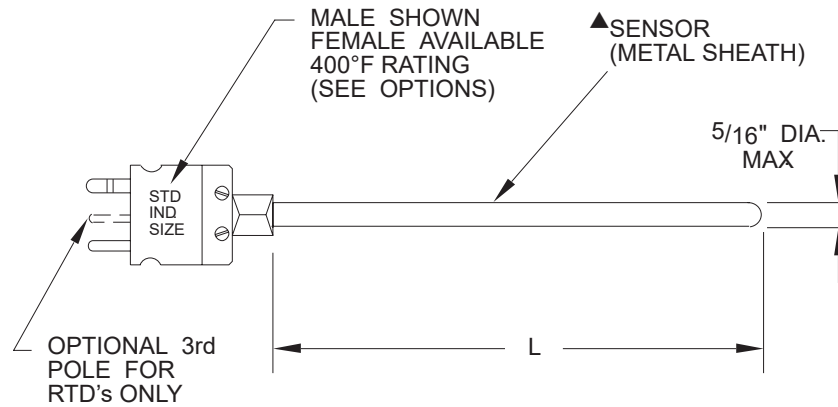




TYPE 06 Sensor with Plug Connection



▲ MgO insulated for thermocouple, Al₂O₃ insulated for R.T.D.

SENSOR						
LINE #	DIAMETER	TYPE	# OF CONTACTS	SHEATH MAT'L	MEASURING JUNCTION	OPTIONS
1	5/16	J		316 SS	GROUNDED	★ COMPRESSION FITTING
2	1/4	K	2	INC.	UNGROUNDED	FEMALE TYPE
3	3/16	E	3	OTHER ADVISE	EXPOSED	WITH JACK OR PLUG HAVING CABLE CLAMP ADAPTOR
4	SMALLER ADVISE	T	4		OTHER ADVISE	† BUSHING DRILLED AND WELDED IN PLACE
5		100 OHM PLAT.			NOT APPLICABLE	HI-TEMP CERAMIC PLUG OR JACK
6		OTHER ADVISE	6			OTHER ADVISE

P/N 06 —

--	--	--	--	--	--

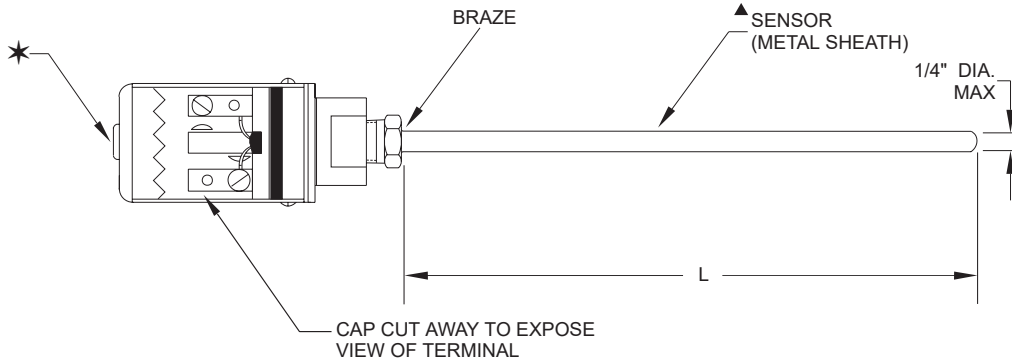
Complete using the line number for each column in sequence from left to right.
Specify: Dimension "L"

★ Specify: Material, NPT and type ferrule (Teflon for readjustment, metal for fixed position) - see pg. 22

† Specify: Material, NPT and location



TYPE 07 Sensor with Small Terminal Head



▲ MgO insulated for thermocouple, AL₂O₃ insulated for RTD.

* Customer connection — also available is cap with 1/2" NPT female tap (see option 3).

LINE #	SENSOR					OPTIONS
	DIAMETER	TYPE	# OF WIRES	SHEATH MATERIAL	MEASURING JUNCTION	
1	1/4	J		316 SS	GROUNDING	❖ COMPRESSION FITTING
2	3/16	K	2	INC.	UNGROUNDING	◆ BUSHING DRILLED AND WELDED IN PLACE
3	SMALLER ADVISE	E	3	OTHER ADVISE	EXPOSED	1/2 NPT TAPPED CAP
4		T	4		OTHER ADVISE	OTHER ADVISE
5		100 OHM PLAT.			NOT APPLICABLE	
6		OTHER ADVISE	6			

P/N **07** —

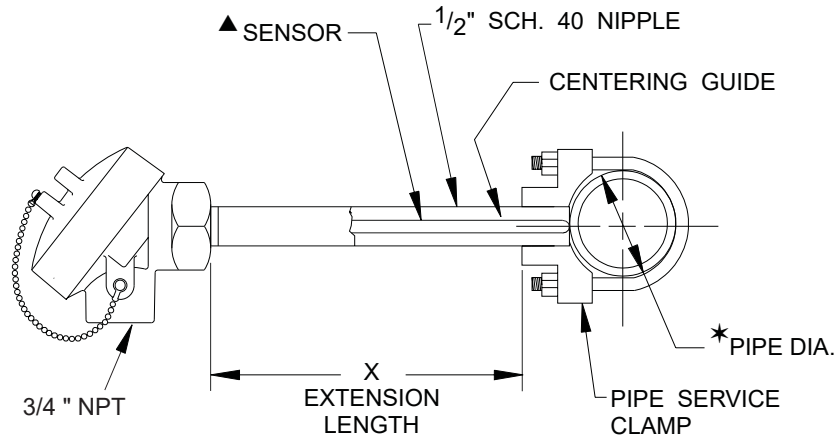
--	--	--	--	--	--

Complete using the line number for each column in sequence from left to right. Specify: Dimension "L"

- ❖ Specify: Material, NPT and type ferrule (Teflon for readjustment, metal for fixed position) - see pg. 22
- ◆ Specify: Material, NPT and location



TYPE 09 Spring Loaded Pipe Clamp Assembly



▲ MgO insulated for thermocouple, Al₂O₃ insulated for RTD.
* Specify pipe diameter.

LINE #	EXTENSION		SENSOR				
	MATERIAL	DIM. X	DIAMETER	TYPE	# OF WIRES	SHEATH MATERIAL	MEASURING JUNCTION
1	ALUM.	3 1/2	1/4	J		316 SS	GROUNDED
2	304 SS	4	3/16	K	2	INC.	UNGROUNDED
3	C.S.	5		E	3	OTHER ADVISE	OTHER ADVISE
4	OTHER ADVISE	5 1/2		T	4		NOT APPLICABLE
5		OTHER ADVISE		100 OHM PLAT.			
6				OTHER ADVISE	6		

P/N 09 —

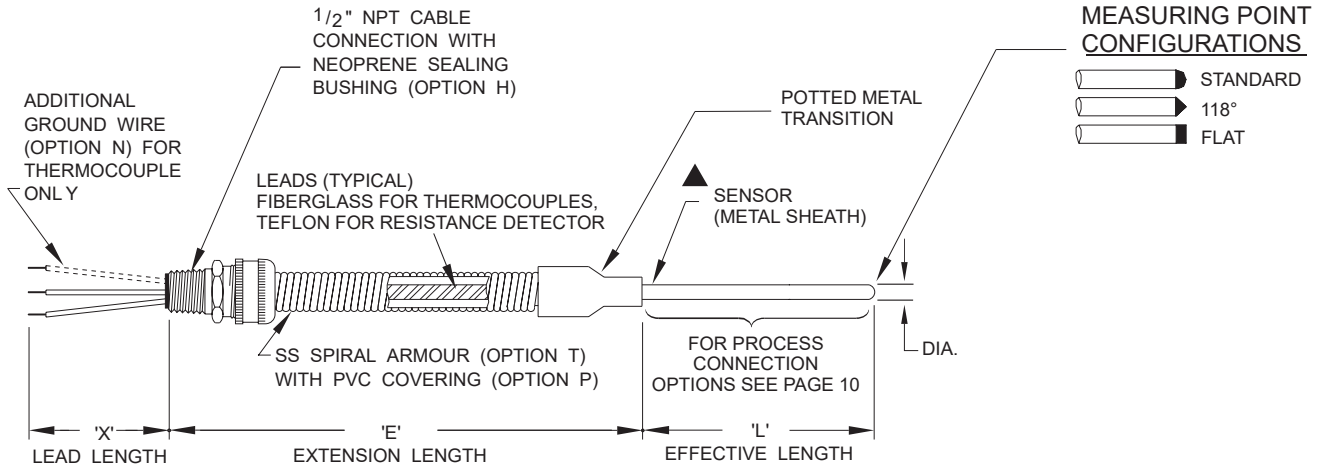
--	--	--	--	--	--	--	--

Complete using the line number for each column in sequence from left to right.





TYPE 11 Thermocouple with Extension Wires



▲ MgO insulated for thermocouple, Al₂O₃ insulated for RTD.

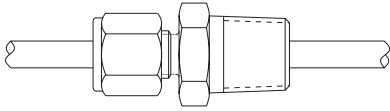
LINE #	DIAMETER	TYPE	# OF WIRES	SHEATH MATERIAL	TIP CONFIGURATION	MEASURING JUNCTION	OPTIONS
1	1/4	J		316	STD.	GROUNDING	T
2	3/16	K	2	INC.	118°	UNGROUNDING	P
3	1/8	E	3	OTHER ADVISE	FLAT	OTHER ADVISE	H
4	1/16	T	4		OTHER ADVISE	NOT APPLICABLE	N
5	OTHER ADVISE	100 OHM PLAT.	5				F
6		OTHER ADVISE	6				M
7							K
8							K1
9							K2
10							K3

P/N **11** —

Complete using the line number for each column in sequence from left to right
Specify: Applicable lengths, diameters, thread sizes and materials.

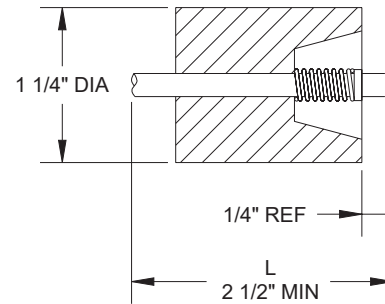
PROCESS CONNECTION OPTIONS

Option F Compression Fitting

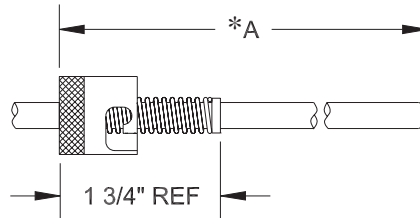


See page 22 for specifications.

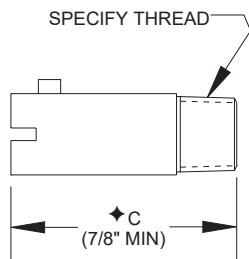
Option M Spring Loaded Holding Magnet



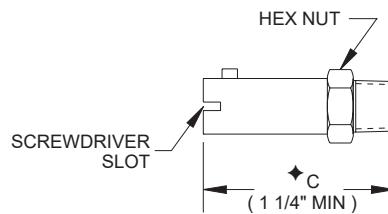
Option K Spring Loaded Bayonet Cap



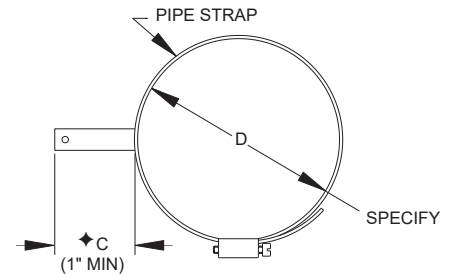
Accessories for K



K1



K2



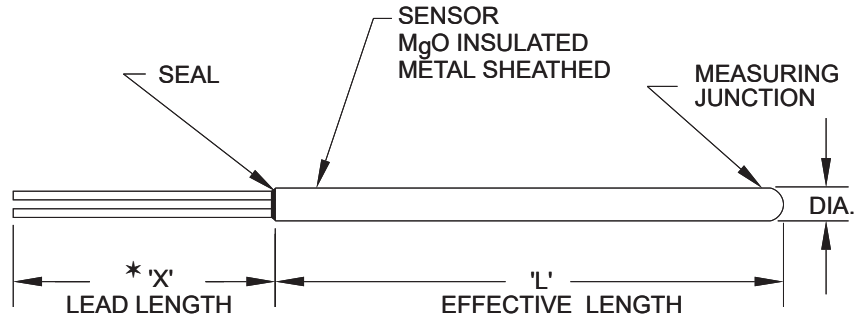
K3

* This dimension = required bore depth + adaptor length "C" + 1/16" or pipe clamp adaptor length "C" + 3/8"

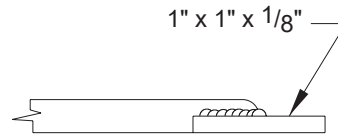
◆ Specify dimensions "C" in 1/2" increments when longer lengths are required



TYPE 12 Thermocouple — Stick Probe



Weld straps are available — add suffix "H" to P/N followed by quantity required.



Will be furnished with radius if applicable pipe size is given.

LINE #	SENSOR		TYPE	# OF WIRES	SHEATH MATERIAL	MEASURING JUNCTION	OPTIONS
	(WIRE GA)	SHEATH DIAMETER					
1	(20)	3/16	J		316 SS	GROUNDED	* COMPRESSION FITTING
2	(18)	1/4	K	2	INC.	UNGROUNDED	▲ BRAZED ON BUSHING
3	(16)	5/16	E		OTHER ADVISE	EXPOSED	WELD PAD
4	OTHER ADVISE		T	4			

P/N **12** —

--	--	--	--	--	--	--	--

Complete using the line number for each column in sequence from left to right. Specify: Dimensions "L" and "X".

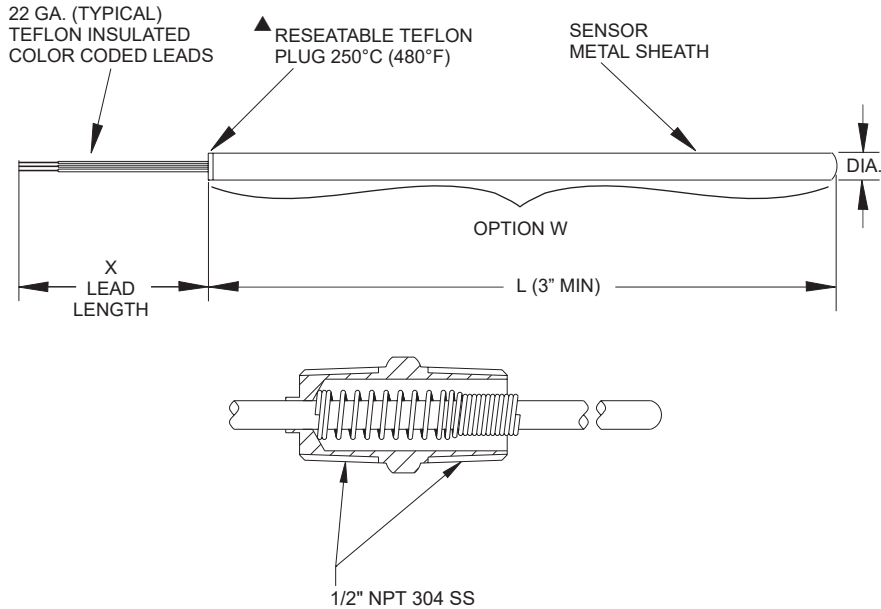
* Specify: Material, NPT, and type ferrule (Teflon for readjustment, metal for fixed position). See pages 22, 23.

▲ Specify: Material, NPT, location and thread mounting direction

* If sleeving required, specify material.



TYPE 13 -165 to 250°C RTD



Option W
Spring Loading
— Supplied in kit form —
(assembly by customer)

▲ Sheathed "L" length can be reduced with tubing cutter

SENSOR					
LINE #	DIA.	TYPE	NO. OF LEADS	SHEATH MAT'L	OPTIONS
1	1/4	100 Ω Plat	6	316 SS	COMPRESSION FITTINGS (see pg. 22)
2	3/16	OTHER ADVISE	2	OTHER ADVISE	
3			3		W
4			4		

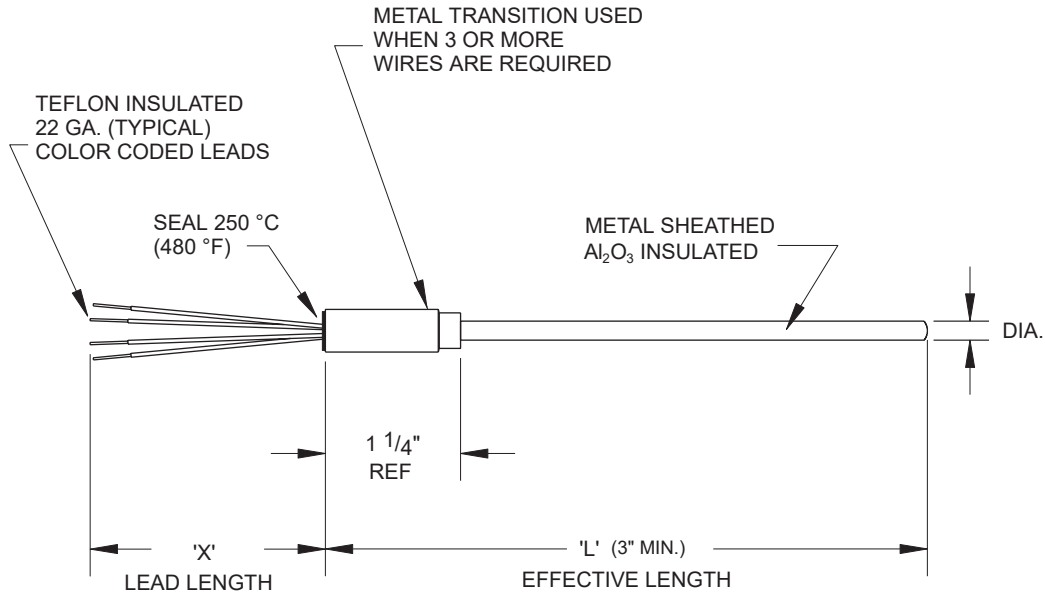
P/N 13 —

--	--	--	--	--

Complete using line no. for each column in sequence from left to right. Specify: Dimension "L" and "X".



TYPE 14 -250 to 550°C RTD



LINE NO.	SENSOR				OPTIONS
	DIA.	TYPE	NO. OF LEADS	SHEATH MAT'L	
1	1/4	100 Ω PLAT.	6	316 SS	* COMPRESSION FITTING
2	3/16	OTHER ADVISE	2	347 SS	▲ BRAZED ON BUSHING
3	1/8		3	OTHER ADVISE	
4			4		

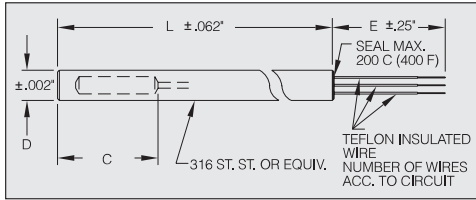
P/N **14** —

--	--	--	--	--

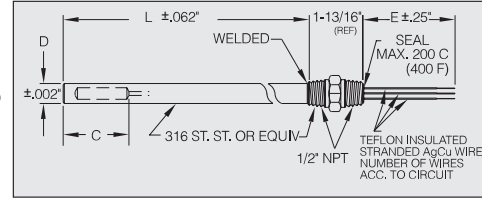
Complete using the line number for each column in sequence from left to right. Specify: Dimensions "L" and "X".

- * Specify: Material, NPT, and type ferrule (Teflon for readjustment, metal for fixed position) – see pg. 22
- ▲ Specify: Material, NPT, location and thread mounting direction

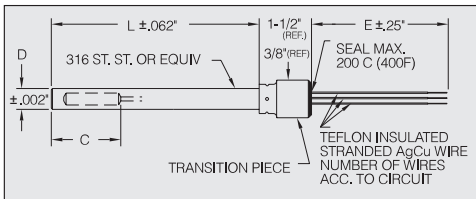
STANDARD RTDs WITH PLATINUM WINDINGS



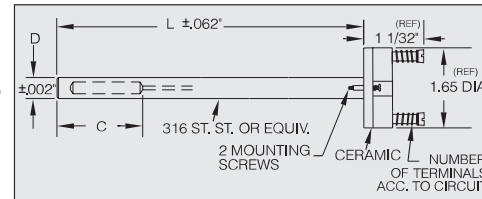
R002



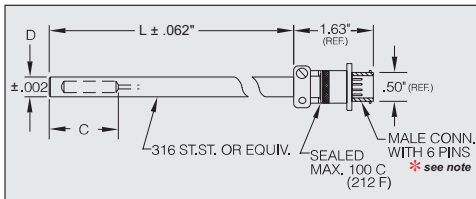
R005



R003

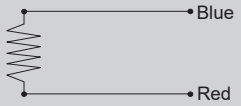
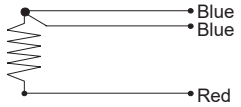
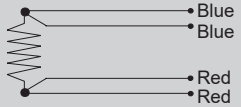
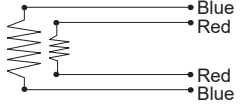
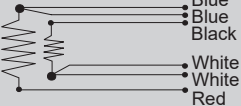


R006



R004
* R018 Mating connector

Temperature Range -250 to 550°C
 -420 to 1020°F
 Diameter (D)25" or .125"
 Winding 100 ± .1Ω @ 0°C, or
 2x100 ± .1Ω @ 0°C
 T.C. = .00385, DIN Class B
 Sensing Length "C" 1" long
 Specify if RTD is to be bendable type.

CIRCUIT	PART NUMBER						To order, specify part #, 'L' & 'E' as applicable.
	R002-101	R003-101	R004-101	R005-101	R006-101	D=0.25"	
	R002-151	R003-151	R004-151	R005-151	R006-151	D=0.125"	
	R002-102	R003-102	R004-102	R005-102	R006-102	D=0.25"	
	R002-152	R003-152	R004-152	R005-152	R006-152	D=0.125"	
	R002-103	R003-103	R004-103	R005-103	R006-103	D=0.25"	
	R002-153	R003-153	R004-153	R005-153	R006-153	D=0.125"	
	R002-105	R003-105	R004-105	R005-105	R006-105	D=0.25"	
	R002-106	R003-106	R004-106	R005-106	R006-106	D=0.25"	

Temperature vs Resistance Characteristic and Tolerance for Temp-Pro RTDs

Platinum-winding, 100Ω @ 0°C (± 0.1%)
 Temperature coefficient, α = .00385

Resistance vs Temperature (°F)

°F	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	Ω/°F †
-400	4.49	3.40	2.30	—	—	—	—	—	—	—	—	—
-300	25.10	22.71	20.33	17.97	15.65	13.38	11.21	9.25	7.42	5.91	4.49	0.206
-200	48.38	46.09	43.80	41.49	39.18	36.87	34.54	32.21	29.87	27.48	25.10	0.233
-100	70.95	68.72	66.49	64.25	62.00	59.75	57.49	55.22	52.95	50.67	48.38	0.226
0	93.01	90.81	88.61	86.41	84.21	82.01	79.81	77.61	75.39	73.18	70.95	0.221

°F	0	10	20	30	40	50	60	70	80	90	100	Ω/°F †
0	93.01	95.20	97.38	99.57	101.74	103.90	106.06	108.22	110.38	112.53	114.68	0.217
100	114.68	116.82	118.97	121.10	123.24	125.37	127.48	129.62	131.74	133.86	135.97	0.213
200	135.97	138.08	140.18	142.29	144.38	146.48	148.57	150.66	152.74	154.82	156.90	0.209
300	156.90	158.97	161.04	163.11	165.17	167.23	169.29	171.34	173.39	175.43	177.48	0.206
400	177.48	179.51	181.55	183.58	185.61	187.63	189.65	191.67	193.68	195.69	197.69	0.202
500	197.69	199.70	201.69	203.69	205.68	207.67	209.65	211.63	213.61	215.58	217.55	0.199
600	217.55	219.52	221.48	223.44	225.40	227.35	229.30	231.24	233.19	235.12	237.06	0.195
700	237.06	238.99	240.92	242.84	244.76	246.68	248.59	250.50	252.40	254.31	256.20	0.191
800	256.20	258.10	259.99	261.88	263.76	265.64	267.52	269.39	271.26	273.13	274.99	0.188
900	274.99	276.85	278.71	280.56	282.41	284.26	286.10	287.93	289.77	291.60	293.43	0.184
1000	293.43	295.25	297.07	298.89	300.70	302.51	304.32	306.12	307.92	309.71	311.50	0.181
1100	311.50	313.29	315.07	316.86	318.63	320.41	322.18	323.94	325.71	327.47	329.22	0.177
1200	329.22	330.97	332.72	334.47	336.21	337.95	339.68	341.41	343.14	344.86	346.58	0.174
1300	346.58	348.30	350.01	351.72	353.43	355.13	356.83	358.52	360.21	361.90	363.59	0.170
1400	363.59	365.27	366.95	368.62	370.29	371.96	373.62	375.28	376.93	378.56	380.23	0.167
1500	380.23	381.81	383.52	385.16	386.79	388.42	390.05	—	—	—	—	0.164

Resistance vs Temperature (°C)

°C	0	-10	-20	-30	-40	-50	-60	-70	-80	-90	-100	Ω/°C †
-200	18.44	14.26	10.35	7.06	4.49	2.52	—	—	—	—	—	—
-100	60.20	56.13	52.04	47.93	43.80	39.65	35.28	31.28	27.03	22.71	18.44	0.418
0	100.00	96.07	92.13	88.17	84.21	80.25	76.28	72.29	68.28	64.25	60.20	0.398
°C	0	10	20	30	40	50	60	70	80	90	100	Ω/°C †
0	100.00	103.90	107.79	111.67	115.54	119.40	123.24	127.07	130.89	134.70	138.50	0.385
100	138.50	142.28	146.06	149.82	153.57	157.32	161.04	164.76	168.47	172.16	175.84	0.373
200	175.84	179.51	183.17	186.82	190.46	194.08	197.70	201.30	204.88	208.46	212.03	0.361
300	212.03	215.58	219.13	222.66	226.18	229.69	233.19	236.67	240.15	243.61	247.06	0.350
400	247.06	250.50	253.93	257.34	260.75	264.14	267.52	270.89	274.25	277.60	280.93	0.338
500	280.93	284.26	287.57	290.87	294.16	297.43	300.70	303.95	307.20	310.43	313.65	0.327
600	313.65	316.86	320.05	323.24	326.41	329.57	R	335.86	338.99	342.10	345.21	0.315
700	345.21	348.30	351.38	354.45	357.51	360.55	363.59	366.61	369.62	372.62	375.61	0.304
800	375.61	378.59	381.55	384.50	387.45	390.38	—	—	—	—	—	0.295

† Average value for 100° range

RTDs with other nominal resistance (i.e.: 500Ω @ 0°C), other temperature coefficient (i.e.: α = .00391) and other tolerances (i.e.: ± 0.03% or ±0.5% @ 0°C) are also available.

Tolerances (°F)

Temperature in °F	± Tolerance	
	in °F	Ω
-420	10.4	1.0
-400	8.3	0.9
-350	3.3	0.7
-300	1.9	0.5
-200	1.5	0.4
-100	1.1	0.3
0	0.7	0.2
32	0.6	0.1
100	0.7	0.2
200	0.9	0.2
300	1.5	0.3
400	2.0	0.4
500	2.7	0.6
600	3.3	0.7
700	3.9	0.8
800	4.5	0.9
900	5.4	1.0
1000	6.0	1.1
1100	6.5	1.1
1200	7.0	1.2
1300	7.6	1.3
1400	8.4	1.4
1500	9.0	1.5
1560	9.4	1.5

Tolerances (°C)

Temperature in °C	± Tolerance	
	in °C	Ω
-250	5.8	1.0
-220	1.8	0.7
-200	1.2	0.5
-100	0.7	0.3
0	0.3	0.1
100	0.5	0.2
200	1.1	0.4
300	1.7	0.6
400	2.3	0.8
500	3.0	1.0
600	3.6	1.1
700	4.2	1.3
800	4.8	1.4
850	5.2	1.5



BASE METAL THERMOCOUPLES

REFERENCE GUIDE					
CALIB.	† DEGREE °F TEMP RANGE	* GAGE	‡ MV OUTPUT	SUITABLE ATMOSPHERE	COMMON FAILURE CAUSES
J	32 – 600	24	0 TO 42.92	REDUCING	ATTACKED BY AMMONIA, NITROGEN AND HYDROGEN
	600 – 900	20		OR	
	900 – 1100	14		NEUTRAL	
	1100 – 1400	8			
K	32 – 1400	24	0 TO 50.99	OXIDIZING	PREFERENTIAL OXIDATION OF CHROMEL LEG WHICH THEN BECOMES NEGATIVE – SULFUR ATTACK ON ALUMEL LEG CAUSING IMBRITTEMENT
	1400 – 1800	20		OR	
	1800 – 2000	14		NEUTRAL	
	2000 – 2300	8			
E	32 – 700	24	0 TO 66.95	OXIDIZING	PREFERENTIAL OXIDATION OF CHROMEL LEG WHICH THEN BECOMES NEGATIVE
	700 – 1000	20			
	1000 – 1200	14			
	1200 – 1600	8			
T	-300 – 500	20	-5.34 TO 19.10	MILD OXIDIZING OR REDUCING	ATTACKED BY AERATED ALKALINE SOLUTIONS
	500 – 700	14			

† Depending on gage size and calibration selected, the high temperature limits will be reduced by 100°F and up to 300°F if a protection housing is not used.

* As gage size increases, life increases but sensitivity decreases.

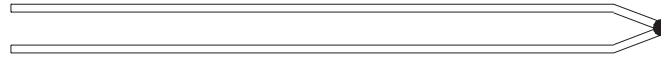
‡ With reference junction temperature at 32°F

To Order (see following page) — Specify

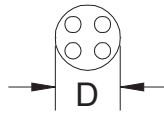
1. Type
2. Calibration
3. Gage Size
4. "L" Length
5. Option if Required
6. For special limits of error add suffix "P" (see page 18)



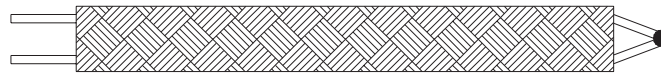
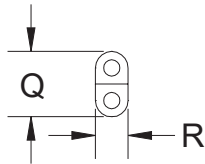
BASE METAL THERMOCOUPLES



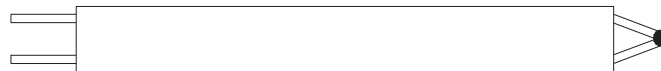
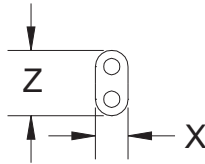
TYPE **170** UNINSULATED



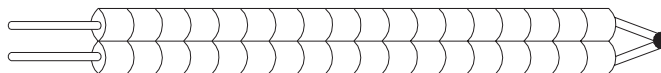
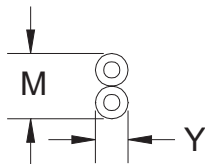
TYPE **171** SINGLE CERAMIC INSULATED,
OR TYPE **172** DUAL (2600°F)



TYPE **173** BRAIDED FIBERGLASS
(800°F)



TYPE **174** TEFLON INSULATED
(-300 TO 400°F)



TYPE **175** FISHSPINE INSULATED

GAUGE	DIMENSIONS							
	d	D	Q	R	Z	X	M	Y
8	.129	1/2	—	—	—	—	17/32	17/64
14	.064	1/4	3/16	7/64	—	—	11/32	11/64
20	.032	3/16	1/8	5/64	1/8	5/64	1/4	1/8
24	.020	3/16	5/64	1/16	7/64	1/16	—	—

— Not Available

THERMOCOUPLE ELEMENTS — LIMITS OF ERROR

Thermocouples should always be long enough to minimize the effect of heat loss due to conduction along the element and the protection housing. Insufficient insertion causes low readings.

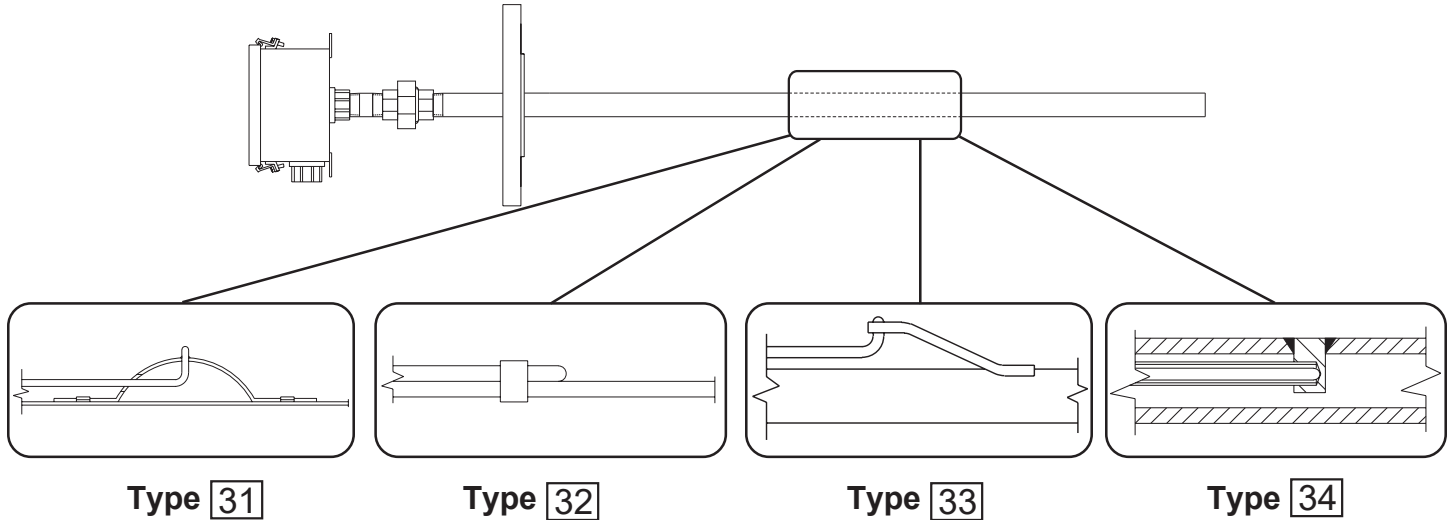
As a general rule, a thermocouple should be inserted a distance equivalent to four times the outside diameter of the protection housing. If the thermocouple must pass through thick walls, insulation and fitting offsets, the length should be increased accordingly. Thermocouple must extend to an area of less than 400°F ambient for termination.

CALI- BRATION	°F TEMP RANGE		± LIMITS OF ERROR	
	FROM	TO	STD.	SPL.
J	32	530	4 °F	2 °F
	530	1400	3/4 %	3/8 %
K	0	530	4 °F	2 °F
	530	2300	3/4 %	3/8 %
E	0	600	3 °F	1.8 °F
	600	1600	1/2 %	3/8 %
T	-300	-75	2 %	1 %
	-75	200	1.5 °F	0.75 °F
	200	700	3/4 %	3/8 %
PS or PR	32	1200	5 °F	3 °F
	1200	2700	1/4 %	1/8 %

See page 16 for reference guide.



TYPE 3 Multipoint Temperature Sensors



TYPE 31

1/16" thick **FLEXIBLE STRIP**, 304 SS is mounting base for metal sheathed MgO insulated THERMOCOUPLES of 1/8" or 3/16" diameter. Flexible design allows for ease of installation when space is limited or straight-in access is prohibited. Junction springloads against the inner wall of the well. Intimate contact of the sensor with the well wall assures fast time response. Easily coiled/uncoiled for ease of shipment and installation. The entire inner assembly can be removed for repair or replacement without process shutdown.

TYPE 32

BUNDLE SENSOR UNIT uses MgO insulated metal sheathed THERMOCOUPLES, RTD's, or THERMISTORS. Diameters of 1/8" and larger are available as required by bore size and number of sensing points required. Sensors can be packed either in one or two layers around a support core. Can be mounted with or without a thermowell by use of threaded sealing fitting.

TYPE 33

SPRINGLOADED BUNDLE — THERMOCOUPLES, RTD's, or THERMISTORS — MgO insulated metal sheathed sensors attach to a guide rod and are held against the well wall by means of either a leaf spring or bimetal strip activated at operating temperature. Positive contact is the result of the integrity of the spring.

TYPE 34

GUIDE TUBE UNIT — THERMOCOUPLES, RTD's — Wells have high mechanical strength for use in high pressure, high temperature, or extremely adverse environments. Individual MgO insulated metal sheathed sensors are springloaded within their respective guide tubes. Hot junction terminates directly against a plug welded to the wall of the well insuring excellent temperature transfer and fast response. Extremely long life with little maintenance, greater reliability. Sensors can be replaced individually, safely and easily without shutdown of the process.

Multipoint assemblies are generally housed within a custom flanged well or pipe protection tube able to withstand the temperatures, pressures and corrosives within the vessel. Junction boxes of sheet steel, stainless, cast iron or aluminum (epoxy-coated if necessary) for general purpose, weatherproof or explosion-proof environments are either local or remote mounted. Any type of intermediate hardware can be supplied to interface the box with the well/sensor assembly.

- SPECIAL DESIGNS include:**
- "miniatures," small diameter units holding many probes with lengths over 100 feet
 - wells with cold end sealed against possible intrusion of process into enclosure
 - open ended guide tube assemblies permitting extension of sensor directly into process per your specifications



TYPE 19 24 Gage Alumina Insulated Noble Metal High Temperature Thermocouples

These thermocouples can be used unprotected in clean oxidizing atmosphere where forced flow is absent. In areas of contamination or forced flow, the use of Mullite or Alumina protection tubes is recommended for improvement of service life.

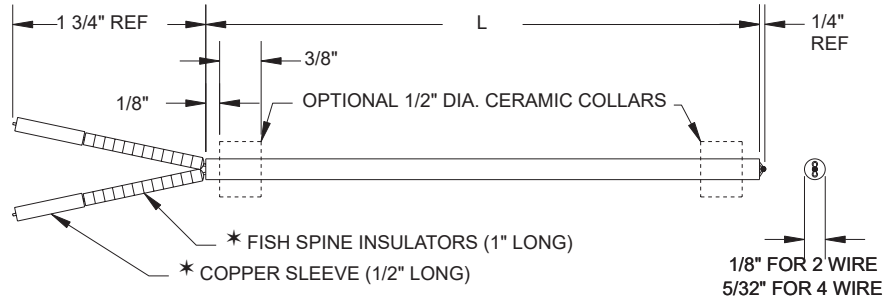
CALIB. CODE	% MATERIAL COMBINATION				MAXIMUM OPERATING TEMPERATURES — °F		
	(+)		VS	(-)		UNPROTECTED	† PROTECTED
	PLAT	RHO		PLAT	RHO		
PS	90	10		100		2550	2700
PR	87	13		100		2550	2700
P20	80	20		95	5	2700	3050
P30 (B)	70	30		94	6	2700	3100
P40	60	40		80	20	2850	3250

† GAS TIGHT TO 3100°F MAX. (SEE PAGE 24)

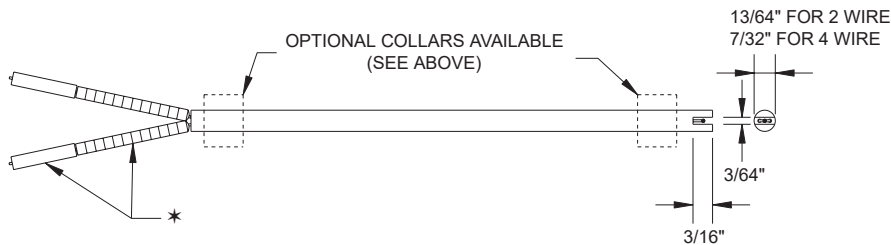
For PS, PR, and P30 Thermocouples, do not use indicator or recorder manufactured prior to 1973 unless they have a revised range scale to match the updated international practical temperature scale of 1968.



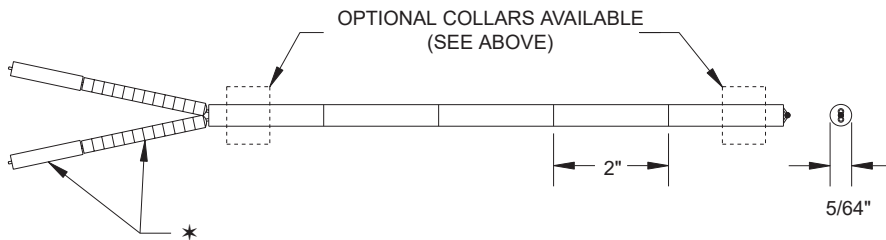
TYPE ▲ 19A SOLID BORE EXPOSED



TYPE ▲ 19B SOLID BORE PROTECTED



TYPE 19C MULTI-INSULATOR EXPOSED



▲ Maximum "L" length is 48"

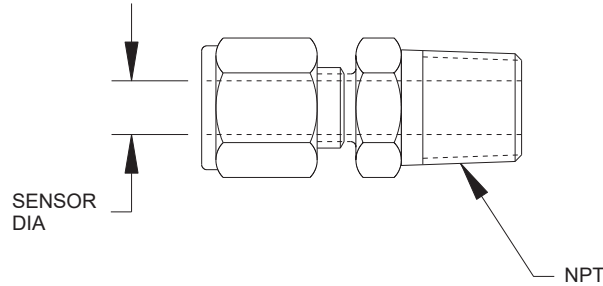
SENSOR				
LINE #	CALIB. CODE	TYPE	NO. OF WIRES	OPTIONS
1	PS	A		COLLAR
2	PR	B	2	JUNCTION CUP
3	P20	C		
4	P30 (B)	OTHER ADVISE	4	OTHER ADVISE
5	P40			

P/N 19 —

Complete using line no. for each column in sequence from left to right and specify dimension "L"



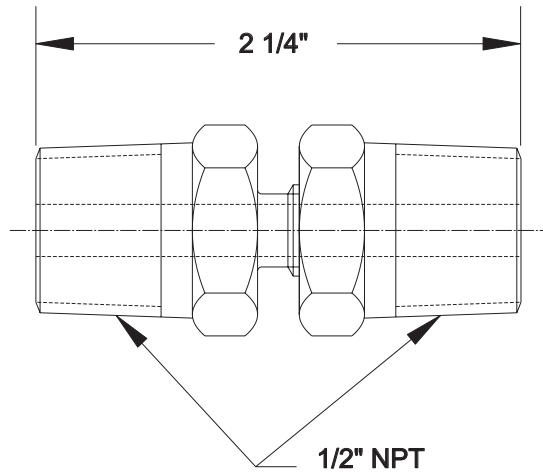
TYPE 77 Male Compression Fittings



NPT CONNECTION SIZE								
SENSOR DIA	BRASS				STAINLESS STEEL			
	1/8"	1/4"	3/8"	1/2"	1/8"	1/4"	3/8"	1/2"
1/16"	7701	7707	7713	7719	7725	7731	7737	7743
1/8"	7702	7708	7714	7720	7726	7732	7738	7744
3/16"	7703	7709	7715	7721	7727	7733	7739	7745
1/4"	7704	7710	7716	7722	7728	7734	7740	7746
5/16"	7705	7711	7717	7723	7729	7735	7741	7747
3/8"	7706	7712	7718	7724	7730	7736	7742	7748

FOR FERRULE TYPE ADD SUFFIX	
T FOR TEFLON Adjustable (425°F Max.)	M FOR METAL Fixed after initial adjustment (1560°F Max.)

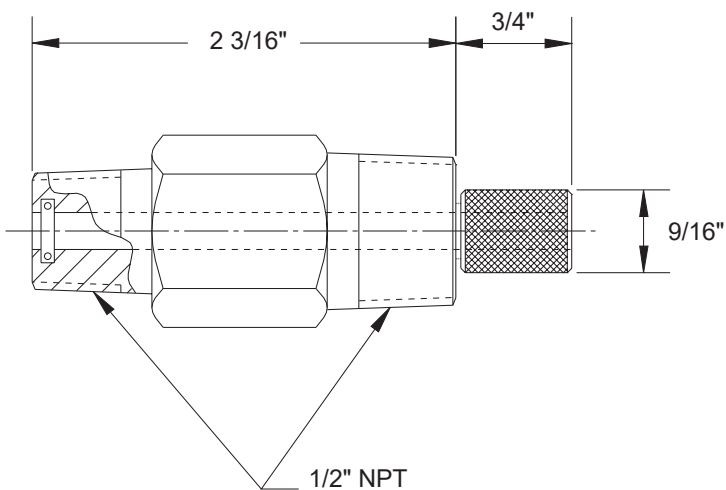
TYPE 78 Double Male Compression Fitting for 1/4" Probe



MATERIAL	TEMP-PRO TYPE
CARBON STEEL - NICKEL PLATED	781
STAINLESS STEEL	782
FOR FERRULE TYPE ADD SUFFIX: T FOR TEFLON * M FOR METAL ▲	
* Adjustable (425°F Max) ▲ Fixed after initial adjustment (1560°F Max)	

TYPE 783 Spring Loaded Fitting Stainless Steel for 1/4" Probe

20 P.S.I.G. Seal
Temperature Limit 260°C (500°F)



MODEL NUMBER	PROBE DIAMETER	BODY MATERIAL
-1	.188	STEEL NICKEL PLATED
-2	.215	
-3	.250	
-4	.188	316 STAINLESS STEEL
-5	.215	
-6	.250	

REFRACTORY PRODUCTS

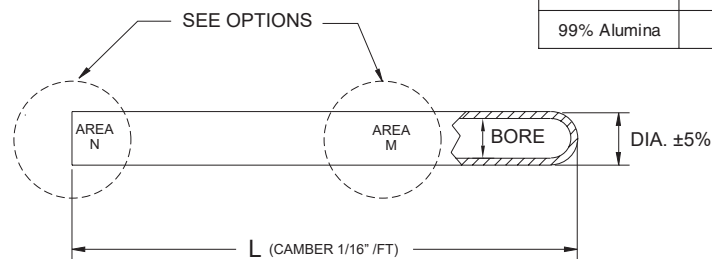
TYPE 21 Ceramic Protection Tubes

MULLITE ($2\text{SiO}_2 - 3\text{Al}_2\text{O}_3$) is an excellent high temperature material combining low thermal expansion and mechanical strength in oxidizing atmospheres. It is available in lengths up to 60" and with the option of both ends open.

ALUMINA (Al_2O_3) is a more chemically resistant, harder, stronger and more refractory than Mullite. This material is normally used in high temperature vacuum furnaces, metallizing, abrasive and corrosive environments. It is available in lengths up to 48" and with the option of both ends open.

SIZE CHART		
DIA.	BORE	CODE
5/16	3/16	210
3/8	1/4	211
1/2	5/16	212
1/2	3/8	213
11/16	7/16	214
3/4	1/2	215
7/8	5/8	216
15/16	11/16	217
1	3/4	218
1 1/8	7/8	219
1 1/4	1	21X

MATERIAL	CODE	GAS TIGHT TEMP. °F
Mullite	E	2600
96% Alumina	A	2800
99% Alumina	H	3100

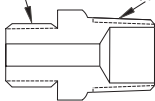


OPTIONS

Cemented in place options

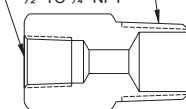
For Area N

1/2" OR 3/4" NPSM 3/4" TO 2" NPT



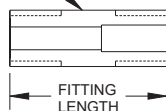
OPTION 3

1/2" TO 3/4" NPT 3/4" TO 2" NPT



OPTION 6

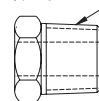
3/4" TO 2" NPT NIPPLE (SIZE DEPENDS ON TYPE SELECTED)



OPTION 7

For Area M or N

3/4" TO 2" NPT



OPTION 9

[†]If used in area "N," threads will be engaging from open end of tube.

To order — Specify:

1. Size/Code
2. Material code
3. Length "L" (in cases where fitting for area "N" is used, then "L" length specified will be considered as that part which extends below the fitting.)
4. Option if required
 - a. Thread sizes
 - b. Fitting material
 - c. Location (if option 9)
 - d. Length (if option 7)
 - e. Specify temperature at area "M" or "N"



TYPE 22 Refractory Thick Wall Outer Protection Tubes

Normally these tubes are used with inner protection tubes as shown on page 24 and in conjunction with noble metal or 8 gauge "K" calibration thermocouples, as shown on pages 21 and 17, respectively.

SILICON CARBIDE (96.5% SiC):

For use in high temperature furnaces, reactors and in the non-ferrous metal industries.

FEATURES:

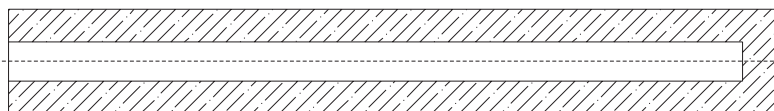
Non-contaminating, hard and dense, non-wetting, high heat-shock resistant, superior corrosion and abrasion resistant, 4000°F working temperature in inert atmospheres, highly resistant to oxidation up to 2900°F. These tubes perform well with Aluminum at 1470°F, Lead at 1110°F, and Tin at 750°F.

SIZES AVAILABLE:			
O.D. ± 1/16	I.D. ± 1/8	WALL ± 1/16	Temp-Pro Type
2"	3/4"	5/8"	*221
1 3/4"	1"	3/8"	222
1 1/4"	3/4"	1/4"	223
3/4"	1/2"	1/8"	224
1/2"	1/4"	1/8"	225

LENGTHS: 12" TO 36" ±1/8

NOTES: Warpage 1/16" / ft.
Out of round 1/8" max.

* Special Composition Tube — 62% Silicon Carbide, 28% Carbon, 10% Alumina with a Sodium Boroclicate Glaze on O.D.





TYPE 226 Refractory Silicon Carbide Protection Tube



For use in high temperature furnaces, reactors and in the non-ferrous metal industries.

FEATURES:

- High temperature strength (retains shape to 3000° F under load)
- Impervious to most gases and liquids
- Excellent thermal shock resistance
- High thermal conductivity
- Superior corrosion and abrasion resistance

O.D. (IN)	O.D. TOL. (IN)	I.D. (IN)	I.D. TOL. (IN)
3/8	± .015	1/4	± .015
5/8	± .025	3/8	± .025
3/4	± .025	1/2	± .025
1	± .030	1/2	± .025
1 1/4	± .040	3/4	± .040

All sizes available in lengths 6" to 54" (length tol = ± .125")

Specify:

Type, O.D., I.D., and Length



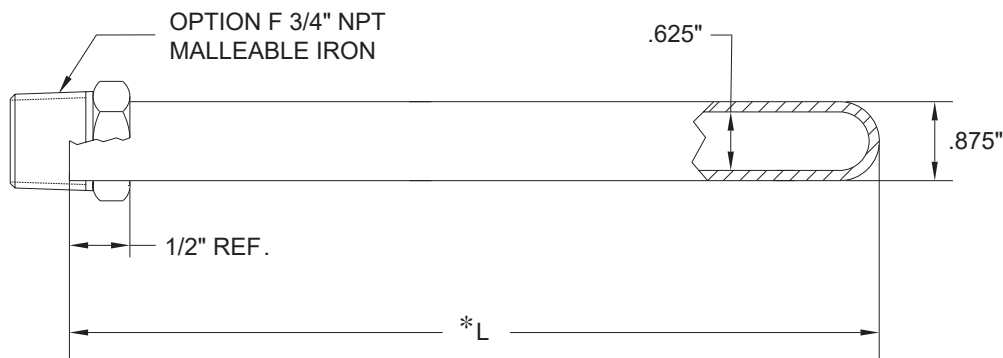
TYPE 54 Special Cast (77Cr, 23Al₂O₃)

PROTECTION TUBE FOR USE IN OXIDIZING ATMOSPHERES UP TO 2500°F

Thermal conductivity comparable to stainless steel. Resistant to wetting by most molten metals except Aluminum. Chemically inert to sulfur dioxide and hydrofluoric acid. NOT recommended for use in carburizing or nitrogen atmospheres.

TYPICAL APPLICATIONS:

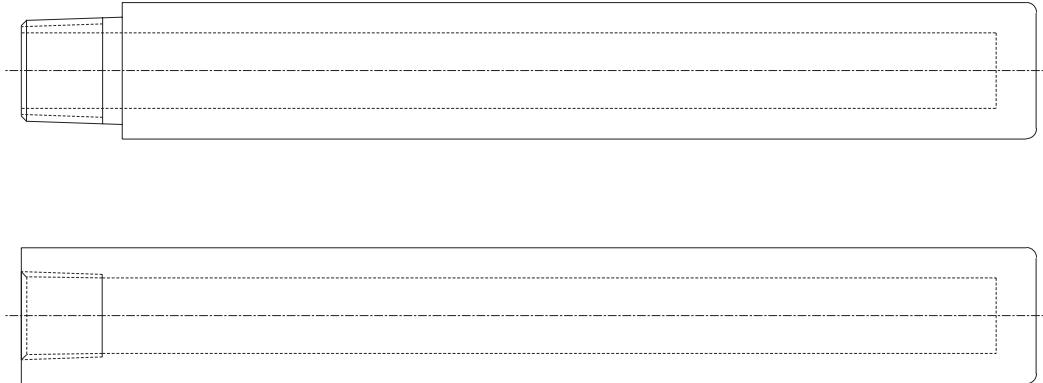
- Blast furnace and stack gases to 2400°F
- Sulphur burner gases to 2000°F
- Chemical process reactors to 2500°F
- Copper base alloys to 2100°F



* Lengths Available: 9"; 12" thru 36" in 6" increments; 48"

TO ORDER — SPECIFY: Type, Length and Option "F" if Required.

TYPE 57 Special Heavy Wall (1 11/16" O.D. x 15/16" I.D.)



Cast iron protection tubes, which are coated with a combination of Alumina, Cobalt, Borax and Feldspar for temperatures up to 1400°F, are used for molten aluminum, zinc and lead applications.

TYPE 57a supplied with 3/4" NPT internal tap

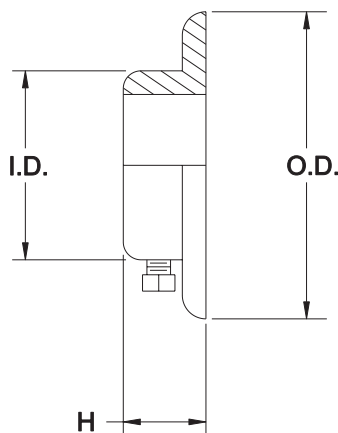
TYPE 57c supplied with 1" NPT external thread

SPECIFY: Type and Length

Sizes are 12" to 72" in 6" increments

TYPE 79 Adjustable Flanges / Plugs and Chains / Caps

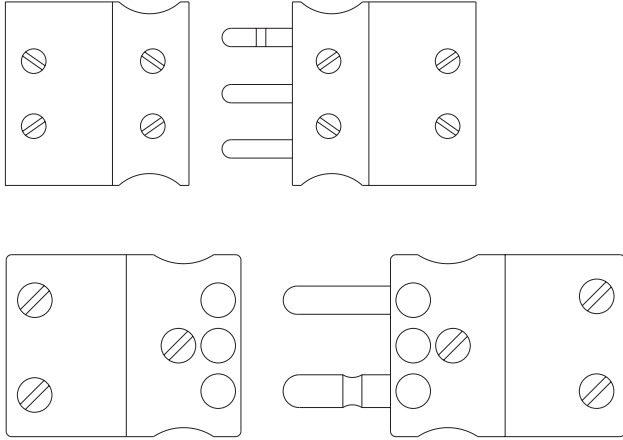
ADJUSTABLE FITTINGS



FOR PIPE SIZES	I.D.	O.D.	H	TEMP-PRO TYPE
1/4"	9/16"	3 1/4"	7/8"	7901
1/2"	55/64"	3 5/8"	7/8"	7902
3/4"	1 1/16"	3 5/8"	7/8"	7903
1"	1 9/16"	4 1/2"	1 1/4"	7904



TYPE 69 Standard Plugs and Jacks



Features

- Cases of glass filled nylon
- Pins machined from solid thermocouple bar stock or rolled from .020 sheet
- Polarity and calibration marked
- Negative terminals marked with red discs
- Compatible with similar standard connectors
- Accepts standard tube adaptors and cable clamps
- Knurled finger grips
- Temperature rating (400°F Max.)

TYPE 69P Miniature 2-Pin

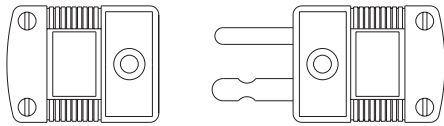


CHART A		
MATERIAL CODE	COLOR CODE	TO BE UTILIZED WITH
J	Black	Iron - Constantan
K	Yellow	Chromel - Alumel
E	Purple	Chromel - Constantan
T	Blue	Copper - Constantan
S	Green	Pt - Pt 10% Rh
R	Green	Pt 10% Rh - Pt 13% Rh
C	White	Copper - Copper

Suffix Code

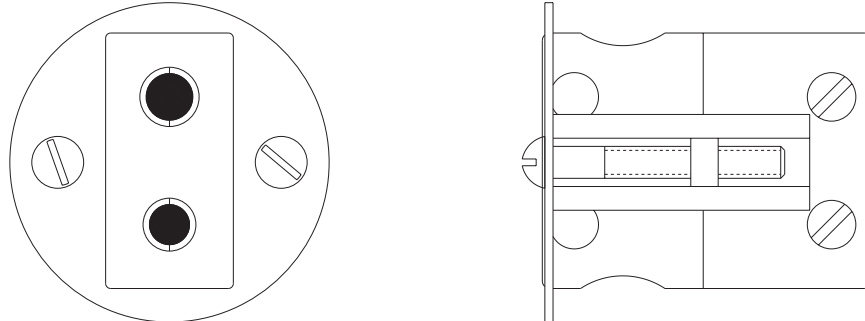
- T** = Tube adaptor, indicate tube size: 1/16", 1/8", 3/16", 1/4", 5/16"
- E** = Cable clamp; specify single or dual
- H** = Higher rated material to 800°F (brown color only)
- X** = Temperatures to 1000°F
- B** = Neoprene covered boot
- G** = 3-prong type used for RTD's or thermocouples having a ground
- D** = Dual (4 or 6 prong) plug/jack arrangement
- S** = Solid pins
- P** = Nickel plated pins

To Order, Specify:

1. Type number.
2. M = plug.
F = jack.
3. Material code from Chart A.
4. Add suffix code if applicable.



TYPE 70 Circular Panel Jacks

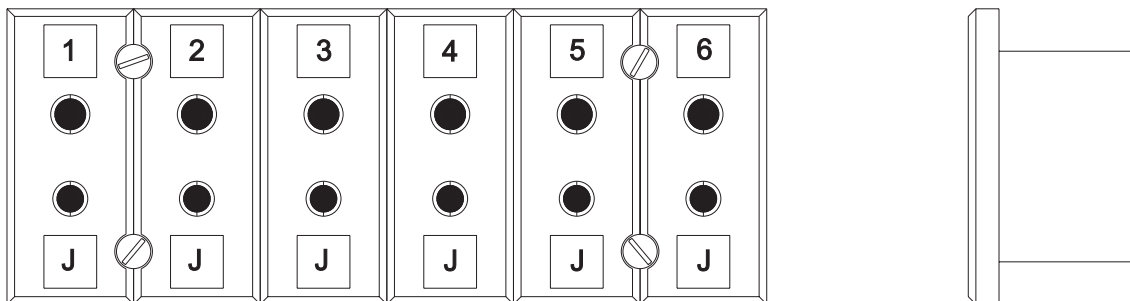


Single circuit - for fitting in standard 3/4" knock-out (1 1/8" diameter)

Self-fastening - fasteners hold tight in walls up to 1/4" thick, front mounting and wiring.

CHART "A"	
MATERIAL CODE	TO BE UTILIZED WITH
J	Iron - Constantan
K	Chromel - Alumel
E	Chromel - Constantan
T	Copper - Constantan
PS	Pt - Pt 10% Rh
PR	Pt 1% Rh - Pt 13% Rh
CU	Copper - Copper

TYPE 71 Universal Panel Jacks



TO ORDER - SPECIFY:

1. Type number
2. Material code from Chart "A"
3. For high temperature (800°F) add suffix code "H"



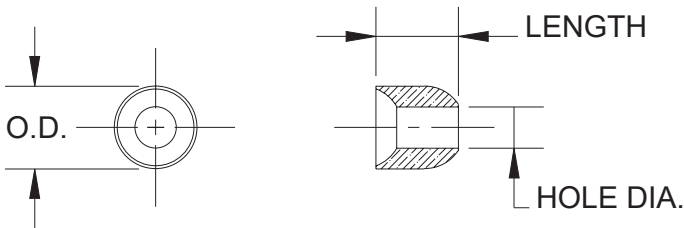
TYPE 80 Ceramic Insulators (2600°F)

Round



O.D.	HOLE DIA.	FOR GAGE	LENGTH	PART NO.	
				2 HOLE	4 HOLE
1/2"	11/64"	8	1"	8001	8009
			3"	8002	8010
1/4"	5/64"	14	1"	8003	8011
			3"	8004	8012
3/16"	5/64"	20	1"	8005	8013
			3"	8006	8014
3/16"	1/32"	24	1"	8007	8015
			3"	8008	8016

Fish Spine



HOLE DIA	O.D.	LENGTH	FOR GAGE	PART NO.
5/32"	17/64"	1/4"	8	8017
5/64"	11/64"	11/64"	14	8018
1/16"	7/64"	7/64"	20	8019

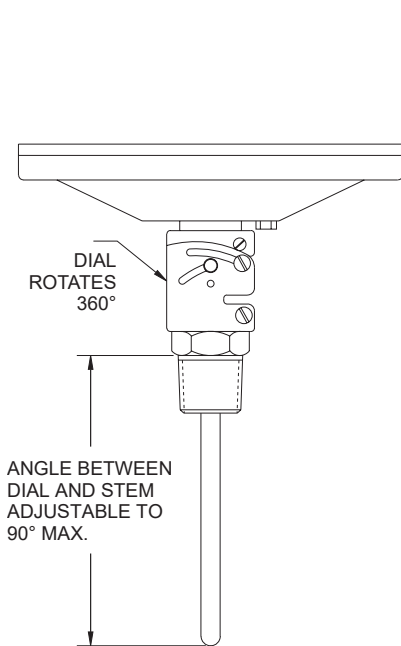
OTHER SIZES AND TYPES ARE AVAILABLE

SPECIFY:

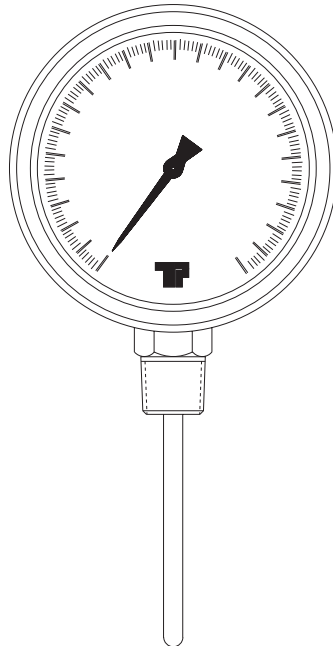
1. Material (Mullite or Alumina)
2. Number of holes
3. Applicable gage size
4. Type (round or oval) – dimension(s)
5. Length



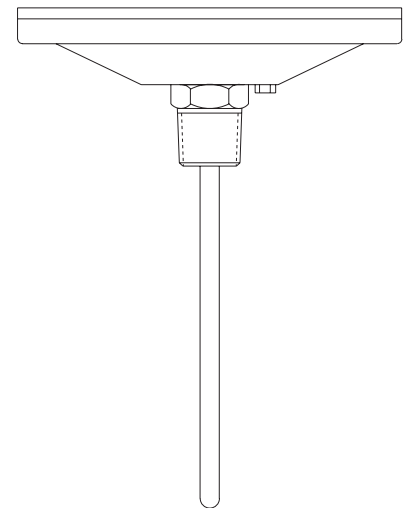
TYPE 83_ Bimetal Thermometers



**Multi-Angle
Type 830**



**Side Connection
Type 831**



**Back Connection
Type 832**

- All SS construction.
- Accuracy within 1% of included range.
- Anti-parallax scale - balanced pointer.
- Overrange protection.
- Dial range to 750°F max.

P/N = ① ② ③ ④ ⑤

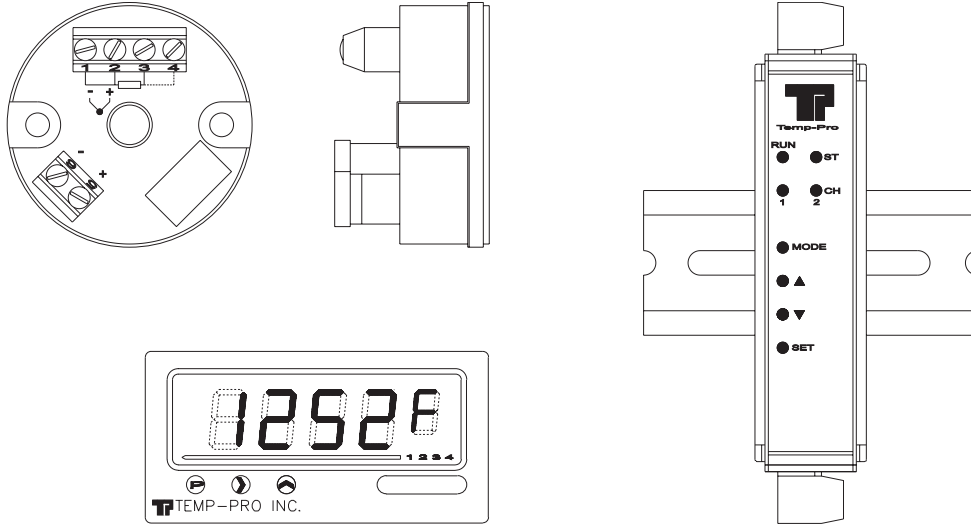
Where:

- ① Type No.
- ② Specify Range
- ③ Specify Degree °C/°F
- ④ Stem Length
- ⑤ Option Code(s)

		OPTIONS X = AVAILABLE			
LINE #	CODE	DESCRIPTION	MULTI-ANGLE	BACK CONNECTION TYPE	SIDE CONNECTION TYPE
1	Q	IF CASE TEMPERATURE EXCEEDS 225°F, SPECIFY TEMPERATURE	X	X	X
2	H	SHATTERPROOF FRONT	X	X	X
3	F	PLASTIC FRONT	X	X	X
4	T	TOP CONNECTION			X
5	B	BOTTOM CONNECTION			X
6	R	RIGHT SIDE CONNECTION			X
7	J	LEFT SIDE CONNECTION			X
8	S	SILICON FILLED	X	X	X
9	A	EXTERNAL RE-SET AND CALIBRATOR	X	X	X



Temperature Transmitters and Digital Indicators



Transmitters for RTDs and Thermocouples

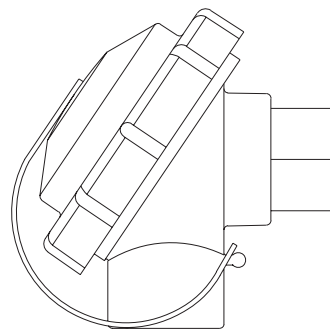
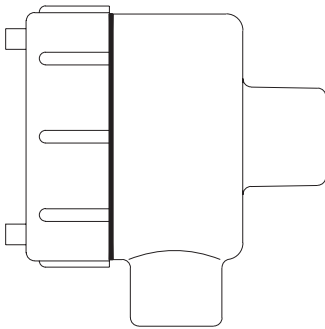
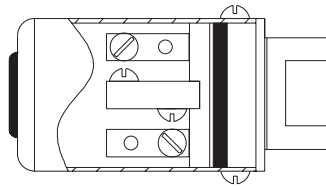
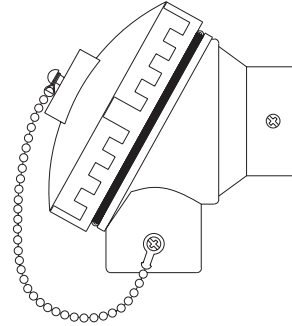
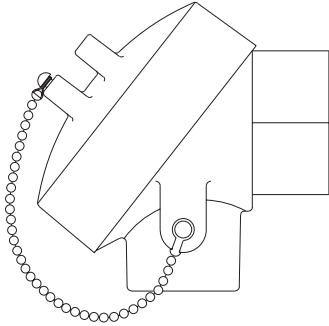
- RTD
 - PT-100 or custom inputs
 - 2, 3 and 4 wire configurations
- Thermocouples
 - Types K, J, T, R, S, E, F (L), N or custom inputs
- Ranges
 - Factory set to standard or custom ranges
 - Push button calibration
 - Smart programmable calibration
 - Smart HART® communication protocol

Temperature Indicators

- In-head mounting
- NEMA-4 front panel mounting
- Relay alarms
- Isolated retransmission
- RS485 Modbus serial communication

HART® is a Registered Trademark of the HART® Communication Foundation

TERMINAL HEADS



MATERIALS

- Aluminum
- Cast Iron
- Polypropylene
- Stainless Steel

TERMINAL BLOCKS

- 2, 3, 4, 6 Wire
- Fixed
- Spring Loaded
- Terminal Strips

SIZES

- 1/2" through 1" process
- 1/2 or 3/4" conduit
- Bushings available for various modifications

STD FINISH

- Zinc plating
- Epoxy coating
- Rubber coating
- Polished

RATING

- Explosion Proof
- NEMA
- CENELEC
- International Electrotechnical Commission (IEC)
- UL Listed
- National Electrical Code (NEC)

OPTIONS

- Ground screw
- In-head transmitter
- Miniature style heads



SPEC. SHEET FOR : THERMOCOUPLES, RESISTANCE or THERMISTORS PROBE

Operating Temperature (°F) _____; Max. Temp at Leads (°F) _____; Probe Dia. _____;
Sheath Mat'l. _____; No. of Leads _____; Length of Leads _____;

IF THERMOCOUPLE:

Calibration – J , K , T , E , Other _____; Measuring Junction – Grounded , Ungrounded , Exposed

IF RESISTANCE PROBE:

100 Ω Platinum , Other _____; Tolerance ± _____ at _____ °F

IF THERMISTOR:

_____ Ohms at _____ °F; _____ % Tol. At Fixed Point _____; _____ % Tol. Over Span of _____ to _____ °F

TERMINAL HEAD:

Standard Industrial Cast Iron , Aluminum ; Light Weight Aluminum ;
Class: Weather Proof , Explosion Proof .

EXTENSION:

Nipple , Nipple-Union , Nipple-Union-Nipple ; Length X _____, _____ NPT;
Sch 40 , Sch 80 ; Mat'l C'Stl , Galv. , S. Stl , Alum.

OPTIONS:

Spring Loaded ; Weld Pad ; Bayonet Cap ; _____,

HARDWARE (see page __):

Temp-Pro Type 77; Type 78; Type 783; Type 784 Fixed; Type 784 Removable.

LENGTH AS APPLICABLE:

Sensor Length Below Process or Well Connector _____ Sensor Length Below Terminal Hardware _____
Sensor Length Below Transition Potting Piece _____

TAG No.:

_____, _____, _____, _____, _____, _____, _____,

SPEC. SHEET FOR : THERMOWELLS or PROTECTION TUBES

MATERIAL:

Well or Protection Tube _____ Flange or Mounting Bushing _____
Accessories _____ Type Plug & Chain, Adj. Flange

DRILLED BARSTOCK:

Bore (I.D.) _____
Insertion Dia. (Straight); _____ to _____ (Taper)
Process Connection Size _____, Male , Female
Sensor Connection Size _____, Male , Female
Flange (Size, Rating, Type) _____, _____, _____
Lengths: Insertion "U" _____, Overall "L" _____
Special Configuration: 2-1/2" Reduced Tip , Other _____
Special Applications: Coating _____, Sheath _____
Finish _____, Heat Treatments _____

PROTECTION TUBE:

Pipe Size _____, Sch. Wt. _____
If Ceramic, O.D. _____, I.D. _____
Mounting Bushing Size _____
Tag No. _____, _____, _____, _____, _____, _____, _____,





TEMP-PRO
powering the world one degree at a time

*Sensor
Catalog*

OTHER PRODUCTS

In addition to the standard sensors we offer in this catalog, TEMP-PRO has complete custom design and manufacturing capabilities to assist you in any temperature sensing requirement. To complement our sensors we offer a complete line of sensing related products.

- Thermocouple and RTD Wire
- Compensated and Uncompensated Terminal Blocks
- Transmitters, Controllers, and Scanners
- Junction Boxes (Control Boxes)
- Wire and Cable Assemblies and Harnesses
- Gauge Panels
- Control Panels
- Liquid Level Detectors
- Remote Terminal Units (RTU's)
- Swamping (Averaging) T/C Boards
- Circuit Boards
- Thermowells
- Sanitary Thermowells
- Steam Sampling Nozzles
- Hydrogen Activity Probes
- Cement Kiln Assemblies (Thermowell/Thermocouple)
- Flat Strip Thermocouple/RTD's

TEMP-PRO Inc. • 200 Industrial Drive • Northampton, MA 01060
Telephone: (413) 584-3165 • Toll Free: (800) 991-9093 • Fax: (413) 586-3625
E-Mail: sales@temp-pro.com • Web Site: www.temp-pro.com


TEMP-PRO
powering the world one degree at a time