

# Manhattan™ Thermocouple Cable

## Temperature Measurement and Control

The measurement of temperature is one of the most vital functions in the control of manufacturing and processing operations. As demands for greater quality, reliability, and economy increase, the demands for more precise measurement and control increase. Newer and more sophisticated electronic circuitry is employed creating stringent demands on the wire and cable used to sense and transmit temperature measurements. To meet these ever-increasing demands, Alpha has a full line of thermocouple-grade wire and thermocouple extension wire and cable.

## The Thermocouple

At the heart of all temperature measurements is the thermocouple. Although involving very complex design parameters, the fundamental concept of all thermocouples is the same. Two wires of dissimilar metal are joined together at one end. An increase in temperature creates an electromotive force (EMF) or signal, which is transmitted through these wires to a monitoring device which “reads” this signal and displays it on a previously calibrated meter or digital device.

The monitoring device is usually at a location some distance away from the actual thermocouple. To connect the thermocouple to the monitor requires wire or cable (for multiple thermocouple installations) that will maintain the integrity of the temperature-EMF

signal generated by the primary wires in the thermocouple.

## Conductor Materials

The range and accuracy of temperature measurement are dependent on the conductor materials employed. Pairs of various metal alloys will react differently with changes in temperature.

The following tables give the temperature range and tolerances for the most popular alloy combinations. All Alpha thermocouple wire and cable is tested and calibrated to the standard limits of error as indicated. Where situations require closer tolerances, wire and cable calibrated to the special error limits is available under special order.

Limits of Error for Thermocouple Grade

ANSI Type	Material	Temperature Range (°C)	Standard Limits (±)	Special Limits (±)
J	Iron/Constantan	0 to 277	2.22°C	1.11°C
		277 to 760	0.75%	0.375%
K	Chromel/Alumel	0 to 277	2.22°C	1.11°C
		277 to 1260	0.75%	0.375%
T	Copper/Constantan	-184 to -101	—	1%
		-101 to -59	2%	1%
		-59 to 93	0.83°C	0.42°C
		93 to 371	0.75%	0.375%
E	Chromel/Constantan	0 to 316	1.67°C	1.25°C
		316 to 871	0.5%	0.375%
R	Platinum 13% Rhodium/ Platinum	0 to 538	1.39°C	—
		538 to 1482	0.25%	—
S	Platinum 10% Rhodium/ Platinum	0 to 538	1.39°C	—
		538 to 1482	0.25%	—

# Manhattan™ Thermocouple Cable

## Limits of Error for Thermocouple Extension Wire

ANSI Type	Material	Temperature Range (°C)	Standard Limits (±)	Special Limits (±)
JX	Iron/Constantan	-18 to 204	2.22°C	1.11°C
KX	Chromel/Alumel	-18 to 204	2.22°C	1.11°C
TX	Copper/Constantan	-59 to 93	0.83°C	0.42°C
EX	Chromel/Constantan	-18 to 204	2.22°C	1.11°C
RSX	Copper/Copper Alloy 11	24 to 204	6.67°C	—

## Insulation and Jacket Material Properties

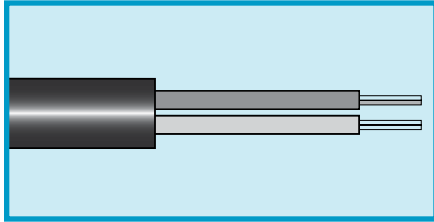
Material	Temperature (°C)		Mechanical			Chemical Resistance			
	Continuous	Intermittent	Flame	Abrasion	Flexibility	Solvents	Acids	Bases	Moisture
PVC	105	—	G	G	G	F	G	G	G
FEP	200	—	E	E	G	E	E	E	E
TFE Tape	260	—	E	E	E	E	E	E	E
Glass Braid	510	650	E	F/G	G	E	E	E	F/G
High-Temp Glass Braid	700	870	E	F/G	G	E	E	E	F/G

E = Excellent, G = Good, F = Fair

## ISA/ANSI Thermocouple Color Coding

ANSI Type	Positive Wire		Negative Wire		Grade	Jacket Color	
	Material	Insul. Color	Material	Insul. Color		Tracer	Extension
J, JX	Iron	White	Constantan	Red	Brown	Black	Black
K, KX	Chromel	Yellow	Alumel	Red	Brown	Yellow	Yellow
T, TX	Copper	Blue	Constantan	Red	Brown	Blue	Blue
E, EX	Chromel	Violet	Constantan	Red	Brown	Violet	Violet
RX, SX	Copper	Black	Alloy 11	Red	—	—	Green

# Manhattan™ Thermocouple Grade Wire



## ISA MC 96.1

### Operating Temperature

- 20°C to +510°C

### Conductor Color Coding

- ISA color-coded insulation and jacket

### Materials

- Solid or stranded alloy wire
- Braided fiberglass or FEP insulation
- Braided fiberglass or FEP jacket

### Availability

100 ft (30.5 m)  
 500 ft (152 m)  
 1000 ft (305 m)  
 Bulk, cut to length  
 (Minimums may apply)

### Duplex Parallel: Glass Braid Insulation, Glass Braid Jacket

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type J: Iron/Constantan</b>				
<b>5769/1</b>	30	0.05	0.030 x 0.048	0.76 x 1.22
<b>5766</b>	24	0.20	0.040 x 0.068	1.02 x 1.73
<b>5767H*</b>	24	0.20	0.064 x 0.102	1.63 x 2.59
<b>5763H*</b>	20	0.51	0.084 x 0.142	2.13 x 3.61
<b>5762S**</b>	20	0.56	0.090 x 0.154	2.29 x 3.91
<b>M9180012</b>	20	0.51	0.060 x 0.106	1.53 x 2.69
<b>Type K: Chromel/Alumel</b>				
<b>5776</b>	24	0.20	0.040 x 0.068	1.02 x 1.73
<b>5772S**</b>	20	0.56	0.060 x 0.108	1.53 x 2.74
<b>5773H*</b>	20	0.51	0.084 x 0.142	2.13 x 3.61
<b>M9180013</b>	20	0.51	0.060 x 0.106	1.53 x 2.69
<b>Type T: Copper/Constantan</b>				
<b>M9180014</b>	20	0.51	0.060 x 0.106	1.53 x 2.69

\*High temperature

\*\*7/28 (7 x 0.32 mm) stranding

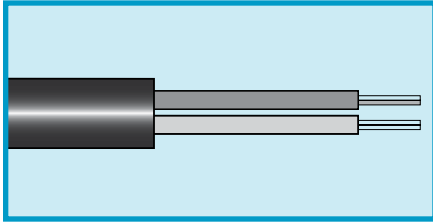
### Duplex Parallel: FEP Insulation, FEP Jacket

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type J: Iron/Constantan</b>				
<b>M9160012</b>	20	0.5	0.072 x 0.124	1.83 x 3.15
<b>Type K: Chromel/Alumel</b>				
<b>M9160013</b>	20	0.5	0.072 x 0.124	1.83 x 3.15
<b>Type T: Copper/Constantan</b>				
<b>M9160014</b>	20	0.5	0.072 x 0.124	1.83 x 3.15



# Manhattan™ Thermocouple Extension Wire

Duplex Parallel, Unshielded



## ISA MC 96.1

### Operating Temperature

- -20°C to +105°C

### Conductor Color Coding

- ISA color-coded insulation and jacket

### Materials

- Solid or stranded alloy wire
- PVC, glass braid, or FEP insulation
- PVC, glass braid, or FEP jacket

### Availability

100 ft (30.5 m)  
 500 ft (152 m)  
 1000 ft (305 m)  
 Bulk, cut to length  
 (Minimums may apply)

### PVC Insulation, PVC Jacket

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type JX: Iron/Constantan</b>				
5716	20	0.51	0.092 x 0.154	2.34 x 3.91
5710	14	2.08	0.124 x 0.218	3.15 x 5.54
<b>Type KX: Chromel/Alumel</b>				
5724	20	0.51	0.092 x 0.154	2.34 x 3.91
5724S*	20	0.56	0.098 x 0.166	2.49 x 4.22
5721	16	1.31	0.111 x 0.192	2.82 x 4.88
<b>Type TX: Copper/Constantan</b>				
5731	20	0.51	0.092 x 0.154	2.34 x 3.91
5731S*	20	0.56	0.098 x 0.166	2.49 x 4.22
5730	16	1.31	0.111 x 0.192	2.82 x 4.88
<b>Type RSX: Copper/Copper Alloy 11</b>				
5740	16	1.31	0.111 x 0.192	2.82 x 4.88

\*7/28 (7 x 0.32 mm) stranding

### Glass Braid Insulation, Glass Braid Jacket

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type JX: Iron/Constantan</b>				
5714	16	1.31	0.085 x 0.150	2.16 x 3.81
<b>Type SX: Copper/Copper Alloy 11</b>				
5741H*	16	1.31	0.085 x 0.150	2.16 x 3.81

\*High temperature

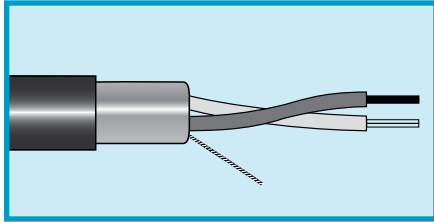
### FEP Insulation, FEP Jacket

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type JX: Iron/Constantan</b>				
5715	16	1.31	0.087 x 0.154	2.21 x 3.91



# Manhattan™ Thermocouple Extension Wire

300 V, Single and Multipair, Unshielded and Foil Shield



**ISA MC 96.1**  
**UL PLTC, ITC**

### Operating Temperature

- -20°C to +105°C
- -80°C to +200°C (High-temperature versions)

### Conductor Color Coding

- ISA color-coded insulation and jacket

### Materials

- Solid alloy wire
- PVC or FEP insulation
- Aluminum/polyester shield, 25% overlap min.  
Foil facing inward
- Tinned copper drain wire
- PVC or FEP jacket

### Availability

100 ft (30.5 m)  
500 ft (152 m)  
1000 ft (305 m)  
Bulk, cut to length  
(Minimums may apply)

### Unshielded Single Pair, PVC Insulation, PVC Jacket UL PLTC/ITC, 300 V, 105°C

Part No.	Conductor Size		Outer Dimension	
	AWG	mm <sup>2</sup>	Inch	mm
<b>Type EX: Chromel/Constantan</b>				
M9000011	20	0.51	0.205	5.21
M9006011	16	1.31	0.235	5.97
<b>Type JX: Iron/Constantan</b>				
M9000012	20	0.51	0.205	5.21
M9006012	16	1.31	0.235	5.97
<b>Type KX: Chromel/Alumel</b>				
M9000013	20	0.51	0.205	5.21
M9006013	16	1.31	0.235	5.97
<b>Type TX: Copper/Constantan</b>				
M9000014	20	0.51	0.205	5.21
M9006014	16	1.31	0.235	5.97

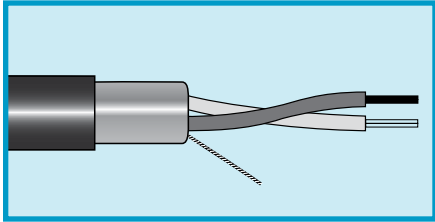
### Foil Shielded Individual and Overall, Twisted Pairs, PVC Insulation, PVC Jacket UL PLTC/ITC, 300 V, 105°C

Part No.	Conductor Size		Pairs	Outer Dimension	
	AWG	mm <sup>2</sup>		Inch	mm
<b>Type EX: Chromel/Constantan</b>					
M9020011	20	0.51	1	0.205	5.21
M9240041	20	0.51	4	0.440	11.18
M9240081	20	0.51	8	0.550	13.97
M9240121	20	0.51	12	0.665	16.89
M9240241	20	0.51	24	0.875	22.23
M9026011	16	1.31	1	0.235	5.97
<b>Type JX: Iron/Constantan</b>					
M9020012	20	0.51	1	0.205	5.21
M9240042	20	0.51	4	0.440	11.18
M9240082	20	0.51	8	0.550	13.97
M9240122	20	0.51	12	0.665	16.89
M9240162	20	0.51	16	0.740	18.80
M9240242	20	0.51	24	0.875	22.23
M9240362	20	0.51	36	1.010	25.65
M9026012	16	1.31	1	0.235	5.97
<b>Type KX: Chromel/Alumel</b>					
M9020013	20	0.51	1	0.205	5.21
M9240043	20	0.51	4	0.440	11.18
M9240083	20	0.51	8	0.550	13.97
M9240123	20	0.51	12	0.665	16.89
M9240243	20	0.51	24	0.875	22.23
M9026013	16	1.31	1	0.235	5.97
<b>Type TX: Copper/Constantan</b>					
M9020014	20	0.51	1	0.205	5.21
M9240044	20	0.51	4	0.440	11.18
M9240084	20	0.51	8	0.550	13.97
M9240124	20	0.51	12	0.665	16.89
M9240244	20	0.51	24	0.875	22.23
M9026014	16	1.31	1	0.235	5.97



# Manhattan™ Thermocouple Extension Wire

300 V, Single and Multipair, Unshielded and Foil Shield



**ISA MC 96.1  
UL PLTC, ITC**

### Operating Temperature

- -20°C to +105°C
- -80°C to +200°C (High-temperature versions)

### Conductor Color Coding

- ISA color-coded insulation and jacket

### Materials

- Solid alloy wire
- PVC or FEP insulation
- Aluminum/polyester shield, 25% overlap min.  
Foil facing inward  
Tinned copper drain wire
- PVC or FEP jacket

### Availability

100 ft (30.5 m)  
500 ft (152 m)  
1000 ft (305 m)  
Bulk, cut to length  
(Minimums may apply)

**Foil Shielded Overall, Twisted Pairs, Solid Conductors, PVC Insulation, PVC Jacket  
UL PLTC, 300 V, 105°C**

Part No.	Conductor Size		Pairs	Outer Dimension	
	AWG	mm <sup>2</sup>		Inch	mm
<b>Type JX: Iron/Constantan</b>					
5711/2004	20	0.51	4	0.369	9.37
5711/2008	20	0.51	8	0.480	12.19
5711/2012	20	0.51	12	0.557	14.15
<b>Type KX: Chromel/Alumel</b>					
5712/2002	20	0.51	2	0.325	8.26
5712/2004	20	0.51	4	0.369	9.37
5712/2008	20	0.51	8	0.480	12.19
5712/2024	20	0.51	24	0.828	21.03
5712/2036	20	0.51	36	0.956	24.28
<b>Type TX: Copper/Constantan</b>					
5713/2004	20	0.51	4	0.369	9.37
5713/2012	20	0.51	12	0.557	14.15
5713/2024	20	0.51	24	0.828	21.03
<b>Type RSX: Copper/Copper Alloy</b>					
5714/1601	16	1.31	2	0.256	6.50

**Foil Shielded Twisted Pairs, FEP Insulation, FEP Jacket  
High Temperature: -80°C to 200°C**

Part No.	Conductor Size		Pairs	Outer Dimension	
	AWG	mm <sup>2</sup>		Inch	mm
<b>Type JX: Iron/Constantan</b>					
5717/2001	20	0.51	1	0.150	3.81
5717/1601	16	1.31	1	0.188	4.78
<b>Type KX: Chromel/Alumel</b>					
5718/2001	20	0.51	1	0.150	3.81
5718/1601	16	1.31	1	0.188	4.78



# Make AlphaWire.com your destination for all your cabling needs!

The screenshot shows the AlphaWire website interface. At the top, there's a navigation bar with links: Login | Join | Dashboard | MyCatalog | Find A Sales Rep | Find A Distributor. A search bar is on the right. Below the navigation is a main banner for 'The New AlphaWire' with the headline 'Alpha, Manhattan, and Dearborn are now simply AlphaWire.' and a 'LEARN MORE' button. To the left of the banner are three key messages: 'The New Face of AlphaWire', 'Performance and Toughness', and 'Renewable Meets Reliable'. Below the banner is a 'New Products at AlphaWire' section featuring 'EcoWire™' with a detailed description and a list of benefits: Better dielectric strength, Wide temperature range that meets VW-1, Low specific gravity, More durable with up to 10x better abrasion and pinch resistance resistance, Up to 45% smaller diameter, Up to 40% lighter, and Fully Recyclable. To the right is a 'News' section with two articles from 12.15.09 and 11.25.09. At the bottom right is a 'Subscribe to our Newsletter' form with a 'SUBSCRIBE' button.

Easy to use, full of information, and designed to make the selection of wire, cable, tubing, and wire management fast and easy—the Alpha Wire website is the only source you need.

- Search products by parameters
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- Download specs
- Read white papers written by our industry experts
- Request a sample (or two!)
- Learn about our market-specific solution sets
- Download literature
- Look around our “Engineer’s Room”
- Build your own cable with our powerful Cable Design Center®



## Communication, Control, and Industrial Series Cable

