

# L.H. MARSHALL THERMOCOUPLES™



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## 100% WARRANTY

L.H. Marshall Company backs its products against defects and will repair or replace defective products returned to us freight prepaid. Excluded from this Warranty is equipment deterioration resulting from normal use, defects due to negligence, misuse, improper installation, accident or unauthorized alteration or repair by the purchaser. Full or partial credits for defective materials will be issued only after our inspection and evaluation.

# ABOUT L.H. MARSHALL



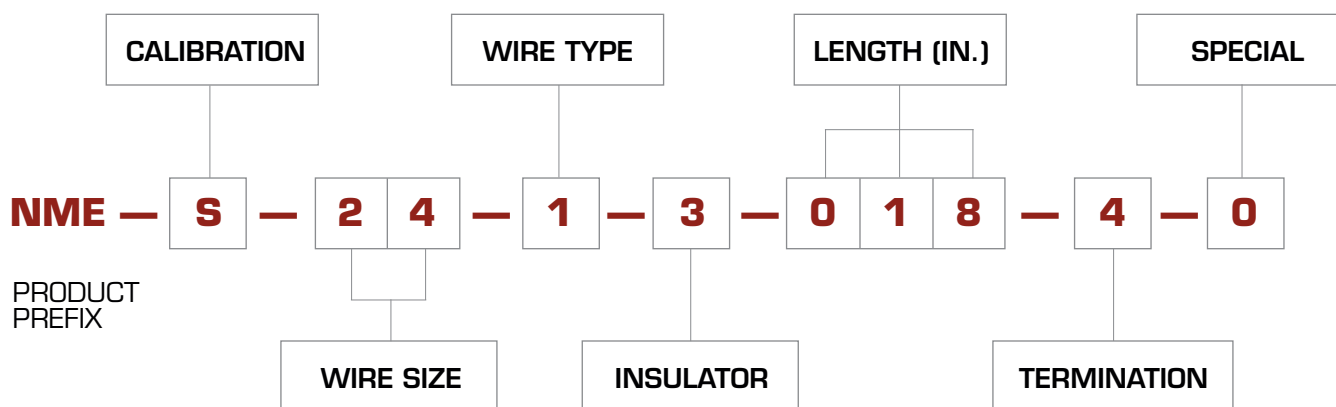
# ORDERING INFORMATION



Each product section in this catalog contains a table that lists the specifications for each component of the featured product. Every specification has a code that is used in a “box” format to create an Ordering Number. To order, fill in each Ordering Number box with the appropriate specification code. This series of numbers and letters will form the final Ordering Number.

## TYPICAL ORDERING NUMBER

A typical Ordering Number for a Noble Metal Element (NME) Thermocouple is shown below as an example.



## THE ABOVE ORDERING NUMBER SPECIFIES A NOBLE METAL ELEMENT (NME):

Plt.-Plt. 10% Rh. Type “S” Noble Element, .020” diameter wire size, Standard Grade Thermocouple wire type, in a 0.125” diameter Alumina insulator, 18” long, with fish spine beads and copper tips, no special specification.

<b>S</b>	Plt.-Plt. 10% Rh. Calibration Type
<b>24</b>	.020” Diameter Wire Size
<b>1</b>	Standard Grade Thermocouple Wire Type
<b>3</b>	0.125” OD Alumina Insulator
<b>018</b>	18” Length
<b>4</b>	Fish Spine Beads/Copper Tip Termination
<b>0</b>	No Special Specification

## HOW TO ORDER USING A SYSTEM OTHER THAN OURS

This catalog is designed to assist you in ordering the appropriate thermocouple, thermocouple components or accessories to meet your exact needs. However, if you are more comfortable with another vendor’s ordering number system or with using a generic description, contact us with that information and we will help you identify your product requirements.



# MARSHALL THERMOCOUPLES™

## MARSHALL THERMOCOUPLE™

The L.H. Marshall Company invented and patented the enclosed tip Thermocouple™ over 80 years ago. Over 10 million Marshall Thermocouples have been sold worldwide for precision temperature measurement. Marshall Thermocouples are reusable, durable, accurate and are a quality product engineered to meet the industry standards for temperature measurement of molten metals.

Scientific research and development at one of America's leading research facilities has led to innovations in steel composition of the Marshall protection tubes resulting in the longest lasting, multiuse thermocouple in the industry.

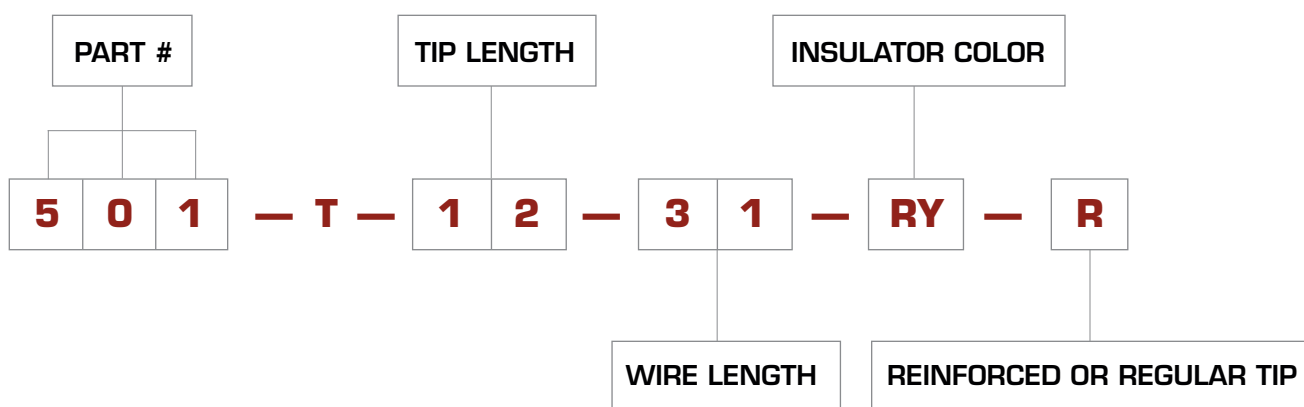
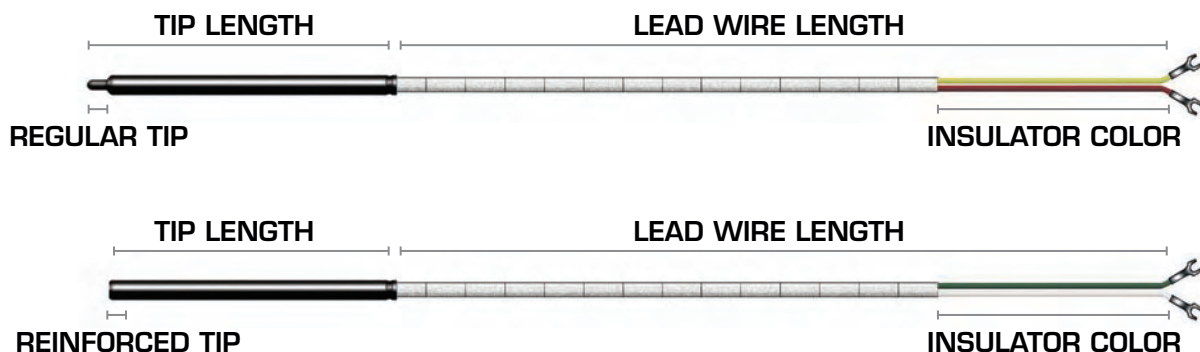
All Marshall Thermocouples are manufactured with Class 1, Special Limits wire which meet and exceed international quality standards of ANSI MC96.1 and IEC 584. Custom Marshall Thermocouples can be made to accommodate any range of industrial need while maintaining superior quality. Calibration certificates are available on Marshall Thermocouples and all products produced by the L.H. Marshall Company are 100% guaranteed.

# MARSHALL THERMOCOUPLE™



## ORDERING INFORMATION

Fill in each Ordering Number box with the appropriate specification code. This series of numbers and letters will form the final Ordering Number.



THE ABOVE ORDERING NUMBER SPECIFIES A MARSHALL THERMOCOUPLE:

PART #	TIP LENGTH	LEAD WIRE LENGTH	INSULATOR COLOR	REINFORCED OR REGULAR TIP
501 - 8" or less	8" - 8" / 203 mm	31" - 31" / 787 mm	RY - Red (-) Yellow (+) Type K	R - Reinforced
701 - 9" or more	12" - 12" / 304 mm	43" - 43" / 1092 mm	GW - Green (+) White (-) Type K	J - Type J
	15" - 15" / 381 mm	55" - 55" / 1397 mm	RW - Red (-) White (+) Type J	Blank - Type K
	18" - 18" / 457 mm	72" - 72" / 1829 mm		
	20" - 20" / 508 mm	96" - 96" / 2438 mm		
	24" - 24" / 610 mm	120" - 120" / 3048 mm		
	30" - 30" / 762 mm			

# THERMOCOUPLE TIPS RED & YELLOW LEAD WIRES



8" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
501-T-8-31-RY	31"	27 lbs / 12 kg
501-T-8-43-RY	43"	30 lbs / 14 kg
501-T-8-55-RY	55"	34 lbs / 16 kg
501-T-8-72-RY	72"	36 lbs / 17 kg
501-T-8-96-RY	96"	40 lbs / 18 kg
501-T-8-120-RY	120"	44 lbs / 20 kg

12" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-12-31-RY	31"	35 lbs / 16 kg
701-T-12-43-RY	43"	39 lbs / 18 kg
701-T-12-55-RY	55"	42 lbs / 19 kg
701-T-12-72-RY	72"	45 lbs / 21 kg
701-T-12-96-RY	96"	50 lbs / 23 kg
701-T-12-120-RY	120"	56 lbs / 26 kg

15" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-15-31-RY	31"	45 lbs / 21 kg
701-T-15-43-RY	43"	48 lbs / 22 kg
701-T-15-55-RY	55"	51 lbs / 24 kg
701-T-15-72-RY	72"	55 lbs / 25 kg
701-T-15-96-RY	96"	59 lbs / 27 kg
701-T-15-120-RY	120"	63 lbs / 29 kg

18" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-18-31-RY	31"	52 lbs / 24 kg
701-T-18-43-RY	43"	55 lbs / 25 kg
701-T-18-55-RY	55"	58 lbs / 27 kg
701-T-18-72-RY	72"	61 lbs / 28 kg
701-T-18-96-RY	96"	65 lbs / 30 kg
701-T-18-120-RY	120"	69 lbs / 32 kg

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

# THERMOCOUPLE TIPS RED & YELLOW LEAD WIRES

CONTINUED



20" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-20-31-RY	31"	54 lbs / 25 kg
701-T-20-43-RY	43"	57 lbs / 26 kg
701-T-20-55-RY	55"	60 lbs / 28 kg
701-T-20-72-RY	72"	63 lbs / 29 kg
701-T-20-96-RY	96"	67 lbs / 31 kg
701-T-20-120-RY	120"	71 lbs / 33 kg

24" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-24-31-RY	31"	62 lbs / 29 kg
701-T-24-43-RY	43"	65 lbs / 30 kg
701-T-24-55-RY	55"	68 lbs / 31 kg
701-T-24-72-RY	72"	71 lbs / 33 kg
701-T-24-96-RY	96"	75 lbs / 34 kg
701-T-24-120-RY	120"	79 lbs / 36 kg

30" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-30-31-RY	31"	72 lbs / 33 kg
701-T-30-43-RY	43"	75 lbs / 34 kg
701-T-30-55-RY	55"	78 lbs / 36 kg
701-T-30-72-RY	72"	81 lbs / 37 kg
701-T-30-96-RY	96"	85 lbs / 39 kg
701-T-30-120-RY	120"	89 lbs / 41 kg

**NOTES:** Longer length tips and wire lengths are available.

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

**L.H. Marshall Company** 270 W. Lane Avenue, Columbus, OH 43201 USA

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# THERMOCOUPLE TIPS GREEN & WHITE LEAD WIRES



8" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
501-T-8-31-GW	31"	27 lbs / 12 kg
501-T-8-43-GW	43"	30 lbs / 14 kg
501-T-8-55-GW	55"	34 lbs / 16 kg
501-T-8-72-GW	72"	36 lbs / 17 kg
501-T-8-96-GW	96"	40 lbs / 18 kg
501-T-8-120-GW	120"	44 lbs / 20 kg

12" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-12-31-GW	31"	35 lbs / 16 kg
701-T-12-43-GW	43"	39 lbs / 18 kg
701-T-12-55-GW	55"	42 lbs / 19 kg
701-T-12-72-GW	72"	45 lbs / 21 kg
701-T-12-96-GW	96"	50 lbs / 23 kg
701-T-12-120-GW	120"	56 lbs / 26 kg

15" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-15-31-GW	31"	45 lbs / 21 kg
701-T-15-43-GW	43"	48 lbs / 22 kg
701-T-15-55-GW	55"	51 lbs / 24 kg
701-T-15-72-GW	72"	55 lbs / 25 kg
701-T-15-96-GW	96"	59 lbs / 27 kg
701-T-15-120-GW	120"	63 lbs / 29 kg

18" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-18-31-GW	31"	52 lbs / 24 kg
701-T-18-43-GW	43"	55 lbs / 25 kg
701-T-18-55-GW	55"	58 lbs / 27 kg
701-T-18-72-GW	72"	61 lbs / 28 kg
701-T-18-96-GW	96"	65 lbs / 30 kg
701-T-18-120-GW	120"	69 lbs / 32 kg

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

# THERMOCOUPLE TIPS GREEN & WHITE LEAD WIRES

CONTINUED



20" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-20-31-GW	31"	54 lbs / 25 kg
701-T-20-43-GW	43"	57 lbs / 26 kg
701-T-20-55-GW	55"	60 lbs / 28 kg
701-T-20-72-GW	72"	63 lbs / 29 kg
701-T-20-96-GW	96"	67 lbs / 31 kg
701-T-20-120-GW	120"	71 lbs / 33 kg

24" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-24-31-GW	31"	62 lbs / 29 kg
701-T-24-43-GW	43"	65 lbs / 30 kg
701-T-24-55-GW	55"	68 lbs / 31 kg
701-T-24-72-GW	72"	71 lbs / 33 kg
701-T-24-96-GW	96"	75 lbs / 34 kg
701-T-24-120-GW	120"	79 lbs / 36 kg

30" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-30-31-GW	31"	72 lbs / 33 kg
701-T-30-43-GW	43"	75 lbs / 34 kg
701-T-30-55-GW	55"	78 lbs / 36 kg
701-T-30-72-GW	72"	81 lbs / 37 kg
701-T-30-96-GW	96"	85 lbs / 39 kg
701-T-30-120-GW	120"	89 lbs / 41 kg

**NOTES:** Longer length tips and wire lengths are available.

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

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# THERMOCOUPLE TIPS RED & YELLOW LEAD WIRES REINFORCED TIP



8" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
501-T-8-31-RY-R	31"	27 lbs / 12 kg
501-T-8-43-RY-R	43"	30 lbs / 14 kg
501-T-8-55-RY-R	55"	34 lbs / 16 kg
501-T-8-72-RY-R	72"	36 lbs / 17 kg
501-T-8-96-RY-R	96"	40 lbs / 18 kg
501-T-8-120-RY-R	120"	44 lbs / 20 kg

12" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-12-31-RY-R	31"	35 lbs / 16 kg
701-T-12-43-RY-R	43"	39 lbs / 18 kg
701-T-12-55-RY-R	55"	42 lbs / 19 kg
701-T-12-72-RY-R	72"	45 lbs / 21 kg
701-T-12-96-RY-R	96"	50 lbs / 23 kg
701-T-12-120-RY-R	120"	56 lbs / 26 kg

15" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-15-31-RY-R	31"	45 lbs / 21 kg
701-T-15-43-RY-R	43"	48 lbs / 22 kg
701-T-15-55-RY-R	55"	51 lbs / 24 kg
701-T-15-72-RY-R	72"	55 lbs / 25 kg
701-T-15-96-RY-R	96"	59 lbs / 27 kg
701-T-15-120-RY-R	120"	63 lbs / 29 kg

18" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-18-31-RY-R	31"	52 lbs / 24 kg
701-T-18-43-RY-R	43"	55 lbs / 25 kg
701-T-18-55-RY-R	55"	58 lbs / 27 kg
701-T-18-72-RY-R	72"	61 lbs / 28 kg
701-T-18-96-RY-R	96"	65 lbs / 30 kg
701-T-18-120-RY-R	120"	69 lbs / 32 kg

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

# THERMOCOUPLE TIPS RED & YELLOW LEAD WIRES REINFORCED TIP CONTINUED



20" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-20-31-RY-R	31"	54 lbs / 25 kg
701-T-20-43-RY-R	43"	57 lbs / 26 kg
701-T-20-55-RY-R	55"	60 lbs / 28 kg
701-T-20-72-RY-R	72"	63 lbs / 29 kg
701-T-20-96-RY-R	96"	67 lbs / 31 kg
701-T-20-120-RY-R	120"	71 lbs / 33 kg

24" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-24-31-RY-R	31"	62 lbs / 29 kg
701-T-24-43-RY-R	43"	65 lbs / 30 kg
701-T-24-55-RY-R	55"	68 lbs / 31 kg
701-T-24-72-RY-R	72"	71 lbs / 33 kg
701-T-24-96-RY-R	96"	75 lbs / 34 kg
701-T-24-120-RY-R	120"	79 lbs / 36 kg

30" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-30-31-RY-R	31"	72 lbs / 33 kg
701-T-30-43-RY-R	43"	75 lbs / 34 kg
701-T-30-55-RY-R	55"	78 lbs / 36 kg
701-T-30-72-RY-R	72"	81 lbs / 37 kg
701-T-30-96-RY-R	96"	85 lbs / 39 kg
701-T-30-120-RY-R	120"	89 lbs / 41 kg

**NOTES:** Longer length tips and wire lengths are available.

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

# THERMOCOUPLE TIPS GREEN & WHITE LEAD WIRES REINFORCED TIP



8" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
501-T-8-31-GW-R	31"	27 lbs / 12 kg
501-T-8-43-GW-R	43"	30 lbs / 14 kg
501-T-8-55-GW-R	55"	34 lbs / 16 kg
501-T-8-72-GW-R	72"	36 lbs / 17 kg
501-T-8-96-GW-R	96"	40 lbs / 18 kg
501-T-8-120-GW-R	120"	44 lbs / 20 kg

12" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-12-31-GW-R	31"	35 lbs / 16 kg
701-T-12-43-GW-R	43"	39 lbs / 18 kg
701-T-12-55-GW-R	55"	42 lbs / 19 kg
701-T-12-72-GW-R	72"	45 lbs / 21 kg
701-T-12-96-GW-R	96"	50 lbs / 23 kg
701-T-12-120-GW-R	120"	56 lbs / 26 kg

15" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-15-31-GW-R	31"	45 lbs / 21 kg
701-T-15-43-GW-R	43"	48 lbs / 22 kg
701-T-15-55-GW-R	55"	51 lbs / 24 kg
701-T-15-72-GW-R	72"	55 lbs / 25 kg
701-T-15-96-GW-R	96"	59 lbs / 27 kg
701-T-15-120-GW-R	120"	63 lbs / 29 kg

18" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-18-31-GW-R	31"	52 lbs / 24 kg
701-T-18-43-GW-R	43"	55 lbs / 25 kg
701-T-18-55-GW-R	55"	58 lbs / 27 kg
701-T-18-72-GW-R	72"	61 lbs / 28 kg
701-T-18-96-GW-R	96"	65 lbs / 30 kg
701-T-18-120-GW-R	120"	69 lbs / 32 kg

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

\*\*\* Per 50 pieces in lbs/kg

# THERMOCOUPLE TIPS GREEN & WHITE LEAD WIRES REINFORCED TIP CONTINUED



20" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-20-31-GW-R	31"	54 lbs / 25 kg
701-T-20-43-GW-R	43"	57 lbs / 26 kg
701-T-20-55-GW-R	55"	60 lbs / 28 kg
701-T-20-72-GW-R	72"	63 lbs / 29 kg
701-T-20-96-GW-R	96"	67 lbs / 31 kg
701-T-20-120-GW-R	120"	71 lbs / 33 kg

24" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-24-31-GW-R	31"	62 lbs / 29 kg
701-T-24-43-GW-R	43"	65 lbs / 30 kg
701-T-24-55-GW-R	55"	68 lbs / 31 kg
701-T-24-72-GW-R	72"	71 lbs / 33 kg
701-T-24-96-GW-R	96"	75 lbs / 34 kg
701-T-24-120-GW-R	120"	79 lbs / 36 kg

30" THERMOCOUPLE TIPS*	FOR USE WITH LANCE LENGTH**	SHIPPING WEIGHT***
701-T-30-31-GW-R	31"	72 lbs / 33 kg
701-T-30-43-GW-R	43"	75 lbs / 34 kg
701-T-30-55-GW-R	55"	78 lbs / 36 kg
701-T-30-72-GW-R	72"	81 lbs / 37 kg
701-T-30-96-GW-R	96"	85 lbs / 39 kg
701-T-30-120-GW-R	120"	89 lbs / 41 kg

**NOTES:** Longer length tips and wire lengths are available.

\* Lead wires can be color coded Red/Yellow or Green/White

\*\* See lance price page for part numbers

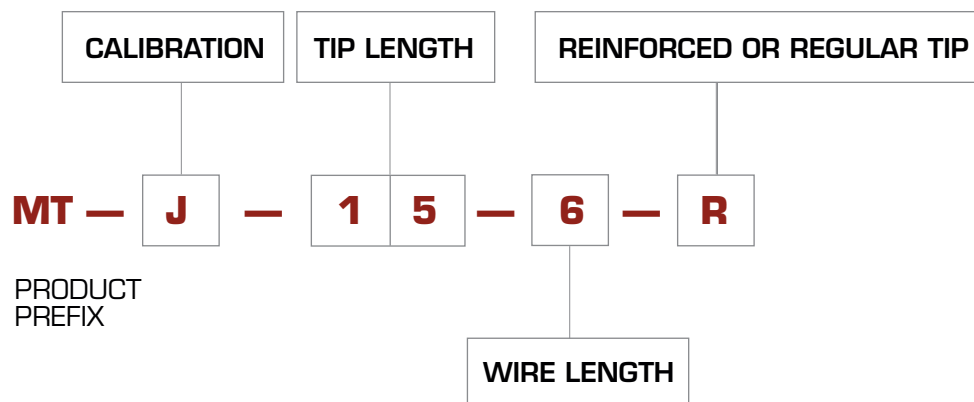
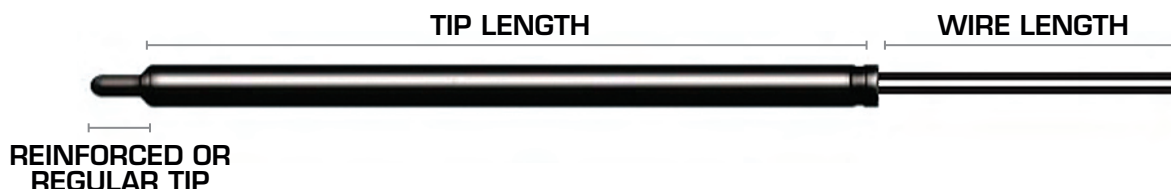
\*\*\* Per 50 pieces in lbs/kg

# MARSHALL THERMOCOUPLE™—MT



## ORDERING INFORMATION

Fill in each Ordering Number box with the appropriate specification code. This series of numbers and letters will form the final Ordering Number.



THE ABOVE ORDERING NUMBER SPECIFIES A MARSHALL THERMOCOUPLE MT:

CALIBRATION	TIP LENGTH	WIRE LENGTH	REINFORCED OR REGULAR TIP
K - Chromel Alumel	8" - 8" / 203 mm	6" - 6" / 152 mm - Standard	R - Reinforced
J - Iron Constantan	12" - 12" / 304 mm	" " - Other in Inches	Blank - Regular Tip
KK - Dual Element	15" - 15" / 381 mm		
JJ - Dual Element	18" - 18" / 457 mm		
	20" - 20" / 508 mm		
	24" - 24" / 610 mm		
	30" - 30" / 762 mm		

# MARSHALL THERMOCOUPLE™—MT



## MT TYPE K

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTK8-6	8 inches	6 inches
MTK12-6	12 inches	6 inches
MTK15-6	15 inches	6 inches
MTK18-6	18 inches	6 inches
MTK20-6	20 inches	6 inches
MTK24-6	24 inches	6 inches
MTK30-6	30 inches	6 inches
MTK36-6	36 inches	6 inches

## MT TYPE J

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTJ8-6	8 inches	6 inches
MTJ12-6	12 inches	6 inches
MTJ15-6	15 inches	6 inches
MTJ18-6	18 inches	6 inches
MTJ20-6	20 inches	6 inches
MTJ24-6	24 inches	6 inches
MTJ30-6	30 inches	6 inches
MTJ36-6	36 inches	6 inches

## MT TYPE K DUAL ELEMENT

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTKK8-6	8 inches	6 inches
MTKK12-6	12 inches	6 inches
MTKKJ15-6	15 inches	6 inches
MTKK18-6	18 inches	6 inches
MTKK20-6	20 inches	6 inches
MTKK24-6	24 inches	6 inches
MTKK30-6	30 inches	6 inches
MTKK36-6	36 inches	6 inches

## MT TYPE J DUAL ELEMENT

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTJJ8-6	8 inches	6 inches
MTJJ12-6	12 inches	6 inches
MTJJ15-6	15 inches	6 inches
MTJJ18-6	18 inches	6 inches
MTJJ20-6	20 inches	6 inches
MTJJ24-6	24 inches	6 inches
MTJJ30-6	30 inches	6 inches
MTJJ36-6	36 inches	6 inches

# MARSHALL THERMOCOUPLE™—MT REINFORCED TIP



## MT TYPE K

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTK8-6-R	8 inches	6 inches
MTK12-6-R	12 inches	6 inches
MTK15-6-R	15 inches	6 inches
MTK18-6-R	18 inches	6 inches
MTK20-6-R	20 inches	6 inches
MTK24-6-R	24 inches	6 inches
MTK30-6-R	30 inches	6 inches
MTK36-6-R	36 inches	6 inches

## MT TYPE J

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTJ8-6-R	8 inches	6 inches
MTJ12-6-R	12 inches	6 inches
MTJ15-6-R	15 inches	6 inches
MTJ18-6-R	18 inches	6 inches
MTJ20-6-R	20 inches	6 inches
MTJ24-6-R	24 inches	6 inches
MTJ30-6-R	30 inches	6 inches
MTJ36-6-R	36 inches	6 inches

## MT TYPE K DUAL ELEMENT

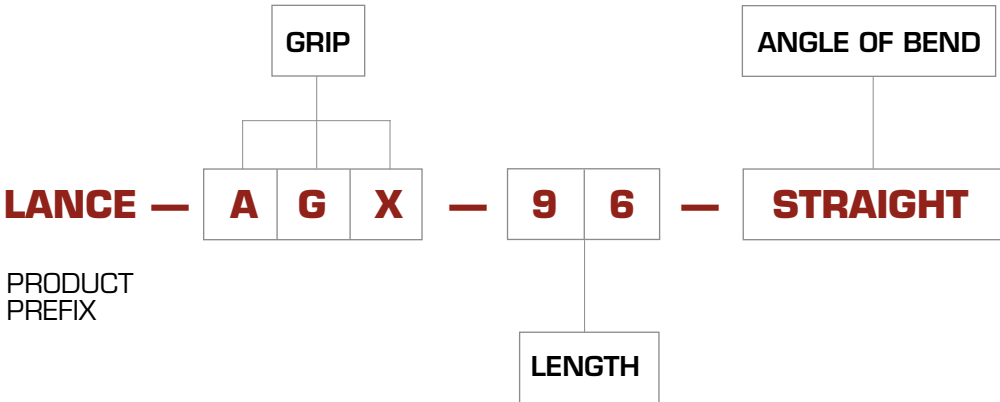
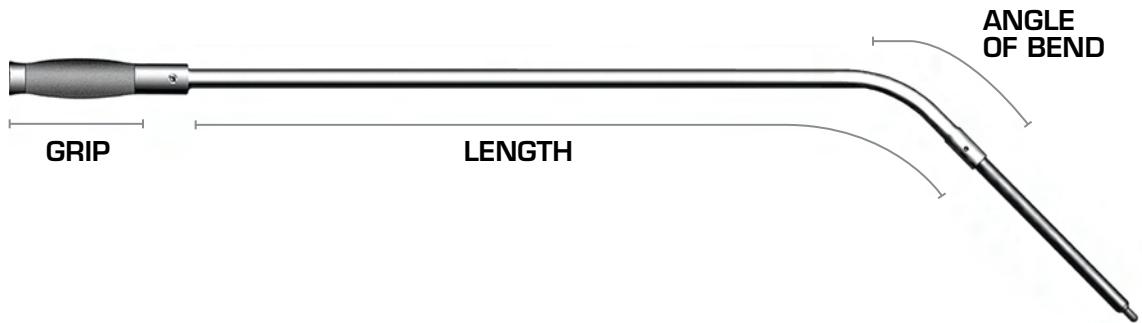
PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTKK8-6-R	8 inches	6 inches
MTKK12-6-R	12 inches	6 inches
MTKK15-6-R	15 inches	6 inches
MTKK18-6-R	18 inches	6 inches
MTKK20-6-R	20 inches	6 inches
MTKK24-6-R	24 inches	6 inches
MTKK30-6-R	30 inches	6 inches
MTKK36-6-R	36 inches	6 inches

## MT TYPE J DUAL ELEMENT

PART #, 6" BARE LEAD	TIP LENGTH	WIRE LENGTH
MTJJ8-6-R	8 inches	6 inches
MTJJ12-6-R	12 inches	6 inches
MTJJ15-6-R	15 inches	6 inches
MTJJ18-6-R	18 inches	6 inches
MTJJ20-6-R	20 inches	6 inches
MTJJ24-6-R	24 inches	6 inches
MTJJ30-6-R	30 inches	6 inches
MTJJ36-6-R	36 inches	6 inches

**ORDERING INFORMATION**

Fill in each Ordering Number box with the appropriate specification code. This series of numbers and letters will form the final Ordering Number.



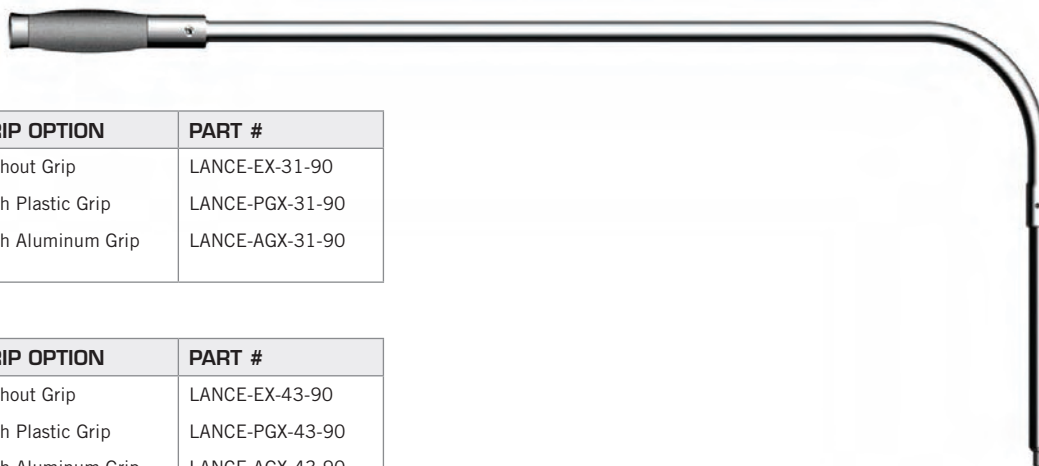
THE ABOVE ORDERING NUMBER SPECIFIES A MARSHALL THERMOCOUPLE MT:

GRIP	LENGTH	ANGLE OF BEND
EX - No Grip	31" - 31" / 787 mm	90 - 90°
AGX - Aluminum	43" - 43" / 1092 mm	45 - 45°
PGX - Plastic	55" - 55" / 1397 mm	Straight - No Bend
	72" - 72" / 1829 mm	* Custom Bend Available
	96" - 96" / 2438 mm	
	120" - 120" / 3048 mm	
	* Custom Length Available	

# CURVED LANCE—90° BEND



**BELOW:** This picture shows the Marshall Lance with a plastic grip and a Marshall Thermocouple™. Prices below do not include the Marshall Thermocouple™ and have various grip options.



SIZE/WEIGHT	GRIP OPTION	PART #
<b>31" / 787 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-31-90
<b>1.5 lbs / 0.7 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-31-90
	With Aluminum Grip	LANCE-AGX-31-90

SIZE/WEIGHT	GRIP OPTION	PART #
<b>43" / 1092 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-43-90
<b>2.0 lbs / 0.9 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-43-90
	With Aluminum Grip	LANCE-AGX-43-90

SIZE/WEIGHT	GRIP OPTION	PART #
<b>55" / 1397 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-55-90
<b>2.5 lbs / 1.1 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-55-90
	With Aluminum Grip	LANCE-AGX-55-90

SIZE/WEIGHT	GRIP OPTION	PART #
<b>72" / 1829 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-72-90
<b>3.0 lbs / 1.4 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-72-90
	With Aluminum Grip	LANCE-AGX-72-90

SIZE/WEIGHT	GRIP OPTION	PART #
<b>96" / 2438 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-96-90
<b>4.0 lbs / 1.8 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-96-90
	With Aluminum Grip	LANCE-AGX-96-90

SIZE/WEIGHT	GRIP OPTION	PART #
<b>120" / 3048 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-120-90
<b>4.5 lbs / 2.0 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-120-90
	With Aluminum Grip	LANCE-AGX-120-90

# STRAIGHT LANCE



**BELOW:** This picture shows the Marshall Lance with a plastic grip and a Marshall Thermocouple™. Prices below do not include the Marshall Thermocouple™ and have various grip options.



SIZE/WEIGHT	GRIP OPTION	PART #
<b>31" / 787 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-31-STRAIGHT
<b>1.5 lbs / 0.7 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-31-STRAIGHT
	With Aluminum Grip	LANCE-AGX-31-STRAIGHT

SIZE/WEIGHT	GRIP OPTION	PART #
<b>43" / 1092 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-43-STRAIGHT
<b>2.0 lbs / 0.9 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-43-STRAIGHT
	With Aluminum Grip	LANCE-AGX-43-STRAIGHT

SIZE/WEIGHT	GRIP OPTION	PART #
<b>55" / 1397 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-55-STRAIGHT
<b>2.5 lbs / 1.1 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-55-STRAIGHT
	With Aluminum Grip	LANCE-AGX-55-STRAIGHT

SIZE/WEIGHT	GRIP OPTION	PART #
<b>72" / 1829 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-72-STRAIGHT
<b>3.0 lbs / 1.4 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-72-STRAIGHT
	With Aluminum Grip	LANCE-AGX-72-STRAIGHT

SIZE/WEIGHT	GRIP OPTION	PART #
<b>96" / 2438 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-96-STRAIGHT
<b>4.0 lbs / 1.8 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-96-STRAIGHT
	With Aluminum Grip	LANCE-AGX-96-STRAIGHT

SIZE/WEIGHT	GRIP OPTION	PART #
<b>120" / 3048 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-120-STRAIGHT
<b>4.5 lbs / 2.0 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-120-STRAIGHT
	With Aluminum Grip	LANCE-AGX-120-STRAIGHT

# CURVED LANCE—45° BEND



**BELOW:** This picture shows the Marshall Lance with a plastic grip and a Marshall Thermocouple™. Prices below do not include the Marshall Thermocouple™ and have various grip options.



SIZE/WEIGHT	GRIP OPTION	PART #
<b>31" / 787 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-31-45
<b>1.5 lbs / 0.7 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-31-45
	With Aluminum Grip	LANCE-AGX-31-45

SIZE/WEIGHT	GRIP OPTION	PART #
<b>43" / 1092 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-43-45
<b>2.0 lbs / 0.9 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-43-45
	With Aluminum Grip	LANCE-AGX-43-45

SIZE/WEIGHT	GRIP OPTION	PART #
<b>55" / 1397 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-55-45
<b>2.5 lbs / 1.1 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-55-45
	With Aluminum Grip	LANCE-AGX-55-45

SIZE/WEIGHT	GRIP OPTION	PART #
<b>72" / 1829 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-72-45
<b>3.0 lbs / 1.4 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-72-45
	With Aluminum Grip	LANCE-AGX-72-45

SIZE/WEIGHT	GRIP OPTION	PART #
<b>96" / 2438 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-96-45
<b>4.0 lbs / 1.8 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-96-45
	With Aluminum Grip	LANCE-AGX-96-45

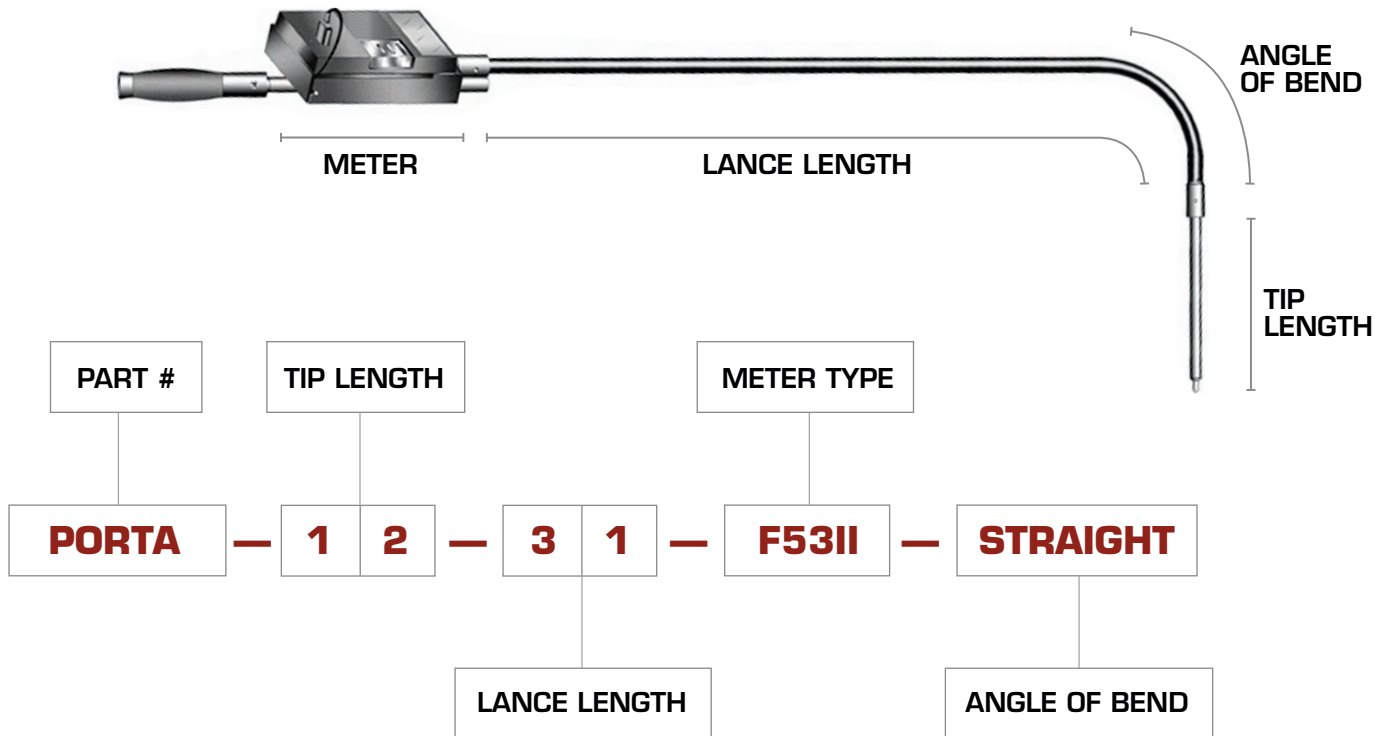
SIZE/WEIGHT	GRIP OPTION	PART #
<b>120" / 3048 mm</b> Inches/Millimeters	Without Grip	LANCE-EX-120-45
<b>4.5 lbs / 2.0 kg</b> Pounds/Kilograms (Approx. Shipping Weight)	With Plastic Grip	LANCE-PGX-120-45
	With Aluminum Grip	LANCE-AGX-120-45

# MARSHALL PORTA-PROBE™



## ORDERING INFORMATION

Fill in each Ordering Number box with the appropriate specification code. This series of numbers and letters will form the final Ordering Number.



## THE ABOVE ORDERING NUMBER SPECIFIES A MARSHALL PORTA-PROBE:

PART #	TIP LENGTH	LANCE LENGTH	METER TYPE	ANGLE OF BEND
PORTA - Standard	8" - 8" / 203 mm	31" - 31" / 787 mm	F51II	90 - 90°
PORTA-Q - Quick Change	12" - 12" / 304 mm	43" - 43" / 1092 mm	F53II	45 - 45°
	15" - 15" / 381 mm	55" - 55" / 1397 mm		Straight - No Bend
	18" - 18" / 457 mm	72" - 72" / 1829 mm		* Custom Bend Available
	20" - 20" / 508 mm	96" - 96" / 2438 mm		
	24" - 24" / 610 mm	120" - 120" / 3048 mm		
	30" - 30" / 762 mm	• Custom Length Available		

# MARSHALL PORTA-PROBE™



**FLUKE METER 51 II**  
CANNOT DOWNLOAD  
TO COMPUTER

METER / ADAPTER BOX	PART #
Fluke Meter 51 II	Fluke51-II
Adapter Box Fluke 51 II	Adapter-Fluke-II
Adapter Box Fluke 51	Adapter-Fluke-51
Adapter Box Quick Change	Adapter-Q



**FLUKE METER 53 II**  
COMPUTER DATA LOGGING,  
CAN DOWNLOAD TO COMPUTER

METER / ADAPTER BOX	PART #
Fluke Meter 53 II	Fluke53-II
Adapter Box Fluke 53 II	Adapter-Fluke-II

\* F53 is for single input and F54 is for dual input

# MARSHALL PORTA-PROBE Q™



**FLUKE METER 51 II**  
CANNOT DOWNLOAD  
TO COMPUTER

METER / ADAPTER BOX	PART #
Fluke Meter 51 II	Fluke51-II
Adapter Box Fluke 51 II	Adapter-Fluke-II
Adapter Box Fluke 51	Adapter-Fluke-51
Adapter Box Quick Change	Adapter-Q



**FLUKE METER 53 II**  
COMPUTER DATA LOGGING,  
CAN DOWNLOAD TO COMPUTER

METER / ADAPTER BOX	PART #
Fluke Meter 53 II	Fluke53-II
Adapter Box Fluke 53 II	Adapter-Fluke-II

\* F53 is for single input and F54 is for dual input

# –EXTENSION WIRES –GRIPS FOR LANCE –THERMOCOUPLE REPLACEMENT PARTS



## EXTENSION WIRE ASSEMBLIES IN METAL CONDUIT WITH FITTING FOR PLASTIC OR ALUMINUM GRIP

LENGTH	PLASTIC GRIP PART #	ALUMINUM GRIP PART #	SHIPPING WEIGHT
40 inches	EXT-PGX-40	EXT-AGX-40	0.75 lbs
5 feet	EXT-PGX-60	EXT-AGX-60	1.00 lbs
8 feet	EXT-PGX-96	EXT-AGX-96	1.25 lbs
10 feet	EXT-PGX-120	EXT-AGX-120	1.25 lbs
15 feet	EXT-PGX-180	EXT-AGX-180	2.00 lbs
20 feet	EXT-PGX-240	EXT-AGX-240	2.50 lbs
25 feet	EXT-PGX-300	EXT-AGX-300	3.00 lbs
30 feet	EXT-PGX-360	EXT-AGX-360	3.50 lbs
Longer length available			

## GRIPS FOR LANCE

DESCRIPTION	PART #
Plastic Handle Grip (Below, left)	PGX
Aluminum Handle Grip (Below, right)	AGX



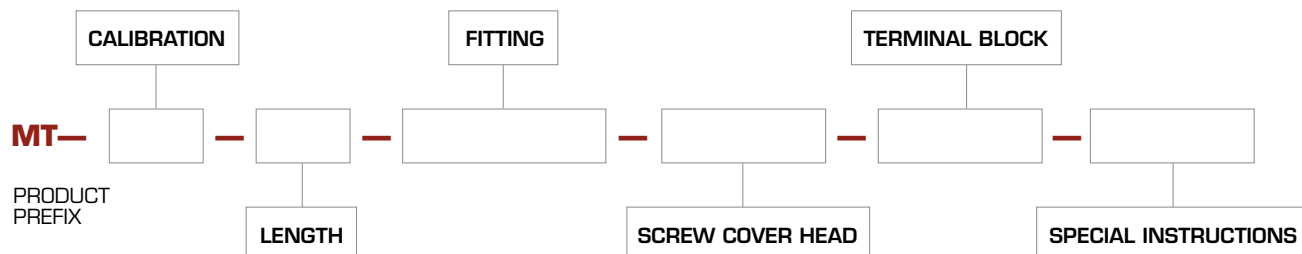
## THERMOCOUPLE REPLACEMENT PARTS

DESCRIPTION	PART #
Terminal Block, 501-AG OR 101-AG	103-TB
Alloy Screws for holding tip, pair	101-EX-2S
Lead wire spring	R-762-S
Lugs for lead wire ends, pair	R-762-LS-2
Lugs for extension wire ends, pair	R-762-LB-2
Anchor ferrule for plastic grip	PG-762-AF
Anchor ferrule for aluminum grip	R-762-AF
Lead wire small ferrules for plastic grip	PG-762-F
Flexible conduit, per foot	T-762-FC

# MT THERMOCOUPLE™ ACCESSORY ITEMS



## TERMINAL BLOCKS AND HEADS



## SPECIFICATIONS / CODES

CALIBRATION	LENGTH	FITTING	GENERAL PURPOSE & SCREW COVER HEADS	TERMINAL BLOCK	SPECIAL
<b>K</b> - Chromel Alumel <b>J</b> - Iron Constantan DUAL ELEMENT <b>KK</b> <b>JJ</b>	<b>8 inches</b> <b>12 inches</b> <b>15 inches</b> <b>18 inches</b> <b>20 inches</b> <b>24 inches</b> <b>30 inches</b> <b>36 inches</b>	<b>1212</b> - 0.50" x 0.50" <b>3434</b> - 0.75" x 0.75" <b>1234</b> - 0.50" x 0.70"	GENERAL PURPOSE HEADS <b>GPH</b> SCREW COVER HEADS <b>SCH</b>	<b>GTB</b> - Terminal Block for General Purpose Head <b>STB</b> - Terminal Block for Screw Cover Head DUAL ELEMENT <b>GTBB</b> <b>STBB</b>	<b>Blank</b> - None

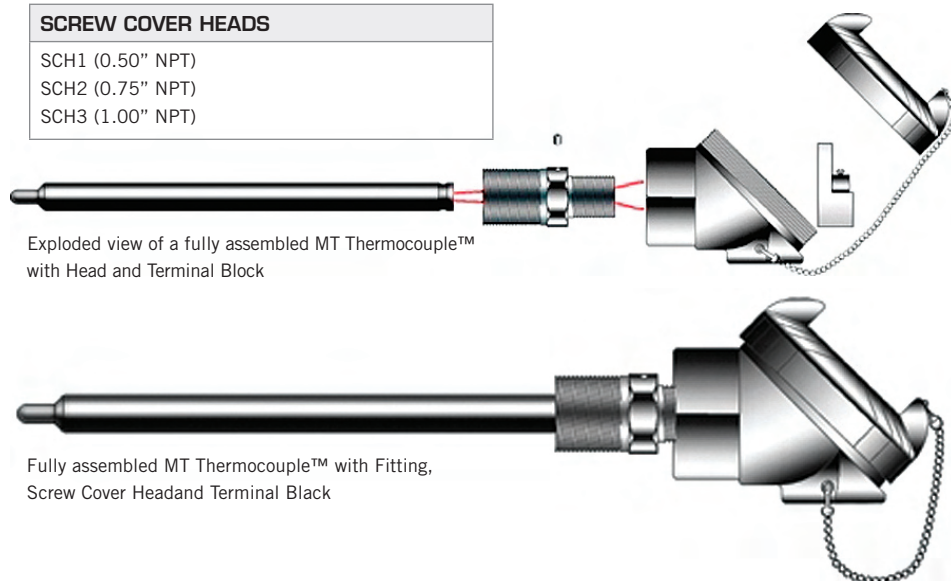
## TERMINAL BLOCKS AND HEADS

TERMINAL BLOCKS
<b>GTB</b> - Terminal Block for General Purpose Head <b>STB</b> - Terminal Block for Screw Cover Head <b>GTBB</b> - Dual Element Terminal Block for General Purpose Head <b>STBB</b> - Dual Element Terminal Block for Screw Cover Head

FITTINGS
<b>1212</b> - Hex Pipe Nipple 0.50" x 0.50" CAT <b>3434</b> - Hex Pipe Nipple 0.75" x 0.75" CAT <b>1234</b> - Hex Pipe Nipple 0.50" x 0.75" CAT

GENERAL PURPOSE HEADS
<b>GPH1</b> (0.50" NPT) <b>GPH2</b> (0.75" NPT) <b>GPH3</b> (1.00" NPT)

SCREW COVER HEADS
<b>SCH1</b> (0.50" NPT) <b>SCH2</b> (0.75" NPT) <b>SCH3</b> (1.00" NPT)



**L.H. Marshall Company** 270 W. Lane Avenue, Columbus, OH 43201 USA

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# THERMOCOUPLES

## THERMOCOUPLES

The L.H. Marshall Company invented and patented the enclosed tip Thermocouple™ over 80 years ago. Over 10 million Marshall Thermocouples have been sold worldwide for precision temperature measurement. Marshall Thermocouples are reusable, durable, accurate and are a quality product engineered to meet the industry standards for temperature measurement of molten metals.

Scientific research and development at one of America's leading research facilities has led to innovations in steel composition of the Marshall protection tubes resulting in the longest lasting, multiuse thermocouple in the industry.

All Marshall Thermocouples are manufactured with Class 1, Special Limits wire which meet and exceed international quality standards of ANSI MC96.1 and IEC 584. Custom Marshall Thermocouples can be made to accommodate any range of industrial need while maintaining superior quality. Calibration certificates are available on Marshall Thermocouples and all products produced by the L.H. Marshall Company are 100% guaranteed.

# NOBLE METAL THERMOCOUPLES/ NOBLE METAL ELEMENTS

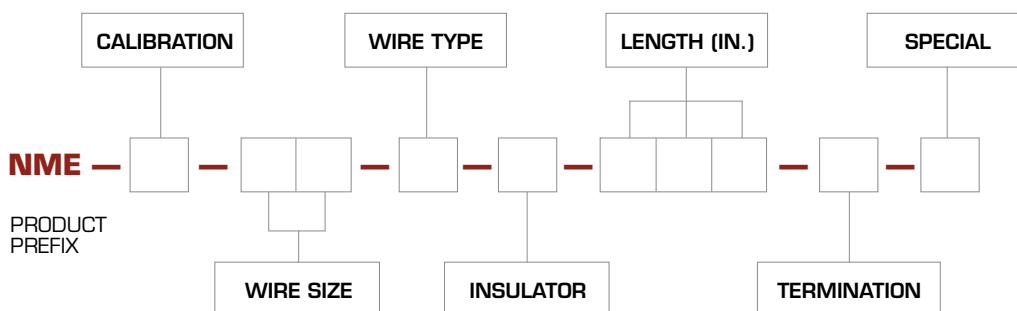


## NOBLE METAL THERMOCOUPLES

Noble Metal Thermocouples are available in a wide variety of configurations. Once a specific application is identified, the thermocouple can be built to order for peak performance. Available in single- or multi-point assemblies, this series of products will perform well in applications of extreme temperatures, as high as 4200°F. For information on material selection parameters for Protection Tubes and other components, please refer to the appropriate pages.

## NOBLE METAL ELEMENTS (NME)

L.H. Marshall Company offers individual platinum elements in Standard, Reference, Fibro and Certified materials, as well as all components for full assemblies. Types S and R are suitable for high temperatures of up to 3000°F for short periods, or 2700°F continuously. Type B is recommended for use in temperatures as high as 3100°F, while a Tungsten-5% Rhenium-Tungsten-26% Rhenium thermocouple is capable of up to 4200°F operating temperature. Platinel II is suitable to 2300°F. Use Specification Codes below to assemble a complete Ordering Number.



## SPECIFICATIONS / CODES

CALIBRATION	WIRE SIZE	WIRE TYPE	INSULATOR	LENGTH	TERMINATION	SPECIAL
<b>S</b> - Plt-Plt 10% Rh	<b>30</b> - .010	<b>1</b> - Standard	<b>1</b> - Bare	Specify from 000" to 999"	<b>1</b> - Copper Tips	<b>0</b> - None
<b>28</b> - .013			<b>2</b> - .125 OD Mullite		<b>2</b> - Knife Clips/Glass Sleeveing	<b>C</b> - Lot Certification
<b>R</b> - Plt-Plt 13% Rh	<b>27</b> - .014	<b>2</b> - Reference Grade	<b>4</b> - .187 OD Mullite		<b>3</b> - Fish Spine Beads Only	<b>D</b> - Dual Element
			<b>A</b> - .187 OD Mullite w/Collar		<b>4</b> - Fish Spine Beads/CU Tips	<b>E</b> - Individual Certification
<b>B</b> - Plt 6% Rh-Plt 30% Rh	<b>26</b> - .016	<b>3</b> - Fibro Grade	<b>E</b> - .200 OD Mullite		<b>5</b> - Fiber Glass Sleeve Only	<b>X</b> - Special (Consult Factory)
<b>24</b> - .020			<b>G</b> - .200 OD Mullite w/Collar		<b>6</b> - Bare Ends Only	
<b>C</b> - W 5% Re-W 26% Re	<b>27</b> - .014		<b>6</b> - .250 OD Mullite		<b>7</b> - Mini Plug w/Tube Adapter	
			<b>C</b> - .250 OD Mullite w/Collar		<b>8</b> - Mini Plug w/Cable Clamps	
<b>F</b> - Platinel	<b>22</b> - .025		<b>3</b> - .125 OD Alumina		<b>A</b> - SHX Alumina Plug	
	<b>21</b> - .028		<b>5</b> - .187 OD Alumina		<b>B</b> - NHX Alumina Plug	
<b>G</b> - Gold	<b>20</b> - .032		<b>B</b> - .187 OD Alumina w/Collar		<b>H</b> - Hi-Temp. Mini Plug	
			<b>F</b> - .200 OD Alumina		<b>P</b> - Hi-Temp. Plug w/Tube Adapter	
<b>L</b> - Silver	<b>18</b> - .040		<b>H</b> - .200 OD Alumina w/Collar		<b>G</b> - Male Plug (400 deg) Tube Adapter	
	<b>15</b> - .060		<b>7</b> - .250 OD Alumina		<b>J</b> - Hi-Temp Jack/Tube Adapter	
	<b>14</b> - .064		<b>D</b> - .250 OD Alumina w/Collar			
	<b>XX</b> - Other		<b>S</b> - 1/16" OD Spaghetti			
			<b>9</b> - 1/16" OD Alumina Ins.			
			<b>8</b> - .150 OD x 1" Alumina			
			<b>M</b> - .156 Alumina w/Collar			
			<b>T</b> - Ceramic Braid-Twist			
			<b>U</b> - Special Insulator			

## EXAMPLE ORDERING NUMBER

IMAGE GOES HERE

Type S, .020" dia. wire size, standard grade thermocouple wire type, in a 3/16" mullite with collar, fish spine beads with copper tips, 18" length.

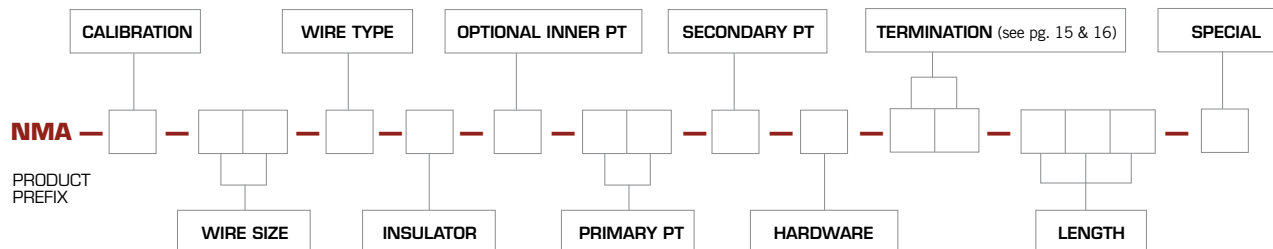
**NME** — **S** — **24** — **1** — **A** — **018** — **4** — **0**

# NOBLE METAL THERMOCOUPLES/ NOBLE METAL ASSEMBLIES



## NOBLE METAL ASSEMBLIES (NMA)

L.H. Marshall Company manufactures a complete line of standard, high temperature thermocouples. A variety of configurations are available to meet rigorous, high temperature applications. Wire calibration and gauge, as well as all components, should be carefully chosen to provide optimum performance in every application. Use the Specification Codes below to assemble a complete Ordering Number, or consult L.H. Marshall for assistance.



## SPECIFICATIONS / CODES

CALIBRATION	WIRE SIZE	WIRE TYPE	INSULATOR	OPTIONAL INNER P/T	PRIMARY P/T
<b>S</b> - Plt-Plt 10% Rh <b>R</b> - Plt-Plt 13% Rh <b>B</b> - Plt 6% Rh-Plt 30% Rh <b>C</b> - W 5% Re-W 26% Re <b>F</b> - PlatineL <b>G</b> - Gold <b>L</b> - Silver	<b>30</b> - .010 <b>28</b> - .013 <b>27</b> - .014 <b>26</b> - .016 <b>24</b> - .020 <b>27</b> - .014 <b>22</b> - .025 <b>21</b> - .028 <b>20</b> - .032 <b>18</b> - .040 <b>15</b> - .060 <b>14</b> - .064 <b>XX</b> - Other	<b>1</b> - Standard <b>2</b> - Reference Grade <b>3</b> - Fibro Grade	<b>2</b> - .125 OD Mullite <b>4</b> - .187 OD Mullite <b>A</b> - .187 OD Mullite w/Collar <b>6</b> - .250 OD Mullite <b>C</b> - .250 OD Mullite w/Collar <b>3</b> - .125 OD Alumina <b>5</b> - .187 OD Alumina <b>B</b> - .187 OD Alumina w/Collar <b>7</b> - .250 OD Alumina <b>D</b> - .250 OD Alumina w/Collar <b>E</b> - 1/16" OD Spaghetti <b>U</b> - Special Insulator <b>M</b> - .156 Alumina w/Collar <b>N</b> - .200 Alumina	<b>0</b> - No Inner Tube <b>3</b> - 5mm x 7mm Mullite <b>1</b> - 1/4" x 3/8" Mullite <b>4</b> - 5mm x 7mm Alumina <b>2</b> - 1/4" x 3/8" Alumina <b>5</b> - 5mm x 8mm Alumina <b>6</b> - 3/16" x 1/4" Alumina	<b>M9</b> - 1/8" x 3/16" OD Mullite <b>M2</b> - 3/16" x 1/4" OD Mullite <b>M5</b> - 5mm x 7mm Mullite <b>M8</b> - 1/4" x 3/8" OD Mullite <b>M3</b> - 3/8" x 1/2" OD Mullite <b>M6</b> - 7/16" x 11/16" OD Mullite <b>MF</b> - 11/16" Mullite 3/4 Hex 3/4 SS <b>MH</b> - 11/16" Mullite w/1/2 x 3/4 Ftg. <b>MN</b> - 11/16" Mullite w/3/4 Nipple <b>MS</b> - 11/16" Mullite w/356 Slv. <b>M4</b> - 1/2" x 3/4" OD Mullite <b>M1</b> - 3/4" x 1" OD Mullite <b>M7</b> - 1" x 1-1/4" Mullite <b>A9</b> - 1/8" x 3/16" OD Alumina <b>A2</b> - 3/16" x 1/4" OD Alumina <b>A0</b> - 3/16" x 5/16" OD Alumina <b>A5</b> - 5mm x 7mm Alumina <b>A8</b> - 1/4" x 3/8" OD Alumina <b>AA</b> - 5/16" x 7/16" Alumina <b>A3</b> - 3/8" x 1/2" OD Alumina <b>A6</b> - 7/16" x 11/16" OD Alumina <b>AF</b> - 11/16" Alumina 3/4 Hex 3/4 SS <b>AH</b> - 11/16" Alumina w/1/2 x 3/4 Ftg. <b>AN</b> - 11/16" Alumina w/3/4 Nipple <b>AS</b> - 11/16" Alumina w/356 Slv. <b>A4</b> - 1/2" x 3/4" OD Alumina <b>A1</b> - 3/4" x 1" OD Alumina <b>A7</b> - 1" x 1-1/4" Alumina <b>I4</b> - 1/4" OD Inconel Tubing <b>I5</b> - 3/16" OD Inconel Tubing <b>H3</b> - Hexaloy <b>HM</b> - 3/8" x 11/16" Halcis "R" <b>HL</b> - 5/16" x 5/8" Halcis "R"
SECONDARY P/T	HARDWARE	LENGTH (INCHES)	SPECIAL		
<b>0</b> - No Secondary <b>2</b> - Silicon Carbide w/o Collar <b>3</b> - 1/2" NPT Inconel <b>4</b> - 3/4" NPT Inconel <b>5</b> - 1" NPT Inconel <b>6</b> - 1/4" x 3/8" Mullite <b>7</b> - 7/16" x 11/16" Mullite <b>8</b> - 1/2" x 3/4" Mullite <b>9</b> - 3/4" x 1" Mullite <b>A</b> - 1" x 1-1/4" Mullite <b>B</b> - 1/4" x 3/8" Alumina <b>C</b> - 7/16" x 11/16" Alumina <b>D</b> - 1/2" x 3/4" Alumina <b>E</b> - 3/4" x 1" Alumina <b>F</b> - 1" x 1-1/4" Alumina <b>G</b> - LT-1 Metal Ceramic <b>H</b> - 1/4" NPT Inconel <b>J</b> - 1/2" 446SS <b>K</b> - 3/4" 309 <b>L</b> - 3/4" NPT 310SS <b>S</b> - Silicon Carbide w/Collar <b>T</b> - 3/4" 253 Alloy <b>U</b> - 3/8" NPT Inconel <b>W</b> - 1/2" 253 Alloy <b>X</b> - 3/4" NPT 304	<b>0</b> - No Hardware <b>1</b> - Support Casting Assembly <b>2</b> - Weatherproof Cover <b>3</b> - 1" Coupling <b>4</b> - Adjustable Flange <b>5</b> - Split Flange <b>6</b> - St. Hex Bush/Alloy Sleeve <b>7</b> - Hex Bushing 1" NPT <b>8</b> - 3/4" Hex 3/4" Fitting <b>9</b> - 3/4" x 1" St. Hex Fitting <b>A</b> - Alloy Sleeve <b>B</b> - 1/2" X Close Nipple <b>C</b> - Close Nipple <b>E</b> - Hex Bushing, 3/4" NPT <b>F</b> - W/P Cover w/Flange <b>H</b> - 1/2" Hex 1/2" Fitting <b>P</b> - 3/4" x 1-1/4" Hex Bushing <b>Q</b> - 1" x 1-1/2" Hex Bushing <b>R</b> - 1/2" x 3/4" St. Hex Fitting <b>T</b> - Tapered Plug <b>W</b> - 1-1/2" Hex Bushing <b>X</b> - 1/2" NPT Hex Bushing	Specify from 000" to 999"	<b>0</b> - None <b>C</b> - Lot Certification (Std.) <b>D</b> - Dual Element <b>E</b> - Individual Certification <b>F</b> - Evacuate & Backfill <b>H</b> - Effective Length <b>X</b> - Special (Consult Factory)		

## PLATINUM THERMOCOUPLE ASSEMBLIES WITH GENERIC DESCRIPTION AND ORDERING NUMBER

IMAGE GOES HERE

Type S, .020" dia. assembly 7/16" x 11/16" Alumina tube, 356 brass sleeve, open terminal head, 18" long.

NMA - S - 24 - 1 - 2 - 0 - A S - 0 - 0 - B 1 - 0 1 8 - 0

IMAGE GOES HERE

Type R, .020" dia. assembly 7/16" x 11/16" Alumina primary tube with 1/2 x 3/4 steel fitting inside a silicon carbide tube with a weatherproof cover and cast iron head, 24" long.

NMA - S - 24 - 1 - 2 - 0 - A S - 0 - 0 - B 1 - 0 1 8 - 0

# BASE METAL ELEMENTS



## BASE METAL ELEMENTS (BME)

L.H. Marshall Company offers individual elements in standard and special limits material, as well as components or full assemblies.

**Type K** - Due to its reliability and accuracy, Type K is used extensively at temperatures of up to 2300°F. It is good practice to always protect this type of thermocouple with a suitable metal or ceramic protection tube, especially in reducing atmospheres. In oxidizing atmospheres and when other conditions are suitable, tube protection is not always necessary; however, protection is recommended for cleanliness and general mechanical protection. Recommended temperature range is 32°F to 2300°F.

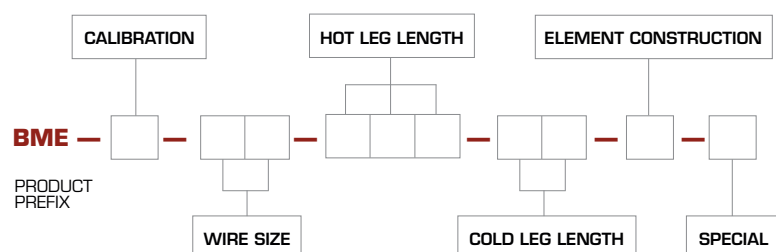
**Type J** - This element may be used, protected or unprotected, where there is a deficiency of free oxygen. To maintain cleanliness and generally longer life, a protection tube is recommended. Because Type J wire will oxidize rapidly at temperatures over 1000°F, it is recommended that larger gauge wire be used to compensate. Recommended temperature range is 32°F to 1400°F.

**Type T** - Useable in oxidizing, reducing or inert atmospheres, as well as vacuum applications. Not subject to corrosion in moist atmospheres. Recommended temperature is 328°F to 662°F, but can be used to -425°F.

**Type E** - This thermocouple is suitable for use in temperatures up to 1652°F in a vacuum, inert, mildly oxidizing or reducing atmosphere. Recommended temperature range is 32°F to 1600°F.

**Type N** - This thermocouple is used primarily at high temperatures of up to 2300°F.

To order an element, use Specification Codes below to assemble a complete Ordering Number.



## TWO BASIC HOT JUNCTION STYLES

TWIST WELD  
STANDARD

IMAGE GOES HERE

BUTT WELD  
OPTIONAL

IMAGE GOES HERE

## SPECIFICATIONS / CODES

CALIBRATION	WIRE SIZE	HOT LEG LENGTH	COLD LEG LENGTH	ELEMENT CONSTRUCTION	SPECIAL
<b>K</b> - Chromel-Alumel <b>J</b> - Iron-Constantan <b>T</b> - Copper-Constantan <b>E</b> - Chromel-Constantan <b>N</b> - Nicrosil-Nisil <b>M</b> - Ni-Ni Moly	<b>8</b> - 8 AWG <b>11</b> - 11 AWG <b>14</b> - 14 AWG <b>16</b> - 16 AWG <b>18</b> - 18 AWG <b>20</b> - 20 AWG <b>22</b> - 22 AWG <b>24</b> - 24 AWG <b>30</b> - 30 AWG	Specify from 000" to 999"	Specify from 00" to 99"	<b>A</b> - Straight SGL Element Insul. <b>C</b> - 90° Angle Element w/Insul. <b>D</b> - Bare Wire Element <b>F</b> - Straight Dual Element w/Insul. <b>G</b> - Angle Dual Element w/Insul. <b>H</b> - SGL One-Hole Ins Per Wire <b>S</b> - E-808-1 Ins	<b>O</b> - None <b>B</b> - Butt Weld <b>C</b> - Lot Certification <b>D</b> - Dual Element <b>E</b> - Individual Certification <b>X</b> - Special (Consult Factory)

## ELEMENT EXAMPLES WITH GENERIC DESCRIPTION AND ORDERING NUMBER

IMAGE GOES HERE

Base Metal Element Type K standard 8 ga. 24"L straight, single element, two-hole oval insulators.

BME - K - 08 - 024 - 00 - A - 0

IMAGE GOES HERE

Base Metal Element Type K standard 8 ga. 12"L hot leg, 18"L cold leg, 90° angle single element, two-hole oval insulators.

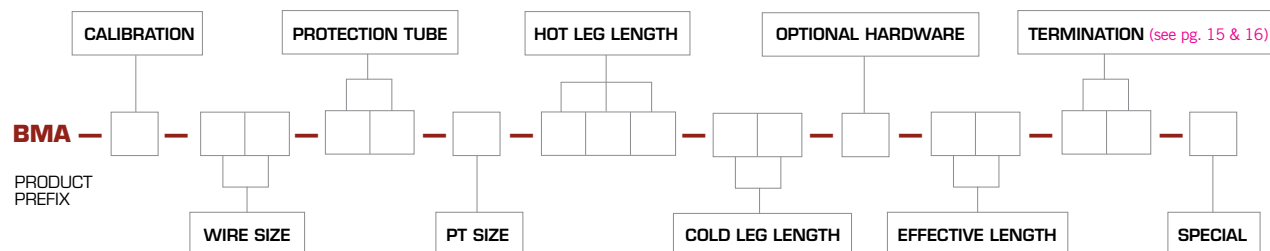
BME - K - 08 - 012 - 18 - C - 0

# BASE METAL ASSEMBLIES



## BASE METAL ASSEMBLIES (BMA)

Industrial base metal thermocouple assemblies are designed to be used in the most severe and demanding environments. The choice of a specific style is, to a large degree, determined by the temperature working range, ambient atmospheric or media conditions and the size and shape required for the application. Control requirements such as accuracy and speed of response may also be considerations.



## SPECIFICATIONS / CODES

CALIBRATION	WIRE SIZE	PROTECTION TUBE	P/T SIZE	HOT LEG LENGTH	COLD LEG LENGTH	OPTIONAL HARDWARE	IMMERSION LENGTH	SPECIAL
J - Iron-Constantan K - Chromel-Alumel T - Copper-Constantan E - Chromel-Constantan N - Nicrosil-Nisil M - Ni-Ni Moly**	08 - 8 AWG 11 - 11 AWG 14 - 14 AWG 16 - 16 AWG 18 - 18 AWG 20 - 20 AWG 22 - 22 AWG 24 - 24 AWG 30 - 30 AWG	15 - 446 SS 16 - Pure Nickel 17 - Inconel 18 - 304 SS 19 - 310 SS 20 - 316 SS 21 - Silicon Carbide 22 - Mullite 23 - Alumina 24 - Metal Ceramic 25 - Carbon Steel 26 - Tercod 27 - Cast Alloy 28 - Cast-Iron w/Tap 29 - 330 SS 30 - Hexalloy 31 - Cast-T 32 - Refractory Coated 33 - Incoloy 800 34 - Hastelloy C 276	A - 1/4" NPT B - 1/2" NPT C - 3/4" NPT D - 1" NPT E - 1-3/4" OD F - 3/8" OD G - 11/16" OD H - 3/4" OD I - 7/8" OD J - 1" OD K - 1/8" NPT L - 3/8" NPT M - 1/2" OD N - 7mm P - 1/4" OD	Specify from 00" to 99"	Specify from 00" to 99"	0 - None A - Adjustable Flange B - 1/4" NPT Fix Hex St.Mt.Bush C - 1/2" NPT Fix Hex St.Mt.Bush D - 3/4" NPT Fix Hex St.Mt.Bush E - 1" NPT Fix Hex St.Mt.Bush F - 1-1/4" NPT Fix Hex St.Mt.Bush G - 1-1/2" NPT Fix Hex St.Mt.Bush H - 1/4" NPT Fix Hex St.St. J - 1/2" NPT Fix Hex St.St. K - 3/4" NPT Fix Hex St.St. L - 1" NPT Fix Hex St.St. M - 1-1/4" NPT Fix Hex St.St. N - 1-1/2" NPT Fix Hex St.St. P - Hot Junction Cup Q - Tapered Plug R - 1/2" x 3/4" St. Hex Fitting S - 3/4" x 1" St. Hex Fitting T - 6" Alloy Sleeve U - 6" Carbon Steel Sleeve W - 1/2" -Hex-1/2" Y - 3/4" -Hex-3/4" Z - 3/4" x 1-1/4" Hex Fitting 3 - 3/4" x 1-1/2" Hex Fitting 2 - 3/4" x Close Nipple	Specify from 00" to 99"	0 - None B - Open Both Ends C - Lot Certification D - Dual Element E - Individual Certification H - SCH 80 X - Special (Consult Factory)

## EXAMPLE ORDERING NUMBERS

IMAGE GOES HERE

Base Metal Assembly, Type K standard 8 ga., Inconel PT 3/4" NPT, 24"L w/1" NPT bushing for 18" immersion, 3/4" snap cover head.

BMA - K - 08 - 17 - C - 024 - 00 - E - 18 - S4 - 0

IMAGE GOES HERE

Base Metal Assembly, Type K standard 8 ga., pure nickel protection tube, 3/4" NPT, hot leg 12"L cold leg 24"L w/ 3/4" cast iron head.

BMA - K - 08 - 16 - C - 012 - 24 - 0 - 00 - C4 - 0

# MAGNESIUM OXIDE INSULATED THERMOCOUPLES



## MAGNESIUM OXIDE (MGO) INSULATED THERMOCOUPLES

An MgO Thermocouple is recommended for high moisture, liquid, high pressure and corrosive environments. This style offers high dielectric strength, durability, quick response to temperature fluctuations, and malleability. The uniform thickness of thermocouple wires insulated with magnesium oxide creates a mechanically strong, corrosion and moisture resistant sensor.

## SPECIFICATIONS

**Insulation Purity** - MgO (magnesium oxide) densely packed High Purity 99.4% MgO is used with Types K, R and S, Inconel Sheathing. All others are Standard Purity 96% MgO.

**Minimum Bend Diameter** - Two times the outside diameter of the sheath.

## CONTINUOUS MAXIMUM TEMPERATURE RATINGS OF SHEATH IN OXIDIZING ATMOSPHERES\*

**304SS:** Up to 1650°F - good corrosion characteristics and resistance to oxidation, generally regarded as a standard sheath material.

**Inconel 600:** Up to 1650°F - good high temperature resistance to corrosion, not suitable for use in presence of sulfur above 1000°F.

**316SS:** Up to 1700°F - has excellent acid corrosion resistance; highly resistant to pitting type corrosion.

**310SS:** Up to 2100°F - good resistance to oxidation and corrosion at high temperatures.

\*Not necessarily a recommended temperature. Sheath wall thickness, contaminants, abrasion and erosion must be considered.

## TIME CONSTANTS

The time required for a thermocouple to indicate 63.2% of a step change in temperature in a surrounding media is the time constant. Several factors influence the measured time constant, such as the degree of insulation compaction, sheath wall thickness and distance of junction from the welded cap on the ungrounded style. These factors, as well as the velocity of liquid or mass past the thermocouple probe, affect the time constant.

TIME CONSTANTS/SECOND			
SHEATH DIAMETER (INCHES)	GROUNDING JUNCTION	UNGROUNDING JUNCTION	EXPOSED JUNCTION
0.040	0.2	0.7	0.1
0.063	0.3	0.8	0.2
0.125	0.5	1.3	0.3
0.188	1.0	2.5	0.5
0.250	2.3	4.3	0.6

## JUNCTION CONSTRUCTION

**Grounded** - Thermocouple welded to the sheath. Fast response with thermocouple protected.

**Ungrounded (Insulated)** - Thermocouple insulated from sheath with magnesium oxide. Stray EMF's are prevented from affecting the reading. Response from rapid or frequent temperature cycling is slower than for grounded style.

**Exposed** - Thermocouple junction is not protected by welded cap. Used for quick response, but is susceptible to early corrosive failure.

**Dual Element Common** - Two thermocouples with junctions welded together.

**Dual Element Isolated (Standard)** - Two thermocouples electrically separate in the same sheath, provides isolation where instrumentation necessitates.

## EXAMPLE ORDERING NUMBERS

IMAGE GOES HERE

This is a Type K Inconel sheath, 1/8" diameter, ungrounded junction, 24" long, with tube adapter and plug. 1/4" NPT stainless steel adjustable compression fitting.

MGO - K - 2 - 4 - U - 0 2 4 - 0 - 0 0 0 - F - 0 0 - 0 4 - 0

IMAGE GOES HERE

This is a Type K 316 stainless steel sheath, 3/16" diameter, ungrounded junction, 12" long transition fitting to 6" glass/glass extension wire with 1" strip 1/8" stainless steel adjustable compression fitting.

MGO - K - 3 - 5 - U - 0 1 2 - 1 - 0 0 6 - E - 0 0 - 1 S - 0

# MAGNESIUM OXIDE INSULATED THERMOCOUPLES



TO ORDER, USE SPECIFICATION CODES BELOW TO ASSEMBLE A COMPLETE ORDERING NUMBER.

CALIBRATION	SHEATH DIAMETER	X-DIMENSION*	Y-DIMENSION**	IMMERSION LENGTH	SPECIAL
MgO					
PRODUCT PREFIX	SHEATH MATERIAL	JUNCTION STYLE	TRANSITION STYLE	PROCESS MOUNT	COLD END TERMINATION (see pg. 15 & 16)

\*X-Dimension is the measurement from the tip of the thermocouple to beginning of termination (length of metal sheath).

\*\* Y-Dimension is the measurement from the beginning of the transition fitting to the end of the wire (transition style only).

## SPECIFICATIONS / CODES

CALIBRATION	SHEATH MATERIAL	SHEATH DIAMETER	JUNCTION CONSTRUCTION	X-DIMENSION (INCHES)	TRANSITION STYLE			
J - Iron-Constantan K - Chromel-Alumel E - Chromel-Constantan T - Copper-Constantan N - Nicrosil-Nisil S - Plt - Plt 10% Rh B - Plt 6% Rh- Plt 30% Rh C - W 5% Re- W 26% Re G - W 3% Re- W 25% Re P - Plt 40% Rh- Plt 20% Rh W - W - W/26% Re M - Ni/Ni Moly	1 - 304SS 2 - Inconel 600 3 - 316SS 4 - 310SS 5 - 446SS 6 - Tantalum 7 - Molybdenum 8 - Inconel 601 9 - Nicrobell A - Hast C-22 H - 2300 P - Plt 10% Rh T - Plt 20% Rh G - 347SS Q - Pure Platinum E - Super Omega Clad	1 - .032 2 - .040 3 - .063 (1/16") 4 - .125 (1/8") 5 - .188 (3/16") 6 - .250 (1/4") 7 - .315 (5/16") 8 - .375 (3/8") 9 - .500 (1/2") M - .090 F - .020 E - .010 L - .750 (3/4") C - .013 H - .025	G - Grounded Junction U - Ungrounded Junction E - Exposed Junction H - Spcl Half Exposed Junction S - Squared Tip-Grounded Junction A - 45 Deg Angle Tip-Grounded Junction	Specify from .000" to .999"	0 - No Trans Flex Lead Wire 1 - Fiberglass Covered 2 - Fiberglass w/Flex ArmCov 3 - Fiberglass w/SS Ovrbrd 4 - Polyvinyl Plastic 5 - Teflon Insulation 6 - Teflon w/SS Ovrbrd 7 - Hitemp Glass w/SS Ovrbrd 8 - Teflon Insul/No Trans Body 9 - Teflon w/Flex Armor M - Hitemp Glass Insulation Std Temp Trans (400°F) C - PVC Coil Cord F - PVC Insulation w/Flex Armor Std Temp Trans (400°F) K - Kapton Insulation Std Temp Trans (400°F) A - Fibre-Glass Insulation Hi Temp Trans (1000°F) B - Fibre-Glass w/Flex Armor Hi Temp Trans (1000°F) D - Fibre-Glass w/SSOB Hi Temp Trans (1000°F) E - Hi Temp Glass w/SSOB Hi Temp Trans (1000°F) G - Hi Temp Glass w/Flex Armor Hi Temp Trans (1000°F) H - Butt-Welded Leads-Varflex-No Trans Ftg. L - Hi Temp Glass Hi Temp Trans (1000°F)			
Y-DIMENSION (INCHES)	PROCESS MOUNTING DEVICE			IMMERSION LENGTH (INCHES)	SPECIAL			
Specify from .000" to .999"	<div>0 - None 1 - SS 1/2-Hex-1/2" NPT Bushing 2 - SS 3/4-Hex-3/4" NPT Bushing 3 - CS 1/2-Hex-1/2" NPT Bushing 4 - CS 3/4-Hex-3/4" NPT Bushing 5 - Hex Proc Mtg Ftg-1/8" NPT 6 - Hex Proc Mtg Ftg-1/4" NPT 7 - Hex Proc Mtg Ftg-3/8" NPT 8 - Hex Proc Mtg Ftg-1/2" NPT 9 - Hex Proc Mtg Ftg-3/4" NPT A - BR Adj Comp Ftg-1/8" NPT B - BR Adj Comp Ftg-1/4" NPT C - BR Adj Comp Ftg-3/8" NPT D - BR Adj Comp Ftg-1/2" NPT E - SS Adj Comp Ftg-1/8" NPT F - SS Adj Comp Ftg-1/4" NPT G - SS Adj Comp Ftg-3/8" NPT H - SS Adj Comp Ftg-1/2" NPT I - CS Adj Comp Ftg-1/8" NPT J - CS Adj Comp Ftg-1/4" NPT K - CS Adj Comp Ftg-3/8" NPT L - CS Adj Comp Ftg-1/2" NPT M - BR Re-Adj Comp Ftg-1/8" NPT N - BR Re-Adj Comp Ftg-1/4" NPT P - BR Re-Adj Comp Ftg-3/8" NPT Q - BR Re-Adj Comp Ftg-1/2" NPT R - SS Re-Adj Comp Ftg-1/8" NPT S - SS Re-Adj Comp Ftg-1/4" NPT T - SS Re-Adj Comp Ftg-3/8" NPT U - SS Re-Adj Comp Ftg-1/2" NPT V - CS Re-Adj Comp Ftg-1/8" NPT W - CS Re-Adj Comp Ftg-1/4" NPT X - CS Re-Adj Comp Ftg-3/8" NPT Y - CS Re-Adj Comp Ftg-1/2" NPT Z - 1/2-Hex-1/2 S.L. Bushing</div>			BR - Brass CS - Carbon Steel SS - Stainless Steel Comp - Compression Fitting Mtg - Fixed Mounting Fitting	Specify from .00" to .99"	0 - None C - Lot Certification D - Dual Element E - Individual Cert F - Evac & Backfill L - Low Drift / Lot Certified W - Weld Pad X - Special (Consult Factory)		
IMAGE GOES HERE				HOT/MEASURING JUNCTION TYPES				
				(G) GROUNDED JUNCTION Welded to form a completely sealed integral junction, the G junction component is recommended in presence of liquids, moisture, gas, or high pressure.				
				(U) UNGROUNDED JUNCTION Fully insulated from the welded sheath end, this junction is excellent for applications where stray EMF's would affect the reading and for rapid or frequent temperature cycling.				
IMAGE GOES HERE			(E) EXPOSED JUNCTION Exposed Junction thermocouple wires are butt welded with insulation sealed against liquid or gas penetration. This component provides the fastest response time, but is unprotected against corrosive or mechanical damage.					

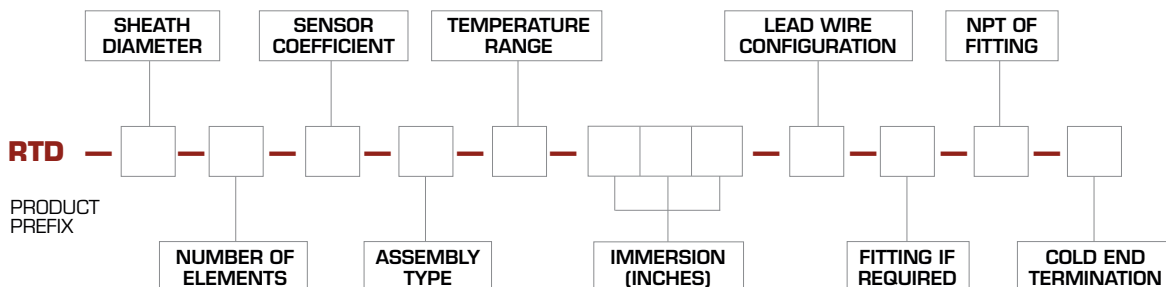
# RESISTANCE TEMPERATURE DETECTORS



## RESISTANCE TEMPERATURE DETECTORS (RTD)

100 Ohm Platinum Temperature Detectors are temperature sensing devices used to measure resistance changes. The resistance properties of these metals increase with temperature in a known and repeatable manner. RTD sensing elements are also available in copper, nickel and nickel-iron wire.

TO ORDER, USE SPECIFICATION CODES BELOW TO ASSEMBLE A COMPLETE ORDERING NUMBER.



## SPECIFICATIONS / CODES

SHEATH DIAMETER (OD)	NUMBER OF ELEMENTS		SENSOR COEFFICIENT		ASSEMBLY TYPE
1 - .125" 2 - .188" 3 - .250" 4 - .313" 5 - .375"	D - Dual S - Single		D - .00385 OHMS/OHM/Deg C A - .00392 OHMS/OHM/Deg C B - .00385 Degussa		G - General Purpose Stem Sensitive S - Spring Loaded for Standard Head E - Spring Loaded for Explosion Proof X - Exp Tip Resp Dry Air/Gas
TEMPERATURE RANGE	IMMERSION (INCHES)	LEAD WIRE CONFIGURATION	FITTING IF REQUIRED	NPT OF FITTING	COLD END TERMINATION
S - 350 to +500°F H - 320 to +1700°F	Specify from 00" to 99"	2 - 2 Wire 3 - 3 Wire 4 - 4 Wire 6 - 6 Dual 3 Wire 8 - 8 Dual 4 Wire	0 - None 1 - Hex Nipple 2 - Hex Bushing (Proc Connect) 3 - Hex Bushing (Head Connect) 4 - Adj Stainless 5 - Hex Nipple Oil Seal 6 - Hex Nipple Spring Loaded 7 - Bayonet Spring Loaded 8 - With Spring 9 - 1/2" x 5" Galvanized Nipple	0 - None A - 1/8" B - 1/4" C - 1/2" D - 3/4" E - 1/4" x 1/2" F - 3/4" x 1/2" G - 1" x 1/2"	0 - 6" Leads w/Strip A - Std Cast Iron Head B - Std Cast Aluminum Head C - Explosion Proof Head D - Miniature Polypropylene E - Assy. w/Flex Armor Lead F - Assy. w/SS Overbraid Leads G - 3 Pin Plug H - Epoxy Coated Aluminum X - Special P - Std Polypropylene Head

## EXAMPLE ORDERING NUMBER

RTD — 2 — S — A — S — H — 0 2 4 — 3 — 6 — C — 0

3/16" OD x 24" length 100 ohm Pt RTD sensor, .00392 ohms/ohm deg. C. Coefficient, 1/2" NPT hex spring loaded nipple, 6" leads.

## COMMON RTD ASSEMBLY TYPES

Type G General Purpose

IMAGE GOES HERE

Type S Spring Loaded

IMAGE GOES HERE

## FITTINGS

1 Hex Nipple

IMAGE GOES HERE

2 Hex Bushing  
(Process Connection)

IMAGE GOES HERE

3 Hex Bushing  
(Head Connection)

IMAGE GOES HERE

4 Adjustable Stainless

IMAGE GOES HERE

5 Hex Nipple with Oil Seal

IMAGE GOES HERE

6 Hex Nipple Spring Loaded

IMAGE GOES HERE

7 Bayonet Spring Loaded

IMAGE GOES HERE

# THERMOCOUPLE TERMINATIONS



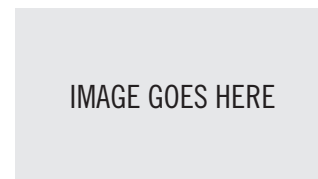
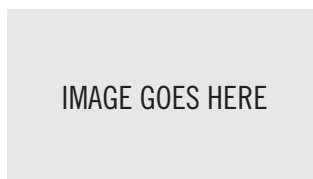
The Termination Specifications listed may be used in assembly Ordering Numbers for Noble, Base and MgO Thermocouples. Most may be ordered separately. Listed are the most common types. Consult the factory for other requirements you may have.

IMAGE GOES HERE	<b>Strip*</b> CODE: _____ "S" (Insert desired length in inches)	<b>High Temperature Male Plug (800°F)</b> CODE: <b>07</b> Standard Connect CODE: <b>23</b> Jab-in Style  <b>High Temperature Male Plug and High Temperature Female Jack (800°F)</b> CODE: <b>08</b> Standard Connect CODE: <b>24</b> Jab-in Style
IMAGE GOES HERE	<b>2-1/2" Strip with Spade Lugs*</b> CODE: <b>02</b>	<b>High Temperature Female Jack (800°F)</b> CODE: <b>09</b> Standard Connect CODE: <b>25</b> Jab-in Style
IMAGE GOES HERE	<b>BX Connect and Locknut</b> CODE: <b>03</b>	<b>High Temperature Male Mini Plug (800°F)</b> CODE: <b>HM</b> <b>Male Plug with Crimp Fitting (400°F)*</b> CODE: <b>CP</b>
IMAGE GOES HERE	<b>Male Plug (400°F)</b> CODE: <b>04</b> Standard Connect CODE: <b>20</b> Jab-in Style	<b>High Temperature Male Plug with Crimp Fitting (800°F)*</b> CODE: <b>CH</b>  <b>Solid Pin Male Plug (400°F)</b> CODE: <b>SP</b>
IMAGE GOES HERE	<b>Male Plug and Female Jack (400°F)</b> CODE: <b>05</b> Standard Connect CODE: <b>21</b> Jab-in Style	<b>3-Pin Male Plug (400°F)</b> CODE: <b>3P</b>  <b>Alumina Male Plug (1200°F)</b> CODE: <b>18</b>
IMAGE GOES HERE	<b>Female Jack (400°F)</b> CODE: <b>06</b> Standard Connect CODE: <b>22</b> Jab-in Style	<b>Alumina Female Jack (1200°F)</b> CODE: <b>19</b>  <b>No Termination*</b> CODE: <b>00</b>
IMAGE GOES HERE	<b>Male Mini Plug (400°F)</b> CODE: <b>10</b>	* Not available as separate item.
IMAGE GOES HERE	<b>Male Mini Plug and Female Mini Jack (400°F)</b> CODE: <b>11</b>	
IMAGE GOES HERE	<b>Female Mini Jack (400°F)</b> CODE: <b>12</b>	

# THERMOCOUPLE TERMINATIONS

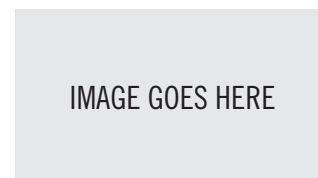
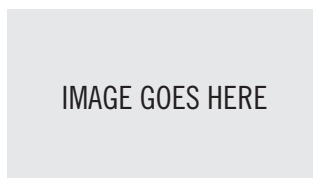


SCREW COVER HEADS WITH TERMINAL BLOCK	
CODE	DESCRIPTION
A1	1" NPT Aluminum
A2	1/2" NPT Aluminum
A4	3/4" NPT Aluminum
C1	1" NPT Cast Iron
C2	1/2" NPT Cast Iron
C4	3/4" NPT Cast Iron
E2	1/2" NPT Epoxy Coated Aluminum
SA	Mini Aluminum (Single)
SD	Mini Aluminum (Double)



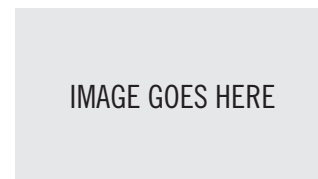
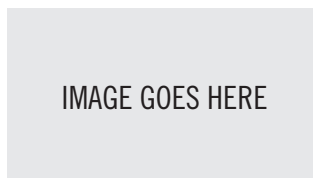
Water Type Open Head  
CODE: 13

SNAP COVER HEADS WITH TERMINAL BLOCK	
CODE	DESCRIPTION
S1	1" NPT Aluminum
S2	1/2" NPT Aluminum
S4	3/4" NPT Aluminum



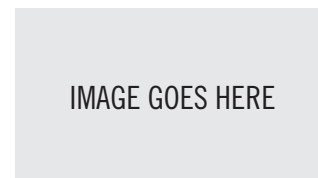
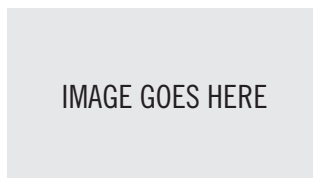
Cannister Head  
CODE: 14

TERMINAL BLOCKS	
CODE	DESCRIPTION
1C	Universal Screw Cover - Single
2C	Universal Screw Cover - Dual
1S	Snap Cover - Single
2S	Snap Cover - Dual

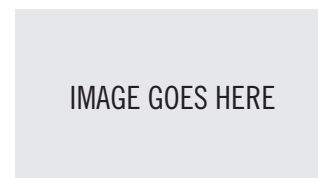


Plastic Weatherproof Head (400°F)  
CODE: 15

OPEN TERMINAL HEADS	
CODE	DESCRIPTION
B1	Open Terminal Head (Noble Metal Only) - Specify Calibration
B2	External Thread Head (Noble Metal Only) - Specify Calibration
B3	Open Terminal Head (Base Metal Only)

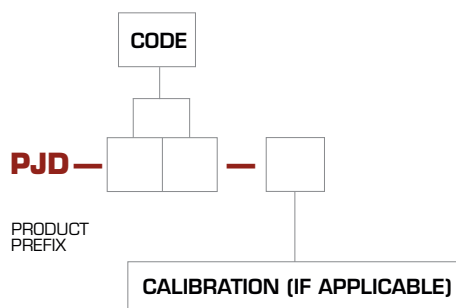


High Temperature Plastic Weatherproof Head (800°F)  
CODE: 16



Explosion-Proof Head  
CODE: 17  
1/2" Polypropylene Head  
CODE: P2

TO ORDER A THERMOCOUPLE TERMINATION AS A SEPARATE ITEM, FOLLOW THE ORDERING INFORMATION BELOW.



EXAMPLE ORDERING NUMBER

PJD — 0 7 — K

# THERMOCOUPLE WIRE

## THERMOCOUPLE WIRE

The L.H. Marshall Company invented and patented the enclosed tip Thermocouple™ over 80 years ago. Over 10 million Marshall Thermocouples have been sold worldwide for precision temperature measurement. Marshall Thermocouples are reusable, durable, accurate and are a quality product engineered to meet the industry standards for temperature measurement of molten metals.

Scientific research and development at one of America's leading research facilities has led to innovations in steel composition of the Marshall protection tubes resulting in the longest lasting, multiuse thermocouple in the industry.

All Marshall Thermocouples are manufactured with Class 1, Special Limits wire which meet and exceed international quality standards of ANSI MC96.1 and IEC 584. Custom Marshall Thermocouples can be made to accommodate any range of industrial need while maintaining superior quality. Calibration certificates are available on Marshall Thermocouples and all products produced by the L.H. Marshall Company are 100% guaranteed.

# THERMOCOUPLE WIRE DATA



## THERMOCOUPLE CODES: CONDUCTOR COMBINATIONS AND CHARACTERISTICS

ANSI CODE	CONDUCTOR COMBINATIONS		TEMP. RANGE	LIMITS OF ERROR			APPLICATION INFORMATION
	POSITIVE + LEG	NEGATIVE - LEG		RANGE (°F)	STANDARD	SPECIAL	
TYPE <b>J</b>	IRON (magnetic) WHITE +	CONSTANTAN RED -	32 to 1400°F (0 to 760°C)	32 to 530 530 to 1400	±4°F ±0.75%	+2°F ±0.4%	Suitable for vacuum, reducing, or inert atmospheres. Reduced life in oxidizing atmosphere. Iron oxidizes rapidly above 1000°F (538°C) so only heavy gauge wire is recommended for high temperature. Bare elements should not be exposed to sulfurous atmospheres above 1000°F (538°C).
TYPE <b>K</b>	CHROMEL YELLOW +	ALUMEL (magnetic) RED -	2 to 2300°F (0 to 1260°C)	32 to 530 530 to 2300	±4°F ±0.75%	±2°F ±0.4%	Recommended for continuous oxidizing or neutral atmospheres. Mostly used above 1000°F (530°C). Subject to failure if exposed to sulfur. Preferential oxidation of chromium in positive leg at certain low oxygen concentrations causes "green rot" and large negative calibration drifts most serious in the 1500-1900°F range.
TYPE <b>T</b>	COPPER BLUE +	CONSTANTAN RED -	32 to 700°F (0 to +370°C)	32 to 200 200 to 700	±2°F ±0.75%	±1°F ±0.4%	Useable in oxidizing, reducing, or inert atmospheres, as well as vacuum. Not subject to corrosion in moist atmospheres.
TYPE <b>E</b>	CHROMEL PURPLE +	CONSTANTAN RED -	32 to 1600°F (0 to 871°C)	32 to 600 600 to 1600	±3°F ±0.5%	±2°F ±0.4%	Recommended for continuously oxidizing or inert atmospheres. Highest thermoelectric output of common calibration.
TYPE <b>S</b>	PLATINUM-10% Rhodium	PLATINUM	32 to 2700°F (0 to 1480°C)	32 to 1000 1000 to 2700	±3°F ±0.25%	±1°F ±0.1%	Recommended for high temperature. Must be protected with non-metallic protection tube and ceramic insulators. Continued high temperature useage causes grain growth which can lead to mechanical failure. Negative calibration drift caused by rhodium diffusion to pure leg as well as from rhodium volatilization.
TYPE <b>R</b>	PLATINUM-13% Rhodium	PLATINUM					
TYPE <b>B</b>	PLATINUM-30% Rhodium	PLATINUM 6% Rhodium	1600 to 3100°F (871 to 1705°C)	1600 to 3100	±0.5%	±0.25%	Same as S & R but output is lower. Also less susceptible to grain growth and drift.
TYPE <b>N</b>	NICROSIL +	NISIL (magnetic) -	32 to 2300°F (0 to 1260°C)	32 to 530 530 to 2300	±4°F ±0.75%	±2°F ±0.4%	Nicrosil/Nisil nickel-based thermocouple alloy used primarily at high temperature (up to 2300°F). While not a direct replacement for Type K, Type N provides better resistance to oxidation at high temperature and longer life in applications where sulfur is present.
TYPE <b>C</b>	TUNGSTEN 5% Rhenium	TUNGSTEN 26% Rhenium	32 to 4200°F (0 to 2330°C)	32 to 800 800 to 4200	±8°F ±1.0%	N/A	This refractory metal thermocouple may be used at temperatures up to 4200°F (2315°C). As it has no oxidation resistance its use is restricted to vacuum, hydrogen or inert atmospheres.

\*\*Special tolerances for temperatures below 32°F are difficult to validate due to limited available information. The following values for Types E and T thermocouples are suggested as a guideline for discussion between the customer and L.H. Marshall Company.

Type E -360 to 32°F ± 2°F or ± 0.5% (whichever is greater)

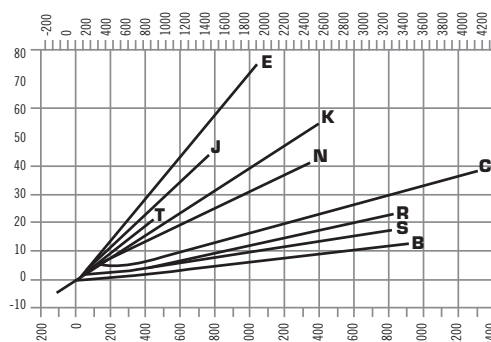
Type T -360 to 32°F ± 0.1°F or ±0.8% (whichever is greater)

Tolerance values for Type J thermocouples at temperatures below 23°F and special tolerances for Type K thermocouples below 32°F are not given due to the nature of the material.

TEMPERATURE IN °F

THERMOCOUPLE  
TEMPERATURE  
EMF GRAPH

TEMPERATURE IN °C



### ANSI SYMBOL

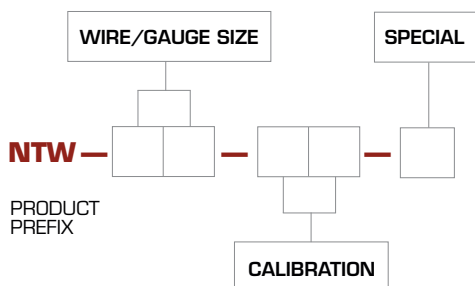
- T** COPPER VS. CONSTANTAN
- E** CHROMEL VS. CONSTANTAN
- J** IRON VS. CONSTANTAN
- K** CHROMEL VS. ALUMEL
- S** PLATINUM 10% RHODIUM VS. PLATINUM
- R** PLATINUM 13% RHODIUM VS. PLATINUM
- B** PLATINUM 30% RHODIUM VS. PLATINUM 6% RHODIUM
- N** NICROSIL VS. NISIL
- C** TUNGSTEN 5% RHENIUM VS. TUNGSTEN 26% RHENIUM

# THERMOCOUPLE WIRE



Noble Metal and Base Metal Thermocouple Wire is available in bulk form for customers who fabricate elements or assemblies. Below are Specification Codes with Ordering Number format for each of these items.

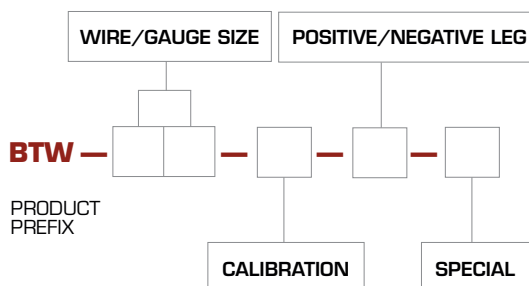
## NOBLE THERMOCOUPLE WIRE (NTW)



WIRE/GAUGE SIZE	CALIBRATION	SPECIAL
32 - 32 AWG (.008)	0P - Pure Platinum Wire	0 - None
30 - 30 AWG (.010)	06 - Platinum-6% Rhodium Wire	F - Fibro
28 - 28 AWG (.013)	10 - Platinum-10% Rhodium Wire	S - Special Limits
27 - 27 AWG (.014)	13 - Platinum-13% Rhodium Wire	C - Certified
26 - 26 AWG (.016)	30 - Platinum-30% Rhodium Wire	
24 - 24 AWG (.020)		
23 - 23 AWG (.023)		
22 - 22 AWG (.025)		
21 - 21 AWG (.028)		
20 - 20 AWG (.032)		
18 - 18 AWG (.040)		
17 - 17 AWG (.045)		
15 - 15 AWG (.060)		
08 - 8 AWG (.125)		

\* Typically sold in inch Quantities

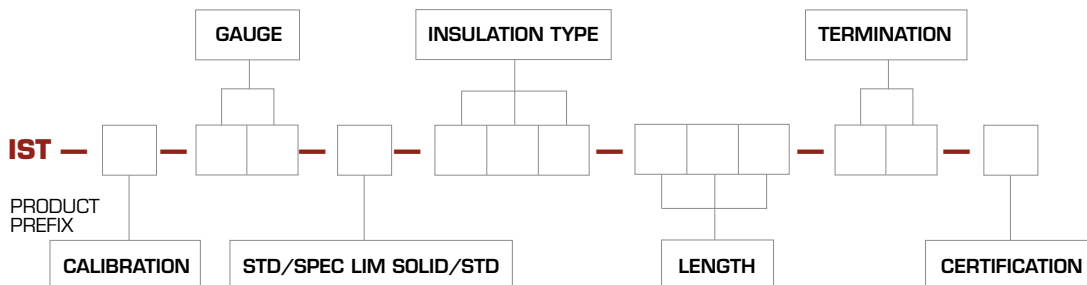
## BARE THERMOCOUPLE WIRE (BTW)



WIRE/GAUGE SIZE	CALIBRATION	POSITIVE/NEGATIVE LEG	SPECIAL
32 - 32 AWG	N - Nicrosil-Nisil	P - Positive Leg	0 - None
30 - 30 AWG	J - Iron-Constantan	N - Negative Leg	S - Special Limits
28 - 28 AWG	K - Chromel-Alumel		C - Certified
27 - 27 AWG	T - Copper-Constantan		
26 - 26 AWG	E - Chromel-Constantan		
24 - 24 AWG	W - 5% Re-W 26% Re		
23 - 23 AWG	M** - Ni/Ni Moly		
22 - 22 AWG			
20 - 20 AWG			
18 - 18 AWG			
17 - 17 AWG			
16 - 16 AWG			
14 - 14 AWG			
11 - 11 AWG			
09 - 9 AWG			
08 - 8 AWG			
02 - 2 AWG			

\* Typically sold in pound Quantities

## INSULATED SURVEY THERMOCOUPLE (IST)



CALIBRATION	GAUGE	STD/SPEC LIM SOLID/STD	INSULATION TYPE	LENGTH	TERMINATION	CERTIFICATION
J - Iron-Constantan	14 - 14 AWG	1 - Solid STD Limits	232 - HiTemp GL BR/HiTemp GL BR	000 - 999	01 - 1" Strip	0 - None
K - Chromel-Alumel	16 - 16 AWG	2 - Solid Special Limits	301 - VIT SIL FIB/VIT SIL FIB		02 - Std. Male Plug	C - Std. Points
N - Nicrosil-Nisil	20 - 20 AWG	5 - Solid Ext Grade	304 - Glass Braid/Glass Braid		03 - Hi-Temp Male Plug	X - Special Points
T - Copper-Constantan	24 - 24 AWG	7 - Stranded Ext Grade	305 - Glass Wrap/Glass Braid		04 - Mini Plug	
	28 - 28 AWG	8 - Stranded STD Limits	309 - HiTemp GL BR/HiTemp GL BRD		05 - Std. Jack	
	30 - 30 AWG	9 - Stranded Special Limits	332 - HiTemp GL BR/HiTemp GL BRD		06 - Hi-Temp Jack	
		3 - Stranded STD Limits	350 - Ceramic Fibr/Ceramic Fibr		XX - Special	
			502 - PVC/PVC			
			507 - FEP Extruded/FEP Extruded			
			513 - Fuse KAP Tape/Fuse KAP Tape			
			508 - TFE Tape/TFE Tape			
			505 - PVC Ripcord			

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## HOW TO READ THE CATALOG NUMBER CHART

L.H. Marshall Company offers a complete line of insulated thermocouple and extension grade wires in single, duplex and multipair constructions. Ordering with another manufacturer's part number is an acceptable option, or construct an L.H. Marshall part number using the box format explained below.

By filling in the boxes in the natural order of progression, construction of a part number for a thermocouple or extension grade wire is a simple seven-step process.

**Step 1:** Insert the "ITW" insulated thermocouple wire or "IEW" insulated extension wire prefix into the designated space.

**Step 2:** Insert the desired calibration K, J, T etc. into the corresponding box.

**Step 3:** Insert desired wire gauge.

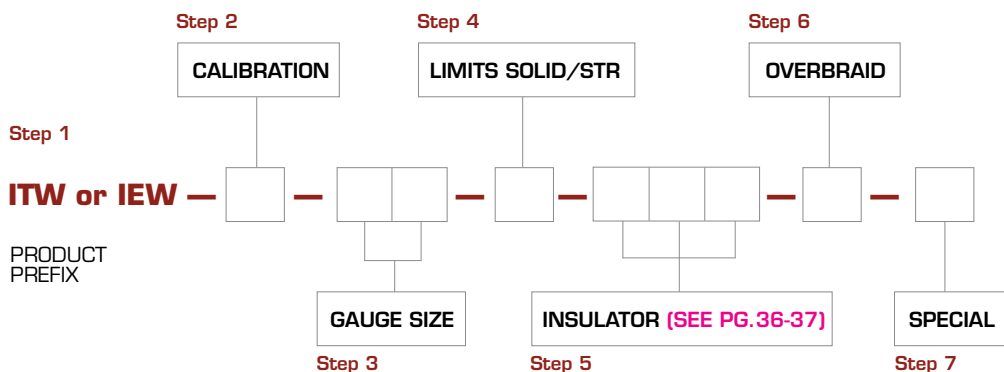
**Step 4:** The "limits/solid/stranded" box consists of a single digit. The #1 indicates solid conductors standard limits or error, while the #3 indicates stranded conductors standard limits of error for thermocouple grade wire. When constructing an extension cable, insert the #5 for solid conductors standard limits of error or the #7 for stranded conductors standard limits of error. NOTE: When special limits of error material is required, these digits must be changed to the next higher even digit, i.e., from ITW-K-20-1-304-0-0.

**Step 5:** Select desired insulation type.

**Step 6:** Select overbraid material. If none, insert "0".

**Step 7:** This box is reserved for certified and custom constructions. If certified (see below) or a custom built wire is required, please consult factory for further instructions. If none, please insert "0" in this box.

**CERTIFICATION:** L.H. Marshall Company can certify bulk thermocouple wire or individual elements traceable to N.I.S.T. Each thermocouple element, coil or spool of wire is tagged with the individual temperature departure from the corresponding calibration curve. Special temperature points as well as notarized results are available. Please consult factory for additional information.



## ANSI TOLERANCES:

Unless specified, our thermocouple and extension wires are supplied to meet Standard Tolerances of ANSI circular MC96. 1-1982. Special Tolerances are also available per ANSI MC96.1. Tolerances for thermocouple and extension wires are given in the accompanying tables. Where tolerances are given in percent, the percentage applies to the temperature being measured.

## INITIAL CALIBRATION TOLERANCES FOR THERMOCOUPLES

Reference Junction 0°C (32°F)

THERMO- COUPLE TYPE	TEMPERATURE RANGE		TOLERANCES †	
	°C	°F	STANDARD	SPECIAL
B	870 to 1700	1598 to 3092	±0.5%	—
E	0 to 900	32 to 1652	±1.7°C or ±0.5%	±1.1°C or ±0.4%
J	0 to 750	32 to 1382	±2.2°C or ±0.75%	±1.1°C or ±0.4%
K	0 to 1250	32 to 2282	±2.2°C or ±0.75%	±1.1°C or ±0.4%
R or S	0 to 1450	32 to 662	±1.0°C or ±0.75%	±0.6°C or ±0.1%
T	0 to 350 Cryogenic Ranges	32 to 662	±1.0°C or ±0.75%	±0.5°C or ±0.4%
E*	-200 to 0	-328 to 32	±1.7°C or ±1%	**
K*	-200 to 0	-328 to 32	±2.2°C or ±2%	**
T*	-200 to 0	-328 to 32	±1.0°C or ±1.5%	**

\*Thermocouples and thermocouple material are normally supplied to meet the tolerances specified in the table for the normal specified range. The same materials, however, may not fall within the cryogenic tolerances in the second section of the table. If materials are required to meet the cryogenic tolerances, the purchase order must so state. Selection of materials usually will be required. Tolerances indicated in this table are not necessarily an indication of the accuracy of temperature measurements in use after initial heating of the materials.

\*\*Little information is available to justify establishing special tolerances for cryogenic temperatures. Limited experience suggests the following tolerances for types E and T thermocouples:

-Type E-200 to 0°C ± 1.0°C or ±0.5% (whichever is greater)

-Type T-200 to 0°C ± 0.5°C or ±0.8% (whichever is greater)

These tolerances are given only as a guide for discussion between purchaser and supplier. Due to the characteristics of the materials, cryogenic tolerances for Type J thermocouples and special cryogenic tolerances for Type K thermocouples are not listed.

† Where tolerances are given in percent, the percentage applies to the temperature being measured in degrees Celsius. For example, the standard tolerance of Type J over the temperature range of 227°C to 750°C is ±0.75 percent. If the temperature being measured is 538°C, the tolerance is ±0.75 percent of 538, or ±4.0°C. To determine the tolerance in degrees Fahrenheit, multiply the tolerance in degrees Celsius times 1.8.

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## INITIAL CALIBRATION TOLERANCES FOR THERMOCOUPLE EXTENSION WIRES

Reference Junction 0°C (32°F)

EXTENSION WIRE TYPE	TEMPERATURE RANGE		TOLERANCES	
	°C	°F	STANDARD	SPECIAL
EX	0 to 200	32 to 392	±1.7°C	—
JX	0 to 200	32 to 392	±2.2°C	±1.1°C
KX	0 to 200	32 to 392	±2.2°C	—
TX	0 to 200	32 to 212	±1.0°C	±0.5°C
SX	0 to 200	32 to 392	±5°F	—
BX	0 to 200	32 to 212	-3.7°C (-6°F)	—

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

Type Wire Measuring Junction Temperature  
SX Greater than 870°C (1598°F)  
BX Greater than 1000°C (1832°F)

Copper (+) versus copper nickel alloy (-).

#Copper versus compensating extension wire, useable to 100°C (212°F) with maximum deviations as indicated, but with no significant deviation over 0 to 50°C (32 to 122°F) range. Matched proprietary alloy compensating wire is available for use over the range 0 to 200°C (32 to 392°F) with claimed tolerances of (0.033 mV (±3.7°C).

## ANSI LETTER DESIGNATIONS

Thermocouple and extension wires are now generally ordered and specified by ANSI letter designations for wire type. Positive and negative legs are identified by the appropriate letter suffixes P and N, respectively.

## ANSI LETTER DESIGNATIONS

ANSI LETTER	DESCRIPTION	POPULAR GENERIC & TRADE NAMES*
T	TP TN	Copper Constantan, Cupron, Advance
J	JP JN	Iron Constantan, Cupron, Advance
E	EP EN	Chromel, Tophel, T1 Constantan, Cupron, Advance
K	KP KN	Chromel, Tophel, T1 Alumel, Nial, T2
S	SP SN	Platinum 10% Rhodium Pure Platinum
R	RP RN	Platinum 13% Rhodium Pure Platinum
B	BP BN	Platinum 30% Rhodium Platinum 6% Rhodium

\*Trade names Cupron, Nial and Tophel 3/4 AMAX, Advance, T1 and T2 3/4 Driver/Harris Co.  
Chromel and Alumel 3/4 Hoskins Mfg. Co.

## SOLID AND STRANDED CONDUCTORS

Thermocouple and extension wires are usually solid conductors, but both are available in stranded construction if greater flexibility is required.

CONDUCTOR		STRANDING	
GAUGE	ANSI TYPE	NO. OF STRANDS	GAUGE
14	All	7	22
16	All	7	24
18	All	7	26
20	All	7	28
22	All	7	30
24	All	7	32

## COLOR CODING

Standard ANSI color coding is used on all insulated thermocouple wire and extension wire when the type of insulation permits. In color coding, the right is reserved to include a tracer to identify the ANSI type.

## ANSI COLOR CODING

ANSI TYPE		MAGNETIC		SINGLE	ANSI COLOR CODE	
T/C	SINGLE	YES	NO		OVERALL EXTENSION WIRE	OVERALL T/C WIRE
T	TP		•	Blue	Blue	Brown
	TN		•	Red		
J	JP	•		White	Black	Brown
	JN		•	Red		
E	EP		•	Purple	Purple	Brown
	EN		•	Red		
K	KP	•	•	Yellow	Yellow	Brown
	KN			Red		
S, R	RP, SP		•	Black	Green	
	RN, SN		•	Red		
B	BP		•	Grey	Grey	
	BN		•	Red		

IMAGE GOES HERE

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## THERMOCOUPLE WIRE, INSULATION, CONSTRUCTION AND CHARACTERISTICS

INSULATION CODE	SINGLE CONDUCTOR		—DUPLEX CONDUCTOR		TEMP. RATING**		ANSI COLOR CODED	PHYSICAL PROPERTIES		NOTES
	Insulation	Impregna- tion	Insulation	Impregnation	Continuous	Single Reading		Abrasion Resistance	Moisture Resistance	
200	High Temp. Glass Braid	High Temp. Varnish	None Twisted	—	704°C 1300°F	871°F 1600°F	Yes	Good	Good	Impregnation retained to 204°C (400°F)
232	High Temp. Glass Braid	High Temp. Varnish	High Temp. Glass Braid	High Temp. Varnish	704°C 1300°F	871°F 1600°F	Yes	Good	Good	Impregnation retained to 204°C (400°F)
301	Vitreous Silica Fiber	None	Vitreous Silica Fiber	None	871°F 1600°F	1092°F 2000°F	No	Fair	Fair	—
302	Double Glass Braid	Silicone Modified Resin	Glass Braid	Silicone Modified Resin	482°F 900°F	538°F 1000°F	Yes	Good	Good	Impregnation retained to 204°C (400°F)
304	Glass Braid	Silicone Modified Resin	Glass Braid	Silicone Modified Resin	482°F 900°F	538°F 1000°F	Yes	Fair	Good	Impregnation retained to 204°C (400°F)
305	Double Glass Wrap	High Temp. Varnish	Glass Braid	Silicone Modified Resin	482°F 900°F	538°F 1000°F	Yes	Fair	Good	Impregnation retained to 204°C (400°F)
307	TFE Tape (not fused) TFE Coated Glass	—	TFE Coated Glass Braid	—	482°F 900°F	538°F 1000°F	Yes	Good	Excellent	Teflon good to 260°C (500°F)
350	Ceramic Fiber	—	Ceramic Fiber	—	1204°F 2200°F	1427°F 2600°F	No	Good	Fair	—
505	Polyvinyl	—	Ripcord	—	-29 to +150°C -20 to +221°C	—	Yes	Good	Excellent	—
507	FEP Extr.	—	FEP Extr.	—	204°F 400°F	316°F 600°F	Yes	Very Good	Excellent	—
508	TFE Tape Fused	—	TFE Tape Fused	—	260°F 500°F	316°F 600°F	Yes	Good	Excellent	—
509	FEP Extr.	—	FEP Extr. Twisted	—	204°F 400°F	316°F 600°F	Yes	Very Good	Excellent	Aluminum/Mylar® shield with drain wire
511	Fused Kapton Tape	—	None Twisted	—	316°F 600°F	427°F 800°F	Yes	Excellent	Excellent	FEP binder melts at approx. 260°C (500°F)
513	Fused Kapton Tape Polyimide	—	Fused Kapton Tape	—	316°F 600°F	427°F 800°F	Yes	Excellent	Excellent	FEP binder melts at approx. 260°C (500°F)
514	Tefzel®	—	Tefzel	—	150°F 302°F	200°F 392°F	Yes	Excellent	Excellent	—

\*Trade names of E I duPont de Nemours & Co.

\*\*Thermocouple extension grade wire is only calibrated up to 204°C (400°F).

Note: ServTex synthetic fibers are organic compounds. Good ventilation is recommended in areas where this product may be subjected to elevated temperatures.

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## EXTENSION WIRE, INSULATION, CONSTRUCTION AND CHARACTERISTICS, CONT.

INSULATION CODE	SINGLE CONDUCTOR		—DUPLEX CONDUCTOR		TEMP. RATING* *		ANSI COLOR CODED	PHYSICAL PROPERTIES		NOTES
	Insulation	Impregna- tion	Insulation	Impregnation	Continuous	Single Reading		Abrasion Resistance	Moisture Resistance	
155	Glass Braid	Silicone Modified Resin	ServTex Braid	Moisture Resistant	288°C 550°F	343°C 650°F	Yes	Good	Fair	Impregnation retained to 149°C (300°F)
157	TFE Tape (not fused) Glass Braid	Silicone Modified Resin	ServTex Braid	Compound	288°C 550°F	343°C 650°F	Yes	Good	Good	Impregnation retained to 204°C (400°F) Teflon good to 260°C (500°F)
232	High Temp Glass Braid	High Temp. Varnish	High Temp Glass Braid	Moisture Resistant Compound	704°C 1300°F	871°C 1600°F	Yes	Good	Good	Impregnation retained to 204°C (400°F)
303	Enamel/ Glass Braid	Silicone Modified Resin	Glass Braid	High Temp. Varnish	482°C 900°F	538°C 1000°F	Yes	Fair	Good	Impregnation retained to 204°C (400°F)
502	Polyvinyl	—	Polyvinyl	—	-29 to +105°C -20 to +221°F	—	Yes	Good	Excellent	—
507	FEP Extr.	—	FEP Teflon Extr.	—	204°C 400°F	316°C 600°F	Yes	Very Good	Excellent	—
509	FEP Extr.	—	FEP Teflon Extr.	—	204°C 400°F	316°C 600°F	Yes	Very Good	Excellent	Aluminum/Mylar* shield with Drain Wire
510	Polyvinyl	—	Polyvinyl Twisted	—	-29 to +105°C -20 to +221°F	—	No	Good	Excellent	Aluminum/Mylar* shield with Drain Wire
514	Tefzel®	—	Tefzel	—	150°C 302°F	200°C 392°F	Yes	Excellent	Excellent	—
515	Tefzel	—	Tefzel Twisted	—	150°C 302°F	200°C 392°F	Yes	Excellent	Excellent	Aluminum/Mylar* shield with Drain Wire

\*Trade names of E I duPont de Nemours & Co.

\*\*Thermocouple extension grade wire is only calibrated up to 204°C (400°F).

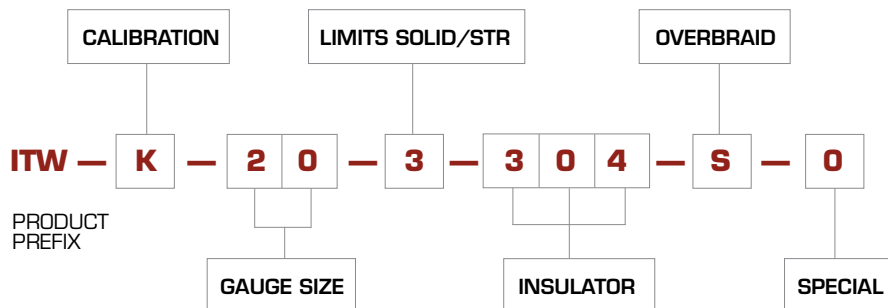
Note: ServTex synthetic fibers are organic compounds. Good ventilation is recommended in areas where this product may be subjected to elevated temperatures.

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## HOW TO ORDER:

### INSULATED THERMOCOUPLE WIRE (ITW)



The box format above illustrates the following:  
Type K, 20 ga., standard limits-stranded conductors, glass braid insulation, stainless steel overbraid.

OVERBRAID SELECTION CODE	
Stainless Steel Wire Braid	S
Tinned Copper Wire Braid	C
Flat Stainless Steel Ribbon Braid	F
Flat Stainless Steel Spiral Wrap	W
Half Oval Galvanized Steel Spiral Wrap	G
Inconel	I

To order standard catalog material with overbraid, do so by catalog number as follows. Desired: ITW-J-20-1-305 with stainless steel wire braid. Specify: Catalog Number ITW-J-20-1-305-S-0.

## INSULATION

AVAILABLE TYPES	CALIBRATION	B & S GAUGE SIZE	CONDUCTOR CODE	INSULATION CODE	EACH CONDUCTOR	OVERALL
J, K		14	1	232	High Temperature Glass Braid	High Temperature Glass Braid
K		16	1	350	Ceramic Fiber	Ceramic Fiber
J, K		16	1	232	High Temperature Glass Braid	High Temperature Glass Braid
K		20	2	301	Vitreous Silica Fiber	Vitreous Silica Fiber
J, K, T, E		20	1, 2, 3	304	Glass Braid	Glass Braid
J, K, T		20	1, 2	305	Double Glass Wrap	Double Glass Wrap
J, K		20	2	232	High Temperature Glass Braid	High Temperature Glass Braid
K		20	2	350	Ceramic Fiber	Ceramic Fiber
J, K, T		20	1, 2	507	FEP Extruded	FEP Extruded
J, K, T		20	1, 2	508	Fused TFE Tape	Fused TFE Tape
J, K, T		20	1, 2, 3	509	FEP Extruded	FEP Extruded
J, K		20	1, 2	511	Fused Kapton Tape	Fused Kapton Tape
J, K, T		20	1, 2	513	Fused Kapton Tape	Fused Kapton Tape
J		20	1, 2	307	TFE Tape/TFE Imp Glass	TFE Tape/TFE Imp Glass
J		20	9	P04	JP Single Conductor	JP Single Conductor
J		20	9	N04	JN Single Conductor	JN Single Conductor
J, K, T		24	1, 2	304	Glass Braid	Glass Braid
J, K, T		24	1, 2	305	Glass Wrap	Glass Wrap
J, K		24	1, 2	232	High Temperature Glass Braid	High Temperature Glass Braid
J, K, T		24	1, 2	508	Fused TFE Tape	Fused TFE Tape
J, K, T		24	1, 2	505	Polyvinyl	Polyvinyl
J, K, T		24	1, 2	513	Fused Kapton Tape	Fused Kapton Tape
T		24	1, 2	514	Tefzel	Tefzel
K		26	1, 2	305	Glass Wrap	Glass Wrap
J, K		28	1, 2	305	Glass Wrap	Glass Wrap
K, T		30	1, 2	305	Glass Wrap	Glass Wrap
K, T		30	1, 2	507	FEP Extruded	FEP Extruded
J, K, T		30	1, 2	513	Fused Kapton Tape	Fused Kapton Tape

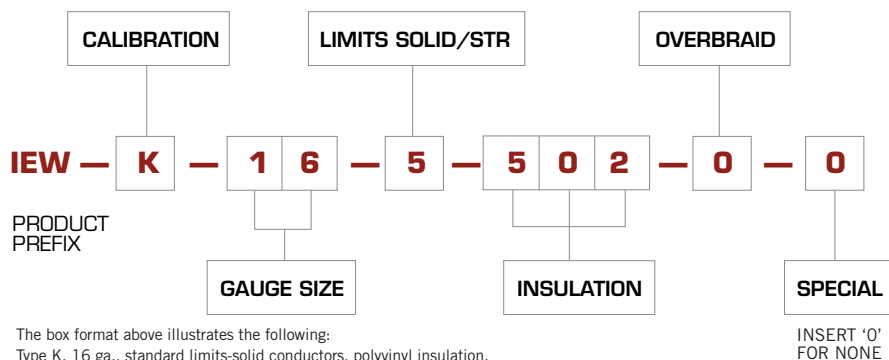
\*Multi Pair Thermocouple Wire Available. Consult Factory.

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## HOW TO ORDER:

### INSULATED EXTENSION WIRE (IEW)



OVERBRAID SELECTION CODE	
Stainless Steel Wire Braid	S
Tinned Copper Wire Braid	C
Flat Stainless Steel Ribbon Braid	F
Flat Stainless Steel Spiral Wrap	W
Half Oval Galvanized Steel Spiral Wrap	G

To order standard catalog material with overbraid, do so by catalog number as follows. Desired: IEW-K-20-5-502 with stainless steel wire braid. Specify: Catalog Number IEW-K-20-5-502-S.

## INSULATION

AVAILABLE TYPES	CALIBRATION	B & S GAUGE SIZE	CONDUCTOR CODE	INSULATION CODE	EACH CONDUCTOR	OVERALL
J, K		14	5	155	Felted ServTex	ServTex Braid
J, K		14	5	502	Polyvinyl	Polyvinyl
J, K		14	5	303	Enamel Glass Braid	Glass Braid
J, K		14	5	232	High Temperature Glass Braid	High Temperature Glass Braid
J, K		14	5	507	FEP Extruded	FEP Extruded
J, K, S		16	5, 7	155	Felted ServTex	ServTex Braid
J, K, S		16	5, 7	157	TFE/Felted ServTex	ServTex Braid
J, K, S		16	5	303	Enamel Glass Braid	Glass Braid
J, K		16	5	232	High Temperature Glass Braid	High Temperature Glass Braid
J, K, E, T, S		16	5, 7	502	Polyvinyl	Polyvinyl
J, K, E, T, S		16	5, 7	510	Polyvinyl	Twisted Aluminum Mylar/PVC
J, K, E, T		16	7	515	Tefzel	Tefzel Twisted
J, K, S		16	5, 7	507	FEP Extruded	FEP Extruded
J, K, S		16	5, 7	509	FEP Extruded	Twisted Aluminum Mylar/PVC
J, K, E, T, S		20	5, 7	502	Polyvinyl	Polyvinyl
J, K, S		20	5	232	High Temperature Glass Braid	High Temperature Glass Braid
J, K, E, T, S		20	5, 7	510	Polyvinyl	Twisted Aluminum Mylar/PVC
J, K, E, T		20	5	514	Tefzel	Tefzel
J, K, S		20	5	507	FEP Extruded	FEP Extruded
J, K, S		20	5, 7	509	FEP Extruded	Twisted Aluminum Mylar/PVC
S		20	5	304	Glass Braid	Glass Braid
S		24	5	304	Glass Braid	Glass Braid
R		22	3	701	PVC	PVC (3-wire) Stranded
R		22	4	701	PVC	PVC (3-wire) Stranded
R		24	3	705	Glass Braid	Glass Braid (3-wire) Stranded
R		24	4	705	Glass Braid	Glass Braid (3-wire) Stranded

# INSULATED THERMOCOUPLE WIRE / INSULATED EXTENSION WIRE



## MULTIPAIR THERMOCOUPLE EXTENSION CABLE

**Special Orders** - Thermocouple extension wire can be made to your specific order as multipair cable with individual and over-all insulations to suit installation conditions. Such cables greatly reduce cost of installation compared to pulling separate pairs of wires through conduit. Minimum quantity of any cable manufactured to order is 1000 feet. Complete specifications must accompany request for quotation.

**Standard Multipair Extension Cable** - The more common extension wire types are made up into standard multipair cables which are usually available for immediate delivery.

**Twisted Pair Cable** - Each conductor is covered with polyvinyl, nominal .015 inch thick, with each pair twisted to reduce magnetic interference. The twisted pairs are cabled and then shielded with a .0015 inch thick aluminum backed Mylar tape and a 20 gauge stranded copper drain wire. The drain wire, in contact with the aluminum, provides a simple mechanical connection for the shield, thus minimizing the effects of electromagnetic interference. The cable is then covered with an outer layer of polyvinyl, nominal .045 inch thick. A heavy Easy-Strip nylon thread is included. This cable is particularly adapted to those installations demanding maximum reduction in magnetic and electrostatic interference.

**Signal Wire and Coding** - As an added convenience, each standard cable contains an extra polyvinyl-clad 20-gauge solid copper wire for use as a signal connection for completing a communications of signal circuit.

These standard cables are color coded on the individual conductors and over-all. The positive leg only on Series 900 is marked 1, 2, etc. Primary insulation will withstand ambient temperatures up to 105°C (221°F) and resists atmosphere and moisture.

**Wire Overbraid** - Any of the standard cables listed in the accompanying tables can be supplied with a braid of stainless steel wire.

## INSULATION

AVAILABLE TYPES	CALIBRATION	B & S GAUGE SIZE	CONDUCTOR CODE	INSULATION CODE	EACH CONDUCTOR	OVERALL
J, K, T		20	5	904	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC
J, K, T		20	5	908	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC
J, K, T		20	5	912	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC
J, K		20	5	916	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC
J, K		20	5	920	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC
J, K, T		20	5	924	Polyvinyl Twisted	Twisted Aluminum Mylar/PVC

NOTE: Multi Pair Extension Cable Available in Teflon Insulation, Consult Factory.

## T/C EXTENSION CABLE - TWISTED PAIRS

Color-coded polyvinyl insulated extension wire, twisted marked pairs

20 gauge stranded copper drain wire in contact with aluminum



20 gauge polyvinyl insulated solid copper signal wire

Aluminum-backed Mylar wrap

Easy-Strip heavy nylon thread

# PROTECTION TUBES

## PROTECTION TUBES

The L.H. Marshall Company invented and patented the enclosed tip Thermocouple™ over 80 years ago. Over 10 million Marshall Thermocouples have been sold worldwide for precision temperature measurement. Marshall Thermocouples are reusable, durable, accurate and are a quality product engineered to meet the industry standards for temperature measurement of molten metals.

Scientific research and development at one of America's leading research facilities has led to innovations in steel composition of the Marshall protection tubes resulting in the longest lasting, multiuse thermocouple in the industry.

All Marshall Thermocouples are manufactured with Class 1, Special Limits wire which meet and exceed international quality standards of ANSI MC96.1 and IEC 584. Custom Marshall Thermocouples can be made to accommodate any range of industrial need while maintaining superior quality. Calibration certificates are available on Marshall Thermocouples and all products produced by the L.H. Marshall Company are 100% guaranteed.

# PROTECTION TUBE COMPARISON TABLE



## SPECIFICATIONS / CODES

PROTECTION TUBE CODE	TYPICAL APPLICATIONS	TUBE DESCRIPTION	COMPOSITION OF FORM	MAX. TEMP.	GENERAL COMMENTS
304	Food Preparation Petroleum Industry Chemical Processes Mixed Acids Lactic Acid Dyeing Tanks	304 Stainless Steel	Controlled amounts of Nickel, Chromium, Carbon, Manganese, Silicon, traces of Phosphorous & Sulfur, balance iron	1600°F Oxidizing, 2300°F Non-Oxidizing	Good resistance to corrosion. For wet process applications such as steam, oil, and many chemical solutions.
316	Petroleum Industry Chemical Processes	316 Stainless Steel	12% Nickel, 17% Chromium, 2-1/2% Molybdenum, 2% Manganese max., 0.08% Carbon max., 1% Silicon max., traces of Phosphorous & Sulfur, balance iron	1600°F Oxidizing	Good resistance to corrosion. Resists pitting corrosion. More resistant to acids than 304 SS.
446	High Temperature Hardening Nitriding Salt Baths Vitreous Enameling Non-ferrous Metals such as Tin, Lead, Zinc or Babbit Metal Smelting Low Temperature Blast Furnaces	446 Stainless Steel	27% Chromium, 0.25% Nitrogen max., 0.20% Carbon max., 1.50% Manganese max., 1.00% Silicon max., traces of Phosphorous & Sulfur, balance iron	2000°F Oxidizing, 2300°F Non-Oxidizing	Good resistance to corrosion at high temperatures. Impervious to sulfurous atmospheres, salt bath or low temperature molten metals.
601	High Temperature Heat Treating Carburizing Nitriding Salt Baths Blast Furnace Operations Gas Generators Ceramic Kilns	Inconel 601	61% Nickel, 23% Chromium, 14% Iron, 1.35% Aluminum	2200°F Oxidizing	Excellent resistance to corrosion and oxidation at high temperature. Good mechanical strength. More resistant to sulfur than Inconel 600. Hydrogen causes embrittlement.
200	Potassium Cyanide Salt Baths 2000°F Caustics and Brines High Temperature Chemical Applications 1200°F	Pure Nickel	Drawn or Drilled, 99.5% Nickel	2200°F Oxidizing, 1000°F Reducing, 2400°F Neutral	For high temperature applications. Will withstand many chemical actions, but must not be placed in the presence of sulfur. Frequently placed in caustic and molten salt baths. Drilled tube recommended for hydrogen atmospheres.
CSP	Annealing Drawing Tempering Glass Lehrs Power Plant Preheaters Food Baking Ovens Asphalt Mixers	Low Carbon Black Steel Pipe	Controlled amounts of Carbon Manganese, Silicon and Copper, traces of Phosphorous & Sulfur, balance Iron	1250°F	For non-corrosive atmospheres and in low temperature molten metals.
CIT	Chemical Industry: • Molten Aluminum • Die Cast Metals	Cast Iron	Cast	1300°F Oxidizing, 2000°F Non-Oxidizing	To 1600°F in reducing atmospheres. Will withstand sulfuric acid and caustic solutions. For extra long life, process coated tubes are available. Cast iron tubes should be painted daily with whitening when measuring aluminum or die cast metal temperatures.
LT-1	High Temperature Heat Treating: • Molten Copper Base Alloys to 2100°F • Blast Furnace and Stack Gases to 2400°F • Sulfur Burners to 2000°F • Cement Kilns to 2200°F • Chemical Process Reactors to 2500°F	Metal-Ceramic Tubes	(Slip cast composite of Chromium and Aluminum Oxide) 77% Chromium 23% Aluminum Oxide	2500°F	Superior oxidation resistance to 2500°F. Thermal conductivity equal to that of stainless steel. Good resistance to most molten metals to 2100°F. Not useable in molten aluminum. With noble metal element, a ceramic primary tube is required.
CPT	Ceramics Industry: • Bright Annealing • Forging Furnaces • Glass Making • High Speed Salt Baths	Mullite	Al2O3 63.5% SiO2 34.2% Fe2O3 0.6% TiO2 0.6% CaO 0.1% MgO 0.4% Na2O 0.6%	2800°F	Impervious to gases at high temperature. Possesses good thermal shock but poor mechanical shock. Often necessary to provide secondary tube protection. Should be mounted vertically. Useable in Barium Chloride salt baths to 2350°F.
CPT	Induction Melting up to 3200°F Applications for metal and ceramic industry requiring extreme temperatures.	Alumina	Al2O3 99.7% SiO2 0.1% MgO 0.1% Na2O 0.1%	3400°F	Fair resistance to thermal and mechanical shock. For very high temperature processes. Impervious to gases up to 3200°F.
SPT	Brick and Ceramic Kilns Steel Soaking Pits Applications requiring resistance to cutting action of flames and gases	Silicon Carbide	90% Silicon Carbide, 9% Silicon Dioxide, balance Aluminum Oxide & Ferric Oxide	3000°F	For molten non-ferrous metals. Also is a secondary protection tube for resistance to thermal shock.

# CERAMIC PROTECTION TUBES



## CERAMIC PROTECTION TUBES (CPT)

Protection tubes are used to help shield sensors, generally thermocouples, from contamination and/or mechanical damage. These tubes usually incorporate some manner by which the tube, sensor, and terminal are assembled and mounted into the process.

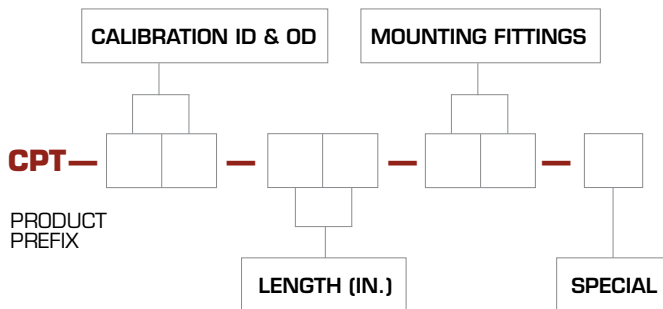
A fine grained, nonporous material, ceramic tubing is gas tight and is used at high temperatures to protect either platinum or base metal thermocouples. Ceramic tubes should either be preheated or slowly heated from 400°F to 800°F to dissipate any moisture that might be collected while at room temperature. Moisture that remains trapped in the tube may affect its performance.

Mullite protection tubes are impervious to gases at high temperatures. This type of tube possesses good thermal shock resistance, having a maximum temperature range of 2800°F.

Alumina protection tubes have a fair resistance to thermal and mechanical shock. Designed for very high temperature processes, these tubes are impervious to gases up to 3200°F.

Both Mullite and Alumina tubes are available in many sizes.

To order, use Specification Codes shown to assemble a complete Ordering Number.



## APPLICATION NOTES

### MULLITE CERAMIC PROTECTION TUBES

- Maximum temperature: 2800°F
- Good resistance to thermal shock and chemicals
- Good mechanical strength
- Can contaminate the platinum element above 2400°F
- Glazed tube-recommended for generator & atmosphere furnaces

### ALUMINA CERAMIC PROTECTION TUBES

- Maximum temperature: 3400°F
- Susceptible to thermal shock. Needs preheating
- Good mechanical strength
- Resists chemicals and will not contaminate platinum

## SPECIFICATIONS / CODES

MATERIAL ID & OD		LENGTH (INCHES)	MOUNTING FITTINGS	SPECIAL
<b>M5</b> - 5mm x 7mm Mullite <b>M8</b> - 1/4" x 3/8" Mullite <b>M3</b> - 3/8" x 1/2" Mullite <b>M6</b> - 7/16" x 11/16" Mullite <b>M4</b> - 1/2" x 3/4" Mullite <b>G0</b> - 1/2" x 3/4" Mullite G-0 <b>G2</b> - 1/2" x 3/4" Mullite G-2 <b>M1</b> - 3/4" x 1" Mullite <b>M7</b> - 1" x 1-1/4" Mullite <b>M9</b> - 1-1/4" x 1-1/2" Mullite <b>A5</b> - 5mm x 7mm Alumina <b>A8</b> - 1/4" x 3/8" Alumina <b>A2</b> - 5/16" x 1/2" Alumina <b>A3</b> - 3/8" x 1/2" Alumina <b>A6</b> - 7/16" x 11/16" Alumina <b>A4</b> - 1/2" x 3/4" Alumina <b>A1</b> - 3/4" x 1" Alumina <b>A7</b> - 1" x 1-1/4" Alumina <b>A9</b> - 1-1/4" x 1-1/2" Alumina <b>A0</b> - 5mm x 8mm Alumina	<b>12</b> - 1-5/8" x 1-7/8" Mullite <b>11</b> - 5/8" x 7/8" Alumina <b>13</b> - 1" x 2" Mullite <b>14</b> - 3/4" x 1-1/4" Mullite <b>15</b> - 3/16" x 1/4" Mullite <b>16</b> - 5/16" x 7/16" Mullite <b>17</b> - 5/8" x 7/8" Mullite <b>18</b> - 1-5/8" x 1-7/8" Alumina <b>19</b> - 3/16" x 5/16" Alumina <b>20</b> - 15mm x 10mm Alumina <b>21</b> - 15mm x 11mm Mullite <b>M2</b> - 3/16" x 1/4" Mullite <b>22</b> - 1/8" x 3/16" Alumina <b>23</b> - 9/16" x 3/4" Mullite <b>26</b> - 9/16" x 3/4" Alumina	Specify from 000" to 999"	<b>00</b> - No Fitting <b>B3</b> - Brass Sleeve <b>B4</b> - 3/4" x 1" Brass Hex Ftg <b>24</b> - 1/2" x 3/4" Hex Ftg <b>05</b> - Pipe Nipple <b>06</b> - Ceramic Collar <b>D2</b> - 1/2-Hex -1/2 Ftg <b>D3</b> - 3/4-Hex -3/4 Ftg <b>D1</b> - 1"-Hex -1" Ftg <b>H2</b> - Hex-1/2 Ftg <b>H3</b> - Hex-3/4 Ftg <b>C1</b> - 1-1/4" Coupling <b>C2</b> - 1" Coupling <b>C3</b> - 1-1/2" Coupling <b>H1</b> - Hex -1" Ftg <b>31</b> - 3/4" x 1" Hex Ftg <b>32</b> - 3/4" x 1-1/4" Hex Ftg <b>25</b> - 1" x 1-1/4" Hex Ftg <b>AS</b> - Alloy Sleeve <b>21</b> - 1/2" x 1" Hex Ftg	<b>0</b> - None <b>B</b> - Open Both Ends <b>E</b> - Effective Length <b>X</b> - Special (Consult Factory)

## EXAMPLE ORDERING NUMBERS

IMAGE GOES HERE

7/16" x 11/16" Mullite Protection Tube with 1/2" x 3/4" NPT Hex Fitting (1/2" x 3/4" NPT Hex Fitting (1/2" fitting for use with connecting head), 16" long.

CPT— M 6 — 1 6 — 2 4 — 0

IMAGE GOES HERE

7/16" x 11/16" Alumina Protection Tube with Brass Ferrule (threaded for use with open terminal head only). Similar ferrule available for 1/4" x 3/8" protection tube, 36" long.

CPT— A 6 — 3 6 — B 3 — 0

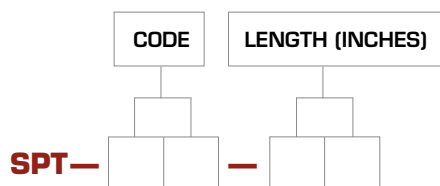
# SILICON CARBIDE PROTECTION TUBES/ METAL CERAMIC PROTECTION TUBES



## SILICON CARBIDE PROTECTION TUBES

Silicon Carbide Tubes provide excellent thermal conductivity for quick response to temperature changes. They can be used as an alternative to Cast Iron Tubes, thus eliminating the possibility of iron pick-up. Special surface treatment assures maximum resistance to metal penetration for protection of the contained thermocouple. Protection tubes are available with or without collar in standard lengths from 12" to 48" in 6-inch increments.

### SILICON CARBIDE PROTECTION TUBE (SPT)



PRODUCT  
PREFIX

SILICON CARBIDE PROTECTION TUBES		
CODE	SIDE ID x OD	LENGTH (INCHES)
WC	1" X 1-3/4" with Collar 3" Diameter	12 - 12" 18 - 18" 24 - 24"
W0	1" x 1-3/4" without Collar	30 - 30" 36 - 36" 42 - 42" 48 - 48"

IMAGE GOES HERE

## SILICON CARBIDE TUBES

Metal Ceramic Protecting Tubes have excellent oxidation resistance and also resist wetting by many metals and alloys as well as basic furnace slags. The chromium metal phase takes on a very tightly bonded layer of chromium oxide which, together with the naturally inert nature of the Alumina, provides this material with its remarkable resistance to oxidizing atmospheres over 2200°F, good corrosion resistance, and the ability to resist wetting by molten metals. When used with platinum thermocouples, it is recommended that a primary Alumina tube be used with metal ceramic tubes.

LT-1 tubes are available with a standard conduit connector in lengths from 12" to 48" in 6-inch increments.

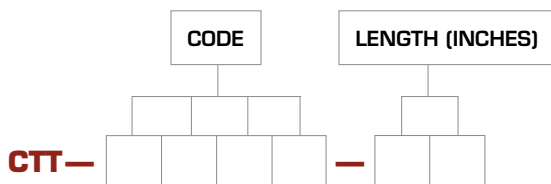
METAL CERAMIC PROTECTION TUBES	
CODE	LENGTH (INCHES)
<div> <div>CODE</div> <div> <div>LT-1</div> <div>PRODUCT PREFIX</div> </div> </div>	12" 18" 24" 30" 36" 42" 48"

IMAGE GOES HERE

# SILICON CARBIDE TARGET TUBES / CERAMIC INSULATOR



## SILICON CARBIDE TARGET TUBE (CTT)



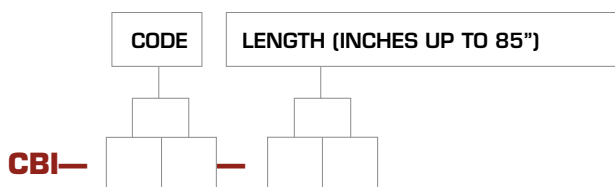
PRODUCT  
PREFIX

SILICON CARBIDE PROTECTION TUBES		
CODE	TYPE	LENGTH (INCHES)
1008	1-1/4" x 2", Collar 3-1/4" Dia.	12", 18"
1009	1-3/4" x 2-1/2", Collar 3-3/4" Dia.	12", 18", 24"
1010	2" x 3", Collar 4-1/4" Dia.	18", 24", 30", 36"
1011	2-1/2" x 3-1/2", Collar 4-3/4" Dia.	24", 30", 36-42"
1071	1-3/8" x 2-1/8", Collar 3-1/2" Dia.	12"
1072	1-1/2" x 2-1/4", Collar 3-1/2" Dia.	18"
1073	1-5/8" x 2-3/8", Collar 3-1/2" Dia.	24"
1074	1-7/8" x 2-3/4", Collar 3-1/2" Dia.	30"
1075	2-1/4" x 3-3/8", Collar 4-3/8" Dia.	36"
1076	2-1/2" x 3-5/8", Collar 4-3/8" Dia.	42"

Any above are available with ceramic liner. Consult factory.

## CERAMIC INSULATOR (CBI)

Thermocouple insulators are selected for specific applications to withstand elevated temperatures and to resist thermal shock. Mullite is available for excellent thermal shock resistance up to 2800°F. For applications up to 3400°F Alumina is recommended. Both Alumina and Mullite insulators are stocked in a variety of sizes and lengths for quick delivery.



PRODUCT  
PREFIX

CERAMIC INSULATORS			
ALUMINA		MULLITE	
CODE	TYPE	CODE	TYPE
A1	1/8" OD .040" (2-bore)	M1	1/8" OD .040" (2-bore)
A2	3/16" OD .062" (2-bore)	M2	3/16" OD .062" (2-bore)
A3	1/4" OD .062" (2-bore)	M3	1/4" OD .062" (2-bore)
A4	3/16" OD .040" (4-bore)	M4	3/16" OD .040" (4-bore)
A5	1/4" OD .062" (4-bore)	M5	1/4" OD .062" (4-bore)
A6	.200" OD .040" (2-bore)	M6	.200" OD .040" (2-bore)

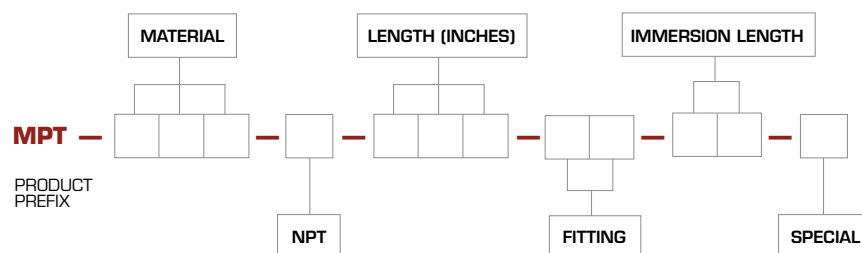
# METAL PROTECTION TUBES



## METAL PROTECTION TUBES (MPT)

To protect thermocouples from corrosion, physical damage and contamination, it is important to use some type of protection tube or well. Metal protection tubes are generally used with base metal thermocouples.

We stock the most widely used standard tubes and can provide other metal tubes on request. See [page 11](#) for Tube Specifications and Applications.



\*Effective length is the length from the closed end of the tube to the bottom thread of the fitting.

## SPECIFICATIONS / CODES

MATERIAL	OPERATING TEMP	REMARKS	NPT	LENGTH	FITTING	IMMERSION LENGTH	SPECIAL
<b>600</b> - 600 Inconel <b>601</b> - 601 Inconel	2220°F	Generally used for high temperature. Good corrosion-resistance.	<b>A</b> - 1/4" NPT <b>B</b> - 1/2" NPT <b>C</b> - 3/4" NPT <b>D</b> - 1" NPT <b>E</b> - 3/4" NPT Tap <b>F</b> - 1/8" NPT <b>H</b> - 3/8" NPT <b>J</b> - 3-1/2" NPT	Specify from 000" to 999"	<b>00</b> - None <b>AF</b> - Adjustable Flange <b>C3</b> - 3/8" Steel Hex Bushing <b>C2</b> - 1/2" Steel Hex Bushing <b>C4</b> - 3/4" Steel Hex Bushing <b>C1</b> - 1" Steel Hex Bushing <b>C5</b> - 1-1/4" Steel Hex Bushing <b>C6</b> - 1-1/2" Steel Hex Bushing <b>S3</b> - 3/8" St.St. Hex Bushing <b>S2</b> - 1/2" St.St. Hex Bushing <b>S4</b> - 3/4" St.St. Hex Bushing <b>S1</b> - 1" St.St. Hex Bushing <b>S5</b> - 1-1/4" St.St. Hex Bushing <b>S6</b> - 1-1/2" St.St. Hex Bushing <b>TP</b> - Tapered Plug <b>RF</b> - Raised Face Flange <b>S7</b> - 2" NPT SS Bushing <b>C7</b> - 2" NPT Steel Bushing <b>FF</b> - Flat Face Flange	Specify from 00" to 99"	<b>0</b> - None <b>B</b> - Open Both Ends <b>H</b> - SCH 80 <b>X</b> - Special (Consult Factory) <b>T</b> - No Threads
<b>304</b> - 304 Stainless Steel <b>309</b> - 309 Stainless Steel	1800°F	Good corrosion-resistance. Embrittles in the 900°F to 1450°F range.					
<b>310</b> - 310 Stainless Steel	2100°F	High mechanical and creep strength at elevated temperature. Very good corrosion resistance.					
<b>316</b> - 316 Stainless Steel	1700°F	Higher corrosion resistance than 304SS. Resists pitting in sulfuric, phosphoric acids.					
<b>330</b> - 330 Stainless Steel	2200°F	Good in oxidizing or reducing atmosphere.					
<b>446</b> - 446 Stainless Steel	2000°F	Highly resistant to sulfur attack. General purpose alloy.					
<b>200</b> - Pure Nickel	2000°F	Do not use in the presence of sulfur or reducing atmosphere.					
<b>CIT</b> - Cast Iron	1400°F	Withstands sulfuric and caustic solutions. Good mechanical strength.					
<b>LT-1</b> - Metal Ceramic	2600°F	Good resistance to mechanical and thermal shock.					
<b>CSP</b> - Carbon Steel Pipe	1000°F	Non-corrosive gases and liquids. Scales quickly at higher temperatures.					

All pipe available in schedule 80. Consult factory for additional information.

## EXAMPLE ORDERING NUMBERS

1/2" NPT x 36" Inconel 601 Protection Tube with 1-1/4" steel bushing for 29" immersion.

**MPT** - **6****0****1** - **B** - **0****3****6** - **C****5** - **2****9** - **0**

# CAST IRON PROTECTION TUBES / TERCOD PROTECTION TUBES



## CAST IRON PROTECTION TUBES (CIPT)

Cast Iron Protection Tubes are typically used in molten aluminum and die cast metal application in reducing atmospheres to 1600°F and will withstand sulfuric and caustic solutions with a maximum temperature of 1300°F (oxidizing) and 2000°F (non-oxidizing). Tubes are 7/8" ID and 1-5/8" OD in lengths of 12" to 46" in 6" increments and are supplied with a 3/4" NPT internal thread.

TO ORDER, USE SPECIFICATION CODES BELOW TO ASSEMBLE A COMPLETE ORDERING NUMBER.

	LENGTH	SPECIFICATIONS/CODES
CIPT —		12 - 12" Long
		18 - 18" Long
PRODUCT PREFIX		24 - 24" Long
		30 - 30" Long
		36 - 36" Long
		48 - 48" Long

EXAMPLE ORDERING NUMBER

CIPT — 1 8

This is an 18" Cast Iron Protection Tube.

IMAGE GOES HERE

## TERCOD PROTECTION TUBES (TPT)

Tercod Tubes are designed for monitoring, melting and holding temperatures of aluminum and other non-ferrous alloys up to 2300°F. They consist of silicon carbide/graphite isostatically formed around threaded pipe for easy installation. These are available in 1/2" and 3/4" NPT pipe in lengths of 12" to 48" in 6" increments.

TO ORDER, USE SPECIFICATION CODES BELOW TO ASSEMBLE A COMPLETE ORDERING NUMBER.

	LENGTH	SPECIFICATIONS/CODES
TPT —		212 - 1/2" NPT Pipe, 12" Long
		218 - 1/2" NPT Pipe, 18" Long
PRODUCT PREFIX		224 - 1/2" NPT Pipe, 24" Long
		230 - 1/2" NPT Pipe, 30" Long
		236 - 1/2" NPT Pipe, 36" Long
		248 - 1/2" NPT Pipe, 48" Long
		312 - 3/4" NPT Pipe, 12" Long
		318 - 3/4" NPT Pipe, 18" Long
		324 - 3/4" NPT Pipe, 24" Long
		330 - 3/4" NPT Pipe, 30" Long
		336 - 3/4" NPT Pipe, 36" Long
		348 - 3/4" NPT Pipe, 48" Long

EXAMPLE ORDERING NUMBER

TPT — 2 3 0

This is a Tercod Protection Tube with 1/2" NPT pipe, 30" long.

IMAGE GOES HERE

# THERMOWELLS

## THERMOWELLS

The L.H. Marshall Company invented and patented the enclosed tip Thermocouple™ over 80 years ago. Over 10 million Marshall Thermocouples have been sold worldwide for precision temperature measurement. Marshall Thermocouples are reusable, durable, accurate and are a quality product engineered to meet the industry standards for temperature measurement of molten metals.

Scientific research and development at one of America's leading research facilities has led to innovations in steel composition of the Marshall protection tubes resulting in the longest lasting, multiuse thermocouple in the industry.

All Marshall Thermocouples are manufactured with Class 1, Special Limits wire which meet and exceed international quality standards of ANSI MC96.1 and IEC 584. Custom Marshall Thermocouples can be made to accommodate any range of industrial need while maintaining superior quality. Calibration certificates are available on Marshall Thermocouples and all products produced by the L.H. Marshall Company are 100% guaranteed.

# THERMOWELLS

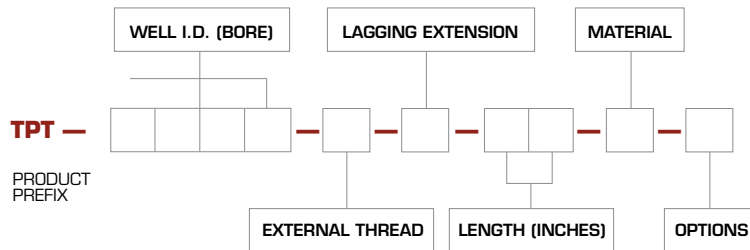


## THERMOWELLS (TPT)

Alloy wells are generally categorized as metal protection tubes. But unlike the tubes we fabricate from standard schedule 40 or 80 pipe, alloy wells are drilled bar stock, precision machined, highly polished and designed for high pressure applications.

Thermocouple assemblies with alloy wells are recommended for used in high-pressure environments or where there is severe vibration. Typical applications include measuring temperatures in water, steam, and air lines in power plants or in chemical and petrochemical applications.

## TO ORDER, USE SPECIFICATION CODES BELOW TO ASSEMBLE A COMPLETE ORDERING NUMBER.



## SPECIFICATIONS / CODES

WELL I.D. (BORE)	EXTERNAL	LAGGING EXTENSION	LENGTH (INCHES)	MATERIAL	OPTIONS
<b>260S</b> - Std. Duty 1/4" Dia. Elements <b>385S</b> - Std. Duty 1/4" Dia. Elements <b>260H</b> - Heavy Duty 1/4" Dia. Elements <b>385H</b> - Heavy Duty 3/8" Dia. Elements <b>260W</b> - Weldin 1/4" Dia. Elements <b>385W</b> - Weldin 3/8" Dia. Elements <b>437S</b> - Std. Duty .437 Bore	<b>A</b> - 1/2" NPT <b>B</b> - 3/4" NPT <b>C</b> - 1" NPT	<b>0</b> - None <b>L</b> - Lagging Extension	<b>04</b> - U=2-1/2, T=0 <b>06</b> - U=4-1/2, T=0, U=2-1/2, T=2 <b>09</b> - U=7-1/2, T=0, U=4-1/2, T=3 <b>12</b> - U=10-1/2, T=0, U=7-1/2, T=3 <b>15</b> - U=13-1/2, T=0, U=10-1/2, T=3 <b>18</b> - U=16-1/2, T=0, U=13-1/2, T=3 <b>24</b> - U=22-1/2, T=0, U=19-1/2, T=3 <b>XX</b> - Other Than Above (Consult Factory) <b>T</b> - Lagging Dimension	<b>1</b> - Brass (ASTM B-16) <b>2</b> - Carbon Steel (C-1018) <b>3</b> - 304 Stainless Steel <b>4</b> - 316 Stainless Steel <b>5</b> - Monel <b>6</b> - Other Than Above (Consult Factory)	<b>0</b> - None <b>B</b> - For Brass Cap & Chain <b>S</b> - For SS Cap & Chain

## EXAMPLE ORDERING NUMBER

**TPT** — 2 6 0 H — B — 0 — 1 2 — 3 — B

This is a heavy-duty threaded thermowell for 1/4" dia. elements, 3/4" NPT process thread, 10-1/2" insertion, 304SS material, brass cap and chain.

IMAGE GOES HERE

No. 260S Standard Duty 1/2" Well For 1/4" Diameter Elements

Other Wells available include Socket-Weld,  
Flanged and Van Stone Thermowells. Consult factory.

IMAGE GOES HERE

No. 385S, 260H and 385H Standard and Heavy Duty Wells for 1/4" or 3/8" Diameter Elements

# HISTORY OF L.H. MARSHALL

