	Fused Kapton Tape	Fused Kapton Tape	.052 x .096	11
GG24T	24	.020	Solid	.753	Glass Braid	Glass Braid	.047 x .081	4

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GwG24T	24	.020	Solid	.753	Glass Wrap	Glass Braid	.042 x .072	4
NN24T	24	.020	Solid	.753	Nylon	Clear Nylon	.060 x .095	6
P24T	24	.020	Solid	.753	Polyvinyl	Non-Rip Cord	.048 x .096	3
TfTf24T	24	.020	Solid	.753	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.055 x .085	5
KK24T	24	.020	Solid	.753	Fused Kapton Tape	Fused Kapton Tape	.050 x .080	6
GwG28T	28	.013	Solid	1.905	Glass Wrap	Glass Braid	.036 x .057	2
GwG30T	30	.010	Solid	3.025	Glass Wrap	Glass Braid	.033 x .053	2

**Duplex - ANSI Type J**

\*\*Color Code: Positive Wire (+) - White  
 Negative Wire (-) - Red  
 Overall Jacket - Brown with White Tracer

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
GG14J	14	.064	Solid	.086	Glass Braid	Glass Braid	.096 x .176	32
KZ16J	16	.051	Solid	.137	Fused Kapton Tape	Twisted	.125	24
GG20J	20	.032	Solid	.357	Glass Braid	Glass Braid	.055 x .100	8
GwG20J	20	.032	Solid	.357	Glass Wrap	Glass Braid	.054 x .095	8
GnGn20J	20	.032	Solid	.357	Nonimpregnated Glass Braid	Nonimpregnated Glass Braid	.057 x .102	9
TfGGt20J	20	.032	Solid	.357	Teflon (TFE) Tape, Teflon (TFE) Impregnated Glass Braid	Teflon (TFE) Impregnated Glass Braid	.075 x .137	11
NN20J	20	.032	Solid	.357	Nylon	Clear Nylon	.068 x .120	11
TxTx20J	20	.032	Solid	.357	Teflon (FEP) Extruded	Teflon (FEP) Extruded	.072 x .124	11
TfTf20J	20	.032	Solid	.357	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.080 x .130	10
TxTxZs20J	20	.032	Solid	.357	Teflon (FEP) Extruded	Twisted, Alum.-Mylar & Drain Wire; Teflon (FEP) Extruded	.132	16
KZ20J	20	.032	Solid	.357	Fused Kapton Tape	Twisted	.067	8

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KK20J	20	.032	Solid	.357	Fused Kapton Tape	Fused Kapton Tape	.052 x .096	11
GgG20FJ	20	7/28	Stranded	.317	Double Glass Braid	Glass Braid	.075 x .137	9
GG24J	24	.020	Solid	.877	Glass Braid	Glass Braid	.047 x .081	4
GwG24J	24	.020	Solid	.877	Glass Wrap	Glass Braid	.042 x .072	4
TfGGt24J	24	.020	Solid	.877	Teflon (TFE) Tape, Teflon (TFE) Impregnated Glass Braid	Teflon (TFE) Impregnated Glass Braid	.062 x .112	8
TfGt24J	24	.020	Solid	.877	Fused Teflon (TFE) Tape	Teflon (TFE) Impregnated Glass Braid	.050 x .082	8
P24J	24	.020	Solid	.877	Polyvinyl	Non-Rip Cord	.048 x .096	4
TfTf24J	24	.020	Solid	.877	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.055 x .085	5
KZ24J	24	.020	Solid	.877	Fused Kapton Tape	Twisted	.063	4
KK24J	24	.020	Solid	.877	Fused Kapton Tape	Fused Kapton Tape	.050 x .060	6
GwG26J	26	.015	Solid	1.394	Glass Wrap	Glass Braid	.040 x .065	3
GwG28J	28	.013	Solid	2.216	Glass Wrap	Glass Braid	.036 x .057	3
GG30J	30	.010	Solid	3.520	Glass Braid	Glass Braid	.037 x .059	3
GwG30J	30	.010	Solid	3.520	Glass Wrap	Glass Braid	.033 x .053	3

**Duplex - ANSI Type E**

\*\*Color Code: Positive Wire (+) - Purple  
 Negative Wire (-) - Red  
 Overall Jacket - Brown with Purple Tracer

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
GG20E	20	.032	Solid	.704	Glass Braid	Glass Braid	.055 x .100	8
TfTf20E	20	.032	Solid	.704	Fused Teflon (TFE) Tape	Fused Teflon (TFE) Tape	.080 x .130	10
GG24E	24	.020	Solid	1.780	Glass Braid	Glass Braid		

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\*Resistance is stated in ohms per Double fee at 20°C (58°F) and are nominal values.

\*\*Color Coding:

- Kapton Insulations will have a colored fiber tracer under the Kapton on the singles.
- Overall insulations of Kapton and Teflon Tapes are not color coded.
- Some high temperature fibrous insulations are not color coded; others will have a colored tracer. The color pigment burns off at 300°F.

## Thermocouple Extension Wire Types, Construction and Characteristics

(Order by Catalog Numbers as shown below and on Page 8).

Type	Single Conductor		Overall		Temperature Rating Continuous	ANSI Color Coded	Insulation Properties	
	Insulation	Impregnation	Insulation	Impregnation			Abrasion Resistance	Moisture Resistance
PN	Polyvinyl .013"	-	Nylon .008" Clear	-	105°C 221°F	Yes	Excellent	Excellent
PP	Polyvinyl .015 to 16 ga. .020 on 14 ga.	-	Polyvinyl .016 to 16 ga. .020 on 14 ga.	-	-29 to +105°C -20 to +221°F	Yes	Good	Excellent
PPZ	Polyvinyl .015"	-	Polyvinyl .020", Twisted	-	-29 to +105°C -20 to +221°F	Yes	Good	Excellent
PPZS	Polyvinyl .015"	-	Polyvinyl .020" Twisted; Alum.- Mylar Shield w/ Drain Wire	-	-29 to +105°C -20 to +221°F	Yes	Good	Excellent

Duplex - ANSI Type KX

\*\*Color Code:

Positive Wire - Yellow (+)  
 - Red  
 Negative Wire - Yellow (-)  
 (-)  
 Overall Jacket

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
PP14KX	14	.064	Solid	.147	Polyvinyl	Polyvinyl	.130 x .225	36
PP16KX	16	.051	Solid	.233	Polyvinyl	Polyvinyl	.112 x .188	27
PPZ16KX	16	.051	Solid	.133	Polyvinyl	Twisted/Polyvinyl	.222	28
PPZS16KX	16	.051	Solid	.233	Polyvinyl	Twisted, Alum-Mylar & Drain Wire/Polyvinyl	.250	29

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PPZ18FKX	18	7/26	Stranded	.315	Polyvinyl	Twisted, Filler, Polyvinyl	.254	39
PP20FKX	20	7/28	Stranded	.538	Polyvinyl	Polyvinyl	.112 x .210	14
PP20KX	20	.032	Solid	.590	Polyvinyl	Polyvinyl	.092 x .150	14
PPZS20KX	20	.032	Solid	.590	Polyvinyl	Twisted, Alum-Maker & Drain Wire/Polyvinyl	.200	20

**Duplex - ANSI Type SX and RX**  
 Compensating Extension Wires for ANSI type  
 R, S Thermocouples

\*\*Color Code: Positive Wire (+) - Black  
 Negative Wire (-) - Red  
 Overall Jacket - Green

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
PP16RSX	16	.051	Solid	.016	Polyvinyl	Polyvinyl	.112 x .188	26
PPZS16RSX	16	.051	Solid	.016	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.250	29
RR18FRSX	18	7/26	Stranded	.025	Rubber	Twisted/Rubber	.400	90
GG20RSX	20	.032	Solid	.040	Polyvinyl	Clear Nylon	.081 x .144	17
PP20RSX	20	.032	Solid	.040	Polyvinyl	Polyvinyl	.092 x .150	15

**Duplex - ANSI Type JX**

\*\*Color Code: Positive Wire (+) - White  
 Negative Wire (-) - Red  
 Overall Jacket - Black

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
PP14JX	14	.064	Solid	.086	Polyvinyl	Polyvinyl	.130 x .225	37
PN16JX	16	.051	Solid	.137	Polyvinyl	Clear Nylon	.102 x .186	26
PP16JX	16	.051	Solid	.137	Polyvinyl	Polyvinyl	.112 x .188	27
PPZ16JX	16	.051	Solid	.137	Polyvinyl	Twisted/Polyvinyl	.222	28
PPZS16JX	16	.051	Solid	.137	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.250	29
PN16FJX	16	7/24	Stranded	.125	Polyvinyl	Clean Nylon	.120 x .212	24
PPZ18FJX	18	7/26	Stranded	.185	Polyvinyl	Twisted, Filler, Polyvinyl	.254	35

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PP20FJX	20	7/28	Stranded	.317	Polyvinyl	Polyvinyl	.115 x .190	14
PN20JX	20	.032	Solid	.357	Polyvinyl	Clear Nylon	.081 x .144	16
PP20JX	20	.032	Solid	.357	Polyvinyl	Polyvinyl	.092 x .150	14
TxTx20JX	20	.032	Solid	.357	Teflon (FEP) Extruded	Teflon (FEP) Extruded	.072 x .124	11
PPZS20JX	20	.032	Solid	.357	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.200	20

**Duplex - ANSI Type EX**

\*\*Color Code: Positive Wire (+) - Purple  
 Negative Wire (-) - Red  
 Overall Jacket - Purple

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
PP16EX	16	.051	Solid	.278	Polyvinyl	Polyvinyl	.112 x .188	27
PPZ16EX	16	.051	Solid	.278	Polyvinyl	Twisted/Polyvinyl	.222	28
PPZS16EX	16	.051	Solid	.278	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.250	29
PP20EX	20	.032	Solid	.704	Polyvinyl	Polyvinyl	.092 x .150	14
PPZS20EX	20	.032	Solid	.704	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.200	20

**Duplex - ANSI Type TX**

\*\*Color Code: Positive Wire (+) - Blue  
 Negative Wire (-) - Red  
 Overall Jacket - Blue

Catalog Number	Wire Size		Type of Wire	Res*	Insulations		Nominal Size Inches	Approx. Shipping Weight #MFT
	Gauge	Inch			Conductors	Overall		
PP14TX	14	.064	Solid	.074	Polyvinyl	Polyvinyl	.103 x .225	37
PP16TX	16	.051	Solid	.118	Polyvinyl	Polyvinyl	.130 x .225	37
PPZ16TX	16	.051	Solid	.118	Polyvinyl	Twisted/Polyvinyl	.222	28
PPZS16TX	16	.051	Solid	.118	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.250	29
PP20TX	20	.032	Solid	.298	Polyvinyl	Polyvinyl	.092 x .150	15

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PP20FTX	20	7/28	Stranded	.272	Polyvinyl	Polyvinyl	.115 x .190	15
PPZS20TX	20	.032	Solid	.298	Polyvinyl	Twisted, Alum.-Mylar & Drain Wire/Polyvinyl	.200	20

\*Resistance is stated in ohms per Double foot at 20°C (68°F) and are nominal values.

\*\*Not ANSI Designations

## Multipair Thermocouple Extension Cable

In many applications the installation of multipair cables is more economical than pulling several single pair wires. The most common calibrations such as JX, KX, and TX are readily available in cable form.

All cables are furnished with twisted pairs and 100% coverage shield tape providing maximum reduction in magnetic and electronic interference.

The available standard cables are listed in the following tables. Special constructions can be quoted to your specifications.

### Construction Specifications

<b>Conductors</b>	20 AWGA solid thermocouple extension grade wire matched for standard limits of error per ANSI C96.1. Pairs are twisted.						
<b>Conductor Insulation</b>	.015" of 105°C polyvinyl chloride color coded.*						
<b>Communication Wire</b>	A 20 or 22 gauge polyvinyl chloride insulated copper wire is provided in the cable for communication.						
<b>Identification</b>	Each pair is numbered 1, 2, 3, etc.						
<b>Lay of Twist</b>	1 1/2" to 2 1/2" - involutes staggered						
<b>Shielding</b>	All twisted pairs are bundled and wrapped with 100% coverage of an aluminum backed Mylar tape shield. a 20 AWG bare (solid or stranded) drain wire is in contact with the aluminum side of the tape.						
<b>Overall Jacket</b>	80°C polyvinyl chloride, color coded.* Jacket thickness depends on the number of pairs in the cable per the following table: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th><u>No. of Pairs</u></th> <th><u>Jacket Thickness</u></th> </tr> </thead> <tbody> <tr> <td>4 and 8</td> <td>.045"</td> </tr> <tr> <td>10, 12, 16, 20, and 24</td> <td>.060"</td> </tr> </tbody> </table>	<u>No. of Pairs</u>	<u>Jacket Thickness</u>	4 and 8	.045"	10, 12, 16, 20, and 24	.060"
<u>No. of Pairs</u>	<u>Jacket Thickness</u>						
4 and 8	.045"						
10, 12, 16, 20, and 24	.060"						
*All color coding is per ANSI C96.1.							



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## Standard Multipair Thermocouple Extension Cable

**Type KX Pairs**      Color Code: Positive Wire (+) - Yellow  
 Negative Wire (-) - Red  
 Overall Jacket - Yellow

Catalog Number	Number of Pairs	Gauge	Approx. O.D., Inch	Approx. Shipping Weight #/MFT
MP20-4-KX	4	20	.360	83
MP20-8-KX	8	20	.465	131
MP20-12-KX	12	20	.520	198
MP20-16-KX	16	20	.610	245
MP20-20-KX	20	20	.730	285
MP20-24-KX	24	20	.775	338

**Type JX Pairs**      Color Code: Positive Wire (+) - White  
 Negative Wire (-) - Red  
 Overall Jacket - Black

Catalog Number	Number of Pairs	Gauge	Approx. O.D., Inch	Approx. Shipping Weight #/MFT
MP20-4-JX	4	20	.360	83
MP20-8-JX	8	20	.465	131
MP20-12-JX	12	20	.520	198
MP20-16-JX	16	20	.610	245
MP20-20-JX	20	20	.730	285
MP20-24-JX	24	20	.775	338

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**Type TX Pairs**      Color Code: Positive Wire (+) - Blue  
 Negative Wire (-) - Red  
 Overall Jacket - Blue

Catalog Number	Number of Pairs	Gauge	Approx. O.D., Inch	Approx. Shipping Weight #/MFT
MP20-4-TX	4	20	.350	80
MP20-8-TX	8	20	.420	125
MP20-12-TX	12	20	.500	180
MP20-16-TX	16	20	.550	220
MP20-20-TX	20	20	.600	250
MP20-24-TX	24	20	.630	320

## Bare Thermocouple Wire

### Base Metal - Matched Pairs

ANSI Calibration	Type of Wire	Wire Size		Approx Ft / #	Catalog Number
		AWG	Inches		
J	Iron/Constantan	8	.128	10	B8J
		14	.064	43	B14J
		20	.032	175	B20J
		24	.020	440	B24J
		30	.010	1760	B30J
K	Chromel/Alumel	8	.128	10	B8K
		14	.064	40	B14K
		20	.032	162	B20K
		24	.020	420	B24K
		30	.010	1685	B30K
E	Chromel/Constantan	8	.128	10	B8E
		14	.064	40	B14E
		20	.032	162	B20E
		24	.020	420	B24E
		30	.010	1685	B30E
T	Copper/Constantan	14	.064	40	B14T
		20	.032	162	B20T
		24	.020	420	B24T

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**Noble Metal - Matched Pairs\***

ANSI Calibration	Type of Wire	Wire Size		Approx Ft / #	Catalog Number
		AWG	Inches		
R	Platinum-13% Rhodium (+) VS Platinum (-)	24	.020	309	B24R
				282	
R	Platinum-10% Rhodium (+) VS Platinum (-)	24	.020	302	B24S
				282	
R	Platinum-30% Rhodium (+) VS Platinum-6% Rhodium (-)	24	.020	345	B24B
				294	

\*Sold as Matched Pairs Only

**Iron / Constantan - Type J - Individual Conductors**

Positive					Negative				
ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number	ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number
JP	Iron	8	23	B8JP	JP	Constantan	8	20	B8JN
		14	91	B14JP			14	80	B14JN
		20	365	B20JP			20	323	B20JN
		24	926	B24JP			24	818	B24JN
		30	3740	B30JP			30	3290	B30JN

**Chromel / Alumel - Type K - Individual Conductors**

Positive					Negative				
ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number	ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number
KP	Chromel	8	20	B8KP	KN	Alumel	8	20	B8KN
		14	80	B14KP			14	80	B14KN
		20	331	B20KP			20	331	B20KN
		24	838	B24KP			24	838	B24KN
		30	3370	B30KP			30	3370	B30KN

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**Chromel / Constantan - Type E - Individual Conductors**

Positive					Negative				
ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number	ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number
EP	Chromel	8	20	B8EP	EN	Constantan	8	20	B8EN
		14	80	B14EP			14	80	B14EN
		20	331	B20EP			20	331	B20EN
		24	838	B24EP			24	838	B24EN
		30	3370	B30EP			30	3370	B30EN

**Copper / Constantan - Type T - Individual Conductors**

Positive					Negative				
ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number	ANSI Calibration	Type of Wire	Wire Size AWG	Approx. ft /#	Catalog Number
TP	Copper	14	80	B14TP	TN	Constantan	14	80	B14TN
		20	322	B20TP			20	331	B20TN
		24	815	B24TP			24	838	B24TN

## Metal Sheathed Thermocouple Wire

### Cerampak Thermocouple Wire

Cerampak - magnesium oxide insulated, metal sheathed thermocouple wire - is used primarily to fabricate thermocouple assemblies. The rugged construction of compacted MgO insulation inside a metal sheathing also makes it useful as an extension wire through harmful environments.

All sheath materials are furnished in a properly annealed condition to allow hand bending in the field.

Cerampak is weldable, flexible - can be bend on a radius two times its diameter - and is moisture resistant when properly sealed.

Material selected from the following Table B will be furnished in a coil with the ends sealed. No wires will be exposed unless requested.

Table A is provided to help in the proper selection to suit your requirements.

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**Table A - Nominal Wire Size and Lengths**

Sheath, Fraction	Diameter, Inches	Conductor Size (AWG)*	
		Single	Duplex
-	.040	33	N/A
1/16	.063	29	30
1/8	.125	24	26
3/16	.188	19	20
1/4	.250	16	19
5/16	.313	14	16

\*Sizes given are nominal minimums. Actual sizes may vary.

**Table B - Material Selection**

Sheath, Diameter	Order Code	ANSI Calibration	Order Code	Sheath Material	Order Code
.040"	040	Chromel/Constantan	E	304 St. St.	34
1/16" (.063")	1	Iron Constantan	J	310 St. St.	30
1/8" (.125")	2	Chromel/Alumel	K	316 St. St.	36
3/16" (.188")	3	Copper/Constantan	T	347 St. St.	37
1/4" (.250")	4	Plat 10% RH/Plat	S	410 St. St.	40
5/16" (.313")	5	Plat 13% RH/Plat	R	446 St. St.	46
3/8" (.375")	6	Plat 30% RH/Plat 6% RH	B	Inconel 600	60
				Inconel 601	61
				Inconel 702	72
				Inconel 800	80

Notes:

1. For Premium Grade (Special Limits of Error) material: add "PG" to the calibration code. Example: 4KPG60
2. For Duplex (4 wire) material: add prefix "2" to the calibration code. Example: 42K60
3. The most commonly used sizes and materials are listed. Others are available - Specify.

### **How to Order:**

Make a selection from each of the 3 sections of Table B and combine to form a catalog number. Specify catalog number and length required.

For duplex (4 wire), special limits of error, or special material - refer to the notes above.