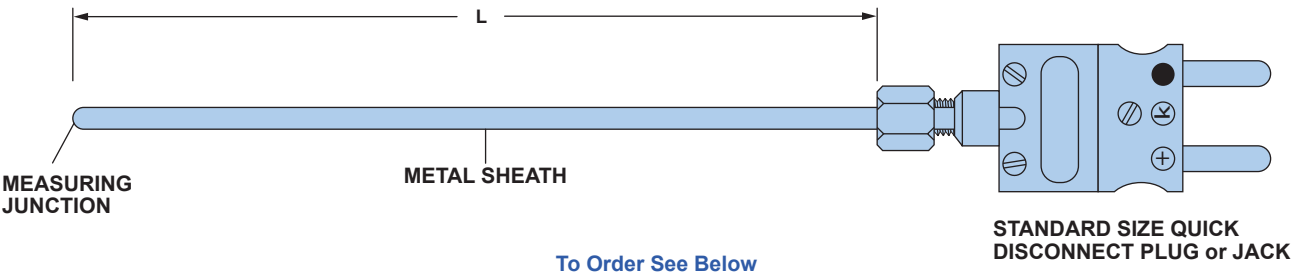
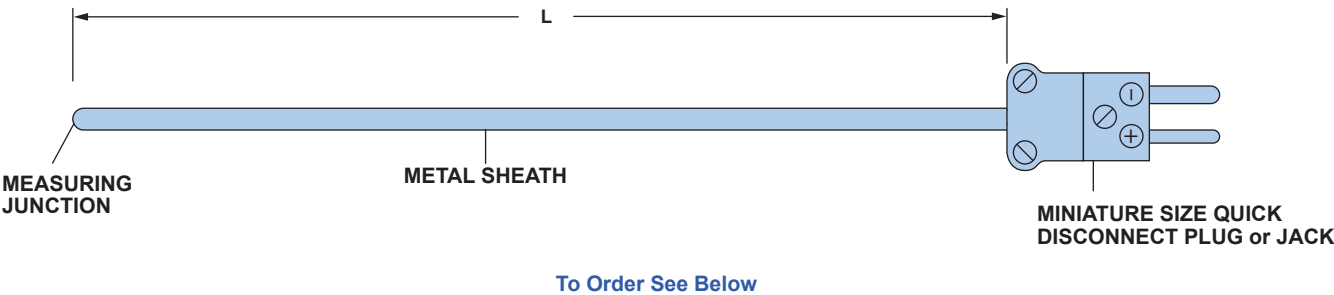


SANDELIUS INSTRUMENTS, INC.

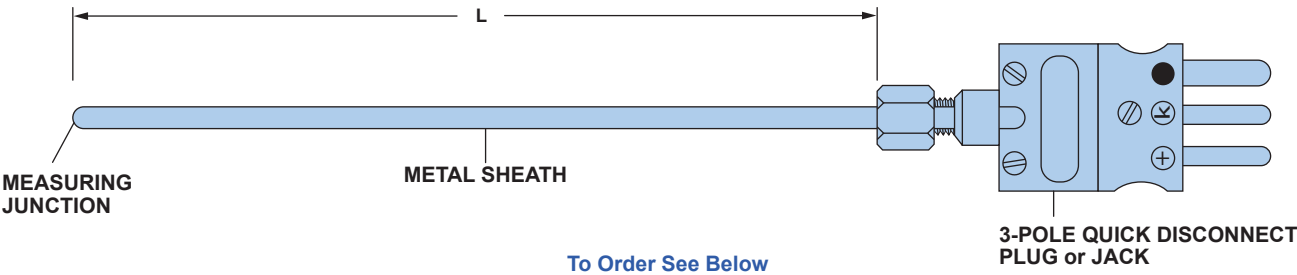
- Sandelius Style 1B – Element with Standard 2-Pole Plug or Jack
- Sandelius Style 2B – Element with Standard Size High Temperature* 2-Pole Plug or Jack
- Sandelius Style 7B – Element with Standard Size Ultra-High Temperature* 2-Pole Plug or Jack



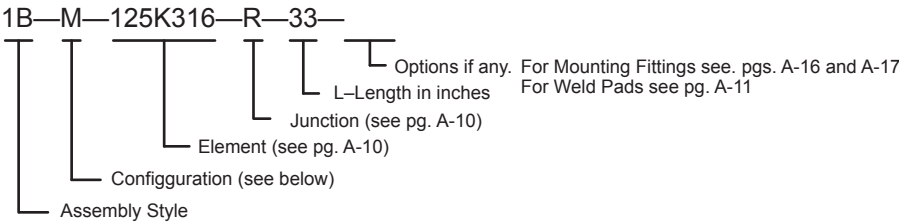
- Sandelius Style 3B – Element with Miniature Plug or Jack (Not available in dual element)
- Sandelius Style 4B – Element with Miniature High Temperature* Plug or Jack (Not available in dual element)



- Sandelius Style 5B – Element with Standard 3-Pole Plug or Jack
- Sandelius Style 6B – Element with Standard Size High Temperature* 3-Pole Plug or Jack



To Order Any “B” Series Assembly Specify



Plug & Jack Configurations for “B” Series Assemblies

ORDER SYMBOL	DESCRIPTION
M	Male connector (plug) mounted on the sheath with no mating connector
MF	Male connector (plug) mounted on the sheath. Furnished complete with matching female connector (jack)
F	Female connector (jack) mounted on the sheath with no mating connector
FM	Female connector (jack) mounted on the sheath. Furnished complete with matching male connector (plug)

*Standard connectors are rated for ambient temperatures of 350°F continuous or 400°F intermittent.
High temperature connectors are rated for ambient temperatures of 500°F continuous or 550°F intermittent.
Ultra-high temperature connectors are rated for ambient temperatures of 800°F continuous or 1000°F intermittent.

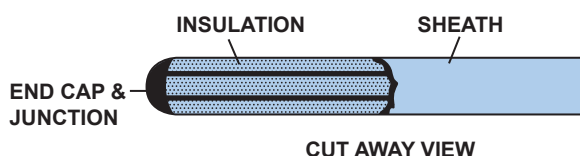
METAL SHEATH TYPE ELEMENTS

METAL SHEATH TYPE THERMOCOUPLE ELEMENTS SANDELIUS NUMBERING SYSTEM

SHEATH O.D IN 1000ths OF AN INCH		CALIBRATION SYMBOL			SHEATH MATERIAL		
ORDER SYMBOL	APPROXIMATE FRACTION	ORDER SYMBOL*	CONDUCTOR MATERIAL	TEMPERATURE RANGE	ORDER SYMBOL	MATERIAL	
020	1/50	E	Chromel / Constantan	-328 - 1652°F**	200	Nickel 200	
032	1/32	J	Iron / Constantan	32 - 1382°F**	304	304SS	
040	1/25	K	Chromel / Alumel	-328 - 2282°F**	304L	304L	
063	1/16	R	Platinum / Platinum 13% Rh	32 - 2642°F	310	310SS	
125	1/8	S	Platinum / Platinum 10% Rh	32 - 2642°F	310L	310L	
188	3/16	B	Platinum 6% Rh / Platinum 30% Rh	1598 - 3092°F	316	316SS	
250	1/4	N	Nicrosil / Nisil	32 - 2282°F	316L	316L	
313	5/16	T	Copper / Constantan	-328 - 662°F**	321	321SS	
375	3/8	* Single letter calibration symbol is used for single element. A double letter calibration symbol is used for dual element. EXAMPLE: 125JJ316 is dual element type J.				347	347SS
500	1/2					400	Monel 400
** Type E, K & T may be used for cryogenic temperature as low as -328°F, but must be specifically ordered to insure accuracy in cryogenic range.				446	446SS		
				600	Inconel 600		
				601	Inconel 601		
				625	Inconel 625		
				800	Incoloy 800		
				276	Hastelloy C-276		
				277	Hastelloy X		
				285	Tantalum		
				337	Titanium Grade 2		
				928	Pyrosil		

MEASURING JUNCTION STYLES

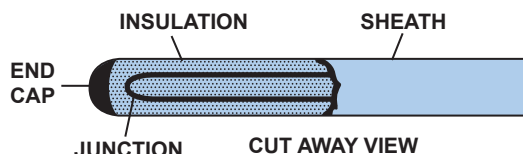
G-GROUNDED JUNCTION



The conductors and sheath material are simultaneously cap welded. This process forms a measuring junction which is an integral part of the end cap and electrically grounded to the sheath. The most common junction style, grounded junctions protect the thermocouple conductors from contamination and offer fast response times.

Order Symbol: G-Single or Dual Element

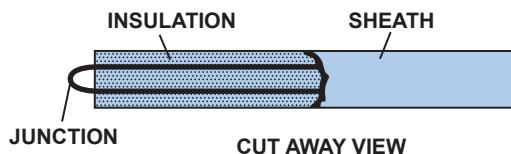
R-REMOTE OR UNGROUNDED JUNCTION



The conductors are first junction welded together. Prior to cap welding the sheath, the junction is covered with insulating material to insulate it from the sheath and end cap. Remote junctions protect the thermocouple conductors from both contamination and outside electrical interference. They are used whenever electrical isolation of the element is desirable.

Order Symbol: R – Single Element
RC* – Dual Element Common
RS* – Dual Element Separate

E-EXPOSED JUNCTION



The sheath material is stripped back slightly and the conductors are welded together to form a measuring junction. The exposed insulation is sealed against moisture penetration. Exposed junctions provide the fastest possible response times but do not offer protection to the thermocouple conductors.

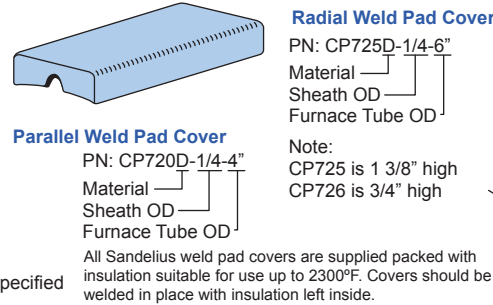
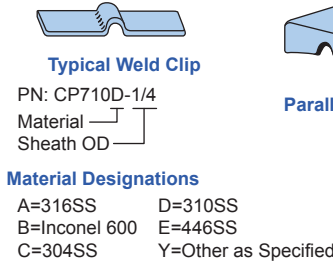
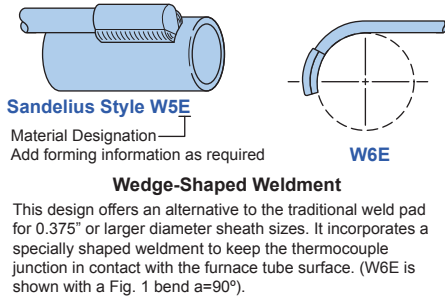
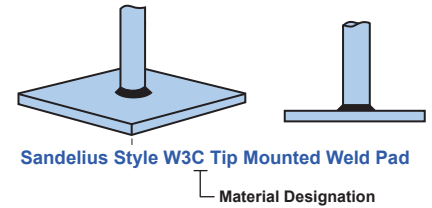
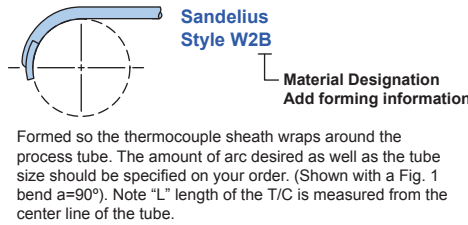
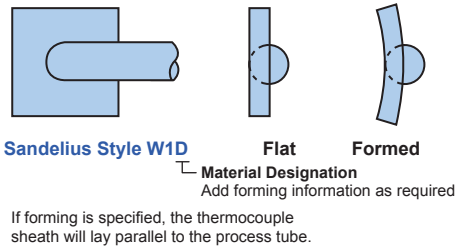
Order Symbol: E – Single Element
EC* – Dual Element Common
ES* – Dual Element Separate

* When ordering dual element remote or exposed junctions, a "C" indicates common junction (all four conductors welded together forming a common junction); an "S" indicates separate junctions (each thermocouple element independently junctioned and isolated from each other).

FURNACE TUBE TEMPERATURE THERMOCOUPLES

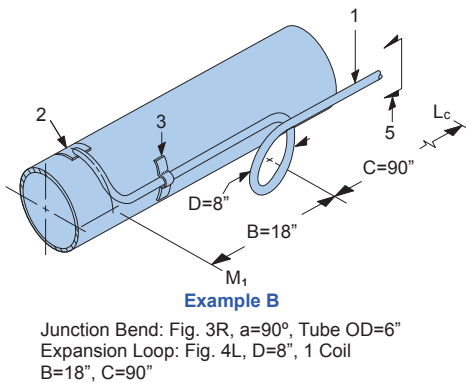
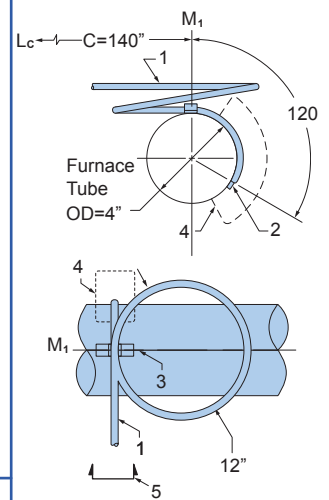
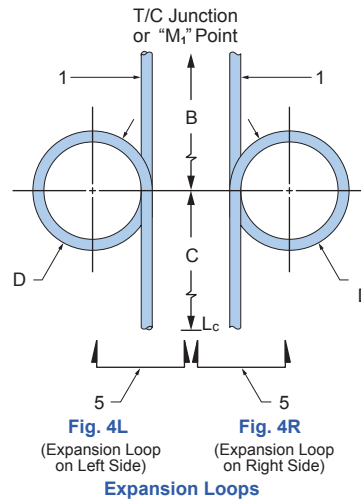
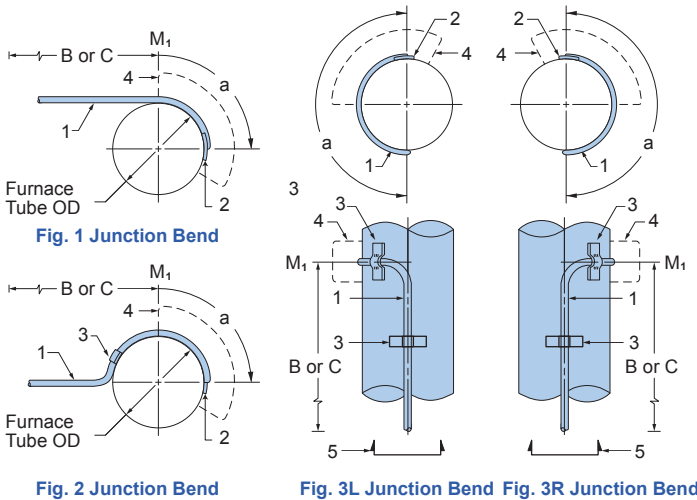
Whenever a thermocouple must be welded in place it is advisable to use a weld pad and weld clips to protect against burn-through of the sheath material during field installation. Sandelius weld pads, weld clips and weld pad covers are available in a wide range of styles and materials.

Standard W1, W2 and W3 style weld pads measure 3/4" x 3/4" x 1/8". Inconel 600 or 310SS have proven to be excellent choices for most furnace applications. Other materials are available on request.



TYPICAL WELD PAD INSTALLATION AND EXPANSION LOOPS

Bending and expansion loops are best specified by sending a drawing or sketch with your order. The following are examples of commonly used configurations. Many other configurations are available. Expansion loops are normally designed to open with furnace tube movement.



Legend

L = The total straight length of the thermocouple sheath before bending as shown in the drawing of each assembly style on pages 2-7. In assemblies including expansion loops and/or bends, this length should be specified as "00" in the part number allowing is to make the necessary calculations.

L_c = The "point of measurement" toward the "cold" or reference end of the sheath. "L_c" is constant as shown in the drawing of each assembly style on pages 2-7.

M₁ = The first "point of measurement" back from the "hot" or measuring junction end of the thermocouple. On a straight assembly with no bends M₁ = L_c. On assemblies incorporating one or more bends M₁ and subsequent points of measurement will vary with the type of bend as indicated in the figures above.

B = The straight length of sheath between the center of an expansion loop and next measuring point toward the "Hot Junction", usually "M₁". (Used only when an expansion loop is specified. If no expansion loop is specified "B" is left blank).

C = The straight length of sheath between "L_c" and the first "point of measurement" encountered; usually either the center of an expansion loop or M₁.

Example A
Junction Bend L Fig. 1, a=120°
Tube OD=4"
Expansion Loop: Fig. 4R,
D=12", 4 Coils, B=0, C=140°

a = Degrees of arc in a bend.
D = The outside diameter of a circular expansion loop.
1 - Thermocouple sheath
2 - Weld pad
3 - Weld clip
4 - Weld pad cover (Dotted for clarity)
5 - Correct view to determine R (right) or L (left) side orientation of an expansion loop.

Ordering Information

First select a thermocouple assembly from pages 2-7 of this catalog. Complete the part number for the assembly desired and add the weld pad designation to the end of the part number.

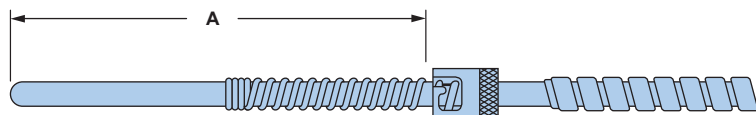
Example: 1A-250K310-G-120-S3-W1D formed to fit 4" OD tube.

To order an assembly with an expansion loop, bend or both add a description of the loop and bending required.

Example: 3T-250K600-G-00-P1-6-W2B Junction bend for Fig. 3R (a=180), Expansion loop per Fig. 4L, D=12", 3-Coils, B=15", C=96" (Note in this example the length is specified as "00" allowing us to calculate the material required).

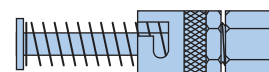
ACCESSORIES

BAYONET TYPE FITTINGS AND ADAPTERS



BAYONET FITTING

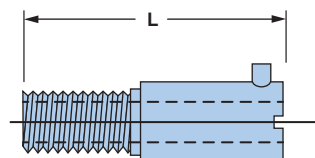
ORDER SYMBOL	DESCRIPTION
FB1	Bayonet Cap with spring stop brazed to sheath. Can be used on either 1/8" or 3/16" diameter.
FB4	Bayonet Cap with adjustable swage type spring. For use on 1/8" diameter probes.
FB5	Bayonet Cap with adjustable swage type spring. For use on 3/16" diameter probes.



ADJUSTABLE BAYONET FITTING

Order Symbol: **FB2B** (with Brass Ferrule)
FB2N (with Nylon Ferrule)
FB2T (with Teflon Ferrule)

Designed for use on 0.125" diameter sheath material. This fitting incorporates a compression type mounting feature. If nylon or Teflon ferrules are used, the fitting may be re-positioned as needed.

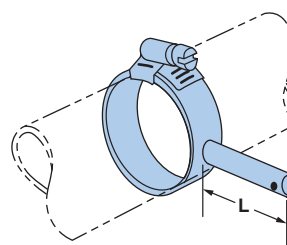


1/8" NPT

STANDARD BAYONET ADAPTER

Order Symbol: **BA-(L)**

Standard Lengths 7/8", 1 1/2", 2 1/2" and 3 1/2". Other lengths and special thread sizes are available on request.



PIPE STRAP BAYONET ADAPTER

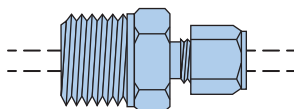
Order Symbol: **FP - 4 - 2**

L Length (in inches)
 Std. L=2"
 Actual Tube or
 Pipe O.D. (in inches)

Pipe strap adapters are available to fit any size tube or pipe. They provide an excellent means to achieve surface temperature measurements while allowing for easy replacement of thermocouple probes.

COMPRESSION FITTINGS

SINGLE THREADED



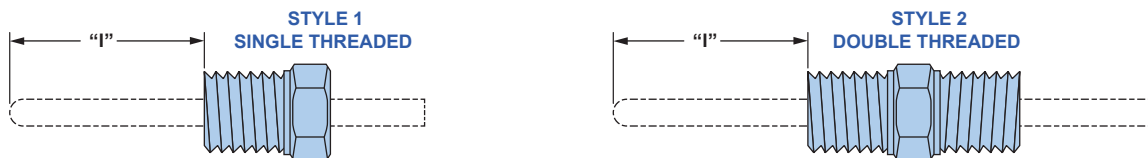
ORDER SYMBOL *	THREAD NPT SIZE	MATERIAL	AVAILABLE TO FIT THESE SHEATH O.D. SIZES
CB11	1/8"	Brass	0.063", 0.125", 0.188", 0.250"
CF11	1/8"	Stainless Steel	0.063", 0.125", 0.188", 0.250"
CB12	1/4"	Brass	0.063", 0.125", 0.188", 0.250", 0.312", 0.375"
CF12	1/4"	Stainless Steel	0.063", 0.125", 0.188", 0.250", 0.312", 0.375"
CB13	3/8"	Brass	0.125", 0.250", 0.312", 0.375"
CF13	3/8"	Stainless Steel	0.125", 0.250", 0.312", 0.375"
CB14	1/2"	Brass	0.125", 0.250", 0.375", 0.500"
CF14	1/2"	Stainless Steel	0.125", 0.188", 0.250", 0.375", 0.500"
CB16	3/4"	Brass	0.250", 0.375", 0.500"
CF16	3/4"	Stainless Steel	0.250", 0.375", 0.500"

Readjustable compression fittings with Teflon sealant ferrules are available upon request. When ordering fittings with Teflon ferrules, simply add a "T" after the order symbol. Example: CF14T-250.

*When ordering fittings as a part of an assembly, the order symbol alone includes all the information required as the fitting will be sized to match the assembly. When ordering fittings separately, the sheath O.D. size must be included. Example: CB12-250. Other materials available upon request.

ACCESSORIES

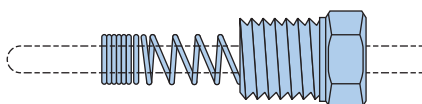
FIXED FITTINGS – ARE BRAZED OR WELDED TO THE SHEATH



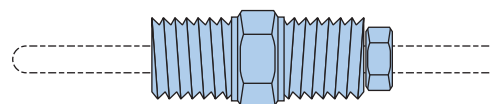
ORDER SYMBOL		THREAD SIZE	MATERIAL	AVAILABLE TO FIT THESE SHEATH O.D. SIZES
STYLE 1	STYLE 2			
F11	F21	1/8" NPT	304SS	0.063, 0.125, 0.188 & 0.250
F12	F22	1/4" NPT	304SS	0.063, 0.125, 0.188, 0.250, 0.313 & 0.375
F14	F24	1/2" NPT	304SS	0.063, 0.125, 0.188, 0.250, 0.313, 0.375 & 0.500
F16	F26	3/4" NPT	304SS	0.063, 0.125, 0.188, 0.250, 0.313, 0.375 & 0.500
F18	F28	1" NPT	304SS	0.063, 0.125, 0.188, 0.250, 0.313, 0.375 & 0.500

SPRING-LOADED FITTINGS

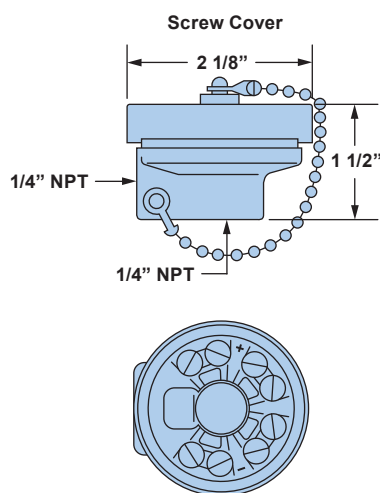
STYLE 1 – SINGLE THREADED



STYLE 2 – DOUBLE THREADED



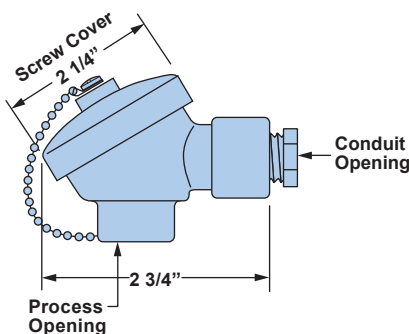
ORDER SYMBOL		THREAD NPT SIZE	MATERIAL	SPRING TYPE	AVAILABLE SHEATH SIZES
STYLE 1	STYLE 2				
SF14	SF24	1/2" NPT	304SS	Adjustable	0.125, 0.188, 0.250, 0.312 & 0.375
SB14	–	1/2" NPT	BRASS	Adjustable	0.125, 0.188, 0.250, 0.312 & 0.375
SPF14	SPF24	1/2" NPT	304SS	Adjustable with Liquid-tight O-Ring	0.125, 0.188 & 0.250



Miniature Weatherproof Thermoset Plastic Head

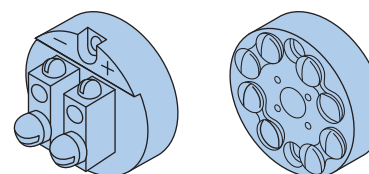
1/4" NPT x 1/4" NPT with 4 Integral Terminals

Part Number	Ambient Temperature Rating
N22	350° F
W22	800° F



Miniature Aluminum Head (Type M)

Part Number: M44* (1/2" x 1/2" NPT)
(Use "120" Series Terminal Blocks)
Max No. of Terminals: 4 + Ground
*See note on page A-18



Ceramic Terminal Blocks

Fit Miniature Head Type: M

Part Number	Description
CP122	2 - Terminals
CP124	4 - Terminals