

Metal Sheathed — Inert Oxide Insulated
THERMOCOUPLE ASSEMBLIES
Customized Thermocouples — Built to your design
Stock Thermocouples — Off-the-shelf availability
RANDOM LENGTH THERMOCOUPLE CABLE
HIGH TEMPERATURE THERMOCOUPLES

DESCRIPTION

Marlox is metal sheathed, inert oxide insulated thermocouple cable from Marlin Manufacturing Corporation. Available in ANSI calibrations with various types of sheath alloys, Marlox can be ordered as complete fabricated assemblies or in random lengths. Drawn to final size and fully annealed standard Marlox, single or dual thermocouple element, is moistureproof, pressure resistant, accurate, bendable and weldable. Quality control procedures insure that all thermocouple material is tested for adequate insulation resistance. All certified Marlox stock is checked for ANSI limits of error conformance by lot sampling in our quality control laboratory which is certified traceable to the NIST. Post assembly certified traceable calibration, is available upon request.

General Selection Parameters

The conditions of measurement determine the type of thermocouple used. Temperature, atmosphere, protection, response, and service life should be considered. The following descriptions serve as a guide to selection.

Thermocouple Type:

Select the thermocouple type that will be capable of operating in your application temperature range.

Sheath Alloy:

Select a sheath alloy that will withstand the temperature and possible corrosives of your application.

Sheath Size:

Use the thermocouple size that will withstand the rigors of your application but with minimal effect on it. See response chart below.

Junction Type:

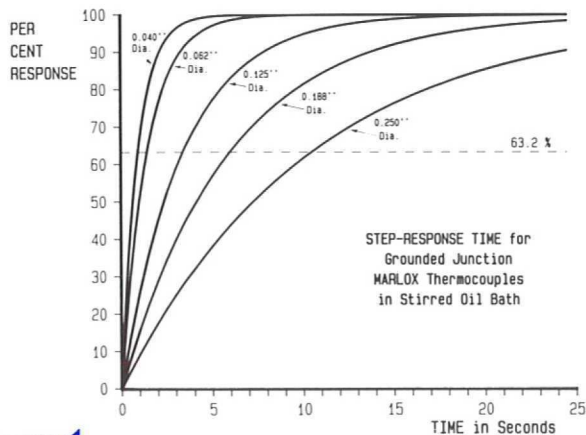
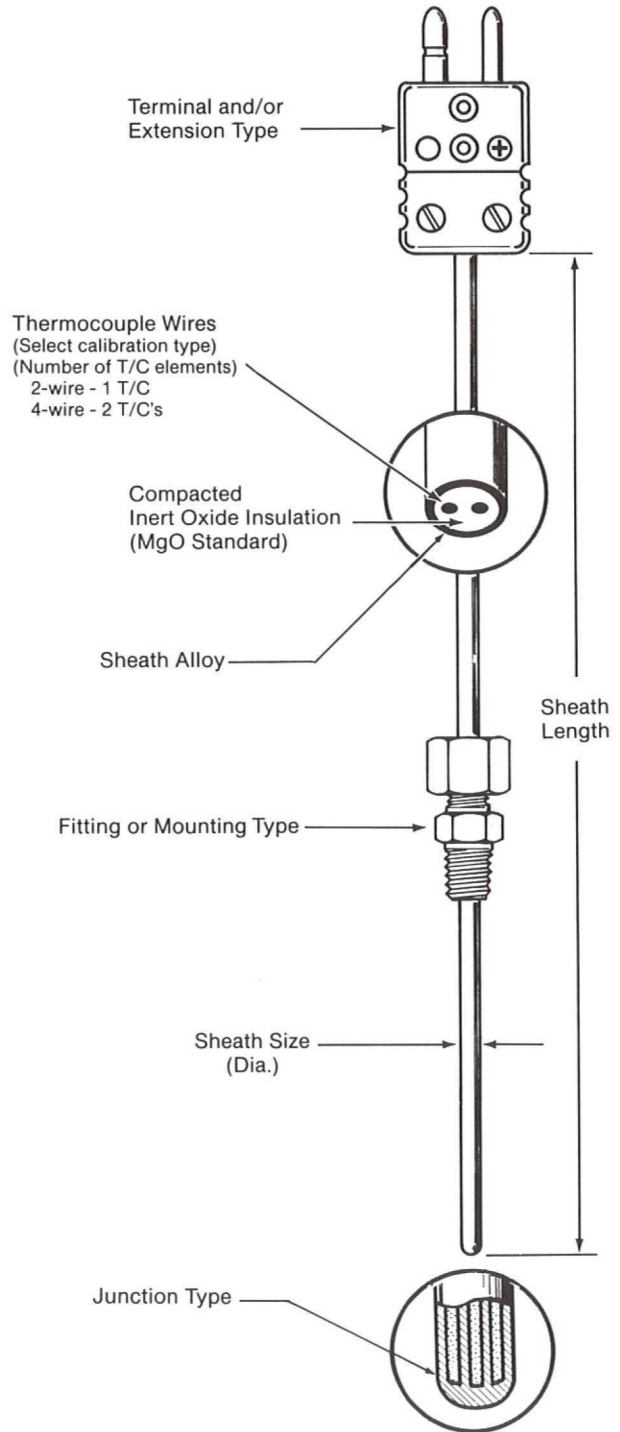
Select the junction that will give the protection and response characteristics that you require.

Fitting or Mounting Type:

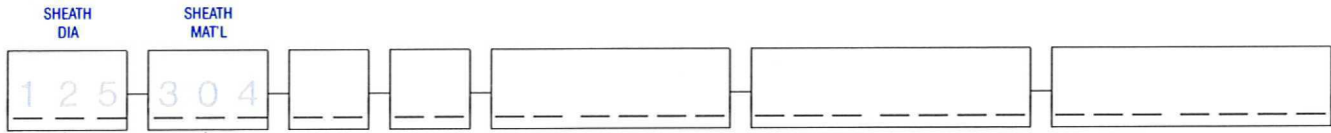
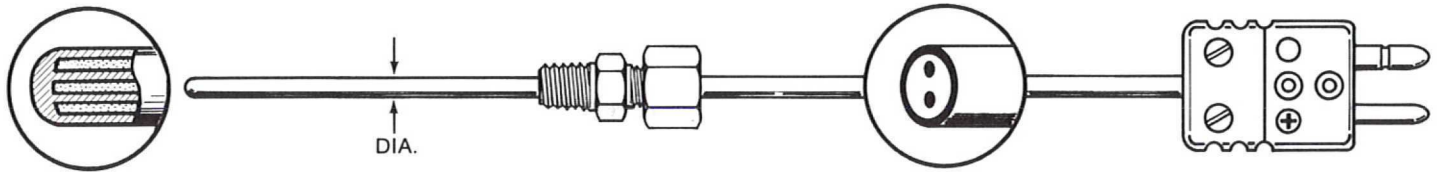
In order to attach and/or seal the thermocouple in your application you can use a fitting, braze, weld or solder it in place.

Terminal and/or Extension Type:

For connection to instruments various terminations and extensions are available.



SENSORS CUSTOM MARLOX® THERMOCOUPLES



CODE	SHEATH SIZE DIA. INCHES	CODE	SHEATH SIZE DIA. INCHES
010	.010	187	.187
020	.020	250	.250
032	.032	312	.312
040	.040	375	.375
062	.062	500	.500
125	.125		

CODE	SHEATH MAT'L.
304	304SS
310	310SS
316	316SS
600	INCONEL™ "600"
230	2300™

Temperature Recommendation

The temperature limits for continuous duty, grounded junction thermocouples are shown for available sheath sizes and thermocouple calibrations. Exposed junction thermocouples should be used at lower temperatures for equivalent service life.

LIMIT TEMPERATURE °F CONTINUOUS DUTY							
SHEATH DIAMETER INCHES	NOMINAL TUBE WALL THICKNESS INCHES	WIRE GAUGE AWG.		ANSI THERMOCOUPLE TYPE			
		SINGLE TC ELEMENT	DUAL TC ELEMENT	J	T	K	E
.020	.003	38		700	400	1600	800
.032	.004	34		700	400	1600	800
.040	.006	33		700	400	1600	800
1/16	.009	28	30	700	400	1600	800
1/8	.017	22	24	700	400	1600	800
3/16	.025	20	21	900	500	2000	1000
1/4	.033	16	18	1000	600	2000	1100
5/16	.041	16		1000	600	2000	1100
3/8	.052	15		1100	700	2000	1200
1/2	.070	10					

DIM. TOLERANCE: Up to .062 ±.001; .125 to .500 ±.003"

Sheath Alloys

304 Stainless Steel (18% Chromium-8% Nickel) is a general purpose, economical, readily available sheath material that has good corrosion and oxidation resistance. Maximum operating temperature 1650°F.

310 Stainless Steel (24% Chromium-19% Nickel) is a material that has improved resistance to corrosion as compared to 304 SS and the best resistance to oxidation of the "300" series stainless steels. Maximum operating temperature 2100°F.

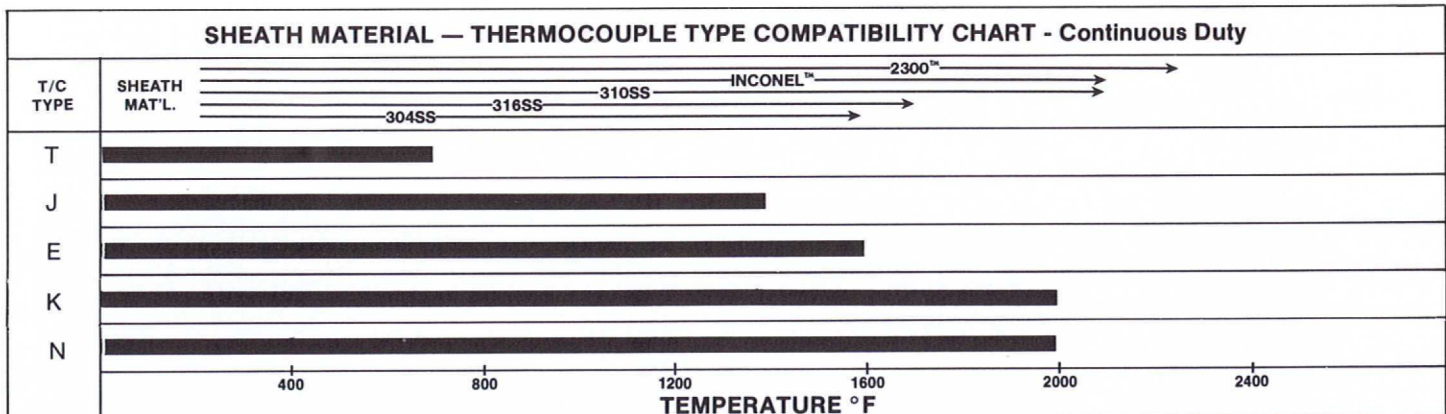
316 Stainless Steel (16% Chromium-10% Nickel) is a material that has superior corrosion resistance as compared to 304 SS or 310 SS with improved oxidation resistance and a higher hot strength than 304 SS. Maximum operating temperature 1700°F.

Inconel™600 (72% Nickel-17% Chromium) is a material that is readily available and has outstanding resistance to oxidation, corrosion and scaling. Should not be used in the presence of sulfur above 1600°F. Maximum operating temperature 2100°F.

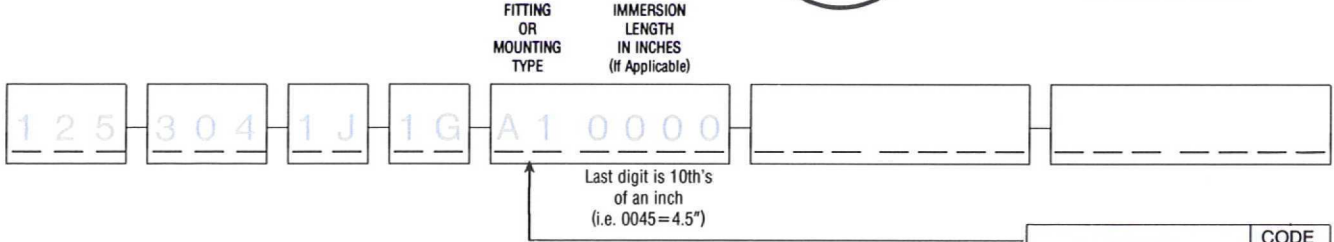
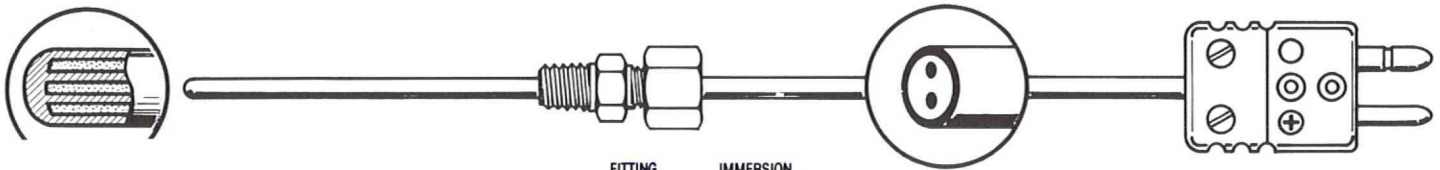
™International Nickel Co.

2300™ This nickel/chrome alloy is a superior alloy for sheathing applications. It is more effective in resisting oxidation at high temperatures than other available alloys as tested in air at 2300°F. Maximum operating temperature 2300°F.

™-Hoskins Mfg. Co.



SENSORS CUSTOM MARLOX® THERMOCOUPLES



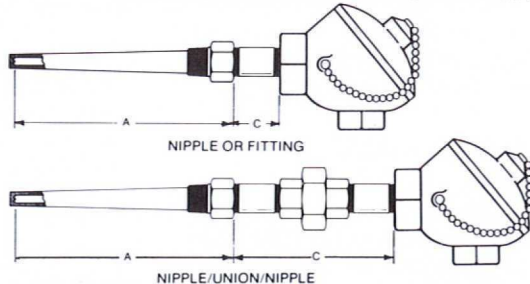
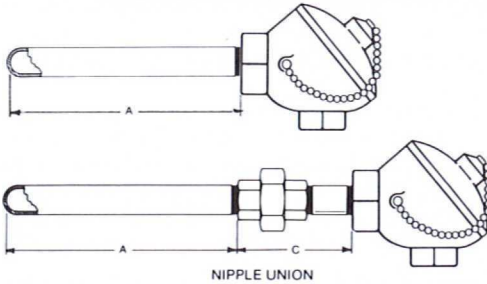
Mounting Fittings — See Selection Summaries for Details

		NONE	CODE	
			XX	
<p>Compression Fittings allow a field positionable setting of the immersion length of the Marlox. Standard fittings are stainless steel, 1/8 NPT or 1/4 NPT thread size, and are supplied with metal ferrules that are not relocatable after compression. Teflon ferrules allow relocation after compression but have a limited temperature and pressure range. Lava ferrules are crushed with compression and must be replaced if Marlox is removed or readjusted.</p>	<p>FIELD POSITIONABLE IMMERSION LENGTH</p>	<p>S.S. Fitting 1/8 NPT 1/4 NPT</p>	<p>A1 A2</p>	
<p>Fixed Fittings are stainless steel, NPT thread sizes, and are brazed to the sheath. Additional sizes, materials and welded mountings are also available.</p>		<p>FIXED IMMERSION LENGTH*</p> <p>* must be specified</p>	<p>1/8 NPT 1/4 NPT 3/8 NPT 1/2 NPT 3/4 NPT 1 NPT</p>	<p>F1 F2 F3 F4 F6 F8</p>
<p>Spring Loaded, Adjustable, Bayonet Type Fittings are compression type which allows a variable Marlox immersion length and also has bayonet mounting feature. Standard fittings are stainless steel and are supplied with metal ferrules for 1/8" or 1/16" Marlox sizes. Teflon ferrules are available which allow relocation after compression.</p>		<p>ADJUSTABLE BAYONET</p>	<p>AB</p>	
<p>Fixed Spring Loaded Bayonet Mounting for 3/16" Dia. Marlox (See Plastic Industry Thermocouple section for bayonet adapters and dimension selection guide for immersion placement.)</p>		<p>FIXED BAYONET</p>	<p>FB() ↑ "A" Dim.</p>	
<p>Fixed Double Fittings (Back to Back Threads) are stainless steel, NPT thread sizes, and are brazed to the sheath. Generally used with terminal heads this arrangement provides a process connection.</p>	<p>IMMERSION LENGTH*</p> <p>* must be specified</p>	<p>1/4 x 1/4 NPT 1/2 x 1/2 NPT 3/4 x 3/4 NPT</p>	<p>D2 D4 D6</p>	
<p>Spring Loaded Epoxy Sealed Fitting provides NPT mounting for terminal head and process connection for bearing applications. For 3/16" Dia. Marlox only select immersion that allows at least a 1/4" interference for spring loading. Utilize a AWA3 or AWC3 weatherproof terminal head and terminal block.</p>		<p>SPRING LOADED EPOXY SEALED FITTING</p>	<p>W1</p>	
<p>Spring Loaded O-Ring Sealed Fitting provides NPT mounting for terminal head and process connection for bearing applications. For 3/16" Dia. Marlox only select immersion that allows at least a 1/4" interference for spring loading. Marlox element may be easily removed from fitting by bayonet mounting. Utilizes a 6WA2 or 6WC2 weatherproof and terminal block.</p>		<p>SPRING LOADED O-RING SEALED, SS FITTING</p>	<p>S1</p>	

NOTES:
 C1=Stl, B1=Brass
 Ferrules: Metal Std. (Non-readjustable)
 "T" for Teflon, e.g. T1
 "L" for Lava, e.g. L1

TYPICAL ASSEMBLY w/PROTECTING TUBE

TYPICAL ASSEMBLY w/THERMOWELL (Notes 1-5 apply)

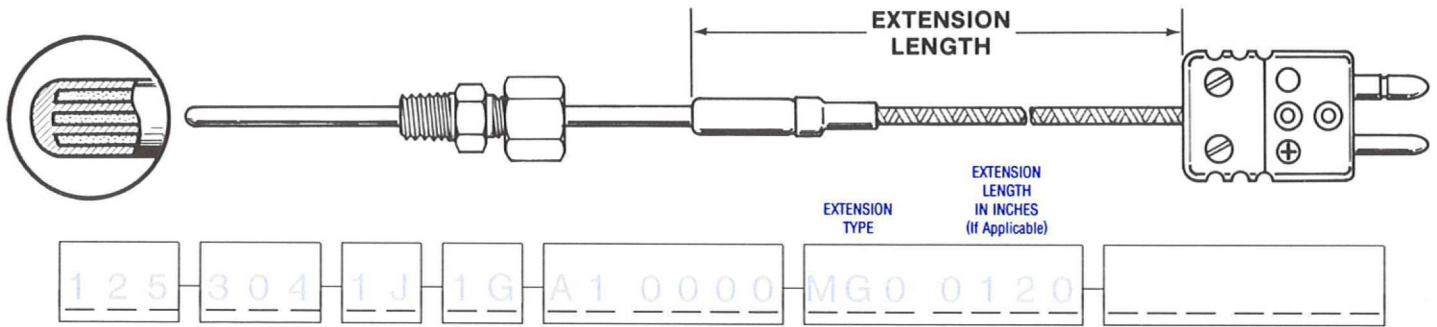


	"C" DIM.	Stl.(1)	SS
NIPPLE	2"	12	42
	5"	15	45
	6"	16	46
NIPPLE/ UNION	2 3/4"	23	53
	3 3/4"	26	56
NIPPLE/ UNION/ NIPPLE	3"	33	63
	6"	36	66

NOTES: 1) Galvanized Steel Standard



SENSORS CUSTOM MARLOX® THERMOCOUPLES

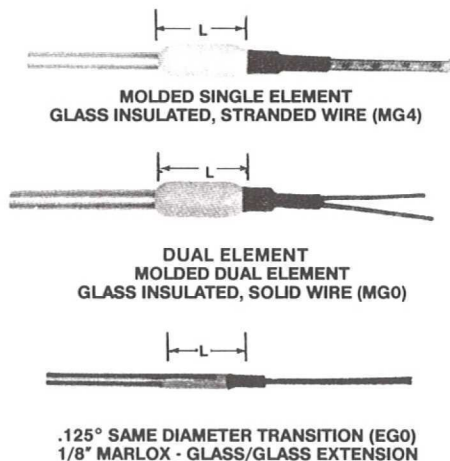


The Marlox Transition

The Marlox transition is an exclusive development from Marlin Manufacturing Corporation. After the wire extension has been spliced to the sheathed thermocouple wire, the transition is molded with a thermoset compound. This transition exhibits the characteristics of high strength and resistivity and protects and splice against moisture, vibration and mechanical damage and also incorporates a strain relief for the wires that obsoletes springs and adapters. Standard transitions can be used in ambient temperatures to 400°F (205°C). High temperature transitions are available for use in ambient temperatures to 800°F (425°C).

MARLOX TRANSITION DIMENSIONS				
MARLOX SIZE DIA. INCHES	TRANSITION* SIZE DIA. INCHES	TRANSITION LENGTH "L" DIMENSION INCHES	WIRE EXTENSION GAUGE (AWG.)	
			SINGLE	DUAL
.020	.190	.875	28	N/A
.032	.190	.875	28	N/A
.040	.190	.875	28	N/A
.062	.190	.875	24	28
.125	.250	1.000	20	24
.187	.312	1.000	20	24
.250	.437	1.000	16	20

* Same diameter transitions are available in .125" Dia. and larger Marlox.
* Dual element transitions are available in .062" Dia. and larger Marlox.



EXTENSION TYPE	
EXTENSION	CODE
NONE	XXX
TEFLON INSULATED 260°C (500°F)	ME0
FIBERGLASS INSULATED 482°C (900°F)	MG0

*Extension length in inches

NOTES:

- 1) For SS flex Armor Cable over Exten. add "3" to code: e.g. "MG3"
 - 2) SS Overbraid over Exten. add "1" to code: e.g. "MG1"
- TRANSITIONS
- 3) Extension includes transitions for use to 205°C (400°F)
 - 4) For Hi-Temp transition 425°C (800°F) add "H" to code: e.g. "HG0"
 - 5) For transition "same size" as Sheath O.D. add "E" to code e.g. "EG0"
 - 6) For "Probe Handle" transition use code "P" e.g. "PT7" (good for 350°F — not available in hi-temp).

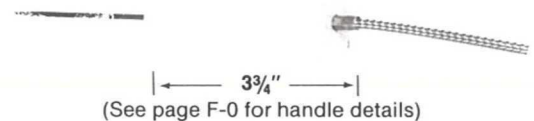
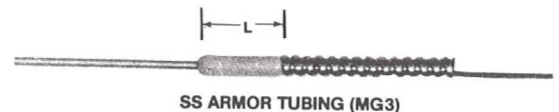
Teflon-Teflon Teflon insulates individual conductors followed by an overall teflon jacket. Superior abrasion and moisture resistance. Resists most acids and vapors. Recommended operating temperature -90°F to 500°F.

Glass-Glass Glass yarn is applied over each conductor then impregnated with silicone varnish plus both conductors are covered with a braid of glass yarn also with silicone varnish. Fair resistance to abrasion and moisture. Recommended operating temperature to 900°F. Varnish is destroyed above 400°F.

Glass-Glass with SS Overbraid Same as Glass-Glass With added abrasion resistance.



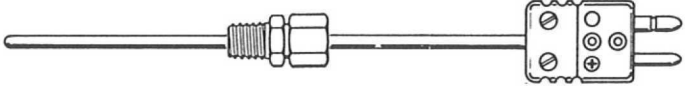
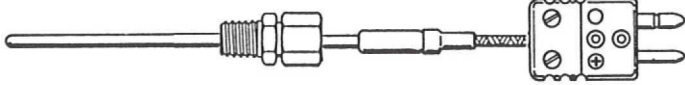
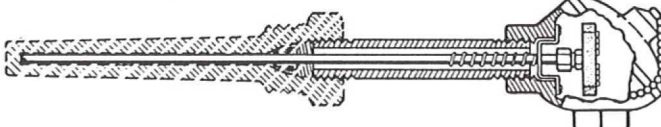
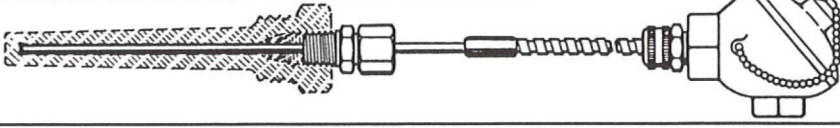

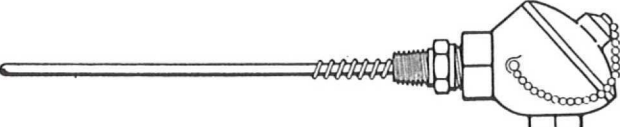

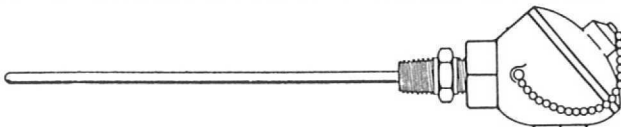
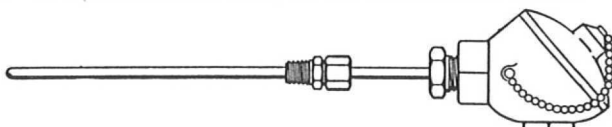
SS Armor Tubing Can be used over any wire extension for added mechanical damage and abrasion resistance.



(See page F-0 for handle details)
PROBE HANDLE TRANSITION W/SS FLEX ARMOR (PT7)
(216) 941-6200



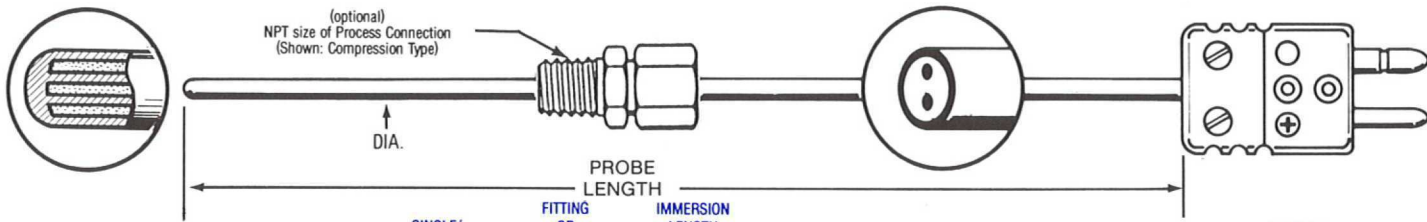
SENSORS
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For
Stock
Marlox
Thermo-
couples



SENSORS — SELECTION SUMMARY CUSTOM MARLOX® THERMOCOUPLES



PROBE DIA. SHEATH MAT'L T/C TYPE SINGLE/ DUAL T/C JUNCTION MOUNTING TYPE FITTING OR JUNCTION MOUNTING TYPE IMMERSION LENGTH IN INCHES (If Applicable) XXX 0000 TERMINAL TYPE PROBE LENGTH IN INCHES

PROBE DIA. CODE
010
020
032
040
062
125
187
250
312
375
500

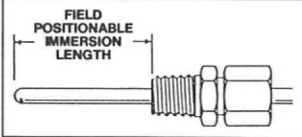
SHEATH MAT'L CODE
304
310
316
600
230

ANSI TYPE
1T
1J
1E
1K
1N

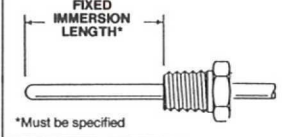
Special tolerance. Use "2" i.e. 2K

MOUNTING FITTING	CODE
NONE	XX
*COMPRESSION FITTING	
SS Fittings 1/8 NPT 1/4 NPT	A1 A2

*Not readjustable with metal ferrule
 NOTES:
 C1=Stl. B1=Brass
 Ferrules:
 Metal Standard (Non-readjustable)
 "T" for Teflon (Readjustable)
 e.g. T1
 "L" for Lava (Non-reusable)
 e.g. L1

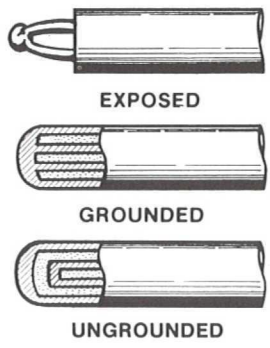


FIXED IMMERSION, SS	
1/8 NPT	F1
1/4 NPT	F2
3/8 NPT	F3
1/2 NPT	F4
3/4 NPT	F6
1 NPT	F8



JUNCTION TYPE	ORDER CODE
Single Thermocouple Element Marlox	
Exposed	1X
Grounded	1G
Ungrounded	1U
*Weld Pad, Grounded Perpendicular	1A
Parallel	1B
Tube Skin	1C
Dual Thermocouple Element Marlox	
Exposed	2X
Grounded	2G
Ungrounded	2U
Weld Pad, Grounded Perpendicular	2A
Parallel	2B
Tube Skin	2C

TERMINAL TYPE	ORDER CODE
BARE LEADS	B10
MINIATURE PLUG — Max Sheath DIA. .125"	M12
STANDARD 2-POLE PLUG — Max Sheath DIA. .250"	P51
STANDARD 2-POLE PLUG W/EXTERNAL STRAIN RELIEF — Max Sheath DIA. .375"	P11
DUAL-STD. 2-POLE PLUG W/EXTERNAL STRAIN RELIEF — Max Sheath DIA. .375"	P12
STANDARD 3-POLE PLUG W/EXTERNAL STRAIN RELIEF — Max Sheath DIA. .375"	P31
NOTES FOR ABOVE CONNECTORS a) Connectors for use to 205°C (400°F) For other option consult factory	
SINGLE ELEMENT MICRO CONNECTOR HEAD — Max Sheath DIA. .250"	500
DUAL ELEMENT MICRO CONNECTOR HEAD — Max Sheath DIA. .250"	504

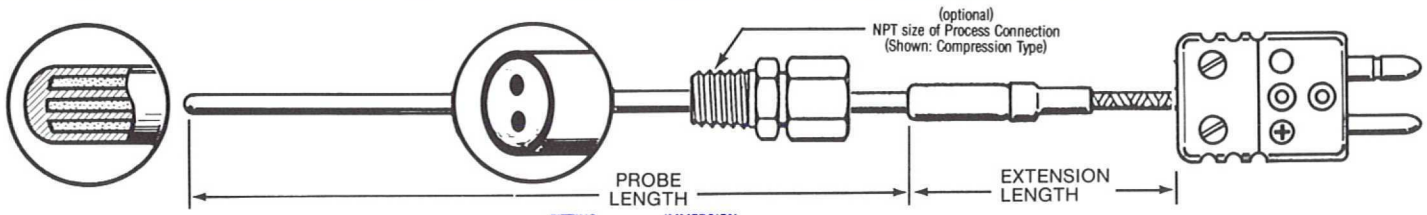


FOR / TITLE:		
DATE:	BY:	REFERENCE



SENSORS — SELECTION SUMMARY

CUSTOM MARLOX® THERMOCOUPLES WITH EXTENSION



PROBE DIA.	SHEATH MAT'L	T/C TYPE	SINGLE/DUAL T/C	JUNCTION MOUNTING TYPE	FITTING OR IMMERSION LENGTH IN INCHES (If Applicable)	EXTENSION TYPE	EXTENSION LENGTH IN INCHES	TERMINAL TYPE	PROBE LENGTH IN INCHES

PROBE DIA. CODE
010
020
032
040
062
125
187
250
312
375
500

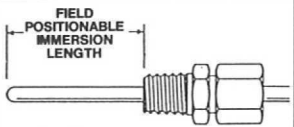
SHEATH MAT'L CODE
304
310
316
600
230

ANSI TYPE
1T
1J
1E
1K
1N

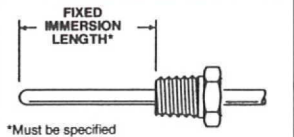
Special tolerance. Use "2" i.e. 2K

MOUNTING FITTING	CODE
NONE	XX
*COMPRESSION FITTING	
SS Fittings	
1/8 NPT	A1
1/4 NPT	A2

*Not readjustable with metal ferrule
 NOTES:
 C1=Stl. B1=Brass
 Ferrules:
 Metal Standard (Non-readjustable)
 "T" for Teflon (Readjustable)
 e.g. T1
 "L" for Lava (Non-reusable)
 e.g. L1



FIXED IMMERSION, SS	
1/8 NPT	F1
1/4 NPT	F2
3/8 NPT	F3
1/2 NPT	F4
3/4 NPT	F6
1 NPT	F8



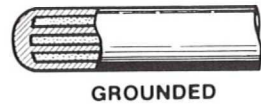
EXTENSION TYPE	CODE
TEFLON INSULATED 260°C (500°F)	MEO
FIBERGLASS INSULATED 482°C (900°F)	MGO

*Extension length in inches
 NOTES:
 1) For SS flex Armor Cable over Exten. add "3" to code: e.g. "MG3"
 2) SS Overbraid over Exten. add "1" to code: e.g. "MG1"
 TRANSITIONS
 3) Extension includes transitions for use to 205°C (400°F)
 4) For Hi-Temp transition 425°C (800°F) add "H" to code: e.g. "HG0"
 5) For transition "same size" as Sheath O.D. add "E" to code e.g. "EG0"
 6) For "Probe Handle" transition use code "P" e.g. "PT7" (good for 350°F — not available in hi-temp).

TERMINAL TYPE	CODE
BARE LEADS	B30
MINIATURE PLUG	M15
STANDARD 2-POLE PLUG W/EXTERNAL STRAIN RELIEF	P15
DUAL-STD. 2-POLE PLUG W/EXTERNAL STRAIN RELIEF	P12
STANDARD 3-POLE PLUG W/EXTERNAL STRAIN RELIEF	P32

NOTES FOR ABOVE TERMINAL CONNECTORS
 a) Connectors for use to 205°C (400°F)
 b) For other options see factory

JUNCTION TYPE	ORDER CODE
Single Thermocouple Element Marlox	
Exposed	1X
Grounded	1G
Ungrounded	1U
*Weld Pad, Grounded	
Perpendicular	1A
Parallel	1B
Tube Skin	1C
Dual Thermocouple Element Marlox	
Exposed	2X
Grounded	2G
Ungrounded	2U
*Weld Pad, Grounded	
Perpendicular	2A
Parallel	2B
Tube Skin	2C



FOR / TITLE:		
DATE:	BY:	REFERENCE

